RKJenamani
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Rajat Kumar Jenamani

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Research Interests

Artificial Intelligence and Robotics: Search-based Planning, Multi-Agent Path Finding, Deep Learning, Planning with Learning from Experience, Applications of Planning to Robotic Systems, Reinforcement Learning.

Academics

2017-2021	*Bachelor of Technology* in **Computer Science and Engineering, IIT Kharagpur**
GPA	**9.64/10.0** (Currently Pursuing)
2017	*All India Senior School Certificate Examination*, **St. Columba's School**
GPA	**97.4%**
2015	*All India Secondary School Examination*, **St. Columba's School**
GPA	**10.0/10.0**

Internships

Personal Robotics Lab, University of Washington **May 19 - Jul 19**
Guide: Prof. Siddhartha Srinivasa, University of Washington

- Implemented and tested motion planning algorithms on roadmaps sampled in the configuration space of arms of HERB, the bi-manual robot and in the configuration space of multiple n-links arms.
- Characterized the behaviors and deficiencies of the algorithms on these multiple high dimensional manipulators and devised efficient algorithms (variants of Conflict Based Search) to address the same.

Research Areas: Graph Theory, Multi-Agent Systems, Robotics

Publications

Deep Learning rooted Potential Piloted RRT* for expeditious Path Planning [PDF]
- Rajat Kumar Jenamani, Manjunath Bhat, K Snehal Reddy, Shamin Aggarwal, Jayanta Mukhopadhyay.
in: *International Conference on Automation, Control and Robotics Engineering, 2019 (Shenzhen, China).*

Research Experience

Artificial Intelligence Team Member: Kharagpur RoboSoccer Students' Group **Mar 18 - Current**
Guide: Prof. Alok Kanti Deb, IIT Kharagpur

- Objective: To build and study cooperative multi-agent systems in dynamic adversarial environments.
- Implemented a methodology for multi-agent robot coordination consisting of a Game Analyzer module that dynamically creates tasks and Assignment Module that automatically assigns tasks to agents optimally.
- Implemented motion planning algorithms and Finite State Machine Architecture for RoboCup SSL.

Research Areas: Multi-Agent Systems, Motion Planning, Robot Soccer

Multi-Agent Path Finding for High Dimensional Manipulators (Bachelor's Theis) **Jan 20 - Current**
Guide: Prof. Partha Pratim Chakrabarti, IIT Kharagpur

- Adapting multi agent pathfinding (MAPF) with continuous time to roadmaps with non-unit edge costs.
- Optimizing MAPF algorithms in domains where evaluation of edge costs is computationally expensive.

Research Areas: Motion Planning, Multi-Agent Systems, Graph Products

Awards & Achievements

- Awarded certificate of **'STUDENT PAR EXCELLENCE'** by Computer Science and Engineering Department, IIT Kharagpur for exemplary academic performance.
- Awarded the **Tower Research Capital India Merit Scholarship** for the academic year 2019-20.
- Among top 25 teams in the world that qualified for **SSL RoboCup 2019**, a 6 vs 6 robot soccer competition.
- **International Collegiate Programming Contest (ICPC) 2019-20:** Ranked 66 among 4401 teams from colleges across India in ICPC India Regionals Online Round. Ranked 50 in ACM ICPC 2020 Asia Amritapuri Regionals.
- **International Collegiate Programming Contest (ICPC) 2018-19:** Ranked 208 among 3282 teams from colleges across India and best ranked sophomore team from IIT Kharagpur in ICPC India Regionals Online Round. Honorable Mention at ACM ICPC 2019 Asia Amritapuri Regionals.

- **Kishore Vaigyanik Protsahan Yojana Scholar(KVPY)**: Secured All India Rank of 298 among 0.05 million applicants. Scholarship awarded to students with talent and aptitude for scientific research by the Govt. of India.
- **Inter-IIT Cultural Meet, 2017**: Part of gold winning Quiz contingent of IIT Kharagpur.

Projects

J.A.R.V.I.C. (Just A Rather Very Intelligent Chatbot) [code] **Feb 19 - Apr 19**

Software Engineering Term Project

- Developed an automated conversational agent that classifies the emotion of the user and forms replies based on them.
- Used Seq2Seq and Bayesian Classifier for back end and an android based application created using Android Studio and Java Socket Programming for front end.

Compiler for tinyC [code] **Jul 19 - Oct 19**

Compilers Term Project

- Developed a compiler for a C-based programming language, using Flex and Bison
- Implemented a Lexical Analyser, Semantic Parser and a Machine Independent Code Generator

Verilog Design of a Single Cycle RISC Instruction Set Architecture [code] **Jul 19 - Oct 19**

Computer Architecture Term Project

- Designed a 32-bit single-cycle CPU with limited MIPS-based instruction set on Verilog and burnt on FPGA for hardware

Random Sampling Motion Planning Algorithms Simulator [code] **May 18 - Jun 18**

- Implemented and tested random sampling algorithms such as Rapidly-exploring Random Trees(RRT), RRT-connect, RRT-Star and RRT-Star with Artificial Potential Field.
- Developed an interactive GUI interface to simulate paths generated by these algorithms using Python and Qt.

Technical Skills

Programming Languages	C | C++ | Python
Libraries and Tools	OpenCV | OMPL | ROS | Boost | DART | Tensorflow

Relevant Coursework

(T)heory and (L)aboratory

Completed	Machine Learning(T), Computer Architecture(T/L), Compilers(T/L), Algorithms II(T), Cryptography(T), Probability and Statistics, Algorithms I(T/L), Software Engineering(T/L), Formal Language and Automata Theory(T), Discrete Structures(T), Programming and Data Structures(T/L)
Ongoing	Deep Learning(T), Operating Systems(T/L), Computer Networks(T/L), Principles of Programming Languages

Positions of Responsibility

- **Secretary, Code Club, IIT Kharagpur**: A society dedicated to shaping IIT Kharagpur's future in the coding arena. Organized up.AI 2018, the largest Artificial Intelligence and Machine-Learning summit in West Bengal, India.
- **Active Member, Quiz Club, IIT Kharagpur**: Responsible for fostering participation and promoting quizzing in IIT Kharagpur.
- **Former Member, Technology Robotix Society, IIT Kharagpur**: Focal point for activities and projects related to robotics in IIT Kharagpur. Organized Robotix 2018, one of India's largest robotics events.
- Acting as Mentor for five freshmen under the aegis of Student Mentor Program organised by Student Welfare Group, IIT Kharagpur.
- **Former Member, Debating Society, St. Columba's School**