

EDUCATION

- 2018–present **Masters 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

RESEARCH EXPERIENCE

- May '17–present **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–present **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
 - Currently mentoring the software subsystem team of our next vehicle, *Triton*
- 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

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](#) [report](#) Course Project for Probabilistic Robotics (EE698G), Prof. Gaurav Pandey
- 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

- Preparation of course material and assignments
- Guest lecturer on system integration using ROS, robot simulation, mathematical foundation for robotics, and non-parametric filters for localization

ACADEMIC ACHIEVEMENTS

2018 **Science and Technology Excellence Award**, IIT Kanpur

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, L^AT_EX

RELEVANT COURSEWORK

Robotics: Probabilistic Mobile Robotics, Robot Manipulators: Dynamics and Control, Robot Motion Planning, Embedded and Cyber-Physical Systems, Robust Control Systems

Mathematics: Probabilistic Modeling and Inferences, 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

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