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## Book of Abstracts

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# Probabilistic Load Flow of Integrated Nepal Power System using Point Estimate Method

*Soni Kumari Sah<sup>a</sup>, Nava Raj Karki<sup>b</sup>*

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## Abstract:

Load flow analysis is an important tool used for planning, operation, protection and determining the steady state operation of electric power systems. Probabilistic load flow considers input uncertainties and aims to overcome the limitations of deterministic load flow in case of consideration of uncertainties of input parameters. This paper presents probabilistic load flow analysis of Integrated Nepal Power System (INPS) considering uncertainty of generation and load parameters using 2m+1 scheme of Point Estimate Method (PEM). PEM replaces the probability distribution of the random input variable with a finite number of discrete concentrations in such a way to preserve required probabilistic information of random input variable. Results of PEM obtained for IEEE-14 bus test system and INPS are presented and also compared against those obtained from Monte Carlo Simulation technique for checking the accuracy and suitability of PEM.

## Keywords:

Probabilistic Load Flow (PLF), Point Estimate Method (PEM), Monte Carlo Simulation (MCS), Integrated Nepal Power system (INPS)

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# Transmission Systems Resilience Assessment: A case study in Integrated Nepal Power System

*Swaechchha Dahal<sup>a</sup>, Nava Raj Karki<sup>b</sup>*

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## Abstract:

The dramatic impacts of earthquake and other natural disasters in the power system is of a growing concern. The impacts are reflected in infrastructure damage, service interruptions, casualties, and the financial burden for recovery. Various countries around the world suffer from loss due to such events. This paper presents a Monte Carlo based simulation to assess seismic impact on Integrated Nepal Power System (INPS). The resilience is quantified with demand not served (MW). The framework is a probabilistic approach to quantify the resilience of the transmission system subject to extreme earthquake. The study further provides criticality ranking of transmission lines. This paper aims on helping system operator to assess the performance of INPS under seismic attacks and be prepared to deploy proper branch strengthening schemes to enhance resilience of INPS.

## Keywords:

Integrated Nepal Power System (INPS), High Impact Low Probability (HILP), resilience metric, criticality ranking

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# Experimental and Simulation Analysis on Stress Developed , Deformation and Modes of Failure of Cables and Beam in Post Tensioning Process

*Rabin Hamal*<sup>a</sup>, *Sunil Adhikari*<sup>b</sup>

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## Abstract:

The use of prestressing in different structures has increased tremendously where the tensile force of the cable is used to provide the compressive force to the concrete. In the present context of Nepal, mainly post-tensioning process is used as the prestressing method in which the stress in cable attains pre-stress at the anchorage block after the maturity of the concrete. The objectives of this study are to find the ultimate tensile strength of the cable, deflection of the beam, and causes of failure of the cable and beam during the post-tensioning process. A mathematical and 3D finite element modeling of post-tensioned concrete beam was used to study the effects of the cable profile, eccentricity, and the magnitude of prestressing force. The deflection of the beam varied significantly on different cable profiles, eccentricity, and pre-stressing force on the cable. The maximum upward deflection was found on the beam with parabolic profile beam, the deflection rises with the increase in the eccentricity and the pre-stressing force. The accuracy of the results obtained from the ANSYS model was validated by comparing it with the result of the mathematical model.

## Keywords:

Pre-stressing, Post-tensioning, anchorage block, 3D finite element, cable profile, eccentricity

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# Kinetics of Manganese Removal from Bore Well Water (Using Katalox Light, BIRM and ISR)

*Chandan Kumar Sah<sup>a</sup>, Iswar Man Amatya<sup>b</sup>*

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## Abstract:

Groundwater scarcity and quality degradation has been a pertinent issue in Kathmandu Valley (KV). The high concentration of Manganese in the groundwater is the major issue in the drinking water quality. This research work presents the removal of Manganese through comparative study of Combined Media Filtration (CMF) to rapid sand filtration (RSF) at three different flow rates. Gravel, Katalox Light, Burgess Iron Removal Method (BIRM), Iron Specific Resin (ISR) and sand are commonly used filter media for CMF and RSF respectively. CMF is catalytic physical surface adsorption purification process of high removal capacity of Manganese through oxidation with precipitation following filtration with higher pH. Two identical filter columns packed with Katalox Light 1.24 mm, ISR 0.56 mm, BIRM 1.23 mm and sand 0.57 mm were used and operated at three discharges viz., 0.018, 0.020 and 0.022 l/s at Manohara-Besi Water Supply Committee located in Changunarayan Nagarpalika, Bhaktapur and detailed study was conducted.. For influent Mn concentration up to of 0.750 mg/l, the effluent Mn concentration was found to be 0.030, 0.041 and 0.044 mg/l in CMF and 0.542, 0.561 and 0.572 mg/l in RSF at 0.018, 0.020 and 0.022 lps respectively. The average Manganese removed at 0.018, 0.020 and 0.022 lps were found to be 95.000, 93.363, and 92.920 % in CMF and 10.500, 9.507, and 8.850 % in RSF of influent average Mn concentration respectively. The Mn removal was found to be more effective at flow rate of 0.018 l/s. CMF and RSF Filters were backwashed with backwashing velocity of 24 m/h with periodic 10-15 minutes and 36 m/h within 3 days respectively, when both filters were run in parallel for 1.5 hours in each filter runs. It was concluded that the CMF media could be a good media for the reduction of Manganese concentration at gravity flow.

## Keywords:

Bore Well Water, Manganese, Katalox Light, Burgess Iron Removal Method, Iron Specific Resin

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# Model Development for Entry Capacity Estimation of Selected Roundabouts of Nepal

*Bipin Gyawali<sup>a</sup>, Anil Marsani<sup>b</sup>*

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## **Abstract:**

This paper comprises development of entry capacity model to estimate entering vehicles from an approach of roundabouts for mix traffic conditions in Nepal. Entry flow, circulating flow and other geometrical data were taken from the roundabouts of cities like Chitwan and Itahari. The flow of the vehicles in these roundabouts, were video recorded from a suitable vantage point, while the geometrical data of the roundabouts were measured in the field. The data was analyzed through regression to formulate the entry capacity model from relevant parameters. From the analysis, it was observed that entry capacity of roundabouts was dependent upon the circulating flow in front of the corresponding entry flow, central island diameter, approach width and exit width.

## **Keywords:**

Roundabouts, Entry capacity, Regression analysis, Nepal

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# Conceptual Design and Stability Analysis of a Fixed Wing UAS Research Platform for Aerial Experiments

*Ashish Karki<sup>a</sup>, Kamal Darlami<sup>b</sup>, Sudip Bhattarai<sup>c</sup>*

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## Abstract:

Recently, the use of Unmanned Aerial Systems(UAS) in civil applications have been very popular. The UAS technology has also improved considerably. UAS can also be used in number of aerial experiments like air quality measurement and monitoring, aerial sensing,etc. The UAS used in these research are highly limited to the multicopter drones (mainly quadcopters) which poses significant endurance limitation due to their high energy consumption. As an alternative to this problem, a fixed wing UAS design is proposed that can be used as a baseline platform to fly the test equipment onboard and perform the aerial experiments. The conceptual design of the UAS is done analytically. The conceptual design involves takeoff weight estimation, constraint analysis, configuration selection and propulsion system selection. The cruise performance of the aircraft was studied analytically and the stability analysis was done using the low fidelity analysis tools such as XFLR5. The mission specification of the proposed UAS, Conceptual Design, Performance Estimation and Static and Dynamic Stability of the UAS is presented in this paper.

## Keywords:

Unmanned Aerial System, Conceptual Design, Constraint Analysis, Wing loading, Power loading, Static Stability, Dynamic Stability

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# Performance Analysis of Shard Selection Techniques on Elasticsearch

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## Abstract:

Distributed systems typically consist of several nodes connected together for handling search operations. Data is divided into those nodes for the purpose of parallel processing and replications. Elasticsearch is the popular distributed search engine where data is organized into indices. Each index of Elasticsearch consists of one or more shards and those shards can be distributed over different nodes. When a search operation is performed on a particular index, sending the search requests to all the related shards distributed over different nodes might result in high latency especially when the size of the cluster is large and nodes are far apart. Shard Selection is the technique that attempts to forward the query to the highly relevant shards discarding other non-relevant shards and thus decreasing the latency. Shard selection comes with the cost of relevance, it's obvious that the application of the shard selection algorithm might decrease the query relevance. There are several shard selection algorithms developed time and again. Among them, ReDDe, Sushi, and Rank-S are very popular. In this paper, implementation of those three algorithms, performance analysis along with the optimization of shard-related parameters are done.

The experimentation is performed using Insider Threat Test Dataset(CERT V6.2) collected from Carnegie Mellon University site. In terms of average latency, Rank-S is performing 14.92% and 9.83% better than SUSHI and ReDDe respectively. Similarly, in terms of Average Document Score, Rank-S is performing 21.68% and 5.488% better than SUSHI and ReDDe respectively.

## Keywords:

Nodes, Elasticsearch, Index, Shards, ReDDe, Sushi, Rank-S

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# Biogas Production from the Horse Dung

Ashok Dhakal <sup>a</sup>, Ram Kumar Sharma <sup>b</sup>, Iswar Man Amatya <sup>c</sup>

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## Abstract:

This study aims to identify the potentiality of biogas generation from the Horse dung in a batch digester at the urban city of Kathmandu Valley. The experiment was performed at psychrophilic temperature zone of  $21.3^{\circ}\text{C} \pm 1.3^{\circ}\text{C}$  with dilution at 7% of Total Solids. On average, the percentage composition of methane was 52.48% and carbon dioxide was 36.26% throughout the study period. The maximum % composition of methane was observed to be 57.20% on the 11<sup>th</sup> May 2021 (i.e. 12<sup>th</sup> Day of the Experiment) and minimum of 44.59% on the 2<sup>nd</sup> May 2021 (i.e. 3<sup>rd</sup> day of the Experiment). Similarly, the % composition of carbon dioxide was maximum on the 2<sup>nd</sup> May 2021 and minimum on 20<sup>th</sup> June 2021. The favorable pH range of 6.5 to 7.5 for anaerobic digestion of biomass was observed within the range for 65.45% of the total experiment days. The % composition of methane content rises till the 12<sup>th</sup> day of the experiment and remains almost neutral till the end of the experiment while the carbon dioxide composition decrease with increase in methane composition and remains almost same until the end of the experiment. While, other gases composition slowly increases till the 12<sup>th</sup> day and just increases slightly and remain in the range as described in the literature. The volatile solids decrease from 3160 mg/ltr to 1260 mg/ltr, destruction of VS was found to be 60.13% in this research. Similarly, the TS decrease from 6100 mg/ltr to 2500mg/ltr with utilization of 3600 mg/ltr. The cumulative volume of the biogas yield was 945-liter, maximum daily production of 47.50 liters was observed on the 9<sup>th</sup> Day of the experiment of corresponding pH 6.5 and temperature  $21.8^{\circ}\text{C}$ . Also, the average daily biogas production was observed to be 17.18 liters.

## Keywords:

biogas, methane, horse dung, renewable energy, biomass

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# Seismic Impacts on Tunnels in Different Rock Mass

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## Abstract:

Several cases of tunnel damage during major earthquakes have challenged the conventional belief that tunnel structures are relatively safe during seismic events. These experiments remind us that the seismic behavior of hydroelectric tunnels needs to be studied in more detail. Therefore, a 2-D plane strain pseudo-static approach is used to determine the seismic impacts on different sized tunnels in different rock mass using finite element modelling software. Different post failure characteristics such as elastic – brittle plastic, strain softening and elastic – perfectly plastic has been used to model the rock mass. In this study, different size of tunnel ranging from 2.00m - 8.00m and rock-mass properties varying from GSI 30 - 75 was used to examine the effect rock mass quality on different sized tunnels. The study showed that for a constant seismic loading, the magnitude of axial force for both the static and seismic cases increase as the tunnel dimension increases and rock mass quality decreases. This increment was seen to be significant in case of poor rock mass and larger tunnel sizes.

## Keywords:

Seismic axial force, Geological Strength Index (GSI), Tunnel

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# Urban Heat Island: A Case study of Kathmandu Valley

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## Abstract:

Rapid urbanization influences the local climate, making cities warmer than its countryside and woodland areas, increase in frequency and magnitude extreme climatic events, that exploits the healthy living environment. Land Use Land Cover (LULC) change influences physical properties of soil and hydrological cycle, eventually alter the temperature. This study focus on the study of surface temperature and Urban Heat Island (UHI) of Kathmandu valley distinctly in Kathmandu, Bhaktapur, and Lalitpur district, as a result of the use of remote sensing and ArcGIS in respect of cities, and countryside and woodland areas. The Landsat 8 satellite's Operational Land Imager (OLI) and Thermal Infrared (TIR) bands were applied to evaluate urban heat islands. Mono window Algorithm (MWA) is used to estimation of land surface temperature. Six weather station temperature data were used to validate analyzed land surface temperature from satellite remote sensing and GIS. Result shows urban sprawl influence on spatial distribution of land surface temperature and existence of hot spot in the central areas of the Kathmandu valley. Central zone of the valley experiences high surface temperature in respect of the neighbouring rural areas. Dense built up areas has significantly higher temperature than the vegetative and water bodies areas.

## Keywords:

Urban Heat Island (UHI), Land Surface Temperature (LST), Land Use Land Chnage (LULC), Remote sensing, Mono Window Algorithm (MWA).

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# Simultaneous Reconfiguration with Optimal Placement and Sizing of D-STATCOM in a Radial Distribution System Using Genetic Algorithm

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## Abstract:

In this composition, a multi objective approach is changed to a single objective minimization function as the weighted sum of power loss, Voltage profile Index and Load Balancing Index. Each single objective minimization function is tested on various weighted methods and analyzed giving equal importance to each objective function. This paper mainly concentrated on Genetic Algorithm(GA) using script environment of MATLAB software and an optimal position of the switches to be opened are obtained. Backward Forward Sweep method is the process from which load flow of the distribution network is done in view of power as flow variable and reconfiguration of the radial distribution network is obtained by branch exchange method which is used to figure out the simultaneous reconfiguration and optimal sitting and sizing of DSTATCOM as a distribution flexible ac transmission system (DFACT) device and its impacts on the distribution system . Reducing power loss, improvement in the load balancing of the feeder and voltage profile improvement is the main intent of this research. The intended approach is validated based on the IEEE 33-bus test system. The obtained results verified that simultaneous reconfiguration with optimal sizing and placement of DSTATCOM reduced the power loss, improved the voltage profile Index and increase Load balancing of the feeder. The obtained outcomes has been correlated with the base value and found that simultaneous reconfiguration along with DSTATCOM is more beneficial than the separate reconfiguration and separate DSTATCOM placement in the radial distribution system and based on different weightage value all findings is analyzed.

## Keywords:

Simultaneous Reconfiguration, Distribution system power loss, Voltage Profile Index, Load Balancing Index, GA

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# A case study of Pokhara Industrial Estate to Estimate Cost of EENS and Perform Reliability Worth Analysis

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## **Abstract:**

Estimation of cost of unserved energy and reliability worth analysis of industrial distribution feeder provides clear concept on value of lost load and its impact on cost of production of manufacturing industries. It provides the useful input tools for electricity planner and policy maker to take serious about ways to reducing outage costs and its impact to customers. In this paper, distribution system modification options are suggested to improve reliability of PID feeder of Pokhara DCS to reduce economic losses of customers and utility due to power outages. Due to unreliable electricity supply with unplanned interruption industrial consumer losses their revenue which reflects losses in national economy as a whole. Cost of EENS is estimated by three different analytical methods depending on customer status of stand by generation system and their perception of willingness to pay/accept higher tariff for improved supply. Results obtained from different methods were analyzed and weighted average of results estimated the cost of EENS of feeder as NRs.41.46/kWh. The estimated economic loss due to power outages in Pokhara Industrial Estate is NRs. 4,81,238.74 per outage and their losses depend upon the customer category and size of industries. In this paper, reliability assessment of PID feeder also conducted to identify the existing reliability indices of distribution system and financial risk associated with existing reliability indices. After estimation of cost of EENS in initial phase of study, distribution system modification options and their reliability worth were computed and compared. Paper concluded optimal modification option is addition of 11 kV overhead redundant line from common grid substation which yields better financial gain and improved reliability of system.

## **Keywords:**

Cost of EENS, Reliability indices, Outage cost, Modification Option

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# Performance Evaluation of Slow Sand Filter Using Fuzzy Rule-Based System

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## Abstract:

Most chemical and biological systems are not linear in nature. To account for the non-linearity of the processes in slow sand filters, fuzzy rule-based system with classification was used to model slow sand filter in Siddhipur Water Treatment Plant, Lalitpur. Membership functions were created using regular hierarchy, and rule conclusions were generated by using the values which have the most matching degree. A total of 82 data rows of inlet turbidity, filter runtime and outlet turbidity was collected for 3 filter cycles for the modeling. Takagi-Sugeno method was used for the fuzzy inference, and outlet turbidity was used as the output variable. Both modeling and validation of the model was done. The modeling showed accuracy of 75.6 % over all the data rows. For validation, the model showed accuracy of 81.25 %. The observed and inferred outlet turbidities showed a value of mean absolute error of 0.2561. Open-source software FISPRO was used for fuzzy modeling.

## Keywords:

filtration, sand, model, fuzzy, grey box

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# Spatial and Temporal Analysis of Landslides during Last Decade in Nepal

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*Bhim Kumar Dahal*<sup>c</sup>, *Keshab Sharma*<sup>d</sup>

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## Abstract:

Landslides are very dangerous in mountainous places such as Nepal, posing a threat to human life, economic damage, and environmental destruction. Despite this scenario, Nepal continues to lack a credible attempt to identify landslide-prone regions, which is a necessary first step toward landslide prevention and mitigation. The purpose of this study is to offer a spatial and temporal analysis of landslides in the Nepal Himalayas and to identify regions at risk of landslides. Ten years of landslide data were collected from 2011 to 2020 to assess annual variations, investigate the relationship between rainfall and landslides, describe the landslide distribution pattern, conduct statistical spatio-temporal analysis, and finally, predict the causes and influential factors of landslides. The findings indicate that landslide occurrences are spatially and temporally concentrated, with 93.26% of all landslides occurring during the wet season. For the cumulative frequency distribution of daily landslides, clear power-law correlations are found. Additionally, the mean centres of landslides are shifting each year, with the majority centred in the country's central area.

## Keywords:

Landslides, Spatial Distribution, Temporal Distribution, Power Law, Nepal Himalayas

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# Multi-Hazard Vulnerability Assessment of Reinforced Concrete Bridge

*Roshan Ghimire<sup>a</sup>*

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## Abstract:

The present study presents vulnerability assessment of a reinforced concrete bridge under the combined effect of ground motion and foundation scouring effect. The critical structures like bridges are highly susceptible to foundation scouring, resulting into failure of bridge. To address this multi hazard scenario, Ratu bridge across Ratu river in Mahottari district of Nepal is considered as the study bridge. Nonlinear time history analysis is performed to evaluate the seismic performance of the bridge. Soil structure interaction is introduced to address the scouring effect. Scouring of soil around foundation causes loss of lateral support. To account this, soil springs are removed up to the scour depth. Parametric analysis is performed varying the scour depth. Nonlinear static pushover analysis is performed to evaluate the capacity of bridge pier. Finally, fragility curves are developed to demonstrate the vulnerability of bridge in the absence and presence of scouring effect under simultaneously occurring seismic excitation. Results show that under the increased scour depth the bridge becomes more flexible. The study concludes that under the combined effect of earthquake and scouring effect, fragility of bridge increases with increase in its scour depth. Hence it is recommended to consider multi hazard scenario like earthquake with flood induced scouring in the performance analysis of bridge.

## Keywords:

Multi-hazard, Scour depth, Soil foundation interaction, Displacement ductility, Fragility

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# Optimal Conductor Reinforcement and Hosting Capacity Enhancement for Radial Distribution Line of Beni Feeder

*Sobit Bahadur Chhetri<sup>a</sup>, Ram Prasad Pandey<sup>b</sup>, Menaka Karki<sup>c</sup>*

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## Abstract:

With the high penetration of DG, the operational limit violation problems can occur in the power system if it exceeds the hosting capacity (HC). One of the measures for increasing hosting capacity would be upgradation of conductor. In this paper, an existing radial distribution system of Beni feeder, Milanchowk substation is studied under various loading conditions. The conductors are upgraded with the conventional optimization tool and feeder reinforcement using SSO, and the effect on system loss, voltage and hosting capacity were analyzed. The loss is minimum for the reinforcement with SSO. The hosting capacity was calculated with generation ranging from 25% to 200% of the peak load with existing, conventionally optimized and reinforced feeder are 55%, 65% and 87% respectively. Along with the higher hosting capacity and lower loss, the reinforcement approach is also supported by the financial analysis.

## Keywords:

Distributed Generation, Conductor Reinforcement, Hosting Capacity, FSBS, SSO

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# Seismic Response of Building Resting on Hill Slopes

Anil Dangol <sup>a</sup>, Gokarna Bahadur Motra <sup>b</sup>

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## Abstract:

Due to the scarcity of flat lands and rapid growth in population, residents are obligated to shift towards hill slope for shelter risking their lives. The buildings situated in hilly areas are much more vulnerable than plain area due to presence of mass irregularities, stiffness irregularities and geometric irregularities, hence susceptible to severe damage when subjected to seismic action. In this study, behavior of step back and step back-set back building under slope of 34 degrees are studied under variation of number of storey from 7 to 9 and their response is compared with plain area building. The analysis is performed to determine the impact of variation of storey's number of building situated at sloping ground on time period, base shear, top storey displacement, performance level and column shear forces and torsion of structure.

## Keywords:

Base Shear, Top storey displacement, Torsion, Performance point, Fundamental Time period

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# Seismic Performance Evaluation of Historic Temples

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## **Abstract:**

The Gorkha Earthquake 2015, including past earthquakes have damaged Nepalese heritage structures beyond recovery. The damage and survival of the historical structures have taught us a lesson on existing vulnerability of typical traditional Nepalese monuments. The paper presents the seismic evaluation of three representative multi-tiered temples with varying number of roofs, plinth area and stories, namely Maju Dega Temple, Changu Narayan Temple, and Chundevi Temple. Using Etabs, The analytical models were generated and optimized using the references from past research works. The structures were assessed for various load cases including gravity load and earthquake loads in terms of Seismic Coefficient Method and Response Spectrum Method as per NBC 105:2020. Results show that the selected three Nepalese Temples are stiff with natural period less than 0.36 seconds. The temples are vulnerable to earthquake forces. The temples fail under compressive, tensile and shear stresses at various locations. The bottom story core wall, piers and spandrels around openings are the most vulnerable parts during an earthquake.

## **Keywords:**

Masonry, Response Spectrum, Heritage Structures, Multi-tiered Temples, Monuments, Seismic Vulnerability

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# Energy Management System for Hybrid PV-Wind-Battery Based Standalone System

Amit Rouniyar <sup>a</sup>, Menaka Karki <sup>b</sup>

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## Abstract:

This research proposes an Energy Management System (EMS) for a small-scale Hybrid PV-Wind-Battery based standalone system. PV energy and wind energy are used as primary energy sources, with the battery serving as a backup supply. The Solar Energy Conversion System (SECS) and the Wind Energy Conversion System (WECS) are modeled and simulated separately with the help of different boost and buck converters. This work also discusses the design, simulation, and implementation of a multi-source renewable energy system MPPT control technique based on a Fuzzy Logic Controller (FLC). Renewable sources are varied according to the solar irradiance and wind speeds while loads are kept constant. The DC load is connected directly to the DC bus, while AC load is connected via inverter. After the addition of the both system, if the power cannot sustain the load due no wind and foggy atmosphere, the battery system is incorporated to support the system. It incorporates the EMS using fuzzy logic for the power balance of the system. For the better performance optimization, operational efficiency and the reliability of the system, hybrid PV-WT-Battery system in modeled and simulated in MATLAB/Simulink. This system is for standalone mode, it provides the foundation for further study with interface to the grid and many other problems.

## Keywords:

Solar Energy Conversion System(SECS), Wind Energy Conversion System(WECS), Energy Management System(EMS), Fuzzy Logic Controllers(FLC), MATLAB/Simulink

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# Seismic Vulnerability Assessment of School Building

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## Abstract:

Seismically undermined infrastructural facilities and poor construction, specifically of school buildings, make the lives of youth severely vulnerable during earthquake. Vulnerability assessment of school building that are constructed before and after 2015 Gorkha earthquake need to be done within time. This paper has evaluated the seismic performance of three different typology building (RC frame) commonly found in Kathmandu. Both Non Linear Static and Dynamic analysis was carried out to evaluate the performance of the buildings in three different earthquake having different peak ground acceleration value. The weak links in the building from which the potential failure may be initiated is studied using pushover analysis. Probability of occurrence of different damage state when subjected to different earthquake was analysed using fragility curve. These analysis has been performed using finite element analysis software SAP 2000. After analysis it has been concluded that the performance of the building constructed after 2015 Gorkha earthquake following the IS 1893:2016 code was within the targeted performance level.

## Keywords:

Vulnerability Assessment, Pushover Analysis, Time History Analysis, Fragility Curve

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# Effect of Excitation Directionality in Seismic Performance of Concrete Gravity Dam

*Sagun Basnet<sup>a</sup>, Rajan Suwal<sup>b</sup>*

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## Abstract:

The purpose of this study is to examine the influence of the direction of earthquake on the seismic performance of a concrete gravity dam under a single earthquake event. For this purpose, the proposed dam of Nalgaad Hydropower Project is selected with some modifications in which the seismic events in two directions are applied along the horizontal axis, namely from upstream to downstream and from downstream to upstream to assess the maximum structural demands. A non-linear dynamic analysis of the Dam-reservoir-foundation system subjected to seven recorded seismic events is conducted to study the effects of a single earthquake event where the responses of models are compared in terms of crest displacement with respect to bottom of dam, principal stress at heel, plastic strain at heel and toe slip of the dam. The results show that the damage parameters and crack propagation processes of concrete gravity dam can be drastically changed with the applied direction of earthquake.

## Keywords:

Concrete gravity dam, Earthquake direction , Single earthquake event,damage demand

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# Comparative Seismic Fragility of RC Bridge under Horizontal, Simultaneous Horizontal & Vertical Excitations

*Sunil Thapa*<sup>a</sup>

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## Abstract:

This paper presents the seismic vulnerability assessment of the multi span simply supported RC bridge under various ground motion with or without considering vertical excitation. Nonlinear analysis of bridge model was done to determine the seismic performance of the bridge. Structural capacity was determined by nonlinear static pushover analysis and seismic demand was established by nonlinear time history analysis. In the time history analysis, seismic inputs are given considering three-dimensional earthquake time history data. Two horizontal components are used as seismic force with or without considering the vertical excitation in both direction of bridge structure. Nine numbers of time history data recorded in a peer strong motion database has been used for this study. The seismic vulnerability of the bridge structure has been determined in terms of maximum displacements at the pier top. The horizontal response of the structures in terms of displacement ductility demand induced at pier top under seismic excitation is determined. The critical sections of the bridge are identified with different damage states having distinct capacity in terms of displacement ductility. By plotting the probability of exceeding the different damage states in ordinate vs input ground motion in the abscissa, fragility curves are produced. Using this comparative fragility curves, it is concluded that the horizontal response quantities like displacement, displacement ductility were not considerably influenced by vertical ground motion but the effect is seen with slight increase in the probability of damages for different states. Based on the findings, RC bridges that are subjected to both horizontal and vertical ground motion may be more vulnerable than those that are just subjected to horizontal ground motion. For a reliable seismic assessment of an RC bridge in the nearfield area, where V/H is likely to be high, including vertical ground motion in the study is recommended.

## Keywords:

Vertical Excitation, V/H Ratio, Hammerhead Bridge Pier, Damage States, Fragility Curves, Seismic Vulnerability

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# Seismic Performance of Reinforced Concrete Frame Building with Fluid Viscous Damper

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## Abstract:

The recent influx of high magnitude earthquakes over the past few years create a scope of study in the field of seismic protection and its value in safeguarding the structures like buildings and bridges. Conventional practices like addition of shear wall and bracing systems add stiffness and strength to structure. But, as we add stiffness to the structure this decreases the period hence increasing the acceleration and demand to the structure. In alternative, there can be a method to reduce the dynamic responses and demand base shear by adding supplementary damping to the structure. In order to adequately protect against seismic activity, energy dissipation devices such as fluid viscous dampers (FVDs) are often applied to mitigate structural sway in structures. The prime objective of this paper is to study the effect of damper parameters for the design of nonlinear FVD on Reinforced concrete framed structure to enhance the seismic performance. A general finite element package of ETABS has been used to generate three dimensional model of four storey reinforced concrete building to undertake non-linear Time History analysis to capture the performance of building with and without damper for different damper parameters and different damper distribution. The main responses of comparison between structures modeled with different viscous damper parameters are story displacement, story drift, and Base shear. After analysis the results showed that installing non-linear FVD with appropriate parameters reduces the responses of structure during seismic event. The lower the velocity exponent the more efficient the viscous damping for seismic energy dissipation. Diagonal corner damper distribution is more effective than mid chevron (double diagonal) distribution of presented RC structure.

## Keywords:

Reinforced concrete structure, Fluid viscous damper, damping coefficient, velocity exponent, Time History Analysis

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# Seismic Vulnerability of Hospital Building

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## **Abstract:**

Building should be designed as structural element to dissipate seismic energy well beyond their elastic limit and pre-constructed building should be strengthening according to their performance. Static nonlinear analysis is carried out to check the performance of building. After many damaging earthquake occur, many number of researches done in the field of building against earthquake. Most part of Nepal is seismically vulnerable area. In this research to access the vulnerability of the structure, development of fragility curve methodology is adopted. Fragility curve shows the probability of prescribed level of damage that on earthquake can causes in a structure for different range of PGA values. In this research building is consider as high code seismic design level according to HAZUS MH MR3 technical manual. Fragility curves represent the expected damage and observed damage have converted into probability for slight, moderate, extensive and complete damage state.

## **Keywords:**

Vulnerability, Fragility curve, Static nonlinear analysis, Damage state

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# Simplified Non-Linear Seismic Analysis of URM Buildings

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## Abstract:

Nepal first published National Building Code in 1994 A.D. However, even after publication of the building code it was not being referred in most of the building designs and constructions. Thus, many seismically vulnerable structures still existed in Nepal that not only susceptible to collapse but may also have affect adjoining structure too. Various past earthquakes resulted in a greater loss of human life and property, structural damages and interrupted the social development. Due to poor construction practices without earthquake safety provisions, haphazardly growing development and lack of awareness amongst the general public and government authorities; the earthquake risk in this area has been significantly increased. This study present the realistic situation of seismic performance of Unreinforced Masonry buildings in the Kritipur Municipality of Kathmandu Valley. In this paper, non-linear seismic analysis of unreinforced masonry buildings is carried out using Simplified Analysis of Masonry buildings(SAM).The method used in this study is based on an equivalent frame idealization of walls subjected to in-plane loading.Rapid Visual Screening survey was carried out on existing URM buildings of Kritipur municipality of Kathmandu Valley and the most representative buildings are selected for the analysis. Two dimensional modeling is done in equivalent frame method, each wall with opening is modeled in to parallel structural walls made of an assemblage of piers and a portion of spandrels. The pier and spandrel elements are modeled as beam-column elements with shear deformation, while the connecting elements are supposed infinitely resistant and stiff, and are modeled by means of rigid offsets at the ends of the pier and spandrel elements. The finite element model of One, Two and Three Storey with rigid floor building is prepared using SAP 2000 v17.2, analyzed and the capacity curves for each are obtained.

## Keywords:

Unreinforced Masonry Buildings, Equivalent Frame Model, Pushover Analysis, Fragility Curve, FOSM

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# Performance Analysis and Rehabilitation Prospective of Aged Small Hydropower Plant – A case study of Fewa Hydropower Plant (1 MW)

*Mahesh Bashyal<sup>a</sup>, Laxman Poudel<sup>b</sup>*

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## Abstract:

Fewa Hydropower Plant is under operation since more than 50 years. Due to continuous deterioration of hydro mechanical and electromechanical components, efficiency of the plant has been reduced significantly. The study investigates the plant rehabilitation prospective after conditional assessment status of power plant along with evaluation of performance indices which indicates current operational scenario. In engineering project investments, financial analysis has been regarded of paramount importance. So, overall financial analysis for assessment of rehabilitation along with performance improvement approaches by increasing efficiency, better operational practices, safety and regulatory capacity of hydropower plants results to improve operational stability and reliability of power supply system thus illustrating main objective of rehabilitation of hydropower projects. One lesson of this exercise is to include hydro plants in rationally planned rehabilitation cycles despite of emergency rehabilitation. Energy generation per annum from rehabilitated plant is 5.35 GWh greater than existing plant and difference in Annual Revenue is NRs.35.21 Million. Financial Analysis indicators BC ratio, IRR, NPV and Payback period indicates project feasibility. Thus, the investigations have shown that the project holds great scope for rehabilitation.

## Keywords:

hydropower, rehabilitation, performance, financial analysis

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# Nepali Speech Recognition using LSTM-CTC

*Rupesh Shrestha <sup>a</sup>, Basanta Joshi <sup>b</sup>*

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## **Abstract:**

Speech recognition system is developed which is able to transcribe an audio input to text format. The system is based on a combination of the Long short-term Memory neural network architecture and the connectionist temporal classification function. Word Error Rate of 40% for isolated word recognition without connectionist temporal classification layer and 34.3% on sentence recognition of Nepali speech corpus with connectionist temporal classification is achieved.

## **Keywords:**

Artificial Intelligence, Automatic Speech Recognition, Connectionist Temporal Classification (CTC), Softmax, Nepali Speech Recognition, Long Short-Term Memory (LSTM)

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# Study of a Flow-Induced-Vibration Energy Harvester: A Case of Two-degree of Freedom Galloping Based Scheme

Ankit Gautam <sup>a</sup>, Mahesh Chandra Luintel <sup>b</sup>

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## Abstract:

The energy harvester based on galloping is an appropriate means to convert flow-induced vibration to electric energy at the small wind speed. The study aims to expand the energy extraction of galloping based piezoelectric energy harvester (GPEH) by using two degrees of freedom (DoF) based GPEH over the normal one degree of freedom based GPEH. The optimum secondary beam was attached to the primary beam of one degree-of-freedom GPEH to design the two-degree-of-freedom GPEH and the results are compared in terms of power peaks and efficiency. The performance analysis of the two-DoF GPEH system has been done with respect to tip mass and the position of the secondary beam. The designed models are numerically analyzed in ANSYS using a Realizable  $k-\varepsilon$  turbulent model along with the two-way coupled fluid-structure interaction simulations. The result shows that the maximum power peaks increased by 15.88% and the efficiency improved by 0.972%. The results from the performance test of the two DoF GPEH suggest that the optimum position for the secondary beam is close to unfixed end of the primary beam at 0.75D. Moreover, the tip mass has a rare change in power peaks at low tip mass while higher tip mass causes to decrease in the harvested power.

