CHARMIN PRITESH DESAI

+1(716)-614-2519 | desaicharmin@gmail.com| LinkedIn | GitHub | Buffalo, NY, USA

EDUCATION

The State University of New York at Buffalo (UB)   **Buffalo, New York, USA**
  ➢ Master of Science in Robotics (Robotics & Artificial Intelligence)   Aug 2021 – May 2023
  ➢ CGPA : 3.22/4

Sardar Vallabhbhai Patel Institute of Technology (SVIT)   **Vasad, Gujarat, India**
  ➢ Bachelor of Engineering in Instrumentation & Control (Industrial Automation)   Aug 2016 – Aug 2020
  ➢ CGPA : 8.15/10

SKILLS

Programming Languages: Python, C , C++, Embedded C, MATLAB & Simulink, Ladder Logic
Hardware: PLC, PID Control, Electrical, Electronics, Embedded Systems
Software: Machine Learning, Computer Vision, Image Processing, Robot Algorithms, ROS, Gazebo
Libraries: NumPy, Pandas, Matplotlib, OpenCV, TensorFlow, Sklearn, Keras

WORK EXPERIENCE

Programming   **2016 – 2023**
  ➢ 3 years of total experience in Python on ROS, Machine Learning, Computer Vision, and Data science.
  ➢ 6 years of total experience in C/C++ on Embedded Systems and 1 year with Assembly, Embeddd C.
  ➢ 1 year of experience with Ladder Logic (PLC Automation).

University at Buffalo : Teaching Assistant   **Feb – May 2023**
  ➢ Conducted lectures on mathematical modelling of robot mechanisms and LABs on 6-DOF Jetmax Robot Arm.
  ➢ Simulated the robot on ROS-Gazebo and ran robot hardware via ROS-1 commands and programs.
  ➢ Calibrated different end-effectors and interfaced different sensors to the robot arm.

Tara Mechons Pvt. Ltd. : Automation Intern   **Apr 2020**
  ➢ Devised an Automatic Turn-Off Electrical Cutting System for operator safety in a team of 4 members.
  ➢ Interfaced 4-pole relay contactor to 3-phase induction motor that energized it.
  ➢ Designed the control circuit such that upon the pull and release of the lever arm the electrical machine turned ON and OFF respectively.

Larsen and Toubro : I&C Intern   **Jun 2019**
  ➢ Engaged in Training on Industrial Instrumentation and Control Systems. Learnt about PLC, Ladder Logic, DCS, SCADA, industrial valves, and transmitters. Studied various motor starters. e.g., 2-3-4 point, VFD's, Soft and DOL.

Niyantras Automation : Automation Intern   **Dec 2018**
  ➢ Prototyped an Indoor Air Quality Monitoring System that operated on Arduino, MQ135, and MQ5 sensor modules to detect particulate matter, N_2O, SO_2, H_2, LPG, CH_4, CO, and alcohol.

PROJECTS (AUTOMATION & CONTROL)

Fanuc LR Mate 200-iD Robot Arm   **Sept – Nov 2021**
  ➢ Standardized position of 6-DOF robot manipulator's end-effector in base frame and world frame.
  ➢ Formulated calculations by Denavit-Hartenberg methodology and Forward Kinematics.
  ➢ Derived 6x6 Jacobian Matrix to generalize linear and angular velocities of end-effector.
  ➢ Chose Euler-Lagrange method to derive a mathematical model of 6-DOF unit.

PLC Automation (Silo Process)   **May 2021**
  ➢ Empty bottles run on 1 conveyor belt by a single-phase induction motor until identified by a photo-switch sensor.
  ➢ This halts the motor and starts a liquid filling apparatus for 3 seconds. Finally, the level sensor ends the filling.
  ➢ Conveyor is commenced again to fill new bottles; this repeated each cycle for 6 seconds.

PLC Automation (Batch Mixer Process)   **Feb – May 2018**
  ➢ Two pumps pour distinct fluids into 1 container until stopped by a high-level sensor. Then fluid mixture is heated and processed by a heater and spinning motor for a set timer of 30 seconds.
  ➢ Finally, an output valve opens, and a third pump supplies resultant fluid out in 10 seconds.
  ➢ Lastly, detected by low-level sensor, two pumps turn on again that repeat the cycle.

