National Conference on Computer, Electrical, Electronics & Communication
(KHWOPA CEEL 2026)
24th February 2026, Bhaktapur, Nepal
NEWSLETTER

National Conference on Computer, Electrical, Electronics and Communication Commenced

On 24th February 2026, one day National Conference on Computer, Electrical, Electronics, and Communication (KHWOPA CEEL 2026), jointly organized by Khwopa Engineering College and Khwopa College of Engineering, formally commenced in college premises. Speaking at the opening session of the conference Mayor of Bhaktapur Municiplity, Sunil Prajapati, Chairman of College management committee, said that in the year 2082 alone, the colleges have already organized four conferences, including two international and two national conferences. He added that these efforts are helping to develop Bhaktapur as a venue for intellectual discussion and reflection.

Mayor Prajapati mentioned that the colleges

operated by the municipality are not only producing skilled engineers but are also preparing honest, disciplined, and passionate technical professionals. He stated that the conferences organized by these colleges on various subjects are elevating Bhaktapur's academic sector and gradually fulfilling the vision of making Bhaktapur a center of knowledge and science. He further informed that the municipality has allocated a budget to operate a research center in collaboration with the engineering college. He said the municipality has set a goal to establish Khwopa University as a model university for the entire country.

Stating that the Nepal Workers and Peasants Party (NWPP) has long advocated granting capable local governments the authority to operate universities, he expressed that the concept of Khwopa University was introduced with the aim of providing research-oriented education integrated with productive labor.

Mayor Prajapati emphasized that the main objective of the conference is to encourage students to work in a research-oriented manner, prepare competitive students in line with the times, and produce human resources capable of contributing to the world. He added that with the belief that colleges and universities should be centers of research, Bhaktapur Municipality has consistently prioritized research.

He expressed concern that shutdowns and strikes in academic institutions like universities negatively affect educational activities. He stressed that only in a peaceful environment in universities and colleges can students pursue their studies smoothly. He also noted the country is falling behind as young manpower continues to migrate abroad.

Deputy Mayor, Bhaktapur Municipality,

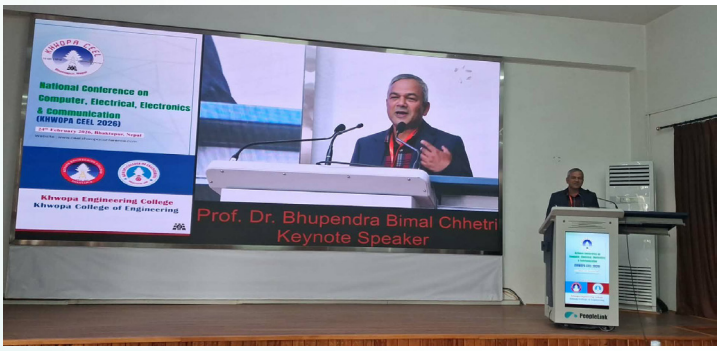
Rajani Joshi, Vice-chair person College management, committee highlighted the need for extensive discussion on the achievements of the conference and its research findings. She stated that the activities of the colleges are helping fulfill the municipality's objectives and that Bhaktapur Municipality is committed to intellectualizing society and making Bhaktapur the best city in the country.

At the program, Principals Sujan Maka of Khwopa Engineering College and Sunil Duwal of Khwopa College of Engineering expressed that the enthusiastic participation of students in the conferences organized by the colleges has further encouraged them. They added that the conference was student-centered and that efforts would be made to advance research in a more refined and systematic manner.

Keynote Address

IOT Technology And Trends

Prof. Bhupendra B. Chhetri



The keynote address by Prof. B. B. Chhetri at the conference provided a comprehensive overview of the rapidly evolving Internet of Things (IoT) ecosystem. The speaker began by clarifying foundational paradigms such as IoT, M2M, CPS, SCADA, and Web of Things, explaining how each contributes to modern connected infrastructures. He highlighted diverse applications ranging from logistics and asset tracking to environmental and industrial monitoring, emphasizing the importance of interoperability and scalable architectures.The talk further explored system selection criteria, connectivity technologies like Wi-Fi, LPWAN, LoRaWAN, cellular, and satellite IoT, and emerging trends including edge computing, AI integration, and Massive IoT. Key challenges such as device management, security, regulatory compliance, and global connectivity were critically discussed alongside enabling technologies like eSIM/iSIM and IoT communication protocols. The keynote speech concluded by stressing IoT's role as a catalyst for innovation and its responsibility to drive sustainable, secure, and inclusive technological progress.

Keynote Address

Value of Reliability in Investment Decisions - Energy Sector Focus

Prof. Dr. Rajesh Karki

Prof. Dr. Rajesh Karki presented on "Value of Reliability in Investment Decisions – Energy Sector Focus," emphasizing the economic rationale and societal importance of reliability-centered investment planning in modern power systems. The presentation aimed to demonstrate how optimal reliability levels should be determined through a balanced assessment of infrastructure investment costs and the economic consequences of power interruptions. The speaker began by establishing the intrinsic relationship between energy consumption and economic growth, highlighting both conventional drivers of load growth—such as population increase, industrialization, and household electrification—and emerging trends including AI-driven data center expansion, electric vehicle penetration, and electrified heating. These evolving demand patterns necessitate periodic investment in generation, transmission, and distribution infrastructure to sustain acceptable reliability standards.

A central concept discussed was value-based reliability investment, where total societal cost is defined as the sum of utility investment cost and customer interruption cost. The objective is to minimize this total cost to achieve economically optimal reliability. The presentation further addressed generation adequacy planning, reserve margin requirements, and probabilistic criteria such as LOLE standards adopted by regulatory bodies. Transmission expansion under N-1 contingency criteria and the increasing importance of ancillary service markets—including frequency control and spinning reserves—were also discussed. Reference was made to the Nepal–India interconnection upgrades, including the Dhalkebar–Muzaffarpur corridor, as a strategic milestone in reliability enhancement.

The keynote speech concluded by underscoring that systematic, economically justified reliability investment is essential for safeguarding societal welfare, supporting industrial growth, and enabling sustainable energy transition in developing and mature power systems alike.

Guest Speech

Resilient, Reliable, and Smart: The Evolving Role of Nepal Electricity Authority in Nepal's Energy Future

Er. Ramu Shrestha

The guest speaker Er. Ramu Shrestha presentation titled "Resilient, Reliable, and Smart: The Evolving Role of Nepal Electricity Authority in Nepal's Energy Future" detaling the NEA's institutional transformation and strategic roadmap. As a vertically integrated utility, the NEA manages generation, transmission, and distribution, showing significant growth in hydropower capacity and infrastructure. Key metrics revealed an expanding consumer base, increased electricity sales, and a progressive reduction in system losses, signaling improved operational efficiency.

