Bibek Koirala

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Education

Southern Illinois University Carbondale, MS Computer Science — Aug 2024 - Present
Research Assistant (Computer Vision | Object Detection)

- CGPA: 4.0/4.0
- **Coursework:** Machine Learning and Soft Computing, Artificial Intelligence, Deep Learning, Data Mining, Natural Language Processing, Parallel and Distributed Computing, Advanced Database System, Cryptography and Network Security

Pulchowk Campus, IOE, Tribhuvan University, Bachelor's Degree in Computer Engineering — Nov 2012 - Sep 2016

- Stood in the top 1% among 15,000 applicants and awarded a full scholarship.
- **Coursework:** Structured and Object-Oriented Programming, Assembly Language, Microprocessor, Signal Processing, Computer Organization and Architecture, Data Structure and Algorithms, Big Data, Computer Security, Operating System, Software Development, AI, Database System

Technical Skills

Programming Languages: Python, C, C++, Java, SQL

Frameworks & Libraries: PyTorch, TensorFlow, OpenCV, scikit-learn, NumPy, SciPy, Pandas, Matplotlib, LangChain, LangGraph

Specialization: Statistics, Convex Optimization, ML (regression, SVM, DT, PCA, kernel methods), DL & Transformers, Computer Vision (Object Detection & Segmentation), LLM, VLM, RAG, Vector Databases, Agentic AI

Tools & Platforms: Git, Linux, VS Code, Jupyter, Cursor AI, LaTeX, Docker, CI/CD (GitHub Actions), Experiment Tracking, Model Versioning

Research & Experience

Research Assistant — Computer Vision, SIUC — Aug 2024 - Present

- Developed an end-to-end Mask R-CNN instance segmentation and classification model on time-stamped microscopy images of bacterial cultures under varying backgrounds, achieving mIoU 0.91-0.98 across growth stages. Improved early detection performance with mAP@0.5 around 0.95 at 2h incubation (previous best 3h); accepted for *oral presentation* at *IEEE ICMLA 2025*. https://github.com/vbek/bacteria-detection
- Built SEEKBOT, a full-stack RAG chatbot with a 10-node LangGraph pipeline, local FAISS vector store, and HuggingFace Inference API (Llama 3.1 8B / Qwen 2.5 72B) enabling semantic search over PDF, DOCX, CSV, md, and web content with persistent sessions and fully local embeddings via sentence-transformers. https://github.com/vbek/SEEKBOT
- Conducted econometric analysis on countries with GDP above 5% from remittance (1960–2023), using ML techniques and clustering to examine relationships among macroeconomic indicators. https://github.com/vbek/Inflation-Dynamics
- Analyzed a highly sparse, high-dimensional criminology survey dataset to identify victimization patterns and cluster victims by reporting behavior, achieving strong alignment with prior research. https://github.com/vbek/Victim-Crime-Perception
- Conducted comparative analysis for automated plant disease detection using CNN (34.7M params), fine-tuned ResNet50 (9.9M trainable params), vanilla ResNet (36.4M params), and vanilla Vision Transformer (ViT) (57.5M params) models on the PlantVillage dataset, achieving accuracies of 99.0%, 99.6%, 98.9%, and 97.9% respectively. https://github.com/vbek/Plant-Disease-Detection
- Developed an automated news credibility detection framework integrating NLP and ML to classify articles using linguistic, semantic, and source-based features, achieving 97% precision and 98% recall on benchmark datasets. https://github.com/vbek/News-Credibility

Lieutenant — Nepali Army — Apr 2018 - Dec 2023

- Completed multiple rigorous leadership and technical training programs emphasizing systems thinking, operational reliability, and disciplined execution.
- Designed and developed a Windows-based GUI dashboard and database-backed information system to manage troop leave and training records, enabling a fully paperless workflow and improving operational efficiency. https://github.com/vbek/Military-Leave-Management-Dashboard
- Engineered automated artillery guidance software, optimizing numerical computation pipelines and reducing targeting error from 50 m to 10 m (at 1000 m range), while reducing computation latency from minutes to microseconds.
- Developed decision-support software to calculate logistical requirements for operational Bailey bridge deployment, improving accuracy, robustness, and deployment speed under real-world constraints.

Leadership & Extracurricular Activities

Military Training and Sports led to strong discipline and teamwork. Captained the Pulchowk Campus cricket team in 2015 and 2016, and played district-level cricket in 2016 and 2017. Also actively participated in volleyball, chess, badminton, and running events.