

BALAJI SELVAKUMAR

Email: balase22@terpmail.umd.edu ——— LinkedIn: linkedin.com/in/balaji-selvakumar/ ——— Mobile: 202-642-2054 ——— Github: BALA22

Education

- University of Maryland
 - Masters of Science - Robotics
 - Sri Krishna College of Engineering and Technology
 - Bachelor of Technology - Mechatronics
- College Park, USA
Jan 2022 - Dec 2023

Coimbatore, India

Work Experience

- Achara Technologies
 - Machine Learning Intern
 - Architecture: Built a ML architecture in R&D for inspecting the fabric defects and classifying the defect type
 - Results: Created a reliable and high-performance supervised learning algorithm resulting in a 30% increase in inspection speed.
 - Oak Ridge National Laboratory
 - Deep Learning Intern
 - Project Contribution: Actively contribute to the ongoing development of the Real-Time Evaluator (RTE) project, focusing on enhancing precision in building component placement during crane installation
 - Robotic Laser Tracking: Utilize state-of-the-art robotic laser tracker technology to measure the real-time position of prefab components with an accuracy of 1/8-inch.
 - Deep Learning for Point Cloud Building Envelope Segmentation (DeeP-CuBES): Development of the DeeP-CuBES project, leveraging deep learning techniques to automatically extract crucial features such as window rough opening dimensions to automate the process of retrofitting older buildings
- Ashburn, VA
August 2019 – June 2020

Oak Ridge, TN
January 2024 – Present

Research Experience

- GAMMA Laboratory
 - Research Assistant
 - Social Navigation: Pioneered the development and seamless integration of a baseline social navigation framework, employing the custom Yolov8 deep learning model to augment the existing navigation pipeline. This innovation empowers the robot to navigate complex urban social environments, including street crossings, with heightened efficiency and situational awareness.
 - SLAM: Implemented LIO-SAM on SPOT robot for real-time lidar-inertial odometry, processing raw data for a comprehensive campus-wide autonomous navigation project. Produced custom training maps(pcd). Implemented a realtime localization algorithm based on LIO-SAM for campus wide autonomous navigation
 - Sensor Integration & Calibration: Integrated and calibrated(extrinsic calibration) Velodyne LIDAR, RealSense Camera, Microstrain IMU and Taoglas GPS on SPOT Robot. Collected rosbags to build maps using LIO-SAM for optimal pathfinding across campus.
 - Motion Planning: From the map created from SLAM algorithm, we used RRT* for global planner to create waypoints for the robot and converted them with respect to point cloud map, and utilized a local planner for navigation.
- July 2023 - Present

Research Area: Autonomous Global Navigation

Projects

- Robotic Perception :: Ground Detection using Semantic segmentation : Trained a UNet-based DL model on a live local dataset to detect the ground plane for autonomous driving with 99.1% efficiency.
- Deep Learning and Artificial Intelligence :: Brain Tumor Classification : Achieved 98% accuracy in MRI classification by training DL models (ResNet and MobileNet) for medical image analysis and diagnosis.
- Autonomous Robotics :: Differential drive Robot: Developed Baron, powered by Raspberry Pi to retrieve objects by localization and tracking using motor encoders and cameras to reduce operation time by 65% .
- Learning Visual Attention as Affordance Cues from Demonstrations for Robotic Grasping : Employed cognitive deep neural networks to enable a robot's grasp of objects by learning affordance cues through imitation from human demonstrations. Mitigated the challenges of long horizon tasks by dividing them into manageable subtasks, facilitating the imitation learning process.

Skills Summary

- Languages: C++, C, Python, R, MATLAB, HTML, CSS3
 - Frameworks: ROS, ROS2, OpenCV, Tensorflow, Pytorch, Numpy, Scipy, Pandas, Pybullet, Seaborn, pcl, open3d, NDT, GICP, teaser++
 - Tools: Gazebo, RViz/Rviz2 , Solid Works, CNC, ANSYS, Git, Jira, LABVIEW, Simulink
 - Platforms: Linux, Web, Windows, Arduino, Raspberry Pi, Mac OSX

Training and Certification

- Tensorflow Developer
 - Courses: Natural Language Generation, LSTM , RNN,CNN, Time Series, Image Processing
- Tensorflow.org
Sept 2023

Other Projects

Electric Bike: Managed a 25-member cross-functional (product, engineering, support) team and coordinated with six professors and professionals toward the successful manufacturing two variants of electric vehicle for inter-collegiate competitions. Received first place in the endurance category in the FORMULA 9 competition and received first place in the acceleration and braking categories in the COC competition.

Automated mail delivery Bot: Designed and developed an autonomous mail delivery robot. Integrated IR, ultrasonic and cameras to enable the robot to navigate and follow lanes, resulting in accurate and reliable mail delivery.

Industrial Fabric Folding Bot: Built a fabric folding bot which uses a pneumatic system. Sensors and controller used: IR sensor and Arduino