## Keywords:

Galloping Energy Harvester, Flow-induced vibration, two-DoF GPEH, Fluid-Structure Interaction

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# Seismic Performance Evaluation of Stone Masonry Building

*Paras Khati*<sup>a</sup>

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## **Abstract:**

Unreinforced stone masonry has been popular mode of construction in Nepal. Past earthquakes in Nepal had shown evidence of large damage in stone masonry buildings. The study is focused on typical residential unreinforced stone masonry buildings. For the analysis, two dimensional modeling is done in thick shell modeling of wall; timbers in both directions were provided assuming only one direction timber acts one at a time. From the research it is found that the existing forms of the buildings are highly vulnerable for future earthquake. The piers of stone masonry buildings fail in tension. The insufficient floor rigidity, improper connection between the walls, ongoing deteriorated structure elements reduces the performance of the building.

## **Keywords:**

Stone Masonry, Seismic Coefficient, Seismic Performance, Response Spectrum

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# Assessment and mapping of Liquefaction Potential of Chitwan by Deterministic and Reliability Approach

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## Abstract:

During Seismic activity, liquefaction is one of the effects which results in failure of structures, damage to property and loss of life. Nepal lies in one of the most seismically active regions in the world. Large number of earthquakes have occurred from past to till date in Nepal. The historical seismicity data and recent seismic activities in Nepal and adjoining areas indicate that Nepal is at high seismic risk. In Chitwan district during 2015 Gorkha earthquake, sign of liquefaction was reported. So, liquefaction potential evaluation of selective areas of Chitwan district is done in this research. This study uses both deterministic and reliability technique for predicting the liquefaction potential of soils due to seismic activity of selective areas of Chitwan. In deterministic approach, liquefaction potential assessment is done by calculating factor of safety. Models and parameters involved in deterministic approach has certain uncertainties due to which different models give dissimilar safety factor. So, in order to deal with the different uncertainties involved in the deterministic approach, reliability analysis is required. Using reliability analysis, the liquefaction potential can be accessed in terms of the probability of occurrence of liquefaction. Liquefaction Potential Index is calculated using both deterministic and reliability method and comparison is done. Also factor of safety against liquefaction and liquefaction potential index are calculated at different earthquake scenarios and it is seen that with increase in magnitude and peak ground acceleration, the liquefaction potential of soil increases considerably. In this study liquefaction potential maps of some areas of Chitwan are generated and it is seen that at Gorkha earthquake 2015 magnitude 7.8 and PGA 0.192g, only some southern parts near to Rapti river tends to have very high liquefaction potential and from map generated using reliability method, it is seen that more areas are susceptible to very high liquefaction possibility.

## Keywords:

Liquefaction, Earthquake, Chitwan, Deterministic, Reliability, First order second moment(FOSM)

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# Residential Sector Energy Demand and Scenario Analysis: A case study on Province 1 of Nepal

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## Abstract:

This paper presents the energy consumption, energy demand and scenario analysis of the residential sector of Province 1 over the period 2019-2030 using the LEAP model. Four scenarios were developed, Business as usual (BAU), LPG substitution scenario, Improved Cooking Stove (ICS) scenario and Sustainable Energy Development Scenario (SEDS). The study shows that in the BAU scenario, the final energy demand of the residential sector of province 1 is expected to be 30.15 PJ, whereas in the SEDS, the final energy demand is expected to be 12.6 PJ such that the total energy demand in cooking decreases by 58% in year 2030. Hilly region has a potential of energy saving compared to other region such that about 64% of energy saving can be achieved in hilly region in SEDS. The electricity consumption per capita in residential sector increases upto 449.2 kWh in the year 2030 in SEDS scenario. In BAU scenario, the GHG emission increases to 534 kt (kiloton) of CO<sub>2</sub> equivalent from 462 kt of CO<sub>2</sub> equivalent in 2030. In SEDS scenario, the GHG emission drops to 56 kt of CO<sub>2</sub> equivalent due to technology policy intervention. The study also shows that electricity consumption per capita in residential sector increase to 292 kWh in 2030 if LPG is substituted with electricity resulting to higher consumption of electrical power thus enhancing the energy security of nation. However, above results can only be achieved with the coordinated action of both provincial and federal government promoting renewable energy systems and energy efficient technologies rather than use traditional firewood and fossil fuels systems.

## Keywords:

Emission, Energy Demand, LEAP and Scenario

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# Efficiency of Tube Settler at Various Angle of Inclinations in Controlled Discharges

*Prashant Bhatta <sup>a</sup>, Iswar Man Amatya <sup>b</sup>*

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## **Abstract:**

High-rate tube settlers are a cost-effective way to update and improve the capacity and efficiency of treatment plants, particularly sedimentation tanks. They take up far less area than traditional sedimentation tanks, in addition to being more efficient. For the Nayabazar Townplanning Groundwater Project (NTGWP), the study aims to calculate the turbidity removal efficiency of tube settlers at various angles of inclination with changing discharge. The study has been carried out at varying flows of 9.33 lps, 10.5 lps, and 11.5 lps for the 77° inclination angle and 60° inclination angle, and the data were analyzed to find the best flow conditions. The removal efficiencies of tube settlers increased for each flow condition at 60° inclination compared to 77° inclination, but decreased as the discharge increased.

## **Keywords:**

tube settlers, efficiency, groundwater, discharge, inclinations

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# Comparing Various Methods to Estimate Evapotranspiration and its Correlation with Air Temperature

*Prabin Shrestha<sup>a</sup>, Narendra Man Shakya<sup>b</sup>*

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## Abstract:

Evapotranspiration (ET) is one of the significant processes in the hydrological cycle. Its measurement is difficult as it is a function of complex weather variables (temperature, radiation, humidity, etc.,). Air temperature can be used to infer the characteristics of weather data like evapotranspiration. The main objective was to develop a correlation between air temperature and evapotranspiration (ET) in a relatively cold climate basin. To achieve this purpose, spatial evapotranspiration (both actual and potential evapotranspiration) was calculated using Penman-Monteith (PM) method by SWAT model and also calculated manually using the FAO-56 method which is the updated version of the well-known Penman equation (Penman,1948). As both of these methods are radiation-based, the Thornthwaite method to estimate PET which is based on temperature was also compared and correlated. The evapotranspiration results from all methods were compared and the relationship between air temperature and evapotranspiration was determined. The rise and fall patterns of evapotranspiration with respect to time were similar for PM and FAO-56 methods. However, the PET values from PM were found to be more dispersed than the reference ET obtained using the FAO-56 method. The general relationship between ET and temperature was found to be positive for all sub-basins and the polynomial regression relationship can be applied to estimate the evapotranspiration both daily and monthly for the desired temperature. Even so, the low value of goodness of fit ( $R^2$ ) indicated that ET is challenging to predict for any region especially the colder regions.

## Keywords:

Evapotranspiration, Penman-Monteith, FAO-56, Thornthwaite, SWAT, Air temperature

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# Suspended Solids Removal Kinetics Comparison in Tube Settler

*Basant Lekhak<sup>a</sup>, Iswar Man Amatya<sup>b</sup>*

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## Abstract:

Suspended solids removal efficiency of tube settler was analyzed by measuring turbidity at several flow rates. 4\*2.8\*2 m dimension tube settler with 85 cm long, 40 mm dia. meter tubes was operated to meet the research objective. Evaluation of tube settler was conducted for four discharges viz., 4.5, 7, 8.5 and 10 litre per seconds (lps). The maximum turbidity removal efficiency was found to be 50.786% at flow rate of 4.5 lps (maximum removal in comparison to other discharge rates). This indicates the effectiveness of the tube settler. The observed actual data was compared with the YAO model, Khatri model and Rajbanshi model to check the validation of the model at the tube settler of Siddhipur Water Treatment Plant. YAO model developed based on coagulated water, and Rajbanshi model developed assuming linear relationship between influent and effluent turbidity cannot be justifiable for this study. Khatri model is showing same trend of data with the observed analytical method as both are for plain sedimentation concept. Khatri model can be used for the tube settler and the factor for the representation of observed value to Khatri model is 0.786.

## Keywords:

Efficiency, Models, Suspended solids, Surface Overflow, Tube Settler, Turbidity

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# Voltage Profile Improvement and Power Loss Reduction of Bairiya and Bankul Feeder of 33/11 kV Gaur Substation

*Sumesh Raut <sup>a</sup>, Rajesh Kaji Kayastha <sup>b</sup>, Dayasagar Niraula <sup>c</sup>*

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## Abstract:

One of the most critical areas of power loss and low voltage profile occurs in Radial Distribution System (RDS) due to undersized conductors, overloading of bus bar, longer feeder length etc. The research focuses in voltage profile improvement and power losses reduction for performance improvement of distribution system. For this purpose, two feeders of Gaur substation of 33/11 kV are selected. Newton Raphson method is employed for carrying out the load flow analysis. The analysis is done for both the cases, i.e. base case loading and peak case loading. The charging substation of 8 MVA rating is injected at the bus with minimum voltage for Bankul feeder since it has poor voltage regulation to enhance the voltage profile and reduce the power losses. Replacement of conductors and transformer tap setting simultaneously helps in performance improvement of distribution system feeder. The active power loss of Bairiya feeder is 129 kW and 391 kW for base case and peak load condition without reconfiguration respectively. Replacement of the weasel and rabbit conductors with dog conductor and adjustment of transformer tap settings in Bairiya feeder reduces the power losses to 88 kW and 329 kW for base load and peak load respectively. This elucidates saving of 63 kW and 41 kW for Bairiya feeder in peak case and base case respectively. The minimum bus voltage for Bankul feeder during peak case loading is 5.25 kV, i.e. 47% of the grid voltage. This violates the NEA Grid Code Standard, 2011. Hence, after injection of 8 MVA substation in Bankul feeder, the bus voltage is improved to 10 kV, i.e. about 91% of the grid voltage. Hence, the feeder now meets the NEA Grid Code Standard. Total power loss for peak loading of Bankul feeder is found to be 152.16 kW, which results in saving of 1275.8 kW for peak case condition. On the other hand, 284 kW power is saved from base case condition after injecting Maulapur substation at Bankul feeder.

## Keywords:

Radial Distribution System (RDS), Electrical Transient Analyzer Program (ETAP), Nepal Electricity Authority (NEA), Voltage Profile, Power loss

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# User Behavior Analytics for Insider Threat Detection using Deep Learning

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## Abstract:

In the field of security analysis of an organization, identifying anomalous activities of user from log data for insider threat detection is difficult as well as important. Identification of such anomalous insider behavior is commonly achieved by use of behavior modeling. This paper presents an approach of one class learning, also known as unary classification or class modelling, where the model is exclusively trained on majority class data. The model learns what a model behavior for an employee of an organization is. The proposed paper attempts to detect the insider threat activities and monitor if any unexpected or suspicious behavior are observed by the model, which produces high reconstruction error within the model and are classified as anomalies. Training of the model implements feature vectors extracted form user log activities in a fixed window of per day. This approach implements Gated Recurrent Unit(GRU) based Autoencoder to model user behavior per day and detect anomalous insider threat points. Since the model is overfitted on normal data, the error produced by normal data is very low while the autoencoder produces high error on malicious class of abnormal data. The dataset used in work is Computer Emergency Response Team(CERT) r4.2 and feature vectors are derived according to the number of times a user performs certain activity within a day is used. Behavior learning through GRU autoencoder is used. At different threshold, performance of model was measured and the model demonstrated good distinction with minimum mis-classification for both classes with values of true positive and true negative rates at 79.81%.

## Keywords:

User Behavior Analytics, Anomaly Detection, GRU RNN Autoencoder, Feature Vectors, Classification Error

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# LSTM Encoder Decoder Model for Fake News Detection

*Niroj Ghimire<sup>a</sup>, Surendra Shrestha<sup>b</sup>*

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## **Abstract:**

With the advancement of technology, fake news is more widely exposed to users globally. Fake news can be found through popular platforms like social media and the Internet. There have been multiple solutions and efforts in the detection of fake news where it even works with artificial intelligence tools. The way to observe the fake news is using stance detection technique, is the focus of this paper. Given a set of news body and headline pair, stance Detection is the task of automatic detection of relationship among pieces of text. The stances between them can be described as 'agree', 'disagree', 'discuss' or 'unrelated'. In this paper, it is found that LSTM-based encoding decoding model using pre-trained GloVe word embeddings achieved 93.69 % accuracy on FNC-1 dataset.

## **Keywords:**

Fake news, Stance detection, NLP, LSTM

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# Sustainable Hybrid Distributed Energy System: A case study at Thingan, Makwanpur, Nepal

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## Abstract:

In rural areas where there is no national grid connection, renewable hybrid system may be a good solution for providing electrical energy. The sustainable development is possible only when there is good facility of electricity. This report proposed a sustainable hybrid system for the rural area, Thingan, Nepal. In order to have persistence, HOMER software is used for determining the optimized solutions. The best solution of optimized solution is obtained by using different dimensions and criteria for making the system sustainable. The different criteria used are technical, economic, environmental and social. Since different criteria are involved Multi-criteria Decision Analysis (MCDA) method is used for decision analysis. The obtained result indicates that the model with micro hydro, solar PV, wind turbine and battery system is more sustainable for Thingan. Sustainability is determined by reducing the cost, environmental hazards and increasing the social benefits, efficiency and reliability of the system.

## Keywords:

hybrid, HOMER, sustainable, energy

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# Convolutional Neural Networks for the Assessment of Fetal Echocardiography

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*Basanta Joshi*<sup>c</sup>, *Shashidhar Ram Joshi*<sup>d</sup>

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## Abstract:

Fetal echocardiography is a standard diagnostic tool used evaluation and monitoring of fetuses with a compromised cardiovascular system associated with several fetal conditions. Convolutional neural network (CNN) is a computer technology which can perform specific tasks with specific goals. In this study we have used deep learning techniques to evaluate fetal cardiac ultrasound images and improve the evaluation of fetal abnormalities. In this study, we implemented convolutional neural network (CNN), a deep learning algorithm for the processing and classification of ultrasonographic images into various classes. The tool we used was able to sort the fetal cardiac images into 5 standard view with 97.47% accuracy. Further, it was able to diagnose Tricuspid Atresia and HLHS with an accuracy of 84.68%. This deep learning based algorithm was an efficient tool for evaluation and monitoring of normal and abnormal fetal heart images

## Keywords:

Fetal echocardiography; Congenital Heart Defect(CHD); Deep learning; Convolutional neural network(CNN); Tricuspid Atresia(TA); Hypoplastic Left Heart Syndrome(HLHS)

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# Impacts of Pedestrian Traffic on Urban Form: A Case of Historic Core of Kathmandu

*Suman Limbu <sup>a</sup>, Padma Bahadur Shahi <sup>b</sup>*

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## **Abstract:**

Pedestrian movement is one of the most environmentally friendly modes of transportation. Pedestrian activity helps to preserve the environment by limiting the usage of automobiles that pollute the air and noise. From an economic standpoint, increased pedestrian traffic in the streets means more possibility for increased business. Pedestrian transportation also promotes engagement and communication, as well as social equality and fairness. As land use changes, so does the dispersion of pedestrians. This research focus on studying the impacts of pedestrian traffic on the urban form in historic core of Kathmandu. Kathmandu is rapidly urbanizing municipality where the pedestrian traffic has increased in even faster pace. To gain insight into the current scenario of study area, both qualitative and quantitative analytical methods were used using the data collected via interviews with key informants and questionnaire survey and pedestrian count at 8 different stations in the study area. Various elements with respect to urban form at study area were analyzed. The study has drawn conclusion and recommendations regarding the urban form and pedestrian traffic management for the municipality, and for the urban areas that are in stage of rapid urbanization.

## **Keywords:**

Pedestrian, Pedestrian Traffic, Urban Form, Pedestrian Traffic Management

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# Rising Temperature Trends across the Narayani River Basin in Central Nepal Projected by CMIP6 Models

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## Abstract:

A sound understanding of projected climate, including precipitation and temperature, is critical for an effective design and planning of adaptation and mitigation measures in combating the adverse effects of climate change. This study projects maximum ( $T_{\max}$ ) and minimum ( $T_{\min}$ ) daily temperature in the Narayani River Basin (NRB), central Nepal, for three future periods, namely, near (NF: 2021-2045), mid (MF: 2046-2075), and far (FF: 2076-2100). Three Global Climate Models (GCMs) were chosen from ten Coupled Model Inter-comparison Project Phase 6 (CMIP6) GCMs under two shared socioeconomic pathways, SSP245 (4.5 Watt/m<sup>2</sup>) and SSP585 (8.5 Watt/m<sup>2</sup>). The selected GCMs were bias-corrected using a linear transfer function after exploring several methods. Two statistical tests, i.e., Sen's Slope and Mann-Kendall, were employed to quantify the magnitude, direction, and significance of monotonic trends. Multi-model Ensemble (MME) of selected GCMs demonstrated a widespread and significant rising trend across the basin at all seventeen meteorological stations, with very few exceptions. The average annual  $T_{\max}$  across the NRB is projected to increase by ranging from 0.08°C to 1.09°C for NF, 0.74°C to 1.58°C for MF, and 1.45°C to 2.15°C for FF under the scenario SSP245. Similarly, under SSP585, the  $T_{\max}$  will increase ranging from 0.6°C to 1.40°C for NF, 1.26°C to 2.31°C for MF, and 2.90°C to 4.68°C for FF with respect to (wrt) the historical period (1980-2014). For  $T_{\min}$  under SSP245, is projected to increase ranging from 0.39°C to 1.24°C for NF, 1.53°C to 2.74°C for MF, and 1.85°C to 3.20°C for FF. Similarly, under SSP585, the  $T_{\min}$  is projected to increase ranging from 0.42°C to 1.46°C for NF, 2.08°C to 3.82°C for MF, and 3.30°C to 5.22°C for FF wrt the historical period. Furthermore, varying trends are expected across the seasons, in particular, higher deviation during winter (0.9°C to 5.4°C) followed by pre-monsoon (-0.1°C to 2.8°C) for  $T_{\max}$  while winter (0.8°C to 3.7°C) followed by post-monsoon (1.1°C to 4.1°C) for  $T_{\min}$  is seen across the basin. Our results indicated that the warming trend is more pronounced for the mountainous region, likely affecting high altitudes' snow and glacier cover. These bias-corrected projections of  $T_{\max}$  and  $T_{\min}$  can be used for climate change impact assessment in hydrology, water resources, and other sectors in the NRB.

## Keywords:

Climate Change, Coupled Model Inter-comparison Project Phase 6 (CMIP6), Global Climate Model (GCM), Narayani River Basin (NRB)

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# Pavement Condition Index for Airports: A case study of Simara Airport

*Swopnil Kalika <sup>a</sup>*

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## Abstract:

Airport Pavement Management System (APMS) is used worldwide for pavement management at airports for optimizing the timing and type of maintenance activities. Pavement Condition Index (PCI) is used as the indicator of pavement condition in APMS to track the pavement deterioration over the years. In Nepal, maintenance in airport pavements is carried out in piecemeal basis with major rehabilitation initiated only after serious operational issues without any systematic framework such as the APMS. This study, as a first step towards implementing APMS in the country, focuses on the various facets associated with determination of PCI for airports by considering a case study of Simara airport. The standard Deduct Value curves for 38 distress type and severity combinations used in PCI determination are transformed into polynomial functions of degree six relating deduct value and logarithmic of distress density, and validated by t-test for 114 readings. Distress survey is conducted for all 64 sample units at runway and all 7 sample units at taxiway and apron with the size of sample units ranging from 550 to 700 sq.m. Fourteen out of 38 total combinations are encountered amongst which longitudinal and transverse cracking, and ravelling are the most prevalent. The PCI for runway is 76, and that for taxiway and apron is 82 indicating that the pavement condition is satisfactory. The PCI values for all 64 sample units at runway fit normal distribution with 9.2 standard deviation. Finally, a 20% sampling rate is found to estimate PCI for the runway pavement within the widely accepted permissible error of 5 with 95% confidence level.

## Keywords:

APMS, PCI, Deduct Value Curves, Pavement Distress, Sample Units

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# Reaching the Unreached: Factors Affecting Community Participation in Local Development Project - A case of Taukhel

*Binu Maharjan<sup>a</sup>, Ajay Chandra Lal<sup>b</sup>*

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## Abstract:

The approach of “community participation” now stands as an established development strategy to promote a more equitable and sustainable development targeting the poor and vulnerable communities in developing countries. After the promulgation of the Constitution of Nepal in 2015, local governing bodies have been provided with new judicial, legislative and executive power with renewed focus on urban planning and effective service delivery. Furthermore, the Local Government Operation Act, 2017 made a provision to promote cooperativeness, co-existence and coordination between the federation, province and local level and deliver efficient and quality services by ensuring people’s participation, accountability and transparency. These changing settings bring major prospects as well as challenges to demand for effective public services and policies by re-evaluating the concept of citizen participation and strengthening public accountability in shaping social policy and improving public services towards attaining sustainable development. In any local development project oriented to community, citizens participation is largely influenced by several internal and external factors which may have intrinsic importance in determining the extent of participation in an uneven context. The participation should always be planning with people, implementation with people and sharing the benefit with people. Therefore, there is need to understand the factors that impact participation from community perspective for local government, policy makers as well as citizens themselves. This study therefore, aims to unpack mainly internal factors that are crucial to be considered during community participation in local development projects. It has basically tried to look into the three main internal indicators; socio-economic, level of awareness and capacity building with a case of community managed reconstruction of settlement after 2015 earthquake at Taukhel, Machhegaun initiated by Lumanti Support Group for Shelter.

## Keywords:

Community Participation, Sustainable Development, Socio-economic Factors, Level of Awareness, Capacity Building

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# Optimal Placement of Solar PV with Transformer OLTC to Improve Voltage Profile in Distribution Feeder: A case study of Industrial II Feeder of Bharatpur DC

*Pritam Raj Bista<sup>a</sup>, Bhriquraj Bhattarai<sup>b</sup>*

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## Abstract:

This paper presents genetic algorithm (GA) optimization including cost optimization, power Loss minimization and voltage improvement to determine the optimal location and size of the Solar PV with substation transformer OLTC in distribution system. The proposed method minimizes the summation of difference of voltage at each bus from unity for improvement of voltage profile. The search method of GA is limited to 50 generations with 50 number of population, 0.8 crossover fraction and 0.01 mutation fraction. Load flow was carried out by using backward-forward sweep algorithm. MATLAB toolbox genetic algorithm function has been used for optimization coding. The optimized data has been simulated in electrical simulation software. The proposed procedure has been applied to IEEE 69 bus system and on a real distribution system, i.e. Industrial II feeder, Chitwan. The optimized result has been obtained according to different tap condition of OLTC. The financial analysis has been performed in Industrial II feeder as well. Result of this paper has been compared with previous publications and report. Simulation result shows that there is significant loss reduction and improvement of voltage profile and line loading after optimal placement of solar PV according to different tap conditions of OLTC in distribution system.

## Keywords:

Distribution System, Loss Minimization, Voltage Profile, Genetic Algorithm, Cost Optimization, OLTC, Solar PV

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# Fatigue Life Analysis of Steel-Concrete Composite Bridge considering Road Surface Condition

*Utkarsha Bhetuwal <sup>a</sup>, Jagat Kumar Shrestha <sup>b</sup>, Rojee Pradhananga <sup>c</sup>*

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## **Abstract:**

The paper presents a detailed analysis of a composite steel-concrete bridge for its fatigue life with inclusion of road surface condition. The model takes in to account the dynamic impact of vehicle on bridge and the stresses induced in the bridge girder affected by road surface condition in the bridge deck. The results are presented to show the effect of good, average and poor road surface condition on the bridge's fatigue life. It is found that bridge with poor road surface condition has low fatigue life in compared to bridge with good road surface condition. The fatigue life is calculated using Linear Elastic Fracture Mechanics (LEFM) approach which considers crack size information. This study can also be applied for the bridge with existing crack, of which, remaining fatigue life can be computed.

## **Keywords:**

Steel-concrete Bridge; Road Surface Condition; Dynamic Impact; Fatigue Life; Crack Size

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# Contestion Minimization in SDN using Two-phase Heuristic Algorithm

*Tirtha Raj Adhikari<sup>a</sup>, Sashidhar Ram Joshi<sup>b</sup>*

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## Abstract:

Network update is unavoidable in any legacy as well as Software Defined Networks. Undesirable and operational events like hardware maintenance, link failure, node failure etc trigger network updates. During the update process although initial and final state may remain consistent, different intermediate links might suffer from inconsistencies. Number of researches have been successful to prevent inconsistencies which are congestion free but time consuming. Network updates are frequent and need to be handled in a timely manner allowing minimum amount of congestion.

This thesis proposes SDN network update mechanism that allows minimum amount of congestion during update to get fast network update and maximum utilization of link resources. Main technique of this particular research is firstly to find the key flow in the network at different flow paths routed from source, intermediate stages and destinations and to rate limit the key flow allowing maximum flow in the link to attain its maximum capacity. The network simulation is tested in Mininet emulator and the flow rules were modified in the forwarding devices by RYU controller using OpenFlow protocol. The Abilene topology having 11 nodes and 14 links is used. The results showed that if key flow in the network is rate limited then other flows will have to loose lesser packets resulting low packet loss in total. Also, if we insert optimum number of intermediate stages during network update from initial to final stage, the amount of packet loss decreases.

## Keywords:

SDN, Network Update, Flow Based, Two-phase Heuristic, Abilene

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# Parametric Analysis of Load Carrying Capacity of Circular-Cylindrical Grid Shell with Quadrilateral Grid

*Thaneshwar Dhungana<sup>a</sup>, Hikmat Raj Joshi<sup>b</sup>*

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## Abstract:

Grid shells show properties of discrete structures as well as continuous shells due to their topology. For single-layered grid shells, the major failure mode is buckling. The major factors that affect the load-carrying capacity of grid shells are grid element properties, connection property, shell geometry, and imperfections. Analytical solution of buckling problem of grid shell is achieved by establishing equivalency between a grid shell and a continuous shell and applying the analytical equation of continuous shell. Different equivalent models are used to determine equivalent properties and an analytical equation for the continuous shell is modified to accommodate those properties.

The geometry is an open circular-cylindrical grid shell subjected to normal load with simply supported boundary conditions. The analysis parameters are grid size and span to depth ratio. An analytical solution is achieved by solving the buckling equation of the continuous shell in MATLAB for the different equivalent models. Geometries are generated in Rhino6 using the Grasshopper plugin. The numerical solution is achieved by modelling geometry and grid element properties in ANSYS and performing a linear buckling analysis. The result from the analytical and numerical methods is compared. From parametric analysis, it is seen that the load-carrying capacity of grid shells decreases with an increase in grid size and span to depth ratio. The denser grid shows bending-dominated characteristics whereas the coarser grid shows membrane-dominated characteristics. For denser grid, orthotropic equivalence model, and for coarser grid equivalent area model is suggested.

## Keywords:

Grid Shell, Circular-Cylindrical Shell, Load-carrying capacity, Equivalent model, Linear buckling analysis, ANSYS

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# Design and Simulation of Francis Turbine Runner for Betan Karnali Hydroelectric Project for Original and Reduced Head Condition

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Smarika Tamrakar<sup>c</sup>, Hari Bahadur Dura<sup>d</sup>*

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## Abstract:

Betan Karnali Hydroelectric Project (BKHEP) experiences a variation of head from 90.82 m to 49.16 m due to increment in tail water level after the construction of Karnali Chisapani Multipurpose Project downstream. The project focuses on design and simulation of the Francis runner at different head conditions before and after the construction of Karnali Chisapani Multipurpose Project. This project will use the BOVET approach in conjunction with other traditional design methods to accommodate turbines of a wide range of heads and flow rates. This turbine design is well suited for the BKHEP case. Along with this, this can be used in the design of the francis turbine of  $0.1 < n_0 < 0.8$ . The in-house MATLAB code generates the profile of leading edge, trailing edge, hub and shroud. The beta angle is calculated in the excel sheet. The ANSYS bladegen is used for the geometry. The runner is meshed in TurboGRID and finally it is exported to ANSYS CFX for the simulation. In the CFX post processing, the hydraulic turbine report is generated to observe the results rather than manual post processing. When simulated at Head of 90.82 m at Flow rate  $92.11 \text{ m}^3/\text{s}$  and Speed 187.5 rpm , efficiency of 94.19% at guide vane opening angle of 18.5 degree. At reduced Head of 49.16 m with same Flow rate  $92.11 \text{ m}^3/\text{s}$  and Speed = 187.5 rpm efficiency 86.33% at guide vane angle of 31 degree. Further simulations were carried by varying blade profile which means varying beta distribution and lean angle . Optimum efficiency of 90.94 % was achieved for lean angle +5 degree at guide vane opening angle 30 degree.

## Keywords:

tail water, Bovet Approach, blade profile, reduced head, efficiency

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# Synthesizing Human Face Image from Textual Description of Facial Attributes Using Attentional Generative Adversarial Network

*Jupiter Tamrakar<sup>a</sup>, Bal Krishna Nyaupane<sup>b</sup>*

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## **Abstract:**

GAN (Generative Adversarial Network) is a revolutionary network architecture that changed the landscape of unsupervised learning and photo-realistic image synthesis. Many types of research has been done for improving the stability of GAN and the quality of the image synthesized. Recent studies are focused on synthesizing images from text descriptions by conditioning the generator and discriminator on these text descriptions. This task falls under the domain of text to image synthesis. In this work, research focuses on implementing a GAN model, for synthesizing face images from a text description of facial attributes. To do so, the model must know what description best matches the image region and vice versa. Hence to accomplish this, the model must have an understanding of language and image. So, in this work, two pre-trained models BERT and Inception-v3, are used. From the pre-trained BERT model, we extract contextual word embedding and, from Inception-v3, image features. Now, using the information about both text and its image pair, the model can generate images accordingly.

## **Keywords:**

GAN, BERT, Bi-GRU, Bi-LSTM, Inception-v3, Image synthesis

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# Video Summarization using Spatio-Temporal Features by Detecting Representative Content based on Supervised Deep Learning

*Ramesh Kumar Sah*<sup>a</sup>, *Sharad Kumar Ghimire*<sup>b</sup>

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## Abstract:

Video Summarization is the technique to generate the compact version of video keeping relevant content intact and eliminating redundancy that helps the user to browse and navigate through the video more efficiently and effectively. In this work, a framework has been proposed which makes use of the spatial and temporal features with self attention from the video sequences to identify the representative content by generating temporal proposals and supervised learning from the data manually created by humans or users. Existing Supervised methods don't deal with the temporal interest and its consistency. However the issue with these approaches is that for the same contextual segment, frame scores of the video alone cannot be sufficient enough to represent the semantic content. For that temporal uniformity is also necessary which can be addressed by predicting the temporal proposals of the video segment on the basis of action recognition task. These shortcomings have been addressed by this proposed work by treating it as temporal action detection which predicts importance score and location of the segments simultaneously by developing the anchor based method which generates anchors of varying lengths to identify interesting proposals. Moreover the extensive quantitative and qualitative analysis on SumMe and TVSum datasets justify that there is 15% and 5% improvements in F-score respectively compared to previous work with similar environment.

## Keywords:

Video Summarization, Self Attention, Deep Learning

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# Development of IRI Prediction Model for National Highways of Nepal

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## Abstract:

Reliable prediction of pavement performance is essential for transportation agencies to effectively plan and manage maintenance, rehabilitation, and reconstruction of roads. Currently, the maintenance needs of national highways in Nepal are decided based on Surface Distress Index (SDI) and International Roughness Index (IRI). SDI is a subjective rating but IRI considers the interaction between pavement and vehicles, and is a globally accepted pavement performance indicator. Therefore, to support with a convenient yet reliable prediction of pavement condition, this study develops an IRI prediction model for pavements of national highways in Nepal using multiple linear regression technique. IRI, traffic and climatic database of and around 1745 highway sections of Nepal were used for the development of the model. The results of regression and validation shows that the model can predict future IRI as a function of initial IRI of the road, commercial vehicle traffic, rainfall and accumulated low and high temperature days the road is subjected to, with a reasonable degree of accuracy. The model shows a good fit to the observed values with R square value of 0.761.

## Keywords:

IRI, pavement performance, multiple linear regression, pavement maintenance

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# Post Disaster Socio-Economic Recovery in the Heritage Settlement of Kathmandu Valley after 2072 Earthquake: A Case of Sankhu

*Upasana Pandey<sup>a</sup>*

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## Abstract:

In the disaster phases, the recovery of socio-economic aspects have remained least understood areas that increase the risks leading to disasters due to earthquake. This research contributes to have knowledge by focusing on the disaster recovery process of the heritage settlement, Sankhu which was affected during Gorkha earthquake 2015. In this research the socio-economic indicators were selected from literature review and pre-testing was carried out with local people in the case area. The research tool adopted is questionnaire survey, whose data is triangulated for validation using key informant strategy as well as observations. Total three key informant was selected and random sampling of 75 respondents was taken from ward6, the traditional area of Sankhu considering equal ethnic groups, gender and age group. The research findings include that the female population have suffered in an education sector than male. Though monthly income has slightly increased after earthquake, still this level comes under lower income earning. The new livelihood of this area has turned to be in business, declining agriculture sector due to the cause of lack of facilities in irrigation system. The tourism sector have been highly affected and no new methods have been adopted by government as well as ward to promote this sector, only plan has been documented. Hence, the research concludes that the economy sector in this area has not been able to recover from the effects of 2015 Gorkha earthquake.

## Keywords:

Post disaster recovery, Socio-economic evaluation indicators, Sustainable livelihood

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# Inter-Local Governmental Collaboration for Urban Planning: A case of Kathmandu Valley

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## Abstract:

Nepal is a young federal country with a federation, 7 provincial and 753 local level governments. Each local government has been given exclusive rights closely related to urban planning and development. Even though there are various issues that needs to collaborated with neighboring local governments (LGs) and act as and integrated planning, there is no provision of horizontal collaboration. The works of LGs has been seen as more inward looking rather than a whole spatial approach. This research tries to find answers on what are the current roles of LGs in urban planning with study of existing framework, how they are collaborating in sectors of urban planning like disaster risk management, transportation planning and solid waste management, focused in Kathmandu valley and what keeps them from collaborating effectively than they are doing now. The result are validated by the three data points; Literature review on governance, collaboration, review of plans, programs and budget of local government after 2017 of research area and search collaboration between them; Questionnaire survey to municipality officials regarding the framing of work of municipalities, level of communication, defined roles and process of decision making in the sectors of urban planning, in a Likert scale of 1-5 and plotting in a circular diagram to visualize collaboration; and key informant interview on finding answers of research questions. Even though the necessity of horizontal collaboration seemed to be realized, it is found that there is no binding legislation or standard framework of collaboration between LGs. There is more of privileged and intermediate type of collaboration. Also, disaster and solid waste management had more collaborative approach than transportation planning. Various factors that ignites collaboration and keeps collaboration from happening is studied through literature and reflected in research area as well.

