

# Pranay Junare

+91 9552800660 | [junarepg18.extc@coep.ac.in](mailto:junarepg18.extc@coep.ac.in) | [linkedin.com/in/pranay-junare/](https://linkedin.com/in/pranay-junare/)

## EDUCATION

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### COLLEGE OF ENGINEERING PUNE

*B.Tech Electronics and Telecommunication, Minor in Computer Science ; CGPA: 8.54*

Pune, India

Aug. 2018 – May 2022

### Birla College of Science

*Class 12; Score: 89.23%*

Mumbai, India

Aug. 2016 – May 2018

### Fatima High School

*Class 10; Score: 92.00%*

Mumbai, India

Aug. 2006 – May 2016

## RESEARCH & INDUSTRIAL EXPERIENCE

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### Research Intern - NTU-India Connect Internship Program

*Nanyang Technological University, Singapore*

June 2021 – Aug 2021

*Nanyang Ave, Singapore*

- Under guidance of [Dr. Xie Ming](#) worked on Collaborative UAV-UGV system for Search and Rescue Task.
- Implemented a Octomap based 3-D mapping approach using UAV and built a 2-D occupancy grid map of the surrounding which can further be used by UGV for navigation.
- Built a Human Detection system on the UAV using Yolo v3 tiny model in order to detect persons to be rescued.

### Research Intern - Mitacs Globalink Internship Program

*Ontario Tech University, Canada*

May 2021 – Jul 2021

*Oshawa, Canada*

- Under guidance of [Dr. Scott Nokleby](#) worked on the project of developing an Autonomous Electric Wheelchair for children with physical disability.
- Built a simulation model of a wheelchair, added gazebo sensor plugins, implemented complete navigation stack, used RTABMap & Octomap mapping approach, and built a system for detecting negative obstacles.

### Undergraduate Research Member

*Centralized Robotics and Automation Lab, COEP*

Mar 2019 – Present

*Pune, India*

- Under guidance of [Dr. Shantipal Ohol](#) worked on different collaborative projects, conducted various workshops & participated in Robotics competitions.
- Lab has the recognition of being the First “The Robotics Society(TRS), India - Student Chapter” of India.
- Briefly worked on 3-wheel omni-directional Mobile robot, implementation of FreeRTOS, State-estimation, Perception & Control of Mobile robot and also explored NAO-6 Humanoid Robot.

### Robotics Intern

*Binary Robotics*

Nov 2020 – Jan 2021

*Pune, India*

- Worked from proof of concept to development of ROS based Heavy duty Autonomous Mobile Robot capable of 500kg payload for autonomous navigation in a dynamic environment such as warehouse, healthcare facility, etc.
- Developed Electronic Design System, performed simulation on Gazebo and used Lidar point clouds & wheel odometry information in order to implement multiple SLAM algorithms.

### Intern

*Exa Mobility*

Apr 2020 – Apr 2020

*Pune, India*

- Worked on MEMS motion sensor calibration & implemented Sensor fusion Algorithms on IMU data.
- Also worked on GPS & Kalman filtering to develop & implement GPS Aided Inertial Navigation System.

## PUBLICATIONS

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1. Mihir Kulkarni, **Pranay Junare**, Mihir Deshmukh, Priti P. Rege, “Visual SLAM combined with Object detection for autonomous indoor navigation using Kinect V2 and ROS”, International Conference on Computing, Communication and Applications (ICCCA),2021. ([Link](#))
2. **Pranay Junare**, Shaunak Mahajan, Prithvish Taukari, Anirudh Nallawar, Dr. Shantipal Ohol, “Development of Robotic Arm Manipulator mounted on Self Balancing Two Wheeled Mobile Robot”, Aerospace and Defence Related Mechanisms (ARMS), 2021. ([Link](#))

## PROJECTS

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### Deep Learning based Robotic Grasping | *Robotics, Computer Vision* | [Report](#) | [Link](#)

- Objective is to optimally grasp objects of variable shape-size aligned at different position and orientations. A custom Deep Learning based robotic grasping model was developed. The model is based on Transfer Learning and predicts the 5-D grasp configuration with an accuracy of 78.2 %.
- Built a low-cost 5-DOF robotic arm and added a parallel plate gripper as the end effector. RGB-D Kinectv2 camera is used for the perception of the objects on the Test workbench setup.
- Complete ROS Noetic and Moveit support is added to the developed robotic arm.
- Full End-to-end grasping pipeline is established right from capturing RGB-D image, prediction of rotated bounding boxes, ROS and moveit support for the robotic arm, 3D grasp pose determination from predicted grasp configuration, Transforms from 2D image to the base link and finally the trajectory planning of Robotic arm.

