Roshan Pandey

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Research Interests

I aspire to develop intelligent systems that seamlessly integrate perception, learning, and interaction. My research lies at the intersection of **robotics, computer vision, machine learning, natural language processing**, and **human–computer interaction**, with a particular focus on healthcare applications. I am especially interested in designing autonomous and assistive agents that can understand, adapt, and collaborate effectively with humans in complex real-world environments. Ultimately, my goal is to build reliable, sustainable, and human-centered AI systems that enhance clinical decision-making, improve patient outcomes, and support more accessible healthcare delivery.

Education

Tribhuvan University, Institute of Engineering **Expected Graduation: July 2026**
Bachelor of Electronics, Communication and Information Engineering *Kathmandu, Nepal*

College: Kathmandu Engineering College

Performance: Percentage: 71%, Rank: 15/96

Radiant Higher Secondary School **Graduated: Jan 2020**
High School Education (Science Stream) *Kathmandu, Nepal*

Physics, Chemistry, Mathematics, and Computer Science

Selected Research Projects

Object Detection-Based Automated Mobile Robot | *Computer Vision, Robotics* **Jan 2025 – Nov 2025**

- Designed and implemented an automated mobile robot integrating computer vision, robotics, and machine learning for autonomous pick-and-place operations.
- Developed a 4 DOF robotic arm (CAD-modeled and 3D-printed) controlled via Raspberry Pi and Arduino, integrated with YOLO-based object detection and CNN-based classification.
- Built end-to-end machine learning pipelines for dataset preparation, augmentation, annotation (CVAT), and YOLOv5/YOLOv8 model training to detect and classify colored objects.
- Implemented grid-based navigation using Dijkstra's algorithm for optimal path planning and real-time feedback-based movement control.
- Achieved successful hardware-software integration of sensors, actuators, and camera modules, demonstrating real-time autonomous object sorting and manipulation.

SAM2-Lite: Real-Time Video Segmentation on Edge Devices | *Computer Vision* **[In Progress]**

- Focusing on bringing Real-Time Video Segmentation to Edge Devices through Memory-Aware Knowledge Distillation.

Research Experience

NAAMII **Jan 2025 – Apr 2025**
NLP Research Intern *Kathmandu, Nepal*

- Conducted research on Nepali NLP with a focus on text summarization, transliteration, and text-to-speech systems.
- Curated and analyzed Nepali NLP datasets, evaluating their features and limitations across tasks such as sentiment analysis, text-to-speech, and machine translation.

Tribhuvan University, IOE, Kathmandu Engineering College **Jan 2024 – Dec 2025**
Undergraduate Researcher (Advisor: Prof. Anmol Ratna Bajracharya) *Kathmandu, Nepal*

- Research Topic: Automating pick-and-place operations in industrial settings using an object detection-based mobile robot integrating computer vision, robotics, and machine learning.
- Designed and implemented a complete system architecture combining object detection (YOLO, CNN), robotic arm motion planning, and autonomous vehicle navigation with asynchronous on-device image processing using Python and Raspberry Pi.
- Built machine learning pipelines for image data collection, augmentation, annotation, and YOLOv5-based model training, achieving reliable detection and navigation through grid-based path planning and Dijkstra's algorithm.
- Integrated sensors (ultrasonic, camera), actuators, motor drivers, and microcontrollers, deploying optimized software and control algorithms for precise robotic operation in realistic industrial environments.

Selected Professional Experience

F1Soft International Pvt. Ltd. **Sept 2025 – Dec 2025**
Data Science Intern *Kathmandu, Nepal*

- Worked under the Data Science and Machine Learning division, contributing to the development and optimization of data-driven products used in fintech applications.
- Performed extensive data preprocessing, cleaning, and exploratory data analysis (EDA) on large financial transaction datasets using Python (Pandas, NumPy) and SQL.
- Developed predictive models for customer behavior analysis and transaction risk detection using machine learning algorithms (Random Forest, XGBoost, Logistic Regression).
- Collaborated with software engineers to deploy ML models into production, integrating APIs and ensuring real-time performance and reliability.
- Created data visualization dashboards using Power BI and Matplotlib to present insights to business and engineering teams.

Remote (Freelance/Contract) **Jan 2023 – Jun 2023**
Backend Developer

- Designed and developed backend systems for web applications, focusing on RESTful API development, database design, and server-side logic using Python (FastAPI, Flask) and Node.js (Express).
- Built and maintained secure, scalable APIs for data management and integration with frontend services, ensuring high performance and low latency.
- Implemented authentication and authorization mechanisms using JWT and OAuth2, improving overall system security.
- Deployed applications on cloud platforms (AWS, Render, Railway) with CI/CD pipelines for seamless version updates.

Teaching & Mentorship

Kathmandu District School **2018 – 2019**

- Homework Peer Mentor
- Junior School Education Volunteer

Junior School **2017 – 2018**

- Math Tutor

Awards and Honors

Tribhuvan University Entrance Scholarship Award **2020**

- Awarded for excellence in engineering entrance examinations.

Technical Skills

Programming Languages: Python, C++/C, Bash, MLIR, Java, Perl, Scala, x86 Assembly, HTML, Javascript
AI & Big Data: SQL, NoSQL, Tensorflow, JAX, NumPy, Pandas, MapReduce, Spark, Jupyter
Databases & Servers: DB2, MySQL, PostgreSQL, MongoDB, Neo4j, Kubernetes, Docker, Google Cloud, Azure, AWS EC2, Drogon, Python Flask
Tools: Git, Linux perf, Vim, Xcode, Android Studio

Activities and Other Experiences

Member of Electronics Project Club **2024 – 2025**
Member of the Robotics Club, Kathmandu Engineering College **2023 – 2024**
Earthquake Disaster Relief Volunteer **2015**