## Keywords:

Local government, Horizontal Collaboration, Integrating framework, Urban Planning, Kathmandu Valley

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# Drivers and Impacts of Urban Sprawl: A case of Imadol

*Shailendra Giri<sup>a</sup>, Ajay Chandra Lal<sup>b</sup>*

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## Abstract:

Due to rapid growth in Kathmandu valley, the peripheral areas of the valley are experiencing urban sprawl. Imadol has also experienced sprawl development due to the outgrowth of built-up areas in Kathmandu valley. There are various drivers of urban sprawl such as lower land price, population growth, availability of roads and private vehicle ownership. Likewise, impacts of urban sprawl include agricultural land-use change, increased infrastructure delivery cost, greater commuting time and social segregation. This research studies the drivers and impacts of the urban sprawl in ward no 2 of Mahalaxmi municipality which lies in Imadol city. Explanatory research design has been adopted for the study. 269 homeowners and 10 key informants were surveyed for the research. Structured questionnaires were used with close-ended questions for both homeowners and key informants. In the study area, the physical drivers are availability of roads and open space. The economic drivers are land speculation, economic opportunities, proximity to job and private vehicle ownership and the social drivers are presence of relatives, proximity to health and education facility and local policies. Likewise, the physical impacts are on land-use and urban form. The economic impacts are occupational change and emergence of new markets. Negative impacts were not observed on the social parameters taken for the study. The area has inefficient transportation and infrastructure services since the development in the area is not a planned development. Proper landuse plan and implementation of building byelaws can be carried out to guide the urban development in the area. Likewise, agricultural land conservation and vacant land taxation can be other methods for controlling urban sprawl.

## Keywords:

Urban sprawl, drivers, impacts, physical, social, economic

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# Designing Walkable city through public perspective and walkability assessment: A case of Jhamsikhel Neighborhood

*Gaurav Nepal<sup>a</sup>, Ajay Chandra Lal<sup>b</sup>*

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## **Abstract:**

The literature in urban planning shows that walkable cities are healthy, resilient, sustainable, economic, and inclusive. Urban Walkability study has been done a lot in recent years to help planning a city. Walkability is a subjective issue, and objective study only is not sufficient to analyse walkability. However, different literature studies have identified some standard features of walkable cities and have been tested to rate the walkability of any urban space. Walkability has been often neglected in the planning process due to difficulty in quantitative measurement and is taken for granted in many cases. Establishing indicators help to analyze walkability quantitatively and plan a walkable city. The paper reviewed existing literature available in the field of walkability indicators. The framework to measure walkability was then be established, filling the gap in existing assessment methods in terms of urban areas and public perspective. Both subjective and objective aspects of walkability measurement were combined in the research. The study demonstrated uniformity of pavements, cleanliness, plantation, lighting and ease of crossing as important aspects to enhance walkability. The result was then illustrated using GIS and Photoshop for better visualization. The framework established can be helpful in the assessment of walkability in similar urban areas and thus provide guidelines to plan walkable cities.

## **Keywords:**

Walkability, Walkable cities, Walkability indicators, Urban Planning

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# Space Utilization by street vendors in world heritage site: A case of Patan Durbar Square

*Ananta Gautam<sup>a</sup>, Inu Pradhan Salike<sup>b</sup>*

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## **Abstract:**

Urbanisation, lack of skills and education to work in formal sectors make people absorbed by informal sectors like Street vending. Because the government lacks a clear reference to arrange the place that can be utilised by them and in accordance with the features of their activity, street sellers occupying public space are frequently regarded as troublemakers. They are associated with the infringement of public spaces and the causes of traffic congestion. As many studies have been carried from the economic perspectives of street vendors, there is a need to study street vendors' space use and distribution pattern. In this context, the vicinity of Patan Durbar Square is taken for the study. This research aims to study the space use, requirement and distribution pattern of street vendors and spatial qualities that encourage vending activities. The data has been collected using observation method, interview with the structured and unstructured questionnaire, mapping of street vendors and other qualitative methods, including case studies. The study demonstrates pedestrian traffic to be the main reason behind choosing the location by street vendors and mostly using space less than ten square feet. The research concludes with the need for their improved recognition and integration in urban space and planning.

## **Keywords:**

Street vendors, Street vending, Space Use

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# Effect of Contemporary Urbanization on Historic Town Tokha

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## Abstract:

Traditional towns are developed for people in their natural mode of movement with an interplay of mass and void. Mass represents the built structures like Buildings, Temples, Falcha, Sattal, etc whereas the space represents streets (Tole), Nani, Chowks, Courtyard, Keba (private garden), religious and cultural nodes. Town relatively large and permanent settlement having linkage with agriculture and history of its development shows the history of mankind. Towns have been in a continuous transitional state since their evolution and its natural process. Urbanization is a frequent and unavoidable phenomenon around the world, with development and expansion helping many individuals and companies but also posing the risk of destroying historical places of cultural significance. The consequences of urbanization on the built environment in the ancient town of Tokha are investigated in this article. Historic cities are frequently targeted for fast urbanization, which is frequently accompanied by changes to the built environment in historic areas. The study's main goal was to figure out how urbanization affected Tokha, a traditional town. To examine urbanization data from the ancient town of Tokha, this study uses both qualitative and quantitative methodologies under the constructivist/ interpretivist paradigm. Our findings indicated distinct physical, economical, and socio-cultural urbanization causes that resulted in observable and substantial changes in Tokha, a medieval town. These elements play an important role in implementing the Local Development Plan (LDP) for Tokha's sustainable urban expansion and cultural preservation.

## Keywords:

Historic Town, Urbanization, Built Environment, Tokha

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# Comparative study of Irrigation Water Requirement and available discharge in Kankai river: A case study of Kankai Irrigation System, Jhapa, Nepal

*Manoj Lamichhane<sup>a</sup>, Yogendra Mishra<sup>b</sup>, Pawan Bhattarai<sup>c</sup>*

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## Abstract:

The present study deals with the determination of Crop water requirement (CWR), Irrigation water requirement (IWR), and scheme supply of all cultivated crops between 1990-2010 of Kankai irrigation commanded area in Jhapa district, Nepal. The cultivated crop includes Monsoon paddy, Maize, Wheat, Potato, Pulses, Mustard, Vegetables and Spring rice. Additionally, it even aims at identifying the major climatic factors which bring about a certain change in reference to evapotranspiration ( $ET_o$ ), CWR and IWR. The CWR, IWR and scheme supply for each crop in the command area were estimated by using Crop Water and Irrigation Requirements Program (CROPWAT) 8.0 Model. Furthermore, the Mann-Kendall test is conducted for the analysis of the temporal trends of climate variables. Temporal trends on climatic factors for the period 1990-2010 showed that maximum temperature and humidity had an upward trend, which eventually results in increasing CWR and IWR. CWR and IWR for every crop during 2000-2010 are in increasing order significantly as compared to 1990-1999. The maximum IWR and minimum IWR were found in the months of February ( $15.7\text{m}^3/\text{sec}$ ) and July ( $0.8\text{ m}^3/\text{sec}$ ) respectively. The available river discharge in the months of February and March are not enough for fulfilling the irrigation requirement in those months and available river water is fairly satisfactory to fulfill the irrigation demand without reduction of crop yield during the month of June, July, August and September of Kankai irrigation system.

## Keywords:

Agriculture, Crop Water Requirement, Irrigation Water Requirement, Evapotranspiration, Mann-Kendall test

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# Post-2015 Gorkha Earthquake Private Housing Reconstruction in core areas of Kathmandu Metropolitan City (KMC)

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## **Abstract:**

Housing after disaster is referred as reconstruction or rehabilitation of housing damaged by any disaster event. Reconstruction of housing allows the affected people to have a secure and private space to return to their normal lives. The reconstruction process after 2015 Gorkha earthquake is mostly focused on the physical recovery. But a city is more than collection of buildings. It is also people who live there and how they interact with one another. The core area of Kathmandu is taken as the area of research. From a traditional core to an urban core, there is a huge paradigm shift in the way of living of people. Literature review showed that urbanization, globalization and demand for urban services and economic gain are the major factors for this change. There are multiple generations living in a same house that was constructed by their forefathers. With division of houses between the siblings, houses have become smaller and congested to live in. Hence the values and importance of a house has changed gradually. Reconstruction is taken as an opportunity to rebuild the traditional settlement into a contemporary one. A trend is seen that the new buildings have been constructed in a new style with disregard to the identity of the place. The study includes both qualitative and quantitative methods for research. Available secondary data is studied for quantitative research purpose to find out the trend of already reconstructed houses. Building permit drawing is studied and site visits are made during the research. A qualitative research method through personal interview and open ended questionnaire survey at the local level is done to understand the challenges of those beneficiaries who are unable to reconstruct. Findings showed that the major factor is the financial constraints of beneficiaries. Other notable issues like multiple ownership of land and building, small plot size, threat to the surrounding building during dismantling are found out.

## **Keywords:**

Private Housing Reconstruction, Traditional core, Urban core

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# Factors Influencing Public Participation in the Planning Process of Damak-Jhapa

*Bhumika Shrestha<sup>a</sup>, Ajay Chandra Lal<sup>b</sup>*

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## Abstract:

By extending the regime's political base and propagating its "Party less" character all the way down to the local settlement level, Nepal's absolute monarchy system, which ended in the 1990s, was used to build a monolithic, impenetrable political power structure throughout the country. Following that, the Local Self-governance Act (LSGA) of 1999 accelerated the process of decentralization, with increased authority and responsibility flowing to local governments, which has the potential to enhance urban productivity and provide conditions for more public participation.

This research aims to examine the factors that influence the planning process. It discusses the positive and negative aspects that influence the pace of public participation in Damak's local planning process. This thesis tries to identify the elements that function as a barrier to participation as well as the factors that encourage involvement. The empirical research for this thesis is structured as a qualitative case study, concentrating on the Damak municipality in Nepal. The research's issue is concerned with the relative responsibilities of sets of factors in accounting for the efficacy of people's participation in Damak's planning process, as well as the interactions between those sets of factors. The positive factors for the public participation are: 1) Awareness the high level of local leadership, along with vision or idea quality, the capacity to communicate such ideas and have them widely accepted. 2) Social and political influence- the allocation of power and authority legally and 3) Accessibility to available resources (both financial and linked to the nature of the area). Likewise, the negative factors for demotivating public participation are: 1) Lack of awareness and miscommunications. 2) Huge gap in gender equality- still a male dominated society. 3) Ethnically influences- marginalized community being dominated by elite group. 3) Lack of a sense of ownership- due to the Nepal government's excessive granting of budgets, there is no public labor participation or monetary contribution. The research is investigated through broad observations of the system and its evolution since 1999, and more precisely through an analysis of Damak municipality. The findings indicate that Municipalities have significant capability (administrative, managerial, and technical), which verifies excellent selection methods for local employees, as well as extensive education and training facilities. Thus, Political parties must concentrate their involvement in municipal governance and take a more strategic role in creating local leaders who are smart players in local development, including the political skills of mobilizing popular support and participation. Participation is critical in today's changing.

**Keywords:** Public Participation, Beneficiaries, Ownership, Effectiveness

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# City Branding and its Economic Impacts in Tokha (A case of Chaku)

*Asta Shrestha<sup>a</sup>, Sudha Shrestha<sup>b</sup>*

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## Abstract:

This paper mainly concentrates on city branding and its economic impacts in Tokha city taking a case of Chaku which is directly or indirectly affects to the urban economy. The attempt here is to analyze the urban development approaches through urban economic planning. So urban development in general is the organizing and managing of urban areas to cope with the future growth. In the contrast to developed countries, the character of urbanization in developing countries is characterized by high growth rate and an unprecedented rural-urban migration because of the intense hardship within the rural areas the study area is additionally exception to the current. The qualitative research methodologies will be determined to be the best fit for this investigation. As a result, a case study approach will be used since the primary research technique, as it allows for the investigation of a phenomena in its natural setting. To analyze the fundamental concepts of the Tokha's branding policy, an explanatory case study will be chosen above a descriptive case study. Interviews, direct observations, and archives are common techniques used in case study research to acquire data of various sorts. On discussing the details of the methodology adopted for the research purpose of study is to prepare a realistic scenario of Chaku including the situational analysis also .it is based on areas of availability of open spaces, the use of existing resources such as land for farming sugarcane, land for farming sugarcane and highly scale manpower. The study area is of ancient settlement ward (mainly 2 and 3) Tokha municipality, has also its impact. However the city has limited resources and infrastructure, which are not in a position to absorb all the prospective migrants. People living in especially ward 2 and 3 of Tokha municipality are unable to sustain from agriculture activities and area changing to non-agriculture activities migrating to urban areas .it is a known fact that responsibilities of urban development does not lie on the government alone .it is also the job of local and private sectors to help government in various way.

## Keywords:

city branding, economic impacts in Tokha, future growth, Chaku, area changing to non-agriculture activities

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# Examining Trend and Characteristics of Urban Sprawl in Kathmandu Valley

*Sampada Thapa Magar<sup>a</sup>, Kirti Kusum Joshi<sup>b</sup>*

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## Abstract:

This paper examines the spatiotemporal pattern of urban growth in Kathmandu Valley between 2000 and 2020 using land use change analysis and spatial metrics technique. The study demonstrates that urban growth in the Valley during the study period is characterized by increased densification in the central or more urbanized areas through infill development followed by increased fragmentation of built-up area in the fringe areas indicating sprawl. Between 2000 and 2010, the built-up area increased by 2.38 times whereas population increased by 1.57 times during the same period, which indicates a sprawl pattern of urban growth. Likewise, between 2010 and 2020, the built-up area increased by 4.68 times compared to a projected rise in population by 2.47 times, indicating further sprawl development in the peri-urban areas. The fragmentation of lands in the peri-urban areas has further resulted into heterogeneous land use combinations. However, due to increase in infill development, the neighborhood distances between built-up patches are decreasing, indicating possible increment in homogeneity in favor of built-up area in the future.

## Keywords:

Land use change, spatial metrics, urban sprawl, urbanization spatial pattern

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# Nexus between Landuse Change and Land Surface Temperature: A case study of Kathmandu Valley

*Aashis Singh<sup>a</sup>, Dibas Shrestha<sup>b</sup>, Khem Poudyal<sup>a</sup>*

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## **Abstract:**

Development of metropolitan regions in Kathmandu valley is expanding rapidly accompanied with change of natural land cover in order to meet the demand of expanding metropolitan populace with impermeable surfaces such as substantial structures, black-top streets, rooftops, walkways and other structures. Such changes has expanded the solar radiation absorption, trapping and storing heat, resulting in an urban heat island (UHI). Land surface temperature (LST) helps in identifying urban climatology, environmental change caused by anthropogenic activities. This study uses Landsat satellite images for classifying the spatial distribution of LST over different land classes in Kathmandu valley. Supervised image classification was used for land use land cover classification and it was correlated against LST obtained using thermal band. Open land and water bodies decreased by 40% and 60% respectively due to encroachment for human settlement, and build up areas increased by three folds. In all years following 1990, the LST has been higher in urban regions than in outskirts, resembling the establishment of UHI. UHI grew in tandem with the expansion of urban areas outside of the core valley. In the winter, the valley's average surface temperature was 15.42 °C, with forest and water bodies having the lowest temperature and built-up regions and open areas having the highest. There is contrast of 2.5 °C between the impermeable surface and forest regions. This signifies increasing forest patches and greenery in the urban area will minimize decrease the LST and minimize UHI.

## **Keywords:**

Landsat, Land surface temperature, Land use land cover, Urban heat island, Kathmandu

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# Energy Performance Evaluation of Rammed Earth Construction

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## Abstract:

Due to the increasing rate of energy consumption in the construction industry, designers have turned to construction methods that use less energy during construction by being more serviceable. Rammed-earth (RE) buildings are one of these ways because of the materials' availability, ease of preparation, and significant reduction in energy usage and environmental impact. When designed correctly, the thermal mass in the walls will maintain a stable internal temperature throughout the seasons. This reduces the need for power-based heating and cooling systems. In the current study, energy performance evaluation of rammed earth construction is done and compared to those of masonry walls. The thermal performance of rammed earth wall was experimentally measured by using thermal imager. West and south wall were taken to measure thermal performances. Similarly, computer based simulation software Ecotect was also used to carry out further analysis. The results illustrate the proper thermal performance of stabilized rammed-earth in comparison to the masonry materials.

## Keywords:

Construction Technology, Rammed Earth Construction, Thermal Comfort, Energy Efficiency, Thermal Performance, Masonry Construction

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# Climatic Effect on Building Facade, an approach to Sustainable Facade Design of Neighborhood Row Housing in Kathmandu Valley

*Bindu Regmi<sup>a</sup>, Biresh Shah<sup>b</sup>, Sanjaya Uprety<sup>c</sup>*

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## Abstract:

Extreme weather events predicted as a result of air pollution have a significant impact on the materials, systems/components, and features used on building facades. The material surfaces of the facade will corrode due to changes in temperature and precipitation. Excessive amounts of rain, especially rain driven by the wind, will exacerbate surface erosion and facilitate moisture penetration and bio deterioration, resulting in a worsening of the building's hydrothermal performance. The rate of degradation of many materials used in building facade systems accelerates as ultraviolet (UV) radiation levels rise. Buildings presently account for more than 40 percent of global energy and one-third of global carbon emissions (Architecture 2030). The paper's major objective is to determine how climate and building facade interact, as well as to examine methods and approaches for building facade sustainability. Similarly Critical facade building materials, systems, components, and features that are vulnerable to accelerated deterioration due to extreme weather events are identified and classified. As a result of the impacts of climate and air pollution on different regions and activities, whether natural or social, it has become a serious concern.

Various aspects such as orientation, material type and durability are very important when designing a building facade, and they have a direct impact on the building's durability and efficiency. The sustainability approach to neighborhood row housing for living standards is the focus of this paper.

## Keywords:

Climate, building facade, sustainability, neighborhood row housing, building orientation, building materials

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# Thermal Performance of Green Roof in Residential Buildings of Kathmandu Valley

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## Abstract:

Green roof technology is one of the energy-saving measures to reduce thermal loads, thereby maintaining a comfortable indoor air temperature. This paper aims to study and evaluate the thermal performance of green roof technology in residential buildings in the Kathmandu Valley. The study continues to analyze the detailed field data collected to identify the summer indoor thermal environment in relation to the outdoor thermal environment. The study also compared the thermal performance of green roofs with the conventional RCC roofs in residential buildings of the Kathmandu Valley. The potential indoor thermal comfort that could be achieved by in-built of different green roof technology in residential buildings has been studied and analyzed. From this study, it was found that among different kinds of green roof technologies, intensive green roof performs better than any other types of green roofs in terms of thermal comfort. The conclusion of the research is that, by the in-built of intensive green roof in building, there was a significant reduction of indoor air temperature by 2.4°C compared to conventional RCC roofing system during summer. Hence, the thermal performance of the green roof technology, which is adapted to change the thermal environment in various ways to achieve thermal comfort, is superior to the thermal performance of contemporary RCC roofing system.

## Keywords:

Green roof, environment, residential buildings, Kathmandu valley, thermal performance, indoor comfort.

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# Assessment of Future Land Use/Cover Change of Kathmandu Valley Using Two Models of Land Change

*Madan Pokhrel<sup>a</sup>, Narendra Man Shakya<sup>b</sup>*

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## Abstract:

Land use/cover (LULC) play an important role in ecological and hydrological processes. Hydrological processes such as groundwater recharge, overland flow, and eco-biodiversity are associated with LULC. Kathmandu valley (KV) and its surrounding areas have been experiencing rapid LULC change because of rapid urbanization. A large swath of agricultural land in KV has been converted into build-up areas. Further studies of LULC change adopting different models give a comprehensive understanding of LULC change and implement area-specific actions to mitigate adverse effects. For LULC, this study extracted historic LULC of 2005 and 2015 from Landsat imagery. The classified maps were validated by comparing with ground truths taken from historic Google earth imageries. The confusion matrix showed a higher resemblance between Classified LULC and ground truths. It gave a Kappa coefficient of over 88% in each classified LULC. These two maps along with driving forces of LULC including road networks, slope, and elevations were used to simulate future LULC. DINAMICA EGO model is based on cellular automata, and the Land change modeler operates on the philosophy of multilayer perception Markov chain Neural Network method. We evaluated the simulated LULC of both maps using the error matrix module in IDRISI Selva. The Kappa coefficient of the simulated map of 2020 and produced LULC of 2020 are 70% and 78% for DINAMICA EGO and LCM. Both models predict that agricultural land in the valley is transforming into urban areas. Both models predicted that around 80% of the flat area in the valley will be of urban form in 2050.

## Keywords:

Land use/cover (LULC) change, Landsat, Dinamica EGO, Land Change Modeler(LCM), Urbanization

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# Converting Spaces into Places: Placemaking of Tudikhel

*Navin Parajuli<sup>a</sup>, Sudha Shrestha<sup>b</sup>*

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## Abstract:

Place-making is a people-centered approach in the process of planning and designing public spaces in cities. This approach pays attention to the opinions of the people living in a particular place and to discover their needs from this place and their aspirations towards it. Placelessness has been defined as an environment without significant places and such underlying attitude which does not acknowledge the significance of places. Tudikhel is a national public space where different festivals, cultural and non-cultural activities take place, along with recreational activities by the public. However, the land area of Tudikhel has been constantly shrinking throughout history due to various factors. Because of this, the range of cultural and non-cultural activities taking place at Tudikhel and place attachment of Tudikhel associated with public have subsequently decreased. In this research, both qualitative and quantitative methods are used to find out the perception of people towards Tudikhel. Data collected from questinnare survey of the people under various categories around Tudikhel involves qualitative aspects of the research. As placemaking is an approach that considers the opinion of people who'll eventually use the space, opinions of people regarding which elements and activities must be incorporated in Tudikhel. Under quantitative approach, the key variables of the study are correlated with each other to find the strength of relationship between the variables. Finally, suitable conclusions are reached regarding strategies including elements and activities of placemaking at Tudikhel. Hence this study emphasizes in restoring of Tudikhel back to 'place' in the contemporary urban context using the activities and elements of placemaking, to ensure the sustainability of Tudikhel as a national public space of Nepal.

## Keywords:

Space, Place, Place attachment, Placemaking

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# Spatial Transformation of Hetauda in Federal Structure of Nepal

*Purushottam Adhikari <sup>a</sup>, Ajay Chandra Lal <sup>b</sup>*

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## **Abstract:**

In Nepal federalism was introduced in 2015. Hetauda was established as the provincial capital of Bagmati province in 2020. After the initiation of federal structure in the government bodies and overall administration of Nepal i.e, in the executive, legislative and judiciary sectors, multiple changes took place in the physical, social, economic and other related areas in Hetauda. However, as the nation's capital Kathmandu functioned as the center for all administrative and economic activities, the nature of transformation after Hetauda became the provincial capital have to be taken under consideration. This study took into account of the components that fall under each of these areas like urban forms, demography, land value, economy and so on. The methods for this research initiated by formulation of questionnaire to collect necessary data and information from key informants belonging to various sectors of Hetauda, as well as from local people of Hetauda. After that, field visit to Hetauda was conducted to collect other data and information about Hetauda city. As a result, three major areas of transformation were deduced viz. physical, social and economic, after the analysis of collected primary and secondary data from the study.

## **Keywords:**

Spatial Transformation, Land Value, Urban Form

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# Solar Chimney for enhanced stack ventilation, a Case of e-Bike Prototype assembly building in Birgunj, Nepal

*Manzil Shrestha<sup>a</sup>, Sanjaya Uprety<sup>b</sup>*

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## Abstract:

In this study the effect of a solar chimney in enhancing the stack ventilation in an e-Bike Prototype Assembly building is analyzed. The Study area is Birgunj, Nepal. Natural ventilation in the existing plans is studied and compared with an alternate scenario of incorporating a solar chimney. Various parameters like temperature (Air, operative and radiant), pressure and velocity distribution, and comfort parameters (PPM and PPD) are compared. The DesignBuilder software is used to analyze natural ventilation. DesignBuilder internal CFD analysis is used to study the effect of solar chimney as a part of the building on the natural ventilation. Results show that there is significant improvement in ACH and air movement inside the building with incorporation of Solar Chimney. The PPD analysis results however show that with the incorporation of solar chimney the Percent of people dissatisfied with thermal condition of the building increases from 56 percent to 92 percent. Although the study shows that the solar chimney can effectively work to enhance the stack effect, the comfort ventilation aspect shows no improvement.

## Keywords:

Passive Stack Ventilation, Solar Chimney, CFD Simulation, Thermal Performance

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# Impact of Materials in the Life-cycle Embodied Energy of Residential Building: A Literature Review

*Prapooja KC<sup>a</sup>, Sudarshan Raj Tiwari<sup>b</sup>, Sanjay Uprety<sup>c</sup>*

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## **Abstract:**

Despite the growing importance of buildings' embodied impacts, efforts to reduce their environmental footprints have focused solely on their operational implications. However, when buildings become more energy-efficient during their operational stage, their embodied impacts grow more significant, potentially accounting for up to 60 percent of their life cycle impacts. This paper covers an extensive and critical analysis of the literature about the impact of materials on the lifecycle embodied energy and a comparison with operating energy has been discussed. The collection and selection method of publications are vital. This paper concludes with a remark as “ the main focus of building energy efficiency research being on operating energy , in the past, and the relative fraction of embodied energy in the total life cycle energy was considered insignificant but due to an increased focus on operating energy optimization, the amount of operating energy is going down over time, and as a result, the proportion of embodied energy in the total LCE is growing which must be looked upon”.

## **Keywords:**

Lifecycle embodied energy (LCEE), Initial embodied energy (IEE), Recurrent embodied Energy (REE) , Demolition Embodied Energy (DEE) , construction, transportation, manufacture

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# Attention-based Graph Convolutional Neural Network for Classification of Musculoskeletal Radiograph Images

*Ganesh Singh Rawal<sup>a</sup>, Shashidhar Ram Joshi<sup>b</sup>*

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## Abstract:

Musculoskeletal Disorders (MSDs) are the problems related to bones and muscles, affecting majority of the world population. Radiographic studies are the most common technique for the detection of these disorders as part of the medical diagnoses. An attention-based graph convolutional neural network (AGCNN) is implemented for the classification of such disorders or abnormalities in musculoskeletal radiograph images. The AGCNN network model is firstly implemented on the standard benchmark MURA dataset, consisting of 40,561 upper extremity radiograph images, for the binary classification of radiograph images into normal and abnormal. The performance of the network model is compared with that of the DenseNet169 baseline model. The network model showed improved performance results than the baseline model. The network is then implemented on radiograph image dataset consisting of 15,701 extremity radiograph images of ankle, elbow, finger, foot, knee, hand, hip, and shoulder. The network that is implemented is an ensembled network of soft attention-based Inception-ResNet-v2 network and graph convolutional network (GCN). Soft Attention map is used to localize the abnormality regions in the radiograph images for qualitative evaluation of the network. The network model achieved an accuracy of 0.884, average recall of 0.874, average F1 score of 0.876, and average AUC score of 0.976. The network model achieved above average results in the classification task. Furthermore, the performance results of the classification task by the ensembled network is compared with that of different state-of-the-art CNN architectures.

## Keywords:

MSDs, AGCNN, MURA, Inception-ResNet-v2, Soft Attention, GCN, AUC

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# Women's Safety in Urban Public Spaces - A Case of Kamalpokhari Area

*Sneha Agrawal <sup>a</sup>, Ajay Chandra Lal <sup>b</sup>*

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## **Abstract:**

As, safety perception of urban public space is a neglected dimension in case of gender responsive areas which is significant for inclusive city design, this paper expounds the necessity of the study on public safety-based urban design in perspective of public spaces. It brings forward the concept of safety-based urban design corresponding to the perception of women in public spaces. Based on an extensive review of literature and empirical work, this paper identifies nine parameters to measure the safety perception of the public places. Ten public spaces are selected based on the typology of urban public spaces in the vicinity of Kamalpokhari area. Safety perception of these areas are then measured based on the grading of safety parameters and safety elements are identified for each type of public space. In conclusion, it was established that safety elements should be kept in mind to achieve safer environment. The research necessitates urban planners and designers to introduce features for women safety, privacy, and comfort in the design of public places.

## **Keywords:**

*Urban public spaces, safety perception, women-friendly spaces, urban design*

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# Determining the Impact of Public Transportation on Urban Mobility: A case study of Banasthali-Sundhara Urban Road

*Birat Sharma<sup>a</sup>, Padma Bahadur Shahi<sup>b</sup>*

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## **Abstract:**

According to a survey of relevant literature on the topic of public transportation and its impact on mobility, a high reliance on this mode of transportation boosts the efficiency of urban mobility while also reducing congestion. According to the literature examined, having an effective public transportation system fosters a safe, sustainable, and egalitarian metropolitan environment. The purpose of this study is to see how public transportation in Kathmandu affects the city's urban mobility. It also evaluates the many techniques and approaches that can be established to enable this mode to play a key part in reducing the city's current level of congestion. The study's research and conclusions are largely based on secondary data; nonetheless, Primary data, on the other hand, has been generated and examined using sample surveys and observation. Despite the fact that an effective public transportation system is the greatest approach to maximize urban mobility, the overall findings of this study revealed that in Kathmandu, this mode of transportation is in critical condition to begin with.

Furthermore, an increasing reliance on vehicles with limited passenger carrying capacity, such as private cars and minibus micro bus, has resulted in clogged intersections and high traffic. Other problems include the city's lack of a prominent core area and demand overlap. The key obstacles that need to be addressed in order to develop an efficient public transportation system in Kathmandu have been highlighted as arising from the similar working hours that are followed for practically all institutions in the city. Other elements at play, such as existing transportation infrastructure, socioeconomic realities, and conventional traffic management procedures, were also addressed while examining strategies to make this mode more efficient. Finally, this thesis offers recommendations centered on policy issues and decision-making factors. In addition, there are some quite precise and specific answers to several existing public transportation issues.

## **Keywords:**

Public transportation, mobility, clogged intersections, demand overlap, transportation issues

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# The Daylight Assessment of classrooms in Community schools of Kathmandu Valley

*Ravindra Gautam<sup>a</sup>, Sushil Bahadur Bajracharya<sup>b</sup>*

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## **Abstract:**

Indoor comfort is a major consideration in the construction industry. School is an important place for kids to hone their various abilities. One of the most important requirements that buildings must meet is the provision of a safe and comfortable internal environment. It has a major contribution to the creation of an adequate educational environment. Visual comfort can be achieved either by artificial lighting or by daylight. Appropriately incorporating daylighting into the building design can improve the economics of a school, positively impact utility costs and by extension the environment as well as result in improvements to the health, productivity, and mood of those working and learning in the structure. This paper presents an overview of indoor daylighting assessment in classrooms of community schools of Kathmandu valley. It compares the window floor ratio to the size of windows offered in various classroom types and their contribution to visual comfort in terms of illuminance and daylight levels. Energy performance in school buildings is very significant, for ascertaining the health and productivity of students and teachers. So thermal and visual comfort has high importance for new buildings design and retrofit of existing ones. The purpose of this research is to study daylighting performance of the various community schools' classroom in the case of Kathmandu valley. Daylight analysis of all seven case classrooms was studied through their opening positions and orientation of building. The study concludes that Daylight analysis of existing classrooms of various case studies didn't meet adequate lighting levels for reading purpose during the day. Only west side unilateral windows position classroom meets above the standard daylight illuminance of 300 lux for reading desk in classroom. The minimum value obtained in the desk plane is 400 lux. Daylighting analysis shows that renovations are needed in most of the classrooms to meet the standard illuminance for reading plane.

## **Keywords:**

Daylight, Classrooms, Community Schools, WWR, WFR, Daylighting Levels

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# Perspectives of Planners and Local People on Socio-economic Factors

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## Abstract:

Urbanization is an inevitable process where people shift from rural to urban settlements changing the built environment. People manipulate land as per their requirement. Since land is a scarce resource and demands for urban development is more than the land available which is evidently increasing in developing countries. The need of people is the factor that drives the planning process and they are the one who has to live with the result. Multi-criteria evaluation is process of applying the decision rules where several criteria will need to be evaluated to meet a specific objective. AHP is commonly used MCE used around the world in a wide variety of decision situations. This paper highlights the difference of perspective on socio-economic factors of experts involved in planning and local people. Further it suggests on possibilities for methodological improvement that needs to be considered for making planning process more participatory.

## Keywords:

Urbanization, Socio-economic, Multi-criteria Evaluation (MCE), Analytical Hierarchy, Process (AHP), Participatory planning

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# Climate change impact on the hydrological characteristics of Tamor River Basin in Nepal based on CMIP6 models

*Dickembs Khatri<sup>a</sup>, Vishnu Prasad Pandey<sup>b</sup>*

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## Abstract:

This study investigated the change in discharge at the Tamor River Basin (TRB) outlet due to climate change in future. Precipitations and temperature time series data were used in the HEC-HMS model for the baseline (historical) period of 1989-2009 to simulate the model. Then, assessed the possible changes in discharge at outlet of the basin under future climatic condition using the latest set of scenarios from ten Coupled Model Inter-comparison Project, phase 6 (CMIP6) models dataset for the future period (2021-2095) under two shared socio-economic pathways (SSP245 and SSP585). The study found that, annual average discharge in the river is increases due to climate change. Seasonal variation in river flows is expected to decrease only in post monsoon season under scenarios SSP245 in FF and SSP585 in NF. However, monthly variation in river flows is expected to increase in most of the months and decrease in the May, October, April under scenarios SSP585 in NF, June under scenarios SSP585 in NF, September under scenarios SSP585 in NF and November under scenarios SSP585 in NF. Overall, increasing pattern of river discharge poses risk on natural hazards such as floods, landslides, and soil erosion in the future. Our finding is expected to help understand the hydrological characteristics of Tamor River, future benefit associated with increase in average annual discharge in the river like, hydropower production, irrigation scheme etc., and adaption measure that can reduce risks associated with increase in hydrological flow in the river.

