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 (Seminar), Deep Learning, Perception and Learning for Robotics, Probabilistic AI, Model Predictive Control, Dynamic Programming and Optimal Control, Robot Dynamics, 3D Vision, Vision Algorithms for Mobile Robotics

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

Publications

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

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 **Reinforcement Learning Framework for Robotics**
ETH Zürich, Prof. Marco Hutter
- Worked on the development of a framework using Tensorflow C/C++ APIs to train and deploy state-of-the-art RL algorithms (such as PPO, TRPO, and DDPG) on a real robot
- Designed a 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

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

Dec '19–Jan '20 **Online Adaptation using Graph Networks in Model-based RL**
Course Project for *Deep Learning*, Dr. Thomas Hofmann
- Developing an algorithm that leverages meta-RL and graph networks to learn a model that exploits an agent's morphology and adapts to environmental uncertainties

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

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

2018 **Sri. Binay Kumar Sinha Award**, IIT Kanpur (Best undergraduate project that has industrial applicability and social relevance)

2018 **SIIC Student Innovation Award**, IIT Kanpur (Best socially-relevant project of global importance among graduating students)

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