# Mayank Mittal

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## Education

2018–present **Master of Science**, *Eidgenössische Technische Hochschule (ETH)*, Zürich
**Major:** Robotics, Systems, and Controls
**Relevant Coursework:** Deep Reinforcement Learning*, Perception and Learning for Robotics*, Reliable and Interpretable AI, Advanced Machine Learning, Robot Dynamics

2014–2018 **Bachelor of Technology**, *Indian Institute of Technology (IIT)*, Kanpur
**Major:** Electrical Engineering
**Relevant Coursework:** Probabilistic Modeling and Inferences, Probabilistic Mobile Robotics, Robot Motion Planning, Robust Control Systems, Control System Analysis

'*' *denotes ongoing*

## Publications

IROS 2018 **Vision-based Autonomous Landing in Catastrophe-Struck Environments**,
arXiv, video Mayank Mittal†, Abhinav Valada†, Wolfram Burgard
*Workshop on Vision-based Drones: What's Next?*

## Research Experience

Nov '18–present **Learning to Navigate with Reinforcement Learning (RL)**
*ETH Zürich*, Prof. Marco Hutter
- Designing an RL agent to jointly learn locomotion-manipulation policies for a quadruped robot (*ANYmal*) equipped with an articulated manipulator
- Developing a framework in C++ to deploy state-of-the-art RL algorithms on a robot

May '17–Aug '18 **Detecting Landing Sites from Aerial Images of Disaster Scenes**
*University of Freiburg*, Prof. Wolfram Burgard
- Using Microsoft AirSim, created synthetic dataset comprising of RGB, depth, surface normals, and segmentation information from a city-scale disaster affected region
- Designed a vision-based system for UAVs to perform on-board localization, mapping, trajectory planning and landing sites detection; tested it on simulations and real-world scenarios

July '16–Mar '17 **Bomb Disposal using Multi-Robot System**
website *Boeing-IIT Kanpur Joint Venture*, Prof. Shantanu Bhattacharya & Prof. S. Kamle
github
- Integrated various hardware into a custom two-wheeled differential drive robot
- Trained the object detection model 'YOLOv2' by J. Redmon *et al.* to classify objects as potential explosives and implemented it on NVidia Jetson TX1 board

Nov '14-June '18 **Autonomous Underwater Vehicle (AUV)**
website *IIT Kanpur*, Prof. Mangal Kothari & Prof. K.S. Venkatesh
github
- Designed and developed Institute's first AUV (*Varun*) which used dead-reckoning for navigation and computer vision to navigate and shoot torpedoes underwater
- Mentored the electrical and software subsystem teams for the next vehicle (*Anahita*)
  - Designing of a hydrophones board to perform underwater acoustic pinger localization
  - Implementing a decoupled PID-based control system for an underwater vehicle

## Selected Projects

Feb '19–present **Detecting Sensor Miscalibration using Semantics**
Course Project for *Perception and Learning for Robotics*, Dr. Cesar Cadena
- Proposing a deep learning architecture to utilize semantic information in the environment for detecting miscalibration in a sensor's calibration parameters

Feb '19–present **Deep Learning for Multi-Camera Tracking and Mapping**
Course Project for *3D Vision*, Prof. Marc Pollefeys
- Extending existing DeepTAM pipeline to leverage a multi-camera setup with known geometry

Nov '18–Dec '18 **Monocular Visual Odometry with Bundle Adjustment**
github Course Project for *Vision Algorithms for Mobile Robotics*, Prof. Davide Scaramuzza
- Implemented a simple monocular visual odometry pipeline with back-end optimization using window-based bundle adjustment

Feb–Apr '18 **Survey on Variational Autoencoders (VAEs) for Bayesian Inference**
report Course Project for *Probabilistic Modeling and Inferences*, 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 Mobile Robotics*, 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'

Oct–Nov '16 **Failure Handling in a Swarm of Quadrotors**
report Course Project for *Embedded and Cyber-Physical Systems*, 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

## Teaching Experience

Jan–Apr '18 **Autonomous Navigation**, *AE640A*, Prof. Mangal Kothari, IIT Kanpur
website
- Developed the course syllabus and prepared 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)
2017 **Academic Excellence Award**, IIT Kanpur (Dean's List)
2017 **WISE Scholarship** by DAAD (Awarded to 192 students in the country)
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), SolidWorks, Ansys, KiCAD
**Languages:** C++, Python, Shell(bash), MATLAB, HTML, CSS
**Frameworks:** ROS, TensorFlow, OpenCV, PCL, Caffe
**Other:** Git, GNU Octave, LaTeX

## Positions of Responsibility

Jan '16–Mar '18 **Team Lead**, *AUV Team*, IIT Kanpur
- Led a team of 18 members to participate at the national underwater robotics competition
- Interacted with various technical companies and research laboratories to acquire sponsorships
- Managed a seed funding by the institute for the development of the first vehicle *Varun*

Mar '16– Apr'17 **Coordinator**, *Robotics Club*, IIT Kanpur
- Managed a team of 18 secretaries to organize various events, workshops, and competitions for robotics enthusiasts in the campus community
- Mentored and ensured completion of summer projects on wheeled humanoid using speech and facial recognition, 3-DOF robot manipulator, and gesture based gaming console