Eashan Gupta

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Education

Ph.D. in Computer Science	University of Illinois, Urbana-Champaign	*4.0/4.0*	**May'23-Present**
MS in Computer Science	University of Illinois, Urbana-Champaign	*3.95/4.0*	**Aug'21-May'23**
B.Tech (with Hons.), Computer Science	Indian Institute of Technology (IIT) Bombay	*9.13/10*	**July'16-June'20**

Technical Skills & Coursework

Languages: C++, C, Golang, Python, P4, Bash, Racket/Scheme, Haskell, Prolog, MIPS, SQL, Java
Technologies: Kubernetes, GitHub, Keras, Jupyter Notebooks, MATLAB, Simulink, Android Studio, Jenkins, PyTorch
Key Coursework: Advanced Computer Networks, Advanced Operating Systems, Distributed Systems, Machine Learning for Signal Processing, Efficient & Predictive Vision, Knowledge-driven Natural Language Generation, Advances in Intelligent and Learning Agents, Advanced Machine Learning, Functional Programming Languages, Graph Theory

Work Experience

Microsoft Research, Redmond | *Research Intern, Networking Research Group* **May'22 - Aug'22**
Paper: *Rethinking Cloud-hosted Financial Exchanges for Response Time Fairness* (Third Author) [**HotNets'22**]
Paper: *DBO: Response Time Fairness for Cloud-Hosted Financial Exchanges* (First Author) [**SIGCOMM'23**]

- Implemented a **prototype** of a cloud hosted Financial Exchange using response time fairness on a **DPDK** platform
- Ran simulations and refined the various protocols to ensure the constraints of Response time fairness

Nutanix, Bengaluru | *Software Developer, Karbon/MSP team* **July'20 - July'21**

∗ Used **Kubernetes** to deploy microservices on a Hyper-converged Infrastructure using virtual machines
∗ Worked to support the Karbon platform on **VMware's hypervisor ESX** other than Nutanix's own hypervisor - AHV
∗ Added multiple features to the Karbon controller like migration to **CoreDNS** on k8s upgrade, network segmentation for efficient traffic handling, redacting logs, and tracking metrics using **Prometheus** and middlewares

Tower Research Capital, Gurgaon | *Core Engineering Intern* **May'19-July'19**

∗ Automated the performance **testing platform** for the software processing the order book data broadcast
∗ Empirically investigated patterns in performance on using **cache allocation technology** with different configurations

Research Experience

Improving bounds of Policy Iteration Algorithm | ***IIT Bombay*** **Feb'20-Aug'20**
Paper: *Some Upper Bounds on the Running Time of Policy Iteration on Deterministic MDPs* (Second Author) [preprint]

∗ Proved exponentially better upper bounds for the number of steps taken by Policy Iteration Algorithms to determine the optimal policy in deterministic Markov Decision Processes by bounding number of path-cycles in a digraph
∗ Conducted empirical experiments on lower order AUSOs to observe the family of randomized Policy Iteration

Towards validation of RTL passes of the GCC compiler | ***IIT Bombay*** **Jan'20-June'20**

∗ Analysed the various Register Transfer Language (**RTL**) optimization passes in **GCC-4.7.2** and implemented a **block-by-block** validation technique to validate program transformations done by the passes
∗ Realized obligations based on the return values, heap memory and function calls of programs in the **Z3 Theorem Prover** tool to prove semantic equivalence between different control flow graphs (**CFGs**)

Optimized DL GPU Task Scheduling for NVIDIA Jetson TX2 | ***UIUC*** **[GitHub]** | **Aug'21-Dec'21**

∗ Implemented GPU task scheduling algorithms for deep learning inference models based on greedy longest chains and load balancing in **PyTorch**; Improved performance of Nimble by upto 16% on TX2, a popular embedded AI hardware

Key Projects

- **Abstract Interpretation and Program Verification**: Used domain specific techniques and fixed point analysis to implement **congruence** and **array** abstract domains for integration into the **CAnalyzer** tool
- **Reduction in Games played on recursion schemes**: Intern with Prof. Roland Meyer at TU Braunschweig, Germany; Worked on the reduction of parity games to safety games played on higher order recursion schemes (**HORS**), using similar results on reduction in games played on collapsible pushdown automata (**CPDA**)
- **Self-Supervised Embedding-based Speech Emotion Recognition**: Trained a **Siamese NN** to distinguish emotions between 2 input speech samples with test accuracy 82% on the **CREMA-D** speech dataset, with upto 54% accuracy for unseen classes. Used the model as an embedding to learn emotion classifier with 81% accuracy
- **Strong Password Generation**: Devised methods to evaluate a password based on the metrics of **guessability** and **memorability** and used them to compare the generative models developed
- **Monadic Parser**: Modernised the parser implementation for core language in **Haskell** using Monads