Pranay Mathur

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EXPERIENCE

Contributor — Google Summer of Code   **May 2022 - Present**

- Working with the Center for Research in Open Source Software (CROSS) on a Path finding algorithm using OpenCV and machine learning (GitHub) (Project)
- Porting EfficientDet to TFlite and deploying it on the Coral USB Accelerator

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, L*AT*E*X*

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

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

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 10th 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

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**