

# Marina Drygala

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## Education

### Doctor of Philosophy Candidate in Computer Science

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE (EPFL)

Waterloo, ON, Canada

Feb. 2021 - PRESENT

### MMath (Master of Mathematics) in Combinatorics and Optimization

UNIVERSITY OF WATERLOO

Waterloo, ON, Canada

Jan. 2019 - Dec 2020

### BMath (Bachelor of Mathematics) in Combinatorics and Optimization

UNIVERSITY OF WATERLOO

Waterloo, ON, Canada

Sept. 2013 - Apr. 2017

## Research Interests

Combinatorial Optimization, Approximation Algorithms

## Research Experience

### Doctoral Research Assistant

EPFL, THEORY OF COMPUTATION LABORATORY

Lausanne, Switzerland

Feb. 2021 - PRESENT

- Develop and analyze approximation algorithms for NP-hard problems
- Study linear programming relaxations and integrality gaps

### Master's Research Project

UNIVERSITY OF WATERLOO AND HOSPITAL FOR SICK CHILDREN

Waterloo, ON, Canada

Jan. 2019 - PRESENT

- Studied how to cut and replace bone from the skulls of infants with improper skull formation
- Formulated the problem of cutting and replacing bone as a mathematic model and identify conditions under which the model exhibits a polynomial-time algorithm, and alternative conditions under which the model is inapproximable (Completed)
- Studied alterations to inapproximable models to obtain provable guarantees
- Efficiently implemented above polynomial-time algorithms

### Data Scientist

UNIVERSITY OF WATERLOO AND PERIMETER INSTITUTE FOR THEORETICAL PHYSICS

Waterloo, ON, Canada

Sept. 2018 - Jan. 2019

- Developed class of neural networks that successfully predict interactions needed to simulate quantum computers, which researchers currently use to help quantum simulators grow in a more scalable way than what is available on current devices
- Prepared collections of resources for incoming students to consult on machine learning techniques and tools, involved providing students with an in-person explanation of what they should learn from consulting these resources
- Presented project goals and results during seminars for visiting faculty members

## Publications

- É, Bamas, M Drygala, O Svensson *A Simple LP-Based Approximation Algorithm for the Matching Augmentation Problem* arXiv e-prints, arXiv-2202
- É, Bamas, M Drygala, A Maggiori *An Improved Analysis of Greedy for Online Steiner Forest*. In Proceedings of the 2022 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA) (pp. 3202-3229). Society for Industrial and Applied Mathematics
- Drake, J., Drygala, M., et al. *Optimized Cranial Bandeau Remodeling*. Unpublished Manuscript, University of Waterloo, Waterloo, Canada and The Hospital for Sick Children, Toronto, Canada
- Teoh, Y.H., Drygala, M., Melko, R.G., Islam, R. (2020). *Machine learning design of a trapped-ion quantum spin simulator*. Quantum Science and Technology, volume 5, number 2

## Awards

**William Tutte Postgraduate Scholarship**  
**NSERC Undergraduate Student Research Award**

Awarded to students who show promise of excellence in research in combinatorics

Awarded to students who show promise of research excellence, meant to nurture interest and potential for a research career in the natural sciences and engineering

## Teaching Experience

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### Graduate Teaching Assistant

Waterloo, ON, Canada

UNIVERSITY OF WATERLOO

Jan. 2019 - PRESENT

- Prepare lesson plans and teach tutorial lectures, involves compiling problems sets and solving them with students in class
- Meet with students seeking extra assistance, and explain in detail course concepts

### Undergraduate Teaching Assistant

Waterloo, ON, Canada

UNIVERSITY OF WATERLOO

Sept. 2014 - Apr. 2017

- Hosted office hours for students taking introductory algebra courses, often involved guiding their transition into university by offering advice on how to alter study habits used in high school
- Offered insight on course-specific topics, while highlighting standard approaches to proofs, that they would require throughout their education

### High School Mathematics Tutor

Waterloo, ON, Canada

SELF-EMPLOYED

Feb. 2017 - June 2018

- For students looking for extra stimulation, introduced topics taught in the next grade level or first-year university
- For students struggling with their current grade level material, hosted biweekly sessions one of which targeted improving prerequisite material and the other aimed at keeping caught up to the current course content
- Students reported increases of 5-20 percentage points on tests