

# Alexandra Veliche

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## Education

### University of Michigan, Ann Arbor, MI

PhD Candidate in Computer Science and Engineering

Advisor: Mahdi Cheraghchi

Expected Graduation Date: May 2025

GPA: 3.89 / 4.00

*Relevant Coursework:* Lattices in Cryptography, Algorithms, Information Theory, Advanced Cryptography, Randomness & Computation, High-Dimensional Probability, Computer & Network Security, Foundations of Artificial Intelligence

*Relevant Activities:* Lattice Theory Crypto reading group, Theoretical Computer Science reading group, Theory Seminar

### Northeastern University, Boston, MA

Bachelor of Science in Mathematics, Minor in Computer Science

Graduation Date: May 2020

Summa Cum Laude

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## Research

### Fine-grained Hardness of the Learning with Errors Problem

*Computational Complexity Theory*

- ◆ *Collaborators:* Divesh Aggarwal, Jin Ming Leong.

National University of Singapore

Summer 2023 – present

### Mean-Based Worst-Case Trace Reconstruction

*Coding Theory*

- ◆ *Collaborators:* João Ribeiro, Mahdi Cheraghchi, Joseph Downs.
- ◆ Generalized all best known upper bounds on the number of traces needed for mean-based trace reconstruction to oblivious synchronization channels.
- ◆ Presented results at ISIT 2021 and published paper in IEEE Transactions on Information Theory.

University of Michigan

Fall 2020 – Fall 2021

### Randomness Extractors

*Cryptography*

- ◆ *Advisor:* Daniel Wichs.
- ◆ Worked on proving that any good seeded extractor is a good two-source extractor.

Northeastern University

Spring 2020

### Nonlocality in Quantum Shallow Circuits (Junior-Senior Honors Thesis)

*Quantum Computing*

- ◆ *Advisor:* Christopher King.
- ◆ Proved results in “Quantum Advantage of Shallow Circuits” by Bravyi, Gosset, and König, for small examples and illustrated the role of nonlocality and graph states in solving the Hidden Linear Function Problem to separate the classes  $NC^0$  and  $QNC^0$ .
- ◆ Wrote an expository report of these results and presented at the Honors Thesis seminar.

Northeastern University

Fall 2019

### Shor’s Algorithm and Its Impact on Present-Day Cryptography (Research Capstone)

*Quantum Computing*

- ◆ *Advisor:* Christopher King.
- ◆ Wrote exposition of Shor’s algorithm for factoring, with a focus on the role of roots of unity in the quantum Fourier transform and presented at the research capstone seminar.

Northeastern University

Fall 2018

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## Teaching

### **CSE Department of University of Michigan**

Ann Arbor, MI

*Graduate Student Instructor for Advanced Cryptography (EECS 575)*

August – December 2022

- ◆ Collaborated with the instructor, Paul Grubbs, to run the course.
- ◆ Taught weekly discussion section consisting of material review and practice problem-solving.
- ◆ Led weekly office hours to improve student comprehension of course material and homework problems.
- ◆ Drafted solutions to biweekly homework problem sets and exams.
- ◆ Monitored Piazza forum to respond to student questions.
- ◆ Graded assignments and exams and gave detailed feedback.

### **CSE Department of University of Michigan**

Ann Arbor, MI

*Graduate Student Instructor for Introduction to Algorithms (EECS 477)*

August – December 2021

- ◆ Collaborated with the instructor, Greg Bodwin, and another assistant to run the course.
- ◆ Taught two weekly discussion sections involving review of material and practice problem-solving.
- ◆ Led weekly office hours to improve student comprehension of course material and homework problems.
- ◆ Drafted solutions to biweekly homework problem sets.
- ◆ Monitored Piazza forum to respond to student questions.

### **New Horizons Summer School**

Online

*Volunteer Teaching Assistant for Cryptography*

June 2021

- ◆ Collaborated with the instructor, Yael Kalai, and two teaching assistants to prepare lectures and practice problems.
- ◆ Led one section of the group problem-solving sessions and office hours.
- ◆ Organized plenary talks and panels with other students.

### **Computer Science Department of Northeastern University**

Boston, MA

*Teaching Assistant for Cryptography (CS 4770)*

January – April 2020

- ◆ Communicated with the instructor, Daniel Wichs, and teaching assistant to design lectures and problem sets.
- ◆ Drafted solutions to weekly homework problems.
- ◆ Monitored Piazza forum to respond to student questions.
- ◆ Graded assignments and exams and gave detailed feedback.

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## Service

### **CSE Department of University of Michigan**

Ann Arbor, MI

*Theory Lunch Seminar Organizer*

August 2021 – Spring 2022

- ◆ Collaborated with another student to organize talks and order food for faculty and graduate students in the theoretical computer science group.

