

# Pranay Mathur

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## EXPERIENCE

### Graduate Engineer Trainee — Addverb Technologies, Noida

Aug 2021 - Present

- Working on appearance-based Navigation of ground-based robots using semantic-scene understanding
- Integrated autonomous mobile-robots with 5G cloud-control based capabilities
- Deployed learning-based vision-front end pipeline for augmenting LiDAR based SLAM in mobile robots

### Intern — Technoyantra, Pune

Jan 2021 - Aug 2021

- Developed a localization algorithm using EKF based fusion of pose estimates from fiducial tags and LIDAR based SLAM ([GitHub](#))
- Implemented pipelines in ROS2 for Point Cloud segmentation, statistical outlier removal and voxel filtering

### Undergraduate Researcher — University of Nevada, Reno, USA

July 2020 - Jan 2021

- Developed a generalizable Resource-Aware algorithm for deployment of Visual Inertial Odometry algorithms on aerial vehicles with computationally constrained onboard systems under the guidance of **Prof. Kostas Alexis** ([Video](#)) ([Paper](#))
- Contributed to Intel ISL Open3D and released two packages incorporated into ROS-perception.
- Presented the packages as a Lightning Talk at ROS-World 2020. ([GitHub](#)) ([Video](#))

### Technical Intern — KPIT Technologies, Pune

May 2020 - July 2020

- Worked on Object Detection based on multi-modal sensor fusion using 3D LIDAR, monocular camera and a RADAR ([Paper](#))
- Developed a novel algorithm for detection of vehicles and pedestrians implemented using tensorflow and ROS ([GitHub](#))

### Research Intern — CSIR Central Electronics Engineering Research Institute, Pilani, India

May 2019 - July 2019

- Implemented RTAB-Map SLAM for Autonomous Navigation of Quadcopters using PX4 and ROS in visually-degraded GPS denied environments using an RGBD camera
- Implemented multi-modal sensor fusion and image noise-removal through classical image processing pipelines under the guidance of **Dr. S. A. Akbar**, Chief Scientist CEERI Pilani, India

## EDUCATION

B.E - Electronics and Instrumentation	BITS Pilani, K.K Birla Goa Campus	CGPA 8.87/10 (Dept. Rank 3)	Aug 2017 – July 2021
Class 12	Army Public School, New Delhi	94.8%	April 2016 – July 2017
Class 10	Army Public School, New Delhi	CGPA 10/10	April 2014 – July 2015

## SKILLS

Robot Operating System (ROS), C, C++, Python, Tensorflow, OpenCV, Linux, MATLAB, Github, Arduino, BASH, LATEX

## COURSES

Data Structures and Algorithms, Object Oriented Programming, Microprocessors and Interfacing, Control Systems, Digital Image processing, Signals and Systems, State Estimation and Localization for Self-Driving Cars

## PUBLICATIONS

**Sparse Image based Navigation Architecture to Mitigate the need of precise Localization in Mobile Robots** ([Paper](#))  
**Pranay Mathur**, Rajesh Kumar, Sarthak Upadhyay  
arXiv, 2022

**Resource-aware Online Parameter Adaptation for Computationally-constrained Visual-Inertial Navigation Systems** ([Paper](#))  
**Pranay Mathur**, Nikhil Khedekar, Kostas Alexis  
IEEE-RAS International Conference on Advanced Robotics, 2021

**A Generalized Kalman Filter Augmented Deep-Learning based Approach for Autonomous Landing in MAVs** ([Paper](#))  
**Pranay Mathur**, Yash Jangir, Neena Goveas  
IEEE International Symposium of Asian Control Association on Intelligent Robotics and Industrial Automation, 2021

**Multi-Sensor Fusion-Based Object Detection Implemented on ROS** ([Paper](#))  
**Pranay Mathur**, Ravish Kumar, Rahul Jain  
Springer International Conference on Machine Learning and Autonomous Systems, 2021

**BCI Controlled Quadcopter using SVM and Recursive LSE Implemented on ROS** ([Paper](#))  
Kshitij Chhabra, **Pranay Mathur**, Veeky Baths  
IEEE International Conference on Systems, Man and Cybernetics, 2020