A major focus was placed on cross-border electricity trade, specifically the 400 kV Dhalkebar–Muzaffarpur line, which facilitates seasonal energy exchange with India. This infrastructure is central to Nepal's transition toward managing energy surpluses. Furthermore, the NEA is pursuing a digital overhaul by implementing SCADA systems in control centers and deploying Smart Meters (AMI) to enhance grid reliability. Metrics like SAIFI and SAIDI are now used for data-driven management of peak loads and transformer monitoring.

The speech concluded by addressing critical future challenges, including seasonal imbalances, renewable energy integration, and the need for financial sustainability. Ultimately, the presentation underscored the NEA's shift toward a modernized, resilient power system designed to ensure long-term energy security and sustainability for Nepal.

Guest Speech

Electricity Grid Codes: Relevance for Electrical Engineers

Er. Saroj Koirala

The guest speaker Er. Saroj Koirala, Consultant in Electricity Regulation and Market Affairs, delivered a presentation titled "Electricity Grid Codes: Relevance for Electrical Engineers," focusing on the regulatory frameworks governing modern power systems in Nepal and South Asia. He defined a Grid Code as a legal document outlining technical rules and responsibilities for transmission system users and operators. Traditionally technical, modern codes now encompass financial aspects like billing and pricing. Mr. Koirala noted that liberalization and the rise of private generation have made these codes essential for ensuring reliable, coordinated grid functioning.

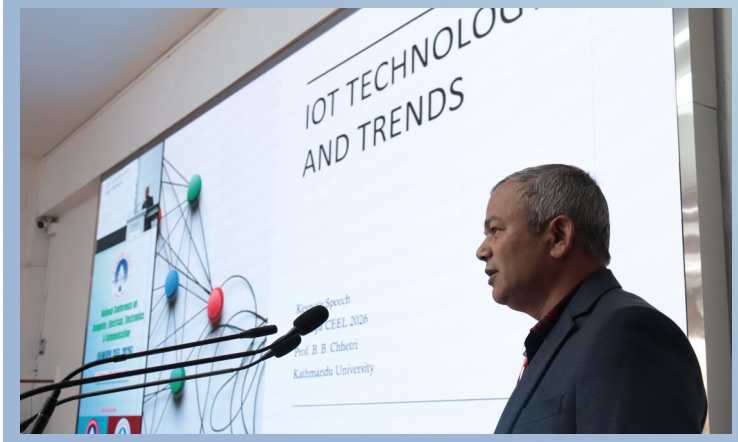
The presentation detailed the Nepal Electricity Grid Code (2023), covering planning, connection requirements, scheduling, and performance standards. It clarifies the roles of System Operators, Grid Owners, and Distributors to maintain efficiency. Furthermore, he introduced the Common Minimum Grid Code (CMGC) developed by SAFIR to harmonize standards for South Asian cross-border electricity trading.

In conclusion, Er. Koirala emphasized that for electrical engineers, grid code compliance is vital for the design and maintenance of power infrastructure. Mastery of these codes is crucial for integrating renewable energy and smart grids, ensuring regulatory adherence, and supporting sustainable regional energy transitions.

Academia and Industry Gap and Opportunities

Dr. Suresh Pokharel

The guest speaker, Dr. Suresh Pokharel highlighted the growing gap between academia and industry in Nepal's rapidly evolving IT sector, emphasizing the national vision of the "IT Decade" (2081–2091), which targets NPR 30 Kharba in IT exports and five lakh direct jobs. Despite producing over 10,000 IT graduates annually, industries face an "entry-level desert" due to graduates lacking deployment-ready and practical skills, particularly in areas such as AI, cloud computing, MLOps, and cybersecurity. He stressed that while universities focus mainly on theoretical foundations, industries demand professionals who can build, deploy, and manage real-world systems collaboratively and adapt to fast-changing technologies. The speaker underscored the importance of stronger collaboration among government, academia, and industry, along with research-oriented education, hands-on practice, internships, cloud deployment skills, and soft skills development. He concluded by encouraging students to strengthen fundamentals, embrace continuous learning, and become real-world problem solvers rather than mere degree holders.



Fallacy-Aware Argument Analysis and Improvement Using Structured Argumentation and Large Language Models

Presenter Jaydev Tripathi introduced an innovative fallacy-aware system designed to analyze and improve arguments by integrating logical fallacy detection, structured argumentation, and large language model reasoning. The study addressed the widespread presence of logical fallacies in everyday discussions and social media, which often weaken arguments and mislead audiences. Detected arguments were then structured using the Toulmin argument model to clearly represent claims, evidence, and warrants. Furthermore, the system utilized the Gemma 3 27B large language model in two adaptive modes: a support mode for improving arguments and a defense mode for critically challenging them. The integration of fallacy detection, Toulmin structuring, and dual-mode LLM reasoning significantly enhanced argument coherence and reduced fallacy prevalence. The work demonstrates strong potential for applications in education, debate coaching, AI-assisted writing, and critical reasoning support systems.

Jayadev Tripathi

Continuous Learning for Research Assistants: A QLoRA-based Multi-Agent Approach

Presenter Ashish Pandey introduced ScholarMind, a self-evolving research assistant designed to address the limitations of static large language models, which often become outdated as scientific knowledge rapidly advances. The study highlighted challenges such as catastrophic forgetting and high computational costs in existing continuous learning methods. ScholarMind adopts a novel multi-agent architecture combined with QLoRA-based low-rank adaptation and 4-bit quantization, enabling continuous model updates on consumer-grade hardware with only 12GB memory. A dual-memory architecture ensures knowledge retention by combining a persistent vector store with sequential parametric updates. Evaluated across 56 autonomous training cycles processing approximately 8,400 research papers, ScholarMind achieved a 72% relative improvement over static baselines. Ablation studies further demonstrated significant gains in data relevance and convergence stability. The framework presents a practical and decentralized solution for resource-constrained, continuously learning research assistants.

Ashish Panday

Nepali Grammatical Error Correction

Presenter Tuyal Shrestha addressed the challenges of developing Grammar Error Correction (GEC) systems for Nepali, a low-resource language lacking large annotated corpora and standardized benchmarks. To bridge this gap, the study constructed a large synthetic dataset of approximately one million parallel sentence pairs, incorporating both corrupted–correction pairs and identity pairs to promote conservative edits. The generated errors covered morphological, orthographic, structural, and semantic categories, created through rule-based techniques, large language models, and round-trip translation to ensure diversity and realism. Framing Nepali GEC as a sequence-to-sequence task, the researchers fine-tuned the multilingual transformer model mT5 using the AdamW optimizer on a Tesla P100 GPU. Evaluation with GLEU+ and token-level F0.5 metrics demonstrated strong performance, achieving a GLEU+ score of 83.55% and an F0.5 score of 0.58. The work establishes solid baseline results and paves the way for practical Nepali grammar-checking and educational applications.

