Geeta Chandra Raju, Bethala

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Education

New York University *New York, USA*

Masters in Mechatronics and Robotics **(GPA: 3.86)** *Sept 2022 - May 2024*

Coursework: Robot Perception, Deep-Learning, Advanced Mechatronics, Swarm Robotics, Robotics, Simulation Tools for Robotics using MATLAB, Foundations of Robotics, Entrepreneurship.

Acharya Nagarjuna University College of Engineering and Technology *Guntur, India*

Bachelor of Technology in Mechanical Engineering Aug 2017 - *Aug 2021*

Coursework: Machine Design, Project Management, Mechatronics, Automatic Control Engineering, Manufacturing

Skills

Languages & Tools: C, Python, MATLAB, ROS, ROS2, Isaac Lab, Isaac Sim, Robot Web Tools, Unity 3D (AR VR), Gazebo, Arduino, Simulink, ReactJS, CATIA, SIMULIA, DELMIA, Fusion360, Solidworks, ABACUS

Publications, Patents and Major Contributions

- **H2-COMPACT: Human-Humanoid Co-Manipulation via Adaptive Contact Trajectory Policies** – *IEEE Humanoids 2025 Project-page* **.**
- **Wavelet Policy: Lifting Scheme for Policy Learning in Long-Horizon Tasks** – *IEEE/CVF ICCV 2025 Paper*
- **Socially-Aware Robot Navigation Enhanced by Bidirectional Natural Language Conversations Using Large Language Models** *– IEEE IROS 2025 Project-page .*
- **Immersive Social Interaction with VR and LLM-Assisted Humanoids** – *IEEE Humanoids 2024 workshop spotlight.*
- **GAMap: Zero-Shot Object Goal Navigation with Multi-Scale Geometric-Affordance Guidance** – Designed and built the real-world robot and experiments, *NeurIPS 2024.*

- **Brain-Controlled Wheelchair System for Disabled Children** – *South African Patent, Official Application No: 2022/07203.*
- **IoT-Based Cloud-Engaged Herbal Liquid Carrier for Logistics** – *German Patent, DNR: 20 2022 103 189.4, Code: G11586DE.*
- Drafted and secured a 100,000 AED grant for ChatSign, (startup) which enables real-time sign language to natural language translation.

Experience

New York University - Abu Dhabi *(Research Engineer)* *June 2024 – Present*

- Assist professors and postdocs in designing and conducting experiments to support their ongoing research in robotics and AI.
- Conduct independent research in robot task learning and human-robot interaction, drawing on concepts from theory of mind and understanding human intentions.
- Customize and optimize various robots, including Unitree G1, H1 and H1-2 humanoids, addressing hardware and software challenges to meet diverse research requirements.
- Collaborate with Unitree and TiTa engineers to enhance robot functionality and address design limitations.

Embodied AI and Robotics Lab – NYU *(Research Assistant)* *August 2023 – May 2024*

- Spearheading development in advanced robotic navigation using ROS, focusing on integrating LLMs and Vision-Language Models (VLMs) for enhanced human-robot interaction and socially aware navigation.

- Engaged in research on commonsense reasoning and spatial perception in robotics using LLMs and CLIP, enhancing robots' interpretation of social contexts and environmental details.
- Developing algorithms for social cue interpretation in dynamic settings, utilizing skills in robotics, machine learning, and NLP to innovate in human-robot interaction.

AI4CE lab – NYU *(Research Assistant)* *July 2023 – January 2024*

- Engaged in a pivotal project mapping New York City using deep mapping algorithms, focusing on hardware design and calibration for sensor-integrated mobile platforms, including 360-degree LiDARs, cameras, and GPS.
- Pioneered in deploying ROS for data synchronization and sensor integration, overcoming design challenges to develop versatile, detachable sensor mounts for varied research applications.
- Acquired expertise in precise sensor calibration, contributing significantly to the accuracy and reliability of vital mapping data for autonomous vehicle testing and urban research.

The Center for K12 STEM Education – NYU *(STEM Leader & Trainer)* *June 2023 – August 2023*

- Led a transformative STEM education program, instructing and inspiring a cohort of 30 middle school and high school students in the fields of sound and microcontrollers, fostering their curiosity and academic growth.
- Provided mentorship and training to a team of instructors, enabling them to deliver exceptional robotics, electronics, and programming programs to a diverse range of students in middle school and high school settings.

