

Ayush Gupta

JUNIOR UNDERGRADUATE · ROBOTICS ENTHUSIAST

Indian Institute Of Technology, Kanpur

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Education

Indian Institute of Technology Kanpur

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING AND MINOR IN INDUSTRIAL MANAGEMENT AND ENGINEERING

- Cumulative Point Index: **9.2/10.0**

Kanpur, India

July 2017 - Present

City Montessori School

INDIAN SCHOOL CERTIFICATE EXAMINATION (INTERMEDIATE)

- Overall Percentage: 95.5%

Lucknow, India

March 2017

St. Francis' College

INDIAN CERTIFICATE OF SECONDARY EDUCATION (HIGH SCHOOL)

- Overall Percentage: 95%

Lucknow, India

March 2015

Research Experience

Team AUV-IITK

FACULTY ADVISOR: PROF. MANGAL KOTHARI

- Fused sensor readings from Doppler Velocity Log (DVL) and IMU using an Extended Kalman Filter to generate odometry message for the vehicle
- Implemented a novel image preprocessing algorithm based on Fusion Framework to formulate a robust underwater computer vision pipeline
- Created multi-class dataset of labeled underwater photos, trained YOLO object detection model and setup real-time inference on Jetson TX2
- Developed and tested acoustic localization system capable of estimating the Direction of Arrival of ultrasonic underwater signals from pinger
- Used signal processing operations such as Short Time Fourier Transform and Cross-Correlation to find time delay of arrival between signals
- Managed a multi-layered software stack for an autonomous underwater vehicle, Anahita developed on ROS and simulated using Gazebo
- Tuned and tested Cascaded PID Controller on the vehicle, enabling it to perform waypoint navigation and visual servoing
- Designed a hierarchical state machine for more robust autonomous behavior of the vehicle, with failsafes and proper decision flow
- Made extensive use of physics engine Gazebo to simulate model of vehicle in a custom hydrodynamically realistic environment
- Created setups for disparity map generation using a pair of cameras and implemented a modified Fast-SLAM for underwater localization

Software Team Member

May 2018 - Present

Team Humanoid, IITK

ROBOTICS CLUB, IIT KANPUR

- Worked on a Bipedal Prototype of the humanoid bot, capable of performing statically stable walking
- Implemented the MATLAB simulated **inverse kinematics walking algorithm** based on ZMP criteria on the actual robot using ROS
- Developed a Web Graphical User Interface for debugging and monitoring using ROS Web Bridge Server and JavaScript

Software Team Member

Dec. 2017 - April 2018

Work Experience

Intelligent Systems Lab

SUPERVISOR: MR. RAVI PRAKASH, DOCTORAL STUDENT

- Ported outdated available ROS code to operate on current development platform using ROS Kinetic on Ubuntu 14.04
- Actualized setup for simulation using **Rviz and Gazebo** for Universal Robots manipulator on a Guardian Robot
- Tweaked the hardware drivers and changed odometry publishers to fix position drift estimated by motor encoders
- Assisted in final aim to create **collaborative autonomous robots** capable of building walls, extinguishing fires

Robotics Intern

April 2019 - Present

New York Office, IIT Kanpur

SUPERVISOR: PROF. MANINDRA AGRAWAL

- Worked on **Scala with Akka-HTTP** for scalable and concurrent multi threading using functional programming
- Documented and compiled the entire collection of backend Application Programming Interfaces using **PostMan**
- Fixed bugs in the Scala backend, and collaborated using Phabricator, while developing an upcoming social platform

Backend Software Intern

May 2018 - July 2018

Skills

Robotics ROS, OpenCV, Arduino, Gazebo, CUDA, Gym

Data Science Tensorflow, Keras, Scikit, MATLAB

Web Development Node.js, MongoDB, Flask, Express, Socket-IO, Bootstrap, HTML5, Jekyll, Travis CI