Tuyal Shrestha

Bidirectional Nepali-English Neural Machine Translation Using Attention-Based Transformer

Nashim Dyola

Presenter Nashim Dyola discussed a bidirectional Neural Machine Translation (NMT) system designed to address the challenges of translating between Nepali and English, particularly in a low-resource context. The proposed approach utilizes the Transformer architecture with an attention mechanism to effectively capture semantic relationships and contextual dependencies. A large parallel corpus of approximately 1.8 million sentence pairs was employed for training, while subword tokenization methods such as SentencePiece and Byte Pair Encoding (BPE) were applied to mitigate data sparsity and vocabulary limitations. The model incorporated optimized hyperparameters and dynamic positional encoding to enhance generalization and computational efficiency, with greedy decoding used during inference. The findings establish a strong baseline and underscore the effectiveness of Transformer-based architectures for improving translation quality in low-resource language pairs.

Video Captioning in Nepali using Transformers

Sulav Sapkota

Presenter Sulav Shrestha introduced a transformer-based framework for Nepali video captioning, addressing the limitations of earlier LSTM and GRU-based approaches in capturing long-range temporal dependencies. The proposed system integrates TimeSformer as the video encoder to extract rich spatiotemporal features and mBART as a multilingual decoder to generate fluent and contextually accurate Nepali captions. Experiments were conducted on the MSVD dataset comprising 1,970 video clips, with a structured train, validation, and test split. The model was trained for approximately five epochs using the AdamW optimizer on a Kaggle P100 GPU. Evaluation results demonstrated notable improvements, achieving BLEU-4 of 29.39, ROUGE-L of 68.40, METEOR of 64.41, and a CIDEr score of 111.23, outperforming prior recurrent-based methods.

Towards Nepali-language LLMs: Efficient GPT Training with a Nepali BPE Tokenizer

Aadarsha Shrestha

Presenter Aadarsha Shrestha discussed the development of a Nepali-language large language model aimed at addressing the challenges of low-resource NLP for Nepali, a language characterized by complex grammar and agglutinative morphology. The study introduced a GPT-2–based model trained using strategies inspired by GPT-3, including optimized learning rate scheduling, batch scaling, and architectural refinements to enhance efficiency. A custom 16k Byte-Pair Encoding (BPE) tokenizer was developed exclusively on Nepali text to ensure improved segmentation and language-specific representation. Pretraining was conducted on a combined 10.75 GB cleaned NepBERTa corpus along with additional web-scraped Nepali news data, while FlashAttention was integrated to reduce memory consumption and stabilize training. After two epochs, the model achieved a training loss of 3.168177, a validation loss of 3.081982, and a perplexity of 21.80, demonstrating its capability to generate coherent Nepali news-style text and establishing a strong foundation for future Nepali LLM research.

Broken Rotor Bar Fault Detection in Induction Motor using Low Sampling Rate

Krishal Joshi

This presentation given by Krishal Joshi was focused on the detection of Broken Rotor Bar faults in an induction motor. The presenter emphasized the struggle of traditional methods when the sampling rate is low, resulting in poor resolution. To overcome this challenge, the study proposed Polyphase Finite Impulse Response upsampling and the Fast Fourier Transform to extract fault features. He demonstrated that rotor health can be precisely classified by the decibel (dB) difference between the fundamental frequency and sidebands; specifically, a 60 dB difference indicates a healthy state, while a value below 36 dB signifies a severe fault. The dB difference measured confirmed the healthy test and the faulty test. The presenter concluded that the method used is reliable even with limited data after the use of upsampling, making it practical in real-world industrial deployments.

Comparative Analysis of MPPT Algorithms and Hardware Implementation of a Solar DC System using an Optimized MPPT

Hardik Khadka

Presenter Hardik Khadka explored the optimization of solar powered DC system using advanced Maximum Power Point Tracking (MPPT) control. This study examined four MPPT algorithms by simulation using MATLAB/ Simulink, followed by implementation of the Incremental Conductance method on microcontrollers. The presenter highlights a successful demonstration of stable 12V regulation and efficient power tracking under varying real-world conditions. This study provides cost effective and stable solution specially targeting rural and off-grid applications in Nepal.

Stator Inter-turn Fault Detection of Induction Motor using FEM

Bibek Sharma Lamichhane

The presentation given by Bibek Sharma Lamichhane was focused on the detection of stator inter-turn short-circuit faults in three-phase induction motor using the Finite Element Method (FEM). Faults in stator winding are the leading cause of motor failure. Inter-turn shorts are critical as they remain undetected until catastrophic damage occurs. A systematic approach for early detection of inter-turn faults in an induction motor is done using the combination of FEM modeling and experimental validation. A 2D electromagnetic model of a 2.2 hp motor was modeled in ANSYS and validated with a physically rewound motor. The presenter highlights that the result indicates that the third harmonics were a key fault signature, increasing from -25.72 db to -17.24 db. The presenter concluded that, with experimental deviation under 8%, this FEM approach is reliable for industrial maintenance.

Design and Simulation of an Active Cell Balancing Using a Bidirectional DC-DC Converter for Enhanced Li-ion Battery Performance

Anil Mainali

The study presented by Anil Mainali focused on active cell balancing for series-connected Lithium-ion battery packs. The presenter emphasized that manufacturing variations and thermal gradients can cause state-of-charge(SoC) imbalances. Traditional passive balancing methods are inherently inefficient, often losing 20–25% of energy as heat, while many existing active methods are complicated and slow. To address such a problem, a bidirectional DC-DC converter is paired with a switch matrix, which allows direct energy transfer between specific cells using a single converter. The system is then modeled and validated using MATLAB/Simulink for different SoC conditions and load profiles to ensure reliable performance. Experimental results indicate a notable reduction in the time required for charge equalization and also increase the efficiency over passive systems. This research provides a practical, cost-effective solution for various high-power applications such as renewable energy.

Stepper Motor Based Dynamometer Testing Bench for Electric Motor Testing

Utsav Dhungana

This paper presented by Utsav Dhungana aims to design a low-cost compact dynamometer using a stepper motor as a controllable load. The presenter highlights the expensive and bulky nature of traditional dynamometers, even for small-scale applications. The presenter explained the use of a microcontroller-based system for real-time data collection and MATLAB/Simulink for system modeling and performance analysis. The proposed system successfully measured torque-speed and power curves and is specifically suited for educational labs and small-scale research.