### **St. Herman of Alaska Christian School**

Allston, MA

*Volunteer Teacher's Assistant for Middle School Geometry Class*

Fall 2016 – Fall 2019

- ◆ Assisted the instructor, Oana Veliche, to run the three-trimester-long course.
  - ◆ Taught and clarified new material to several students in grades 6 – 8 once a week.
  - ◆ Composed lessons, homework, and exams in LaTeX and translated problems from Romanian textbook into English.
  - ◆ Designed hands-on activities for students to apply course material.
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## Employment

### **National University of Singapore, Centre for Quantum Technologies**

Singapore

*Research Visitor / Intern*

Summer 2023

- ♦ Collaborated with Divesh Aggarwal and Jin Ming Leong on a research project about fine-grained hardness of the Learning with Errors problem.

### **Mathematics Department of Northeastern University**

Boston, MA

*Mathematics Tutor*

May 2017 – April 2019

- ♦ Instructed over 10 students per week in various mathematics courses to facilitate comprehension of class material.
- ♦ Adapted and customized teaching style to accommodate the learning style and experience of each student.

### **Cengage Learning**

Boston, MA

*Cybersecurity Co-op*

January – July 2018

- ♦ Communicated with co-workers and organized projects for antivirus software installation and endpoint upgrades.
- ♦ Learned basics of ethical hacking and web application security, using OWASP Zap and Metasploit in Kali Linux.
- ♦ Compiled endpoint status reports in Microsoft Excel and monitored activity within the company environment.

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## Conferences & Seminars

### **Graduate Research Opportunities for Women in Mathematics (GROW) Conference**

*University of Michigan, Ann Arbor, MI*

October 2018

### **Nebraska Conference for Undergraduate Women in Mathematics (NCUWM)**

*University of Nebraska, Lincoln, NE*

January – February 2019

- ♦ Presented poster on “Shor’s Algorithm and Its Impact on Modern Cryptography”.

### **Hudson River Undergraduate Math Conference (HRUMC)**

*Smith College, Northampton, MA*

March 2019

- ♦ Gave a talk on “Shor’s Algorithm and Its Impact on Modern Cryptography” project.

### **Nebraska Conference for Undergraduate Women in Mathematics (NCUWM)**

*University of Nebraska, Lincoln, NE*

January – February 2020

- ♦ Presented poster on “Nonlocality in Shallow Quantum Circuits” project.

### **IEEE International Symposium on Information Theory (ISIT)**

July 2021

*Online*

- ♦ Prepared and recorded the 4-minute highlight talk and represented our group in the Q&A session.
- ♦ One of the three winning teams in the Four Minutes, Two Techniques student contest.

### **Theory Lunch Seminar, University of Michigan**

January 2022

*Ann Arbor, MI*

- ♦ Gave a talk on “Duality between Packings and Coverings of the Hamming Space” paper by Cohen and Vardy.

### **Theory Lunch Seminar, University of Michigan**

October 2022

*Ann Arbor, MI*

- ♦ Gave a talk about Shannon capacity of graphs and connections to coding theory.

### **Theory Lunch Seminar, University of Michigan**

March 2023

*Ann Arbor, MI*

- ♦ Gave a talk on “Mean-Based Trace Reconstruction over Oblivious Synchronisation Channels” paper.

## Computing Theory Seminar, National University of Singapore

May 2023

Singapore

- ♦ Gave a talk on “Mean-Based Trace Reconstruction over Oblivious Synchronisation Channels” paper.

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## Honors & Awards

### Honorable Mention Award for Teaching

May 2022

Recognized for commitment as a Graduate Student Instructor to the academic mission of the University of Michigan's CSE Department.

### ISIT 2021 Four Minutes, Two Techniques Student Challenge Winner

July 2021

\$300 awarded to each member of the top 3 teams for a collaborative 4-minute video explaining 2 techniques.

### PEAK Shout-It-Out Award

January 2020

\$230 awarded for travel to present a poster at the NCUWM in February 2020.

### Churchill Scholarship Nominee

November 2019

Nominated by Northeastern University to the national Churchill Scholarship competition, for a fully-sponsored year-long master's degree at Cambridge University, U.K.

### National Merit Scholarship

Fall 2016 – Spring 2020

\$250 per semester, merit-based scholarship sponsored by Liberty Mutual.

### Dean's List

Fall 2016 – Spring 2020

Awarded to students who maintain a GPA greater than 3.5 per semester.

### High-school valedictorian

May 2016

Awarded for academic merit, one of the top three students in graduating class of 2016.

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## Extracurricular Activities

- ♦ Member of OCF (Orthodox Christian Fellowship) club at University of Michigan.
- ♦ *Interests:* Orthodox Christianity, hiking, travelling, painting, drawing, cooking, baking, reading.