SAI SIDDARTH NICHENAMETLA

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EDUCATION

Master of Science, August 2022 – December 2023

- **Engineering Science (Robotics),** University at Buffalo, The State University of New York, GPA: 3.519/4

Bachelor of Technology, August 2017 - July 2021

- **Mechanical Engineering,** Jawaharlal Nehru Technological University-Hyderabad, India, GPA: 7.66/10

SKILLS & TOOLS

Programming Languages: Python, TensorFlow, Keras, Pytorch, OpenCV, Linux, Robotic Operating System (ROS), Structure from Motion (SFM), AWS, SQL, MATLAB – Workspace, Simulink, CoppeliaSim (V-rep), Gazebo
Automation & Hardware skills: PLC, Pneumatics, Allen Bradley, VBuilder, Cognex Vision Sensors, Fanuc Robot Programming, UR Robot Programming
CAD: AutoCAD, Catia V5, SolidWorks-CSWP, Ansys, Autodesk Sketchbook, NX CAD, Autodesk Fusion, 3D Printing and Scanning
Technical Skills: Microsoft Office

WORK EXPERIENCE

Research Scholar, Human in Loop Systems Lab, University at Buffalo-SUNY, Buffalo, NY: January 2024 – Present

- Focusing on autonomous vehicles, particularly driverless trucks, developed a fail-safe system enabling virtual control through steering controllers, using the BeamNG.tech simulator with Python for realistic environment simulation.
- Designed and implemented a deep learning neural network capable of identifying traffic signs, and other entities, utilizing a media-pipeline alongside TensorFlow, Keras, and OpenCV APIs for comprehensive image recognition.
- Successfully deployed a UR5 robot integrated with a Programmable Logic Controller (PLC) to oversee a conveyor belt system, employing Cognex vision and laser sensors for innovative industrial automation applications.
- Spearheaded the development of a cutting-edge application in industrial automation, focusing on packaging, segregation, and dynamic pick-and-place operations, showcasing my expertise in robotics and industrial automation technologies.

Manufacturing Automation Engineer, Xylem, Buffalo, NY: September 2023 – December 2023

- Spearheaded the design and implementation of an automated production line for manufacturing of compact coolers utilizing Fanuc Robots and Fanuc m710ic/45 robot for simulation purposes using python.
- This integration of welding, testing, painting, and curing processes significantly enhanced productivity, assembling, and operating machinery, reducing manufacturing time to 45 minutes, and reduced manual labor requirements by 85%.
- Engineered a sophisticated motion planning algorithm with an automatic tool switching feature, significantly improving operational safety, and reducing machinery collision risks which led to safer, and more efficient production workflows.
- Directed the integration of conveyor belt systems and hardware with PLC programming, achieving seamless automation and synchronized operations across the production line that significantly optimized efficiency and minimized downtime.

Assistant Systems Engineer, Tata Consultancy Services, Hyderabad, Telangana, India: October 2021 – May 2022

- Served as an SAP Fiori Security Consultant, overseeing management and optimization of EAS tasks (enterprise application system) within SAP Fiori application, with a particular emphasis on assignment of roles and access controls.
- This role involved the meticulous allocation of system privileges and the safeguarding of application data integrity.
- Crafted and implemented comprehensive protocols for creation of security roles and testing of applications. This process included defining access permissions, establishing security guidelines.
- This responsibility entailed the precise configuration of access rights, the maintenance of user permissions, and the preparation of applications for further processing, thereby enhancing overall system security and functionality.

Engineer- Intern, Uniscient Engineering Private Limited, Hyderabad, Telangana, India: May 2019 – July 2019

- Specialized in designing a range of heat exchangers tailored to specific customer requirements using Catia V5 and SolidWorks, ensuring precise and functional product development from initial concept to final design.
- Conducted comprehensive Computational Fluid Dynamics (CFD) simulations and thermal analyses using Ansys, incorporating Finite Element Analysis (FEA) to evaluate and optimize heat exchanger performance under various operational conditions.
- Finalized and prepared detailed product drafts and documentation in AutoCAD, ensuring accuracy and adherence to engineering standards, facilitating a smooth transition from design to manufacturing.

ENGINEERING PROJECTS

***Advanced Computer Vision System for Traffic Sign Recognition for Autonomous TurtleBot Navigation,* 2024:** Python, OpenCV, CNN, TensorFlow, Keras, ROS, Linux

- Engineered a ROS-integrated computer vision system within the Real Robot in simulated environment, enabling detailed insights into navigation and object recognition through the detection of various road elements and pedestrians.

