

Mayank Mittal

✉ mittalma@student.ethz.ch

📁 [mayankm96.github.io](https://github.com/mayankm96)

🌐 [mayankm-0096](#)

📱 [mayankm96](#)

EDUCATION

- 2018–present **Master of Science**, *Eidgenössische Technische Hochschule (ETH)*, Zürich
Major: Robotics, Systems and Controls
- 2014–2018 **Bachelor of Technology**, *Indian Institute of Technology (IIT)*, Kanpur, *CGPA- 9.0/10*
Major: Electrical Engineering

PUBLICATIONS

- Sept '18 **Vision-based Autonomous Landing in Catastrophe-Struck Environments**,
[arXiv](#) Mayank Mittal*, Abhinav Valada*, Wolfram Burgard
Workshop on Vision-based Drones: What's Next? at IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2018

RESEARCH EXPERIENCE

- May '17–Aug '17 **Predicting Landing Sites from Aerial Images of Disaster Scenes**
University of Freiburg, Prof. Wolfram Burgard
- Created large synthetic dataset on Microsoft drone simulator **AirSim** comprising of scene, normals, segmentation and depth information of a map for disaster affected regions
 - Trained CNN model 'MarrRevisited' proposed by Aayush B. *et.al.* on the created dataset for surface normals prediction and performed a qualitative and quantitative analysis of the results
 - Proposed **pipelines for extracting candidate landing sites**, using the trained model and input RGB-D data, based on histogram based segmentation and costmaps
- Nov '14–June '18 **Autonomous Underwater Vehicle (AUV)**
IIT Kanpur, Prof. Mangal Kothari & Prof. K.S. Venkatesh
- Designed and developed **Institute's first AUV**, *Varun*, which uses computer vision and dead-reckoning sensors for navigation and is capable of shooting torpedo and drop markers
 - Optimized robot's structure and assemblies using **SolidWorks and Ansys Workbench**
 - Fabricated **waterproof casings** using in-house manufacturing facilities like lathe, milling
 - Designed **power distribution board** for the vehicle to ensure isolation between processor and motors, and also provide circuit protection
 - Formalized **experiment to calibrate thrusts** from vehicle's actuators to voltage signal
 - Mentored the electrical and software subsystem teams working on the next vehicle, *Hyperion*
 - Designing of hydrophones board to simultaneously sample data from four hydrophones and perform **acoustic pinger localization** using cross-correlation method
 - Implementing a **PID-based control system** for the vehicle to perform coupled motion
- July '16–Mar '17 **Bomb Disposal using Multi-Robot System**
Boeing-IIT Kanpur Joint Venture, Prof. Shantanu Bhattacharya & Prof. S. Kamle
- Integrated various hardware into a custom two-wheeled differential drive robot, *Alpha*
 - Performed simulation of *Alpha* in **gazebo** environment for creating maps and navigation
 - Implemented and compared the results of RGBD-SLAM, ORB-SLAM, **Gmapping**, and **Hector-SLAM**
 - Implemented the **object detection model 'YOLOv2'** by Joseph Redmon *et al.* using ROS and Caffe framework to classify objects as potential explosives in real time
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- ## MAJOR COURSE PROJECTS
- Feb–Apr '18 **Survey on Variational Autoencoders (VAEs) for Bayesian Inference**
[report](#) Course Project for Probabilistic Modeling and Inferences (CS698X), under Prof. Piyush Rai
- Studied and implemented various recent developments in VAEs such as semi-amortized autoencoders, conditional VAEs, DRAW architecture

- Feb–Apr '17 **Visual Odometry using careful Feature Selection and Tracking**
[github](#) *Course Project for Probabilistic Robotics (EE698G)*, Prof. Gaurav Pandey
[report](#)
 - Implemented the algorithm for stereo odometry, adapted from the works of I. Cvišić and I. Petrović in ‘Stereo odometry based on careful feature selection and tracking’
- Mar–Apr '17 **MATLAB based GUI for Motion Planning**
[github](#) *Course Project for Robot Motion Planning (ME766A)*, Prof. Ashish Dutta
 - Created an interactive user interface on MATLAB to run a number of motion planning algorithms such as Rapidly exploring Random Tree (RRT) and its variants, and potential field method, in a user defined 2-D environment at specified start and goal points
- Oct–Nov '16 **Failure Handling in Swarm of Quadrotors**
[report](#) *Course Project for Embedded and Cyber-Physical Systems (CS637A)*, Prof. Indranil Saha
 - Proposed an **extended state machine design for communication in a swarm**, with ability to handle failures, while ensuring redundancy, decentralization and anonymity
 - Used gazebo to simulate swarm behavior in quadrotors using **hector-quad** packages

