Himanshu Gaurav Singh

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Education

2019-23 Bachelors in Computer Science at **IIT, Delhi** (**GPA: 9.96/10, Institute Rank: 2**)
2021-22 Senior High School(CBSE) (99.0%)

Publications

[1] Namasivayam Kalithasan*, **Himanshu Gaurav Singh***, Vishal Bindal*, Arnav Tuli, Vishwajeet Agrawal, Rahul Jain, Parag Singla, and Rohan Paul. "Learning Neuro-symbolic Programs for Language-Guided Robotic Manipulation". In: *NeurIPS' 22 Workshop on Neuro Causal and Symbolic AI (nCSI). Full paper under review at ICRA'23*. URL: http://arxiv.org/abs/2211.06652.

Work Experience

Undergraduate Researcher at *Robotics and Embodied-AI Lab, IIT Delhi* October 2021 - Ongoing

– Developed end-to-end trainable neuro-symbolic architecture that performs multi-step object manipulation and complex reasoning with no sub-goal supervision. Full paper under review at **ICRA'23**.

Research Assistant at *Extreme Classification Lab, IIT Delhi* October 2022 - Ongoing

– Exploring graph-based approaches to learning better representations of the label space for the problem of multi-label extreme classification.

Quantitative Researcher Intern at *Tower Research Capital* June 2022 - Aug 2022

– Explored machine learning models to capture the movement of stock prices over time intervals longer than those dealt by conventional HFT strategies.

– Improved the prediction correlation to the actual price movement by **400%** at test time.

Software Engineer Intern at *N.K.Securities(hypergrowth trading startup)* June 2021 - Aug 2021

– Designed and built a trading engine simulating the event model of a stock exchange used for back-testing trading algorithms.

Scholastic Achievements

– **All India Rank 2 in JEE-Advanced, 2019** among **2 million candidates nationwide**.
– Received the **IIT Delhi Semester Merit Award**(top 7%) in **all** semesters.
– Selected among 50 students worldwide to attend the **Cornell Maryland Max Planck Research Summer School, 2022** held at **Max Planck Institute for Software Systems**.
– Received **Aditya Birla Scholarship, 2019**, among 16 students of the engineering stream nationwide.
– Received **Bronze medal** at the **Asia Pacific Mathematics Olympiad**, 2018.
– **Ranked 4th** in KVPY(SA),2018: science examination conducted by the **Indian Institute Of Science, Bangalore** among **1,00,000 candidates nationwide**.

Relevant Courses

Artificial Intelligence: Introduction to Artificial Intelligence, Advanced Machine Learning, Special Topics in Embodied-AI, Special Topics in Geometric Deep Learning(ongoing)
Mathematics: Optimization methods(ongoing), Linear Algebra, Probability and Stochastic Processes
Software Engineering: Parallel and Distributed Programming, Operating Systems, Design Practices

Technical Skills

Programming Languages: **Proficient**: Python, C/C++ **Competent**: CUDA, R, Java, SML
Libraries and Frameworks: PyTorch, Tensorflow, OpenMP, MPI, OpenCV, SDL

ML Projects

Object localisation and data association from noisy observations Code
Course project, Autonomous systems
– Designed **robust localisation systems** for airplanes receiving position information from radars under simulation using **kalman filters** and **data association** algorithms, coded in **Python**.

Solving Boolean programs using neural networks Code
Course project, Machine Learning
– Trained deep neural nets for learning to classify hands of the card-game *bridge* in terms of in-hand card denominations. Analysed training-time and performance over varying depth and activation functions.

Analysis and implementation of classical RL algorithms Code
Course project, Autonomous systems
– Implemented model-based algorithms such as **Balanced Wandering, Certainty Equivalence** and model-free algorithms such as **TD-learning, Q-learning, SARSA** over a grid world environment.

Traffic density estimation using CCTV footage Code
Course project, Design Practices
– Estimated vehicle queue and dynamic density from a surveillance footage through camera-angle correction and **Lucas-Kanade optical flow** implemented in the **OpenCV** library in **C++**.

Other Projects

Scalable implementation of Twitter's Who To Follow Algorithm
Course project, Parallel and Distributed Programming
– Implemented Twitter's WTF(see paper) algorithm in **C++** using the **OpenMP** library.
– Empirically demonstrated strong scalability and efficiency of the implementation upto 64 cores.

Coroutine implementation for a uni-processor operating system
Course project, Operating Systems
– Added coroutines(user level threads for non-preemptive multitasking, see paper) to an operating system.
– Coded and tested the full functionality using **x86** assembly language and **C**.

Interpreter and type-checker for a functional programming language Code
Course project, Programming Languages
– Built tool in **SML** to scan, parse and evaluate expressions in a toy functional programming language with support for recursive and higher-order functions.
– Implemented the β**-reduction** algorithm as the computation engine in the call-by-value paradigm.

Chat application using Socket programming Code
Course project, Computer Networks
– Implemented application layer protocols for a remote chatting application in **Python**.

Extracurricular Activities

Tutor for weekly classes in basic science and mathematics for underprivileged students under the Munirka Teaching Project(**NGO**) under the **National Service Scheme(NSS)**.
As **hostel representative** of the **Algorithms and Coding Club**, designed original competitive programming tasks for competitions and gave **online lectures**.