Dhananjay Ashok

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EDUCATION

University of Toronto, Honors Bachelors of Arts and Science: 2018 - 2022
Computer Science and Economics Double Major, GPA: 3.93/4.0
Dean's List Scholar, Valerie Brooks Scholarship, Professor William Kingston, and Dr John Kingston Scholarship

Carnegie Mellon University, Master of Science, Machine Learning: 2022 - 2023
Focus on logical and factually grounded LLM systems that maintain robustness to distribution shift, GPA: 3.8/4.0

PROFESSIONAL EXPERIENCE

Machine Learning Research Intern, Apple Inc (Summer 2023)
- Worked on automated understanding and processing of log files
- Applied Multi Agent RL methods to Cellular networking problems.

MITACs Accelerate Fellow, Borealis AI (Summer 2022)
- Worked on developing efficient gradient free training methods for Neural Networks
- Created GDSolver - the first hybrid Solver based training algorithm capable of training real valued neural networks.
- Extended work to use SAT Solvers for Binarized Neural Networks and Convolutional Layers

Research Engineer Intern, Automated Reasoning Group, Amazon Web Services (Summer 2021)
- Worked in **C** and **C++** on automated verification of safety of Amazon codebases
- Requires in-depth knowledge of the C family of languages and solvers
- Requires knowledge of verification techniques used to verify AI systems (solvers and reachability analysis)

RESEARCH AND LAB EXPERIENCE

Approximately Correct Machine Intelligence Lab**,** Prof. Zachary Lipton, Carnegie Mellon University (2022-present)
- Worked on **in-context learning** to simultaneously perform FewShot and Cross Domain **NER**
- **Lead author** on paper submitted to **ICLR2024** (In review)
- Researched distribution shift from a statistical perspective, and created a label shift detection metric

Auton Lab, Prof. Barnabas Poczos, Carnegie Mellon University (2022-present)
- Worked on **Factual Error Correction** in Scientific Domain and integrating Knowledge Bases with LLMs to make robust and reliable Error Correction systems
- **Lead author** on paper accepted at **EMNLP2023** (findings)

Data Science for Social Good Lab, Prof. Rayid Ghani, Carnegie Mellon University (2022-present)
- Worked on making ML systems deployed in the real world **less biassed** and more **robust to shifts over time**

Vector Institute/ PAIR Lab, Prof. Animesh Garg, University of Toronto (2019-2022)
- Research engineer in the UofT **P**eople, **AI**, & **R**obots Research Group working on questions related to applicable advances in AI and robotics with specific focus on perception and control in robotic simulations
- Applied Causal Discovery in Physical Systems to counterfactual data augmentation in batch RL and interactive model discovery.

Vijay Ganesh Lab, Prof. Vijay Ganesh, University of Waterloo (2019-2022)

— Research engineer in the Vijay Ganesh Lab working on questions related to **robust, interpretable**, and **verifiably constraint compliant** AI systems.
— Worked on efficient testing algorithms to adversarially debug Neural Networks of arbitrary architectures, producing a **paper as a co-author**
— Worked on Solver based training of Neural Networks, producing a publication at **IJCAI22** as a **main author**
— Worked on augmenting genetic algorithms with domain knowledge to aid symbolic regression, producing a publication at **AAAI21** as a **main author**

SKILLS

Computer Science, Programming Languages and Software Development Frameworks

- ➔ Strong computer science background in Algorithms, Data Structures, Optimization etc.
- ➔ Proficient in: Python, C++/C#, Java, Bash Scripting, SQL, Ruby, Git
- ➔ Proficient in DL, Distributed, Parallelization and, Scaling with TensorFlow (2.0), PyTorch, Hadoop, Spark and CUDA

Research Skills

- ➔ Proficient in reading research papers, reproducing results and extending the tool from the paper
- ➔ Experienced in designing experiments to isolate parts of complicated systems and answer research questions

Natural Language Processing and Large Language Models

- ➔ Proficient in training, pretraining, fine-tuning, prefix tuning and customization of LLMs
- ➔ Experienced in parallelization of large models, infusion of knowledge bases into LLMs and custom architectures using the attention mechanism and transformers.

PUBLICATIONS AND PREPRINTS

PromptNER: Prompting for Named Entity Recognition, **ArXiV Preprint (Lead Author)**

- ❖ Created a FewShot and Cross Domain Named Entity Recognition that sets the state of the art on over 8 different datasets
- ❖ **Lead author** on the paper submitted to **ICLR2023**

The student becomes the master: Outperforming GPT3 on Scientific Factual Error Correction, **EMNLP2023 (Lead Author)**

- ❖ Created a Factual Error Correction tool in the scientific domain that outperforms all contemporary methods and Prompting on GPT3
- ❖ **Lead author** on the paper accepted at EMNLP2023 (findings)

Label Shift Detection and Mitigation, **ArXiV Preprint (Lead Author)**

- ❖ Created a statistically principled estimation procedure for decomposition of observed distribution shift into label shift and covariate shift. Provided the first decision mechanism to decide whether or not to use label shift estimation methods

Logic Guided Genetic Algorithms, **AAAI21 (Lead Author)**

- ❖ Research on Symbolic Regression with Auxiliary Truth Enhanced Genetic Algorithms,

A Solver and Gradient Descent based DNN Training Algorithm, **IJCAI22 (Lead Author)**

- ❖ Created a novel algorithm for training neural networks with a hybrid system of MILP solvers and neural networks

Constrained Gradient Descent Method for Testing Neural Networks, **ArXiV Preprint (Co-Author)**

- ❖ Research on using soft probabilistic logic and gradient descent to generate satisfying inputs (e.g. adversarial examples) for a given neural network

EXTRACURRICULARS

- ❖ Judged World's Best Speaker at the World Schools Debating Society 2018. Indian National Team Debate Coach: 2019-2020. Best Speaker, Champion: North American Universities Debating Championships 2020