## Keywords:

Climate change, CMIP6, HEC-HMS modelling, Hydrological change, Tamor River Basin

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# A Day-ahead Optimal Energy Scheduling of Grid-tied Residential Solar Power System using Particle Swarm Optimization

Asha Khanal <sup>a</sup>, Nava Raj Karki <sup>b</sup>

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## Abstract:

This paper suggests the day-ahead optimal energy scheduling technique of grid-tied residential photovoltaic system in order to conform to the electricity tariff to optimize operational household benefit. The solution is conceived as optimization problem, with the objective of maximizing household energy benefit and the optimization variable being the dispatching ratio of electricity, which is the ratio of PV electricity sold to the grid to the additional PV energy after supplying load. After that, the formulated nonlinear optimization problem is solved using a Particle Swarm Optimization (PSO). The verification analysis is performed using a typical grid-tied solar powered system having solar photovoltaic system and battery energy storage system which is located in Lalitpur, Nepal. The findings indicate that the suggested energy scheduling strategy, in conjunction with a heuristic optimization approach, is successful for the optimal energy scheduling of the several energy sources to achieve maximum financial benefits under the time-of-day tariff.

## Keywords:

Grid-tied Solar, energy scheduling, Particle Swarm Optimization (PSO), Time of Day tariff (TOD)

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# Maximization of System Loadability based Optimum Sizing and Placement of Multi-DG Units Simultaneously Using HPSO in Distribution System

*Pradip Khatri<sup>a</sup>, Nava Raj Karki<sup>b</sup>*

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## Abstract:

In the future generation system, distributed generation (DG) is predicted to become more essential. Furthermore, the size and placement of DG unit that changes the flow of active and reactive power and its course in a power system will cause a significant impact on stability of bus voltages, losses of power, reliability and loadability. Maximization of the network loadability is key interest of this paper. After one DG Unit has been installed, various approaches based on sequential DG site selection cannot yield to the optimum result for peak loadability of the system. The paper presents an optimization process to determine the optimum sizing and allocation of multiple DG units simultaneously in a distribution network based on the maximizing the loadability. For multi-DG units, the optimization is carried out using a hybrid particle swarm optimization (HPSO) technique considering DG penetration level, current carrying capacity of line and magnitudes of voltage as system constraints. Along with the financial analysis, the proposed algorithm is tested on a standard IEEE-33 radial distribution system. Results support the necessity of simultaneous allocation of multi-DG units to ameliorate the loadability of distribution system.

## Keywords:

Distributed generation (DG), Hybrid Particle Swarm Optimization (HPSO), Loadability, Optimal size, Optimal location

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# Analysis of Active Mobility in the Historical Core City of Kathmandu

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## **Abstract:**

The historical core city of Kathmandu valley is undergoing through several urban challenges, transportation being one of the most prevalent fields. The compact walkable streets of Malla period and the unique streetscape of Rana period are forced to accommodate the increasing vehicular flow higher than its design capacity resulting to the chaotic mobility and degrading life standard of the people. The increasing population coupled with addition of vehicles in the street have shifted people from walking and cycling to vehicular mode for mobility. In order to decelerate the aggravation of such situation, active mobility; defined especially as walking and cycling, can be a right solution for Kathmandu core city. This research tries to assess the eminence of active mobility in present mobility pattern of the core area on the basis of traffic survey done in identified stretches along with identification of ways for shifting vehicular mobility to active mobility in the streets of core area.

Mobility in historical core area of Kathmandu has been pressing problem to be solved as Mechanical mobility is posing great threat to city life. In context of social sustainability of a city, the paper has raised the issues critically. Pedestrianization will contribute to enhancement of urban environment of city core by curtailing mobility by motorized vehicles. The paper tries to give emphasis on desirability of pedestrianized mobility which cuts down the pollution level too. The research aims to analyze different factors affecting active mobility in the study area and also identify the ways to improve them. For this, the research follows post positivist paradigm with triangulation of review of existing literature, related case studies and site observation constituting the structure of methodology. The research also discusses the attitude and perception of people towards the active mobility through the results obtained from questionnaire survey.

## **Keywords:**

Active mobility, Historical core city, Mobility pattern, Attitude, Perception

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# Probabilistic load flow analysis using point estimation method in Tandri Distribution feeder

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Menaka Karki <sup>c</sup>, Nitesh Kumar Yadav <sup>d</sup>

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## Abstract:

On Increasing in distributed generation(DG) at various location, the uncertainty factor in the distribution system has increases rapidly. The use of deterministic load flow(DLF) is unable to show the uncertainty operation of the grid so Probabilistic load flow(PLF) analysis is used to reflect the uncertainty of DG and load. Deterministic load flow is done using the square root method of load flow. The Result obtained from the Point-estimation method(PEM) and Monte- carlo simulation(MCS) is compared in IEEE-33 Bus Radial Distribution system. Integrated Nepalese Power System(INPS) of Tandri Feeder is used for PLF using PEM. Active Power of the DG and Active and Reactive Power use by the load are taken random variable for PEM. Gram charlier expansion with chebyshev hermite polynomial equation of random variable is consider to calculate the Probability Density function(PDF) and Cumulative distribution function(CDF).Hourly variation of solar irradiance from 9am to 5pm is model using the beta probability density function. Solar as a DG is connected at the different Buses and Probability of over voltage and under voltage at different bus before and after DG penetration is analysed. The result show the effect of DG penetration on Voltage and power loss of the system.

## Keywords:

Probabilistic Load flow,Distributed Generation, Gram charlier expansion, Point Estimation Method

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# Assessment of Socio-economic and Environmental Aspects of E-rickshaws on Urban Scenario; Case of Butwal, Nepal

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## Abstract:

When compared to auto rickshaws and human-pulled rickshaws, E-rickshaws are a better option due to less human effort and lower fuel costs. E-rickshaws emit far less pollution and provide last-mile connectivity, which means they give door-to-door service. It is a popular means of transportation in Nepal since it is both comfortable and cost-effective. E-rickshaws, one of these para-transit modes, have grown in popularity among urban people in developing countries as a quick and economical method of transportation. The case area Butwal has seen a rapid development of the E-rickshaw service in a relatively short period. Apart from mainstream public transportation, para-transit today plays an important role in the movement of people and products in cities all over the world. Electric rickshaws have both positive and negative consequences. The rapid rise of e-rickshaws has become a burden on the current transportation sphere due to unplanned development, unregulated population development, and a shortage of road space. Even though it is an environmentally beneficial, noiseless, and sustainable method of transportation, it contributes to the town's growing traffic congestion problem.

The main objective of this study was to examine the socio-economic and environmental aspects of E-rickshaws in an urban setting. The research paradigm was Post - Positivism, and Constructivism and mixed methodology (Qualitative and Quantitative Research Methodology) was used. Questionnaire survey of e-rickshaw driver and passengers was conducted and results were analyzed using SPSS. From the results it was concluded that e-rickshaw is socially sustainable but for achieving economic sustainability there are few areas of improvements. Environmentally it is sustainable means of transportation which requires some strict regulations in battery disposal and safe recycling of batteries and spare parts. Based on the conclusions recommendations were made.

## Keywords:

Sustainable transportation, E-vehicles, E-rickshaws, Para-transit System, Butwal, Socio-economic aspects, Environmental aspects

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# Modeling Strength of Short Fiber Reinforced Polymer Composites with Randomly Oriented Fibers

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## Abstract:

In this work a micro-mechanical model of for the prediction of the strength of randomly oriented short fiber reinforced composites is presented. The model incorporates the fiber length and fiber content that affects the properties of the composites. This model also integrates the orientation factor derived from a fiber orientation distribution function describing realistic directional arrangement of fibers during manufacturing of composites. The effect of interaction of fiber and matrix at their interface is represented by the interfacial shear strength in the proposed model. The model is validated with experimental data available in literature. The tensile strength values predicted from the proposed model is compared with commonly known models available in literature and it is found to give best fit with experimental data compared with other models.

## Keywords:

Short Fiber Reinforced Composites, Modeling, Tensile Strength

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# Application of DMA Concept for the Pressure Management of the Water Supply Network (A Study of Meghauli: Small Town Project)

*Subigy Devkota<sup>a</sup>, Mahesh Bhattarai<sup>b</sup>*

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## **Abstract:**

Application of District Metered Areas (DMA) concept in water distribution network is said to be advantageous in terms of leakage reduction and rational distribution of water which has been the case of concern in the last few decades. The case study was carried out for the conversion of existing non-DMA based network in Meghauli to DMA based network to study changes in pressure distribution using EPANET 2.2 software. The results demonstrated that in the DMA based network excess pressure is reduced by 14

## **Keywords:**

DMA, Leakage, Pressure, equitable, network

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# Assessing the Potentiality of Rainwater Harvesting via Zoning in the Core City Limits of the Kathmandu Metropolitan City

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## Abstract:

Rapid and haphazard urbanization, alarming population growth, and climate change are causing a huge stress in water management in Kathmandu Metropolitan City (KMC). Declining ground water level, expanding water supply-demand gap, and increased intensity and frequency of urban flooding in the city are of major concern. Rainwater harvesting (RWH) is considered as a potential solution in addressing water stress and aiding water management in different parts of the world. This study explores the potential of RWH in urban context of KMC and delineate the potentiality index via zoning. Analytical hierarchy process (AHP) based multi-criteria decision making is applied establishing rainwater harvesting potentiality index (RWHPI). Drainage density, roof area density, basin slope, and runoff coefficient are considered for RWHPI. Results showed that 28.78% of the total basin area has good RWHPI, 46.30% has moderate, and only 24.90% has low RWHPI. Also, Roof Rainwater harvesting (R-RWH) is alone able to meet nearly 23% of the total domestic water demand of the city.

## Keywords:

Rainwater harvesting potential, rainwater harvesting, urban water management, Analytical Hierarchy Potential (AHP)

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# Content Based Image Retrieval Using Convolutional Neural Network, Principal Component Analysis and K-means Clustering

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## Abstract:

Content based image retrieval (CBIR) is a system that takes an image as an input and provides a set of similar images to the input as output in an order of matched similarity. Features matching among images is a vague topic. It depends on what characteristics are taken into account and what degree of characteristics are balanced. In terms of semantics, images with high feature similarities to the query can be quite distinct from the query. This paper introduces a scheme for image retrieval, cluster-based image retrieval via unsupervised learning. In a certain feature space, semantically similar images appear to be clustered. This paper aims to capture semantic concepts by comparing images with the same semantics, and extracting image clusters will provide more reliable results instead of a collection of ordered images. Clusters therefore offer the algorithm and the users semantic relevant clues obtained from the input question that indicate where to navigate. Principal component analysis is used to reduce the dimensions of the extracted features of the training images. Here a representative image that has feature similarity to majority of the images, also known as cluster centre is compared with the input query processed result and then images of the cluster are sorted as per the similarity measure in terms of feature. Oxford university 17 category flower data set is used in this paper. Precision parameter is calculated based on the number of similar image retrieval out of five most similar images and the system is evaluated using the average precision for different test cases.

## Keywords:

Feature Extraction, Principal component analysis, K-means clustering

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# Passengers' Perception towards Quality of Public Transportation Services in Kathmandu Valley

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## Abstract:

The increasing modal shift from public to private vehicles in Kathmandu Valley is not only a regional traffic issue but is also alarming for the sustainable growth of the whole nation. Modal shift intentions are only controllable if service quality issues are properly identified and addressed. This paper presents a detailed study on passengers' perception towards quality of public transportation services in Kathmandu Valley and helps to identify a prioritized list of areas that requires immediate improvement. SERVQUAL (Service Quality) model based on RECSA (Reliability, Extent of service, Comfort, Safety and Affordability) quality aspects is used for the analysis of the quality of existing public transportation services. The model compares passengers' expectation and perception on various quality domains and identifies the areas of notable gap. Analysis of passengers' responses shows significant gaps between their expectations and perceptions in all five quality aspects of the services. Further, gap analysis shows safety aspect suffers with a highest gap followed by comfort aspect.

## Keywords:

Public transportation, service quality, gap analysis

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# Stochastic Gradient Descent and Discriminative Fine Tuning on ResNet, DenseNet, Inception-ResNet and MobileNet for the Multi-class Pathogenic Microbes Classification

*Nirajan Jha*<sup>a</sup>, *Dibakar Raj Pant*<sup>b</sup>

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## Abstract:

Pathological microbes classification and identification in pathological and medical field is important for diagnosis of numerous diseases and treatment of infection can be done accordingly. Similarly, outbreak of pandemics can be traced out. Microbiologists use various orientation of microorganisms and their shapes for multi-classification of such species manually. Such classification and taxonomy of microorganisms make the task tedious and sometimes difficult for professional microbiologists to classify. In this proposed work, deep learning has been implemented for identification and classification of pathogenic microbes. Multi class classification of 33 different species of pathogenic microbes has been done implementing ResNet, DenseNet, Inception-ResNet and MobileNet. Similarly, there is tuning of learning rates with the application of Stochastic Gradient Descent and Discriminative Fine Tuning approaches that has helped in enhancing the performance of the model. The classification accuracy of 90.62 has been obtained for Discriminative Fine Tuning approach and 100 for SGDR approach in ResNet50 architecture. The classification accuracy of 91.67 has been obtained for Discriminative Fine Tuning and 100 for SGDR in DenseNet121 architecture. Similarly, the classification accuracy of 96.88 has been obtained for Discriminative Fine Tuning and 100 for SGDR approach. Also, the classification accuracy of 100 has been obtained for approaches of Discriminative Fine Tuning and SGDR in Inception-ResNet-V2 architecture.

## Keywords:

Pathological microbes classification, Deep learning, Convolutional Neural Network, Image Multi-Classification, Discriminative Fine Tuning

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# Energy Performance of Conventional Residential Buildings of Kathmandu: A case of Reflective and Insulated Roofs

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## Abstract:

Buildings are composed of several fabrics that contributes in its thermal comfort and the energy consumption. Roof surfaces are one of largest parts of building envelopes that in constant exposure to the outdoor environment results in the phenomena of overheating of the rooms beneath the roof with constant penetration of solar radiation on outside fabric of roof surface. This paper intends to study the roof surfaces of Conventional Residential buildings in Kathmandu valley in the perspective of Insulation and reflective coatings. The thermal comfort with respect to the cooling and heating loads attained by the roofs were studied thereby resulting the impact and effects on the overall energy performance and energy demand caused by its structure and the construction material A survey to collect the data and perspective towards roof and the thermal comfort with respect to roof structure and its material during the construction was conducted to correlate the outcomes and results with the outputs of the typical prototype conventional residential building of Kathmandu during the course of simulation . In the course of the survey majority of respondent were in favor of cooling the rooms beneath the roof such that the roofs are mostly heated in the course of the year. The U-value and reflectance of the roofing materials were studied such that, the results in simulated scenario of green roof and the clay tile provision has come up to be the best deal by attaining the lesser overall energy consumption to maintain the thermal comfort as compared to the base scenario of the roof. Also Reflective Paint coating come out to be the better measure to reduce the cooling load of the rooms beneath the roof of Conventional Building in Kathmandu Valley.

## Keywords:

Thermal Comfort, Roofing Materials, Insulation, Reflective coatings, Cooling and heating load

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# Numerical Analysis of Slope Reinforced with Piles: A case study of Upper Trishuli 3B Hydroelectric Project

*Utsav Thapa<sup>a</sup>, Bhim Kumar Dahal<sup>b</sup>*

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## Abstract:

A powerhouse slope of Upper Trishuli 3B Hydroelectric Project is taken as a case study to perform stability analysis of the steep cut slopes by performing numerical analysis on the unstable and pile reinforced soil slope. Samples from top, middle and bottom of the slope were tested in laboratory for soil classification and shear parameters. Numerical models were developed in PLAXIS 2D V20 to study the parametric variation of three parameters of vertical pile i.e. diameter, length and spacing based on factor of safety. A comparative study was performed by changing configuration of vertical pile to combination of cross beam and vertical pile which is called h-type anti-slide pile ( hTP pile). The result of the study is that hTP pile have better performance in slope than vertical pile only.

## Keywords:

Slope stability, Finite Element Method, Pile, Factor of Safety, Parametric variation, h type anti-slide pile

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# Optimal Protection Coordination for Microgrid with Grid Connected and Islanded Capabilities Using Dual Setting Directional Over Current Relays

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## Abstract:

Due to the increasing interest in distributed generation(DG) at various levels microgrid concepts have developed. A microgrid can operate either in islanded mode or in grid-connected mode. In grid-connected mode both utility grid and distributed generator supply fault current but in islanded mode only DG contributed to fault current. Short circuit level difference between different modes of microgrid operation is the main challenge in protection coordination. Directional overcurrent relays (DOCRs) are used as main protection equipment for the microgrid. DOCRs must detect and eliminate fault in both modes of operation, while coordination constraints between backup and primary relay are maintained. DGs in the distribution system cause bidirectional power flow. So it is better to have a relay that can respond differently for both directions. In this paper dual setting DOCRs are used which have two different settings for a different direction. A Genetic algorithm has been used as an optimization technique to determine optimal relay setting and coordination between relays in MATLAB. The test system used was a 9 bus Canadian distribution system. In this research, it has been found that it is possible to have one optimal relay setting that satisfies both microgrid modes of operation. In addition, the primary and backup relay can be coordinate effectively for the protection of microgrid without violating protection system constraints. The result shows that using dual setting DOCR total relay operation time in both primary and backup relay can be minimized compared to conventional DOCR.

## Keywords:

Microgrid, Genetic Algorithm (GA), Protection Coordination, DOCR, DG

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# Estimating Methane Gas Generation from Landfill Site - A case study of Sisdol Landfill Site, Nuwakot Nepal

*Kusum Deo<sup>a</sup>, Ram Kumar Sharma<sup>b</sup>, Shanti Kala Subedi<sup>c</sup>*

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## Abstract:

Methane gas is one of the major greenhouse gases with global warming potential 28 times than Carbon Dioxide (CO<sub>2</sub>). Landfills, which are common methods of municipal waste disposal, are one of the main sources of anthropogenic methane (CH<sub>4</sub>) emissions. CH<sub>4</sub> not only is source of GHG but also a great source of alternative energy as it has a high potential for energy production and by using proper technology, large amounts of energy can be extracted from it. The aim of the study is to estimate the methane emission rate and total methane emission from the Sisdol landfill under different scenario and find out the possible reduction of methane in each scenario so that best alternative for the municipal waste management can be applied in future for sustainable municipal solid waste management in Kathmandu. One of the common mathematical models used for estimating the amount of methane potential and generation is LandGEM software due to its simplicity and precise, site based estimation of generation of methane, which was applied in this study to estimate the CH<sub>4</sub> emitted till date and emission in future from Sisdol landfill site for six different predictive scenarios: S0, S1, S2, S3, S4 and S5 which were developed based on people's perception and economical and technical feasibility and possibility of each scenario in the future. As a result, CH<sub>4</sub> in the site was estimated to be 2283.93 Mg/year in 2021 with total 25, 02,999.78 Mg waste disposed in place and 3678.43 Mg/year in 2030 under BAU. Based on the emission under different scenarios and the comparative study of each scenario, it maximum reduction in methane generation was found under integrated scenario (S5) and minimum was for recycling scenario (S4). Without any doubt, increase in emission was the result of worst case scenario. Hence, integrated scenario was concluded to be the best alternative for municipal waste management in Kathmandu. The result of the study could be used for the designing and planning of alternatives for waste management and also for assessing the feasibility of the gas capture system from landfills.

## Keywords:

Methane, municipal Solid Waste, Landfill, Sisdol, LandGEM model

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# Probabilistic Performance Index (PPI) based Contingency Screening for Integrated Nepal Power System Reliability Evaluation

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## Abstract:

Continuous supply of adequate quantity of quality electrical energy to the customer is prime objective of overall power system operation. As power system behavior is stochastic in nature, random failure of component is a major challenge associated with power system reliability. The study and evaluation on power system reliability is most important aspects for planning, design and operation of power system network. This research work comprises the reliability evaluation of our Integrated Nepal Power System(INPS) operation based on probabilistic approach of reliability assessment. Ten(10) number of contingencies which are most probable to be operated are studied and analyzed. In this study, 39 generating plants and 71 transmission lines all together 110 number of component are taken. The loads, maximum demand(MW) has taken as fixed. State values of individual component are calculated with binomial probability distribution. Truncation of state space has been carried to truncate the state spaces having insignificant probabilities. Transition rate and state frequency of individual contingencies are calculated using reliability indices based on probability values. The load curtailment to be occurred in each contingency has been assessed with Digsilent powerfactory simulation, where contingencies are individually run for getting load curtail level. Finally, PPI index for all contingencies are calculated, PPI values indicates the severity of that contingency, higher the PPI higher the severity and vice-versa. This research concluded that, only the load curtailment value do not truly reflect the severity to be expected with that operation rather it is due to the combine effect of load curtail and state frequency of that state operation.

## Keywords:

Reliability evaluation, INPS , Probabilistic Performance Index, Contingency Analysis

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# Study on Drivers' Yielding Behavior at Pedestrian Crossings

*Sumona Bajracharya<sup>a</sup>, Anil Marsani<sup>b</sup>*

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## Abstract:

Driver yielding at pedestrian crossings is essential for the safety of all road users. While driver yielding behavior may depend upon various road and road-user characteristics, this study investigates driver yielding behavior for twelve variables. Data is extracted from six study locations and analyzed by using binary logistic regression. The final model, Model III indicates that driver yielding depends upon ten significant parameters: no. of pedestrians crossing the road at the same time (N), pedestrian age category, pedestrian gender, pedestrian speed, driver age category, driver gender, vehicle type, vehicle speed, presence of a median strip and zebra-crossing marking condition. The study did not find any increase in yielding for older age groups (more than 60 years) or for females carrying an infant.

## Keywords:

vulnerable road users, zebra-crossing, road safety

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# Impact Assesment of Plug-in-Electric Vehicles on Distribution System through Home Charging

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*Sanjeev Maharjan*<sup>c</sup>, *Samundra Gurung*<sup>d</sup>

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## Abstract:

Global environmental issues have brought several international agreements to reduce carbon emission. In this context, electric vehicles (EVs) can be the best alternatives to reduce petroleum consumption and carbon emission simultaneously. EVs getting massive popularity with new policies initiated by several governments. But the rapid deployment of EVs can be burden to power distribution network. This research is focused on impacts of plug-in-electric vehicles(PEVs) on distribution system with stochastic behaviours of PEVs. The distribution system is analyzed in terms of feeder peak, total power loss and energy loss, voltage deviation, transformer loading, and line loading before and after the penetration of PEVs over a wide range considering home charging scenario. The results is analyzed to determine the withstand capacity of distribution system for PEVs. The line loading reached 104.63% violating the limit with 80% of PEVs but the voltage deviation is under limit.

## Keywords:

Distribution system, DigSILENT, Electric Vehicle, Monte Carlo Simulation, Plug-in-electric vehicle

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# A Typical Residential Masonry Building in Urban Settlement and its Seismic Assessment

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## **Abstract:**

Maximum of masonry buildings in urban areas are with large openings in ground floor level and with different stages of construction adding more non-engineered complexity to the structure. In this paper, the analytical methodology for seismic vulnerability assessment is presented through a case study of existing masonry building in Panauti Municipality with different structural deficiencies. Stepwise procedures of seismic assessment is analyzed through non-linear pushover analysis and fragility functions are generated to define the level of vulnerability of the building. The area elements at potential yielding sections are replaced with Multi-linear plastic non-linear link elements which are defined in finite element software SAP2000. The proposed study has direct implication towards assessing the vulnerability of similar case study of URM residential buildings which further assists for the development of proper retrofitting strategies assuring life safety requirements.

## **Keywords:**

Unreinforced Masonry (URM), Nonlinear Link, Pushover, Fragility, Seismic Vulnerability

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# An Analysis on Open Spaces in Kathmandu Valley from Disaster Management Perspectives

*Akriti Rimal*<sup>a</sup>

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## **Abstract:**

Open spaces are critical urban resources, and their significance is generally recognized only when disaster strikes. The decrease in usable area of open spaces in Kathmandu Valley can be taken as a prediction of extreme difficulties in post-disaster crisis management. So, it is better to be prepared for disaster beforehand than waiting for it and we must have plan for the people who survived from the disaster in order to control and check epidemics and famines that can happen after disaster event. So, there is a need to strengthen the disaster management capability and the foremost step towards disaster preparedness is to identify the possible open spaces where people can be kept safe during and after the disaster. This research aims to study and evaluate open spaces to know whether they are suitable for use during emergencies or not, whether those open spaces have the quality to become emergency open spaces and thereby strengthen emergency preparedness and provide the initial response planning framework for local governments and partner agencies.

## **Keywords:**

Open Spaces, Disaster management, Kathmandu

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# Vulnerability Assessment of a Hybrid Masonry Building with Unreinforced Masonry Peripheral Walls and Central Reinforced Concrete Columns

Pranav Acharya <sup>a</sup>, Gokarna B. Motra <sup>b</sup>, Kshitij C. Shrestha <sup>c</sup>, Arun Paudel <sup>d</sup>

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## Abstract:

The practice of unreinforced masonry has been around since ages. In seismically active zones like Nepal, it is utmost for the structures to be designed by following proper seismic design criteria. But, most of the older unreinforced buildings in Nepal are non-engineered to semi engineered structures, which lack proper seismic detailing. A detailed visual assessment of the Panauti municipality area, led to the identification of a unique building typology. The typology has centrally located reinforced concrete columns supporting concrete slabs and beams spanning along the grid of columns which altogether rested over peripheral load bearing unreinforced brick masonry in cement mortar. The building was modelled in SAP2000 and pushover analysis was performed. This was followed by generation of fragility curves under different Peak Ground Accelerations(PGAs) of response spectra in IS 1893:2016 and NBC 105:2020. The fragility curves thus obtained were used to understand the vulnerability of the structure to considered earthquakes. This study can be further used for seismic assessment of similar typology buildings and for appropriate recommendation of strengthening measures.

## Keywords:

Unreinforced Masonry, NL Links, Link element, Capacity spectrum, Fragility generation

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# Energy retrofitting of façade: Curtaining with Building Integrated Photovoltaics

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## **Abstract:**

The use of renewable resources helps to reduce dependence of fossil fuels, improve global energy security and tackle environmental problems like climate change. Building integrated Photovoltaics (BIPV) are on the rise as they serve the dual purpose of regulating indoor environment as well as generating electricity. This study presents the analysis of the energy retrofitting of façade with BIPV in the building of Kathmandu Valley. The research focuses on the comparison analysis of placement and type of BIPV in the façade for maximum generation of energy. For this purpose, various type of BIPV were studied and suitable type was used for further calculation. Manual calculation for the sizing of PVs was done for the case building and for the comparison, computer based energy simulation was also carried out using various software i.e. rhino for 3d modelling and grasshopper and ladybug tool for the further analysis of solar radiation and PV. The results illustrates that the placement of BIPV with maximum efficiency in south and east façade of the case building reduces 46.3% of the total consumed units per month. Energy retrofit of façade with BIPV could significantly reduce the monthly bill of the building and can be used as energy mix for the future

## **Keywords:**

Building Integrated Photovoltaics, Energy Retrofit, Solar energy, Building facade

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# An Investigation on Potential of Decentralized Rainwater Harvesting for improving Sustainability of an Urban Residential Area - A Case of Samakhushi, Kathmandu

*Anami Bohara<sup>a</sup>, Sangeeta Singh<sup>b</sup>*

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## **Abstract:**

This study aims to identify the potential of rainwater harvesting on a neighborhood scale by doing qualitative and quantitative analysis. Small neighborhood of Samakhushi, Kathmandu was selected as a good representative of compact urban residential area. Samakhushi lies in northern belt of Kathmandu valley where there is high infiltration rate for ground water recharge but also has water logged streets during rainy days and water scarcity during dry seasons. Based on a statistical analysis of the rainfall, the amount of rainwater that might be captured from roofs and ground surfaces was calculated. Potable water consumption of households of urban residential was determined based on the standard data from literature. In this study, potential of rainwater in compact urban area for regenerating water sensitive urban development was evaluated. In addition, a possibility of minimizing wastewater from rainwater harvesting was evaluated. The study also examined case studies with success stories, which reflects improved urban scenario through rainwater harvesting. Moreover, social perspective from community, government institutions and technology providers on rainwater harvesting was also analyzed. Based on the qualitative and quantitative data, direct and indirect benefits were explored that helps to improve water sustainability and water sensitive planning of an urban residential area.

## **Keywords:**

Urban Residential Area, Rainwater Harvesting, Ground Water Recharge, Water Sustainability, Water Sensitive Urban Development

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# Influence of Infill Wall Stiffness on The Fundamental Time Period of RC Frame Buildings

*Prabin Gautam<sup>a</sup>, Bharat Mandal<sup>b</sup>, Sanjay Kumar Sah<sup>c</sup>*

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## **Abstract:**

Fundamental time period of structure is the most censorious parameter for seismic design of structure. Vibration period of building depends upon geometry of building, mechanical properties of construction materials and other various factors. In this research, effect of infill wall panel strength on the fundamental time period of regular reinforced concrete frame building was investigated. A total of 180 regular building models were analyzed by using finite element software. Infill wall panels were modelled as single equivalent diagonal strut macro-models. It was found that infill wall stiffness has considerable influence on the fundamental period of RC building and should be considered in the prediction of fundamental period. After analysis different analytical equations are given from regression analysis in which fundamental time period of building is depends on height of building, base dimension of building, modulus of elasticity of infill wall panel and thickness of infill wall panel.

## **Keywords:**

Fundamental Time Period , Regular RC Frame Building, Infill Wall, Rayleigh Method

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# Comparative Study of Flat Slab Structures with Steel Bracings

*Rabin Aryal<sup>a</sup>, Kamal Bahadur Thapa<sup>b</sup>*

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## **Abstract:**

Many past researches shows that the flat slab building system is weak in lateral load resistance induced due to seismic actions. To enhance the seismic performance of flat slab building, it needs effective lateral load resisting system. In the present work, G+5, G+7 and G+9 storied conventional building and flat slab building system were modelled. For lateral load resistance, various types of steel braces were modelled on flat slab structure. Equivalent static analysis method and Response spectrum analysis method were performed using IS 1893 2016. The comparative study of seismic parameters such as maximum storey displacement, storey drift, base shear and time period were performed. The study shows that, use of steel bracings as a lateral load resisting system enhances the seismic performance of flat slab system.

## **Keywords:**

Flat Slab, Steel brace, Linear Analysis, Drift, Displacement, ETABS

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# Distributed Denial of Service Attack Detection on Software Defined Networking

*Suwan Babu Bastola<sup>a</sup>, Subarna Shakya<sup>b</sup>*

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## Abstract:

The DDoS attack detection on Software Defined Networking architecture provides a central approach for monitoring the network traffics and informing the network administrator to apply respective counter measures. This research work builds different Deep Learning models for DDoS Detection viz LSTM, GRU, BLSTM and LSTM-GRU hybrid approach using the latest DDoS specific dataset CIC DDoS 2019. The comparison of the different detection models by cross-validation with the train-test split of 8:2. The hybrid LSTM-GRU model outperforms other models considering different performance metrics like accuracy, precision, recall, specificity and f-score. The LSTM-GRU and BLSTM detection model are implemented on the SDN architecture considering standard Carnet topology and different sized linear topology, and python based Ryu controller. The traffic including legitimate and DDoS traffic are generated on SDN environment is parsed real time and values of the features is extracted, and fed into the detection model residing at SDN Ryu controller that classifies the traffic as normal or DDoS attack. The latency comparison shows LSTM-GRU model has lower latency than BLSTM model. On several SDN architectures, the LSTM-GRU based DDoS detection model is implemented. In terms of fault tolerance and CPU utilization %, the master-slave SDN design is proven to be more beneficial.

## Keywords:

Software Defined Networking, DDoS, CIC DDoS 2019, LSTM, GRU, BLSTM, TCP-SYN, UDP, Ryu Controller

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# Numerical Modelling of Triaxial Tests for Kathmandu soils

*Kushalta Nyoupane<sup>a</sup>, Santosh Kumar Yadav<sup>b</sup>, Indra Prasad Acharya<sup>c</sup>*

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## **Abstract:**

The experimental data available from triaxial tests for Kathmandu soil samples of different three places are analyzed and the characteristics are studied using three different constitutive soil models. Furthermore, the determination of stiffness and strength parameters for respective soil models are calibrated. Consolidated undrained tests for the soils of Kupondol, Jaisedewal and Gokarna at the depths of 4-6m have been modelled and the parameters are calibrated using Finite Element software. Stress paths and stress strain plots to which soil specimens were subjected in experimental triaxial tests are exercised in different soil models such that the tests are well simulated. The laboratory tests done for three different soil specimens in three different research have been used in the study. Finally, the study showed that all three constitutive models: Mohr Coulomb Model (MC), Modified Cam Clay (MCC) Model and Hardening Soil Model (HSM) were able demonstrate the soil behaviour for Jaisedewal soil. However, HSM model better illustrated the stress strain behaviour and stress paths for Kupondol soil and stress strain behaviour and pore water- axial strain behaviour for Gokarna soil.

## **Keywords:**

Soil Model, Consolidated Undrained Triaxial tests, Kathmandu soil, Stress Path, Finite Element Method

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# Text-to-Image Synthesis using Conditional Stacked Generative Adversarial Network with Skip-Thought Vectors

*Susmita Sharma*<sup>a</sup>, *Subarna Shakya*<sup>b</sup>

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## Abstract:

Generative Adversarial Network is an emerging technology for synthesizing realistic images. Text to image synthesis have been used for many research studies however, it is very difficult to reflect the meaning in the images from given text descriptions. Samples generated from text-to-image synthesis may lack details and also produce low quality images. In this research, the text-to-image synthesis is further divided into three stages namely Text embedding, low resolution image generation and high resolution image generation. The text embedding is carried out by skip-thought vectors including Recurrent Neural Network encoder with Gated Recurrent Unit activation to create  $4*4*1024$  dimension text embedding. Two conditional GANs are stacked over each other where the first GAN generate low resolution  $64*64$  dimension images. The second GAN utilizes the low resolution image to generate more detailed  $256*256$  high resolution images. The Conditional Stacked Generative Adversarial Network with Skip-Thought Vectors uses Caltech-UCSD Birds 200 (CUB-200) data-set produced by California Institute of Technology. The same network with different skip-thought encoders produces varied visuals i.e. the combine-skip encoder outperforms the bi-skip and uni-skip encoders. With an inception score of  $5.19\pm 0.04$  and FID of 46.92, the ST-CSGAN generates images from text descriptions, which is greater than other models for the CUB dataset.

## Keywords:

Generative Adversarial Networks, Skip-Thought Vectors, Conditional Stacked Generative Adversarial Network, Text-to-Image Synthesis, Caltech-UCSD Birds 200, Inception Score, Fréchet Inception Distance.

