

Rajendra Singh

Fourth year

Computer Science and Engineering

Indian Institute of Technology, Palakkad

Address : 315, Tilang-B, IIT Palakkad, Kerala, India

E-Mail : singh.raj1997@gmail.com

Phone : +91 7073091997

D.O.B : 27th November 1997

Web : <https://iamrajee.github.io/>



SUMMARY

◆ Domain	:	Robotics and Computer Vision
◆ Internships	:	Gadgeon, UST Global, Researchshala and IIT Madras.
◆ Projects	:	SLAM , Manipulators, Reinforcement Learning based UAV controller, Swarm etc
◆ Position	:	Former Head, Robotics club, IIT Palakkad
◆ Achievements	:	KVPY fellowship, AWES Scholarship
◆ Contributions to	:	ros, ros2, moveit, moveit2, moveit_task_constructor, moveit_tutorials etc.
◆ About	:	I have a passionate interest in vision-based robotics. I'm research oriented, team player and looking forward to collaborate with enthusiastic team or startup researching in this domain.

EDUCATION

Program	Institution	%/CGPA	Year
• B. Tech (Present)	Indian Institute of Technology(IIT), Palakkad	7.33/10 (Till VII Semester)	2016 - April, 2020
• XII	Delhi Public School(DPS), Udaipur	89%	2015 - 16
• X	Delhi Rajasthan Public School, Rajsamand	96%	2013 - 14

TECHNICAL SKILLS

Area	Skills
► Robotics	<ul style="list-style-type: none">• SLAM(2D gmapping/3D RtabMap)• Motion and Path planning• Swarm behaviour and algorithms• Feedback control system• Perception(Feature matching, Semantic segmentation, Object detection)• Sensor fusion(Kalman, Particle filter)• Robot kinematics and dynamics(DH/Newton/Eular/Lagrangian method)• Embedded System(ARM, RTOS, FPGA)
► Reinforcement Learning	Q-learning, Sarsa, Monte Carlo, TD, Multi-armed bandit, DQN, Genetic algorithm
► Machine Learning	Linear and Logistic Regression, Neural Networks(convolutional, recurrent),
► Languages	C, C++ , Python
► Software/Tools	ROS 1/2, Moveit, Gazebo, V-REP, Matlab, Fusion 360, Keil, Atmel studio 6, OpenCV, OpenGL
► Hardware	Rplidar A2M8, Realsense D435, Nvidia Jetson(Tx2, nano), Raspi3B+, GstarIV GPS, Zybo-zyng FPGA, KL25Z arm cortex-M0+ , Atmega16/32/2560, NodeMCU, GSM, Pyboard, OpenMV, PlutoX
► Other	Open Source Development, Shell scripting, Latex, Review and research paper, Knowledge of patents

WORK EXPERIENCES

- January-June, 2020 ● **Robotics Research Intern, Gadgeon Smart Systems**
 - Kochi, India
 - Working toward to develop cobot of two panda arm to perform complex manipulation **Task** with task level motion planning using Moveit and Moveit_task_constructor motion planning framework.
- May-July, 2019 ● **Computer Vision and Sensor Fusion Intern, UST Global**
 - Trivandrum, India
 - Studied various **SLAM** algorithm and implemented it using ROS by fusing sensor data of lidar and 3d depth camera. Later, I worked on control and planning of robotic manipulator for vision-based pick and place task.
- May-July, 2018 ● **Research Intern, Researchshala**
 - Chandigarh, India
 - Worked on deep learning **projects** related to transfer learning, topic modelling, web and pdf scraping, extracting and analysing useful information from unstructured data.
- May-June, 2017 ● **Robotics Intern, Centre for Inovation, IIT Madras**
 - Chennai, India
 - Studied state of art 3D printing technology and then built **Prusa i3 3D printer** and a robotic arm using this printer.

