Rabin Giri

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Research interests — I am passionate about advancing autonomous robotics that can understand and interact intelligently with real world environments. My background includes hands-on experience in embedded systems, robot navigation, hydroelectric trash automation, and dam depth measurement using sensor-based solutions. My current research interest lies in developing intelligent robotic agents capable of performing semantic SLAM by integrating sensor data with object recognition systems such as YOLO and generalizing contextual understanding through large language models (LLM). The aim is to explore how robots can continuously learn from their environment using reinforcement learning, build semantic maps, and perform complex decision making to solve real-world challenges in dynamic environments. My long-term goal is to contribute to the development of agentic AI - robots that can observe, learn, adapt, and assist with real-life household or industrial tasks autonomously and ethically.

Skills

Robotics ROS, ROS2, Gazebo
AI Framework TensorFlow, Keras, PyTorch, SciKit-Learn, NumPy, Pandas, Matplotlib
Embedded Systems Arduino, AVR, STM32, ESP32, PLC, Embedded Linux, CMSIS, FreeRTOS
Languages Python, C, C++, Bash, HTML, CSS, JavaScript, Lua, Dart
Web Technologies Django, REST APIs
Electronics Circuit Simulation, Circuit Design, Circuit Assembly
Tools Platforms Docker, Git, Linux Terminal, VIM, VS Code

Experience

Co-Founder and Robotics & Embedded System Engineer, Paaila Technology **2016 – Present**

- Co-founded Paaila Technology with five colleagues and led the Robotics and Embedded Systems division from inception.
- Directed the design and development of multiple commercial robots, focusing on real-world applications in service automation and human-robot interaction.[Link]

Traffic Signal System Developer – Urban Traffic Automation **2021 – Persent**

- Designed software and algorithms to manage traffic congestion through intelligent traffic light control systems.
- Successfully deployed the system in major cities across Nepal, including Kathmandu, Bhaktapur, Lalitpur, Birgunj, and Nepalgunj.
- Collaborated with the **Japan International Cooperation Agency (JICA)** to synchronize multiple traffic intersections for smoother vehicle flow.
- Helped implement Japanese traffic control standards and adapted them to suit Nepal's road conditions and infrastructure.

Industrial Automation Projects **2022 – 2024**

- Developed a hydroelectric dam depth measurement system using an ESP32-based PLC (2024). The system measures depth at user-set frequencies and uploads data to Firebase cloud. Completed in collaboration with Abhiyan Engineering Nepal. System installed at the Chameliya Khola Hydropower Station.
- Contributed as PLC programmer for Trash Rack Cleaning Machine, a product by Abhiyan Engineering Nepal (2023). Logic consists of three programmed robotic arms, each with three degrees of freedom, to collect trash from a dam. Developed automation code for Wecon PLC, synchronized all arms via RS485 communication, and designed HMI for user interaction. System installed at the Aadhi Khola hydroelectric plant.[Link]
- Worked with Matra Incorporation, an industrial automation company in Nepal, on Interlocking Brick Hydraulic Machine (2023). Designed the electrical system and programmed Mitsubishi PLC to automate the machine, which produces up to 1600 interlocking bricks per day.[Link]
- Worked as an Automation Engineer for the Rani Jamara Kulariya Irrigation Project (2022), a National Pride project of Nepal. Developed and programmed the automatic dam door control system used to regulate water flow in irrigation canals. The system improves irrigation efficiency through reliable and precise water distribution.[Link]

Nursing Robot Project **2020 – 2021**

- Contributed to the development of a nursing assistant robot during the COVID-19 pandemic to support contactless care in isolation wards.
- Designed functionalities for autonomous delivery of food and medicine to patients, reducing human exposure.
- Integrated a video communication system to facilitate real-time interaction between patients and doctors.
- Focused on system reliability and ease of use for deployment in healthcare settings under emergency conditions.[Link]

Paaila Ventilator Project **2020 – Present**

- Lead the development of the **Paaila Ventilator**, a low-cost invasive ventilator system initiated during the COVID-19 pandemic to address critical shortages in respiratory support.
- Designed and implemented the first version (2020), based on an Ambu bag mechanism operating in volume control mode. Integrated features such as assist control mode, adjustable PEEP, PIP, tidal volume, and maximum pressure. This version received production approval from the Nepal Medical Society.
- Collaborated with the RED Vent team (formed by MIT alumni) on the second version (2023), which introduced turbine-based pressure control, advanced oxygen regulation, and PRVC/PCV algorithm integration.
- Played a central role in testing and validating ventilation algorithms, and contributed significantly to the design, manufacturing, and clinical testing pipeline.
- Secured research funding in 2025 from the Nepal Academy of Science and Technology (NAST) to support further testing and refinement of control parameters. [Link1][Link2]

Ginger Robot, Robotics Restaurant Project **2017 – 2019**

- Played a key role in launching Nepal's first Robotics Restaurant, integrating automation across ordering, food delivery, and customer interaction.
- Designed and implemented core algorithms for odometry and sensor fusion to enable indoor autonomous navigation.
- Developed and synchronized multi-robot systems, ensuring seamless coordination in a dynamic restaurant environment.
- Built the user interface (GUI) for robot management and monitoring; proposed a smart ordering system using interactive digital tables.[Link1] [Link2] [Link3]

