

# Krystal Maughan

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*Research Interests: Mathematical Cryptography, Elliptic Curves, Random Processes, Computational Number Theory (Arithmetic Geometry), Coding Theory (Error-Correcting Codes), Algebraic Graph Theory, Quantum Algorithms, Quantum Resource Estimation*

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**University of Vermont, PhD student**

**2019-present**

*Computer Science PhD student, minor in Pure Mathematics*

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**(PhD) classes:** *Mathematical (Post-Quantum) Cryptography, Elliptic Curves and Modular Forms, Combinatorial Graph Theory, Spectral Graph Theory, Category Theory, Random Probabilistic Graphs, Secure and Distributed Computation, Algebraic Graph Theory and Quantum Computing, Abstract Algebra I (Groups), III (Rings/Fields/Galois Theory), IV (Category Theory, Lie Algebra), Privacy Law and Policy, Machine Learning, Data Privacy, Software Verification (Agda), Computer Human Interaction.*

**Oral Qualification Exams in:** (1) Quantum Computing, Quantum Algorithms and Classical Mathematical Cryptanalysis, (2) Elliptic Curves (3) Combinatorial Graph Theory

## **RESEARCH EXPERIENCE:**

**Research Assistant (Vermont)**

**2021-present**

*PhD Supervisors: C. Vincent, J. Near: Research on Isogeny-Based Cryptography*

- *Mathematical Cryptography Research*

*Supervisor: Joe Near: Research on Provable Fairness and (Differential) Privacy*

**2019-2020**

*Using Machine Learning. Funded via Amazon Research Award (2020-2022 PI: J. Near, D. Darais).*

## **Publications**

- ❖ *"Machine Learning for Modular Multiplication" (submitted)* 2024
- Women in Numbers VI (2024) : Research Directions in Number Theory**  
(Lauter K., Li C., **Maughan K.**, PhD, Newton R., Srivastava M.)
- ❖ *Prediction Sensitivity: Continual Audit of Counterfactual Fairness in Deployed Classifiers (**Maughan, K.**, Ngong, I., Near, J.)* 2022  
(presented as poster at "Equity and Access in Algorithms, Mechanisms and Optimization (**EAAMO**) Doctoral Consortium")
- ❖ *"Towards a Measure of Individual Fairness for Deep Learning"* 2020  
(**Maughan, K.** and Near, J.) - presented as poster for **MD4SG**  
(presented at "Mechanism Design for Social Good" conference)
- ❖ *"Towards Auditability for Fairness in Deep Learning"* 2020  
(Ngong, I., **Maughan, K.** and Near, J.)- presented as poster for **AFCI at NeurIPS**

### Abstracts:

- ❖ “Post-Quantum Secure, Foldable, Recursive Proofs of Isogeny Knowledge With Reduced Time Complexity” (submitted) 2024  
(**Maughan K.**, Near J., Vincent C.)

### Pre-prints:

- ❖ “Improving Utility for Analysis of Correlated Columns using Pufferfish Privacy” 2022  
(**Maughan, K.** and Near, J.)

### Accepted Workshop Conference Posters:

- ❖ Post-Quantum Secure Recursive Proofs of Isogeny Knowledge with Reduced Time Complexity (Maughan, K. and Vincent C., and Near, J.) at **CQIQC-X** 2024
- ❖ Post-Quantum Secure Recursive Proofs of Isogeny Knowledge with Reduced Time Complexity (Maughan, K. and Vincent C., and Near, J.) at **USTARS 2024** 2024
- ❖ Post-Quantum Secure Recursive Proofs of Isogeny Knowledge with Reduced Time Complexity (**Maughan, K.**, and Vincent C., PhD) accepted at **QIP 2024** 2023  
Poster for Quantum Information Processing conference, Taipei, Taiwan
- ❖ “Compositional Isogeny Schemes”- poster presented, **CrossFyre at Eurocrypt** 2023  
Poster for workshop on Provably Robust Schemes, Lyon, France (**Maughan, K**)
- ❖ “Compositional Isogeny Schemes”- presented as poster at **ACM Richard Tapia** 2022  
Poster Competition at Conference, Washington, D.C. (**Maughan, K**)
- ❖ “Archipelago Pensée” 2020  
(**Maughan, K.**) - presented as a poster for Resistance AI (**RAIS**) at **NeurIPS**

