Chandravaran V. Kunjeti

(267) 476-2787 | kunjeti@seas.upenn.edu | https://chandravaran.github.io/

EDUCATION

University of Pennsylvania — ***Expected Graduation May 2024***
Master of Science in Robotics — *CGPA: 3.9/4.0*

National Institute of Technology Karnataka, Surathkal — ***Graduated May 2022***
Bachelor of Technology in Electronics and Communication Engineering & Minor in Computer Science — *CGPA: 9.46/10*

COURSES & SKILLS

Relevant courses: **Controls and Optimization for Robotics**, Autonomous Racing**, Principles of Deep learning**

Programming: **C++ 17**, **Python**, C, **PyTorch**, Tensorflow, **Keras,** Matplotlib || **Tools: Docker**, **CMake**, **GIT**, Bash, AWS, MATLAB

Robotics: ROS, ROS2, **Non Linear Control**, SLAM, **Kalman Filter, CNNs** || **Hardware:** Intel NUC, Raspberry Pi, **Jetson Devices,** Serial protocol

PROFESSIONAL EXPERIENCE

Amazon Robotics C++ Intern || Motion planning & Perception — ***May 2023 – Present***
Manipulation team — *Boston, MA*

- Developing a **motion planning** algorithm to create **obstacle free path** for the robotic arm **Cardinal** by creating a **non-linear optimization problem** that can currently solve in **50ms**.
- Implementing an optimization problem where **images** and **point clouds** are utilized as **constraints**, while also leveraging a **pre-generated path** generated using **Frenet** as a seed and expecting a **2x improvement** in solve time.
- Collaborating with **cross-functional** teams, including **motion planning**, **perception** and product managers, to ensure **seamless integration** with existing platform to perform **hardware experiments**.
- Created **detailed technical** documentation to facilitate **knowledge sharing** and future development efforts.

Graduate Research Assistant || Bipedal Control & Perception — ***Jan 2023 – May 2023***
DAIR Lab (GRASP Laboratory subsidiary) — *Philadelphia, PA*

- Worked on the perception stack to extract **convex foot** hold locations from an **elevation map**
- Analyzed hardware experiments and implemented **filtering** techniques to **improve foot** locations.
- Helped develop an **optimization-based foot trajectory** that **minimized jerk** of the feet.

Graduate Research Assistant || Quadruped Control — ***Aug 2022 – Jan 2023***
*Kod*Lab (GRASP Laboratory subsidiary)* — *Philadelphia, PA*

- Developed a **PID controller** class and verified its functionality on hardware as part of the **Kod*Lab SDK** – the lab's open-source **BLDC motor driver** and control framework written in **C++17**
- Implemented a Python interface for broadcasting joystick inputs from a host computer via the Lightweight Communication and Marshalling (**LCM**) library, enabling user-customizable remote joystick control.
- Co-designed a **debugging tool in Python** capable of **visualizing** and plotting the state of a quadruped robot via log playbook, enabling the **rapid diagnosis** of a **control system** bug

Research Intern || Quadruped Software Development — ***Dec 2020 – Sept 2021***
Stochastic Robotics Lab — *Bengaluru, India*

- Led a team of three undergraduates to build a **software framework** capable of switching between **linear and neural network control** policies, enabling the Stochlite quadrupedal robot to traverse **slopes** up to **13 degrees**
- Overhauled the ROS robot visualization by providing additional **SPI, UART**, and **RS485** communication interfaces to retrieve data from time-of-flight sensors, inertial measurement units (**IMU**s) and B3M motors

PROJECTS

Depth Estimation || *Python, Deep Learning, Perception* — ***Aug 2022 – Nov 2022***

- Developed a **novel depth estimation** technique by combining Sum of absolute difference, and Census transform by using Laplacian equation to **minimize** the **error** to **5%** from **7%**
- Modeled a CNN called Y-net that mimicked the new depth estimation technique, reducing error to **3%**
- Reduced error to **2.5%,** by using **RGB** and **gradient images** for more **spatial information**.

Robust Navigation System for Legged Robots || *C++ 14, EKF, Perception, Controls, Ros* — ***Jan 2022 – May 2022***

- Constructed a **2 stage odometry data pipeline** that computes RGBD odometry followed by point to plane ICP algorithm reducing the error to **2%** and brought down the computation time to **0.1s**
- Formulated a **state estimator using** a novel slope estimation technique, **IMU** sensor data, and **motor** feedback to fuse state with **point cloud odometry data**
- Developed an **optimized bridge** between Open3D and ROS to enable conversions from **0.5s to 0.01msec**.

Perception Pipeline for Janitorial Robot || *Python, Deep Learning, Point Cloud, ROS* || *$5300 Funding* — ***Mar 2021 – May 2022***

- Built and simulated a robot to clean a washroom autonomously for the ARTPARK robotics challenge
- Modeled the **algorithm** for finding the **optimal entry point** using door detection and **laser scan**
- Used 3D point clouds to find and **estimate** the **dimensions** of a **tabletop** and **sink** in a room
- Trained a deep model on **YoloV4** and **SSD mobilenet** using transfer learning to detect cans, and dustbins