### Visual SLAM & Object Recognition for Autonomous Mobile Robot | *Robotics, Perception* | [Link](#)

- Did comparative study of different RGB-D camera's such as different models of Intel Realsense and Kinect.
- Studied RTAB-Map and KinectFusion algorithms for indoor localization and worked on its implementation.
- Implemented RTABMap SLAM algorithm on gazebo simulator and tested the same in real-time using Kinect v2 RGB-D camera
- In addition to that alongside Yolo V3 object detection model was implemented in order to achieve task of robust perception in autonomous navigation.

### Simulation and Design of Cubalance | *Robotics, Automation* | [Link](#)

- Cubalance is a STM32 ARM Cortex M4 based robotic cube which can perform locomotion on different terrains and can balance on an edge. The simulation was done on Matlab and Simulink.
- Implemented Control Algorithms such as PID and LQR in order to achieve stability.

### Robust Control of Inverted Pendulum Robot | *Robotics, Automation* | [Link](#)

- Inverted Pendulum Robot - A two-wheeled robot capable of navigating and balancing on its own was built.
- It has MEMS Motion sensors and Atmega-32 at its core which pass downs PID controlled signal to the motors
- Tested different IMU Sensor Fusion Algorithms such as Complementary filter, Mahony filter & Madgwick filter.

### Semi-Autonomous Omni-directional Mobile Robot for ABU Robocon | *Robotics, Automation*

- Worked on perception, optimal control of basedrive & different trajectory generation for efficient path planning by interfacing IMU sensor, Encoded Motors, Laser sensors, etc. Also worked on actuation of pneumatic mechanisms.
- Implemented FreeRTOS on STM32 ARM Cortex M4 Micro-controller for efficient real-time operations.
- Also Interfaced NRF24L01 tranceiver module for establishing communication between two robots.

### Home Automation System | *IoT, Embedded Systems*

- Built simple home automation system which helps users to wirelessly control home appliances using their phone.
- The system was built using Arduino Uno, HC-05 Bluetooth Module and a High voltage Isolation circuit.

## TECHNICAL SKILLS

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**Programming Languages:** Python, C, C++, Embedded C

**Firmware:** ARM Cortex M4, Mongoose OS, MOS tool, FreeRTOS

**Frameworks and Tools:** ROS, Pytorch, OpenCV, MATLAB, Simulink, Gazebo, Altium PCB Designer, Proteus.

**Hardware:** ARM Microcontroller, AVR Microcontroller, I2C/ UART/ SPI Protocols, LiDAR, MEMS Motion Sensors.

## NOTABLE ACHIEVEMENTS

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- Won 3rd prize at “M-Exhibit UG Project Competition’22” among 40+ teams, 2022
- Won Consolation prize at “Directorate of Technical Education’s Project Competition’22” among 110+ teams, 2022
- Secretary of “The Robotics Society, India - COEP Chapter” for Academic year 2021-2022.
- NTU-India Connect Scholarship Award from Nanyang Technological University, Singapore, 2021
- Mitacs Globalink Research Internship Award, 2021
- Won “Judge’s special Award” at National ABU Robocon’20 among 155 teams across India, 2020
- Winner of Search & Destroy robotics competition at Mindspark’19(Tech. event with footfall of 20K+ people), 2019
- Selected for IBM Datacamp to learn, explore and work under Professionals of IBM Global Team.
- 1st Ranker at Institute Level in National Science Olympiad 2017.

## EXTRA-CURRICULAR ACTIVITIES

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- Technical Team Member - Robot Study Circle - College of Engineering, Pune
- Coordinator, Lead Anchor - Robotex India - Pune Regional Robotics Event 2019
- Coordinator - SPICMACAY COEP – Music and Arts Association
- Volunteer - National Social Service(NSS)
- Indian Classical Singing ,Playing Harmonium & Tabla (Musical Instrument) , Playing Badminton