Harin Kumar Nallaguntla

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Education

Khoury College of Computer Sciences at Northeastern University — Boston, MA
Master of Science in Robotics; ***GPA: 3.96/4.0*** — *Sep 2022 - April 2024*
Coursework - Master's Thesis, Legged Robotics, Reinforcement Learning and Sequential Decision Making, Robot Mechanics and Control, Robotics Sensing and Navigation

National Institute of Technology — Surat, India
Bachelor of Technology in Mechanical Engineering; ***GPA: 8.5/10.0*** — *Apr 2018 - May 2022*
Coursework - Control Systems Engineering, Computer-Aided Design and Manufacturing, Computer Programming, Theory of Machines, Optimization Techniques

Technical Skills

Programming Languages: MATLAB, Python, C, C++, CUDA, Rust, SQL, Allen Bradley/Siemens PLC, JavaScript, C#
Platforms: Ubuntu, Windows, Kali Linux, MacOS, AWS, GCP, Microsoft Azure
Technologies: Git, ROS/ROS2, SSH, Rviz, OpenCV, PyTorch, Jax, Raspberry Pi, Arduino, Docker, NVIDIA Jetson, MS Office
Design and Manufacturing: SolidWorks, OnShape, AutoCAD, Ultimaker S3/S5 3D printers, ULTRA R9000 Laser Cutter

Experience

Silicon Synapse Lab — **Mar 2023 – May 2024**
Research Assistant | Python, C++, Git, Ubuntu, Rust, PyTorch, ROS/ROS2, SSH, Docker, AWS — *Boston, MA, USA*

- Spearheaded the development and maintenance of mechatronic design and software stack for COBRA, an innovative morpho-functional snake robot designed for traversing uneven terrains, improving locomotion efficiency by over 40%.
- Pioneered the implementation of energy-efficient trajectory planner for Harpy robot, a collaborative creation with Caltech, enhancing performance by prioritizing stability and optimizing its thruster-assisted bipedal locomotion.
- Developed an accelerated Deep Learning training pipeline, resulting in 4x boost in model training capacity, thereby substantially expediting prototyping and deployment workflows.
- Employed a dynamic reinforcement learning-based optimization algorithm aimed at reducing the sim-to-real gap, resulting in a remarkable 90% improvement in the accuracy and fidelity of COBRA's locomotion simulations.
- Designed a novel contact-implicit motion planning framework that generates locomotion patterns for seamless object manipulation, utilizing COBRA's unique body design to enhance dexterity and precision, achieving a 95% success rate.

Key Achievements:

- Received NASA's prestigious Artemis Award for developing the COBRA robot, which will support lunar colonization initiatives in the NASA's upcoming Artemis Missions.
- Authored three papers submitted to top conferences, with one accepted for publication at IEEE/ASME AIM 2024 and the others under review at IROS and CDC 2024.
- Secured over $200,000 in funding from NASA for the development of the COBRA robot and additional funding from Caltech to enhance the autonomous capabilities of the Harpy robot.

Lycan Automotive — **Mar 2021 – Feb 2022**
Software Engineer | Python, ROS, PyTorch, GTSAM, OpenCV, Tensorflow, CARLA, Ubuntu, C++, Git — *Bangalore, India*

- Led the creation of a sophisticated self-driving framework for next-generation electric vehicles, successfully securing seed funding from investors to propel further advancements.
- Optimized single-stage and multi-stage machine learning algorithms for 3D object detection, achieving a remarkable mean average precision of 87%.
- Utilized robust computer vision algorithms for lane detection, achieving an impressive 84% accuracy in accurately identifying and distinguishing between all lanes on the road.
- Deployed a factor graph optimization framework on an electric vehicle to enhance SLAM capabilities by leveraging data from IMU and camera sensors, achieving a remarkable accuracy of 93%.
- Implemented a sophisticated collision avoidance algorithm adept at preventing collisions with both vehicles and pedestrians, achieving success rate of 95%.

Projects

Autonomous TurtleBot for Disaster Response | *ROS/ROS2, Python, C/C++, Gazebo* — **Sep 2021 – Oct 2021**

- Established an autonomous disaster response system for a TurtleBot, utilizing a robust model predictive controller to achieve an outstanding 98% success rate in rescue missions.
- Constructed a robust sensor fusion framework that utilizes data from wheel encoders, IMU, Camera and LiDAR for pose graph optimization, achieving impressive accuracies of 93% for SLAM and 95% for visual SLAM.

HAL_9000: Implementation Of a GPU-Accelerated Deep Learning Framework | *Jax, CUDA* **Jul 2020 – Aug 2020**

- Implemented CNN, RNN, LSTM, DQN and Transformer models from scratch, encapsulated into a Python library, while harnessing accelerated GPU programming framework to enhance training speeds by 60%.
- Conducted training and evaluation of CNNs, Transfromers and RNNs from HAL_9000 framework on image and text datasets, attaining impressive test accuracies of 94%, 97% and 95% respectively.