

MAYANK MITTAL

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EDUCATION

- 2014–present **Bachelor of Technology**, *Indian Institute of Technology*, Kanpur, *CGPA- 9.3/10*
Major: Electrical Engineering
- 2014 **Grade XII**, *Amity International School*, Noida, *Result- 97%*
- 2012 **Grade X**, *Amity International School*, Noida, *CGPA- 10/10*

RESEARCH EXPERIENCE

- May–July '17 **Predicting Landing Sites from Aerial Images of Disaster Scenes**
University of Freiburg, Prof. Wolfram Burgard
- Created **large dataset**, using Microsoft drone **simulator AirSim**, comprising of scene, normals and depth views of a self- designed map of a disaster affected region
 - Trained deep learning model inspired from '**MarrRevisited**' architecture by Aayush B. *et al.* on the created dataset; performed a qualitative and quantitative analysis of the results
 - Proposed a **pipeline to extract candidate landing sites**, using the trained model and input RGB-D data, based on histogram based segmentation **in real-time**
- July '16–Mar '17 **Bomb Disposal using Multi-Robot System**
Boeing-IIT Kanpur Joint Venture, Prof. Shantanu Bhattacharya & Prof. S. Kamle
- [website](#)
- 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
- [github](#)
- Nov '14–present **Autonomous Underwater Vehicle (AUV)**
IIT Kanpur, Prof. K.S. Venkatesh & Prof. Sachin Y. Shinde
- [website](#)
- 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 PWM signal
 - Currently mentoring the software subsystem team of our next vehicle, *Triton*
- [github](#)
- [report](#)

MAJOR COURSE PROJECTS

- Feb–Apr '17 **Visual Odometry using careful Feature Selection and Tracking**
Course Project for Probabilistic Robotics (EE698G), Prof. Gaurav Pandey
- [github](#)
- 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'
 - Evaluated the implemented algorithm on KITTI Dataset City 01 and Residential 07 sequences
- [report](#)
- Mar–Apr '17 **MATLAB based GUI for Motion Planning**
Course Project for Robot Motion Planning (ME766A), Prof. Ashish Dutta
- [github](#)
- 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**
Course Project for Embedded and Cyber-Physical Systems (CS637A), Prof. Indranil Saha
- [report](#)
- 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
 - Tested communication network on hardware using X-Bees(Series 2) in broadcasting mode

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
- Proposed an alternate design to the original controller by P. Colmegna *et al.*,
 - Used **Robust Control Toolbox** and **Simulink** to show that new controller ensured a better performance for the considered nominal model of adult patient
- May–Jun '16 **Reviewing Approaches to Simultaneous Localization And Mapping (SLAM)**
NYU-IIT Kanpur Research Track, Prof. Farshad Khorrami (New York University)
- Reviewed **Kalman Filter** and **Monte- Carlo methods** for back-end system in SLAM
 - Implemented **EKF SLAM** in virtual environment through **V-REP** and MATLAB
- Feb–Mar '16 **Adjustable Medical Chair**
Course Project for course Manufacturing Processes-II (TA202A), Prof. Neeraj Sinha
- Designed and manufactured a scaled-down model of **dental chair** with independent controls for various motion, using operations like welding, turning, milling, drilling and fitting
- Dec '15 **Finite Element Analysis in Electromagnetism**
NPDE-TCA Winter Internship, Dr. B.V. Rathish Kumar (IIT Kanpur)
- Studied the Ritz-vibrational and Glarenkin's finite element analysis in 1- and 2- dimensions
 - Solved 2-D boundary valued problems on electrostatics and time harmonics on MATLAB

TEACHING EXPERIENCE

- Upcoming **Autonomous Navigation, AE640A**, Prof. Mangal Kothari, IIT Kanpur
Preparation of course material and assignments

ACADEMIC ACHIEVEMENTS

- 2017 **WISE Scholarship** by DAAD (Awarded to 192 students in the country)
- 2016 **Academic Excellence Award**, IIT Kanpur (Awarded to 60 students out of 840)
- 2016 **2nd place** in **Student Underwater Vehicle (SAVe)** competition by NIOT, Chennai
- 2014 **All India Rank 656** in JEE Advanced among 150,000 students
- 2014 **All India Rank 324** in JEE Mains among 1.2 million students
- 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:** Matrix Theory and Linear Estimation, Topics in Probabilistic Modeling and Inferences*, 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

* to be completed in Spring 2018

POSITIONS OF RESPONSIBILITY

Jan '16–present **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 two-days **workshop** on '**Robot Simulation using ROS and Gazebo**'

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