SEMINAR PRESENTATIONS

- **Task-Level Motion Planning for Multi-manipulator system**
- IEEE Computer Society, GEC Palakkad
Conducted a seminar on discussing motion planning, moveit, multi-manipulators etc.
- **Visual SLAM on mobile manipulator using a robot operating system**
- Industry-Academia Conclave, IIT Palakkad
Presented a **poster** showcasing the implementation of 3D visual SLAM on an industrial manipulator robot.
- **Low-cost Prusa-i3 3D printer**
- Open House, Centre for Innovation(CFI), IIT Madras
Showcased low cost, self-made Prusa-i3 3D printer and its applications.

SELECTED PROJECTS

► Multi-manipulator	Task-Level Motion Planning for Multi-manipulator system. (See here)	January-June, 2020
► Swarm	Simulating swarm behaviour of flocking and foraging in V-REP and Argos simulator	October-December, 2019
► Q-learning	Q-learning based controlled for ARdrone, simulated in gazebo using ROS	August - October, 2019
► Manipulator	Vision-based control and trajectory planning of robotic manipulator in point-cloud data	June - July, 2019
► SLAM	Implemented SLAM on AGV by sensor fusion of data from 2D lidar and 3D camera	May - June, 2019

To know more about these projects, please visit: <https://iamrajee.github.io/projects/>

COMPETITIONS

► SIH, Hardware	Path planning to fly two drones in a synchronized manner, maintaining same altitude and attitude.	January - June, 2019
► E-yantra	Simulated thirsty crow story using wheeled robot, Overhead camera, Aruco marker, Blender models, Augment environment using OpenGL, Path planning and Navigation on hexagon grid using IR sensor	August,18-March, 2019
► Inter-IIT	Build a model for Satellite image classification using just 14 images, IIT Bombay	July - December, 2018
► Inter-IIT	Built automated Toilet Cleaning Robot for cleaning toilet seat and floor, IIT Madras	July - December, 2017

RELEVANT COURSES AND WORKSHOPS

Area	Courses
► Maths	Linear algebra, Probability, Stochastic Process and Statistics, Differential Calculus
► CS	Data Structures and Algorithms, DBMS, OS, Computer networks, Compilers, Parallel programming
► AI	ML basic(workshop), Principle of machine learning(CS4801), ML by Andrew Ng(CS229), DL(CS5007), RL basic and Advanced
► Robotics	Robotics manipulation and control, Robotics basics and Advanced, IOT basics, Embedded system, Signal and system, Engineering mechanics, Biomedical and Instrumentation, ROS basics and Advanced, Navigation stack, ROS Manipulation, ROS OpenAI gym

POSITION OF RESPONSIBILITY

- **Head of Robotics Club, IIT Palakkad** July 2018 - May 2019
 - Taught basics and advanced concept of robotics to a group of 40 students(12 teams).
 - Supervised 9 student projects.
 - Mentored 2 student projects(Humanoid and Submarine robots).
 - Encouraged and motivated student to participate in a regional and national competition.

SCHOLASTIC ACHIEVEMENTS

- 2017 ♦ Winner, Kaizen Robotics Competition, Lema labs.
- 2016 ♦ Awarded **KVPY** Fellowship by Department of Science and Technology(**DST**), Govt. of India.
- 2016 ♦ Qualified **IIT-Jee** Advanced 2016 with a percentile of 99.3 amongst a total of 1.2 million students.
- 2015 ♦ Best Student of Year Award 2014-15, District Private Education Committee, Rajsamand
- 2014 ♦ Awarded Merit Scholarship Class X, Army Welfare Education Society(**AWES**).

REFERENCES

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| <ul style="list-style-type: none">• Mr. Ashok Nair
Director Service Delivery
UST Global, Thiruvananthapuram, India
E-Mail: ashok.nair@ust-global.com | <ul style="list-style-type: none">• Mr. Shubham Jain
Founder and CEO
Researchshala, Chandigarh, India
E-Mail: shubham@researchshala.com | <ul style="list-style-type: none">• Dr. Santhakumar Mohan
Professor of Robotics and Control, Department of Mechanical Engineering, IIT Palakkad
E-Mail: santhakumar@iitpkd.ac.in |
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