Simulation Study of Optimal Eggbeater Antenna for LEO Satellite Ground Station

Susan Hyongoju

Mr. Susan Hyongoju commenced the presentation by introducing a simulation study related to the design and optimization of an eggbeater antenna operating at 137.5 MHz in the Very High Frequency (VHF) band. The antenna was designed for the reception of weather information and Low Rate Picture Transmission (LRPT) images from Low Earth Orbit (LEO) satellites. He stated that the design and analysis of the antenna were performed using Antenna Magus and CST Studio Suite, which allowed for a detailed electromagnetic analysis. Two types of reflectors, namely radial and square plate, were compared to analyze the effect of the reflectors on the radiation patterns and efficiency of the antenna. He stated that the application of advanced simulation tools greatly improves the optimization of traditional antenna designs, which enables amateur as well as professional ground stations to obtain better signal integrity and near-optimal satellite reception performance.

Comparative Performance Evaluation of Machine Learning Algorithms for Power System Fault Classification

Simran Bhujel

This presentation given by Simran Bhujel was focused on the evaluation of machine learning algorithms for fault classification within power transmission systems. The conventional method struggles to characterize the non-linear and non-stationary signal. To address such challenges, this study proposes a data-driven approach using Discrete Wavelet Transform for feature extraction combined with Machine Learning algorithms. The methodology involved simulating different faults in the standard IEEE 9-bus system by varying fault resistance from 1ohm to 5 ohms. By using the Daubechies 4 wavelet, the research captured transient features of the current signal to train supervised models, including Support Vector Machine, decision tree (DT), and K-Nearest Neighbor. The presenter concludes that the comparative evaluation reveals that the DT classifier achieved the highest accuracy of 91.56%.

Design and Implementation of a Customized Door Lock System for Local Needs

Ojesh Manandhar

Mr. Ojesh Manandhar initiated the presentation by introducing a customized IoT door lock system that he designed to overcome accessibility issues in multi-story residential buildings. The proposed system enables residents, especially senior citizens, to unlock the ground floor doors from the higher floors of the building remotely. The system was developed after conducting a survey among the local community to ensure that the proposed solution meets the local requirements. Mr. Manandhar concluded that the proposed system is an affordable and user-friendly smart security solution that meets the local requirements and improves accessibility in residential environments.

AGROBOT – Smart Plant Monitoring via ML Vision and CNC Automation

Rojish Twati

Mr. Rojish Twati commenced his presentation by introducing AGROBOT, an automated indoor plant monitoring and care system that combines CNC automation, IoT sensing, and machine learning algorithms. The system consists of a three-axis CNC system that uses NEMA 17 stepper motors, while the control is done by a Raspberry Pi and Arduino microcontroller using GRBL firmware. For real-time monitoring, the system uses soil moisture sensors, LDRs, and a camera module for data acquisition. Although the system is currently capable of binary health classification, he assured that it has the ability to reduce human intervention and that it can be scaled up for more advanced precision agriculture applications.

Design and Deployment of a Low Cost, High Sampling Ground Sensor Terminal for Disaster Risk Reduction

Sajan Duwal

Mr. Sajan Duwal initiated the presentation by introducing the need for continuous and accurate environmental information in disaster-susceptible areas. He introduced the design and implementation of a low-cost Ground Sensor Terminal (GST) developed to offer high-frequency digital data with enhanced reliability. The system is capable of multi-mode operation and has UHF digipeater communication, which facilitates smooth data transfer between sensor nodes, ground stations, and Low Earth Orbit (LEO) satellites over long ranges. He concluded that the system provides a scalable and feasible solution for disaster risk reduction, climate observation, agricultural observation, and long-term environmental observation.

Design of Seismic Monitoring System

Rajani Shrestha

Ms. Rajani Shrestha initiated her presentation by highlighting the need for efficient seismic data acquisition in areas where there is a lack of monitoring networks. She proposed a low-cost seismic monitoring system using MEMS accelerometers such as ADXL345 and MPU6050, along with Raspberry Pi and LoRa communication technology for remote data transfer. She explained the calibration process using a controlled shake table and also provided results of comparative analysis, where the MPU6050 sensor showed better correlation results. The proposed system is scalable, economical, and feasible for improving seismic monitoring, disaster preparedness, and geological studies in areas with limited resources.

KeyShard: Distributed Password Management System

Sachit Neupane

Presenter Sachit Neupane introduced KeyShard, a decentralized password management system designed to overcome the critical vulnerabilities of traditional centralized password managers. Emphasizing the risks of single points of failure and large-scale credential breaches, the study proposed a distributed architecture where encrypted password shards are stored across Dockerized BoltDB nodes. The system further integrates Ed25519 digital signatures to secure inter-node communication and employs an XGBoost-based password strength analyzer trained on 440,000 samples, achieving a macro-average accuracy of 80.42%. Through cryptographic key separation using HKDF and a robust threat model assuming untrusted servers, KeyShard ensures enhanced fault isolation, high availability, and significantly improved resistance against weak password selection, offering a scalable and enterprise-ready solution for secure credential management.

Multiple Disease Prediction System: Medipredict

Sumika Rai

Presenter Sumika Rai introduced Medipredict, a web-based healthcare application designed for early medical screening through the prediction of diabetes, heart disease, and Parkinson's disease using machine learning techniques. Unlike conventional single-disease systems, the platform integrates multiple prediction models within a unified three-tier architecture comprising presentation, application, and model layers. The models were trained on benchmark datasets from the UCI Machine Learning Repository and Kaggle, achieving accuracy rates above 90%, supported by strong precision, recall, ROC–AUC scores, and confusion matrix evaluations. Comparative results showed Random Forest outperforming Logistic Regression and SVM. While currently limited to three diseases and public datasets, the system demonstrates strong potential for expansion through deep learning integration and mobile-based deployment.

GAN-Based Comparative Study for High-Fidelity Celebrity Image Denoising

NIschal Mainali

Presenter Nischal Neupane delivered a detailed comparative study on GAN-based techniques for enhancing the quality of celebrity images affected by noise during acquisition, compression, and transmission. The research evaluated multiple generative models, including CGAN, SRGAN, ESRGAN, and a newly proposed Denoising GAN framework. The proposed model combines adversarial learning with perceptual loss and structural similarity constraints to effectively remove complex noise while preserving identity-specific facial features. Performance was assessed using PSNR, SSIM, MS-SSIM, and LPIPS metrics. Experimental findings revealed that the proposed Denoising GAN outperformed existing approaches, achieving approximately 32 PSNR, 0.90 SSIM, and 0.98 MS-SSIM, alongside the lowest LPIPS score of 0.05, reflecting superior perceptual quality and structural preservation.