## PROJECTS

### Drone Delivery Using SLAM and Object Avoidance ([GitHub](#))

May 2019 - July 2021

Faculty Advisor: Dr. Sarang C. Dhongdi, Assistant Professor, Dept. of EEE

- Developed an algorithm for autonomous navigation of drones in GPS-denied environments using RTAB-Map V-SLAM and an RGBD camera
- Developed custom computer vision algorithms using CNN based attention maps for obstacle recognition and avoidance implemented in Tensorflow and OpenCV
- Selected for funding by the EEE Dept. and Sandbox Fabrication Lab, BITS Goa

### Autonomous Landing of MAVs using a Kalman Filter and Faster-RCNN ([Paper](#))

Jan 2021 - July 2021

Faculty Advisor: Prof. Neena Goveas, Associate Dean & Prof. BITS Goa

- Developed an algorithm for autonomous landing of MAVs exploiting transfer learning to eliminate the need for fiducial markers on landing sites
- Used the Faster-RCNN architecture implemented in Tensorflow along with a Kalman Filter based controller deployed using the PX4 stack and mavros

### Drone Control using Brain Wave Mapping ([GitHub](#)) ([Paper](#))

Dec 2018 - July 2021

Faculty Advisor: Dr. Veeky Baths, Associate Professor, BITS Goa

- Fabricated a BCI based Quadcopter using SVM classification and Recursive LSE
- Worked with Processing3, Python, Emotiv, Robot Operating System (ROS), mavros
- Received the prestigious Prof. Suresh Ramaswamy Memorial Award

### Human Machine Teaming — DRDO

Jun 2018 - Apr 2019

Faculty Advisor: Prof. Neena Goveas, Associate Dean and Prof. BITS Goa

- Contributed to a project on Human Machine Teaming and swarm robotics for the Defence Research and Development Organization ([Certificate](#))
- Simulated a mission-plan involving a swarm of quadcopters on RotorS
- Deployed using ROS (Robot Operating System), Python, RotorS and Gazebo

### Project Kratos – Mars Rover ([LinkedIn](#)) ([GitHub](#))

Dec 2017 - Jun 2019

Faculty Advisor: Dr. Toby Joseph, Dept. of Physics, BITS Goa

- Contributed in building a Mars Rover that ranked 10<sup>th</sup> of 25 teams in the Indian Rover Challenge
- Lead the communication sub-system and implemented a scheduling algorithm to transmit multiple camera and data feeds with minimal latency
- Set up Communication Networks using the Ubiquiti Networks Platform and automated processes using BASH scripting in Linux

### Stabilisation of UAVs using Gyroscope and Accelerometer ([GitHub](#))

Dec 2017 - Jun 2018

- Implemented a PID controller using gyroscope and accelerometer data from an IMU for stabilization of aircraft in adverse operating conditions
- Used an MPU 6050 Inertial Measurement Unit and an Arduino Mega 2560 microcontrollers

### Human Pose Estimation based Robot with Electrotactile Haptic Feedback

Aug 2021 - Present

Faculty Advisor: Prof. Neena Goveas, Associate Dean & Prof. BITS Goa

- Developed an algorithm for teleoperation of robot manipulators for diagnostic purposes using human pose estimation and electro-tactile haptic feedback

## AWARDS AND SCHOLARSHIP

Best Paper Award

IEEE IRIA, July 2021

ESSA Merit Scholarship

Army Welfare Education Society, Feb 2021

Mantra Innovator of the Year

CEL and BITSAA International, Dec 2020

Runners-Up - Arduino Open

Quark, BITS Pilani, Goa, Feb 2020

Prof. Suresh Ramaswamy Memorial Award

BITSAA International, Oct 2019

Winner - Mayday Mystery Air-Crash Investigation

Quark, BITS Pilani, Goa, Feb 2018

## POSITIONS OF RESPONSIBILITY & VOLUNTEERING

Teaching Assistant - Signals and Systems

Jan 2021 - June 2021

President - Axon, NeuroTechX, BITS Goa

Dec 2020 - June 2021

Teaching Assistant - Microelectronic Circuits

Jan 2020 - May 2020

Treasurer - Aerodynamics Club BITS Goa

Jul 2019 - Aug 2020

Course Instructor - Introduction to Aerodynamics and Aviation

Aug 2019 - Dec 2019

Chief Coordinator - Academic Undergraduate Studies Division, BITS Pilani, Goa

Aug 2018 - June 2021

Inventory Head - Aerodynamics Club, BITS Goa

Jun 2018 - Jun 2019