Hardik Shah

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Education

2019–Present **B.E. in Computer Science Engineering**, *BITS Pilani, Goa*, *9.76/10*.
Institute Rank 3 in a batch of 900 students;
Recipient of 4 consecutive BITS Goa Merit Scholarships – 100% tuition fee waiver.

Experience

Institution **Central Electronics Engineering Research Institute (CSIR-CEERI)** [May-Sept'21]
Machine Learning Research Intern
*Under **Dr. Madan Lakshmanan** (Senior Scientist, CEERI) and **Dr. Sandeep Joshi** (Asst. Prof, BITS Pilani)*

Project Title Subject State Classification System using PPG signals

Description Classification of a person as fatigued or non-fatigued based on PPG signals of a human subject. Conducted data preprocessing, benchmarking of classification algorithms, along with various feature extraction strategies and regularisation techniques. Achieved state-of-the-art accuracy of 86% with NN-based implementation.

Research Projects

Title **Unity ROS Integration for simulation of differential drive robots** [Jan-May'21]
Prof. Rakesh Warier, BITS - *Publication in progress.*

Description Designed a simulator for robot interaction in complex environments using Unity Game Engine and integrated with ROS. Benchmarked the performance of Unity and baseline simulator (Gazebo) in terms of accuracy, precision and physics. Set up SLAM(Simultaneous Localization and Mapping) and visualization of obstacles from Unity in RViZ; implemented Dijkstra's algorithm on the map for autonomous traversal of the bot.
Code: [SLAM], [UnityROS], [LiDAR Simulation]

Title **FastDepth++: Monocular Depth Estimation for Indoor Scenes** [Ongoing]
Prof. Sravan Danda and Prof. Aditya Challa, BITS

Description Devising Statistical Tests to validate hypotheses regarding depth data in indoor scenes. Designing CNN based architectures and supervised learning based approaches for real time depth map generation. Implemented an encoder-decoder model *FastDepth* in pytorch; working with Resnet, U-Net and MobileNet for encoding layers.

Title **Project Kratos** [Website] [2020 - Ongoing]
Autonomous Subsystem lead

Description Development of a mars rover as part of the University Rover Challenge (URC). Team lead of the Autonomous Subsystem, responsible for autonomous traversal. Simulated autonomous 2D path planning for 3D bots with ROS using A*, RRT*, Dijkstra's; testing on Unity Game Engine and Gazebo. Implemented YOLOv3, Mask RCNN algorithms, transfer learning for arrow detection and tested it on the real world using a robot to detect AR Tags and Arrows. Achieved ROS integration using darknet_ROS. [Code]

Title **Artpark Robotics Challenge** [Website] [2021]

Description Development of janitor bot, selected for stage 2: among top 28 teams out of 200+.

Technical Strengths

Languages	Python, C++, C, JAVA, C#, MATLAB, Latex, HTML, CSS
Softwares	Pytorch, Tensorflow, OpenCV, Unity Game Engine, Robot Operating System (ROS), Verilog, AutoCAD, Android Studio
Platforms	Windows, Linux(Ubuntu, PopOS)

Relevant Courses

CS Courses	Data Structures and Algorithms, Database Management, Object Oriented Programming, Logic in Computer Science
EE Courses	Digital Design, Microprocessors and Interfacing
Math Courses	Linear Algebra, Statistical Inference and Applications, Discrete Mathematical Structures in Computer Science, Probability and Statistics, Calculus

Certifications

- Introduction to Aviation and Aerodynamics - CTE Bits Goa
- Version Control with Git by Atlassian - Coursera
- Machine Learning by Stanford - Coursera
- Deep Learning Specialization by DeepLearning.ai - Coursera

Leadership and Volunteering

Ongoing **Subsystem Lead, Autonomous Subsystem Project Kratos**, *BITS Goa*.
Managing a team of 14 members. Continuous designing and improvement of all the framework components through research. Managed manufacturing, fabrication and integration of the essential rover components for the subsystem. Involved in close collaborations with other teams.

Spring 2021 **Teaching Assistant for Discrete Structures in Computer Science**, *BITS Goa*.

Summer 2021 **Mentor for Autonomous Traversal for Differential Drive Robots**, [Website].
Mentored and taught 30 first year students path planning and control theory concepts for Differential Drive robots. Also covered object detection concepts like basic classification models, transfer learning and implementations of the same in pytorch.

2020-2021 **Student Mentor, Institute Peer Mentorship Programme**.
Responsible for mentoring a group of 7 freshmen to help adjust to the new environment, academically and socially and guide them towards a holistic development.

2019-2021 **Volunteer, Abhigyaan**, [Website].
Abhigyaan is a social service initiative by the students of BITS-Goa. It aims at providing education to underprivileged children living in the BITS campus and nearby areas. I taught Physics and Chemistry to students of 11th and 12th grade, and helped them prepare for competitive exams.

Extra Curricular Activities

- Selected for the Microsoft Engage Mentorship Program 2021.
- Studied aerodynamic structures and design as part of Center for Technical Education.
- Involved in competitive programming, rated Div1 on CodeChef (1800+ rating).
- Part of college tennis team, representing institute at state and national tournaments.
- Completed the Goa River Half Marathon 2019 - 21km.
- Interests: Reading, Cycling, Swimming, Trekking, Chess