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# Assessment of Residential Neighbourhood of Kathmandu Valley for Social Sustainability

*Roji Puri<sup>a</sup>, Sangeeta Singh<sup>b</sup>*

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## **Abstract:**

Kathmandu valley has witnessed the growth of planned residential development by both public and formal private sectors in past several decades of the urban development. The aim of predominant mode of planning of such development is based mostly on land readjustment technique and housing development. They either provide the service plot or ready to move in housing stock. Though Kathmandu is the most preferred place to reside in due to abundant facilities and job opportunities, it has been lacking a proper planned neighborhood. There aren't enough studies that measure context specificity sustainability at neighbourhood level. The cities all across is facing serious challenges of the climate change effects. With all this the need for climate action – model to assess the neighbourhood is required. The purpose of this research work is to the study is to know the interrelationship between infrastructure, services and social development through comparative case study of planned and spontaneous settlement and accessing the perception of the residents towards sustainable aspects more of societies and neighbourhood infrastructures, also accessing the perception of the residents towards sustainable aspects more of societies and neighbourhood infrastructures. The study tries to go through inter linkage between urban neighbourhood infrastructure and social sustainability. While it is obvious that situations of an old traditional local environment plainly dissimilar to those of a new settlement with high socio-cultural aspect with influence to the surrounding new settlements. Context-specificity is alarmed with the consideration of local characteristics, as characteristics of each new development has different climatic, social, and economic settings. This requires taking acceptable account of the differences between various localities with expansion require different approaches.

## **Keywords:**

Urban Neighbourhood, Social Sustainability, Assessment of Social Sustainability, Sustainable Social Development

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# Making Bhaktapur Walkable Again – Can we reverse it back to ancient walkable town?

*Rojita Sharma <sup>a</sup>, Sudarshan Raj Tiwari <sup>b</sup>*

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## **Abstract:**

Over the past decade the quality of the walking environment has become a significant factor in transportation planning and design. Sustainable transport is transportation that meets the current needs without compromising the ability of future generations to meet their own needs. Walkability is a measure of how friendly an area is to walking. Walkability has health, environmental, and economic benefits. Bhaktapur is the oldest city of Kathmandu valley, dated back to the medieval period. Bhaktapur and many other traditional towns in Nepal were never planned to accommodate motorized vehicles. There are too many vehicles in the ancient town. This research aims to explore the influencing factors for walking and cycling. However, the special needs of bicyclists are not addressed here. This research uses qualitative measures to study whether an urban community can shift its lifestyles, attitudes, and habits from motorized to walking for short trips without jeopardizing the quality of life and the policymakers to formulating plans on achieving walkable environments.

## **Keywords:**

Sustainable transportation, walkability, Bhaktapur, quality of life, ancient walkable town

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# Evaluation of Seismic Performance of RC Frame Building with Variation in Effective Stiffness

*Namrata Thapa<sup>a</sup>, Prem Nath Maskey<sup>b</sup>*

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## **Abstract:**

Due to cracking, there will be a substantial reduction in flexural stiffness which ultimately results in larger deflections. Member stiffness is commonly considered as the gross stiffness, or as the effective stiffness which is an approximate percentage of gross stiffness, in the study and design of reinforced concrete (RC) buildings. NBC 105:2020 recommends the use of effective stiffness of cracked sections during analysis, however it is not addressed in NBC 105:1994. Several configurations of moment-resisting frames, regular in plan and elevation, with variation in the number of bays and storey number are designed and analyzed by using gross and cracked section properties. The motive of this research is to study the effect of the modeling approach of building in terms of gross and cracked sections on the structural performance under earthquakes. Non-linear static analysis is done in ETABSv19 to evaluate the overstrength and ductility of structures designed using gross and cracked section properties.

## **Keywords:**

Effective stiffness, Overstrength factor, Ductility factor

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# People Perception towards Adoption of Electric Vehicle in Kathmandu Valley

*Diksha Shandilya<sup>a</sup>, Hans Narve Skotte<sup>b</sup>*

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## Abstract:

The development of electric vehicles and electric public transport altogether uplifts the quality of life of people and is also a boon for sustainable urban mobility. This research aims to find perceptions, attitudes and behavioral intentions towards mass adoption of electric vehicles and identify advantages and barriers to consumer adoption. The findings of this paper can help in understanding perception and adoption in a developing country scenario where electric vehicles are still in early market phase. Questionnaire survey was conducted and 251 people were interviewed regarding their perception on adoption of electric vehicles. The indicators used to perception was socio-demographics, human travel behavior, experience of using electric vehicles, attitude, behavior, knowledge, awareness and public transportation (accessibility, availability, affordability, safety and comfort). It was analyzed using Likert's scale from 1-5 rating and further SPSS was used for regression and correlation analysis for perception analysis. Log Frame analysis was done for qualitative analysis. Although findings show people having positive affinity for sustainability (73.7%) and electric vehicles, very few (only 8%) actually owned electric vehicles. The gap is mainly due to barriers of cost, infrastructure and policies. Evidence based policies need to be addressed.

## Keywords:

Electric Vehicle, Adoption, People's Perception, SPSS, Regression Model, Log Frame Analysis

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# A Case Study of Dodhara-Chadani Distribution Feeder for Multi-Objective Optimization of PV Penetration

*Umesh Bhandari <sup>a</sup>, Menaka Karki <sup>b</sup>*

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## Abstract:

Electrical power involving Distributed Generation (DG) is being the hot cake to serve consumers demand. While supplying demand, power quality, voltage stability, loss reduction, etc. of the Distribution System Network (DSN) are of prime concern. In this work, Modal Analysis determines candidate buses for solar PV placement and different methodology for multi-objective (MO) Penetration Optimization of Solar PV in a RDS are analyzed. Random Penetration Optimization, MO Penetration Optimization using Genetic Algorithm (MOGA) and Non-Dominated Sorting Genetic Algorithm-II (NSGA-II) are discussed for sizing optimally the solar PV in IEEE-33 Bus System with expected improved performances like Active Loss Reduction (ALR), Voltage Deviation Index (VDI), Voltage Stability Index (VSI), etc. The results of the optimization tools are analyzed and hypothesis testing is performed to check whether the obtained results are statistically significant. Penetration optimization of Dodhara-Chadani (DoC) Distribution Feeder of Dodhara Substation is performed taking multiple objectives for deterministic Sources and deterministic loads. The effect of uncertainty is also analysed to determine the best locations for PV penetration. Other different cases are also analysed.

## Keywords:

Modal Analysis, Penetration Optimization, Multi-Objective Genetic Algorithm (MOGA), Non-Dominated Sorting Genetic Algorithm-II (NSGA-II)

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# Sustainable Placemaking – Envisioning the Potential of Everyday Places (Exploring and Redefining Public Spaces of Kathmandu)

*Niharika Mathema<sup>a</sup>, Sudarshan Raj Tiwari<sup>b</sup>, Martina M. Keitsch<sup>c</sup>*

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## Abstract:

Urban environments are now changing rapidly in Kathmandu resulting in the haphazard and unplanned development of most new urban areas. The high urbanization rate involves risks of accelerating seclusion, displacement, gentrification and social inequality. These transformations raise questions on how livable, inclusive and sustainable public spaces are. In the context of swift urbanization, where the importance for creating sustainable and inclusive cities is at stake, addressing public spaces is crucial. It necessitates designing quality public spaces that will ensure healthy, inclusive and meaningful experiences for city dwellers in increasingly dense urban environments. One strategy to address this can be Placemaking, which has emerged as a movement for shaping public spaces since the 1960s. It can be an innovative and promising way to respond to current urban dynamics and deal with the ongoing urban transformation in Kathmandu. In this attempt, the research focuses on the case study of Indrachowk. The thesis has adopted mixed methods approach to gain holistic and in-depth information about the underlying issues in Indrachowk and to explore the prospects of Placemaking to address them. For that, critical place quality evaluation has been done and then Placemaking strategies responsive to Indrachowk's historic and social fabric have been discussed.

## Keywords:

Placemaking, Public Space, Experience, Quality, Sustainability

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# Managing A Sustainable Domestic Tourism for Bhaktapur Durbar Square: Learning from Patan Durbar Square

*Jasmina Shrestha <sup>a</sup>, Sudarshan Raj Tiwari <sup>b</sup>*

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## **Abstract:**

Tourism can be considered as the main component for protecting the cultural and natural heritage of the country and considered as the important source for generating economic growth and employment opportunities of the country. Covid-19 pandemic has been affecting each and every sector around the world along with tourism. Due to the pandemic, lockdown in most of the countries, restriction to travel and no group meetings. The Bhaktapur and Patan Durbar Square are the major cultural attraction for tourist. The domestic visitors in Bhaktapur Durbar Square are less in number compared to Patan Durbar Square hindering the economic and socio-culture of the place. Domestic tourism can be one of the solutions to recover the losses in the tourism sector but need to follow the safety protocols. The main objective of this research is to find out how Patan Durbar Square have ability to be more attractive for domestic tourism before Covid-19 pandemic than Bhaktapur Durbar Square and how to develop conclusions and recommendations on future prospects of domestic tourism in Bhaktapur Durbar Square with various programs and activities learning from Patan Durbar Square.

## **Keywords:**

Tourism, Covid-19, Pandemic, Bhaktapur Durbar Square, Patan Durbar Square, Domestic tourism

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# Urban Spatial Transformation: A case study of Pokhara Metropolitan City

*Dinesh Bhattarai<sup>a</sup>, Ajay Chandra Lal<sup>b</sup>*

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## **Abstract:**

This article analyses the spatial distribution of different land use types. The article utilizes land use /land cover data based on time-series Landsat images, remote sensing images which were collected from earlier research papers, municipal and district reports as well as references were taken from Google historical time-line and open street map. Although the data may deviate from actual data due to various reason, however, the aim of this article is to establish the trend of spatial transformation which is useful to indicate the pattern of urban growth and land use/ land cover of the Pokhara metropolitan city (hereafter PMC). The result indicates that PMC has been spatially transforming with rising built up space at the expense of decreasing agricultural land and open space which challenges the already vulnerable and risk hazard geology of the region. The main reason cited were high rate of migration, lack of land use and zoning maps and inadequate development control.

## **Keywords:**

Spatial pattern, urban growth, land use changes

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# Exploring the prospects of Eco-tourism for Sustainable Development: A case of Chitlang

*Sabin Khadgi<sup>a</sup>, Sangeeta Singh<sup>b</sup>*

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## Abstract:

Ecotourism, a branch of sustainable tourism, is a travel that is based not only on nature but also on the hosts, their needs, culture and their relationships with the land. Ecotourism focuses on conservation of biodiversity, integrity of resources, protection of environment, sustainable development of communities along with their economic enhancement. Poor tourism linkages with the rural communities, limited policies and guidelines to support eco-based tourism initiatives, exploitation of natural resources and limited considerations on factors of sustainability, has resulted in negative impacts on potential rural communities. This study intends to explore and investigate prospects of developing eco-tourism as means for sustainable development by analyzing the nexus between parameters: local communities, ecology and eco-tourism activities. Chitlang has the potential to be developed into an eco-tourism destination due to the range of characteristics it possesses. There are many types of eco-tourism services and integration of each in helps in sustainable development. Different types of eco-tourism services identified in Chitlang are community based, culture based, nature based, agrotourism based and adventure-based tourism activities. Chitlang is ideal for experiences regarding nature, spirituality, recreation, historical studies, cultural tours, linguistic, socio-economic activities, folk culture, entertainment, literature, biking, cycling, caving, sightseeing, trekking, hiking, bird watching, wildlife exploration and research activities.

## Keywords:

Eco-tourism, Eco-tourism services, Sustainable development, Analyzing nexus

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# Sustainability assessment of Adaptive Reuse buildings in Kathmandu - A Study of 3 Cases at Patan

*Kripa Shakya<sup>a</sup>, Sudarshan Raj Tiwari<sup>b</sup>*

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## **Abstract:**

Sustainable development is one of the dominant movements in the 21st century, especially in the sector of building and city design. Sustainability is not solely as an environmental concern, but also incorporates economic and social dimensions. Adaptive reuse is a building practice which offers multiple sustainability benefits compared to new construction. It contributes towards the concept of sustainable development as it promotes reusing as much as possible of the existing built structure by finding a different suitable use and reducing abandonment or destruction. Currently sustainability assessment is relevant mostly to new construction. The primary purpose of this research is the assessment of adaptive reuse projects in Patan in terms of factors based on existing literature and the context of Patan. Among the three projects considered in the study, two are repurposed hotels at Swotha area of Patan (Traditional homes and the Inn) and the other is a heritage center Yala Maya Kendra located at Patan Dhoka. The study is also an attempt to observe the methods and materials that are being used in the existing adaptive reuse buildings and its impacts.

## **Keywords:**

Adaptive reuse, Sustainability, Traditional building

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# The Integration of Informal Female Waste Workers in Solid Waste Management of Kathmandu

*Nishaj Kunwar<sup>a</sup>, Sangeeta Singh<sup>b</sup>*

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## Abstract:

Kathmandu, being the capital of the city is one of the most polluted city of the world. Increased population and lack of facilities in other region of the country have forced people to migrate into the city and this has created a big problems for employment. Unplanned urbanization and increased population have intensified the urban solid waste and the local government have big pressure to manage this wastes. Though government came up with different plans and alternatives but they alone could not help to solve the issues of waste. The best way help with this issues is through the source reduction and reuse of the materials. It has multiple benefits as the waste is being reduced or reuse, the pressure is reduced to the landfill helps to reduce environmental degradation, the cost for management will also decrease and the value added to the waste could help people to generate income. The integration of female waste workers provides support and attract other females to work in waste management thus creating a chance of employment and support livelihood for their families. A large workgroup working in the sector will definitely help in solving the problem of waste management and create a sustainable livelihood for those who engage.

## Keywords:

informal female waste workers, municipal solid waste, waste management

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# Computational study of chill down process in helical cryogenic transfer line internally coated with low thermal conductive layer

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## Abstract:

The chill down of cryogenic transfer line is important for transporting cryogenics from storage units such as cryogenic tanks or Dewar vessels prior to the actual operation of cryogenic systems. Any attempt to reduce chill down time of cryogenic transfer lines result in energy conservation, lowering overall performance costs and aiding in the efficient functioning of any cryogenic system. One of the methods to do so is coating the thin layer of low thermal conductive layer on the inner surface of a transfer line/piping along with proper selection of piping material. In the present research work, computational study of chill down process is carried out in a helical transfer line internally coated with low thermal conductive material of polytetrafluoroethylene which belong to a family of Teflon carrying liquid nitrogen as cryogen. The effect of transfer line materials and change in dimensionless pitch ratio (axial pitch) in chill down time has been investigated. And, the effect of variation of inlet velocity on chill down process is also studied. From the computational study, it is observed that aluminium cools faster than steel and copper. For the specified model, the chilldown time of aluminum transferline is 96 seconds, copper is 134 seconds, and steel is 140 seconds. Also, it is discovered that changing the dimensionless pitch ratio by adjusting the axial pitch results in a minor variation in chill down time. Furthermore, the chill down time for a copper helical transfer line with an inlet velocity of 0.03 m/s is 134 seconds, 0.06 m/s is 78 seconds, and 0.09 m/s is 64 seconds, implying that increasing the inlet velocity of flow leads the cryogenic transfer line to chill down quickly.

## Keywords:

Helical transfer line, Cryogenics, Chill down time, Polytetrafluoroethylene, dimensionless pitch ratio

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# Effect of Structural Lightweight Concrete on Energy Performance of a Residential Building

*Bivek Joshi<sup>a</sup>, Sanjaya Uprety<sup>b</sup>*

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## Abstract:

In this modern world, everything is linked with efficiency in terms of energy, economics, or comfort. The inclusion of energy efficiency measures in construction industry could bring significant decrease in energy consumption. The materials used in the construction of building envelope can vary the consumption based on their thermal properties and thus contribute in overall life cycle cost of the building. The usage of materials having low thermal conductivity can substantially reduce the energy consumption in a building. To find the effect, a study was carried out on structural lightweight concrete (SLWC) with low thermal conductivity compared to normal weight concrete (NWC). A residential building on a warm and temperate climate of Dhangadhi was considered to find out the influence of SLWC replacing NWC on roof. The thermal properties; density, specific heat and thermal conductivity coefficients of the concrete types were extracted from literatures. The energy consumption of the building for heating and cooling periods for both NWC and SLWC were calculated using the Ecotect simulation. The results showed the decrement in energy consumption using the SLWC mix. All heating energy of the building marked the energy saving by 11.2 percent and total annual energy consumption by 4.7 percent using SLWC over NWC to maintain the indoor environment.

## Keywords:

Energy efficiency, structural lightweight concrete, normal weight concrete, thermal conductivity, thermal comfort

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# Exploring the prospects of Traditional Alcohol Making as a Sustainable Rural Livelihood: A case of Burunchuli, Lalitpur

*Mandeep Shrestha<sup>a</sup>, Sudarshan Raj Tiwari<sup>b</sup>*

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## **Abstract:**

Nepal has a long history of preparing and consuming of various types of indigenous local alcoholic drinks based on the various agro-plants, depending on the varying agro-climatic conditions of the regions of that ethnic group. Ethnic beverages are an important part of the social landscape with high visibility and societal influence, as drinking alcohol culture frequently accompanies socializing in the case of Nepal. Alcohol is used as a part of many cultural, religious and social practices in many of the Nepalese society. Some of indigenous traditional alcohols found and consumed locally in Nepal are: Chhynag / Thon, Aeylaa / Raksi, Tongba, JhaiKatte, etc. among which some have gained international recognition beyond the producing region; such as Sake, Moutai and Tequila. When used in a rational way, the production of traditional beverages can help to increase the value of raw materials and generate income as a means of livelihood also it helps to preserve and promote the food heritage and tradition. This can contribute to the economic development of the producing regions, considering different aspects of industrial production in order to develop sustainable production systems.

## **Keywords:**

Traditional alcohol making, Rural Livelihood, Business Model, Social acceptance

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# The Architecture of Mass Housing in Kathmandu: Shifting Values & Housing Demand Trends

*Nina Malla <sup>a</sup>, Hans Narve Skotte <sup>b</sup>*

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## **Abstract:**

The evolution of mass housing architecture mainly aimed to convey two points: a social dwelling, based on the technologies and theories developed through WWII; and an ideal environment for family togetherness and growth. This study aimed to identify the role of group housing in land development, physical as well as social life in the housing community, comparison of perspective of users in traditional settlement and group housing. In the case of the mass housing market, efficiency in its production, good responses of customers, project sustainability are the major issue to be considered. In this research, the current scenario of mass housing projects in Kathmandu is studied and also attempts to dismantle the current tension between the implication of housing projects and process of providing amenities also the cost benefits and difference with mass house and individual built house.

The mass luxury housing architecture is taking its market and blooming in the context of Kathmandu and limited research has been done in this context it is hence important to understand the ongoing situation. The research will hence try to find out why people are attracted towards these developer-based housing projects, user satisfaction in different housing communities i.e. traditional and group housing.

## **Keywords:**

Mass housing colonies, shifting values and housing demand trends, traditional housing, and housing heterogeneity

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# Disaster Related Tweets Categorization using Multimodal Approach

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*Sanjeeb Prasad Panday*<sup>c</sup>, *Aman Shakya*<sup>d</sup>

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## Abstract:

Contents shared in form of text and images in multimedia during and after disasters can be used to analyze the information about the event. The analysis can be done to know the report of affected people as missing or injured, infrastructure and utility damages, rescue needed for victims and many others. Many researches in the past have been done on focusing on either text modality or on image modality for disaster response. Only few work has been done till now for the use of both text and image modality for disaster response and they only focus on same category of text and images and practically it is found less reliable. In this paper, we propose to use both text and image of different category and fuse them using score fusion for joint representation of text and images. For text modality, we have used BERT model and for image modality we have used VGG16 modality and fused them using late fusion for multimodal analysis of disaster related tweet categorization.

## Keywords:

Multimodal content, Multimodal fusion, Disasters and analysis

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# Optimization of Model Parameters of HEC-RAS 2D Model on Flood Inundation Mapping: A case study of Kankai River Basin

*Gaurav Dahal<sup>a</sup>, Ram Krishna Regmi<sup>b</sup>, Sumit Adhikari<sup>c</sup>*

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## Abstract:

Among different natural hazards, floods are the most common and disastrous around world. Flood simulation model are used to predict the consequences of probable flood by estimating inundation area, depth and velocity of flow. US Army Corps of Engineering Hydrologic Engineering Center (HEC) has developed HEC-RAS which performs one dimensional (1D) steady and unsteady flow calculation, as well as two dimensional (2D) unsteady flow calculation. In this study HEC-RAS 2D model is used to predict flood inundation of Kankai River originating from mid-hills and further sensitivity of model parameter are evaluated. In order to accurately represent the hydraulic processes happening in the river, selection of appropriate model parameter is most important. This study is focused on evaluation of those model parameter sensitivity on Inundation Area, Water Surface Elevation and Computational Time. Sensitivity of Mesh geometry, Time step, Equation set and Theta weighing factor for 2D model are evaluated in detail and with selection of optimal parameters, inundation map of Kankai River is obtained. Based on sensitivity analysis, this study aims to provide general recommendation on selection of optimal model parameter for 2D flood modeling using HEC-RAS. For 100 years return period of flood,  $65.5 \text{ km}^2$  of area got inundated, which represent 4.36% of catchment area of Kankai River Basin.

## Keywords:

HEC-RAS , Flood Inundation, Kankai River

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# Emergency Response Planning in Residential High Rise Buildings of Kathmandu Valley

*Krishna Shrestha<sup>a</sup>, Kshitij Charan Shrestha<sup>b</sup>, Ajay Chandra Lal<sup>c</sup>*

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## **Abstract:**

Kathmandu Valley is highly vulnerable to disasters and people are aware of the risks yet there is very low effort for preparedness. We are now taking the path of 'development' with high-rise buildings, underground parking and wide roads. But a well-structured response system with well-functioning services during emergencies is still lacking in areas such as search and rescue, ambulance and fire services. Fast and effective response can save lives. A building must have a safety policy, emergency response procedure and elaborate evacuation plan specific to the needs of the people of the complex, design and layout of the buildings, roads, staircases, roofs, open landscape and current people available for response during an emergency. This paper aims to study and evaluate the effectiveness of policies behind these factors and their implementation, and understanding the building user's perception towards them.

## **Keywords:**

Emergency; response; policies; evacuation; high-rise buildings; apartments

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# Impact of Window-Wall Ratio on Heating and Cooling Energy Consumption: A Case of Office Building in Kathmandu

*Anish Awale<sup>a</sup>, Sanjaya Uprety<sup>b</sup>*

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## Abstract:

Window systems are commonly regarded as the most important part to be properly built for energy efficiency because of the function they play in heat exchange processes and solar gain management. The window-wall ratio (WWR) is one of the most important energy-saving design elements that influence building energy usage. WWR analysis and optimization are crucial for achieving energy efficiency in buildings. It does not matter whether a building is well insulated or poorly insulated; windows are the most vulnerable to energy losses between 48 percent to 61 percent. It has been discovered by studies that by employing the right WWR, building energy usage can be lowered by 9-15 percent, and that improper WWR can increase energy use by 5 percent to 25 percent. Transparent components of building envelopes or fenestration are especially prone to substantial heat gain and loss because they are comprised of highly conductive materials and exposed to direct heat gain from solar radiation. So, window design should be given a prime concern in building design in order to achieve energy efficiency in buildings.

## Keywords:

Thermal comfort, energy efficiency in commercial building, window to wall ratio, heating/cooling load,

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# Seepage Assessment of Concrete Face Rockfill Dhap Dam

*Anup Lamichhane<sup>a</sup>, Bhagaban Acharya<sup>b</sup>, Indra Prasad Acharya<sup>c</sup>*

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## **Abstract:**

Dhap dam is the first CFRD type dam under construction in the Gokarneshwor Municipality in Bagmati Province, Nepal. The dam is constructed in the gneiss rock foundation underlain by the colluvium deposit. This paper presents the seepage assessment through the dam with associated geotechnical investigations undertaken during the course of this study. As a part of this study, an ongoing geotechnical investigation organized by the Bagmati River Basin Irrigation Project was supervised and necessary data relevant to this study was collected. The geotechnical investigation consisted of drilling boreholes, Lugeon tests, Lefranc tests and groutings undertaken around the plinth region of the upstream face of the dam. A geotechnical model was proposed based on the information collated from borehole logs. The hydraulic conductivity of the foundation materials was interpreted from the Lugeon tests. Two-dimensional Seep/W numerical models were prepared considering dam sections and foundation materials to estimate the seepage through the dam. The necessary data required in the models including foundation materials and corresponding hydraulic conductivity values are employed from the data collected during geotechnical investigations. Numerical models were analyzed and seepage at the downstream toe of the dam was recorded. Additionally, numerical models were analyzed by incorporating grouting in the models to evaluate the influence of grouting on the seepage performance of the dam. The study revealed that the inclusion of grouting in the plinth region of the CFRD dam reduced the seepage by approximately 6 times than that constructed without grouting. Although there are uncertainties regarding the foundation profile and hydraulic conductivities because of varied foundation material, this study presented an insight into the potential seepage characteristics of the CFRD dam built on the gneiss rock foundation.

## **Keywords:**

Seep/W, CFRD, Seepage Assessment, Permeability, Lugeon test, Lefranc test

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# Perceptual Image Super Resolution Using Stacked Receptive field Blocks and U-Net

*Surendra K C<sup>a</sup>, Sharan Thapa<sup>b</sup>*

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## Abstract:

The low resolution images appear in many cases. Generative Adversarial Networks takes advantage of two independent neural networks to create realistic data. The estimation of a high resolution image from its counterpart low resolution image called super resolution which is used in this research using GANs. The input is a low resolution human face of size  $64 \times 64$  is used which keeps certain information but not details. This network is capable of generation of images into  $4 \times$  up scaling factors. The network is a min-max player game where the generator and the discriminator are trained simultaneously and competed against each other to reach the state where the discriminator is no more able to discriminate between the real and the fake image. This state is known as Nash Equilibrium. The main aim of this network model is to minimize the loss of the generator and maximize the loss of the discriminator so that the generator can generate more real looking images and the discriminator will be unable to differentiate between the image generated by the generator as the fake one. The use of Strong discriminator and the effective generator that is able to extract the coarse and excellent skin texture from Low Resolution input images with adversarial training containing VGG based perceptual loss can improve state-of-art of perceptual super resolution of Low Resolution images.

## Keywords:

Generative Adversarial Networks, Receptive Field Block, U-Net Discriminator, Super Resolutions

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# Performance Analysis of Students from Private and Government Schools of Kathmandu Valley

*Sampada Dhakal*<sup>a</sup>, *Arun Kumar Timalsina*<sup>b</sup>

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## Abstract:

Private and public schools have existed in Nepal for a long time. With the difference in school type, the performance of students has been observed to be different as well. To prove this well accepted fact on the mathematical basis, analysis has been done in this project using several tools provided by statistics and data analysis. To estimate the probability density of obtained marks of students, kernel density estimation has been used. The marks distribution showed students in private schools obtain comparatively higher marks. Z-score test showed gender did not affect the marks of students. Linear regression technique has been implied to find out if the final term marks can be predicted on the basis of earlier exams. The results showed the prediction of final term marks can be done with greater accuracy for private schools. Similarly, correlation coefficients have been calculated to find whether there exists a relationship between marks obtained at various subjects which showed students tend to obtain less marks at Mathematics than any other subjects.

## Keywords:

data analysis, significance test, regression, kernel density estimation

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# Study on the Factors Influencing the Usage of Pedestrian Bridges

*Saroj Adhikary<sup>a</sup>, Pradeep Kumar Shrestha<sup>b</sup>*

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## **Abstract:**

Road crashes, with the involvement of pedestrian is of great concern nowadays. One of the most vulnerable pedestrian group are those crossing the road below the pedestrian bridge. With the trend of crossing the road below the pedestrian bridges, pedestrian related crashes are increasing day by day. Hence, this research aims to identify the factors that influence the usage of the pedestrian bridge using questionnaire survey at ten pedestrian bridges locations of Kathmandu and Lalipur district. In total, 456 samples were collected of which 185 used pedestrian bridges for crossing the road whereas 271 cross the road without using it. Binary model was developed in order to identify the factors influencing use and non-use of pedestrian bridge. The model showed that use of the pedestrian bridge was significantly influenced by crossing time, crossing principles, baggage, previous crash experience, presence of bus stop and driving license

## **Keywords:**

Pedestrian bridges, Use, No Use, Logistic Regression

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# Learning from User: Construction of High Altitude Vernacular Design - Case of Jhong, Mustang

*Neha Ligal<sup>a</sup>, Sushil B. Bajracharya<sup>b</sup>*

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## Abstract:

Nepal, known as the country of Mountains. It is also a country rich in Art and Architecture. Nepal has diverse climatic zones resulting in the opportunity for the different diversities of architecture throughout the country. In this thesis, the vernacular architecture of Mustang district, particularly Jhong is studied to understand its environmental adaptive and sustainability from three different overlapping perspectives: Environment, Culture, and Modernism.

The changes in architecture, culture, and settlement are an important part of any development. Being the intellectually aware and technologically forward generation of the 21st century, now we should be able to develop or change in the more sustainable way. This paper aims to explore the gap between the vernacular architecture of the past and the present with respect to the design and construction because the causes of architecture changes can tell about why architecture changes, and this knowledge can be captured to prevent architecture knowledge vaporization and architecture degeneration. Also tries to explore the possibility of understanding the user perspective and learn from the user related to this causes of architecture changes. The research follows case study, participatory design method, Observation and interview on the basis of literature review. Qualitative data were analyzed on the basis of the data collected during the Field visit and interview. The findings revealed that End user perception of their residence is very important and it can influence the design of building. Thus including end user as the design partner can be beneficial for the society in terms of sustainable design.

## Keywords:

User Participation, Users knowledge , Sustainable design

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# Three-Dimensional Elastic Analysis of Flexible Pavement under Static Vehicular Load

*Bijay Ban<sup>a</sup>, Jagat K. Shrestha<sup>b</sup>, Rojee Pradhananga<sup>c</sup>, Kshitij C. Shrestha<sup>d</sup>*

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## Abstract:

Structural analysis of pavement is essential to investigate effect of various factors affecting pavement condition. This paper presents a three-dimensional finite element model suitable for structural analysis of flexible pavements in Nepal. The pavement model is developed using finite element software ANSYS and can simulate pavement responses under static vehicular load. The vehicular loading and material properties parameters are defined based on Department of Roads Nepal's guideline for design of flexible pavements. The pavement model is validated with the classic theoretical responses formulated for single layer pavement system. The validated model is further utilized to investigate the pavement responses of a three layered pavement system. The pavement responses are simulated and compared for two interface conditions, bonded contact and friction contact between the pavement layers. The test results shows decrease in pavement responses over the depth of the pavement and increase in pavement responses when the interface layers are not perfectly bonded.

## Keywords:

Finite Element Modeling, Flexible Pavement, Static Analysis

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# The Perception of Seismic Risk among People and its Influence on Building Code Compliance in Gokarneshwor Municipality

*Sumit Deo<sup>a</sup>, Hari Darshan Shrestha<sup>b</sup>*

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## **Abstract:**

Nepal lies in an active seismic region. It has experienced many destructive earthquakes in the past. To protect lives and property, compliance with building code and bye-laws is one of the effective mitigation measures for disaster risk reduction. So, it is important to convince people that the implementation of these rules will help to make their building safe and worthwhile. Often people base their decision regarding safety and mitigation measures on their own risk perception. So, enhanced seismic risk perception can have positive contribution to improve awareness regarding safer construction and help in better compliance to building code and bye-laws by increasing awareness. The study aimed to examine the seismic risk perception level and identify several factors influencing it and explore the linkage between seismic risk perception and building code compliance. Based on Cochran's method, 250 households' samples were collected from Gokarneshwor Municipality using the simple random sampling method. Questionnaire surveys were conducted which included questions about socio-demographic profile of the community which included gender, age, education, income level, occupation, ownership status. It further included the indicators of perception of seismic risk which was derived from literature review and also included basic building-related information. Quantitative and qualitative method was used in the study. Quantitative approach used statistical methods to determine the risk perception level. Co-relation was used to determine the significant factors among risk perception indicators. Comparison of mean (T-test, Anova test) was used to explore impact of socio-demographic variables on risk perception. Similarly Chi-square test was done to check statistical significance between enhanced seismic risk perception and code-compliance. Qualitative approach used people's views to explore ideas related to seismic risk perception. The seismic risk perception level of people was found to be fairly good. Knowledge, experience of past disaster, trust in community and authorities, attitude toward the vulnerability of building significantly affected the risk perception of people. Similarly compliance with building code and seismic risk perception showed significant association. Thus, enhanced seismic risk perception has potential in influencing building code compliance.

## **Keywords:**

Seismic Risk Perception, Building Code and Bye-laws Compliance

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# One Shot Object Detection and Segmentation Mask using Attention Localization

*Bhimesh Chandra Acharya<sup>a</sup>, Hari Prasad Baral<sup>b</sup>, Bikram Acharya<sup>c</sup>*

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## Abstract:

Object detection is a part of research in computer vision that detects and recognizes object instances in images/video. During the development of object detection over an extended period of time, there have been numerous approaches and obtained some shots of promising results. Training a machine learning model requires a huge volume of data and computation power to classify an object, but if there is little data available, learning good features can be computationally expensive. Here we present a simple method for one-shot object localization and instance segmentation, which generates a segmentation mask for all objects within a complex scene (Reference/Target image), with respect to objects similar to the query image. To address this challenging task, the proposal is to use an attention-based transformer encoder and decoder with a Siamese network to predict similarity between the all-segmented mask object of target images to the underlying query image, irrespective of class, seen or unseen during training. Experimental evaluation shows that our proposed model achieves 68.8 AP50 for box prediction and also obtains 93% accuracy in similarity.

## Keywords:

Transformer encoder-decoder, multiheaded attention layer, siamese network, Oneshot object detection

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# Comparative Analysis of Nepali News Classification using SVM, LSTM and Transformer Model

*Saroj Sharma Wagle<sup>a</sup>, Sharan Thapa<sup>b</sup>*

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## Abstract:

This paper aims to tackle the task of Nepali News Classification by using different machine learning and deep learning algorithms. This paper extends previous works on Nepali News Classification by comparing results for multiple approaches including traditional methods of machine learning like SVM to current state-of-the-art Transformer models. The different algorithms compared are: Support Vector Machines, Long Short-Term Memory, Bidirectional Long Short-Term Memory and Transformer. News classification is done into 17 categories using around 200k news articles scraped from various news portals. The dataset was divided into training and testing sets with a split of 80-20. Furthermore, 20% of the training data was used for validation during training. After training the different models, it was seen that the Transformer obtains the best result for the dataset. The transformer was first pre-trained on all the available training news articles without any labels, using Masked Language Modelling. After the pre-training phase, finetuning gave a result with a training f1-score of 96.54% and a testing f1-score of 95.45%, outperforming all models tried out in this paper.