- Achieved remarkable classification accuracy (98.83% training, 96.05% validation) on traffic sign recognition by developing and fine-tuning a CNN model with a meticulously labeled image dataset, focusing on critical signs like speed limits and pedestrian crossings.
- Streamlined the image processing pipeline by establishing a ROS node for real-time image capture via TurtleBot's camera, coupled with a Python script for precise traffic sign prediction, further refining model efficacy through hyperparameter adjustments and performance tracking to reach a 96.04% success rate.

***Intelligent Radar based Autonomous Navigation for TurtleBot,* 2024:** Python, ROS, Linux

- Designed and deployed a neural network-based control system for a TurtleBot equipped with a trio of radars, achieving autonomous navigation within circuit environments with a remarkable accuracy rate of 98.9%.
- Utilized radars for precise obstacle detection and distance measurement, enabling the robot to dynamically adjust its path in real-time, ensuring efficient and uninterrupted circuit navigation.
- Implemented strategic logic within the control system to optimize the robot's movements based on environmental feedback, significantly reducing collision risk, and enhancing pathfinding efficiency across multiple circuits.

***Collision Avoidance and Path Planning,* 2023:** MATLAB, CoppeliaSim (V-rep)

- Adapted autonomous vehicle collision avoidance concepts to engineer path and motion planning algorithms for a Powerball robot manipulator, enabling it to navigate around both static and dynamic obstacles using Probabilistic Road Maps (PRM) and Temporal Probabilistic Road Maps (T-PRM) with A* search.
- Developed three path planning algorithms: RRT, A* search, and Dijkstra's algorithm for static obstacle avoidance and compared them with dynamic cases, concluding that A* search demonstrates the most potential when combined with T-PRM.
- Enhanced obstacle prediction accuracy by incorporating a vision system and Kalman filter into the system, achieving a 70% success rate in dynamic obstacle avoidance scenarios.

***Emotion, Age and Gender Recognition,* 2023:** MATLAB, Python, OpenCV

- Crafted a linear classifier for precise identification of characteristics including gender, age, and emotion, utilizing inherent feature-extraction functions.
- Discovered a positive correlation between enlarged training dataset size and recognition accuracy, achieving 97% accuracy in gender detection, 90% in age, and 51% in emotion recognition.
- As the dataset contains images of the same individuals in different situations, we developed a K-means clustering algorithm to categorize similar faces by detecting features and facial encodings, achieving 100% accuracy, attributed to comprehensive utilization of unique features processed by OpenCV library.

***Gesture Recognition,* 2023:** MATLAB

- Designed a sophisticated gesture recognition system by extracting Rubine features, with weight derivation from collected training data via MATLAB GUI enhancing linear classification and accurately differentiates gestures.
- Boasted a 98.9% accuracy rate in comparing the test data against the training data, showcasing the systems for applications such as gesture-based control systems.
- As part of my study, I refactored the $1 classifier for gesture recognition. This modification emphasizes specific start and end points crucial for the algorithm, which are used to calculate features.

***Stereo Visual Odometry,* 2023:** Python, Robotic Operating Systems (ROS), Linux, OpenCV, Structure from Motion

- Engineered a Stereo Camera framework to achieve advanced visual odometry for precise 3D pose retrieval, focusing exclusively on the odometry dataset. This project was developed from scratch using computer vision techniques, OpenCV, and NumPy.
- Performed visual odometry entirely using computer vision techniques to accurately estimate the trajectory of the stereo camera setup. This approach enabled the precise tracking of vehicle movement through complex environments without relying on sensor fusion methods.
- Utilized advanced camera calibration and feature extraction methods to enhance the accuracy and reliability of odometry calculations utilizing RANSAC, achieving a significant improvement in performance and providing a robust foundation for autonomous vehicle navigation systems.

Markov Localization and Path Following for Autonomous Navigation, 2023: MATLAB, Python, Linux, ROS

- Devised a Markov localization within a SLAM suite using MATLAB in 2023, significantly enhancing robot state estimation by integrating sensor data with motion models. Validated through extensive simulations, demonstrating robustness and dependability.
- Incorporated PID and Pure Pursuit control techniques into a Linux-based ROS framework to improve autonomous navigation, focusing on advanced path tracing and motion planning.
- Applied the combined localization and control system to a F1tenth autonomous race car, showcasing adaptability and achieving an exceptional error margin of 0.2 meters, illustrating precision in robotic path following.

***All-Terrain Vehicle,* 2020:** SolidWorks, Catia V5, Ansys, NX CAD, AutoCAD, Lotus, MSC ADAMS

- Modelled an all-terrain vehicle 3D modeling software, conducted FEA analysis in Ansys, and static and dynamic analysis via ADAMS.
- My manufacturing support, particularly in vibration mitigation, CNC machining, welding, and fabrication boosted my project management expertise.
- Created a detailed bill of materials, a technical presentation, and carried out cost and sales analysis, and vehicle was displayed at SAE BAJA 2020, showcasing my leadership in the college's SAE club as an executive council member.