Prajwal SINGHANIA

Graduate Student | University of Maryland - College Park

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Research Statement : I am interested in developing and optimizing HPC systems for AI training and inference. Currently, my work focuses on scaling parallel AI training systems to a large number of GPUs and developing faster, memory-efficient inference techniques for LLMs. I am also interested in opportunities that leverage my experience in the FinTech industry with my research in HPC and AI.

🎓 EDUCATION

Present 2023	**COMPUTER SCIENCE**	University of Maryland, College Park *Doctor of Philosophy (Ph.D.)*	Advisor : Dr. Abhinav Bhatele CGPA : **4.0/4.0**	Flagship Fellow
2020 2015	**COMPUTER SCIENCE & ENGINEERING**	Indian Institute of Technology, Kharagpur *Integrated B.Tech. (Hons.) + M.Tech.* CGPA : **9.88/10**	Institute Silver Medalist
2015	**HIGHER SECONDARY EDUCATION (ISC)**	Swaraj India Public School, Kanpur Percentage : **98%**

💼 WORK

August 2023 July 2020	Senior Associate - Trading Systems, **ALPHAGREP SECURITIES PVT. LTD.**, Bangalore, India ➤ Led a team of 4 members to develop and maintain order management and market-data infrastructure for Crypto exchanges like Binance, Deribit, etc. and FIX-based exchanges like SocGen, Instinet, etc. ➤ Developed the core order-routing framework for rapid onboarding of Crypto exchanges. It abstracted features like disconnect recovery, HTTP-Websocket arbitration, etc., from exchange-specific code ➤ Developed and maintained low-latency order management and drop-copy infrastructure for NSE, adding support for features like ORS-DC trade arbing, risk checks for options trading, and many more ➤ Continually involved in latency optimizations for high-frequency trading software built on C++, based on concepts like cache-warming for real-time systems, kernel-bypass for networking applications, etc. `C++` `Bash Scripting` `Trading Systems`

📖 PUBLICATIONS

2021	**Alternating Direction Method of Multipliers for Quantization** Tianjian Huang, Prajwal Singhania, Maziar Sanjabi, Pabitra Mitra, Meisam Razaviyayn. *In : Proceedings of The 24th International Conference on Artificial Intelligence and Statistics* ↗ Link
2019	**Stance Detection in Web and Social Media : A Comparative Study** Shalmoli Ghosh, Prajwal Singhania, Siddharth Singh, Koustav Rudra, Saptarshi Ghosh. *In : Crestani F. et al. (eds) Experimental IR Meets Multilinguality, Multimodality, and Interaction. CLEF 2019.* ↗ Link
2019	**Thou shalt not hate : Countering online hate speech** Binny Mathew, Punyajoy Saha, Hardik Tharad, Subham Rajgaria, Prajwal Singhania, Suman Kalyan Maity, Pawan Goyal, Animesh Mukherjee, *In : Proceedings of the International AAAI Conference on Web and Social Media* ↗ Link

🪪 INTERNSHIPS

July 2019 May 2019	Risk Technology Intern, **TOWER RESEARCH CAPITAL**, Gurgaon, India ➤ Deployed an end-to-end pipeline for simulation of an existing trade monitoring tool on historical dates ➤ The developed product helps risk managers configure better parameters for the monitoring tool ➤ Created visualizations for log analysis using Kibana, which are critical for trade risk assessment `Bash Scripting` `C++` `Python` `Jenkins` `HTML/CSS` `Javascript` `ELK`
July 2018 May 2018	Summer Research Intern, **UNIVERSITY OF SOUTHERN CALIFORNIA**, Los Angeles, California, USA ➤ Hypothesized adaptively quantizing the network layers with different bitwidths for accuracy gains ➤ Analyzed the effect of different regularisation techniques to aid in the quantization/binarization ➤ Developed a training algorithm using regularisation to optimally pick the quantization for each layer `Neural Networks` `TensorFlow` `PyTorch` `Python` `Theoretical ML`