## Keywords:

BERT, BiLSTM, LSTM, News Classification, News Corpus, SVM, Transformer

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# Seismic Performance Evaluation of Building on Sloping Ground with Shear Wall

*Prakash Lamichhane*<sup>a</sup>

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## **Abstract:**

Construction of structures on sloping ground is increasing day by day due to insufficient plain grounds. Such structures are highly vulnerable than building on plain ground due to irregular and unsymmetrical in horizontal and vertical directions under seismic load. Here, Seismic performance of step back building with and without shear wall is done by Response Spectrum Analysis and Pushover analysis. SAP2000 version 20.2.0 structural analysis software is used to analyze the buildings due to seismic forces. We thoroughly scrutinized and contrasted the properties of building on the basis of top storey displacement, fundamental time periods and base shear. At last, addition of shear wall in hill building provides better seismic performance by decreasing the story displacement and number of plastic hinges.

## **Keywords:**

Response spectrum, Pushover, SAP2000, Step-back building, Shear wall, Plastic hinges

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# Coloring of Gray Scale Image using U-net Architecture

*Bhuwan Acharya<sup>a</sup>, Sitaram Pokhrel<sup>b</sup>*

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## **Abstract:**

Coloring of a gray scale image is extensively chosen for various researches in graphics and computer vision especially with deep learning methods. U-net is crucial for coloring of the gray scale image, which is the major part of this research work. The U-net is a type of deep Convolution Neural Network (CNN) which consists of the down sampling and up sampling paths. They are connected through the bottleneck and skip connection between the encoder and decoder which provides the copy and concatenate the feature maps from encoder to decoder. The input to the network is gray image of size  $256 \times 256 \times 1$  and it produced the RGB color image of same size as input. The Mean Squared Error (MSE) loss function is distinguished the quality between the generated color image to its corresponding ground truth image. The Peak Signal to Noise Ratio (PSNR) is used for the quality measurement of the predicted color image and the ground truth image.

## **Keywords:**

U-Net, CNN, Mean Square Error, Encoder-Decoder, PSNR

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# A Hybrid Approach in Generative Adversarial Network for Image Dehazing

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## Abstract:

Unfavorable weather conditions like haze affect the quality of images taken under these conditions. Although various dehazing algorithms have been developed to address this issue, there is still room for improvement in this field to achieve better dehazing results. The transmission map and atmospheric light are estimated by directly learning from the training images in most existing data-driven methods, including Generative Adversarial Network (GAN). In this paper, a hybrid approach is proposed to solve the image dehazing problem. Unlike other GANs, it does not estimate the transmission map and atmospheric light within the GAN module but rather uses a transmission module to estimate the transmission map separately. The transmission module consisted of a convolutional recurrent network that takes the hazy image as input and generated its transmission map. The estimated transmission map and the hazy image are feed to the GAN module and trained like other GAN networks. The proposed architecture is called HybridGAN. A wide variety of datasets is used to train this system.

The proposed method performed very well for different types of hazy images taken under different conditions. Also, different image quality assessments were carried out. Quantitative assessments were done on the RESIDE and D-HAZE datasets. Qualitative assessments were also carried out. All of the assessment techniques supported the superiority of the model when compared with other methods.

## Keywords:

HybridGAN, image dehazing, cGAN, SSIM, PSNR

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# Comparative Performance Analysis of Fog Computing Based Model in Healthcare Systems

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## Abstract:

Internet of Things (IoT) is one of the evolving areas to bring convenient devices that are connected to each other providing innovative solutions. Healthcare systems are now automated using IoT and Cloud to analyze the patient information correctly and quickly. However, huge latency and high bandwidth usage are few problems associated while working with huge amounts of IoT data in Cloud Computing approach. For some time-critical applications like healthcare, this huge latency is not permissible. Fog Computing tries to solve the problems associated with Cloud by providing processing at the edge of the network. This research proposes an approach where a fog-based healthcare architecture is used and compared in two environments: Cloud and Fog based Cloud System. The architecture is implemented using two existing algorithms; Cloud Only and Edge Wards and the proposed Hybrid Edge Wards Algorithm (HEWA) for three application categories; low-intensity, medium-intensity and high-intensity. Five different topologies are evaluated and the performance is compared using metrics like Execution Time, Network Usage and Energy Consumption. The results obtained show that the fog computing approach have better performance compared to Cloud Only approach, and HEWA algorithm works better than Edge Wards algorithm in case of execution time. The result is also verified using AWS CloudFront by utilizing the CDN Architecture of CloudFront that gives low latency compared to the one without using CloudFront.

## Keywords:

Cloud Computing, Internet of Things, Fog Computing, Execution Time, Network Usage, Energy Consumption, CDN

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# Extractive Method for Nepali Text Summarization Using Text Ranking and LSTM

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## Abstract:

Extracting the gist and main theme of any document is called summary. So text summarization process helps for understanding sense of any text file without reading all sentences. In machine learning there are two type of summarization method i.e abstractive and extractive method. In this research extractive method of summarization is followed for Nepali text document with help of word embedding. For word embedding purpose GloVe algorithm is used, which create embedding of Nepali word corpus. Before feeding to GloVe algorithm preprocessing of data is done to the given raw data. For text summarization of Nepali text, sentence embedding is created with help of GloVe embedding, after that similarity matrix is created between sentences using cosine similarity. Similarity matrix is used to create graph  $G(V,E)$ , where sentences is treated as vertex and similarity value between two sentences is assigned as weight of edges. After that Text rank algorithm is applied to select top k sentences. These selected sentences become summary as result of system generated summary. Also attention based LSTM encoder decoder model is trained for text summarization. In this model, GloVe embedding of Neapli words is feed to encoder with three stacked LSTM encoder. Output of sequence embedding of encoder is taken as input to decoder. While using attention layer in encoder decoder model, it allows to create a context-vector at each time step, given the decoder's current hidden state and a subset of the encoder's hidden states. The context vector  $c_i$  depends on a sequence of hidden states to which the encoder maps the input sentence. Each hidden state  $h_i$  contains information about the whole input sequence with strong focus on the parts surrounding the  $i^{\text{th}}$  word of the input sentence. The context vector is computed as a weighted sum of these hidden states  $h_i$ . After that sequence decoder produces summary as predicted summary. For the evaluation of system generated summary ROUGE-1 and ROUGE -2 is calculated with the reference of human generated summary. For this purpose, 14 different categories of Nepali news articles are collected as corpus for training to GloVe model.

## Keywords:

Text Summarization, GloVe, Text Rank Algorithm, LSTM Encoder Decoder, Attention, ROUGE

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# Simulation of Trade-Off among Planned Reservoir Projects and Inter-Basin Transfer Project: A case study of Sunkoshi River in Koshi Basin, Nepal

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*Utsav Bhattarai*<sup>d</sup>, *Mukesh Raj Kafle*<sup>e</sup>

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## Abstract:

The Sun Koshi River is a major tributary of the Koshi River Basin in Nepal. There are a number of reservoir projects and inter-basin transfer projects planned for hydropower generation, irrigation, and water supply to the Terai Region of Nepal. These include the Sunkoshi Marin Diversion Multipurpose Project (SMDMP) which will divert the part of Sunkoshi river flow to the Bagmati river to irrigate the Terai's cultivable land. There are a few reservoir projects that are also planned in the River mainly with the objective of hydropower generation, which includes the two reservoir projects Sunkoshi III and Sunkoshi II. These projects are found to be studied and planned independently and in isolation without even considering the relationship (tradeoff) of one project with the others. This study endeavors to develop a simulation model considering the inter-relationships of all these three projects in the River Basin. The HEC-ResSim software is used for the simulation of the reservoir operations and diversion of water to meet the irrigation water requirements and to generate the maximum hydroelectricity from the projects. The developed simulation model was used to assess the tradeoff of benefits, in terms of energy generation and irrigation water supply, under different scenarios of project development. The results show that simulating and planning the whole system (three projects together) will yield a higher benefit in terms of energy generation while meeting the irrigation requirements than planning the three projects in isolation.

## Keywords:

Cascade Reservoir, Inter-Basin Transfer, HEC-ResSim, Reservoir Operation

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# Pounding Effect on Adjacent Building with Different Plinth Level

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## Abstract:

The difference in the dynamic properties of adjacent structures results in the pounding. The difference in mass or stiffness leads to the out-of-phase vibration of the building, causing seismic interaction during the time of the earthquake. Though many research has been carried out in the pounding, there are less research that matches the scenario of Nepal, especially the Kathmandu valley where there is a dense population and unplanned urbanization. Although the building code, has provision of seismic gap there is no scenario, where it has been applied. With a proper study on the pounding effect on such buildings, the displacement and force-induced can be studied and helps in the proper construction of buildings. So, there need to be codal provision inclusive of pounding force for the better evaluation of so such adjacent building. The analysis on pounding adjacent buildings using infill was carried out for different building configuration such as when plinth level of adjacent buildings were at different using sap2000. The infill wall were simulated as diagonal struts. The stiffness of the gap element was taken as 100 to 10000 times the stiffness of neighboring linked element. The pounding force are greater at floor to floor pounding rather than floor to column pounding.

## Keywords:

Pounding, Infill wall, Displacement, pounding force

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# Development of Screw-Type Runner for Conical Basin of Gravitational Water Vortex Power Plant

*Anish Maharjan<sup>a</sup>, Raj Kumar Chaulagain<sup>b</sup>*

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## Abstract:

The gravitational water vortex power plant (GWVPP) is an emergent type of hydropower plant which utilizes energy created by water vortex to generate electricity. It is very efficient in ultra-low head range (0.7-2 m). This study tries to develop and optimize a screw type runner for GWVPP considering top surface of GWVPP open to atmosphere. The optimized screw type runner is found to have dimensions of 100 mm pitch length, 100 mm radius of curvature with one number of blade. The maximum efficiency is found to be 13.99%. Similarly, previous-type runner having similar surface area and same radius of curvature with that of the optimized screw-type runner under same boundary conditions is found to have a maximum efficiency of 7.03%.

## Keywords:

Gravitational Water Vortex Power Plant (GWVPP) – Computational Fluid Dynamics (CFD) –Screw-Type Runner–Conical Vertical Archimedes Screw Runner– Conical Runner–Open Channel Flow–Two Phase Modeling

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# Assessing future precipitation in Gandaki River basin based on CMIP6 projections

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## Abstract:

Selecting representative climate models and appropriate bias correction techniques is a decisive step for assessing climate change. A widely used approach for selecting climate models is the evaluation of past performance during the historical period. The selected models are then used to assess the likely deviation in the future under changing climate. The multimodel ensemble of the selected global climate models (GCMs) helps to reduce associated uncertainties in projection. This study included a pool of twelve GCMs, from the Coupled Model Inter-comparison Project - Phase 6 (CMIP6) under two shared socioeconomic pathways, SSP245 and SSP585, to assess projected change in precipitation in the Gandaki River Basin. Future precipitation is projected based on four selected CMIP6-GCMs (i.e., EC-Earth3-Veg, MPI-ESM1-2-HR, MPI-ESM1-2-LR, EC-Earth3) and their ensemble, using robust quantile mapping method for three future periods, namely, near (NF: 2021-2046), mid (MF: 2047-2073), and far (FF: 2074-2100). The precipitation projection from the multimodel ensemble indicated a 7-32% increase in annual precipitation in the NF and 18-45% increase in the FF under SSP245, while 6-35% increase in the NF and 42-110% increase in the FF under SSP585 with respect to the baseline period (1980-2014). Under both scenarios, future precipitation is projected to decrease from November to March and increase from April to October. In terms of season, it is projected to increase during pre-monsoon and monsoon seasons and decrease in post-monsoon and winter seasons under both scenarios. Our study highlights that the variation in the rate of increase is higher towards the FF, and the severity of the increase is more pronounced under SSP585.

## Keywords:

Bias correction method, climate change, Gandaki basin, global climate model, precipitation projection

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# Demand Side Management using Dynamic Pricing, A case study in Civil Homes-Dhapakhel, Nepal

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## Abstract:

Effective and efficient use of electrical power has always been a topic of discussion of modern world. Not only energy utilities but also an end consumer can make efforts to make smart use of electrical power. Demand side management is a group of such actions which helps in optimizing the energy consumption pattern of the end user. As power demanded by consumer varies, different load consumption patterns may be noticed with respect to time. In residential buildings, power demand is high in evening and morning time whereas power demand is low in other times of the day. Conventional meters are independent of energy consumption patterns and charge flat retail electrical prices to consumers. However, smart-meters can make records of energy consumption and are able to send information to the utility. In this study, a survey of the Chapagaun distribution feeder in a colony area under Lagankhel substation, Kathmandu is conducted. With a sample size of 63 consumers from 75 consumers, 16 appliances are noted and are categorized under shift-able and non-shift-able loads. Shift-able appliances are separately scheduled to solve the inconvenience of manual switching by using an Energy Consumption Scheduler (ECS) called a smart meter to reduce peak loads. The peak-to-average ratio of the ECS system demand is minimized in our study, which is achieved by changing the consumer behaviour and by changing electricity prices with respect to demand of power. I.e. for lower demand electricity charges are low and charges are high for high demand, which is also called dynamic pricing. From optimization results, the peak load was successfully reduced to 68.32 kW from 86.59 kW and also a significant improvement in load factor from 25.52% to 32.34% was obtained.

## Keywords:

Appliance scheduling, Demand Side Management, peak clipping, Dynamic pricing, Energy consumption pattern

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# Impact of Climate Change on Streamflow and water balance in Kankai-Mai River Basin

*Aashish Gautam<sup>a</sup>, Saroj Karki<sup>b</sup>, Mukesh Raj Kafle<sup>c</sup>*

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## Abstract:

Kankai-Mai River basin(KRB) is purely rain-fed and consists of perennial rivers originating from mid-hills of the Mahabharat range. Projections of precipitation and temperature show the vulnerability of the hydrological regime to climate variability. The impact of climate change in the river flow is limitedly known in Nepal and is also in the case of the Kankai-Mai. In order to assess the climate change, impact on the hydrology of the Kankai river, the Soil and Water Assessment Tool (SWAT) was used. The baseline scenario was developed in the SWAT based on the precipitation and temperature time series data for 1990-2005. The future climatic dataset (2021-2095) was prepared using a set of four latest generation Coupled Model Inter-comparison Project (CMIP6) models under two Shared Socioeconomic Pathways (SSP245 and SSP585) to assess future discharge. From the study, it was projected that there will be a continual increase in average monthly temperatures (both maximum and minimum) for all three future time periods (the 2030s, 2060s, and 2080s) with the more profound rise in winter and pre-monsoon seasons. The average annual precipitation was projected to vary between -2.44% to +23.15% for both SSP 245 and SSP 585 scenarios with the appreciable decrease during dry months while considerable increases were found during wet months. The extremities of rainfall estimated to be very high in wet months and low in dry months were reflected in basin discharge. Modeling results have shown that under both scenarios, the monthly discharges are projected to get fluctuated between -34.6% to +39.2% for all the future periods causing annual discharge to change between -3.4% to 18.1%. The study demonstrated that the temperature will increase in the future in the basin with erratic rainfall patterns affecting the discharge at the basin.

## Keywords:

Climate change, CMIP6, Hydrology, Kankai, SWAT

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# Characterization of Hydro-meteorological, Morphometric and Anthropogenic Drivers of Inundation and their Interrelationship in a Hilly Watershed of Kathmandu Valley in Nepal

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Pawan Kumar Bhattarai<sup>c</sup>, Vishnu Prasad Pandey<sup>d</sup>*

## Abstract:

Kathmandu valley, an abode to more than 2.5 million people has experienced a substantial increase in urbanization. More land surfaces are modifying into built-up areas, causing the conversion of pervious surfaces to impervious surfaces. The water storage capacity of the basin is decreasing while surface runoff amount and its rate is increasing. In addition, interference of human activities on river environment is contributing the change in flow regime of rivers. The result is frequent flooding in monsoon in most of the rivers traversing the valley. Thus, study of impacts of urbanization on flooding is beneficial for urban planning and disaster management in the valley. This research analyzed the decadal trends in precipitation, river discharge, and land use/cover data over the course of three decades with an objective to investigate the possible inundation drivers. Similarly, morphometric analysis was also carried out to analyze the natural factors affecting the inundation. The annual, monsoon, non-monsoon, and maximum values of rainfall in the catchment showed no statistically significant increasing decadal trend for confidence level of 0.09, according to the trend analysis using non-parametric Mann-kendall test and Sen's slope analysis. During the last three decades, the built-up area showed continuous increase of 29.61%, 30.87% and 24.53% accordingly, during 1990-2000, 2000-2010 and 2010-2020, mostly compensated by the decline in the agricultural areas. Even though urbanization increased, a decreasing or statistically insignificant decadal discharge trend was detected. Morphometric analysis showed greater influence of Balkhu and Godawari sub-basin on probable flood.

## Keywords:

Decadal trend, inundation drivers, land use/cover, Mann-kendall test, morphometric analysis, Sen's slope

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# Performance Analysis and Classification of Rice Plant Disease using Multi-class Support Vector Machine and Transfer Learning Models

*Prajwol Amatya<sup>a</sup>, Hari KC<sup>b</sup>*

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## Abstract:

Cereal crops, such as rice, share a major portion of the gross income of most countries whose economy is based on agriculture. Timely detection of rice plant diseases, if any, is critical to avoid losses and ensure a healthy harvest. Due to the lack of information and the absence of skilled specialist support, it is difficult and time consuming for farmers to diagnose diseases accurately. This research is aimed at effectively classifying five main rice plant diseases using image processing and machine learning approaches. Initially, the diseased region in the image of the infected rice plant leaf is segmented to remove the healthy leaf portion and the background. Then, different features are extracted from it. Using these features, a multiclass SVM model was developed that gave an accuracy of 89.5%. Also, two models using transfer learning approach were developed with MobileNetV2 and ResNet50 to classify rice diseases from the segmented images, which gave an accuracy of 94.8% and 74.4% respectively.

## Keywords:

SVM, CNN, Transfer Learning, ResNet, MobileNet

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# Landscape Image Season Transfer using Generative Adversarial Networks

*Bishnu Hari Paudel<sup>a</sup>, Rupesh Kumar Sah<sup>b</sup>*

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## **Abstract:**

Image season transfer problem is an application domain of image-to-image translation and defined as transferring image from one season to another; for instance, transferring summer image to winter and it's vice versa. Image-to-image (I2I) translation involves generating a new synthetic form of a given input image with a specific alteration by keeping the source image attributes intact and their mapping from source to target domain. I2I is one of the popular applications of deep learning neural networks. One of successful variants of Generative Adversarial Networks (GANs), CycleGAN has been implemented with unpaired data samples. The CycleGAN is two domains, unsupervised approach to cyclic consistency which can be trained without pair image samples. Residual Network (ResNet) is used for generative model and PatchGAN is for discriminative model in the first CycleGAN, and hence ResNet generator became general practice. The Residual Network architecture is replaced here with U-Net architecture. U-Net is considered as a fast neural network and works fine even with small size of dataset. This study uses two sets of landscape images to train the GAN model and hence transfer the season from summer to winter or in opposite direction.

## **Keywords:**

Image-to-Image Translation, CycleGAN, U-Net, PatchGAN, Cycle-Consistency, Adversarial, Composite Model

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# Prediction of Solar Radiation: A case study at Hill Station Kushma, Nepal using Artificial Neural Networks (ANNs)

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Pratima Neupane<sup>d</sup>, Ashok Chalise<sup>e</sup>*

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## Abstract:

In this study, the neural network toolbox (NN tool) of MATLAB is used for the prediction of solar radiation. The dataset was obtained from an online medium for the location of Kushma, Hill Station Parbat for duration between 2004 to 2014. The objective of this research work is to predict the solar radiation for optimum harnessing solar energy resources to mitigate the adverse effect of environment and climate change. The input variables are maximum temperature, minimum temperature, precipitation, wind speed and relative humidity with output variable being solar radiation. Different models were developed by varying the number of inputs. The Feed-Forward Back-Propagation neural network and Levenberg-Marquardt algorithm were used for training and testing purposes. The best model was obtained when all of the input variables and the number of 20 hidden layer neurons were used. The best model is Artificial Neural Network (ANN) I with the correlation coefficient (R) for training are 0.904 and 0.877 for testing. The error values of Mean Average Error (MAE) and Mean Square Error (MSE) for this ANN model I are 1.177 and 2.451 respectively. The obtained results showed that the ANN model and techniques can be used to accurately predict the monthly average global solar radiation in Kusma Parbat.

## Keywords:

forecasting, energy crisis, climate change, meteorological parameters, ANN tool, solar radiation

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# Reliability Analysis of Seismic Bearing Capacity of Bridge foundation on Slope: A case study on Simaltar Khola Bridge

*Madan Ranabhat<sup>a</sup>, Indra Prasad Acharya<sup>b</sup>*

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## Abstract:

This research studies about the co-relation of reliability index and factor of safety with respect to ground seismicity, ground slope and depth of foundation. Simaltar Khola Bridge is considered for the study purpose. It uses Taylor's series approximation to evaluate the reliability, varying different parameters like horizontal ground acceleration, ground slope, depth of foundation, coefficient of variance. The sensitivity analysis is carried out by adjusting each parameter by 30% above and below the original (normal) value by 10% in increment and decrement order, while leaving the other parameters constant. The finding of this research determines that ultimate seismic bearing capacity is 580.754 KN/m<sup>2</sup>, factor of safety is 2.927, and reliability index is 4.418 for horizontal ground acceleration 0.34g; all of them lies within the acceptable range. Factor of safety is most sensitive to horizontal ground acceleration, and also sensitive to other factor like ground slope and foundation depth than reliability index. Reliability index is most sensitive to coefficient of variance of soil internal frictional angle.

## Keywords:

Reliability index, Factor of Safety, Seismic Bearing Capacity, Shallow foundation, Sensitivity Analysis

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# Embodied - Carbon Emission from Building in Overall Life Cycle - A case study of Kathmandu

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## **Abstract:**

The majority of research have concentrated on operation carbon mitigation techniques, with little attention paid to embedded carbon emissions. A process-based approach was used to estimate the embedded carbon from the building sector of Kathmandu district in the total life cycle in order to obtain the embodied carbon emission from the buildings of Kathmandu district. The overall result of the study shows the total embodied carbon emission from the building sector in the overall life cycle was 1444.86 Mt. While using the alternative materials AAC block, hollow cement concrete block and AAC block with aluminium openings in the same building reduces the total emission by 4.7%, 3.37% and 1.93% respectively. The research has focused on the construction phase including only the civil raw materials rather than the sanitary and electrical fixtures. So, detail analysis considering the electrical and sanitary fixtures and other phases like operation and maintenance and demolition should be considered in future study.

## **Keywords:**

embodied carbon, carbon emission, process decomposition

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# Evaluation and Assessment of Landslide Susceptibility of Sindhupalchowk District using Artificial Neural Network in Regional Scale

*Bikesh Manandhar<sup>a</sup>, Ananta Man Singh Pradhan<sup>b</sup>,  
Pawan Kumar Bhattarai<sup>c</sup>*

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## Abstract:

Landslides are one of the world's most dangerous natural hazards. On Nepal's steep hills, preventing landslides is very difficult. Furthermore, there are few real-time monitoring systems, either to collect field data or connect to warning systems. Techniques that allow for the rapid identification of landslide-prone areas while avoiding the need for substantial field data are necessary in such a situation. The evaluation of landslide hazard is a complex procedure that frequently depends on an index, a statistical connection, or a physical process. Owing to developments in computer science, machine learning approaches have lately been effectively used in identifying landslide dangers with greater precision. Due to its high number of steep hills, the Sindhupalchowk district is one of the areas of Nepal that are most prone to landslides. The landslide susceptibility map of the research area was generated using the optimal input parameters and independent variables in the form of conditional factors using the multi layered perceptron python script, which normalizes the susceptibility indices from 0.1 to 0.9. This script prepares data, tunes settings for best results, and generates the susceptibility map as a deliverable in three phases. Further, four landslide susceptibility classifications were defined using three threshold percentages (56%, 28%, and 10%) of digitized landslide occurrence (training and validation datasets). The ROC analysis was performed to evaluate the accuracy of the models. The calculated AUC values for success and prediction rate were 84.83% and 84.8%, respectively. According to the categorization, the rate is excellent (0.8-0.9), indicating that the landslide susceptibility is fairly accurate. Landslide susceptibility mapping is an important technique for predicting the likelihood of landslides in steep terrain. As a result, reliable landslide prediction models are essential. This study was conducted for the Sindhupalchowk area and yielded positive results that may be extended to other places after retrieval of trustworthy parameters.

## Keywords:

Artificial Neural Network, Factor Selection, Landslide susceptibility

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# Overstrength Factor and Ductility Factor for Seismic Design of RC Buildings

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## Abstract:

It is utmost importance to design a structure such that they are economical and also has an adequate strength to resist the loads applied on them. Due to this reason, the design lateral strength in most of the design codes including NBC 105: 2020 is lowered from the required elastic lateral strength by the combination of overstrength factor ( $\Omega_u$ ) and ductility factor ( $R_{\mu}$ ) resulting in smaller member section. The structural member sizes govern the time period and drift of the structure on which the overstrength factor ( $\Omega_u$ ) and ductility factor ( $R_{\mu}$ ) is dependent. The total number of 36 configurations of low-rise buildings most common in Nepal is selected and each building is analysed with two different structural member sizes. The NBC 105:2020 is selected for the seismic design of RC buildings and non-linear analysis is performed using provision in FEMA 356:2000. The results indicated that the change in building configuration and structural member sizes affects the overstrength factor ( $\Omega_u$ ) and ductility factor ( $R_{\mu}$ ).

## Keywords:

Overstrength Factor, Ductility Factor, Response Reduction Factor

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# Optimization of the Investment Casting Process Parameters of Sculpture Manufacturing in Nepal

*Zenisha Shrestha<sup>a</sup>, Bijendra Prajapati<sup>b</sup>*

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## Abstract:

Nepalese Foundry industries has been using Investment Casting, also known as lost wax casting, for the manufacturing of sculptures. The manufacturing techniques have been passed down generations after generations and no significant improvement in the process have been made leaving wider research gap. In the present study, the investment casting process parameters is optimized using Taguchi approach to reduce the lead time and waste. A sword is selected for analysis on the basis of frequency and its measurable pattern. A set of experiment is prepared with Taguchi's L9 orthogonal array with control factors being number of slurry coating, preheat temperature, pouring temperature and cooling method. The control factors are analyzed for optimization of weight of the cast and dimension of the cast i.e. length of the sculpture. It is found that weight of the cast was most influenced by preheat temperature and the dimension of the cast by number of slurry coating. The optimum result for both of the factors were found to be on higher number of slurry coating, higher preheat temperature, lower pouring temperature. The optimum solution for both weight an dimension of cast was found to be on 550°C preheat temperature, 1175°C pouring temperature, 2 layers of slurry coating an air cooling of the cast.

## Keywords:

Investment Casting, Taguchi Method, Optimization, Nepalese Sculpture, Orthogonal Array, Process Parameter, ProCAST, Minitab

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# Effect of Trailing Edge Profile on Performance of Francis Turbine for Micro Hydropower

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*Laxman Poudel*<sup>c</sup>, *Neeraj Adhikari*<sup>d</sup>

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## Abstract:

To develop a Francis turbine runner blade, analytical calculations and CFD simulations were performed. The Bovet method was used to design a single blade runner. Ansys Bladegen V16.0 was used to construct the blade geometry. Ansys Meshing was used to create the grid model in Turbogrid which used fine mesh quality and a tetrahedron type mesh. For the steady state analysis, a SST turbulence model was chosen. More over three different modification was done on trailing edge profile apart from the parabolic trailing edge obtained from Bovet Method. Elongation on hub region resulted 1.28 percent increase in hydraulic efficiency of runner. Circumferential Velocity and pressure Contour was extracted from CFX result to analyze the increase in efficiency. Mesh independence test was also carried out to choose the best number of elements and node to reduce computation time. In addition to this performance analysis of optimized runner was done on off design condition by applying 70, 80, 90 and 110 percent of designed flow rate.

## Keywords:

Francis Turbine, Micro Hydropower, Trailing Edge, Hydraulic Efficiency

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# Generation of a Suspended Sediment Rating Curve of a Himalayan River based on a Long-term Data: A case study of Kabeli River

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## Abstract:

Suspended Sediment Rating Curve (SSRC) is one of the most cost effective method for monitoring and predicting suspended sediment concentration for water resource project development. This method allows estimating the sediment inflow based on the river discharge - which is relatively easier to monitor. SSRC for most of the projects in Nepal are derived based on the Ordinary Least Square (OLS) method using trend line fit function of MS-Excel, because of its simplicity. The performance of OLS method for Himalayan River has, however, not yet been evaluated because of the lack of availability of the long-term suspended sediment data. This paper investigates different methods for generating the SSRC of a Himalayan River, namely OLS method, bias correction method and optimization method. Kabeli River, a tributary of Tamor River originating from the Himalayan region, was selected as a case study because of the availability of daily suspended sediment concentration and flow data recorded for 8 years. SSRC for Kabeli River constructed by OLS method underestimate long-term sediment load by 54%. The bias correction method significantly improved SSRC but overestimated the sediment load by about 8%. The optimization method provided the closest values to the observed suspended sediment load and thus deemed as the best method of generating the SSRC for the Himalayan Rivers. Analysis of the sediment rating suggests that delivery of sediment is always in supply limitation from the catchment.

## Keywords:

Sediment Load, Sediment Rating Curve, Bias Correction

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# An Assessment of Socio-Economic Sustainability of Decentralized Treatment System in Nepal (Case studies from Nala Community DEWATS and Dhulikhel Hospital DEWATS)

*Sunita Budhathoki<sup>a</sup>, Sangeeta Singh<sup>b</sup>*

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## Abstract:

In the South Asian region, Nepal has the fastest rate of urbanization, with sanitation and wastewater management posing some of the most serious difficulties. A large portion of the population still lacks access to toilets, and practically all wastewater and septage is released into rivers and aquatic bodies without treatment. As a result, urban surroundings are severely polluted, public health is compromised, and opportunities for economic growth and development are hampered. Alternatives to the traditional, centralized wastewater treatment systems, which have mostly failed to solve the challenges of inadequate sanitation in Nepal's urban areas, are urgently needed. In Nepal, the concept of environmental sanitation, utilizing technology like as DEWATS, is developing as a viable option. Based on current experiences in Nepal, this thesis assesses the socioeconomic sustainability elements of DEWATS. Case studies from two models, community-based and institute-based, are presented in order to highlight the scope of the associated benefits, identify the main drivers for long-term operation and maintenance (O&M), and reveal the barriers preventing larger-scale adoption and promotion of such systems. The main objectives of this research are to identify the main challenges and success factors of operation and management of the DEWATS system in Nepal; including analyze the performance of the system; and to make recommendations on how the system can be improved and how lesions can be applied to similar type of systems in different areas of Nepal.

## Keywords:

DEWATS, Socioeconomic Sustainability, Operation and management, Nepal, Anaerobic baffled reactor, Constructed wetlands

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# Structural Suitability of Masonry Structure for Residential Buildings in Rural Areas of Nepal

*Kamal Paudel<sup>a</sup>, Hari Darsan Shrestha<sup>b</sup>*

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## **Abstract:**

Construction of masonry structures using different kinds of masonry units is still widely in practice in the rural area and suburban part of Nepal. For the suitability of the building and its implementation evaluation of seismic performance is required. Its affordability and use of local material in construction also governs the suitability of structure in different location. For this four typologies of building based on reconstruction in 32 districts after Gorkha earthquake were considered for the analysis. These buildings were modelled using finite element software and analysis by using linear dynamic analysis. Three time histories (Gorkha, Imp Valley and Kobe) were used for the linear dynamic analysis and fragility curve were generated. These fragility curve were compared to understand the seismic performance characteristic of the selected structural system. Material and labor required for building were estimated and total cost of selected building system were calculated.

## **Keywords:**

Building Typology, Masonry Building, Time History Analysis, Seismic Performance

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# Role of ICT for Women Empowerment: with reference to a member of female cooperatives (Case of Kaski)

*Somat Adhikari<sup>a</sup>, Martina Keitsch<sup>b</sup>*

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## Abstract:

Information and Communication Technology (ICTs) can bring a progressive change in individuals' everyday lives. ICTs help people live better lives in various domains such as employment, health, agriculture, education, etc. In a developing country like ours, this steady shift is also visible. However, in terms of social growth and economic Empowerment, women in rural Nepal have encountered numerous hurdles. The primary purpose of this study was to investigate the role of information and communication technologies (ICTs), especially mobile phones, in empowering the members of women cooperatives in the Kaski District. The specific objectives were to examine the socioeconomic characteristics of the respondents, extent of use of ICT (mobile phones) among rural women to assess the level of socioeconomic Empowerment of the respondents by the use of mobile phones. A questionnaire was used to obtain information from respondents, and interviews were taken where necessary. The research was a survey in the form of descriptive research (methodology was applied research based on the purpose and data collection was descriptive-correlation). The research population included all members of 3 women's cooperatives in Kaski. The respondents were 75 rural women selected through random sampling from those cooperatives. ICT plays various roles in empowering women, such as offering entrepreneurial opportunities, breaking isolation, providing linkages to inputs and markets, assisting small and medium-sized businesses, reducing poverty and illiteracy, and improving rural women's income and savings. The problems affecting the use of ICT devices include absence and erratic supply of electricity, low level of awareness etc.