OTHER PROJECTS

- Oct–Nov '16 **Applying \mathcal{H}_∞ Control to Reduce Risks of Diabetes Mellitus in Patients**
Course Project for Robust Control Systems (EE654A), Prof. Ramprasad Potluri
- May–Jun '16 **Review on Recent Approaches to Simultaneous Localization And Mapping**
NYU-IIT Kanpur Research Track, Prof. Farshad Khorrami (New York University)
- Feb–Mar '16 **Designing of Adjustable Medical Chair**
Course Project for course Manufacturing Processes-II (TA202A), Prof. Neeraj Sinha
- Dec '15 **Review on Finite Element Analysis in Electromagnetism**
NPDE-TCA Winter Internship, Dr. B.V. Rathish Kumar (IIT Kanpur)

TEACHING EXPERIENCE

- Jan–Apr '18 **Autonomous Navigation, AE640A**, Prof. Mangal Kothari, IIT Kanpur
[website](#)
 - Developed the course syllabus and planned individual class sessions
 - Preparation of course handouts and assignments
 - Guest lecturer on system integration using ROS, robot simulation, mathematical foundation for robotics, and non-parametric filters for localization

ACADEMIC ACHIEVEMENTS

- 2018 **SIIC Student Innovation Award**, IIT Kanpur (Convocation Award)
- 2018 **Sri. Binay Kumar Sinha Award**, IIT Kanpur (Convocation Award)
- 2018 **Science and Technology Excellence Award**, IIT Kanpur (Gymkhaana Award)
- 2017 **Academic Excellence Award**, IIT Kanpur (Dean's List)
- 2017 **WISE Scholarship** by DAAD (Awarded to 192 students in the country)
- 2016 **Academic Excellence Award**, IIT Kanpur (Dean's List)
- 2016 **2nd place in Student Underwater Vehicle (SAVe) competition** by NIOT, Chennai
- 2012 **Kishore Vaigyanik Protsahan Yogna (KVPY) Fellowship** by Govt. of India
- 2010 **National Talent Search Scholarship (NTSE)** by Govt. of India

TECHNICAL SKILLS

- Software:** Gazebo, UnrealEngine Editor (AirSim), V-REP, SolidWorks, Ansys, KiCAD, PSpice
- Languages:** Python, C++, C, Shell(bash), MATLAB, HTML, CSS
- Frameworks:** ROS, Caffe, TensorFlow, OpenCV, PCL
- Other:** Git, GNU Octave, \LaTeX

RELEVANT COURSEWORK

- Robotics:** Robot Dynamics*, Probabilistic Mobile Robotics, Robot Manipulators: Dynamics and Control, Robot Motion Planning, Embedded and Cyber-Physical Systems
- Artificial Intelligence:** Advanced Machine Learning*, Reliable and Interpretable Artificial Intelligence*, Probabilistic Artificial Intelligence*, Probabilistic Modeling and Inferences
- Controls:** Dynamic Programming and Optimal Control*, System Identification*, Robust Control Systems, Control System Analysis, Signals and Systems
- Mathematics:** Matrix Theory and Linear Estimation, Probability and Statistics, Ordinary/Partial Differential Equations, Complex Analysis
- Algorithms:** Data Structures and Algorithms, Fundamentals of Programming
- Electronics:** Power Electronics, Digital Electronics, Microelectronics- I, Power Systems

* denotes current course at ETH Zürich

POSITIONS OF RESPONSIBILITY

- Jan '16–Apr '18 **Team Leader**, *AUV Team*, IIT Kanpur
- Leading a team of 16 members from various majors to develop our next underwater vehicle
 - Overseeing various **operational and technical** aspects of the project
 - Managed funding of Rs.769,000 for the development of our first vehicle *Varun*
- Apr '16–Mar '17 **Coordinator**, *Robotics Club*, IIT Kanpur
- Led a team of 18 members and handled a budget of Rs.125,000 to organize various events, workshops, and competitions for robotics enthusiasts in the campus community
 - **Mentored** and ensured completion of **summer projects** on facial recognition, 3-DOF robot manipulator, gesture-based gaming console, and Wi-Fi based indoor localization system
 - Organized a week-long lecture series in collaboration with the Institute's Center of Mechatronics; presented **talks** on **sensing and actuation, micro-controllers and CAD designing**
- Aug '15–July '16 **Student Guide & Academic Mentor**, *Counseling Service*, IIT Kanpur
- Assisted 6 freshmen students in adjusting to the college environment
 - Provided personal tutoring to academically weak students for their courses

MISCELLANEOUS

- Oct '17 Conducted **workshop** on '**Robotics using ROS and Gazebo**' at IIT Kanpur
- Sept '17 Presented a **talk** on '**Applications of Deep Learning in Robotics**' for Machine Learning Research Day (MLRD) organized by SIGML, IIT Kanpur
- Oct '15 Secured 2nd place in inter-college lawn tennis tournament at SNU, Greater Noida
- Mar '15 Secured 3rd place at inter-college lawn tennis tournament at IIT, Roorkee