

EDUCATIONAL QUALIFICATIONS

Year	Degree	Institute	CPI/Aggregate
2019 (<i>expected</i>)	MS in Robotics	Carnegie Mellon University	-
2017	B.Tech. (EE)	Indian Institute of Technology Kanpur	9.4/10.0
2013	XII	Delhi Public School R.K. Puram, New Delhi	97.0%
2011	X	Apeejay School, NOIDA	10.0/10.0

RESEARCH INTERNSHIPS

- **Infrastructure for Socially Assistive Robotics (SAR)** (May'16 – Jul'16)
Guide: Prof. Maja Mataric, Interaction Lab, University of Southern California
 - Created robust infrastructure for conducting autonomous long term in-home studies for SAR
 - Developed a number concepts game in JS for children with ASD, and defined the game's interaction with the MIT DragonBot, which acts as a knowledgeable peer of the child
 - Containerized the entire software stack for the study, enabling easy installation and portability
 - Developed Robot Operating System (ROS) wrappers for facial recognition and analysis libraries to allow the robot to detect and use the children's facial response in real time
- **Majority Vote Point classifier for machine fault diagnosis** (May'15 – Jul'15)
Guide: Dr. Nishchal Verma, Associate Professor, IIT Kanpur
 - Proposed a classification algorithm, Majority Vote Point (MVP) classifier that is more generalized than linear kernel support vector machines
 - Formulated an upper bound on the VC dimension of the MVP classifier using theoretical arguments
 - Estimated the value of the VC dimension empirically by proving convergence of growth function
 - Carried out a case study on acoustic fault diagnosis and demonstrated the greater consistency of the MVP classifier in case of real world classification with shallow features

PROJECTS

- **Quadrotor localization using markers** (Aug'16 – Nov'16)
Guide: Dr. Gaurav Pandey, Assistant Professor, IIT Kanpur (Course Project)
 - Integrated data from ArUco markers, PX4 optical flow sensors and IMU in ROS with an Unscented Kalman Filter and rotation compensation implemented from scratch, for localizing a quadrotor
- **Dense Object Detection in real-time** (Aug'16 – Nov'16)
Guide: Dr. Gaurav Sharma, Assistant Professor, IIT Kanpur (Course Project)
 - Conducted a parameter study on the YOLO (You Only Look Once) CNN-based real-time object detection framework and got improved detection and localization in cluttered scenes
 - Adapted the YOLO network and trained it on the KITTI object detection benchmark
- **Disparate Image Matching** (Aug'16 – Nov'16)
Guide: Dr. Tanaya Guha, Assistant Professor, IIT Kanpur (Course Project)
 - Implemented a novel image feature descriptor (Duality Descriptor) and a feature detector (MMID) from scratch in MATLAB that performs better than SIFT at matching disparate images
- **Visual Question Answering** (Jan'16 – Apr'16)
Guide: Dr. Vinay Namboodiri, Assistant Professor, IIT Kanpur (Course Project)
 - Implemented a deep net to answer natural language questions about images on the VQA dataset
 - Image features were extracted from a pre-trained convolutional network, word vectors were generated from a Long Short Term Memory (LSTM) network and a softmax classifier was trained
- **Real time obstacle detection for autonomous vehicles** (Jul'15 – Nov'15)
Guide: Dr. Gaurav Pandey, Assistant Professor, IIT Kanpur
 - Long range (2m-10m) obstacle detection for autonomous vehicles using stereo cameras
 - Computed the free space available in front of the vehicle, by building a depth map, detecting and removing the road, sky and background, and identifying potential obstacles
 - Developed a column based algorithm similar to stixel representation for computational efficiency
- **Underwater Surveillance Vehicle** (May'14 – Jul'14)
Guide: Dr. Bhaskar Dasgupta, Professor, IIT Kanpur
 - Developed a robust underwater vehicle capable of manoeuvrability with 6 degrees of freedom
 - Designed a PID controller for autonomous stabilization against water currents

- Built electronic circuitry for power management and communication with ground station
- Won **2nd Prize for Best Project** at the IIT Kanpur Student Research Convention 2014
- **ABU Robocon 2014: A Pan-Asian robotics competition** (Oct'13 – Apr'13)
Supervisor: Dr. Bhaskar Dasgupta, Professor, IIT Kanpur
 - Objective: Make 2 robots (1 manual and 1 autonomous) to navigate a playground, completing a given set of tasks like climbing a ladder and swinging
 - Implemented autonomous pole detection and gripping algorithms on Arduino platform
 - Integrated ultrasonic, force and proximity sensors for obstacle avoidance and smart navigation
 - Won the **Most Innovative Design award** and secured overall **6th position** at the National Round held at Pune, India among 89 participating teams

