

ANTON SUGOLOV

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Toronto, ON

EDUCATION

HBSc. Applied Mathematics and Statistics

Sep. 2020 - Jun. 2024

Victoria College at the University of Toronto, St. George

3.82

- Fourth year Applied Mathematics specialist and Statistics major.
- **Highlights:** Deep Learning, Nonlinear Optimization, Partial Differential Equations, Probability, Data Analysis

EXPERIENCE

Quantum Computing and Machine Learning

May 2023 - Aug. 2023

Prof. Hans-Arno Jacobsen and Dr. Viki Kumar Prasad

Middleware Systems Research Group, University of Toronto

- NSERC USRA research opportunity in quantum circuit architecture for chemical bond separation energy prediction.
- Developed algorithm for selecting gate operation placement in quantum circuits to increase trainability and expressibility.
- Improved prediction on noisy regression data (50%) and chemical bond separation energy, fitted potential energy surfaces.
- Ensured scalability to 16-qubit systems and flexible control over usage of quantum resources throughout algorithm.
- Technical experience with PennyLane, PyTorch Geometric, Shell scripting, Slurm for HPC training.

Statistical Genetics

June 2020 - June 2021

Prof. Lei Sun and Dr. Andrew Paterson

University of Toronto

- Used PLINK v1.9, R for quality control, association tests, and principal component analysis on genetic data.
- Created open-source tutorial for running Genome Wide Association Studies using publicly available 1000 Genomes gene expression data, wrote accompanying 40-page documentation and published pipeline.
- Lead a workshop replicating GWAS results for 15 students with an introductory understanding of statistics.

PUBLICATIONS

- **Sugolov, A.**, Emmenegger, E., Paterson, A.D., Sun L. Statistical Learning of Large-Scale Genetic Data: How to Run a Genome-Wide Association Study of Gene-Expression Data Using the 1000 Genomes Project Data. *Statistics in Biosciences* (2023).

PRESENTATIONS

Quantum circuit architecture selection via local optimization towards quantum machine learning of bond dissociation energy chemical data

Middleware Systems Research Group

- **Best Poster:** Data Sciences Institute Undergraduate Research Day, Data Sciences Institute. *August 10, 2023*. Poster
- Undergraduate Engineering Research Day, University of Toronto. *August 16, 2023*. Podium
- Data Sciences Institute Research Day, MaRS Discovery District. *September 27, 2023*. Poster
- Q-Site Conference, University of Toronto. *September 30, 2023*. Poster

Introduction to the Inverse Kasteleyn Matrix

Sep. 27, 2023

MAT477: Seminar in the Dimer Model and Discrete Riemann Surfaces

- Introduced and proved a result about the probability of a choice of dimers in a uniformly randomly selected configuration.

Introduction to the Ising, Potts, Percolation, and Random Cluster Models

Nov. 15, 2023

MAT477: Seminar in the Dimer Model and Discrete Riemann Surfaces

- Introduced study of clustering behaviour in Ising, Potts, Percolation models through the Random Cluster Model.

PROJECTS

Clustering in Multihead Attention

Nov. 2023

MAT1510, Deep Learning: Theory and Data Science

- Extending past work by Geshkovski et al. about geometric representations in self-attention to multi-head experiments.
- Discussing further connections to literature and Master equation from statistical mechanics.

Deep Learning

- Implementing transformer-based model with applied Koopman operators for learning physical time series data.
- Coursework experience with additive, generalized linear models, multilevel models, random forests, gradient boosting, LDA, QDA, and implementing stochastic gradient descent.
- Exploring relations between learning in statistical mechanics to energy based modeling and modern deep learning.

Course Scheduling Application

Dec. 2021

CSC207, Software Design

- Created Java-based course scheduler implementing SOLID design principles, design patterns, and clean architecture.

SKILLS & INTERESTS

Programming & Markup

Python, R, Java, HTML, \LaTeX

Packages

PyTorch, PennyLane, Numpy, Pandas, Sklearn

Technical

GitHub, Arch Linux, Shell, Slurm, Hugo

Languages

Native: English, Ukrainian *Basic:* French, German, Spanish

Interests

Sailing, Brazilian Jiu-Jitsu, Strength training, Learning languages

HONOURS

NSERC Undergraduate Summer Research Award

May - Aug. 2023

Prof. Hans-Arno Jacobsen, Middleware Systems Research Group

Department of Electrical and Computer Engineering, University of Toronto

\$7,500

Best Poster Presentation (1/3)

Aug. 10, 2023

Data Sciences Institute Undergraduate Research Day

Mrs. F. N. G. Starr Memorial Scholarship

2023

Victoria College

Regents Scholarship I, II

2021 - 2022

Victoria College

Dean's List Scholar

2021 - 2023

University of Toronto

University of Toronto Scholar

2020 - 2021

University of Toronto