

# Bibek Koirala

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🌐 Portfolio

## 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

**Specialization:** Statistics, Convex Optimization, ML (regression, SVM, DT, PCA, kernel methods), DL & Transformers, Annotations, Computer Vision (Object Detection & Segmentation), LLM, VLM

**Tools & Platforms:** Git, Linux, VS Code, Jupyter, Cursor AI, LaTeX

## 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  $\approx$  0.95 at 2h incubation (previous best 3h); accepted for *oral presentation* at *IEEE ICMLA 2025*.  
🔗 <https://github.com/vbek/bacteria-detection>
- Conducted econometric analysis on countries with  $\approx$ 5% of GDP 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 8 rigorous military training emphasizing leadership, discipline.
- Developed a Windows-based GUI Dashboard and Database Management System to manage troop leave and training records, supporting a paperless workflow. 🔗 <https://github.com/vbek/Military-Leave-Management-Dashboard>
- Built automated artillery guidance software, reducing targeting error from 50 m to 10 m (at 1000 m range) and computation time from 10 min (manual) to  $\mu$ s.
- Developed software to calculate logistic requirements for operational Bailey bridge installation reducing errors, and accelerating deployment.

## 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.