Programming Languages C++, Python, Scala, Javascript

Utilities LabView, MATLAB, Git, SVN, Bash, Unity, Postman

Selected Projects

Realtime Onboard Dense RGB-D Mapping on UAVs

Summer Project

MENTOR: PROF. MANGAL KOTHARI

May 2019 - Present

- Studied and experimented various techniques related to 3D mapping of environment using monocular and stereo cameras on Jetson TX2
- Evaluated approaches for shortcomings and computational requirements considering its onboard realtime implementation on UAV

Chat-IITK

Course Project - ESC101

MENTOR: PROF. PUROSHOTTAM KAR

Spring 2018

- Designed and developed a chat application on NodeJS, Express, Socket-IO, and MongoDB
- Implemented real-time chat using Socket-IO with PassportJS for extensively implemented **authentication** and **cookie handling**
- **Database management** implemented using MongoDB, and application deployed on Heroku's server

Mechanical Quadraped

Course Project - TA202

MENTOR: PROF. SHANTANU BHATTACHARYA

Spring 2019

- Designed and simulated a four-legged assembly that uses Jansen's linkage mechanism to walk using Solidworks
- Made a working model of the same under constraints of size and materials using manufacturing processes such as lathing, milling and drilling

Honors & Achievements

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|------|--|---------|
| 2019 | First Runner Up , Student Autonomous Underwater Vehicle Competition (SAVe), organised by National Institute Of Ocean Technology, Chennai | Chennai |
| 2017 | Top 0.7% in country , Joint Entrance Examination Advanced, 160,000 candidates | India |
| 2017 | Top 0.001% in country , Joint Entrance Examination Mains, 1.3 million candidates | India |
| 2016 | Top 1% in state , National Standard Examination in Physics | India |
| 2016 | Top 1% in country , National Standard Examination in Chemistry | India |

Positions Of Responsibility

Team Autonomous Underwater Vehicle, IITK

Science and Technology Council

SOFTWARE TEAM LEAD

April 2019 - Present

- Leading a group of 8 people working on the software of Anahita, while managing funding, sponsorships, and technical progress
- Maintaining entire stack of an Autonomous Vehicle, deployed on Git, implemented using ROS, OpenCV and simulation integrated using Gazebo
- Working to participate in the international underwater robotics competition, **AUVSI RoboSub 2019**, and **SAUVC 2020**

IITK Consulting Group

Students' Gymkhana

SECRETARY

July 2018 - April 2019

- Successfully prepared and delivered lecture to the campus community on introductory Machine Learning and Data Science
- Founding member of the Hobby Group, aiming to work on outsourced consulting projects, with emphasis on insights from collected data

Robotics Club

Students' Gymkhana

SECRETARY

April 2018 - April 2019

- Volunteered in organizing introductory workshops for interested freshman students across the year
- Managed the club website, prepared content for lectures and helped organising competitions for campus community

Counselling Service

IIT Kanpur

ACADEMIC MENTOR AND STUDENT GUIDE

April 2018 - April 2019

- Assisted five freshmen students in adjusting to the college environment, providing guidance and emotional support
- Took campus level remedial classes for freshman year Mathematics, provided personal tutoring to academically weak students for their courses

Coursework

*: EXCEPTIONAL PERFORMANCE, A: GRADE O: ONGOING, I: NEXT SEMESTER, #: ONLINE AUDIT

- Multi-Variable Calculus
- Linear Algebra and Differential Equations
- Fundamentals Of Computing (*)
- Introduction to Machine Design (*)
- Partial Differential Equations
- Probability and Statistics
- Mechanics of Solids (A)
- Dynamics (A)
- Fluid Mechanics (A)
- Energy Systems (o)

Extra Curriculars

- Takneek 2018** Runners Up in robotic soccer event Wild Soccer, and an image processing competition, Visualise, organised by Robotics Club
- code.fun.do** The application generated summaries of the latest news based on the current trending hashtags on Twitter using NLP
- The Ball Game** Developed basic platform game while in high school, on Javascript & C#, updated on Github with Android & Windows builds