Pari Robot Project **2018 – 2020**

- Led the robotics development of Pari Robot, a humanoid service assistant deployed at airports and banks for receptionist and information guidance tasks.
- Programmed arm movements using inverse kinematics to enable natural human-like gestures and pointing behavior.
- Designed and implemented an autonomous docking and recharging system to maximize uptime in 24/7 service environments.
- Integrated custom robotics software with the ROS (Robot Operating System) ecosystem for modularity and scalability.[Link1][Link2]

Education

Tribhuvan University, Institute of Engineering, Pulchowk Campus
M.Sc. Computer System and Knowledge Engineering 2019-2022
Advisor - Assoc. Prof. Anand Kumar Sah
Thesis - Particle Filter Enhanced by CNN-LSTM for Localization of Autonomous Robot in Indoor Environment

Tribhuvan University, Institute of Engineering, Pulchowk Campus
B.E. Electronics and Communication Engineering 2012-2016
Advisor - Dinesh Baniya Kshatri
Final Project - Autonomous navigation of a mobile robot in indoor environments

Publications

- **Giri, Rabin**, Sah, A. K., & Satyal, S. (2024). *Particle Filter Enhanced by CNN-LSTM for Localization of Autonomous Robot in Indoor Environment*. *International Journal on Engineering Technology, 1*(2), 1–12. [PDF]

- Paneru, B., Basnet, N., Shrestha, S., **Giri, Rabin**, Kshatri, D. B., & Campus, P. (2016). *Autonomous navigation of a mobile robot in indoor environments*. *Zerone Scholar, 1*(1), 3–8. [Link]

Notable Academic Projects and Research

Enhancing Particle Filter with CNN-LSTM for Robot Localization

- Addressed the particle filter's kidnapped and initialization problems by integrating a CNN-LSTM neural network.
- Trained the network using time-series camera images labeled with particle filter-generated position data, enabling it to predict initial robot positions.
- Conducted experiments on both real hardware and in simulation using Gazebo.
- Successfully fused deep learning and probabilistic algorithms to improve localization accuracy. [Link1][Link2][Link3]

Multimodal Fake News Detection using BERT and XceptionNet

- Developed a fake news classification system by combining textual and visual features using transfer learning techniques.
- Employed BERT for natural language understanding and XceptionNet for image feature extraction, creating a multimodal architecture capable of analyzing both content types simultaneously.
- Trained and evaluated the model on the FakeNewsNet dataset; compared its performance against other multimodal architectures such as XLnet-VGG19 and XLnet-Resnet.

- Utilized TensorFlow and Keras frameworks for model implementation, achieving improved accuracy over single-modality and conventional multimodal baselines.

Autonomous navigation wheelchair

- Programmed STM32 microcontroller and integrated the system with the Robot Operating System (ROS).
- Contributed to developing a ROS-compatible robotic base using a wheelchair platform for autonomous navigation.
- Designed and simulated electronic circuits for the control and navigation systems. [Link]

ABU Robocon 2016, Thailand

- Led the ABU Robocon 2016 team Nepal from inception, contributing to planning and strategy development, robot odometry, task synchronization, microcontroller programming, as well as circuit simulation and analysis. [Link1][Link2]

ABU Robocon 2015, Indonesia

- Contributed to ABU Robocon 2016 as a programmer, focusing on robot base code development, sensor fusion algorithms, electronic circuit simulation and design, and inter-robot communication systems.[Link1] [Link2]

HONORS AND ACHIEVEMENTS

- Ranked 19th out of 3,600 applicants in the M.Sc. Engineering entrance examination and awarded a full merit-based scholarship for graduate studies
- Guided Team Nepal in ABU Robocon 2022 India (Asia-Pacific Robot Contest) in electronics hardware and controller programming. The team achieved 2nd Runner-up position and received the Nagase Award
- Ranked 243 out of 15000 applicants in the B.E engineering entrance exam. Received merit-based partial scholarship for undergraduate study
- Awarded the Best Engineering Award and Panasonic Award representing Team Nepal at ABU Robocon 2016, Thailand
- Awarded the Best Idea Award and Mabuchi Motor Award representing Team Nepal at ABU Robocon 2015, Indonesia
- Achieved First Place for three consecutive years (2014, 2015, 2016) in the annual national technological festival LOCUS during undergraduate studies, for outstanding software and hardware projects.
- Ranked 31 out of 6000 applicants in the Diploma engineering entrance examination and awarded full merit-based scholarship for diploma study
- Received multiple national recognitions for my startup, including the National Science, Technology and Innovation Award (2022, Government of Nepal), NCELL Innovation-Driven Crisis Response ICT Award (2020), National ICT Award (2020, Government of Nepal), Most Creative Business (CBC Cup 2018), Best Startup Award and Most Innovative Product (ICT Award 2017), and the Best Industry Technology Award (FNCCI 2017).

Leadership and Voluntary Works

- Technical volunteer for manufacturing Himalayan Nettle (Allo) processing machine in 2018 to support women-led micro-enterprises and enhance productivity.[Link]
- Organizer of IOE Robocon 2016, intercollege national robotic contest. [Link]
- Built and installed Charito Ghar, pre-fabricated houses for earthquake(2015) victims.[Link]
- Taught 'Scratch' to primary school students to kindle programming interest in them, as part of Young Leader's Collaboration for Global Health 2015 Project.
- Volunteer instructor for Embedded Systems Programming during LOCUS National Technological Festival (2015)
- Invited instructor for "Developing Applications with C" workshop organized by Nepal Engineering College (2013)