Mayank Mittal

Graduate student, ETH Zürich

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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 (Seminar), Deep Learning*, Model Predictive Control, Robot Dynamics, Perception and Learning for Robotics, Probabilistic AI

2014–2018 **Bachelor of Technology**, *Indian Institute of Technology (IIT)*, Kanpur
Major: Electrical Engineering
- Awarded *Sri. Binay Kumar Sinha Award* for the best undergraduate project that has industrial applicability and social relevance
- Awarded *SIIC Student Innovation Award* for developing path-breaking technology of global importance

Relevant Coursework: Probabilistic Modeling and Inferences, Probabilistic Mobile Robotics, Robot Motion Planning, Robust Control Systems, Control System Analysis

Publications

ICRA 2020 **Learning Camera Miscalibration Detection**,
Andrei Cramariuc†, Aleksandar Petrov†, Rohit Suri, Mayank Mittal, Roland Siegwart, Cesar Cadena
(Under Review)

ISRR 2019 **Autonomous Vision-Based UAV for Urban Search and Rescue**,
arXiv Mayank Mittal, Rohit Mohan, Wolfram Burgard, Abhinav Valada

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

Research Experience

Sep '19 –present **Safe Grasping for Robotic Hand with Fingers**
NNAISENSE SA, Dr. Marco Gallieri & Dr. S.S.M. Salehain
- Developing a safe-learning algorithm for grasping of unknown objects using adaptive force control

Apr–Jul '19 **Learning Hybrid Locomotion-Manipulation Control for Arm-on-ANYmal**
ETH Zürich, Prof. Marco Hutter
- Investigated application of reinforcement learning to learn policies for the mobile manipulator ALMA, a torque controlled quadrupedal robot equipped with a 6-DOF robotic arm
- Implemented the environment in RaiSim along with different multi-agent designs to train and evaluate their performances on a set of proposed benchmark tasks for mobile manipulators

Nov '18–May '19 **Learning to Navigate with Reinforcement Learning**
ETH Zürich, Prof. Marco Hutter
- Worked on the development of a framework in C++ to train and deploy state-of-the-art RL algorithms (such as PPO, TRPO, and DDPG) on a real robot
- Developed the python package for performance comparison between various RL frameworks

May '17–Aug '18 **Detecting Landing Sites from Aerial Images of Disaster Scenes**
website *University of Freiburg*, Prof. Wolfram Burgard
video
- 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

Jul '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-Jun '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 and computer vision for navigating and performing tasks like shooting torpedoes autonomously
- 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 the underwater vehicle

Selected Projects

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

Feb –Jun '19 **Deep Learning for Multi-Camera Tracking and Mapping**
report Course Project for *3D Vision*, Prof. Marc Pollefeys
github
- Extended the existing DeepTAM pipeline to leverage a multi-camera setup for visual odometry

Nov –Dec '18 **Verification of Neural Networks using Linear Programming**
report Course Project for *Reliable and Interpretable AI*, Prof. Martin Vechev
github
- Proposed an efficient method to verify robustness of deep ReLU-based classifiers against norm-bounded adversarial perturbations by applying interval domain analysis and linear programming

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

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
- Helped in developing the course syllabus and preparing the assignments
- Guest lecturer on mathematical foundation for robotics, non-parametric filters for localization, system integration using ROS, and robot simulation

Academic Achievements

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** (NTSE) Scholarship by Govt. of India

Technical skills

Software: Gazebo, UnrealEngine Editor (AirSim), SolidWorks, Ansys, KiCAD
Languages: C++, Python, Shell(bash), MATLAB, HTML, CSS
Frameworks: ROS, PyTorch, 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 sponsorship

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