

Rahul Kumar

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ACADEMIC DETAILS

Education	Institute	Year	CPI / %
B. Tech: Computer Science and Engineering	IIT Kharagpur	2016- Till date	9.46 / 10
Intermediate	DAV Kapildev, Ranchi	2014 - 2016	95.4 %

PUBLICATIONS

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

WORK EXPERIENCE

- **Amazon Robotics, Seattle**
SDE - Robotics 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 to demo the automation of manual 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**
Research 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. Compared the devised algorithm with various state of the art learning and non-learning baselines in different environments.
Research Areas: Deep Learning, Variational AutoEncoders, Graph Space Planning, Constrained Space Problems
Advisor: Prof. Siddhartha Srinivasa
- **Kharagpur RoboSoccer Students' Group, IIT Kharagpur**
AI Team Head
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. Worked on trapezoidal velocity profiling and PID optimised with PSO for smooth motion of robots in real-world environment.
Research Areas: Vision, Motion Planning and Controls, Multi-Agent systems, Robot-Soccer
Advisor: Prof. Jayanta Mukhopadhyay

RECENT PROJECTS

- **Action/Event Recognition for Safety Analytics**
Dec'17 - Feb'18
Recognising actions in video clips by extending CNN in the time domain. The model developed to be most suited for an industrial setting like detecting accidents in a factory.
Research Areas: Computer Vision, ConvNets, Encoder Decoder Models
Advisor: Prof. Pabitra Mitra
- **RRT Simulator**
Developed an interactive GUI interface to simulate paths 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 transformations and ranking algorithm to produce a ranked list of questions.
Advisor: Prof. Plaban Kumar Bhowmik

- **Shopping Mall Management System** (Term Project) Jan'18 - April'18
Developed an object orientated system using Java to provide an online platform for different stakeholders, easing their services and requests. Explored various stages of Software Development Life Cycle including SRS preparation, UML Designing, Implementation and Testing.
Advisor: Prof. Sudip Misra
- **Medical OCR**
Worked in a team of 6 to build an OCR for detecting handwriting of medical professionals from prescriptions. Extracted text based region from the image are fed to the OCR to recognize corresponding prescription. 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. Cryptographically signed certificates were registered on the bitcoin blockchain. Added features to create, issue and validate certificates.

RESPONSIBILITIES

- **Instructor** (MIT-IIT Robotics Workshop) *1st May'17 - 15th May'17*
Guide: Prof. Sudeshna Sarkar
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.AI Summit, 2018.

AWARDS AND ACHIEVEMENTS

- **KVPY 2016.**
Secured All India Rank **9th** in one of the prestigious examination initiated by the 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
- **Hack-A-Bit, 2018**
Secured 3rd position in the 36 hrs national level hackathon organized at BIT Mesra, Ranchi

Relevant Courses

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

TECHNICAL SKILLS

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