Mechatronics, Controls, and Robotics Lab – NYU *(Research Assistant)* *Feb 2023 – May 2023*

- Led development of a ROS-based navigation stack for mobile robots, focusing on dynamic environments Also, enhanced the system by integrating with web and Unity platforms for improved visualization and user interaction.
- Built a test rig for testing the manipulator for speed, force, precision and repeatability of the mobile manipulators.

Racchabanda *(Robotics Engineer)* *Apr 2022 - Sept 2022*

- Integral in enhancing a tele-operational robotics project, focusing on seamless integration of ROS and Robot Web Tools, and implementing WebSocket and ESP32 for robust control, leading to precise PID speed regulation and effective obstacle avoidance.
- Spearheaded the design and launch of market-ready Agri IoT products, such as automated irrigation systems and animal feeders, utilizing ESP32 boards and IoT technologies to boost agricultural efficiency and user convenience.

Projects and Research

Collaborative Development in Humanoid Robotics *August 2024 - Present*

- Developed a teleoperation system integrating RGB cameras, motion tracking, and VR for whole and upper-body control of humanoid robots.
- Collaborated with TiTa engineers to implement hardware upgrades for a bi-wheeled, legged robot designed for ladder climbing.
- Worked with Unitree engineers to redesign humanoid arm and hand systems, focusing on optimizing hardware and communication protocols.

LLM Based Home Assistive Robot (*MMVC - NYU*) *June 2023 – October 2023*

- Engineered an advanced home assistive robot utilizing a Large Language Model (LLM) for natural language understanding and response. Integrated ROS and Gazebo simulation for realistic environmental interaction, employing depth cameras and YOLOv8 for precise object recognition and interaction.

- Implemented SLAM for efficient navigation, enabling the robot to autonomously maneuver and complete tasks based on user commands. Enhanced robot's functionality to dynamically identify goal objects or locations and execute tasks through analysis of LLM-generated responses.

Interactive Social Robot Navigation Using LLM (*NYUAD Center for AI & Robotics*) *July 2023 – Sept 2023*

- Developed and implemented the Hybrid Soft Actor-Critic with Large Language Model (HSAC-LLM) algorithm for socially aware robot navigation in ROS and Gazebo simulation environments.
- Successfully integrated deep reinforcement learning and large language models to enable robots to interact with humans in real-world scenarios, improving navigation, obstacle avoidance, and human-robot interactions.

Mobile Manipulator to interact with Medical Machines *(MCRL - NYU)* *Jan 2023 – May 2023*

- Developed a mobile manipulator for remote operation of medical devices, incorporating touch screen interface and web-based control, and emphasizing mobile robot navigation and obstacle avoidance.
- Developed and integrated a web-based control system using WebSocket, enabling the robot to be controlled from anywhere in the world.

Shape Memory Alloyed Actuated Soft Robotics Hand Rehabilitation *(FAMS - NYU)* *Jan 2023 – May 2023*

- Engineered a soft robotic hand rehabilitation device using Shape Memory Alloys (Nitinol), optimizing actuator design for enhanced force output and efficiency, tailored for patient-specific rehabilitation needs.

Telepresence Robot *Apr 2022 – Jan 2023*

- Developed version 1 of a telepresence robot using ESP as a client and WebSocket for low latency communication and bidirectional face-to-face communication with PID speed control.
- Implemented autonomous navigation in version 2 using SLAM and Gmapping with ROS and worked towards establishing low latency communication between the robot and controller using a cloud server.

Smart Rescue System using Object Recognition & UAVs *Mar 2020 – Dec 2020*

- Developed a drone for flood rescue operations with image processing & location-tracking capabilities using GPS and LoRa technology. Created accompanying mobile app and module for data decoding and location plotting.

Certifications and Achievements

- Organiser of EMAI workshop in conjunction with IEEE ICIP 2024
- Smart India Hackathon, Hardware Edition National 1st Prize.
- Student Engineering Model Competition 2nd place in Strategic Applications, “India International Science Festival”.
- Titan Wear Hacks, National Top 10 Best Innovation award.
- Paper Presentation (Institution of Engineers, India), 1st Prize.
- Certification in Aerial Robotics from *University of Pennsylvania*.
- Udemy ROS Web-based Navigation with ROS Bridge.
- Course completion “Computer Vision Basics” from *University at Buffalo & SUNY* .
- Course completion “Mechanics of Materials-I” from Georgia Tech.