

# Rahul Kumar

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## ACADEMIC DETAILS

Education	Institute	Year	CPI / %
B. Tech: Computer Science and Engineering	IIT Kharagpur	2016- Till date	9.20 / 10
Intermediate	DAV Kpildev, Ranchi	2014 - 2016	95.4 %

## PUBLICATIONS

- **LEGO: Leveraging Experience in RoadmapGeneration for Sampling-Based Planning**  
by Rahul Kumar, Aditya Mandalika, Sanjiban Choudhury, Siddhartha Srinivasa  
*in Intelligent Robots and Systems, IROS, 2019 IEEE/RSJ International Conference, (Macau, China). Nov 2019 PDF*

## WORK EXPERIENCE

- **Amazon Robotics, Seattle**  
Software Engineering Intern May'19-July'19  
*Topic: End to end system to demo box stacking using a robotic arm*  
Worked to build end to end stack for hands free automation of box picking using UR10 (6-DoF robotic arm).Designed perception module to identify boxes from time-of-flight image using clustering and plane fitting methods.Integrated controller, motion planning and calibration modules.  
*Working Areas:* Perception, Path Planning, State Machines, Robotic Automation and Controls
- **University of Washington**  
Summer Intern, Personal Robotics Lab May'18-July'18  
*Topic: Learning Sampling Methods for Robot Motion Planning*  
Devised non-uniform sampling strategies that favor sampling in bottleneck regions to accelerate the planning process simultaneously maintaining its quality in smoothly changing environment.  
*Research Areas:* Deep Learning, Variational AutoEncoders, Graph Space Planning, Constrained Space Problems  
*Advisor: Prof. Siddhartha Srinivasa*
- **Kharagpur RoboSoccer Students' Group, IIT Kharagpur**  
Software Teamm Member Feb'17 - Present  
*Objective: To build Autonomous Soccer Playing Robots*  
Implemented path planning algorithms and Finite State Machines (FSM) Architecture for RoboCup Small Size League Robots, Designed a simulator for robots using PyQt, Worked on Kalman Filter to tackle noisy data from Camera, enhancing World Model of the Game State.  
*Research Areas:* Multi-agent systems, motion planning, noise filters, robot soccer  
*Advisor: Prof. Jayanta Mukhopadhyay*

## PROJECTS

- **Action/Event Recognition for Safety Analytics** Dec'17 - Feb'18  
*Prof. Pabitra Mitra*  
Recognising actions in video clips by extending CNN in the time domain. The model developed to be most suited foran industrial setting like detecting accidents in a factory.  
*Working Areas:* Computer Vision, ConvNets, Encoder Decoder Models
- **Digital Legal Assistant | Open Soft 2019, General Championships, IIT Kharagpur**  
Developed the stack to search for related cases and acts for a given natural language query. Database was made of around 50000 supreme court case. Used page ranking algorithms on citation graphs to determine the ordering of results and cases.
- **RRT Simulator**  
Developed an interactive GUI interface to simulate a path generated by RRTs avoiding obstacles using Python and Qt. Added Features for low level skill testing of individual robots.  
*Tools and Libraries:* OMPL, PyQt, ROS.  
*Repository:* <https://github.com/vernwalrahul/RRTSimulator/>
- **Question Generation from RDF graphs via Discriminative Ranking** Aug'18 - Nov'18  
Developed an application to automatically generate Q/A pairs from RDF graphs. It involves identification of popular-entities, extraction of their relation with other entities using hop distance. Extracted tokens are then fed to tranformations and ranking algorithm to produce a ranked list of questions.  
*Advisor: Prof. Plaban Bhowmik*

- **Medical OCR**  
Worked in a team of 6 to build an OCR for detecting of medical professionals from prescriptions. Integrated Peter Norvig's spelling corrector algorithm to auto-correct misspelled words.
- **Blockchain Certificates** (IBM Blockchain Hackathon)  
An application on digital certificates using blockchain technology to avoid fraud certificates and speed up the verification process.

## RESPONSIBILITIES

- **Instructor** (MIT-IIT Robotics Workshop)  
*Guide: Prof. Sudeshna Sarkar* *1st May'17 - 15th May'17*  
Conducted a fortnight long Robotics workshop for higher school students Introduced basics of C, C++, Processing and their applications in the field of robotics
- **Image Processing Mentor** (IEEE Robotics Winter Workshop) *Dec'17*  
Conducted a week-long IP workshop for 1st and 2nd year undergraduates at IIT Kharagpur, teaching basic Image Processing using OpenCV and C++.
- **Mentor, Kharagpur Winter of Code, 2017** (IIT Kharagpur)  
Mentored a couple of students in KWOC (organized by Kharagpur Open Source Society ) which is a 5-week long GSoC-styled programme for students who are new to open source software development.
- **Executive Head, Kharagpur Open Source Society** (IIT Kharagpur) *Feb'17 - Present*  
Organised the Git, GitHub and Linux workshop for getting participants started with open source software development, during Open Source Summit, Kshitij.
- **Executive Head, Code Club** (IIT Kharagpur) *Aug'17 - Present*  
Organised AI BootCamp to let participants dive into the theory of Machine Learning and its applications during Up.AISummit, 2018.

## AWARDS AND ACHIEVEMENTS

- **Smart India Hackathon - 2019**  
Was among the top 6 teams competing for the Smart India Hackathon Grand Finale 2019 (Software)
- **KVPY 2016.**  
Secured All India Rank 9th in one of the prestigious examination initiated by Department of Science and Technology, Government of India
- **IIT JEE Advanced 2016.**  
Secured All India Rank 266 in JEE Advanced 2016.
- **Robocup 2017.**  
First team from India to qualify for SSL, Robocup 2017 held in Japan, among top 24 teams across the globe.
- **Best Fresher, Conquest, Kshitij 2017**  
Participated in an Robotics Event at Kshitij 2017 , Asia's largest techno-management fest. Awarded the best fresher at IIT Kharagpur.
- **IBM Blockchain Hackathon, Kshitij 2018**  
Secured 3rd position in the national level hackathon organized at Kshitij, 2018.

## RELEVANT COURSES

- **Completed:** \*Programming and Data Structures, \*Algorithms - I, II, Formal Language and Automata Theory, \*Software Engineering, Probability and Statistics. \*Computer Architecture, Matrix Algebra, Knowledge Modelling and Semantic Technologies, \*Compilers, \*DBMS
- **Ongoing:** Artificial Intelligence, Reinforcement Learning, Image Processing  
\*: *Theory + Lab*

## TECHNICAL SKILLS

- **Languages** C, C++, Python, Matlab,  $\text{\LaTeX}$   
**Libraries and Tools** Tensorflow, OMPL , OpenCV, ROS, PyQt, Octave  
**Field of Interest** Computer Vision, Path Planning, Machine Learning, Decentralised Systems.