RTD Signal Conditioning Circuit   **Mar 2018**
  ➢ Designed and developed a signal conditioning circuit for temperature measurement.
  ➢ Connected RTD (PT100) temperature sensor to Wheatstone bridge and connected the output to IC741 Op-Amp.
  ➢ Calibrated the 0-100 °C range to 0-5 V output. Also developed its PCB through etching process.

Embedded and Automation   **2019 – 2021**
1. Invented miniature adapter to time any device/appliance from 1-99 minutes with automatic turn-off functionality.
2. Reconstructed an indoor automatic light system controllable in 4 ways (PIR/IR Remote/Phone/Ambient Light).
3. Prototyped an automatic water piping system which prevented water wastage and measured usage.

Wireless Speed Control of DC Motor   **Mar 2019**
➢ Interfaced a 12V high torque dc motor to NodeMCU microcontroller via BC548 transistor.
➢ Programmed the NodeMCU microcontroller board on Arduino IDE. Used Blynk APP to connect NodeMCU and controlled the motor speed through the APP.

PROJECTS (ROBOTICS & ARTIFICIAL INTELLIGENCE)

Autonomous Plant Watering Robot ([View](#))   **Sept 2022 – May 2023**
➢ **Objective :-** Developed an autonomous robot to work in an unknown environment. Facilitated by SLAM Gmapping to create occupancy grid. Used A* path planning to plan the shortest path. Utilized robot's own velocity and AprilTags for robot pose estimation and plant detection. Controlled the robot to navigate to plants.
1. **SLAM :-** Used Gmapping on a TurtleBot3 robot in ROS gazebo to generate an image of size 384x384 pixels.
2. **Occupancy Grid :-** Performed image processing to generate an occupancy grid matrix of 400x400 pixels.
3. **Path Planning :-** Used homogenous transformation method to formulate two opposite coordinate frame transformations from Gazebo world frame to occupancy grid frame and vice-versa. Optimized A* algorithm from scratch and planned a 95% improved shortest path for the robot.
4. **Perception :-** Deployed AprilTags in gazebo. Executed AprilTag continuous detection node to derive the transform from any AprilTag's frame to robot's camera frame and world frame.
5. **Localization :-** Calculated the pose of the robot in the world frame with almost 100% accuracy.
   a) Updated robot's pose from AprilTag detection by a ROS Server-TF Broadcaster & Client-TF Listener node.
   b) Updated robot's pose using its own linear and angular velocity through trigonometric calculation.
6. **Recognition :-** Programmed a mathematical algorithm which estimates the true position of a plant from continuously updated robot's pose and robot to plant transform.
7. **Exploration :-** Robot explores the environment parallelly searching for plants to save their position in its memory.
   a) Programmatically came up with random points in the occupancy grid for robot exploration.
   b) Implemented K-Means Clustering algorithm with A* planning as a distance metric to cluster the points.
8. **Navigation & Control :-** Executed a controller node, driving the robot 80% faster from start to goal/plant location.
9. **Plant Watering :-** Enabled the robot navigating a shortest path for watering all the plants in least time.

Face Detection and Clustering   **May 2022**
➢ Implemented Face Detection on 100's of images using OpenCV and Python using Haar Cascade.
➢ Used KMeans Clustering algorithm to cluster the detected faces, an achieved a F1 score > 0.81 on test dataset.

Neural Network on Income Dataset & CNN on Fashion-MNIST Dataset   **April 2022**
➢ A Neural Network was built on income dataset of size 32500 to predict a person's income. An accuracy of 85.60 % was achieved though Hyperparameter Tuning for NN model optimization.
➢ CNN was built on Fashion-MNIST dataset of size of 70000 images to predict the item type. Accuracy of 92.05 % was achieved through Hyperparameter Tuning for CNN model optimization.

Wall Detection and Motion Planning (ROS)   **Mar – Apr 2022**
➢ Implemented RANSAC algorithm for a mobile robot to detect walls in an environment from laser scanner data.
➢ Performed motion planning with Bug2 algorithm from utilizing data passed by RANSAC node.

House Pricing Prediction (Linear Regression) and Gender Prediction (Logistic Regression)   **Feb - Mar 2022**
➢ Analyzed data to forecast house prices in Boston based and achieved 94.8 % accuracy using linear regression.
➢ Made analysis on a penguin dataset for gender identification using logistic regression with 91% accuracy.