Rohin Garg

Senior Undergraduate | IIT Kanpur

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EDUCATION

INDIAN INSTITUTE OF TECHNOLOGY, KANPUR
Bachelor of Technology, Electrical Engineering
Expected April 2020 | Kanpur | Dean's List (2017-2018) • Cum. GPA: 8.83/10.0

D.R.A. BHAVAN VIDYALAYA | AISSCE (CBSE) (High School) • 95.4%
2016 | Chandigarh, India

TAGORE INTERNATIONAL SCHOOL V.V | AISSE (CBSE) (Secondary School) • 10.0/10.0
2014 | New Delhi, India

HONORS & AWARDS

2018	**Dean's List**	Academic Excellence Award
2017	**Scholarship**	Indian Army scholarship: All India Merit
2016	**All India Rank- 420**	Joint Entrance Exam Advanced of 180,000 candidates
2016	**All India Rank- 2472**	Joint Entrance Exam Mains of 1.2 million candidates
2016	**Winner**	Lawn Tennis Institute Championship
2014	**Grade 5 Pianist**	Trinity College London

RESEARCH EXPERIENCE

INTELLIGENT GROUND VEHICLE | Team Member
September 2019 - Present | IIT Kanpur
- Member of a team aiming to participate in IGVC, organized by Oakland University and AUVSI.
- Currently working to build a ground vehicle capable of autonomously navigating lanes while avoiding obstacles.
- Working on fusing LIDAR and Camera for bounding rectangles and object detection.
- Working with Rapidly Exploring Random Tree algorithm for path planning and motion control.

INTENT AWARE AGENTS | AI Research Intern
May 2019 - September 2019 | Adobe Big Data Experience Lab
- *Submitted to WWW 2020 for review.* (First Author): link to pre-print
- Addressed the issue of guidance towards insights that help with the user's intent, i.e. a long term objective.
- Conceptualized a formal definition of Intent in the domain of user behaviour analysis.
- Introduced novel training methods, neural architectures and a custom loss function to train intent-aware agents inspired from the Reinforcement learning and time series prediction models .
- Designed evaluation functions to evaluate our work on different, more generalized datasets.

MUSIC INFORMATION RETRIEVAL | Undergraduate Researcher
Dec 2018 – April 2019 | Prof. Vipul Arora, MIR Lab, IIT Kanpur
- Worked with **Prof Vipul Arora** to extract melody of different instruments from polyphonic music.
- Studied and Implemented the state of the art Data driven melody extraction algorithms.
- Used the SF-NMF (Source Frequency Non-Negative Matrix Factorization) algorithm to pre-process the raw spectrogram to give enhanced inputs to Conv-RNN neural network.
- Provided a novel extension to SF-NMF, i.e. Melody specific SF-NMF that gave more flexibility to different possible melody lines to enhance by learning matrix representations.

REALTIME OBJECT TRACKING | Visual Recognition
Jan 2019 – April 2019 | Prof. Vinay Namboodiri, CS783
- Applied real time object tracking algorithms (SORT) on IIT Kanpur's surveillance cameras dataset.
- Conofigured YOLO v3 to work with SORT, a uch faster object detection algoritm.
- Used future frame prediction using generative adversarial networks to replace Kalman Filters in SORT algorithm.
- Improved the results using domain adaptation to IIT Kanpur's surveillance domain.

EDGE CACHING IN WIRELESS NETWORKS | Research Internship
New York University, Polytechnic Institute
May 2018 – August 2018 | Prof. Shivendra Panwar, NYU
- Implemented Virtual Networks, both sparse and dense on GENI, a testbed supported by National Science Foundation (US).
- Studied and experimented existing edge caching algorithms for 3G/4G networks.
- Created novel caching methods for dense small cell deployments for future 5G networks.
- Implemented Realistic web-content request patterns for testing the methods using simple caching algorithms on GENI.

CONVEX HULL - RANDOMIZED | Randomised Algorithms
August 2018 - December 2018 | Prof. Surender Baswana, CS648
- Considered Incremental and Geometric approaches to find the Smallest enclosing circle for a set of n-dimensional points.
- Incremental approaches turned out to be the simplest and didn't require much geometric knowledge.
- Derived a recursive solution that involved choosing a point randomly at every step, thus re-inventing the Welzl's algorithm from scratch.
- Proved the expected algorithmic complexity to be $O(n)$, which was further verified through experiments.

OTHER PROJECTS

INERTIAL NAVIGATION SYSTEM | Information of Technology System Design
May 2018 - August 2018 | Prof. Amay Karkare and GT Silicon Pvt. Ltd
- Course Project for IoT System Design, aimed at Correcting systematic heading drift using dual foot-mounted configuration.
- Collected Real-time data from Oblu, a motion detecting device from each foot.
- Cloud services like firebase was used to store and process data.
- A novel algorithm was designed and applied for data fusion from both devices, and the output was displayed as the final path travelled by the user.