July 2017 May 2017	Summer Intern, INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE, Hsinch, Taiwan ❯ Built a CNN-based Genre Recognizer to classify music into 5 genres : rock, jazz, classical, gospel, rap ❯ Scraped 5000 musical pieces from YouTube and converted them to spectrograms to build our dataset ❯ Used CNN-based Neural Style Transfer to create a musical piece having the desired melody and genre Convolutional Neural Networks TensorFlow Python

🖥 PROJECTS

ALTERNATING DIRECTION METHOD OF MULTIPLIERS FOR QUANTIZATION 2019 - 2021

Continuation of the work done during my internship at University of Southern California

❯ Studied the performance of the ADMM for Quantization and established convergence properties to certain stationary points
❯ Collaborated to develop variants of ADMM-Q that can handle inexact update rules, and have slightly improved performance
❯ Empirically evaluated the performance of the methods in training binarized neural networks on MNIST and CIFAR-10 datasets

Python   PyTorch

EFFICIENT CNN INFERENCING ENGINE ON GPU CLUSTERS 2020

🄾 github.com/prajwal1210/HP3-CNN-Inferencing

❯ Implemented multiple convolution kernels for a CNN Inference Engine and analyzed them for AlexNet & VGG-19 architectures
❯ Created a custom neural network specification format using Google's Protobuf to store and load pretrained models in C++
❯ Implemented a forward pass library to load the custom model and perform standard CNN operations (Conv, Pool, etc.)
❯ Profiled the convolution algorithms for the above mentioned architectures to analyze run times and GPU memory usage

C++   cuDNN   Protobuf   OpenCV   Python

STANCE DETECTION IN WEB AND SOCIAL MEDIA : A COMPARATIVE STUDY 2018 - 2019

🄾 github.com/prajwal1210/Stance-Detection-in-Web-and-Social-Media

❯ Investigated the reproducibility, performances and shortcomings of various methods for stance detection on microblog text
❯ Improved performances of the existing state-of-the-art models using a novel change in the pre-processing methodology
❯ Achieved overall state-of-the-art performance on SEMEVAL 2016 and MPCHI datesets by applying Google's BERT model

Python   PyTorch   Tensorflow   Theano   NLTK

THOU SHALT NOT HATE : COUNTERING ONLINE HATE SPEECH 2017 - 2019

🄾 github.com/hate-alert/Countering_Hate_Speech_ICWSM2019

❯ Scraped and annotated YouTube comments on Black, Jew and LGBTQ communities as counter/non-counter to hate videos
❯ Labelled each counter-speech comment further according to 8 counter-speech types defined based on previous works
❯ Implemented models like Tf-Idf, LSTM & CNN to classify counterspeech ; psycholinguistically analyzed types of counterspeech

Python   Keras   NLTK

☱ SKILLS

General	Software Development, Management, Research, Leadership, Public Speaking
Programming	*Proficient* : C++, Python, Bash, MPI ∣ *Familiar* : CUDA, Java, Git, LaTeX, HTML, CSS, JavaScript

🏆 HONORS AND AWARDS

2023	**Flagship Fellowship :** Among the 30 recipients for AY23-24 for exceptional qualifications and a clear promise for outstanding performance in doctoral study
2021	**Institute Silver Medal** : For securing the highest CGPA among the graduating students of my course
2019	**2nd Runner-Up, TCS-Pan IIT Conclave Hackathon** : Built a model for early detection of Parkinson's Disease
2018	**C. Singh & J. Levy Student Excellence Award** : For academic excellence to students with limited means
2018	**J.C. Ghosh Memorial Endowment Prize** : For securing the highest CGPA in class at the end of 6th semester

📖 RELEVANT COURSEWORK

High Performance Computing Systems ∣ Computer & Network Security ∣ Computer Organization and Architecture ∣ Database Management Systems ∣ Operating Systems ∣ Computer Networks ∣ Compilers ∣ Machine Learning ∣ Deep Learning ∣ Natural Language Processing

👤 EXTRA-CURRICULAR

April 2018 April 2017	Governor, DEBATING SOCIETY, IIT Kharagpur ❯ Managed daily activities and participation of 60+ members in 10+ national tournaments ❯ Participated in national level Parliamentary Debate Tournaments like NUJS PD 2018, DMD 2016, etc.