Venkata Sai Sricharan Kasturi

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EDUCATION

University of Maryland, College Park, MD — January 2023 - December 2024
Master of Engineering in Robotics — GPA: 3.53/4.0

Guru Nanak Institutions Technical Campus, Hyderabad, India — July 2018 - July 2022
Bachelor of Technology in Mechanical Engineering — GPA: 8.35/10

SKILLS

Programming Languages: Python, C++, CUDA, Bash, JavaScript, HTML/CSS, MATLAB
Development & Platforms: Git, GitHub, Linux, Docker, CI/CD, Jupyter Notebook, CMake, Raspberry Pi, Arduino IDE, Windows
Robotics & Control: ROS1/ROS2 (MoveIt, RViz, Gazebo, URDF), SLAM, PID, Kalman Filtering, System Modeling, CARLA
AI & ML: YOLO, Reinforcement/Transfer Learning, CNN/RNN, Supervised/Unsupervised Learning, Clustering, PCA, t-tests
Frameworks & Libraries: PyTorch, TensorFlow, Keras, OpenCV, scikit-learn, NumPy, pandas, Matplotlib, Eigen
CAD & Simulation: SolidWorks, MATLAB/Simulink, ANSYS, Autodesk Inventor, Creo, AutoCAD
Sensor & Embedded Systems: LIDAR, Depth Cameras, IMU, Encoders, Ultrasonic Sensors, PCB Design
Software: Microsoft Office (Excel, Word, PowerPoint), Google Workspace (Docs, Sheets, Slides), Adobe Photoshop

WORK EXPERIENCE

Design Intern — Hyderabad, India
South Central Railway — April 2021 – July 2021

- Designed and analyzed critical railway components, including engine parts, wheels, outer body structures, and brake systems, to enhance performance and efficiency through innovative design solutions.
- Conducted comprehensive evaluations using industry-standard software such as SolidWorks, Simulia, and ANSYS, ensuring precision and reliability in component analysis.
- Gained hands-on experience in railway system design, effectively bridging theoretical concepts with practical applications for optimized system performance.

Perception Intern — Hyderabad, India
XMachines — May 2023 – December 2023

- Specialized in computer vision, machine learning, and AI for Precision Agriculture, Manufacturing Automation, Solar Power Plant Management, and Robotics Research, achieving a 25% efficiency improvement in precision agriculture and material handling automation.
- Collected and processed data using lidar, stereo cameras, and proximity sensors, enhancing AI-based robot and autonomous platform accuracy by 20%, and reducing solar power plant inspection time by 30% through advanced AI deployment.
- Demonstrated strong problem-solving skills and technical expertise in applying advanced computer vision and AI techniques to real-world applications, driving innovation across diverse industries.

PROJECTS

DQN-Based Autonomous Navigation System | *PyTorch, Keras, CNN, DQN, Path Planning, Reinforcement Learning, Gazebo, ROS2*

- Designed and implemented a Deep Q-Network (DQN)-based autonomous navigation framework in ROS2 and Gazebo, achieving a 25% reduction in collision rates and a 20% improvement in navigation success in dynamic, obstacle-filled urban simulations.
- Enhanced training stability and policy optimization with prioritized experience replay, dueling network architecture, and target network updates, processing high-dimensional inputs such as scaled RGB camera images and LIDAR data, and achieving 90% success in trajectory optimization across 100+ simulation experiments.
- Developed and fine-tuned reward functions incorporating environment-specific feedback, accelerating convergence by 15% and improving trajectory adherence accuracy by 10% for complex navigation tasks in dynamic urban environments.

Improved Bi-directional RRT* for Robot Path Planning | *Turtlebot3, Gazebo, A*, Dynamic Window, Sensor Fusion, ROS2, Matplotlib*

- Engineered and optimized the Double Tree RRT* algorithm, achieving a 62% reduction in computation time and a 35% decrease in path length compared to traditional RRT*, facilitating efficient path planning in complex environments with a 30% improvement in convergence speed during real-time ROS and Gazebo simulations.
- Integrated SLAM with LIDAR data to produce occupancy grid maps with 95% mapping accuracy, ensuring precise localization and effective obstacle avoidance with a 200mm clearance, while demonstrating seamless adaptability to dynamic environmental changes.
- Validated the algorithm on a TurtleBot3 Burger robot, achieving a 98% success rate in navigating unknown environments and reducing path planning failure rates by 40%, ensuring robust performance in real-world scenarios.

Integrated Obstacle Recognition and Autonomous Navigation System | *SLAM, YOLOv8, OpenCV, Raspberry Pi, Embedded Control*

- Led a team of 5 to design an autonomous differential drive robot with real-time pick-and-place functionality, achieving 92% detection accuracy and reducing YOLOv8 training time by 15% through mosaic augmentation and custom datasets, while ensuring 98% reliability in odometry estimation and precise motion control with closed-loop feedback.
- Integrated multi-sensor fusion (RGB camera, IMU, encoders, and ultrasonic sensors) with landmark-based SLAM, enhancing navigation precision by 30%, enabling dynamic trajectory adjustments in complex environments, and achieving 92% path-following accuracy with stable 10 FPS obstacle recognition.

