Rajat Kumar Jenamani

Research Interests:
Motion Planning, Planning and Learning, Manipulation, Multi-Agent Planning Human-Robot Interaction

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Languages and Tools:
C++, Python, Java, ROS, Boost, Eigen, OpenCV, Tensorflow, OMPL, PyBullet, Isaac Sim

EDUCATION

Indian Institute of Technology Kharagpur | B. Tech. in Computer Science and Engineering 2017 - 2021
GPA **9.69/10.0** (Department Rank 2) *Advisor*: Prof. Partha P. Chakrabarti
Thesis: Multi Agent Pathfinding on Roadmaps with Non-Unit Edge Costs

PUBLICATIONS

[3] Search-Based Planning for Generation of Stable Stacks of Objects [under review]
by Rajat Kumar Jenamani, Muhammad Suhail Saleem and Maxim Likhachev
Submitted to *IEEE International Conference on Robotics and Automation*, ICRA 2021 [PDF]

[2] Robotic Motion Planning using Learned Critical Sources and Local Sampling
by Rajat Kumar Jenamani*, Rahul Kumar*, Parth Mall* and Kushal Kedia*
In *IEEE International Conference on Robotics and Automation*, ICRA 2020 workshop - MLPC [PDF]

[1] Deep Learning rooted Potential Piloted RRT* for expeditious Path Planning
by K Snehal Reddy*, Manjunath Bhat*, Shamin Aggarwal*, Rajat Kumar Jenamani*, Jayanta Mukhopadhyay
In *Proceedings of the 4th International Conference on Automation, Control and Robotics Engineering*, CACRE 2019 [PDF]

EXPERIENCE

Carnegie Mellon University - Research Intern, Search Based Planning Lab May 20 - Current
Topic: Enabling efficient transport of objects by generating movable stacks *Advisor*: Prof. Maxim Likhachev
- Developed an algorithm that efficiently generates movable stacks of objects by lazily using computationally expensive physics-based simulations along with a custom scoring function that assigns scores to stacks[3].
- Achieved significant improvements in the number of objects in the generated stacks and their stability over baselines on YCB Object Dataset. Validated the construction feasibility of the generated stacks on a PR2 robot.

Research Areas: Lazy Search, Heuristic Search, Physics Based Simulations, Motion Planning and Manipulation

Microsoft - Software Engineering Intern May 20 - July 20
Topic: Enhancing Outlook Actionable Messages Approval Process *Team*: Office 365 Ecosystem Team (India)
Working Areas: REST APIs, Azure DevOps, OAuth 2.0, MVC Model

University of Washington - Research Intern, Personal Robotics Lab May 19 - July 19
Topic: Multi Agent Motion Planning for Robotic Arms *Advisor*: Prof. Siddhartha Srinivasa
- Adapted multi-agent pathfinding algorithms such as LPA* on Cartesian/Tensor Product Graphs and Conflict Based Search to variants lazy with collision checking - the computational bottleneck in higher dimensions.
- Tested on the arms of the Home Exploring Robotic Butler (HERB), thus enabling it to execute complex bi-manual tasks that require simultaneous movement of its arms; also tested on n-link arms.

Research Areas: Multi-Agent Motion Planning, Lazy Search

Kharagpur RoboSoccer Students' Group - AI Team March 18 - Current
Topic: Cooperative multi-agent systems in dynamic adversarial environments.
- Proposed a deep learning based approach to tune the sensitive parameters of RRT*-Artificial Potential Field[1].
- Worked on motion planning algorithms, multi-robot coordination and finite state machines for RoboCup SSL.
- Started a year-round reading group for discussions on the latest research in the field of Robotics and AI.

Research Areas: Multi-Robot Systems, Motion Planning

The Cornell, Maryland, Max Planck Pre-doctoral Research School 2020 - Attendee August 2020
Attended a week long school involving lectures from and interactions with professors doing state-of-the-art research in domains like large-scale machine learning and theory of deep learning. Among 105 students selected.

AWARDS AND ACHIEVEMENTS

Tower Research Capital India Merit Scholarship 2020
1 out of 3 students selected across my institute for Tower Research Capital India Merit Scholarship 2020.

Student Par Excellence Award - CSE, IIT Kharagpur
Awarded certificate of **'Student Par Excellence'** by IIT Kharagpur for exemplary academic performance.

SSL RoboCup 2019 - Qualification
Among the top 25 teams in the world that qualified for SSL RoboCup 2019, a 6 vs 6 robot soccer competition.

GKF International Internship Scholarship 2020 - IIT KGP Foundation of USA
1 out of 5 students from my institute awarded the scholarship (a maximum grant of $5000) for my CMU internship.

Asia Amritapuri Regionals Rank 50 - ACM ICPC 2020
Ranked 50 in Asia Amritapuri Regionals of International Collegiate Programming Contest 2020. Ranked 66 among 4401 teams in the nationwide prelims.

IIT Entrance Exams
In **top 0.07%** in JEE Mains and **top 1.5%** in JEE Advanced (nationwide exams for admission to IITs).

KVPY Scholarship
Awarded the KVPY Scholarship for scientific research by the Government of India. In **top 0.6%** of applicants.

PROJECTS

Multi Agent Pathfinding on Roadmaps with Non-Unit Edge Costs (Undergraduate Thesis)
Developing product graphs based algorithms for multi agent pathfinding on roadmaps with non unit edge costs. Proposed method achieved an order of magnitude improvement over a product graph based baseline. Graded "Excellent" in interim evaluation.
Research Areas: Multi-Agent Pathfinding, Graph Search, Product Graphs

Leveraging Experience for Robotic Motion Planning in Complex Environments
Led a team of undergrads to research learned motion planning in domains where learning the complete structure of the environment is intractable. Our work on learning to identify critical sources in the environment and using the space-filling property of planners such as RRT to exploit these sources was recognized in a top-tier conference[2].
Repository: `https://github.com/RKJenamani/CS-RRT`
Research Areas: Planning with Learning from Experience, Sampling-Based Motion Planning, Robot Learning

J.A.R.V.I.C. - Just A Rather Very Intelligent Chatbot
Built an automated conversational agent that classifies the emotion of the user and forms replies based on them. Used Bayesian and LSTM based classifiers for sentiment analysis and generated replies using seq2seq models.
Repository: `https://github.com/RKJenamani/J.A.R.V.I.C.`
Research Areas: Automated Chatbot, Sentiment Analysis, Natural Language Proccessing

POSITIONS OF RESPONSIBILITY

Code Club, IIT Kharagpur - General Secretary Jan 19 - Current
Organized intra-institute workshops, hackathons and competitions such as ICPC-style programming contests. Organized up.AI 2018, an event dedicated to AI for Social Good in association with Intel, Jio and other tech giants.

Student Welfare Group, IIT Kharagpur - Mentorship Aug 19 - Current
Mentoring five freshmen from my department under the aegis of Student Mentor Program.

Technology Robotix Society, IIT Kharagpur - Member Aug 17 - Mar 18
Conducted seminars and workshops for students at IIT Kharagpur and other colleges. Organized Robotix 2018, one of India's largest robotics events.