**Ayush Gupta**

JUNIOR UNDERGRADUATE · ROBOTICS ENTHUSIAST

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**Education**

**Indian Institute of Technology Kanpur**

Kanpur, India

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

July 2017 - Present

• Cumulative Point Index: 9.0\*/10.0

**City Montessori School**

Lucknow, India

INDIAN SCHOOL CERTIFICATE EXAMINATION (INTERMEDIATE)

March 2017

• Overall Percentage: 95.5%

**St. Francis’ College**

Lucknow, India

INDIAN CERTIFICATE OF SECONDARY EDUCATION (HIGH SCHOOL)

March 2015

• Overall Percentage: 95%

**Research Experience**

**Team AUV-IITK**

Software Team Member

FACULTY ADVISOR: PROF. MANGAL KOTHARI

May 2018 - Present

* 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 hierarichal 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

**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**

**Intelligent Systems Lab**

Robotics Intern

SUPERVISOR: MR. RAVI PRAKASH, DOCTORAL STUDENT

April 2019 - Present

* 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

**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: 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, L A TEX, Git, SVN, Bash, Unity, Postman

Design: Solidworks 2018, AutoCAD, Inventor, LabVIEW

**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 Quadruped**

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**

2019: First Runner Up , Student Autonomous Underwater Vehicle Competition (SAVe),

Chennai, organised by National Insitute Of Ocean Technology, Chennai

2017: Top 0.7% in country , Joint Entrance Examination Advanced, 160,000 candidates India

2017: Top 0.1% 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, !: 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