Deep Learning Based Music Source Separation For Newari Traditional Instruments

Sushant Twayana

Mr. Sushant Twayana highlighted an innovative application of deep learning for preserving and analyzing Newari traditional music, focusing on instruments such as the bansuri, dhimay, and lala khin. Addressing the scarcity of computational tools for culturally specific audio processing, the study proposed a music source separation system tailored to Newari classical compositions. The approach processes 44.1 kHz recordings using Short-Time Fourier Transform to generate spectrogram inputs for neural network models. A customized dataset comprising recordings of local instruments and vocals was developed using both coherent and incoherent mixing strategies for robust training and evaluation. Various architectures, including U-Net frameworks and generative adversarial networks, were comparatively analyzed to identify the most effective method for handling spectral overlap and preserving intrinsic timbral qualities. Performance was evaluated through source-to-distortion ratio, signal-to-noise ratio, and qualitative assessments by Newari musicians, ensuring perceptual authenticity. The study establishes foundational tools for digital archiving, restoration, transcription, and cultural preservation of endangered musical traditions.

MetaLoRA: Establishing Reproducible Standards for Dynamic Rank Allocation in Parameter-Efficient Fine-Tuning

Ashish Panday

Presenter Ashish Pandey introduced MetaLoRA, a rigorous framework designed to establish reproducible standards for dynamic rank allocation in parameter-efficient fine-tuning methods such as LoRA. Addressing the limitations of heuristic-based approaches, the study proposed a mathematically grounded optimization strategy using Lagrangian multipliers and binary search to ensure strict compliance with predefined memory constraints. The framework follows a three-phase methodology: gradient-based importance estimation validated across five random seeds and over 317,000 samples, constrained optimization for guaranteed memory allocation, and extensive calibration across 4,400 configurations achieving sub-1% prediction error. By publicly releasing code, datasets, and protocols, the study promotes transparency, reproducibility, and reliable deployment of dynamic fine-tuning strategies in resource-constrained and production environments.

Behavioral Anomaly Detection in Blockchain Voting System

Isha Bhattarai

Presenter Isha Bhattrai explored an innovative framework that enhances blockchain-based voting systems by integrating behavioral anomaly detection alongside cryptographic security. While traditional blockchain voting emphasizes transparency and tamper resistance, this study addressed the overlooked risk of coordinated manipulation through behavioral patterns. Implemented on a private Ethereum network using the Geth client and Clique Proof of Authority consensus, the system models voting behavior through transaction-derived features such as timing patterns, inter-vote intervals, and participation deviations. An unsupervised Isolation Forest algorithm was employed to detect suspicious activities without requiring labeled datasets. Experimental evaluation under simulated normal and adversarial scenarios demonstrated strong performance, achieving a precision of 0.837, recall of 0.673, F1-score of 0.746, and an AUC-ROC of 0.936, while maintaining high specificity and minimal impact on transaction throughput. The findings highlight the effectiveness of combining machine learning–based behavioral monitoring with blockchain infrastructure to strengthen election security and system resilience.

State of Charge Estimation of Lithium-Ion Batteries using Extended Kalman Filter

Shubhanga Aryal

The presentation given by Shubhabga Aryal was specifically on State of Charge (SoC) estimation of lithium-ion batteries using an Extended Kalman Filter (EKF). Author mentioned that traditional methods like Coulomb Counting are prone to errors, which leads to a loss of accuracy. This study compares first-order (1RC) and second-order (2RC) equivalent circuit models data by implementing EKF using Hybrid Pulse Power Characterization. The (2RC-EKF) model was more effective at capturing electrochemical behaviors. The presenter also emphasized that, with the use of the 2RC-EKF model, the SoC error is reduced to 2.52%, which was validated through hardware circuits, making it more accurate and ideal for modern battery management systems.

Modeling and Hardware Implementation of a Temperature Control System

Nuna Khanal

The presentation given by Nuna Khanal was focused on precision temperature regulation using a Proportional-Integral (PI) controller. Standard On/Off control methods are inefficient as they can cause temperature overshoot, slow responses, and unnecessary energy losses. In this study, the thermal behavior of the room was treated as a first-order dynamic system and modeled in MATLAB/Simulink. The simulation was validated through a hardware implementation featuring an incandescent light as a heating element, an Arduino microcontroller, a DHT22 digital temperature sensor, and a solid-state relay to regulate the power. Simulation indicate settling time of approximately 12 seconds with an overshoot of 8%, the hardware system maintains the temperature within a tight deadband of ±1°C, which almost matches the simulation. The presenter concluded that, by using low-cost Arduino hardware with simulation-based tuning, we can achieve industrial-grade precision.

Islanding Detection in a Grid-Tied Photovoltaic (PV) System for Renewable Energy Sources

Anamika Karna

Presenter Anamika KArna focused on the implementation of a passive islanding detection technique for grid-tied photovoltaic systems. Unintentional islanding in which the local loads remain powered even after a grid disconnection, can cause severe safety hazards, power quality degradation, and equipment damage. To address these problems, this study implements a passive detection technique based on the Rate of Change of Frequency (ROCOF). This methodology utilizes the zero-crossing detection to monitor the system frequency at the point of common coupling. An Arduino controller with a ZMPT101B voltage sensor and a relay trip circuit is utilized to disconnect the system upon detection. The system is then validated through MATLAB/Simulink and prototype testing; the system identifies islanding events when ROCOF exceeds 800ms. This design maintains a balance between high speed detection and noise immunity, preventing false tripping.

Modeling and Design of a PV-BESS-Based Standalone DC Microgrid for EV Charging Applications

Rohit Shrestha

Mr. Rohit Shrestha stressed the lack of EV charging infrastructure in remote or grid-limited areas. This study integrates Photovoltaic generation, a Battery Energy Storage System, and EV loads connected via a common DC bus. The presenter mentioned the system performance evaluation using MATLAB to model the dynamic interaction between renewable generation and EV load. The findings demonstrated a highly stable bus voltage with minimal error within a 0.375% error margin. Also, the battery performance validates reliable Battery State of Charge management and a constant charging current for EV batteries. The author emphasized that the system provided a reliable, decentralized alternative to traditional grid-connected charging stations.

Design and Implementation of an Adaptive LCL Filter for Harmonic Mitigation in a 500 W Standalone Single-Phase Inverter

Gaurav Sah

Mr. Gaurav Sah addressed the performance degradation of fixed-parameter filters by proposing an adaptive LCL filter design for standalone inverters. Arduino based system was used to monitor load current and variations, and a relay-based mechanism was used to select specific inductor-capacitor combinations for low, medium, and high load cases. The experimental findings demonstrated that the proposed adaptive LCL filter significantly outperformed conventional fixed-parameter designs by reducing Total Harmonic Distortion across a broad spectrum of load conditions. This research provides a practical, cost-effective solution for improving power quality in off grid system where load profiles are inherently unpredictable.