SENTIMENT ANALYSIS | Supervised Machine Learning
June 2017 - July 2017 | An Independent Initiative
- Studied different Supervised ML classifiers: Naive Bayes, Support Vector Machines, Random Forrest classifiers, K-means Clustering etc.
- Implemented them in Python and studied different techniques to improve test accuracy: Principal Component Analysis, Regularization etc.
- For the final model used Naïve Bayes classification model on training data for maximum accuracy.

SONAR | Object Detection
Nov 2016 - Jan 2017 | Electronics Club, IIT Kanpur
- Used **Arduino, Processing software, Servo-motor** and **Ultrasonic sensor** to make a miniature object detector.
- The servo motor was programmed via arduino to rotate for 180 degrees with the ultrasonic sensor mounted on it. The signal from the sensor was processed in arduino and sent to processing software to convert to coordinates that were displayed on a radar-like interface.
- We were able to detect objects with a high precision within 3 meters of distance.

INDUSTRIAL EXPERIENCE

ADOBE | AI Research Intern
May 2019 - September 2019 | Big Data Experience Labs, Bangalore, India
- Did a 3 month internship as an AI research intern at BEL labs, Adobe.
- Worked under 2 research scientists on Intelligent Agents for smart user interfaces for Adobe Experience Cloud.
- Brainstormed for over 2 weeks to come up with innovative ideas, 3 of which were combined to formulate our final problem statement: designing an Intent aware recommendation system.
- Did extensive literature survey, implemented various pre-existing solutions and novel algorithms using python and Pytorch framework.

NEW YORK OFFICE, IIT KANPUR | Software Engineering Intern
May 2018 – August 2018 | IIT Kanpur
- Managed linux systems and integrated development workflow from variousteams in a secure and scalable way.
- Studied the Circuit Breaker Microservice to monitor application services.
- Deployed Prometheus Alertmanager service using Pushover API for notifi-cations on Pod failures.

RELEVANT COURSEWORK

COMPUTER SCIENCE AND ELECTRICAL ENGINEERING

Visual Recognition
Machine Learning for Signal Processing*
Randomised Algorithnms
Reinforcement Learning (NPTEL-Lecture Series)*
Introduction to Machine Learning
Internet of Things - System Design
Data Structures and Algorithms
Modern Control Systems* (level 2)
Control System Analysis (level 1)
Fundamentals of Computing
Digital Electronics
Electromagnetic Theory
Microelectronics
Introduction to Electronics

MATHEMATICS AND SCIENCES

Neurobiology*
Probability and Statistics
Linear Algebra
Complex Variables
Partial Differential Equations
Ordinary Differential Equations
Real Analysis
Physics 1: Classical Mechanics
Introduction to Logic
Modern Art*
Literature and Censorship

(* Ongoing)

TEACHING

TEACHING ASSISTANT | CONTROL SYSTEM ANALYSIS

Dec 2019 - Present | IIT Kanpur

- Help in making and grading assignments for the course.
- Conduct Lab sessions, which involves writing code and clearing doubts for the students.

LANGUAGES AND SKILLS

PROGRAMMING

Over 5000 lines:
Python • C++ • LaTeX • Matlab
Over 1000 lines:
C • Shell • Arduino • Processing • Robot OS **Familiar:**
GoLang • Kubernetes • HTML • CSS • Javascript

SPOKEN & WRITTEN

Native fluency:
English, Hindi
Reading fluency:
Sanskrit
Very-Basic Understanding
German • Japanese • French

EXTRA CURRICULARS

COUNSELLING SERVICE

STUDENT GUIDE

Helped in conducting orientation for more than 800 incoming freshmen. Personally mentored 6 freshmen to help them blend in the new campus culture of IIT Kanpur,as well as provided them emotional assistance when they needed help and support.

ELECTRONICS CLUB

SECRETARY

Conducted Workshops and Lectures for students regarding basic electronic principles. Helped in making problem statements for institute level competitions. Maintained the club components.

MUSIC

GRADE 5 PIANIST

as recognised by Trinity College London.

MUSIC CLUB, IIT KANPUR

Performed on several occasions with our band, participated in several music events and competitions at both intra and inter institute level.

SPORTS

MEMBER: SPORTS CONTINGENT-IIT KANPUR

Member of Institute Lawn Tennis team. Completed the Lawn Tennis Summer camp 2017.

WINNER: INSTITUTE COMPETITION

Won the Singles and Doubles Intra-Institute Lawn Tennis Competition.

Proficient in Lawn Tennis and Badminton