

# Quinn Fisher

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## EDUCATION

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### MSc Mathematics (Applied)

University of Toronto

Supervisor: [Prof. Vardan Papyan](#)

Toronto, Canada

Nov 2023

**Thesis topic:** Inductive Biases in Deep Networks Trained with Mixup

### Hon. BSc Mathematics & Physics

University of Toronto

Toronto, Canada

April 2022

**Awards:** High Distinction, Dean's List

## EXPERIENCE

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### 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. Experiments include the training of various deep network architectures (Vision Transformers, ResNets, etc.) using numerous data augmentation methods.
- Investigate mathematical properties of image classification and diffusion networks through analysis of intermediate representations.
- Maintain up-to-date knowledge through regular review of academic papers. Contributed 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

August 2021 – April 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

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

## CONFERENCE PRESENTATIONS

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

## SKILLS & INTERESTS

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|---|--|
| • <b>Python</b> (Pytorch, Numpy, Scipy) | • <b>Deep Learning</b> (Generative Networks, LLMs) |
| • <b>SQL, Apache Spark</b>              | • <b>Audio processing, Computer Vision</b>         |
| • <b>Machine Learning, Data Science</b> | • <b>Mathematical/Statistical Modelling</b>        |

## RESEARCH

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**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](#)