## Keywords:

Information and Communication Technologies, Empowerment, Women's Cooperatives

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# Modeling the Impacts of Land Use/Cover Change on Runoff and Sediment Yield of Bagmati River Basin in Kathmandu Valley

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## Abstract:

Kathmandu valley (KV) is suffering from rapid land-use change due to the high rate of urbanization affecting the hydrological process, which is crucial for the sustainability of limited water resources. Land use/land cover (LULC) change in a watershed greatly affects the watershed hydrology and sediment yield. KV has the potential for a rapid LULC change in the foreseeable future and requires attention. This study used the Soil and Water Assessment Tool (SWAT) as a simulation tool for modelling the impact of LULC change on the catchment hydrological as well as sedimentological behaviour of the Bagmati river in the KV. This study incorporates hydrological and climate data from 2000 to 2016 for the analysis of LULC change effect on discharge and sediment yield. LULC data of the International Centre for Integrated Mountain Development (ICIMOD) for the years 2000 and 2010 A.D was used for the historical change analysis. Calibration, validation and sensitivity analysis was carried out using SWAT Calibration and Uncertainty Procedure (SWAT-CUP). The model result for both calibration and validation have shown a good agreement with the observed values as indicated by NSE(0.9/0.89, 0.73/0.83),  $R^2$ (0.9/0.92, 0.74/0.85),  $bR^2$ (0.84/0.91, 0.56/0.68), RSR(0.32/0.34, 0.52/0.41) and PBIAS(2.7/-16.7, -9.4/-23.2) for discharge as well as sediment. LULC change analysis shows the increase of built-up area by 6.65% from 2000 to 2010 A.D while all the other land use classes shows a decreasing trend. In the change LULC context, the simulated surface runoff contribution to streamflow (SURQ) changes by (+)10%, the lateral flow (LATQ) changes by (-)6%, groundwater contribution (GWQ) changes by (-)6% and the sediment yield changes by (+)20% respectively.

Quantification of water balance and sediment yield within the urban watershed is more useful for the planning of water management as well as downstream projects for the engineer, environmentalist and others.

## Keywords:

Land use land cover (LULC), Soil and Water Assessment Tool (SWAT), SWAT Calibration and Uncertainty Procedure (SWAT-CUP), Discharge, Sediment yield

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# Seismic Vulnerability Assessment of Typical 2-Storey Brick Masonry House in Mud Mortar in Panauti Municipality

*Pradeep Tamang<sup>a</sup>, Hari Darshan Shrestha<sup>b</sup>*

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## **Abstract:**

This study primarily focuses on Seismic vulnerability assessment of a typical 2 storey brick masonry house in mud mortar through the use of nonlinear link elements. Nonlinear link elements incorporate the nonlinearity of the model through force-deformation relationship which is obtained from literature reviews. The model is subjected to nonlinear static pushover analysis to obtain pushover curve and further obtain fragility curves through the capacity spectrum method which helped in assessing the vulnerability of building. The fragility curves displayed that, for an earthquake with PGA of 0.4g it has a probability of exceedence of almost 100% for Immediate Occupancy, roughly 95

## **Keywords:**

Vulnerability assessment, unreinforced masonry, fragility curve

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# Computational Study of Location of Return Ventilation In HVAC Systems For Negative Pressure Airborne Infection Isolation Rooms

*Sunil Khadka <sup>a</sup>, Vishwa Prasanna Amatya <sup>b</sup>, Ajay Kumar Jha <sup>c</sup>*

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## **Abstract:**

Negative pressure all airborne infection isolation rooms are a specialized application of the hospital's HVAC system, designed to isolate patients with air-borne diseases. During the COVID-19 pandemic in Nepal, many makeshift isolation rooms were built with poor ventilation strategies that increased the risk of cross-contamination. The present study investigates the optimum operational conditions of hospital HVAC systems to minimize cross-infection. Design and simulation of negative pressure isolation room with three different exhaust vent configurations are conducted using Computational Fluid Dynamics (ANSYS software). The predicted behaviour and airflow characteristics of the optimized isolation rooms are assessed for compliance with the prevailing ASHRAE standards. Out of the three cases, the best airflow results are obtained when the outlet vent is kept in the near-patient head. Under this model, the inlet air is introduced to the room from cleaning zone to breathing zone and then flow moves downwards to the return grille. Since most of the dirty zone lies below the knee level of medical personnel, there is less probability of medical personnel inhaling the contaminated area. The temperature is computed at 23°C, pressure obtained is -4.5 Pa, humidity is 48%, carbon dioxide concentration ppm is 480 ppm and the air change rate is 13.61. All these parameters comply with the established global standards for HVAC systems.

## **Keywords:**

Negative Pressure Room, Isolation Room, CFD, COVID-19, HVAC, HVAC for Hospitals, AIIR

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# Speech Emotion Recognition using Convolutional Recurrent Neural Network

*Om Prakash Yadav*<sup>a</sup>, *Laxmi Prasad Bastola*<sup>b</sup>, *Jagdish Sharma*<sup>c</sup>

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## Abstract:

Deep learning for Speech Emotion Recognition (SER) has advantages over traditional approach using machine learning algorithm, having capability to detect emotional feature within speech signal. Convolutional Recurrent Neural Network (CRNN), consisting Convolution Neural Network (CNN) and Bidirectional Long Short Term Memory (BiLSTM) is proposed to learn emotional feature from log-mel scaled spectrograms. Local features are learned by convolution kernels of CNN and a layer of BiLSTM is selected to learn temporal dependencies from learned local features. Speech utterances are pre-processed to remove background noise and non-informative portions. Also data augmentation techniques are investigated and selected the best techniques to enrich number of data samples improving the recognition rate of the model. The proposed model is tested with two widely used datasets i.e. RAVDESS in North American English and Berlin EMO-DB in German language. It is observed that constructed model performance improve to 85.76% for RAVDESS and 91.59% for Berlin EMO-DB and the model is language independent.

## Keywords:

Bidirectional Long Short Term Memory, Convolutional Recurrent Neural Network, Log-Mel Spectrogram, Speech Emotion Recognition

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# Form finding and Optimization of Grid Shells using Force Density Method

*Nishan Thapa<sup>a</sup>, Bharat Mandal<sup>b</sup>*

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## **Abstract:**

Force Density Method is widely used method for form finding of tensile cable nets and grid shells. A design tool that utilizes force density method along with Genetic Algorithm have been formulated in Rhino-Grasshopper, a parametric environment, for design and optimization of grid shells. Variation of structural weight and height of grid shell is studied for various topologies, subdivisions and force density values. Genetic Algorithm has been used for optimization of grid-shell to get minimum weight for prescribed grid shell heights.

## **Keywords:**

Force Density Method, Genetic Algorithm , Optimization, Grid Shell

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# Non-Linear Damage Accumulation based Fatigue Life Estimation of Reinforced Concrete Bridges

*Prabin Wagle<sup>a</sup>, Kamal Bahadur Thapa<sup>b</sup>*

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## **Abstract:**

This paper presents an attempt to determine fatigue life of reinforced concrete bridges by adopting a non-linear damage accumulation method subjected to different amplitude loading due to passing of vehicles in Nepal. The bridge was modeled in finite element software and static analysis was carried out to determine the stresses acting on a bridge deck. The corresponding stresses in reinforcement bars is determined using limit state method and the stresses are incorporated in sequential law to carry out the fatigue life. Since S-N curves available in different codes represents stresses corresponding to more than hundred thousand cycles of failure, a full range S-N curve is developed to carry out sequential law. The material properties of the modeled bridges are taken from design data. The paper concludes that the fatigue damage due to sequential law is low in previous years; however, there is exponential increase in damage in later years. Although the updated linear method seems to yield almost comparable result as sequential law, the fatigue progress is best represented by sequential law.

## **Keywords:**

Sequential Law, reinforced concrete bridge, S-N curve, Fatigue damage, Non-linear damage

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# Evaluation of Pedestrian LOS for Footpath by Cluster Analysis and Questionnaire Survey (A case study of Kathmandu)

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## Abstract:

This study comprises defining Pedestrian level of service ranges from LOS A to F for footpath by k-means cluster analysis based on parameters speed, flow rate and space that were extracted from video graphic survey of different footpath of Kathmandu and Quality of Service (QOS) ranges by questionnaire survey. PLOS ranges based upon space from A to F were found to be >12.28, 12.28-9.24, 9.24-7.54, 7.54-6.02, 6.02-4.25 and <4.25 m<sup>2</sup>/ped respectively. PLOS ranges based upon flow rate from A to F were found to be <9, 9-12.12, 12.12-15.91, 15.91-19.67, 19.67-23.07 and >23.07 ped/min/m respectively. PLOS ranges based upon speed from A to F were found to be >79.8, 79.8-75.6, 75.6-70.8, 70.8-66.6, 66.6-62.4 and <62.4 m/min respectively. Importance and Satisfactory ratings of different physical and user characteristics for footpath were collected from user perception through questionnaire survey and walkability index was determined to define QOS ranges from A to E. QOS categories of walkability for footpath ranges from A to E were found to be >130, 130-105, 105-86, 86-67 and <67 respectively. The PLOS ranges defined in this study are significantly different from that mentioned in HCM 2010 due to different land use pattern, illegal parking, vendors activities and different obstructions.

## Keywords:

Pedestrian Level of service, Quality of Service, average pedestrian space, speed, flow rate, K-means clustering

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# Study of Thermal Comfort in Terai Region Nepal – A case of School Building in Kapilvastu District

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## Abstract:

Global average surface temperature has increased by more than 1.6 degrees Fahrenheit (0.9 degrees Celsius). Similarly the temperature of Nepal is warming at the rate faster rate than that of the global average temperature. Thermally discomfort creates the negative impact in the academic performance, so there should be serious attention to improve the indoor thermal environment of classroom. Adaptation to climate change is a functional requirement and best way of insulating is to have well-defined thermal boundary in building. All of the existing schools in Nepal have been constructed without any concern for the comfort of the occupants and the adaptation of the buildings to the local climate. This research focuses on evaluating and comparing effect of envelopes in uninsulated prototypical school with thermally insulated in Kapilvastu district. This study will help to report the thermal environmental conditions of classrooms in the schools of Kapilvastu. Primary data would be collected through school survey and case studies while secondary data would be collected through various literatures. The comfort temperature of Kapilvastu has been calculated using the Nicol formula, the lowest temperature in which the people of Kapilvastu feel comfortable is 20.3°C, whereas the highest temperature in which the people of Kapilvastu feel comfortable is 28.6°. For KVM School reduction in monthly load is 8 % for scenario 2, 22% for scenario 3 and 20.6% for scenario 4. For Udayapur School reduction in monthly load is 41.49% for scenario 2, 31.5% for scenario 3 and 46% for scenario 4. The findings based on calculations Material with lesser U-value can save 10-40% monthly cooling or heating load in summer than uninsulated buildings of Kapilvastu.

## Keywords:

Adaptive thermal comfort, Comfort Temperature, Adaptive thermal comfort

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# Prediction of Pedestrian Gap Acceptance Behavior in Urban Mid-Block Illegal Crossing Under Mixed Traffic Condition

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## Abstract:

The crossing movement of the pedestrian across the road at mid-block locations illegally leads to high risk of pedestrian- vehicle conflicts. This study is concentrated on the size of the vehicular gaps accepted by the pedestrian for crossing at mid-block section of the ring road. The middle four lanes which are free from the disturbance of the temporary parking of vehicles were only used for this study. Two popular machine learning models, Random Forest (RF) and Extreme Gradient Boosting (XG Boost) were used in addition to traditional Multiple Linear Regression (MLR) model to predict the size of the accepted gaps. In total, twenty one independent variables were extracted from the video recorded at site consisting of pedestrian demographic, behavioral and traffic related characteristics. The significant independent variables in MLR model was obtained based on the t-test value and p-value. Similarly, the importance score of independent variables for RF and XG Boost model was obtained using function `feature_importances_` in Python Jupyter Notebook. Seven variables were found to be statistically significant in MLR model. To keep same number of variables in all three final models, seven corresponding important variables were chosen for fitting RF and XG Boost model. Two variables, safety distance and vehicle speed were found to be important in all three models. The fitness of model in terms of R-squared value with important variables only was found to be 89.20%, 99.66% and 99.92% for MLR, RF and XG Boost models respectively. Similarly, the performance of these trained models in terms of root mean squared error was obtained as 0.3358, 0.1114 and 0.0914. Both machine learning models performed better than MLR. XG Boost outperformed rest of the models in model fitness and gap size prediction.

## Keywords:

Multiple Linear Regression, Random Forest, Extreme Gradient Boosting, Accepted gap size, Rolling gap, Safety distance

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# Pelton Runner Erosion due to Cavitation : A case study of Storage Hydropower Plant, Kulekhani First Hydropower Station

*Narendra Kumar Mandal <sup>a</sup>, Tri Ratna Bajracharya <sup>b</sup>*

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## Abstract:

This research is an attempt to figure out that Pelton runner erosion due to cavitation phenomena along with efficiency deterioration, though it operates under atmospheric pressure, where sediment concentration is quite low. This was found from the case study of storage hydropower plant, Kulekhani First Hydropower Station. Sediment Analysis were carried out on laboratory as per the guidelines of International Electro-Technical Commission (IEC) 62364. The laboratory Test report informs that the sediment concentration of reservoir water feeding to turbine is quite low i.e 70 ppm. Also the major mineral contents are Quartz, Feldspar, Mica and Other (Tourmaline, Homblende, Calcite, Clay, Hard rock fragments, clay lumps etc). Sizes of mineral content ranges from 0.001 to 1 mm. The result of the study clearly shows that cavitation do occur, though it operates under atmospheric condition. The Pelton runner erosion due to cavitation occurs mainly at the splitter tip back side zone and gradually increasing on operation basis. Also the study reveals that the plant efficiency has a degrading trend line along with fluctuations. The efficiency calculations are done on the basis of daily water consumption and fluctuating effective head where water volume is determined with polynomial based reservoir capacity equation.

## Keywords:

Cavitation, Runner, Bucket, Splitter, Efficiency, Sediment

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# Reservoir Sustainability and Sediment Management- case study:Jagdulla Peaking Run-of-River Hydroelectric Project, Dolpa, Nepal

*Ujjwal Marasini <sup>a</sup>, Hari Prasad Pandit <sup>b</sup>*

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## Abstract:

Reservoir sedimentation is the biggest threat to the reservoir. Sediment in reservoir fills the dead storage causing the decrease in the live storage of the dam and effects the sustainability of the reservoirs. To maintain the sustainability, before the construction of the dam it is utmost important to identify the sediment management techniques. Recently, sediment flushing operations have been more common to release part of the stored sediment in reservoirs. It entrains and transports reservoir delta deposits by drawing the reservoir down to run off river flows. This study considers the case of Jagdulla Peaking Run-of-River Hydroelectric Project to evaluate the performance of 1D model built in open software HEC-RAS. This is used to develop a hydraulic analysis of sediment transportation model. Calibration is done by applying various sediment transport functions and Manning's roughness coefficient. The model output indicates the hydraulic performance, sediment transportation, sediment deposition and the sustainability of the reservoir of the project. The output of the model combined with local knowledge can help to attenuate the problem arising due to the sediment.

## Keywords:

Sediment deposition, Sediment flushing, HEC-RAS, Reservoir Sustainability

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# Transportation Sector in Kathmandu Valley: Responsible for significant amount of Carbon Dioxide emission & Correlation to Chronic Obstructive Pulmonary Disease (COPD)

*Gaurab Thapa<sup>a</sup>, Neeraj Adhikari<sup>b</sup>*

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## Abstract:

For both developing and developed countries, air pollution is one of the primary causes of death. Air pollution was the second leading cause of mortality in one of the Kathmandu Valley's main hospitals in 2011, and the third leading cause in the United States. One of the key factors was the use of fossil fuels for transportation. Vehicle registration in the 665-sq.km Kathmandu Valley climbed from 45,871 in 1990/1991 to 570,145 in 2010/2011, a 12-fold increase in 20 years. Various government divisions provided statistics on car registration and the number of COPD patients. A survey of Kathmandu Valley residents was also used to acquire data on average daily commute distance and fuel mileage. The amount of carbon dioxide (CO<sub>2</sub>) emissions by transportation sector is calculated in this article, and a link between CO<sub>2</sub> emissions and COPD patients is established. CO<sub>2</sub> emissions were found to be extremely high, according to the findings.

## Keywords:

fuel consumption, carbon dioxide emission, health impact, Chronic Obstructive Pulmonary Disease, Kathmandu valley

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# Cooling Performance of a Single-Phase Truncated Cone Shaped Fins Array in a Microchannel Heat Sink: A Numerical Analysis

*Amrit Karki<sup>a</sup>, Surya Prasad Adhikari<sup>b</sup>*

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## Abstract:

The presence of fins in a microchannel tends to enhance the heat sink's heat transfer performance. Heat transfer is increased by disruption of flow by fins in the channel creating swirls, whereas pressure drop across the channel increases with fin density and fin size, requiring more powerful pumps to create flow across the channel. Truncated Conical Fins arrays with varying fin density are created and compared to cylindrical pin fins at various Reynolds numbers. For this, various performance parameters such as  $T_{\max}$ ,  $T_{\min}$ ,  $T_{\text{ave}}$  of the chip's top surface, and Uniformity of Chip's Top Surface (UCTS) are measured, as well as the pressure drop across the fin array. At higher Reynolds numbers ( $Re$ ), Cylindrical Pin Fins outperform Truncated Conical Fins in thermal performance in but pressure drop across fins is more in cylindrical fins. At lower Reynold's Numbers, sparsely dispersed truncated conical fins performed the best thermally while pressure drop remained comparable. UCTS was similar for all arrays at greater  $Re$ , but UCTS did rise for all arrays as  $Re$  decreased, with the least increment for sparsely distributed truncated conical fins.

## Keywords:

Heat Sink, Micro-Pin Fin, Truncated Conical Fins

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# Finite Element Analysis of Stone Column System: A Parametric Study

*Suvash Gyawali<sup>a</sup>, Santosh Kumar Yadav<sup>b</sup>, Indra Prasad Acharya<sup>c</sup>*

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## Abstract:

The performance of stone column has been studied as a method of ground improvement technique including the influence of design parameters on the settlement. The effect of area replacement ratio, influence of friction angle of stone column and influence of column stiffness has been studied with the use of finite element analysis. The study shows that settlement decreases with the increase in area replacement ratio. The friction angle has significant effect on the performance of stone column whereas the influence of column stiffness is negligible to the overall performance as it is dependent on stiffness properties of surrounding soil.

## Keywords:

Stone Column, Settlement Improvement Factor, Finite Element Method, Parametric Study

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# Influence of Soil Structure Interaction in the Seismic Behavior of Residential Steel Building

*Kailash Chaudhary<sup>a</sup>, Kshitij Charana Shrestha<sup>b</sup>*

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## **Abstract:**

The present practice neglects the soil structure interaction (SSI) effect and design the base of structure as fixed one. A designer assumes the fixed base case as safe, however, time period and damping characteristics are significantly affected when considering SSI. Different researches regarding SSI is introduced but the finite element (FE) validation of the relations is rarely reported. This research focuses to understand the effect of SSI on the response of typical residential steel structure with the validated FE model. Four different residential steel buildings are used for the case study. The bare frame is modelled and analyzed, using FE method under two different boundary conditions i.e., fixed base and SSI. From the results obtained, it shows that the SSI has significant effect in base shear and time period of the building.

## **Keywords:**

SSI , Kinematic interaction, Inertial interaction

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# Use of Climate Change Projections for Resilience Planning: A case study of Kathmandu Valley

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## Abstract:

Climate change is predicted to inflict damage on agriculture, water resources, infrastructure, and millions of people's livelihoods. In the context of climate change, the impacts of urbanization on the future air conditions of cities around the world are still undefined. We used the latest climate models from the Coupled Model Intercomparison Project Phase 6 to project future climate risks over the Kathmandu valley in terms of precipitation and temperature changes (CMIP6). We used multiple datasets, including APHRODITE, ERA 5, and Bias corrected CMIP6 for the SSP585 scenario, to estimate future projections. This study examined how projections may affect the future climate of the Kathmandu valley and develops adaption techniques for expected precipitation and temperature in Kathmandu, with the goal of enhancing climate change policy. According to this analysis, by the end of the twenty-first century, annual mean precipitation, monsoon precipitation, extreme precipitation occurrences, and annual mean temperature will have increased by 17.7%, 72.31%, 26.69%, and 0.083 °C sequentially under SSP585 scenarios. Based on the recent impact of climate change as projected by the CMIP6 model, there is a growing political interest in decreasing the danger of urban climate change through adaption techniques. The findings of this study suggest that a unique vision of future warming has the most impact on urban livelihood and development. Because the number of available CMIP6 models is currently limited, more CMIP6 models will need to be evaluated in the future.

## Keywords:

Climate change, Resilience Planning, CMIP6, Kathmandu Urbanization, Temperature, Precipitation

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# Urban Reconstruction Process and Challenges for Residential Building after Nepal Earthquake 2015: case study at Bhaktapur Municipality

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## Abstract:

Modern technology of reinforce cement concrete (RCC) was adopted during reconstruction of residential building after Nepal earthquake 2015 instead of adopting traditional materials and technology of brick mortar load bearing wall system. Life span of RCC buildings are expected to be fifty to sixty years. There is probability of lost in transfer of these traditional technologies of housing construction in near future. The devastating earthquake of April 25 2015 destroyed world Heritage sites in Kathmandu, Bhaktapur and Lalitpur, including the iconic Dharahara and historic Kasthamandap. Many neighborhoods of Kathmandu, Lalitpur and Bhaktapur were severely affected forcing people to take shelter in open spaces and streets. Reconstruction process was started after few years of earthquake in 2015. But even after five year of earthquake reconstruction work has not been completed. Then main reconstruction challenges are poor financial status of house owner and problem in legal inheritance of land and house among siblings. The main objective of this study is to examine process and challenges for reconstruction of residential building after Nepal earthquake 2015 at Bhaktapur Municipality. The specific objectives are to study about architectural conservation in reconstructed buildings, to study challenges faced by house owner for reconstruction, to acknowledge social changes after post-earthquake reconstruction and to study about Reconstruction Process at Bhaktapur Municipality. This study was carried out based on questionnaire survey among 25 households of different ward at Bhaktapur municipality core area and data was analyzed in IBM SPSS software. Some houses have completed its reconstruction work, some are in process and some houses has not even started for reconstruction work. There are significant effort was made by Bhaktapur municipality to conserve building architecture by making byelaws for exposing brick at façade and making slope roof at staircase cover. There have been significant social changes and improved in people's life style after reconstruction of residential buildings.

## Keywords:

Reconstruction, process and challenges, architectural conservation, social change

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# Burrows-Wheeler Post-Transformation with Effective Clustering and Interpolative Coding

*Amit Kumar Yadav*<sup>a</sup>, *Sanjeeb Prasad Panday*<sup>b</sup>

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## Abstract:

Burrows-Wheeler Transformation, in simple words, sorts the data reversibly. Generally, sorted data can't be reversed to its original form but BWT uses the last index to get the original data. In this research the main focus is to manipulate the result of BWT for better compression. The BWT, RLE and MFT are used together. The order of using these may differ according to the requirement. We have used RLE and MFT after BWT in this research. The result of BWT has been passed through RLE module to get the Run characters, Run Length and Run Character frequencies. The Run characters and Run Character Frequencies has been passed through MFT module to get MFT number and final MFT list. Then the MFT number and Run length, which are non-negative integers, has been sorted using counting sort module. This module sorts the numbers according to Run characters. The result is non-negative integer which has been coded using interpolative coding method. This method does not uses any statistics like calculating probabilities to produce final result. Hence the method is also called Non-statistical Coding. The data has been decompressed using the same module as compression but in reverse order. The data is decoded using interpolative decoder and then MFF module has been used to unsort the data and provide Run Characters and Run. These are passed through RLE decoder to get the original file. It results lossless output.

## Keywords:

BWT, Lossless Compression, Non-statistical Coding, Run Length Encoding, Move to Front coding

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# Interference Analysis of 5G in Coexistence Scenario with Short Range Devices (SRD)

*Mahendra Adhikari*<sup>a</sup>

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## Abstract:

The rapid growth of mobile data traffic and demand of faster broadband services set the target of 5G for mobile and broadband services. For the 5G cellular mobile communication, lower (1GHz) and mid (1 to 6 GHz) 5G candidate band are more promising due to coverage and capacity. Government of Nepal planning to test 5G for cellular and commercial use in near future. Based on NTA study plan and current frequency allocation data for cellular system in Nepal, this paper presents an interference analysis of 5G in co-existence scenario with Short Range Devices (SRD) in the 850 MHz band considering 868 MHz as 5G reference frequency and SRD's operating in (863 – 870) MHz licensed exempted band. Monte-Carlo based SEAMCAT simulation has been used to exploit the interference probability on victim system from interfering system while operating in same or adjacent frequency in coexistence scenario. Using this methodology, impact and tendencies of several parameters over the probability of interference on victim systems are analyzed, like separation distance, numbers of interferers and propagation scenario (e.g. indoor and outdoor). Based on the result of probability of interference/bitrate degradation, required minimum distance between interfering transmitter and victim receiver are recommended to ensure victim system service availability greater than 95%. This paper also highlights some future research directions to minimize the probability of interference to ensure the compatible operation 5G and SRD's in coexistence scenario.

## Keywords:

Electromagnetic Interference, 5G, Spectrum, Short Range Device (SRD), Co-existence, SEAMCAT

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# Lateral Behavior of Pile in Sand

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**Abstract:**

Pile foundation used to support structures like bridges and slender tower are subjected to considerable lateral loads. Pile behavior as an individual and piles in group under lateral load are complex because of soil structure interaction and shadowing effects. The interaction between piles depends on parameters like type of soil, spacing, length of pile and presence of water table. This paper presents the analysis of models with single and a row of piles (1x3) under varying parameters. The soil is modeled to be sand using Mohr-Coulomb Constitutive model in PLAXIS 2D. The deflection characteristics and stresses developed in piles under different conditions is compared with past studies. Pile as single and group show insignificant changes in deformation and stress values for change in vertical loading. When water table is introduced, pile shows increased deflection and stresses with increased value of vertical loading. Leading pile in a row show more stresses compared to trailing piles. The trailing pile farthest from leading pile shows minimum value of stress.

**Keywords:**

Soil Structure Interaction, PLAXIS 2D, Lateral Loading, Combined Loading, Leading Pile

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# Pumped Solar Hydro Power for Electrification of Madan Bhandari University of Science and Technology

*Anish Kumar Shakya*<sup>a</sup>, *Amrit Nakarmi*<sup>b</sup>, *Sangeeta Singh*<sup>c</sup>

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## Abstract:

This paper is the result of the thesis of MSESSD entitled “Pumped Solar hydro power for electrification of Madan Bhandari University (MBUST), Chitlang”. In the present context the energy consumption in a university is huge so, adequate supply with proper management is necessary. Likewise, Nepal is very rich in water resources with high potential of producing hydropower along with a very high solar potential. As the energy from the sun is intermittent in nature and also available only during day time. Hence, to make its best and continuous use, an energy storage system which can store the energy when excess energy is available and then use the stored energy when it is not available. Likewise, on the other hand it is difficult to store electricity and the trajectories of the graph of supply and demand do not match thereby creating power outages at one time and at other times leaving extra power in the system. In peak hours of solar output, the hydro power output is reduced and solar PV output is fully absorbed. In the period of low solar output, however, the hydropower output is regulated based on the electrical loads at the receiving end to meet the electricity needs of the University. Therefore, this research analyses the demand and consumption pattern of the existing universities like Tribhuvan University and Kathmandu University. The analyzed data along with the data obtained through survey of the MBUST were used to determine the total Solar capacity to be installed and the volume of water to be pumped for the storage purpose. The size of the tank is determined to provide the hydro-electricity for the nonsunshine hours.

## Keywords:

Hybrid, energy consumption, Solar PV, Storage capacity, hydropower, MBUST

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# Deep Learning Based Voice Conversion Network

*Ashok Basnet<sup>a</sup>, Basanta Joshi<sup>b</sup>, Suman Sharma<sup>c</sup>*

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## Abstract:

Timbre, Content, Rhythm and Prosody are four crucial aspects of speech. These aspects controls how person speaks. When two speaker utters same content, then other three aspects controls the differences in their speech. Converting any person voice to the targeted speaker voice by control over these three parameters is the the main work presented in this paper. Voice synthesized by text-to-speech system if trained on lesser amount of data produces robotic and foggy sound. Producing a new dataset for adding a new speaker on the system is costly. The proposed method is an end-to-end system based on multi-domain google's Wavenet auto-encoder with disentangled latent space and shared encoder trained on Nepali speech dataset. The use of an auto-encoder can remove noise from the audio. The encoder part of the autoencoder transforms audio into the latent space representation where as decoder side decodes latent space representation back to the voice of the targeted speaker. The rhythm, prosody and timbre of targeted speaker's voice is modified artificially. The network is trained in unsupervised way to recover these modified aspects back to the original speech. Attention mechanism network is supposed to recover the timing of the speaker in order to match the prosody of the targeted speaker. The model is trained on 480 datasets from 17 speakers followed by training on 1500 datasets of single speakers extracted from youtube for 5000 epochs. The correlation of the synthesized audio with the recorded speech of targeted speaker is found to be 0.78. Also the evaluation of quality by mean opinion score results the score of 2.78. Increase in the size of dataset, clarity of recorded audio sample and increase in number of training epochs can further increase the naturalness of the converted speech.

## Keywords:

Timbre, Content, Rhythm, Prosody, Google's WaveNet, Autoencoder, Latent Space, Attention Mechanism

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# pyMPEALab toolkit for accelerating phase design in multi-principal element alloys

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## Abstract:

Multi-principal element alloys (MPEAs) occur at or nearby the centre of the multicomponent phase space, and they have the unique potential to be tailored with a blend of several desirable properties for the development of materials of future. The lack of universal phase diagrams for MPEAs has been a major challenge in the accelerated design of products with these materials. This study aims to solve this issue by employing data-driven approaches in phase prediction. A MPEA is first represented by numerical fingerprints (composition, atomic size difference, electronegativity, enthalpy of mixing, entropy of mixing, dimensionless  $\Omega$  parameter, valence electron concentration and phase types), and an artificial neural network(ANN) is developed upon the datasets of these numerical descriptors. A pyMPEALab GUI interface is developed on the top of this ANN model with a computational capability to associate composition features with remaining other input features. With the GUI interface, an user can predict the phase(s) of a MPEA by entering solely the information of composition. It is further explored on how the knowledge of phase(s) prediction in composition-varied  $Al_xCrCoFeMnNi$  and  $CoCrNiNb_x$  can help in understanding the mechanical behavior of these MPEAs.

## Keywords:

Multi-principal element alloys, Artificial neural network, Phase, Composition, Thermodynamic properties

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# Effect of Rainfall on Stability of Soil Slope

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## **Abstract:**

Slope failure caused by rain is a frequent geotechnical hazard that occurs all over the world. Infiltration of rainwater into the soil raises porewater pressure and lowers matric suction as well as shear strength, resulting in slope failure. The present study investigates the effect of different rainfall events on a natural slope of Paima area in Bajura district using numerical modeling. GeoStudio software was used to analyze seepage and slope stability. Finite element analysis of transient seepage through unsaturated-saturated soils was used to calculate the porewater pressure in the slope during rainfall and slope stability analysis was conducted by limit equilibrium Morgenstern-Price method. The results obtained from the analysis show that the rainwater infiltration reduces the safety factor and the rate of reduction increases as the rainfall intensity increases. The stable slope prior to rainfall event becomes unstable after rainfall events. Parametric studies on slopes with two distinct permeabilities show that slopes with high permeability soil become critical in a short time, while slopes with low permeability sustain relatively a long duration.

## **Keywords:**

Landslides, Rainfall, Seepage analysis, Slope stability, Unsaturated soil

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# Generating Nepali Handwritten Letters and Words Using Generative Adversarial Networks

*Raj Kiran Chhatkuli<sup>a</sup>, Hari Prasad Baral<sup>b</sup>, Surendra KC<sup>c</sup>*

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## Abstract:

The power of machine learning in the field of image processing has increased dramatically because of the advancement in deep neural networks. Many works on handwritten English, Arabic, Chinese, and Japanese scripts have previously been completed. So, this paper aims to develop Nepali Handwritten letter and words Generator using Generative Adversarial Networks (GAN). Basically, the Nepali script has 12 vowels, 36 consonant basic forms, ten numeric characters, and a few special characters. Moreover, there are some special characters in the script. The input that is used is a low resolution noise image i.e 100-dim z-vector generated by a uniform distribution with a range of -1.0 to 1.0. The dataset used for this paper comprises of Nepali handwritten letter and word dataset both in Devanagari script. And using those dataset in GAN Network it was discovered that recognizable and readable Nepali handwritten letters and words could be constructed by merely beginning from noise.

## Keywords:

Word Generation, DNN, GAN, Latent Space

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# Incremental Dynamic Analysis of RC Framed Structures Under Mainshock-Aftershock Sequences

*Pooja Maharjan <sup>a</sup>, Prem Nath Maskey <sup>b</sup>*

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## **Abstract:**

Earthquakes are major unpredictable natural phenomenon which often results in major disasters. In any real earthquake, shaking occurs in sequence of foreshocks, main shock and aftershocks. These repeated earthquakes may occur several times within even few hours or minutes leaving very limited time between occurrence of tremors. This may hamper the reoccupancy and restoration activities of structures in post-disastral situations. When structures are subjected to repeated earthquakes, structural damages get further accumulated which results in degradation in stiffness and strength characteristics of structural members. Therefore, it is important to evaluate the responses of reinforced concrete (RC) buildings under repeated earthquakes to prevent possible damages. This study is mainly focused on fragility assessment of RC framed structure designed according to the Nepal National Building codes of practice under single and repeated ground motions. Incremental dynamic analysis is performed using SAP2000. Results obtained in this study are evaluated in terms of lateral displacement, residual displacement, maximum inter-story drift ratio for particular peak ground acceleration. Depending on the results it is concluded that repeated earthquakes have significant effects on seismic responses of structure. It is also found that seismic vulnerability considerably increases when structure is exposed to sequence earthquake.

## **Keywords:**

Repeated earthquake, Incremental dynamic analysis (IDA), Collapse capacity, Residual Displacement

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# Budget Pacing Optimization for Effective Online Ad Campaign using Quantum Accelerator Models

*Pradip Bhandari*<sup>a</sup>, *Subarna Shakya*<sup>b</sup>, *Nanda Bikram Adhikari*<sup>c</sup>

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## Abstract:

The problem with the advertiser is not able to properly utilize or spend the allocated budget in the allocated hours. Current industry standards for probabilistic throttling and bid modification are designed to execute in the Central Processing Unit (CPU) for better results. Optimization and data parallelism is not performed efficiently in the CPU so this research needs some better solution. Probabilistic throttling and bid modification can be implemented in Quantum Processing Unit (QPU) but it does not optimize the budget timing as this is not an optimization problem. This paper shows modified edge-weighted bipartite matching formulated as Quadratic Unconstrained Binary Optimization (QUBO) problem and implemented in QPU units as an optimization problem with large data set in near real-time. This is both processing and data parallelism hungry so it is more suitable for QPU when compared with CPU and Graphics Processing Unit (GPU). Quantum accelerators are processing units specially designed using quantum phenomena like superposition, entanglement, annealing. This research has explored the untouched opportunities in the quantum computing field. This research has been able to show the increase in results significantly by the use of specific approaches suitable for QPU units. Implementing QPU has increased budget timing synchronization from 11th hour to 21st hour which is 41% increase. The processing time is about 8.1% better in QPU as compared to CPU and 21.3% better as compared to GPU and this also leads to a decrease in latency by 2.48% as compared to CPU and 24.41% as compared to GPU.