ENTREPRENEURSHIP EXPERIENCE

Co-Founder and CTO, Agilo Technologies Pvt. Ltd. (Oct'15 – Apr'17)

- evive: Make STEM learning fun again!
 - **Spearheaded** the development of **evive**, an open source Arduino powered electronics platform for learning and prototyping electronics circuits, building robots and hacking together IoT solutions
 - Led a **successful crowdfunding** campaign on Indiegogo, raising \$35k USD from over 300 backers in 33 countries and getting featured in 25 magazines
 - **Pioneered** the concept of a visual menu-based interface to Arduino which removes repetitiveness
 - **Won** the Hackaday Prize Automation Challenge for evive
- Development of an industrial reactor cleaning robot (Consulting with Reliance Industries Ltd.)
 - Designed the **control system** for a 3-link 3DOF planar robotic manipulator, incorporating inverse kinematics with singularity robustness
 - Created a user interface in ROS to control the robot and manage inter-process communication

Leaders in Innovation Fellow, Royal Academy of Engineering, UK (Mar'17)

- Selected for a residential entrepreneurship course in London by the Royal Academy of Engineering
- **Won 1st place** in final elevator pitch competition among 60 participants

SCHOLASTIC ACHIEVEMENTS

- Secured a Minor in Artificial Intelligence from the Department of Computer Science, IIT Kanpur
- Won an Academic Excellence Award for two years from 2014-16 at IIT Kanpur
- All India Rank-429 in the JEE Advanced 2013, among 75,000 students
- All India Rank-29 in the prestigious KVPY (Kishore Vaigyanik Protsahan Yojana) Fellowship Exam 2013
- Secured a top-100 position in the Times Scholars Programme 2012
- Finished among the top 1% in the National Standard Examination in Physics 2013 among 40,000 students

PUBLICATIONS

1. **Agarwal, Akshat**; Verma, Nishchal, "Generalization ability of Majority Vote Point classifiers for Motor Fault Diagnosis." *2016 IEEE International Conference on Industrial and Information Systems*. (accepted)
2. **Agarwal, Akshat**; Shah, Dhruval; Verma, Pankaj; Sharma, Abhishek, "evive: An active STEM learning and prototyping platform." *2016 IEEE Region 10 Humanitarian Technology Conference*. (accepted)

TECHNICAL SKILLS

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|-------------------------|---|
| • Programming Skills | Python, Robot Operating System (ROS), MATLAB, C, C++, JavaScript, LaTeX |
| • Software | Docker, NGINX, Altium Designer, Android Studio, Autodesk Inventor |
| • Electronics Platforms | Arduino, BeagleBone Black |
| • Operating Systems | Linux, Windows |

RELEVANT COURSES

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| • Probabilistic Mobile Robotics | • Robot Motion Planning |
| • Data Structures and Algorithms | • Optimization Techniques for Machine Learning |
| • Artificial Intelligence | • Multi Agent Systems: Games, Algorithms, Evolution |
| • Recent Advances in Computer Vision | • Machine Learning – Andrew Ng ** |
| • Probability and Statistics | • Fundamentals of Computing |
| • Mathematics I - Calculus | • Image Processing |

POSITIONS OF RESPONSIBILITY

- Student Guide and Academic Mentor, Counselling Service, IIT Kanpur
 - Responsible for successful acclimatization and performance of 9 1st year students
 - Facilitated the organization of a week-long orientation programme for freshmen
 - Mentored academically weak students for the course ‘Fundamentals of Computing’
- Secretary, Robotics Club IIT Kanpur
 - Conceptualized the problem statement and arena of 3 robotics competitions for Takneek ‘14
 - Took lectures and conducted workshops on circuit design and microcontroller programming
- Under Graduate Assistant Coordinator, Electrical Engineering Association, IIT Kanpur

EXTRACURRICULAR ACTIVITIES

- Volunteering for the English Proficiency Programme, IIT Kanpur
- Won 1st prize in robotics event ‘Block It’ in Takneek ‘14, the inter hall technical festival of IIT Kanpur
- Volunteered in Synchronicity, a rock band competition, in Antaragni ‘14, the cultural festival of IIT Kanpur