Visualization and Electrical Analytics of Kathmandu University using Smart Meters

Sadit Rasaili

The talk given by Sadit Rasaili focused on the Real-time smart meter analytics for Kathmandu University. Traditional analog meters only show cumulative data, which makes it difficult to analyze load fluctuations or voltage stability. This project utilizes IoT-based integration with the Iammeter Smart Meter API via JWT authentication. The system features a backend architecture built on FastAPI and PostgreSQL for low-latency data management, which is seamlessly integrated with a React-based dashboard for real-time visualization of electrical parameters. A Random forest-based module was developed that predicts short-term energy demand and peak loads. This innovative approach allowed the administrators to optimize distribution with precise load monitoring.

Soft Body Dynamics Using Mass-Spring and Internal Pressure Model

Aayush Twayana

Mr. Aayush Twayana delivered the presentation by introducing a soft body dynamics model designed for computer graphics simulation. The model uses a mass-spring system with internal pressure forces to improve deformation simulation. He explained that the simulation applies forces to connected vertices of a mesh, taking into account gravity, spring, and damping forces. The simulation uses Newton's Second Law of Motion to determine the vertices' motion. The addition of the internal pressure force helps to maintain the volume and stability of the structure during deformation. The simulation balances realism and efficiency, making it ideal for real-time graphics simulation. He concluded that the simulation provides an effective means of simulating soft body dynamics in animation and simulation software.

Automatic Plastic Bottle Sorting with Robotic Arm

Subarna Poudel

Mr. Subarna Poudel commenced his presentation by highlighting the increasing plastic waste problem in the world and the remarkably low rate of recycling in the world. He presented a low-cost automated plastic bottle sorting system that combines a Raspberry Pi and a 6-DOF 3D-printed robotic arm for real-time plastic bottle detection and sorting. The detection system is driven by an SSD MobileNet v2 model that is trained on a local dataset, achieving a mean Average Precision (mAP) of 81.08%. A hierarchical control system allows for synchronized image processing and servo motor control, ensuring seamless system functionality. The system was tested for its effectiveness, and it showed a 92% success rate in sorting plastic bottles in 250 trials. Although the system has a moderate processing rate, he highlighted the system's applicability and usefulness in contributing to sustainable plastic waste management through the provision of affordable robotic solutions.

Real-Time Hand Gesture Interface for PC Control Using Computer Vision

Gyan Hari Dahal

Mr. Gyan Hari Dahal initiated his presentation by introducing a real-time hand gesture recognition system developed for the purpose of implementing touchless human-computer interaction. He described how the system utilizes MediaPipe for precise hand landmark detection and a hybrid deep learning model that combines CNN, Bidirectional LSTM, and attention models for efficient gesture classification. The trained model showed excellent performance, with 98.76% accuracy and the ability to maintain real-time processing rates of 10-15 frames per second on conventional hardware. Performance analysis showed that the system is capable of efficient gesture classification with negligible errors. He concluded that the proposed system is a robust, efficient, and viable solution for implementing gesture-controlled PC operations.

Text-to-MIDI Generation Conditioned on Lyric-Derived Emotion

Anjan Baral

Mr. Anjan Baral commenced his presentation by highlighting an emotion-sensing text-to-MIDI generation system that conditions symbolic music generation on lyric-derived emotional information. The proposed system matches song lyrics with MIDI files and encodes musical sequences in the REMI+ format for structured event modeling. To overcome the exposure bias problem and improve global coherence, the system combines negative log-likelihood training with adversarial fine-tuning via Transformer-GANs. The experimental results showed competitive NLL scores and 71% accuracy on emotion classification for the generated samples, suggesting better emotional coherence and musical realism. He concluded that the addition of lyric-conditioning makes the controllability and expressiveness of symbolic music generation systems much stronger.

An Indoor Autonomous Robot Using Robot Operating System

Pranisha Shrestha

Ms. Pranisha Shrestha initiated her presentation by introducing the concept of an indoor autonomous robot developed using the Robot Operating System (ROS). The proposed system includes the integration of an RPLiDAR sensor to facilitate real-time environment mapping and obstacle detection. Additionally, Raspberry Pi is used as the main processing unit to ensure efficiency and cost-effectiveness. Before actual implementation, the system was simulated and tested using ROS tools such as RViz and Gazebo to analyze navigation capabilities. The experimental outcome showed the autonomous system's ability to move and adapt to indoor environments. She concluded that the developed system enhances efficiency and offers a flexible solution for indoor autonomous robotic systems.

SmartWheels RL – Autonomous Vehicle Training in Unity

Anish Kaiti

Mr. Anish Kaiti initiated his presentation by highlighting an autonomous vehicle development framework that was designed using deep reinforcement learning in the Unity simulation environment. The autonomous vehicle development framework was presented as a sequential decision-making problem, where the agent was trained using Proximal Policy Optimization (PPO) to execute lane following, obstacle avoidance, and smooth navigation. The simulation environment enabled the agent to be tested in a controlled manner for various traffic and obstacle conditions without posing any risk to the real-world environment. The experimental results showed consistent and stable vehicle driving in the simulated environment. He concluded that reinforcement learning in simulation environments such as Unity provides a safe, scalable, and efficient method for the development and testing of autonomous vehicle systems.

Ransomware Detection in Encrypted Network Traffic Using Machine Learning

Gobinda Bista

Poster presenter Gobinda Bista addressed the growing threat of ransomware attacks, particularly emphasizing the challenges of detecting malicious activities within encrypted network traffic where payload inspection is not feasible. The study proposed a flow-based machine learning framework that relies on network flow features rather than packet contents. To generate the dataset, ransomware samples were executed in a controlled environment using Cuckoo Sandbox, and the resulting traffic was combined with benign web browsing data. Flow-level features were extracted from Zeek conn.log files and converted into CSV format for detailed feature analysis. The research implemented and evaluated supervised machine learning models, including Decision Tree, Random Forest, and XGBoost. The experimental results demonstrated outstanding detection performance, with Random Forest achieving the highest accuracy of 99.76%, followed closely by XGBoost and Decision Tree. The findings highlight that flow-based machine learning offers an effective, scalable, and payload-independent approach for ransomware detection in modern encrypted network environments.

