Quinn Fisher

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Education

MSc Mathematics (Applied) — Toronto, Canada
University of Toronto — *Nov 2023*
Supervisor: Prof. Vardan Papyan

Thesis topic: Inductive Biases in Deep Networks Trained with Mixup

Hon. BSc Mathematics & Physics — Toronto, Canada
University of Toronto — *April 2022*
Awards: High Distinction, Dean's List

Experience

University of Toronto (Mathematics Department)/Vector Institute — Toronto, Canada
Deep Learning Researcher/Faculty Affiliate Researcher — *September 2023 – Present*

- Run experiments on a GPU cluster, ensuring optimal resource utilization. Train of various deep network architectures (Vision Transformers, ResNets, etc.) using numerous data augmentation methods. Develop new fine-tuning methods for vision transformers and LLMs.
- Investigate mathematical properties of deep networks through analysis of intermediate representations.
- Maintain up-to-date knowledge through regular review of academic papers. Contribute to the academic community via publication and conference presentations.

University of Toronto — Toronto, Canada
Teaching Assistant — *Sep 2022 – June 2023*

- Lead tutorials, assist with lectures, grade homework/tests, and deliver office hours for MAT223 (Linear Algebra) and MAT133 (Calculus for Business).

Capco — Toronto, Canada
Data Science/Consultant Intern — *May 2021 – Sept 2021*

- Clean and performed feature engineering on a dataset of error reports from servers, including the creation of new temporal features
- Use PySpark to implement a random forest to classify severity of error reports.
- Map out technology architectures and research topics for clients looking to implement new products/features.

Dalla Lana School of Public Health — Toronto, Canada
Biostatistics Research Assistant — *March 2021 – March 2022*

- Supervised by Osvaldo Espin-Garcia in collaboration with the GEM Project for Crohn's and Colitis research.
- Write R and bash scripts to clean and implement quality control on genetic data as well as implement a multi-ancestry GWAS via a linear mixed effects model.

Greenhouse (Band) — Toronto, Canada
Musician/Producer — *Jun 2016 – Present*

- Write, produce, and record music.
- Communicate with musicians, venue owners, and press to organize performances, finances, and creative projects.

Publications

Quinn LeBlanc Fisher, Haoming Meng, Vardan Papyan, "Pushing Boundaries: Mixup's Influence on Neural Collapse", *International Conference on Learning Representations (ICLR)*, 2024

Conference Presentations

Quinn LeBlanc Fisher "Pushing Boundaries: Mixup's Influence on Neural Collapse", *Remarkable 2024 Conferece*, Vector Institute for Artificial Intelligence, 2024

Skills & Interests

- **Python** (Pytorch, Numpy, Scikit-learn, Pandas)
- **SQL, Apache Spark**
- **Machine Learning, Data Science**
- **Deep Learning** (Generative Networks, LLMs)
- **Audio processing, Computer Vision**
- **Mathematical/Statistical Modelling**

Research

Pushing Boundaries: Mixup's Influence on Neural Collapse | *Paper* | *Webpage*

- Published via ICLR 2024. Project in collaboration with Prof. Vardan Papyan and Haoming Meng.
- Investigate geometric configurations of last-layer activations for deep networks trained with mixup.
- Show empirically and theoretically that the when trained with mixup, the last-layer activations converge to a distinct configuration.

Optimal Transport in Diffusion Networks | *Webpage*

- Implement and evaluate score-based generative models for generating images.
- Investigate the path between images and noise. Using various metrics, we find evidence that the path is an optimal transport
- Project done with assistance from Prof. Vardan Papyan and Prof. Adrian Nachman.

Mathematical Model of Opioid Addiction | *Webpage*

- Use python to implement and modify compartment model for prescription opiate addiction and examine transient behaviour.
- Fit the model to relevant Ontario opiate data in an attempt to gain insight into the rise in opioid related deaths during the COVID-19 pandemic.
- Supervised by Prof. Adam Stinchcombe