Prashant Raj Bista

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Research Interests: Deep learning for wireless physical-layer systems — semantic communication, joint source-channel coding, and channel estimation

Education

Tribhuvan University, IOE, Thapathali Campus *Apr 2021 – Apr 2025*
B.E. – Electronics, Information and Communication Engineering *First Division*
AI Fellowship 2024 | *Fusemachines Nepal* | Certificate *Apr 2024 – Oct 2024*

Relevant Coursework: Communication System, Wireless Communication, Digital Signal Processing, Antenna and Propagation, RF and Microwave Engineering, Electromagnetics, Filter Design, Probability and Statistics, Control System, Engineering Mathematics I–III

Research Experience

DeepSC-S: Semantic Communication for Speech (reproduction) | *PyTorch, Weights & Biases* *Documentation* | *Weights*

- Reproduced DeepSC-S (arXiv:2012.05369): neural speech transceiver trained end-to-end over AWGN, Rayleigh, and Rician channels
- Trained on Edinburgh DataShare speech with random SNR 0–20 dB; reached 7.5–10.5 dB SDR on AWGN with under 1 dB matched-vs-mismatched channel gap at 20 dB
- Documented every underspecified design choice against the authors' reference implementation; published checkpoints and a five-stage staged write-up

ADJSCC: Wireless Image Transmission (reproduction) | *PyTorch, CIFAR-10* *Documentation* | *Weights*

- Reproduced "Wireless Image Transmission Using Deep Source Channel Coding With Attention Modules" (arXiv:2012.00533)
- Confirmed the paper's central claim: SNR-conditioned attention lets a single model track the upper envelope of fixed-SNR baselines (33.12 dB PSNR at 10 dB vs 29.57/31.66 dB)
- Released weights, evaluation CSVs, and an interactive result viewer with a paper-vs-reproduction deviation table

OFDM Channel Estimation with Deep Learning | *PyTorch, MLP/CNN/Transformer* *Documentation*

- Benchmarked LS/LMMSE classical baselines against MLP, CNN, and Transformer channel estimators for OFDM systems
- Built LMMSE+NN residual hybrid estimators robust to channel covariance mismatch

Nepali-to-English Speech Translation with Prosody Preservation | *wav2vec 2.0, mBART, F5-TTS* *Github* | *Thesis*

- Undergraduate thesis, supervised by Er. Kshetraphal Bohara: end-to-end speech-to-speech pipeline translating Nepali audio to English while preserving tone, stress, and rhythm
- Fine-tuned wav2vec 2.0 for Nepali ASR and mBART for translation; achieved WER 0.41 and SacreBLEU 38.84

Research Trainee *May 2025 – Aug 2025*
Nepal Research and Collaboration Center (NRCC) *Review Paper*

- Trained in research methodology and academic writing under Toshika Ojha; authored a five-year review paper on SLAM and drone autonomy

Publications

Mechanical Automation with Vision: A Design for Rubik's Cube Solver *May 2024*
Proceedings of the 15th IOE Graduate Conference, Vol. 15 (ISSN 2350-8914) Paper

- Developed a low-cost mechanical system that solves the 3x3x3 Rubik's Cube
- Used YOLO for cube face detection and a custom mechanism for solving

Professional Experience

Associate Software Engineer *Dec 2024 – Jun 2026*
Azminds Services · Full-time · Kathmandu, Nepal

- Built a RAG chatbot integrating structured databases, PDFs, and web-search retrieval
- Built backend data pipelines using Databricks and Apache Spark

Junior AI Engineer *Jun 2025 – Jun 2026*
IdeaBoxAI · Outsourced through Azminds Services · Remote

- Built FastAPI microservices for a multi-tenant AI platform with credit-based usage metering, Redis caching, streaming, and Langfuse observability
- Trained and evaluated time-series forecasting models (demand planning, shipment-delay prediction, supplier ranking) on ClickHouse and LangGraph pipelines
- Built an LLM evaluation pipeline comparing multilingual packaging-label PDFs via OCR extraction

Personal Projects

Wireless Network Architecture Explorer | *Three.js, WebGL* *Demo*

- Built interactive 3D explorer of 2G/3G/4G/5G network architecture with real antenna radiation-pattern physics

LLM Misuse Monitor | *Python, FastAPI, SQLite, Docker, Streamlit* *Github*

- Built async monitoring service flagging jailbreaks, prompt injection, and PII leakage in self-hosted LLM traffic
- Designed cross-session risk-scoring engine that catches slow-burn misuse missed by single-message filters
- Integrated Llama Guard 3, Presidio, and LLM Guard as pluggable detectors
- Prototyped white-box detection from model logprobs; shipped with triage dashboard and Docker deployment

Technical Skills

Research Areas: Deep Learning for Wireless Communication (Semantic Communication, Deep Joint Source-Channel Coding, Channel Modeling)
Scientific Computing: NumPy, SciPy, MATLAB, GNU Octave
Machine Learning & AI: PyTorch, Generative AI, LLM-based Systems, XGBoost, YOLOv8
Programming: Python, C++, C
Experimentation & Prototyping: Weights & Biases, LangChain, LangGraph, Streamlit, Jupyter
Data Analysis: Pandas, PostgreSQL, SQLAlchemy
Academic & Research Tools: LaTeX, Git, Linux, Bash
Cloud Platform: AWS
Languages: Nepali (native), English (IELTS Band 7), Hindi

References

Available upon request.