Shruti: Audio-Visual Speech Recognition in Nepali Language

Sahil Duwal

The Poster presenter Sahil Duwal introduced Shruti, a novel framework developed to advance Nepali-language speech recognition through audio-visual integration. Addressing the scarcity of multimodal resources in low-resource languages, the system combines lip movement analysis with audio signals to transcribe arbitrary Devanagari words using a character-level architecture. The visual stream employs a 3D ResNet-18 frontend with a Conformer encoder for temporal modeling and a Transformer decoder trained using a joint CTC-attention objective. In parallel, the audio branch utilizes a fine-tuned Wav2Vec2.0 model to extract rich speech features. Both modalities are temporally aligned and fused into a 1536-dimensional feature vector, which is processed by a two-layer unidirectional LSTM for final transcription. To support the framework, the team curated a unique dataset comprising over 50 speakers with more than six hours of visual speech data and four hours of audio speech data. Despite challenges such as limited public datasets and environmental sensitivity, the audio model achieved a Character Error Rate (CER) of 0.15, while the fused AVSR system recorded a CER of 0.49. The study establishes an important baseline for Nepali multimodal speech recognition and highlights its potential applications in assistive technology, security systems, and inclusive digital communication.

Nepali Sign Language Detection

Sumira Khatiwoda

The Poster presenter Sumira Khatiwoda introduced an innovative real-time hand gesture recognition system designed for Nepali Sign Language (NSL), addressing the significant lack of dedicated datasets and automated recognition tools in this domain. To overcome this gap, the research team independently developed a custom NSL dataset, collecting approximately 300 images per alphabet using Python-based hand-tracking modules for image capture and annotation. The proposed system utilizes a ResNet50-based convolutional neural network, pre-trained on ImageNet and fine-tuned with custom classification layers, to recognize 20 commonly used NSL alphabets. Data augmentation techniques such as rotation, flipping, brightness adjustment, and zooming were applied to enhance model robustness and minimize overfitting.The complete recognition pipeline includes video capture, hand preprocessing, feature extraction, gesture classification, and real-time output generation. Experimental results demonstrate that the ResNet50 model significantly outperformed a baseline CNN in terms of accuracy, precision, and recall, with performance validated through confusion matrix analysis. Field testing at the Central Secondary School for the Deaf ensured practical applicability. Although currently limited to 20 alphabets and sensitive to lighting and background variations, the study outlines future plans for full alphabet coverage, sentence-level recognition, and mobile deployment to improve accessibility.

AI-Based Virtual Try-On System

Pragun Bhandari

Poster presenter Pragun Bhandari introduced an optimized virtual fashion try-on system aimed at enhancing user experience in online retail. Addressing the limitations of traditional e-commerce in visualizing garment fit and appearance, the study leverages the VITON-HD framework to generate high-resolution (1024×768) realistic try-on images. The system integrates computer vision and deep learning techniques, utilizing key components such as SegGenerator for human parsing, a Geometric Matching Module (GMM) for garment warping, and a fine-tuned ALIAS generator for final image synthesis. Trained on 13,679 image pairs from the VITON-HD dataset over 16 epochs using an NVIDIA RTX 2080 GPU, the model employed optimization strategies like mixed precision and gradient accumulation. The results demonstrated significant improvements, including a 27.04% reduction in total loss and enhanced pixel-level and perceptual accuracy, validating its effectiveness in producing realistic virtual try-on experiences.

Gender-Aware AI Decision Support System for Safer Clinical Diagnosis

Jenisha Shrestha

Presenters Jenisha Shrestha introduced DiagHer, a gender-aware clinical decision support system designed to address diagnostic bias and improve medication safety. Highlighting the often-overlooked gender-specific variations in symptoms and drug responses, the study aims to enhance equity and safety in healthcare delivery. The system was developed using a self-curated dataset of approximately 1,200 structured records covering major disease categories, with balanced gender representation and thorough preprocessing. Logistic regression and decision tree classifiers, evaluated using an 80:20 train–test split, achieved an accuracy of 89.3%, with notable improvements in identifying gender-specific medication risks. The presenters emphasized its potential application in primary healthcare and telemedicine to reduce adverse drug effects and promote equitable clinical decision-making.

Weather Forecasting Utilizing Quantum and Conventional Neural Networks

Bijay Kadariya

Mr. Bijay Kadariya presenters explored an advanced weather forecasting framework integrating conventional deep learning and quantum-enhanced models. Addressing the limitations of traditional statistical approaches like AR and ARIMA in capturing nonlinear temporal patterns, the study proposed a Multiple Input Multiple Output (MIMO) architecture using LSTM and hybrid Quantum LSTM (QLSTM) networks. The system simultaneously predicts temperature, humidity, wind speed, and atmospheric pressure over a seven-day horizon. Hyperparameters were optimized through systematic grid search, and performance was evaluated using Mean Absolute Error (MAE). The best LSTM model achieved an MAE of 0.063579, while the QLSTM outperformed it with a lower MAE of 0.055776. Notably, the QLSTM required fewer recurrent layers, demonstrating the efficiency of quantum-enhanced feature representation. The findings highlight the promising potential of hybrid quantum–classical neural networks for improving time-series weather prediction accuracy.

