

EDUCATION

- **Nirma University, Institute of Technology** Ahmedabad, India
Bachelor of Technology in Mechanical Engineering; CGPA: 8.12/10 Aug. 2015– May 2019
- **Shiv Jyoti Higher Secondary School** Kota, India
Higher Secondary; Percentage: 92.2 May 2013 – May 2015

RESEARCH EXPERIENCE

- **Indian Institute of Science, Bangalore** June 2019 - Present
Research Intern and Teaching Assistant (Robert Bosch Center for Cyber Physical Studies) Prof. Raghu Krishanpuram
 - **Team Vision and Machine Learning for Mohamed Bin Zayed International Robotics Challenge (MBZIRC) 2020:** Working on navigation and autonomy of drones in GPS denied environment as a part of the IISC-TCS collaboration for [MBZIRC 2020](#)
 - [Video of the project](#)
 - **Visual SLAM:** Improved robustness and working of ORB-SLAM 2 for smoke occluded environments by introduction of penalising co-efficients other than reprojection error. Created a image dehazing pipeline for the algorithm to work more accurately
 - **Google Cartographer:** Implemented and tuned the Google Cartographer using LIDAR data and IMU feed on different datasets for improving accuracy and processing for real world applications
 - **Indoor Localisation of Turtlebot3:** A ROS package was coded and implemented on the bot to perform Visual SLAM using markers in indoor environments and performing Bundle Adjustment on recognising loop closure
 - **Teaching Assistant for the course Autonomous Navigation(CP 313)**
- **CAIR(Center for Artificial Intelligence and Robotics),DRDO,Bangalore** Jan 2019 - May 2019
Research Intern (Intelligent Systems and Robotics Division) Dr. Shubhashisha Sahoo
 - **Robust Outdoor Navigation of an Unmanned Ground Vehicle(UGV):** Aim of the project was to autonomously navigate and map an unstructured outdoor environment through a UGV using pose-graph optimisation techniques
 - **Sensor Fusion:** Streams of sensor data from GPS, Monocular camera and LIDAR were fused using Extended Kalman Filter to increase the robustness of navigation.
 - **Map stitching:** Map stitching using a RGB-D camera was implemented on the platform facilitating surveillance for soldiers
 - **Trajectory Planner for an undercarriage scanning robot:** A geometry based trajectory planner was devised and implemented for scanning the undercarriage of a given car using position of wheels from monocular camera given input from a HMI display by user
- **ICreate, Ahmedabad** June 2018 - July 2018
Research Engineer(Startup:Probot C2) Founder:Denim Patel
 - **Underwater Tank Cleaning Robot:** Aim of the project was to design, control and fabricate various modules to aid autonomous cleaning of a water tank
 - **Differential Pan and Tilt Module:** Designed and Fabricated a pan and tilt module using the concept of differential gears with the fast spraying nozzle as an end effector for uniform spraying of chemicals and water facilitating a more dexterity in work space
 - **Control and Actuation:** The gears of the module were actuated using stepper motors who were in turn controlled by an micro controller for which an control algorithm was devised and implemented
 - **Self propelled rotary water spraying mechanism:** A rotary water spraying module was designed and fabricated for concentrated cleaning of a circular patch of tank
 - [Video link of the project](#)
- **Visvesvaraya National Institute of Technology (VNIT), Nagpur** June 2017 - July 2017
Research Intern(Innovation and Robotics lab) Dr. Shital Chiddarwar
 - **Manual garbage collecting robot:** Aim of the project was to design a low cost ,human powered robot which can be mass manufactured for aiding the sweepers in cleaning of the campus.
 - **Design:** The chassis had 2 wheels and a handle bar extended to human height for pushing the robot. Bevel gears attached to the wheels were connected to 2 front downward facing horizontal brushes pushing the garbage to a main rotary brush which in turn pushed it in a bin at the back of the robot.

RESEARCH PROJECTS

- **Remote controlled Modular Snake Robot**
 - A modular snake robot was conceptualised and designed from scratch in Fusion 360 which was fabricated using rapid prototyping techniques whose gaits were tested in various arenas modelled in V-REP
 - The movement of the snake was controlled using a custom made remote control with an NRF module, Joystick and on board micro controller
 - Optimal Serpentine gaits for various scenarios were implemented by varying the frequency and amplitude of the trajectory generating sine curve
 - [Video link of the project](#) [Video Link of Simulation](#)
- **Custom made non-holonomic robot for benchmarking SLAM algorithms (Simultaneous Localisation and Mapping)**
 - A differential drive robot equipped with wheel encoders. on board compute, Kinect Camera was made for the purpose of benchmarking different SLAM algorithms namely RTAB, LSD SLAM and ORB SLAM
 - Full navigation stack was implemented on the robot for tracking a given set of way points with dynamic obstacle avoidance
- **Delta Robot**
 - Design and Fabrication of a parallel type robot as part of an assignment in Robotics
 - Inverse and forward kinematics of the robot were implemented and visualised in MATLAB.
- **Fuzzy Logic Controller for Self Driving Car**
 - Worked on developing a very basic fuzzy logic model for an autonomous car and implemented in MATLAB using the Fuzzy Logic Toolbar.
- **Thermal Battery Belt**
 - Envisaged the idea of Thermal Battery Belt, which used PCM (Phase changing material) for storing heat as a portable source of energy , to overcome the scarcity of conventional sources of energy in remote areas.
 - [Video link of the project](#)

ACHIEVEMENTS

- **[E-Yantra Robotics Competition](#)**: Made it to the **top 10 teams in the semi finals of the E-yantra robotics competition among 1000 teams** that participated for designing the **modular snake robot**, sponsored by MHRD and conducted by IIT Bombay
- **[Shell Ideas Challenge 360](#)**: Selected for the 2nd stage of the Shell Ideas 360 challenge for conceptualization of thermal battery belts and were among **top 72 teams in the 1500 teams that participated from colleges all over the world with the likes of NUS and MIT**

PROGRAMMING SKILLS

- **Deep Learning Framework**: PyTorch, TensorFlow
- **Languages**: C, C++, Python, Embedded C
- **Simulator**: AirSim, Carla, Gazebo, V-REP
- **CAD Modelling Software**: SolidWorks (CSWA certification) , Fusion 360
- **ROS**

RELEVANT COURSEWORK

- **Robotics, Deep Learning, Computer Vision, Autonomous Mobile Robots ,Control of Mobile Robots, Linear Algebra, Multi-Variate Calculus**