# DEEP PATEL

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## EDUCATION

**Birla Institute of Technology and Science, Pilani** Pilani, India
Bachelor of Engineering in Mechanical || GPA: 8.28/10.00 Jul 2022
*Selected Coursework:* Internet of Things, Computer Programming, Applied Statistical Methods, Power Plant Engineering, Symbolic Logic, Linear Algebra and Complex Analysis, Differential Equations, Applied Calculus

## RESEARCH EXPERIENCE

**RRC, International Institute of Information Technology - Hyderabad** Hyderabad, India
Research Intern – *Grasping and perching mechanism for Drones* Jun 2021 - Mar 2022

- Designed a multi-functional gripper for drone which can grasp objects (8cm to 20cm diameter), perch passively onto a support and act as a landing gear for drone.
- Optimized the gripper fingers for high grasp strength and workspace and implemented the motor control using ESP8266.
- Fabricated 2 prototypes ground-up by 3D-printing and laser cutting, capable of lifting 1.2kg payload during flight.
- Achieved adaptive landing for inclined terrain and passive perching on cylindrical supports in the several experiments performed for functionality and mathematical model validation.
- 1st authored research paper under preparation for IEEE Robotics and Automation Letters (RA-L).

## PROFESSIONAL EXPERIENCE

**Robotics Software Developer** Aug 2022 - present
Vimaan.ai – *Geometric Vision team* Bengaluru, India

- Integrated 2D Cartographer SLAM with fiducial marker (ArUco) detection to get reliable odometry source crucial to get location information for mobile platform products used for inventory counting. Achieved location accuracy within 10cm.
- Diminished developer's Root Cause Analysis (RCA) workload by 20% through the implementation of a module. This module flagged and halted the processing of faulty data in the pipeline.
- Developing the core software for industrial pallet dimensioning of high business value in a team of 3. Overseeing the testing, deployment, and operational aspects of software delivered.
- Implemented health monitoring to increase reliability and automated the sensor calibration for the industrial pallet dimensioning product which reduced the setup installation time from 1 week to 2 days.

**R&D Intern** May 2020 - Jun 2020
Adani Power Ltd. (Remote) Ahmedabad, India

- Conducted CFD analysis using ANSYS Fluent, for corroded condenser water piping; the results analytically showed root cause as erosion at bends due to particulate matter in seawater.
- Recommended an alternative coating from the market to mitigate erosion, aiming to decrease the erosion rate identified in the analysis.

## PROJECTS

**Semantic Mapping for Indoor SLAM** Jan 2022 – Apr 2022
Embedded Systems and Robotics Lab. (Inspire Lab), BITS Pilani Pilani, India

- Mapped indoor features such as room numbers, doors, windows, and elevators within a 3D SLAM map using a Kinect depth sensor. This contribution was to enhance 3D map with semantics which can be used for indoor guide robot for visually impaired individuals.
- Accomplished plane segmentation from depth images utilizing RANSAC, effectively integrating object markers into the 3D indoor map.

**Quadruped Robot** Sep 2019 - Nov 2020
(Robotics Team) ROBOCON, BITS Pilani Pilani, India

- Developed a simulation of a trotting quadruped robot in Gazebo ROS. The project raised INR 200k (USD 2400) in funding from BITS Alumni Association (BITSAA) for prototyping.
- Implemented five gaits and leg kinematics in Python, making the robot fully capable of stable motion within a range of variable speeds based on MIT Cheetah research – 'High speed Trot Running'.
- Performed mechanical design analysis to choose the right motors and calculate the payload capacity. Additionally designed a gripper mechanism to hold payloads.
- Created a smooth trajectory for each footstep using Bezier curves and architected the overall control flow for walking in ROS.

**Flipkart GRID 3.0 Robotics Challenge - competition** Sep 2021 - Oct 2021
BITS Pilani Pilani, India

- Implemented A* search path planning algorithm for 4 mobile robots controlled centrally in a leader-follower configuration for a relay race.
- Achieved both dynamic and static obstacle avoidance by developing a custom path planning algorithm merging A* search and Artificial Potential Fields (APF) to navigate 4 mobile robots.

**Smart Traffic Management** Feb 2021 - Apr 2021
Internet of Things – course project, BITS Pilani Pilani, India

- Implemented object detection and segmentation using transfer learning with YOLOv4 model to determine traffic density at a road crossing along with emergency vehicle detection.
- Built a webpage to show live traffic data with vehicle count plot and Google maps location on a Flask backend.
- Successfully demonstrated reduced traffic signal waiting time on lanes with high traffic and/or emergency vehicles.

**Conservation of water in cooling towers** Aug 2020 - Dec 2020
Semester project, BITS Pilani Pilani, India

- Analyzed water vapor trajectory inside cooling towers using particle tracking in ANSYS DPM enabling better understanding of effect of drift eliminators on rising vapors.
- Identified the most optimized design with increased efficiency by conducting a comparative CFD study on various geometrical parameters of a wave plate drift eliminator.

**Tethered Quadcopter – Reel Mechanism** Mar 2019 - Apr 2019
(Robotics Team) ROBOCON, BITS Pilani Pilani, India

- Designed a compact reeling mechanism in Fusion 360 which can hold up to 30ft of power cable rounds for power supply of a tethered drone. using constant force spring to ensure a constant payload.
- The reeling mechanism used a constant force spring with gear box to ensure constant tension in the tether with minimal payload addition to the drone.

## SKILLS

**Programming Languages:** Python, C/C++
**Software:** Solidworks, Fusion 360, MATLAB, Ultimaker Cura, Gazebo, Git, Docker
**Libraries:** Robot Operating System (ROS), OpenCV, NumPy, Pandas, Scikit, Tensorflow
**Computing Environments:** Linux, Arduino, Raspberry Pi, NVIDIA Jetson
**Other:** 3D printing, Laser cutting

## CERTIFICATIONS

**Robotics: Computational Motion Planning**, Coursera – University of Pennsylvania [certificate]
**Python for Everybody: Introductory course**, Coursera – University of Michigan [certificate]

## ACTIVITIES & LEADERSHIP ROLES

**Mechanical subsystem Head**, College Robotics Team (ROBOCON), BITS Pilani 2020 - 2021
**Coordinator – Arduino Workshop**, College Robotics Team (ROBOCON), BITS Pilani 2019