Image Colorization using GAN

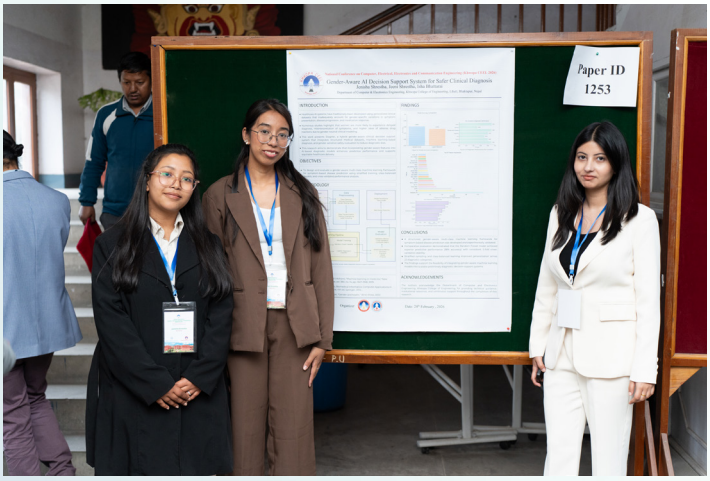
Shreejan Kisee

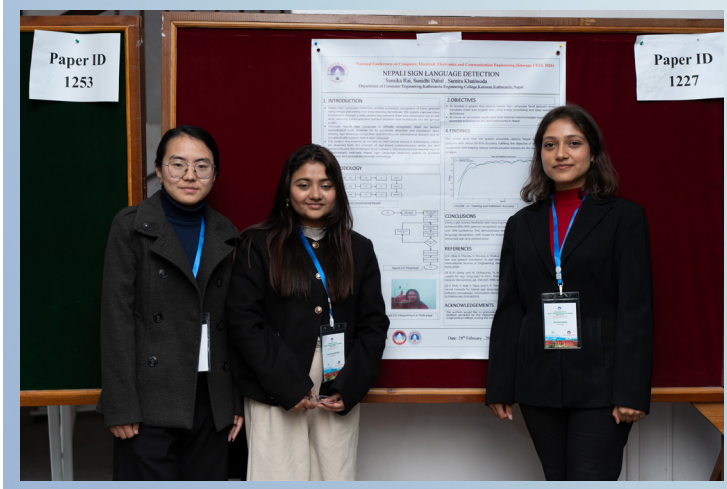
The presenters Mr. Shreejan Kisee introduced a GAN-based approach for automatic colorization of vintage black-and-white photographs of Nepal, addressing the challenges of restoring culturally significant archival imagery. A custom dataset of Nepali historical images was curated to incorporate region-specific clothing, textures, and environmental details often absent in existing benchmarks. The model operates in the CIELAB color space, separating luminance from chrominance, and utilizes a combination of adversarial and reconstruction losses to ensure both perceptual realism and color accuracy. Performance evaluation demonstrated strong results, achieving a PSNR of 22.16 dB and an SSIM of 0.9314, indicating effective structural preservation. Additional metrics, including LPIPS (0.1934), FID (79.93), and a low Delta E value (0.1396), further confirmed high perceptual quality and chromatic precision. The study highlights the effectiveness of culturally contextualized GAN training for realistic historical image restoration.

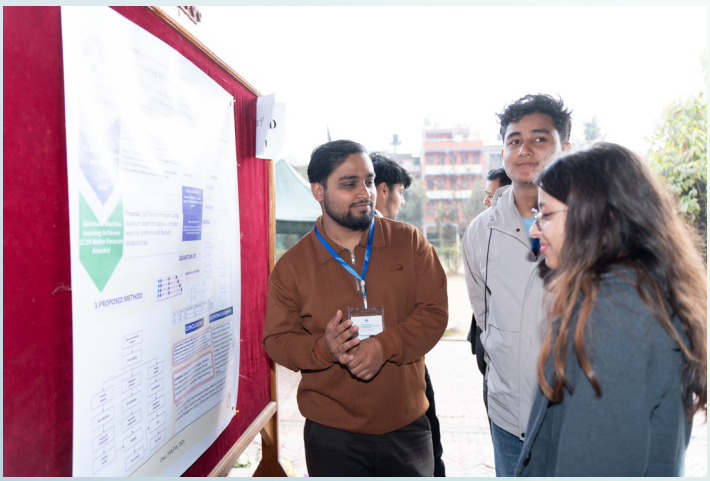
Nepali Speech Recognition and Text Summarization

Suprishma Maharjan

The poster presenter Suprishma Maharjan introduced an integrated system for Nepali Automatic Speech Recognition (ASR) and text summarization, aiming to enhance accessibility for low-resource language processing. The ASR model was developed by fine-tuning OpenAI's Whisper on the Common Voice 16.0 Nepali dataset, comprising 681 audio samples. Through optimized training strategies, including gradient checkpointing and token suppression, the model achieved stable convergence within 1,000 steps. The training loss reduced significantly from 1.6849 to 0.0002, and Word Error Rate (WER) improved from 0.71 to 0.68, demonstrating efficient and production-ready performance. For text summarization, mBART-large-50 was fine-tuned with LoRA applied to attention layers to reduce trainable parameters. After three epochs, the model achieved a training loss of 1.339 with measurable ROUGE scores. The study contributes to advancing Nepali language AI applications in speech processing and automated summarization.







Best Paper/Poster of Conference	Presenter
Design of Seismic Monitoring System	*Abina Makaju*
	Rajani Shrestha
	Rojishma Laghu
	Shriya Chakatu
Comparative Performance Evaluation Of Machine Learning Algorithms For Power System Fault Classification	*Simran Bhujel*
	Archisha Singh
	Puskar Pudasaini
	Utsav Khatiwada
	Shristi Sharma
Deep Learning Based Music Source Separation For Newari Traditional Instruments	*Poojan Koju*
	Anish Shilpakar
	Sumina Awa
	Sushant Twayana
	Romik Gosai
Gender-Aware AI Decision Support System For Safer Clinical Diagnosis(Poster)	*Isha Bhattarai*
	Jeeni Shrestha
	Jenisha Shrestha

National Conference on Computer, Electrical, Electronics and Communication Conculded Successfully

In the closing session of KHWOPA CEEL 2026, distinguished dignitaries and organizing members, delivered their remarks reflecting on the achievements and success of the conference.

Dr. Ramesh Marikhu, representative Session Chair and dignitary of the conference, expressed his honor in closely observing and evaluating the innovative student projects presented during the Electronics Session. He appreciated the creativity, effort, and technical knowledge demonstrated by the participants. Emphasizing continuous improvement, he encouraged students to refine their projects further and strengthen both theoretical understanding and practical application. He also highlighted the importance of applying projects to solve local real-world problems and urged researchers to elevate their work to international standards through quality publications. He conveyed appreciation to Khwopa Engineering College and Khwopa College of Engineering for successfully organizing the conference in the fields of IoT, Artificial Intelligence, and Robotics.

Delivering the Vote of Thanks, Dr. Sarbagya Bajracharya, Coordinator of KHWOPA CEEL 2026 and the Research and Innovation Unit, acknowledged the collective effort behind the event's success. He reported that 46 abstracts were received (26 Computer, 12 Electrical, and 8 Electronics and Communication), with a total participation of 351 attendees. He also noted that several papers received appreciation for potential collaboration and journal publication. He extended gratitude to the leadership, speakers, session chairs, delegates, volunteers, and organizing teams, and concluded with an apology for any unintended harshness during the demanding coordination process.

Er. Sunil Duwal, Principal of Khwopa College of Engineering, and Er. Sujan Maka, Principal of Khwopa Engineering College, both expressed heartfelt appreciation to the organizing committees, technical teams, volunteers, and participants. They highlighted the importance of conferences in promoting research culture, student participation, academic collaboration, and institutional development. The conference was formally closed with gratitude to all contributors who made KHWOPA CEEL 2026 a success.


SESSION CHAIR


DELEGATES


(KHWOPA CEEL 2026)


National Conference on Computer, Electrical, Electronics & Communication


(KHWOPA CEEL 2026)
24th February 2026, Bhaktapur, Nepal
CLOSING SESSION


CLOSING SESSION


National Conference on Computer, Electrical, Electronics & Communication