

GOKUL PRABHAKARAN

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EDUCATION

University of Michigan, Ann Arbor

Aug 2022 – Current

- Master of Science in Robotics
- **GPA: 4.0/4.0**
- **Research Assistant** at the University of Michigan's Biped Lab under Professor Jessie Grizzle
- **Graduate Student Instructor (GSI)** for Graduate level Robotic Systems Laboratory, ROB 550

National University of Singapore (NUS)

Aug 2018 – June 2022

- Bachelor of Engineering in Mechanical Engineering, Honours (Robotics Specialization)
- Minor in Computer Science
- GPA: 4.46/5, Dean's List for AY2020/2021 Semester 2
- Reserve Tutor for Introduction to Software Engineering, CS2103

PUBLICATIONS

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- [M. Eva Mungai, Gokul Prabhakaran, Jessie W. Grizzle: Fall Prediction for Bipedal Robots: The Standing Phase](#). Submitted to **ICRA 2024** [[paper](#)] [[dataset](#)]
 - Working on another paper which is an extension of the above publication. Extension is to predict falls on hardware and take recovery actions to prevent falls, if feasible

WORK EXPERIENCE

Bipedal Robotics Research Assistant, Biped Robotics Laboratory, Michigan, Ann Arbor

December 2022 – Current

- Created a [dataset](#) of the Digit robot's response to abrupt, incipient and intermittent forces, both in simulation and hardware
- Maximized lead time for fall prediction while minimizing false positive rates, by leveraging a 1D convolutional neural network (CNN)
- Developed an algorithm capable of detecting lead time of the robot, when subjected to abrupt, incipient or intermittent forces
- Submitted our work, [Fall Prediction for Bipedal Robots: The Standing Phase](#), to **ICRA 2024**
- Current work includes making this algorithm perform in real time fashion on the hardware as well as developing control algorithms to execute recovery actions when a fall is detected by our algorithm

Manipulator Robotics Intern, Panasonic R&D Center Singapore, Singapore

May 2022 – July 2022

- Implemented ideas from a research paper to enable UR5 robot to grasp unknown objects from 3D point cloud
- Created a program to segment a table-top from the point-cloud data. Its pose and size were estimated and added to the Moveit! planning scene for collision avoidance
- Created a custom dataset of objects and trained a YOLOv5-Oriented Bounding box model. This model together with a depth camera was used to estimate the 3D position and the yaw angle of known objects for grasping
- Setup a Simulation of UR5 robot, Robotiq gripper and Realsense camera in Gazebo and Rviz for testing

Mobile Manipulator Robotics Intern, A*STAR (ARTC), Singapore

July 2020 – Nov 2020

- Developed Programs to move the joints of the robot arm, using the Moveit! package and ROS control package. Utilized SLAM for mapping and navigation of the robot
- Programmed a pick & place demo for a mobile manipulator. Generated a 3D octomap and did point cloud filtering for grasping objects, while avoiding collision

Robotics Intern, SHADO Group, Singapore

May 2020 - Jul 2020

- Developed a functionality to existing mobile vehicles using Infrared Sensors, that allows robots/vehicles to follow a person
- Took charge of the mechanical design, electronics set up and software programming of the whole system and produced a working prototype in 2 months

Artificial Intelligence Intern, Amaris AI, Singapore

May 2019 - Jul 2019

- Built a computer vision software to perform image processing on ID cards and university offer letters to extract important information that helped to automate manual registration and verification processes
- Developed a software that can automatically extract documents and information from emails for processing

ACADEMIC PROJECTS

Drone motion planning and trajectory tracking using MPC [[code](#)]

Sep 2023 – Dec 2023

- Derived the equations of motion of a drone from first principles and simulated it on MATLAB
- Used RRT* with a minimum-snap trajectory to plan a path to a goal pose, around obstacles
- Designed a linear and a non-linear MPC controller using quadratic and non-linear programming techniques to track the reference trajectory obtained from the motion planner

NeuralODE Model for planar pushing task with obstacles [[code](#)]

Sep 202 – Dec 2023

- Trained a NeuralODE model to learn the dynamics of pushing a block with a robot arm
- Used MPPI algorithm to generate and track a trajectory towards the goal, while avoiding obstacles
- Analyzed the effects of model parameters and ODE solvers on the performance of the system and reported the results

Robotics System Laboratory – Robot arm and Mobile robot [[video](#)]

Sep 2022 – Dec 2022

- Derived forward and inverse kinematics for a 5DOF robot arm from scratch and tested it on the hardware
- Integrated a Computer Vision system with the robot arm to identify and stack colored blocks of different sizes.
- Implemented a PID controller for a mobile robot to follow linear and angular velocity commands
- Developed a mapping and particle filter localization algorithm to perform SLAM using a LiDAR
- Integrated a A* path planner and a frontier explorer onto the robot, to enable autonomous mapping and navigation of the surroundings

Undergraduate Research Opportunities Program (UROP), NUS ARC

Jan 2021 – May 2022

Mechanical Engineering Team, NUS DJI Robomaster

Aug 2019 – Aug 2020

Innoventure - The Leadership & Innovation Challenge, NUS Engineering

Aug 2019 - May 2020

Orbital, NUS School of Computing

June 2019 - Aug 2019

Hornet Mechanical Engineering team, Bumblebee

Aug 2018 - Apr 2019

LEADERSHIP EXPERIENCE

Enhancement Projects Director, Society of Mechanical Engineering

Aug 2019 – Aug 2020

- Established tie-ups with engineering industries such as Airbus and Rolls Royce to arrange for site visits, enabling us to act as a bridge between students and industries
- In charge of facilitating technical workshops such as Solidworks, Autodesk to hone industry relevant skills for students

SKILLS

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- *Programming Languages:* Python, Java, C++, C, MATLAB
 - *Softwares/Tools:* Pytorch, Robotics Operation System (ROS), Arduino, Raspberry pi, Solidworks and Git
 - *Operating System:* Linux, Windows
 - *Skills:* MPC, Trajectory Optimization, Deep Learning, Motion Planning, SLAM, Perception