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Mayank Mittal

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
Major: Electrical Engineering

Publications

Oct '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 '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
- Trained CNN model 'MarrRevisisted' proposed by Aayush B. *et.al.* on this dataset for surface normals prediction using Caffe framework
- 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, *Alpha*
- Implemented various SLAM algorithms such as RGBD-SLAM, ORB-SLAM and GMapping
- Trained the object detection model **'YOLOv2'** by Joseph 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 shoot torpedo and drop markers
- Mentored the electrical and software subsystem teams for the next vehicle, *Hyperion*
  - Designing of a hydrophones board to perform underwater **acoustic pinger localization**
  - Implementing a decoupled **PID-based control system** for the vehicle

Selected Projects

Feb–Apr '18 **Survey on Variational Autoencoders (VAEs) for Bayesian Inference**
report Course Project for Probabilistic Modeling and Inferences (CS698X), 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'

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

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 several motion planning algorithms such as Rapidly exploring Random Trees and its variants in a user defined 2-D environment

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), V-REP, SolidWorks, Ansys, KiCAD
Languages: Python, C++, C, Shell(bash), MATLAB, HTML, CSS
Frameworks: ROS, Caffe, PyTorch, OpenCV, PCL
Other: Git, GNU Octave, LaTeX

Relevant Coursework

Robotics: Robot Dynamics*, Probabilistic Mobile Robotics, Robot Manipulators: Dynamics and Controls, Robot Motion Planning, Embedded and Cyber-Physical Systems
AI/ML: 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
Algorithms: Data Structures and Algorithms, Fundamentals of Programming

* *denotes current courses at ETH Zürich*

Positions of Responsibility

Jan '16–Apr '18 **Team Leader**, *AUV Team*, IIT Kanpur
Apr '16–Mar '17 **Coordinator**, *Robotics Club*, IIT Kanpur
Aug '15–July '16 **Student Guide & Academic Mentor**, *Counseling Service*, IIT Kanpur

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