Manav Singhal

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Education

- **National Institute of Technology Karnataka** — Surathkal, India
  Bachelor of Technology in Electrical and Electronics (Minor in Computer Science). — *July 2018 – May 2022*
  - Cumulative GPA: **9.07/10.00**
  - **Relevant Coursework**: Machine Learning, Probability and Statistics, Optimization Techniques, Linear Algebra.

Experience

- **Carnegie Mellon University** — Pittsburgh, USA
  Research Intern. *Supervisors: Prof. Katia Sycara and Dr. Dana Hughes* — *June 2021 - Present*
  - Working on the **Artificial Social Intelligence for Successful Teams (ASIST)** project with the Advanced Agent – Robotics Technology Lab.
  - Working on modeling the beliefs possessed by agents using a **Multi-Observer** model thus interpreting the decisions taken by them in a multi-agent team setting in a **search and rescue task** simulated in the Minecraft environment.
- **Microsoft Research** — New York City, USA
  Independent Research Developer. *Supervisors: Pavithra Srinath and Olga Vrousgou* — *May 2021 - Present*
  - Working on **Empirical Analysis of Privacy Preserving Learning** with the Real World Reinforcement Learning Team.
  - Analyzing the effect of **aggregated learning** (i.e. saving only those features after training that have crossed a certain threshold of users) on the model learning capabilities of the Open Source library VowpalWabbit. Current work on the patch can be found here.
- **Indian Institute of Technology Palakkad** — Palakkad, India
  Research Intern. *Supervisor: Prof. Chandra Shekar Lakshminarayanan* — *December 2020 - Present*
  - Experimenting with extending operation research techniques to the reinforcement learning setting for **train scheduling**.
- **Indian Institute of Science** — Bangalore, India
  Research Intern. *Supervisor: Prof. Shalabh Bhatnagar* — *May 2020 - July 2020*
  - Worked on evaluating widely used single-agent approaches, such as **Dueling Deep Q Networks (DDQN)** and **Proximal Policy Optimization (PPO)**, using distributed scalable implementations from RLlib, to identify their shortcomings on the multi-agent **Flatland** Environment for efficient train scheduling.
  - Reviewed the existing literature on Markov Decision Process (MDP) for **Vehicle Rescheduling Problem** and the algorithms developed to solve the problem specifically catering to the scheduling of trains. Report
- **Indian Institute of Technology Kharagpur** — Kharagpur, India
  Research Intern. *Supervisor: Prof. Niloy Ganguly* — *May 2019 - June 2019*
  - Part of the Complex Networks Research Group(CNeRG), experimenting with **Class Activation Maps** in NLP to understand the words affecting the **textual entailment** prediction being made by the CNN model on the SNLI dataset consisting of 570k sentence pairs. Achieved a **60%** test accuracy.
  - Built a preprocessing pipeline for **tweets on ebola** for **classification** of their GloVe embeddings with Bidirectional LSTMs.

Selected Projects

- Interactive Multi-Agent Reinforcement Learning: *Project with IEEE NITK Student Branch.* Worked to develop and improve algorithms that learn to play mixed cooperative-competitive many-player games collaboratively.
- Predicting Generalization in Deep Learning (PGDL): Analyzed the Cognitive Neural Activation (CNA) metric as an appropriate complexity measure to predict generalization hence understand the reasoning of the generalization capability of Neural Networks for the NeurIPS 2020 PGDL Competition.
- Adversarial Attacks on Reinforcement Learning Algorithms: *Project with IEEE NITK Student Branch.* Implemented Deep Q Networks and Policy Gradient to analyze the effects of trained adversarial attacks on agents in zero-sum robotic environments in a multi-agent domain.

- Indoor Positioning: Implemented an approach to determine the precise location of an object within a room using trilateration on the distances of the object obtained from three fixed points determined using time delays between radio and sound waves.
- Linking E-commerce to OTT media content: Worked on an application for product recommendations in multimedia. Implemented a pipeline for displaying relevant objects from e-commerce websites for each frame within a video to enable a seamless online shopping experience.

Programming Skills

- **Programming Languages**: **Adept**: Python, C++ **Familiar**: C, Java
- **Relevant Tools/Frameworks**: Keras, Tensorflow, Pytorch, Numpy, Git, Matlab, Scilab, Jupyter, OpenAI Gym

Achievements

- Selected for the Robotic Institute Summer Scholar (RISS) Program 2021 conducted by the **Robotics Institute, Carnegie Mellon University**. (58 out of 700+ applicants)
- Selected for the Reinforcement Learning Open Source Fest 2021 conducted by **Microsoft Research, New York City**. (10 out of 200+ applicants)
- Awarded the Summer Research Fellowship 2020 conducted by the **Indian Academy of Sciences** to pursue a research internship at IISc Bangalore.
- Recipient of the OP Jindal Engineering Scholarship (OPJEMS) 2019. (80 out of 1100 eligible candidates)
- Ranked **3rd** amongst 75+ participants in Dishathon, a hackathon organized by **DishTV**.
- Recipient of the **Research Assistant Scholarship** given by **PES University** to promising students in the field of science and technology.
- Selected for a technical training program at **Infosys, Bangalore**. (40 out of 500+ applicants)

Extra Curricular Activities

- **Secretary** of Web Club NITK: Coordinated 20+ computer science events organized by a group of 70+ students.
- **Executive Member** of IEEE NITK: Mentored 15+ students in a Summer Program on Basics of Blockchain.
- Personal Blog: Creating content for blogging my views on thought-provoking issues.
- An avid debater:
  - **Finalist** at the Speak For India 2019 edition.
  - **Finalist** at the Team India selections for World School Debating Championship 2017.