# ROSHAN PANDEY

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## RESEARCH INTERESTS

I aspire to develop intelligent systems that seamlessly integrate perception, learning, and interaction. My research interests lie at the intersection of robotics, computer vision, machine learning, and natural language processing, with a focus on building autonomous agents that can understand, adapt, and collaborate effectively in complex real-world environments.

## EDUCATION

**Tribhuwan University** Expected Graduation: July 2026

**Institution of Engineering,** Kathmandu, Nepal

**Kathmandu Engineering College**

Bachelor of Electronics, Communication and Information Engineering

GPA: around 3.5 to 3.7/ 4.0

**High School Education** Graduation: Jan 2020

Radiant Higher Secondary School
Science Stream — Physics, Chemistry, Mathematics, and Computer Science

## PUBLICATIONS & INDUSTRIAL PATENT PUBLICATIONS

- Streaming Video Segmentation on Edge via Distillation and Memory Pruning. [ In progress
- Text-Conditioned Open-Vocabulary 3D Occupancy for Autonomous Driving [ In progress
- Temporally-Grounded Retrieval-Augmented Video QA for Hour-Long Clips [ In progress

## RESEARCH EXPERIENCE

**NLP Research Intern** Jan 2025 – Apr 2025
NAAMII

- 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.

**Undergraduate Researcher** Jan 2024 - Dec 2024
Tribhuvan University, IOE, Kathmandu Engineering College
Advisors: Prof. Anmol Ratna Bajracharya

**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.

- Developed and programmed an autonomous robotic arm (4 DOF), modeled in CAD and 3D-printed, controlled via servo motors and integrated with real-time computer vision for object manipulation and sorting.
- 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

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

- 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).
- Implemented feature engineering and model evaluation pipelines with scikit-learn, focusing on improving accuracy, recall, and F1 scores.
- 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 for decision-making.
- Gained hands-on experience in version control (Git), team-based agile workflow, and MLOps concepts such as model tracking and reproducibility.

**Backend Developer (Remote)** Jan 2023 – Jun 2023

- 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.
- Worked with PostgreSQL, MySQL, and MongoDB for efficient data storage, indexing, and query optimization.
- Implemented authentication and authorization mechanisms using JWT and OAuth2, improving overall system security.
- Deployed applications on cloud platforms (AWS, Render, and Railway) with CI/CD pipelines for seamless version updates and maintenance.
- Collaborated remotely with cross-functional teams using Git, GitHub, and Agile tools (Trello, Jira) for task tracking, version control, and code reviews.
- Integrated third-party APIs (payment gateways, email services) and optimized backend performance through caching (Redis) and asynchronous task execution.

## TEACHING & MENTORSHIP

Math tutor at junior school 2017 – 2018
Kathmandu District School : Homework Peer Mentor 2018– 2019
Kathmandu District School : junior School Education Volunteer 2018 – 2019

## AWARDS AND HONORS

Tribhuwan University Entrance Scholarship Award 2020

## TECHNICAL SKILLS

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|---|---|
| **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 electronic project club 2024-2025
Member of the Robotics Club, Kathmandu Engineering College 2023 – 2024
Earthquake Disaster Relief Volunteer 2015

## PROJECTS

**Object Detection-Based Automated Mobile Robot** Jan 2025 – Dec 2025
Tribhuvan University, IOE, Kathmandu Engineering College
Advisor**:** Prof. Anmol Ratna Bajracharya

- 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.
- Explored potential applications in logistics, manufacturing, and inspection systems with future improvements planned using stereo vision and LIDAR integration.