Sophia Pietsch

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Education

University of Waterloo *GPA: 96.24% / Major GPA: 96.8%*

Candidate for Bachelor of Computer Science *September 2018 - June 2023*

- **Computer Science**: Machine Learning, Computer Vision, Operating Systems, Algorithm Design and Analysis, Computer Security and Privacy, Graphics, Compiler Contruction, Real-Time Programming, Databases
- **Mathematics**: Advanced-Level Calculus, Advanced-Level Algebra, Advanced-Level Linear Algebra, Combinatorics, Optimization, Advanced-Level Probability, Advanced-Level Statistics

Research Interests

Reinforcement Learning, Multi-Task Learning, Meta Learning, Few-Shot Learning, Unsupervised Learning

Research Experience

Waabi Innovation Inc. *Toronto*

Advisors: Raquel Urtasun and Sergio Casas *May 2022 - August 2022*

- Redesigned trajectory prediction models in PyTorch to accurately simulate the behaviour of vehicles most important to the self-driving vehicle, improving prediction metrics for these vehicles by 10%
- Simulated behaviour of other vehicles for each potential future trajectory of the self-driving vehicle, allowing the self-driving vehicle to drive more proactively by accounting for realistic reactions of other vehicles
- Presented a paper at an internal conference, reviewed other submissions for the conference and participated in discussions about presented topics

Cryptography, Security, and Privacy Lab, University of Waterloo *Remote*

Advisors: Florian Kerschbaum and Ehsan Amjadian *September 2021 - April 2022*

- Created a novel distributed anomaly detection system for PDF documents by clustering encrypted confidential data, allowing multiple parties to share early warnings about potential malware
- Designed a custom PyTorch autoencoder which preserves the similarity of 94% of feature vectors while enabling encryption of feature vectors, allowing comparison of confidential files
- mproved resiliency against adversarial attacks by training autoencoder to be robust against small changes in PDFs, decreasing the number of misclassifications caused by such modifications by 50%
- Designed custom clustering algorithm to identify classes of similar PDFs based on distances between feature vectors, correctly identifying 89% of existing classes

Cryptography, Security, and Privacy Lab, University of Waterloo *Remote*

Advisor: Florian Kerschbaum *May 2021 - August 2021*

- Implemented a new algorithm for inequality comparions over homomorphically encryped data that reduces the number of consecutive multiplications necessary, significantly increasing the number of computations possible

Research Projects

Inequality Comparisons over Homomorphically Encrypted Data *University of Waterloo*

Course: Algorithm Design and Analysis *2021*

- Proved correctness and runtime for the inequality comparison algorithm developed at the Cryptography, Security, and Privacy lab
- Researched previous work in the area, wrote a paper contrasting the new approach with a prevalent algorithm and presented the paper to the course

Training Connect 4 Agents Against an Optimal Agent *University of Waterloo*

Course: Introduction to Artificial Intelligence *2020*

- Trained Connect 4 agents using Temporal Difference Learning, beating an optimal agent over 80% of the time
- Modified the reward function to allow agents to train against an existing optimal agent
- Documented methodology and results in a paper as a group and presented the project to the course

Industry Experience

Bloomberg *New York*

Software Engineering Intern *August 2022 - December 2022*

- Investigated algorithms and methods for the detection of performance regressions in Ticker Plant system, allowing detection of issues before they impact clients
- Identified suitable anomaly detection algorithms by evaluating their detection rate and accuracy on sample data from the system, ensuring that engineers can confidently halt code promotion upon detection of an issue
- Designed and implemented an application which uses the proposed algorithm to detect performance regressions, allowing resolution of issues without interruptions of service

Side Effects Software, Inc. *Remote*

3D Software Developer *January 2021 - April 2021*

- Created prototypes for a new editing tool in the Houdini 3D modeling and special effects software using C++, allowing artists to create better textures for 3D objects easier by reducing the stretching of texture maps
- Computed optimal shapes of triangles in mesh to obtain a texture mapping whose stretching and contraction is automatically reduced, allowing simple adjustments without requiring user input
- Allowed redistribution of stretching and contraction of texture maps through user-defined weights, ensuring that important portions of texture maps are not distorted on the 3D object

Skills

Deep Learning	PyTorch, TensorFlow, Keras
Programming	Python, C++, C, Java, C#, Scala, TypeScript/JavaScript, SQL
Technologies	Hadoop, Spark, PostgreSQL, Linux

Scholarships and Awards

Women in Mathematics Scholarship *2022*

University of Waterloo

President's Research Award *2021*

University of Waterloo

Hack the North Finalist *2021*

Hack the North

Karen Padham Taylor Scholarship for Women in Computer Science *2020*

University of Waterloo

John Hin Chung Tsang Memorial Scholarship *2019*

University of Waterloo

Personal Interests

Cooking, Video Games, Reading, Cosmology, Swimming, Sculpting, Skiing, Drawing, Painting, Quantum Mechanics