## Keywords:

Quantum Accelerators, Optimization, Budget pacing, Online advertisement

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# Internal Forces in a Pile during Seismic Event in Cohesive Soil

*Gaurav Malla <sup>a</sup>, Indra Prasad Acharya <sup>b</sup>*

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## **Abstract:**

During the event of earthquake the pile foundation is subjected to time dependent stresses, displacements and strain which is dependent on the underlying soil strata. For such events the study needs to be properly carried out to estimate the internal forces in the pile that is likely to be developed during such events. This paper presents the study of maximum bending moment and shear stress developed in pile foundation during such events with comparison between different pile diameter and spacing for fine grained soil. PLAXIS 2D is used to model and analyse the internal forces generated in the pile during such event. The results from the analysis shows that there is increment in the bending moment and shear force in the pile with increase in the pile diameter and pile spacing.

## **Keywords:**

PLAXIS-2D, earthquake, pile, fine grained soil, bending moment, shear force

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# Development of Analytical Fragility Curves to Assess Status of Existing Two-Span RCC Bridge in Nepal

*Pramod Tiwari <sup>a</sup>, Gokarna B. Motra <sup>b</sup>, Kshitij C. Shrestha <sup>c</sup>*

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## **Abstract:**

This paper presents the seismic vulnerability of a typical two spanned RCC T-girder bridge in Nepal with a span length of 25m and a single circular pier. The bridge is modeled on finite element analysis-based program OpenSees. Ten different earthquake motions are considered for the non-linear time history analysis of the bridge with the drift ratio taken as the parameter to check the damage states (DS) and the performance limits. The pier of the bridge is taken as the most critical component and the fragility curves are developed considering the non-linear deformation concentrated in the pier only. The study suggests that for the ground motion with spectral acceleration of 0.5g, the bridge is susceptible to moderate damage at forty nine percent probability of exceedance, to extensive damage at twenty six percent probability of exceedance and complete damage at eighteen percent probability of exceedance.

## **Keywords:**

Seismic Vulnerability Assessment, Fragility curves, OpeenSees, RCC T-grider bridge

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# Real Estate Development Practice in Kathmandu Valley: Context of Planned Housing

*Nistha Nakarmi<sup>a</sup>, Sushil Bajracharya<sup>b</sup>, Sangeeta Singh<sup>c</sup>*

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## **Abstract:**

The extensive growth of population has its toll on urbanization and haphazard growth in the morphology of cityscape in the context of Kathmandu Valley. The growth of the city is portrayed in increasing real estate development projects which is a response to the chain of demand of the growing population. This paper presents the status of Real estate development practice in Kathmandu Valley with an explanation of the process of development and the analysis of every step of the process. The identified steps in the process are acquisition, planning, site development, procurement, quantity survey, finance, marketing, and sales/ rent.

## **Keywords:**

Real estate, Housing, Real Estate Development

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# Temporal Changes of Temperature, Snow Cover And Glacier Area of Lumding Tsho Lake Watershed

*Sauhardra Joshi<sup>a</sup>, Pawan Bhattarai<sup>b</sup>*

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## Abstract:

The Himalayan region has a history of Glacial Lake Outburst Flood (GLOF) events which have caused loss of lives and properties downstream. Some of the glacial lakes in Nepal are among Potentially Dangerous Glacial Lakes (PDGL) having high risk of potential flood hazards. Lumding Tsho Glacier is one of the six PDGL with significant change in its lake volume over the few decades. This study aims to study temporal changes in Temperature, Snow Cover and Glacial cover over the lake catchment in the past few decades. The study provides valuable information regarding temporal changes of Temperature, Snow Cover and Glacier Area that supports the lake volume changes which has been already studied. The mean daily temperature was found to have an uptrend at the rate of  $0.01825$  °C per year and the snow line was found to be decreasing at maximum rate at elevation range of 4000m to 5000m at  $0.00219$   $km^2$ /year. Similarly, the glacial coverage was found to have a significant decline over the past few decades at a rate of  $3.362$   $km^2$  per decade which also confirms that the glacial melt contributed to the increased lake volume.

## Keywords:

GLOF, Temporal Changes, Temperature, Snow Cover, Lumding Tsho Lake

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# Study of the Effect of Geogrid on the Stability of Embankment

*Tanoj Dulal<sup>a</sup>, Santosh Kumar Yadav<sup>b</sup>*

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## **Abstract:**

Embankments are built to increase the height of the surface compared to the height of the surrounding area. Various infrastructures are being built on embankment and infrastructures resting on embankment may collapse due to embankment failure which may result in loss of human lives, financial loss and disruption of any services provided by infrastructure projects, the loss of which may takes years to be compensated. Analytical Method and Finite Element Method (FEM) were used to assess the performance of the embankment with and without use of geogrid. The factor of safety of embankment without geogrid and after using geogrid of certain tensile strength was determined to check the stability of the embankment. It was found that with the use of geogrid, the displacement parameters of embankment; horizontal displacement, vertical displacement and total displacement of the embankment decreased and the stability of the embankment was enhanced. Also, the stress parameters i.e. total principal stress, effective principal stress and pore water pressures tend to increase with the use of geogrid through limiting lateral deformations. The purpose of this study is to evaluate the usefulness of geogrid on the embankment to enhance its stability.

## **Keywords:**

Embankment, Geogrid, Stability

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# POI Recommendations with the Use of Knowledge Graph Convolutional Networks

*Nabin Paudyal<sup>a</sup>, Arun Kumar Timalisina<sup>b</sup>*

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## Abstract:

The lack of check-in data, which is a form of implicit feedback data, is a major problem prevalent in almost all of the prevalent Point of Interest (POI) recommendation systems. The problem of cold start and sparsity actually is a commonly occurring theme in collaborative filtering based recommendation systems for all item types. On the other hand, availability of different kinds of contextual information for the POIs creates another unique challenge in regards to leveraging them in the most effective manner. So researchers tend to collect information about attributes of users and items and design algorithms that can make use of these side information along with the user-item interaction data to effectively understand the users' preferences towards items. Knowledge graph (KG) is one of such approaches which consists of tuples representing relationships existing between two entities. Graph Neural Networks (GNN) meanwhile are gaining popularity because of their power in modeling the dependencies between nodes in a graph. They are able to generate rich contextual embedding for entities without having to explicitly specify features and attributes for the nodes representing the entities. In this paper, we propose to combine the contextual information provided by KG with the power of GNN at modeling node dependencies in the resulting Knowledge Graph Convolution Network (KGCN) to generate POI recommendations for users. The experiments carried out on Foursquare dataset exhibited performance improvement of 24.19%, 13.20% and 16.27% respectively for top 5, 10 and 20 POI recommendations in terms of F1-score. Similarly, for Gowalla dataset, the performance improvement observed was 19.35%, 10.29% and 6.77% respectively for top 5, 10 and 20 POI recommendations in terms of F1-score.

## Keywords:

Graph Neural Networks, Graph Machine Learning, Knowledge Graphs, POI Recommendation System

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# Anomaly Detection in Computer Networks using Multilayer Perceptron

*Bishal Heuju<sup>a</sup>, Daya Sagar Baral<sup>b</sup>*

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## Abstract:

The tremendous growth of internet and computer networks is making it easier for people to stay connected with each other and share resources at their ease. With the increasing networks, there has been continuous growth in malicious network attacks in intent to steal and exploit the personal information of an individual, business or an organization. In this work, a method for the classification of network anomalies is presented using Multilayer Perceptron on NSL-KDD and UNSW-NB15 dataset to train the classification model. The NSL-KDD and UNSW-NB15 datasets are preprocessed and then fitted using MLPClassifier. Grid Search is used for parameter optimization evaluated using different analysis metrics. The model is trained for both multiclass and binary class classification which can classify the 5 classes for KDD dataset and 10 classes for UNSW-NB15 dataset. The experimental results show that Grid Search found the optimum parameters for the neural network to be 2 hidden layers with 100 neurons in each layer and learning rate of 0.001; and performs fairly well for both multiclass and binary classification.

## Keywords:

anomaly, networks, NN, KDD-99, UNSW-NB15

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# Provenance Based Malicious Node Detection In Wireless Sensor Network Using Bloom Filter

*Roshan Kandel <sup>a</sup>, Daya Sagar Baral <sup>b</sup>*

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## **Abstract:**

Wireless Sensor Networks (WSN) are essential in modern day to gain information about the environmental studies that are useful in decision making. Data is transferred through wireless medium, so the integrity of the data has to be maintained. We have created a model that helps to securely transmit the data from source node to base station. We have implied provenance based bloom filter and cryptographic algorithm to securely transmit data to the base station. We have also created a model to detect packet dropping malicious node when data is in transit. In our model, we have used AODV protocol as a routing algorithm and AES-128 as a cryptographic algorithm to encrypt the data during transmission. Bloom filter requires a hashing algorithm so in our case SHA-224 cryptographic hashing algorithm has been deployed. We used a light weight Bloom filter model to transmit the data and to detect any packet dropping node which act as an intermediate nodes. We used provenance information to help detect any malicious packet dropping nodes. We relied on provenance encoding and decoding methods to our model. We analyzed our model using different parameters like Verification failure rate (VFR), True false positive (TFP), throughput, end to end delay, etc on different number of nodes, packet size and bloom filter size.

## **Keywords:**

WSN, Malicious Node, Bloom Filter, Provenance, AODV, AES, SHA, Packet Drop

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# Uncertainty Estimation in Detecting Knee Abnormalities on MRI using Bayesian Deep Learning

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## Abstract:

CNN is mostly used to detect knee injuries because of its high accuracy which can extract features automatically but has a millions of parameters and is often subjected to overconfident results. This research work introduces distribution in weights in the last three convolutional operations which acts as an ensemble of networks, and uncertainty is calculated from the mean and variance from the prediction of the multiple networks using variational inference. We have used multipath Bayesian CNN to extract features from MRI of the knee from three different planes; axial, coronal and sagittal to detect multi-label abnormalities. The Bayesian CNN model achieved the result comparable to the pretrained model and slightly better than Montecarlo methods. When both Bien et al. Sagittal plane and Stajduhar et al. training datasets are combined to detect ACL label of the sagittal plane, the AUC score increased to 0.917 for the Bayesian CNN model, where the state of the art for the similar case is 0.911. The uncertain images from training data of Sagittal plane are removed and tested on Stajduhar et al. dataset using Alexnet pretrained model to increase the AUC of the test datasets.

## Keywords:

CNN, MRI, Bayesian CNN, Montecarlo, AUC, Uncertainty

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# Spiking Neural Network based Handwritten Devanagari Character Recognition

*Bikram Acharya<sup>a</sup>, Dibakar Raj Pant<sup>b</sup>*

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## Abstract:

Spiking neural networks (SNNs) involves communication and processing of fragmented and asynchronous binary signals. It differs from traditional approach neural networks as it operates on spikes, which are discrete events that occur at particular times rather than constant values. Application of spiking neural network are being widely explored at recent times and while deep Neural Networks and Classical Machine Learning techniques were previously used to address handwritten recognition problem, Spiking Neural Networks (SNN) have become more promising with recent development of neuromorphic device. This research work implements SNN model for hand-written Devanagari digits classification. The proposed method weights transfer from ANN network to similar SNN network along with threshold calculation for SNN layers. Learning in neurons is achieved by using spike timing dependent plasticity (STDP), an unsupervised learning process, to strengthen synapses that results to the generation of an output spike, while those that do not contribute are weakened. This work uses a very popular Devanagari Handwritten Character Dataset and over the course of number of experiments and using evaluation metrics like Accuracy, Loss, confusion matrix and f1 score, it was found that Hybrid SNN(VGG-16) performed better on overall metrics and had accuracy of 96.7% on test sets and 98.5% on train sets, highest among all tested architectures.

## Keywords:

Hybrid Learning, Thresholding, Synapse, Spiking Neural Network, Spike Timing Dependent Plasticity

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# Head Pose Estimation by Few Shot Learning Techniques

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## **Abstract:**

Head pose estimation is used in a variety of human-computer interface applications, like stare tracking, driving assistance, impaired assistance and entertainment. Other range of application include biometric recognition, mainly in video surveillance. The advancement in convolutional neural networks has significantly improved the performance of head pose estimation in recent works. However, difficulties in capturing well labelled head pose data, massive training time and differences in the facial features of different persons makes them difficult to use. The proposed work addresses the problem of estimating the head pose from RGB images. An approach to learn latent representation of head pose features has been obtained using ResNet-50 architecture. BIWI Kinect head pose dataset has been used to train the network. The latent embeddings are further passed into a quick, adaptable head pose estimator trained using one shot learning in few shot settings. A mean absolute error (MAE) of 6.405 has been achieved for five-way one-shot settings in predicting the 3D head pose angles (yaw, pitch and roll).

## **Keywords:**

Head Pose Estimation, Few Shot Learning, Deep Learning, Resnet

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# English Speech Recognition Using Convolution Neural Network, Gated Recurrent Unit and Connectionist Temporal Classification

*Bishon Lamichhane*<sup>a</sup>

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## Abstract:

Conversion of an audio into equivalent text is called speech recognition system. The preferred way of communication between people is Speech .Making machines capable of conversing with humans is a difficult but necessary task. A vital first step is for machines to be able to hear and understand what humans are saying. As a result, voice recognition becomes a critical tool for bridging the gap between robots and people.This work implements CNN(Convolution Neural Network),GRU(Gated Recurrent Unit) and CTC(Connectionist Temporal Classification) to convert English audio into equivalent English text.A deep neural network solves two closely related tasks. It learns to recognize phonemes and to formulate grammar rules at the same time. In fact, a model is able to parallel and accurate build both of them, when a training corpus is large enough.CNN is used for extracting time and frequency features.GRU is used for processing sequential data.CTC allows GRU to learn over train data.After processing data through CNN,GRU and CTC English Text is obtained as output.

## Keywords:

Speech Recognition,Artificial Neural Network, CNN, GRU, CTC

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# Crowd Visualization and Counting by Smooth Dilated Convolutional Network

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## Abstract:

With mass urbanization, culturally diversified country with many cultural and religious activities happening time and again, the need of crowd estimation from single image and information on the distribution of crowd in the same is deemed necessary. The old-fashioned way of keeping records, sensor-based counting fails when the crowd movement is dynamic and random. Task is challenging due to geometric distortion, perspective distortion, severe occlusion, illumination condition in the image. The fore-mentioned challenges has been addressed by Deep Learning Convolution Neural Network wherein CNN is employed as a feature extractor and Smoothed Dilated CNN is used in the back-end that facilitates aggregation of multi-scale contextual information by increasing the receptive field with same resolution. Smoothing of the Dilated CNN refers to removing the gridding artifacts that is introduced by the Dilated CNN. Model is end-to-end trainable since it employs pure convolution structure. Model can accept arbitrary size and resolution of input image converting it into density map, which is used for crowd counting. Training of the model begins with the generation of ground-truth density map which is computed based on geometry-adaptive kernel to account for perspective effect on the input images with denser crowd and fixed kernel on the input images with sparse crowd. ShanghaiTech dataset is been used which comprises of 1198 tagged images with a total amount of 330,165 persons. Comparison between dilation rate 2 and 4 for both PartA and PartB of ShanghaiTech dataset is made. Upon evaluation of the model with the Csrnet where smoothing of the dilated convolution is not implemented, the counting accuracy and quality of the density map for both PartA and PartB of the dataset has been significantly increased.

## Keywords:

crowd counting, density map, atrous convolution, smoothed dilated CNN

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# Energy Efficiency of Software-Defined Wireless Network

*Sonu Singh<sup>a</sup>, Daya Sagar Baral<sup>b</sup>, Babu Ram Dawadi<sup>c</sup>*

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## Abstract:

To handle the traffic, the network devices must be switched on 24 hours a day. The networking hardware of legacy wireless network embedded the controlling and data forwarding functions in the same devices. Most of the network devices present in the network is comparatively ideal for most of the time which shows an unnecessary energy consumption in communication network. Software defined wireless network (SDWN) is a new network paradigm which separates the data plane and control plane providing flexibility and virtualization to the network. Software defined network (SDN) allows the administrators to manage the network devices through centralized controller and enables programmable network devices. SDN provides opportunities to enhance the overall network performance and energy efficiency. This paper proposes a traffic aware smartsleep and wakeup approach to reduce the energy consumption of SDN enabled wireless network during idle state of network. The main idea is to switch off the unused access points (APs), routers and links to sleep mode during the time when they carry no traffic. We have used Mininet-WiFi network emulator for the simulation of typical wireless network and open day light (ODL) as SDN remote controller. This paper presents the comparison between the energy consumption of traditional wireless network and software defined wireless network. This comparison is done to know; how much energy can be optimized by wireless network using SDWN as compared to traditional wireless network. The result showed that we can save up to 47

## Keywords:

SDWN, Energy Efficiency, Performance, Wireless Network

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# Pedestrian Movement Prediction Using Encoder-Decoder Model

*Bikram Acharya<sup>a</sup>, Diwakar Raj Pant<sup>b</sup>*

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## Abstract:

Pedestrian trajectory prediction in crowded space with multi-agent are extensively researched with possibility of being automated using learned models. The key task is to accurately encode observation sequence, model long-term dependencies from the past trajectories and forecast potential trajectories and reducing the task complexity to a manageable subset from which we can learn social impact from other pedestrians, scene limits, and multi-modal possibilities of expected routes and generalize to challenging scenarios and even output unacceptable solutions. This paper presents effective use of hard negatives samples with contrastive learning to preserve motion representation, which captures desirable generalization properties, very little computational overhead and improved the quality of visual representations in socially aware pedestrian trajectory prediction. The data set used was ETH-UCY, comprising of total 5 different sets ETH, Hotel, Univ, Zara1 and Zara2 with ADE,FDE and Collision Avoidance Metric as metrics for performance. The result shows that proposed methodology with hard negative sampling has better collision avoidance with values 0.3, 0.56 and 0.08 in Hotel,Univ and Zara1 dataset respectively. However, state-of-art social-nce shows better average FDE for all dataset i.e 0.381(Social-nce)<0.47(Our).

## Keywords:

Pedestrian Trajectory, Contrastive Learning, Motion Representation, Spatio-temporal Encoding, Multi-agent System, Trajectron++

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# Energy consumption pattern in Residential Sector: Policy Review of Kathmandu Metropolitan City

*Bipina Bhandari<sup>a</sup>, Sanjaya Uprety<sup>b</sup>, Barsha Shrestha<sup>c</sup>*

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## Abstract:

In a double sense, the home energy sector has become a crucial to achieving rapid emission reductions globally. In recent years, more people in Nepal have moved into cities as a result of increasing urbanization. Current urban expansion, as well as the residential way of life, has been proved to have a negative impact on world ecology, environment, and climate. The report examines the residential sector's energy consumption in Kathmandu Metropolitan City, as well as its projections until 2030, as well as policy evaluation. The base year data was derived from census 2011 secondary data. Energy Data Sheet and Energy Synopsis Report were used to collect the energy intensity and other characteristics needed for the Long-Range Energy Alternatives Planning System (LEAP). The demographic factors were computed using information from the report and other sources. According to the evaluation findings, the effective policy, i.e., switching LPG to electricity by the end of 2030, is not practicable based on the current scenario analysis because no such arrangements or developments have been witnessed to date. New policies introducing various energy-saving technologies should be suggested, and policymakers should be more cautious about the policies' legitimacy, involving energy professionals, designers, and urban planners in the policy-making process to make it more effective and efficient. A correctly planned strategy would result in a reduction in energy consumption as well as emissions, as well as the ability to maximize the use of energy resource potential.

## Keywords:

Energy Consumption, Policy, Scenario, Residential Sector, LEAP, Simulation

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# Parameters Influencing the Adoption of Energy Efficiency in the Building Design Process

*Upashana Poudel <sup>a</sup>, Sanjay Uprety <sup>b</sup>, Barsha Shrestha <sup>c</sup>*

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## **Abstract:**

Buildings account for between 30 and 40 percent of the total end use energy. Therefore, using energy within the scope of basic needs and transforming initial designs into greener and more sustainable methods can have a significant impact on the management of energy resources. Individual homeowners and building users who invest in energy efficiency often see a quick return on their investment due to lower energy costs. Because a new building's efficiency will influence its energy consumption until it is renovated, or even for the rest of its life. Thus, It is essential to identify the key factors that are affecting the limit of energy usage in buildings so that any minor to significant action plan may be developed to reduce Nepal's energy demand by the building sector. Changes in the design process, on the other hand, can incorporate energy efficiency from the start. This involves an understanding of the parameters through which design is influenced by both the client and the architects.

## **Keywords:**

energy efficiency, energy policy, design process, building design

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# Prospect of Stand-Alone Solar PV in Energy Mix in Residential Buildings: A case study of Matipur, Sindhuli

*Bharat Shrestha<sup>a</sup>, Sanjaya Uprety<sup>b</sup>*

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## Abstract:

Due to hard land topography and not having sources of energy like oil, gas, coal reserves etc. energy distribution is hard in remote communities of Nepal. So, people use traditional biomass, wood, imported kerosene, etc. in remote areas. The deficiency of energy or electrification of remote areas can be done using stand-alone solar PV system. The requirement of a house, electronic devices as well as comfort condition is required to be considered. With the total energy requirement system sizing of different components of Stand-Alone solar PV is done for its suitability. Also, firewood consumption in remote area needed to be discouraged considering environment and people health. The energy simulation for existing building is carried out through Ecotect software where the results of total annual heating and cooling was identified and introduced to total energy consumption. For efficient practice, passive design strategies could be used to reduce heating and cooling load. Stand-Alone solar PV could be important element to be used for lighting purpose, includes two number of solar panel and rest energy can be fulfilled by adopting suitable energy mix concept replacing non-renewable source of energy by renewable source of energy.

## Keywords:

Stand-alone solar PV, energy mix, rural electrification, passive design strategies

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# Effect of Stone Dust on Geotechnical parameter of Fine Grained Soil

*Paribesh Phuyal<sup>a</sup>, Bhim Kumar Dahal<sup>b</sup>*

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## Abstract:

Large volume of Construction activities in building, road, Concrete work has resulted in increase in use of Crushed Stone. To account for this, large number of Crusher plants are installed all over the country. Stone Dust is formed as a by-product in process of Crushing, Screening and Stock Piling during Crushing Operation. It is a waste product and leads to pollution and problem of stock piling in crushing plant. To address this issue Stone Dust is used in this Study. Sample was collected from problematic site and modification of soil is carried out by addition of stone dust in the range of 0 to 50% by the percentage increase of 10%, 20%, 30%, 40% and 50%. The effect of Stone Dust on Liquid Limit, Plastic Limit, Plasticity Index, Optimum Moisture Content, Maximum Dry Density and Unconfined Compressive Strength (UCS) value is considered. Liquid limit, Plastic Limit and Plasticity Index of original sample 83.32%, 37.93% and 45% were reduced to 60.77%, 29.55% and 31% respectively. The OMC and MDD values of original sample was 50.2% and 1099.16 Kg/m<sup>3</sup> which transformed to 37.97% and 1268.29Kg/m<sup>3</sup> at 50% stone dust content. Also with addition of stone dust the Unconfined Compressive Strength of Soil sample increased as anticipated.

## Keywords:

Stone Dust, Liquid Limit, Plastic Limit, UCS

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# Socio-Economic Aspects of Integrated Solid Waste Management at Dhangadi Sub-Metropolitan City

Asha Bohara <sup>a</sup>, Sangeeta Singh <sup>b</sup>

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## Abstract:

Solid waste management (SWM) has been an integral part of human society. The exponential rise in the urban population of the developing countries in the past few decades and the resulting accelerated urbanization phenomenon has brought to the necessity to develop environmentally sustainable and efficient waste management systems. The Integrated Solid Waste Management (ISWM) includes waste generation, segregation, recycling and reuse, collection, decentralized treatment, transportation and finally reuse, disposal & treatment to achieve socio economic and environmental sustainability. Dhangadi sub-metropolitan city is biggest market center of the region. Rapid urbanization is happening in city and surrounding while it lacks resources and infrastructure. The sub metropolis has been crude dumping since many years. For sustainable solid waste management of the municipalities, Regional Urban Development Project (RUDP) has proposed Integrated Solid Waste Management (ISWM) subprojects in 4 municipalities of Sudurpaschim province and Dhangadi sub metropolis is one among them. This project is in implementation phase that has failed to gain social acceptance and faced sever protest from community near proposed site. The municipality has now proposed new site which lies within national forest area. This research work explores to understand real ground situation related to project and evaluating it from environmental and socio-economic aspect.

## Keywords:

Solid waste management (SWM), Integrated Solid Waste Management (ISWM), social acceptance

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# Forecast of Rainfall using Two-Way Nesting on Advanced Research and Forecasting (ARW) WRF model over Dipayal

*Sandip Karki<sup>a</sup>, Neeraj Adhikari<sup>b</sup>*

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## **Abstract:**

Extreme precipitation results huge loss of life and property. The enhancement of computer aided weather prediction technology have made the weather forecast easy and accurate, and its alert can be seen at smartphones. This research was done to analyze the accuracy of the forecast on daily rainfall over the Dipayal station. In this research, Advanced Research and Forecasting (ARW) WRF model was used with the WRF software version of 4.2. The model was initially down-scaled into 30 km x 30 km grid using Global Forecast System(GFS) data which was further nested twice into 10 km x 10 km and 3.33 km x 3.33 km grid respectively. The nested was done using two way nesting technique.

The model was validated using observed ground station data using simple statistics, quantitative verification (Bias, RMSE and MAE) and binary contingency table methods. The study shows that the finer domain is more accurate than the coarser domains and able to simulate more accurately. The accuracy of forecast is found to be greater than the 70%. Further it shows that the detection and false alarm is greater in coarser domain than finer domains due to coarser domain are more continuous.

## **Keywords:**

Climate Change, Advanced Research Forecasting (ARW) WRF modeling system, Prediction, Two way nesting, Global Forecasting System

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# Numerical Study on Implication of Geogrid in the Pavement Construction: A case study on Ring Road Section, Khasibazaar Kathmandu

*Prabin Regmi<sup>a</sup>, Anil Bhandari<sup>b</sup>, Bhim Kumar Dahal<sup>c</sup>*

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## Abstract:

This research studies about the behavior of geogrid in pavement construction contrast its results with the unreinforced case. A section of the ring road in Kathmandu is taken to study the behavior using a numerical simulation method with the help of the Finite element method (FEM) modeling software, Plaxis-2D. The strata of the road (base, sub-base, capping layer and sub-grade) are modeled using the Mohr-coulomb model, while the geogrid and bituminous layer is modeled as linearly elastic. Static load with contact pressure 550 kPa is used in the study. Surface deformation was selected as main criteria to study the benefit of geogrid in pavement. Surface deformation is found to be decreased by the inclusion of geogrid. Maximum reduction in the surface deformation is observed when geogrid is placed at the interface of subbase and capping layer in all pavement thicknesses. Surface deformation has reduced up to the maximum value by 13% in the thin pavement of thickness 790mm. Based on maximum reduction in surface reduction optimum location of geogrid reinforcement is observed at interface of subbase and capping layer. Inclusion of geogrid in pavement construction is found to have a significant improvement in pavement behavior, but its use is more pronounced in the case of thin pavement thickness. Also the effect of geogrid is more pronounced in case of overloading of vehicle.

## Keywords:

Geogrid, Surface deformation, Pavements, Optimum location, Finite element method

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# Seismic Behaviour of Buildings as per NBC 105:1994, NBC 105:2020 and IS 1893:2016

*Rajesh Banjara <sup>a</sup>, Deepak Thapa <sup>b</sup>, Tek Bahadur Katuwal <sup>c</sup>, Sailesh Adhikari <sup>d</sup>*

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## **Abstract:**

A comparative study is performed between different RC Buildings as per Nepalese (Nepal National Building Code, NBC) and Indian (Indian Standard, IS) previously existing and revised standards with consideration of several design compliances. NBC 105:1994 was revised to NBC 105:2020 and also IS 1893:2002 to IS 1893:2016 which are used for RC building in current study. This paper presents the analysis of low-rise RC building of three storey and staircase cover. For the analysis Various response parameters are used using linear and non-linear static and linear dynamic approaches. The result obtained from the NBC 105:2020 was greater than the other codal provisions based on dynamic properties (time period, response reduction factor, overstrength, ductility) and seismic response (drift, displacement & base shear). The value of Base shear is higher by 104%, 116% and 157% in NBC 105:2020 than the other codal provisions NBC 105:2020 SLS, IS 1893:2002 and NBC 105:1994. The performance verification overestimate the value of performance limit state due to the due to the adaptation of latest seismic index in the estimation of the seismic hazard in NBC 105:2020.

## **Keywords:**

Nepal National Building Code (NBC), Indian Standard (IS), Seismic Analysis, Ultimate Limit State (ULS), Serviceability Limit State (SLS)

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# Timeseries of Analysis of ERA Snow Water Equivalent over the Langtang Basin

*Udaya Acharya<sup>a</sup>, Dibas Shrestha<sup>b</sup>, Khem Narayan Poudyal<sup>c</sup>*

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## Abstract:

Snow melt is an important contributor to runoff in rivers originating from the Himalayas. Snow-cover dynamics in the Himalayas therefore influence the water availability in the downstream region. The knowledge of snow water equivalent (SWE) helps to understand the total available of water content from snow in a given basin. The lack of proper hydro-meteorological stations in the mountainous catchment makes it challenging to properly quantify the value of SWE. In this study, the use of European Center for Medium Range Weather Forecast reanalysis data is used to understand the change in the SWE and temperature in the Langtang basin, Nepal.

Firstly, the temperature of ERA grid 10 is compared with the temperature station at Kyanging, Langtang which lie within the ERA grid 10. The results were comparable and the differences in temperature was due to the discrepancy in the elevation consideration of ERA. The lapse rate calculation of ERA also was also found within the permissible limit. Secondly, the SWE data from ERA is validated with the Resolution Imaging Spectroradiometer (MODIS) 8-day maximum snow-cover extent. The ERA SWE provides a good representation of the seasonal and annual evolution of snow-cover. Lastly, the time series analysis of the SWE and temperature is done from 1981 until 2019. The timeseries analysis of ERA shows that the temperature of the Langtang catchment is increasing from 1981 until 2020 at 0.01 degree per year while the SWE is decreasing at 0.43mm per year.

## Keywords:

ERA, Langtang river basin, Snow water equivalent, Temperature

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# Performance of R.C. Frame Building with and without Shear Wall Based on Linear and Non-Linear Static Analysis

*Jyoti Shah<sup>a</sup>, Dinesh Kumar Gupta<sup>b</sup>, Sailesh Adhikari<sup>c</sup>*

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## Abstract:

Shear wall construction is practiced to oppose the consequences of the lateral forces. Seismic and wind forces are the foremost ordinary lateral loads particularly designed to hold in multistory buildings. This paper used five models of 5 story building with & without shear walls at various locations. The dimension of the building is 16.5m \* 16.5m. The building is sited in Nepal having soil type soft soil and features a role of commercial building. The goal of this research is to perform linear and non-linear static analysis. The linear static results of the story drift & story displacement for this study was within permissible limit concluding that introduction of shear walls are efficient structural means to decrease the value of story drift & displacement. Base shear increases with the inclusion of shear walls however it depends upon the position of shear walls. Similarly, the results for the non-linear static analysis was obtained that buildings with the introduction of shear walls are efficient in terms of ductility and strength as it is capable of reducing deflection at performance point. In X-direction, Model-2NL showed decrease by 28.36%, in Model-3NL by 35.10%, in Model-4NL by 32.49%, in Model-5NL by 36.90% as compared to Model-1NL (Bare Frame). Performance point for Model-1NL has the lowest Base Shear followed by Model-2NL, Model-4NL, Model-3NL, Model-5NL along X-direction. Model-3NL possesses the lowest number of plastic hinges till the last step.

## Keywords:

pushover analysis, plastic hinge, base shear, story drift, story displacement, performance point

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# Emergency Ventilation for Smoke Control in Head Race Tunnel at Solu Khola Dudh Koshi Hydro Power Project 86 Mw

*Amrit Bhattarai<sup>a</sup>, Prajwal Raj Shakya<sup>b</sup>*

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## Abstract:

This is a paper related to the tunnel fire which is caused due to misfire, excessive combustible gases, short circuit and other hazardous activities which takes place inside tunnel during construction of tunnel. In this paper, Solu Khola Dudh Koshi Hydro Electric Project (SKDKHEP) Head Race Tunnel size is reduced to 1:20 scale and fire scenario is created. In addition to this, comparative study is done by arranging ventilation fan at different place inside tunnel. By using Pyrosim, simulation is done and optimized solution is achieved. Also, fan load for overall tunnel ventilation is calculated. Also, Heat Release Rate (HRR) is plotted against time along with parametric study of Velocity and temperature profile during the fire evacuation.

## Keywords:

Critical Velocity, Computational Fluid Dynamics (CFD), Tunnel Ventilation, Heat Release Rate (HRR), Backlayering

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# Analysis of Bearing Capacity of Strip Foundation on Cohesive Soil with Soil Patch of Different Property

*Kushal Bijukchhe <sup>a</sup>, Santosh Kumar Yadav <sup>b</sup>*

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## Abstract:

Soil in its natural form is a non-homogeneous mass, with possibilities of consisting more than one layer and pockets of heterogeneity. The pocket of heterogeneity explicitly includes the existence of void or soil of contrasting properties of buried rock mass. This study deals with the determination of bearing capacity of surface strip foundation over cohesive soil with continuous square soil patch of different consistency than that of parent soil. The analysis is made using commercially available finite element software in which the soil is modeled using Mohr Coulomb elastic perfectly plastic material model. Plane strain triangular 15-noded discrete elements is used to model the soil domain. The parametric study includes the effect of vertical and horizontal position of square shaped soil patch with respect to foundation and consistency of patch soil on the bearing capacity of surface strip foundation. The result of the study indicates that there exists a critical zone of influence under the foundation. The performance of the foundation will be significantly influenced due to existence of the soil patch in the parent soil layer only when the it is located with in this region. The size of this zone of influence depends on various factors as soil property of the parent soil and soil patch and the size of the foundation and soil patch. When the soil patch is located within the critical zone, the bearing capacity of the foundation and the deformation behaviour of the soil varies significantly with the location of the soil patch.

## Keywords:

Soil patch, Parent Soil, Bearing Capacity, Strip Foundation, FEM

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