

# Ayush Gupta

SOPHOMORE · ROBOTICS ENTHUSIAST

Indian Institute Of Technology, Kanpur

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## Education

### Indian Institute of Technology Kanpur

BACHELOR OF TECHNOLOGY, MECHANICAL ENGINEERING

- Cumulative Grade Point: **9.34/10.0**

Kanpur, India

July 2017 - Present

## Research Experience

### Team Autonomous Underwater Vehicle, IITK

Software Team Member

FACULTY ADVISOR: PROF. MANGAL KOTHARI

May 2018 - Present

- Implemented a novel preprocessing algorithm to formulate a robust underwater vision pipeline, for object detection in a modular fashion
- Fused data from DVL and IMU to create odometry, and working on a finite State Machine for improved and robust underwater autonomy
- Tested the vehicle underwater for more than 200 man hours in January, while working on web-based ROS GUI and data visualisation
- First Runner Up at national level AUV compeition, NIOT-SAVE 2019 with the newly manufactured Vehicle, Anahita (Design Paper: Arxiv)

### Working for Mohammad Bin Zayed International Robotics Competition, 2020

Intelligent Systems Laboratory, IITK

FACULTY SUPERVISOR: PROF. LAXMIDHAR BEHERA

April 2019 - Present

- Created setup for simulation and testing on Universal Robots manipulator mounted on a wheeled Guardian robot
- Performed SLAM using LIDAR and 3D pointcloud from Kinect, and implementing heuristics to map football field sized arena
- Ported outdated available ROS code to work for current development platform which uses ROS-Kinetic, on Ubuntu 14.04
- Objective to create a team of collaborative autonomous robots capable of building a wall and extinguishing fires in unknown environments

### Team Humanoid, IITK

Software Team Member

ROBOTICS CLUB, IIT KANPUR

Dec. 2017 - April 2018

- 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

## Work Experience

### New York Office, IIT Kanpur

Backend Software Intern

SUPERVISOR: PROF. MANINDRA AGRAWAL

May 2018 - July 2018

- 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

## Skills

**Robotics** Robot Operating System, OpenCV, Arduino, Gazebo, SLAM, OctoMap, Stereo Vision, MATLAB

**Web Development** REST API, Express, Socket-IO, Bootstrap, HTML5, Mongo, Jekyll, Travis CI

**Programming** Node.js, C++, Java, Python, Scala, Unity, Git

**Languages** English, Hindi

## Selected Projects

### Object Detection for Unmanned Autonomous Aerial Vehicles

Meher Baba Prize, Indian Air Force

MENTOR: PROF. MANGAL KOTHARI

March 2019 - Present

- Performed data cleaning and preprocessing on the Stanford Aerial Dataset, provided by Stanford Computational Vision and Geometry Lab
- Tested performances of various convolutional neural networks on dataset including modified YOLOv3, TinyYOLO, and LeNet
- Further implementation to be done on embedded Jetson TX2 GPU, leading to constraints on CNN model for real-time detection on drones

### Chat-IITK

Course Project - ESCI01

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

## Microsoft Code Fun Do

*Academia Accelerator, Microsoft*

HACKATHON PARTICIPANT

March 2017

- The application generated summaries of the latest news based on the current trending hashtags on Twitter, using NLTK library and Azure
- Implemented the tweepy library which provided the hashtags as well as the tweets related to them
- Used Natural Language Processing to filter nouns and verbs, and rate words based on their frequency-inverse document frequency value

## The Ball Game

*Code on Github*

3D GAME DESIGNED AND DEVELOPED ON UNITY

January 2014

- Developed a basic platform game on the Game Development Framework Unity using JavaScript, and C# in the 9th grade
- Followed online tutorials and implemented collisions and links in the Unity Game Engine, while developing the game

## Honors & Achievements

|           |  |                |
|-----------|--|----------------|
| 2019      | <b>First Runner Up</b> , Student Autonomous Underwater Vehicle Competition (SAVe), organised by <b>National Institute Of Ocean Technology, Chennai</b> | <i>Chennai</i> |
| 2017      | <b>Top 0.7% in country</b> , Joint Entrance Examination Advanced, <b>160,000 candidates</b>  | <i>India</i>   |
| 2017      | <b>Top 0.001% in country</b> , Joint Entrance Examination Mains, <b>1.2 million candidates</b>   | <i>India</i>   |
| 2016      | <b>Top 1% in country</b> , National Standard Examination in <b>Physics</b>   | <i>India</i>   |
| 2015 & 16 | <b>Top 1% in country</b> , National Standard Examination in <b>Astronomy</b>   | <i>India</i>   |

## Positions Of Responsibility

### Team Autonomous Underwater Vehicle, IITK

*Science and Technology Council*

SOFTWARE TEAM LEAD

April 2019 - Present

- Leading a group of 5 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, IIT Kanpur

*Kanpur, India*

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

*Kanpur, India*

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, O: ONGOING, !: NEXT SEMESTER, #: ONLINE AUDIT

- Multi-Variable Calculus
- Linear Algebra and Differential Equations
- Fundamentals Of Computing (\*)
- Introduction to Machine Design (\*)
- Partial Differential Equations
- Fluid Mechanics
- Introduction to Solid Mechanics