- Developed a multi-threaded system on Raspberry Pi for concurrent sensor processing and motor control, reducing task execution time by 25% through optimized path planning and autonomous recalibration, with sensor data latency under 50ms and a 35% reduction in trajectory deviations during experimental validation.

Mobile Manipulator Robot Design & Control | *ROS2, MATLAB, SolidWorks, UR10, LIDAR, URDF, Kinematics, Dynamics, Gazebo*

- Designed and implemented a 6-DOF mobile manipulator combining a UR10 arm with a differential drive, achieving a 20% enhancement in load stability through optimized chassis design and steerable L-joints, with 98% pick-and-place accuracy (±1 mm) using Denavit-Hartenberg parameters and Jacobian-based trajectory planning.
- Developed ROS2-based navigation integrated with LIDAR fusion, enabling precise real-time control with 20ms latency, validated in Gazebo simulations for high-precision industrial tasks in complex environments.
- Optimized end-effector functionality by transitioning to a vacuum gripper, increasing grasp reliability by 25% and reducing task execution errors, resulting in a 30% improvement in motion stability during manipulative operations.

LQR and LQG Controllers for Dual-Load Crane System | *MATLAB, Kalman Filtering, System Modeling, Lyapunov Stability*

- Developed and implemented LQR and LQG controllers for a dual-suspended load crane system in MATLAB, reducing oscillations by 30% and improving response time by 25% using Lyapunov stability analysis, with robust stability under disturbances up to 10% of input force.
- Conducted 100+ simulations on linear and nonlinear models, utilizing Kalman filtering to achieve 98% trajectory tracking accuracy under ±15° displacements and 15% load variations, reducing state estimation noise by 5% in low signal-to-noise environments.
- Designed state-space representations and derived system dynamics using Euler-Lagrange equations, ensuring controllability and observability for varying load configurations, with validated precise control in challenging operating conditions.

My Derma: Mobile Deep Learning for Skin Cancer Detection | *TensorFlow Lite, ResNet-50, InceptionV3, DenseNet201, Flutter*

- Designed an ensemble deep learning model combining ResNet-50, InceptionV3, DenseNet201, and MobileNetV2, achieving 97.15% test accuracy and 98.46% validation accuracy on the HAM10000 dataset, with advanced data augmentation, weighted sampling, and an F1-score of 0.99 for melanoma detection.
- Deployed the model as a TensorFlow Lite application with a Flutter-based mobile interface, reducing latency by 30% through model compression and quantization, enabling real-time skin cancer diagnostics across seven lesion types.
- Conducted ablation studies, hyperparameter optimization, and implemented SMOTE for class imbalance resolution, enhancing model robustness and improving computational efficiency by 25% compared to baseline methods.

Machine Learning for Bearing Fault Diagnosis | *MATLAB, Predictive Maintenance, Time-Domain and Frequency-Domain Features*

- Developed an advanced bearing fault diagnosis system using machine learning models (SVM, SOM, RF, and KNN), achieving up to 100% classification accuracy across eight fault scenarios through optimized feature selection and training, with average accuracies exceeding 99.9% validated via 5-fold cross-validation.
- Extracted and analyzed time- and frequency-domain features (RMS, kurtosis, harmonic factors) to precisely identify roller, inner-race, and outer-race defects in SKF tapered roller bearings, ensuring robust diagnostic performance across diverse fault combinations and operating conditions.
- Reduced computational complexity by 20% through Random Forest-based feature importance analysis while maintaining diagnostic precision, validating results with confusion matrices and F1-scores for consistent fault classification accuracy.

Chatter-Free Sliding-Mode Control with Disturbance Rejection | *MATLAB, State Observers, First-Order and Second-Order Systems*

- Implemented a discrete-time sliding-mode control system using the implicit Euler method, achieving chatter-free stabilization and reducing disturbance effects proportional to the sampling time, validated across 100+ MATLAB simulations with trajectory tracking accuracy exceeding 98%.
- Designed controllers for first- and second-order perturbed systems, achieving a 30% improvement in system stability under disturbances up to 10% of input force, while integrating advanced state observers and disturbance compensation to reduce tracking error by 20%.
- Conducted performance analysis against classical and twisting sliding-mode controllers, achieving 25% faster response times and superior disturbance rejection using zero-order-hold (ZOH) methods for nonlinear systems in discrete-time domains.

ACTIVITIES

Robotics President Hyderabad, India
Team Roboccon, ***Guru Nanak Institutions Technical Campus*** 2020 - 2022

- Runner-up in the Inter-College Robotics Competition (Pick and Place) "Robout-2k19" and finalist in Aliens Tech-Robo Competition (ATRC); participated in multiple Roboveda events including Robo Soccer, Robo Sumo, Tug of War, and Drone competitions at Sreenidhi University and BITS.
- Served as President of Team Roboccon, mentoring and training over 50 students while demonstrating strong leadership in robotics projects and competitions.

CERTIFICATIONS

A Deep Understanding of Deep Learning - *Udemy* October 2024
Aerial Robotics – *Coursera-Upenn* June 2023