

# Apoorva Kumar

ROBOTICS ENGINEER · MACHINE LEARNING ENTHUSIAST

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## Education

<b>IIT Guwahati</b> , B.Tech Major in Electronics and Electrical Engineering	CGPA : 8.11/10	2016 - 2020	<i>Guwahati, India</i>
<b>IIT Guwahati</b> , B.Tech Minor in Computer Sciences and Engineering	CGPA : 8.5/10	2017 - 2019	<i>Guwahati, India</i>
<b>St. Michaels High School, Patna</b> , Senior Secondary from CBSE	Grade : 95.2%	2013 - 2015	<i>Patna, India</i>
<b>Don Bosco Academy, Patna</b> , Secondary from ICSE	Grade : 94.2%	2002 - 2013	<i>Patna, India</i>

## Skills

<b>Robotics</b>	ROS, OpenCV, Stereo Vision, Visual Odometry
<b>Programming</b>	Python, C++/C, Java, C#*
<b>Hardware</b>	Arduino, Raspberry-Pi, IMU Sensor, Camera, RGBD Camera, Motors And Encoders
<b>Machine Learning</b>	Decision Trees, SVM, Neural Networks, CNNs, GANs*, RNNs*
<b>Tools/Packages</b>	Keras, Tensorflow, Unity3D*, Pytorch, Numpy, Matplotlib, Pandas, Gazebo*
<b>Operating Systems</b>	Windows, Linux*
<b>Miscellaneous</b>	Photography, Android App Development*, Web-Request Handling

\* Elementary Proficiency

## Work Experience

### Strato IT, Protec Inc.

*Anyang, S.Korea*

ROBOTICS & DEEP LEARNING INTERN

*May 2019 - Jul. 2019*

- Worked on building a **visual and inertial odometer** for automated cart.
- Implemented **Deep Learning models** like iResNet and PSMNet in **Keras and Pytorch** for **disparity estimation of systems**. Tested on various **benchmark data-sets** to develop a odometer for indoor localization.
- Later wrote **ROS packages** to test and compare the **accuracy of present hardware and software techniques** in visual and inertial odometry.

### AppSecure

*Bengaluru, India*

API DEVELOPER & MACHINE LEARNING INTERN

*May. 2018 - Jul. 2018*

- Implemented a **combined software** for **active sub-domain and port scanning** for web-servers.
- Implemented a distributed **web stress test tool** with high anonymity.
- Used the above mentioned scanner on websites and **trained a model** to **predict the presence of a word** in the web-server directory or sub-domain.

## Key Courses

### Electrical and Electronics

- Control Systems
- Discrete Time Control Systems
- Signals & Systems, Networks
- Probability and Random Processes
- Digital Systems
- Microprocessors

### Computer Science

- Game Theory
- Operating Systems
- Computer Architecture
- Data Structures
- Algorithms
- Networks

### Robotics

- ROS Tutorials in Python
- A.I. for Robotics
- Deep Learning for Self-Driving Cars

### Mathematics

- Linear Algebra
- Basic Calculus
- Discrete Maths

### Machine Learning and Deep Learning

- Basic Machine Learning
- Artificial Neural Networks
- SVMs, Decision Trees and Random Forest
- CNN and Computer Vision

## Awards

2018	<b>Bronze Medal</b> , TCTD, 7th Inter IIT TechMeet, IIT Bombay	<i>Bombay, India</i>
2017	<b>Bronze Medal</b> , Technologies for Soldier Support, 6th Inter IIT TechMeet, IIT Madras	<i>Madras, India</i>
2018	<b>1st Position for 2 consecutive years</b> , Electrovote, Inter-Hostel Tech-Innovation Event, IIT Guwahati	<i>Guwahati, India</i>

## Selected Projects

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### Self-Balancing Cycle

IIT Guwahati, India

DESIGN PROJECT, EEE DEPARTMENT | 3 MEMBER TEAM

Jan. 2019 - May. 2019

- Build an autonomous moving **self balanced cycle** using weight balancing as part of Course Project.
- The cycle balanced itself using a **controller** which used the data from an **IMU to predict its orientation** and rotate an attached mass to **balance the center of gravity** of the cycle henceforth balancing the cycle.
- Worked on building the movable **physical model** and the **electronic circuit** for the sensors and actuators.

### Soil Nutrient Estimation Robot

IIT Guwahati, India

7TH INTER IIT TECHMEET | 5 MEMBER TEAM |  GITHUB

Nov. 2018 - Dec. 2018

- The robot collected **soil sample** and measured **nitrogen-phosphorus-potassium** content of **every 1 sq. meter** of farmland respectively.
- It performed **Colorimetry** using a **LDR and RGB-LED** on soil samples to estimate accurate fertilizer requirement for different farmland patches.

### Eye In The Sky

IIT Guwahati, India

7TH INTER IIT TECHMEET | 3 MEMBER TEAM |  GITHUB

Nov. 2018 - Dec. 2018

- Achieved remote sensing of satellite data using **deep learning semantic segmentation**.
- Implemented 4 different algorithms **UNet, PSPNet** both with **RGB Channels and One-Hot encoded channels**.
- Trained on provided 13 images with 4 channels containing 8 classes.

### ARLE(Automated Robot for Library Enhancement)

IIT Guwahati, India

4I LABS, IIT GUWAHATI | 9 MEMBER TEAM |  GITHUB |  HOMEPAGE |  YOUTUBE

Jul. 2017 - PRESENT

- This was a project undertaken to add to the already in-action **automation of Library of IIT Guwahati**.
- Built a **four wheeled robot** which can perform **SLAM and visual mapping** in library environment and reach the **location of any specified book**.
- Wrote a **ROS package** to achieve the **visual odometry and mapping** mentioned using **LIDAR and RGBD Camera**.
- Aimed at building a robot which can **pick and place misplaced books** in the library into their correct shelves.

### Technologies for Soldier Support- Health Monitoring System

IIT Guwahati, India

6TH INTER IIT TECHMEET | 3 MEMBER TEAM

Dec. 2017 - Jan. 2018

- Designed a **human wearable suit** using MEMS Sensors namely **MPU9250, Temperature Sensor and Heart Rate sensor** to predict the physical state of **ability and inability** of a soldier during any battle.
- Build with a **ESP8266** it transmitted data of the **soldiers condition** to base station.

## Positions of Responsibility

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Apr. 2018 - Apr. 2019 **Secretary**, Robotics Club, IIT Guwahati

Guwahati, India

Feb. 2018 - Apr. 2019 **Co-Founder and Manager**, IITG.ai, IIT Guwahati

Guwahati, India

Apr. 2017 - Apr. 2018 **Technical Secretary**, Umiam Hostel, Hostel Affairs Board, IIT Guwahati

Guwahati, India

Apr. 2017 - Apr. 2019 **Team Head**, ARLE, 4i Labs, IIT Guwahati

Guwahati, India