### Collaboration on Other Research Projects in Progress:

- ❖ Mathematical Cryptography: Work on Compositional Isogeny Schemes (ongoing) 2022-present  
(PI: C. Vincent, Near J. PhD, **Maughan, K.**)
- ❖ Error-correcting codes / LDPC using group algebras 2023-present  
(PI: Chimal-Dzul, H., Hoffer W., **Maughan, K.**, Maya N.A., W., Morris K.)
- ❖ Expander properties of Isogenies 2023-present  
(Arpin, S., Bowen R., Clements J., Codogni G., Eisenträger K., Ghantous W., Bo Lau J., LeGrow J., Macula J., Mahaney W., **Maughan. K.**, Morrison T., Orvis E., Rickards J., Sabitova M., Scullard G., Zobernig L.)
- ❖ Quantum Backtracking for Constraint Satisfaction Problems (CSP) 2023-present  
(Jhunhunwala V., **Maughan K.** PI: Schirman E.)
- ❖ “Experimental Investigation of Lehmer’s Conjecture for Elliptic Curves”, 2024-present  
(Clark J. M., Dombrowsky C., Iranzo M. C., Katz S., **Maughan K.**, Orvis E.,  
Supervised by: Looper N., PhD and Chidambaram S., PhD, Silverman J., PhD)
- ❖ SPAR Project on Interacting Agents for Safety Constraints 2024-present  
(**Maughan K.** and several authors, PI: Heitzig J., PhD)
- ❖ Arbitrary Haskell research (workshop paper) 2024-present  
(Bates M., Jafri S., **Maughan K.**, Near J.)
- ❖ Graphs research 2023-present  
(**Maughan K.**, PI: Rombach, P. )
- ❖ Summer Research Project 2024-present  
(PI mentor: Alapati N.)

### **Collaboration on Other Research Projects in Progress:**

- ❖ *Post-Quantum Cryptography project* 2024-present  
(**Maughan K.**, and other co-authors, PI: Cherkaoui, I.)
- ❖ *Independent research project* 2023-present  
(PI: Lees A., PhD, **K. Maughan**)
- ❖ *Summer of Bitcoin (Virtual) "Price of Anarchy in Selfish Routing on the Lightning Network"* (R. Pickhardt, S. Alscher, **K. Maughan**) 2022

### **Whitepapers (Data Privacy and Security):**

- ❖ *Client Telemetry Aggregation, Microsoft internal (joint work with: P. Angulo, PhD)* 2021

### **INVITED VISITING PhD STUDENT RESEARCHER (UC Berkeley)**

- ❖ *Simons Institute, "Quantum Algorithms, Complexity and Fault Tolerance"* 2024
  - *Invited as a visiting researcher for workshop and Error Correcting Codes*
  - *Participated in Bootcamp (Berkeley, California from Jan 22nd to Feb 16th)*
  - *Hosted by Irani, S., PhD (UC Irvine, Simons Associate Director)*
  - *Provided with Funding for Travel, Lodging and Per-Diem (1 of 8, \$3,500 U.S.)*

### **SPECIAL HONOURS**

- ❖ *Invited Student Participant, 11th Heidelberg Laureate Forum (HLF)* 2024
  - *Handpicked as 1 of 100 candidates in Maths (or Computer Science) to attend the Forum in Heidelberg. Chosen candidates represent promising young researchers who are given the opportunity to interact with the brightest minds in Mathematics and Computer Science (i.e. winners of the Turing award, The ACM Prize in Computing, Fields Medal, IMU Abacus Medal and Nevanlinna Prize).*

### **TEACHING EXPERIENCE**

- ❖ **PhD Teaching Fellow**, iSchool Inclusion Institute (i3), "Computational Thinking" 2023
  - *1 of 2 PhD applicants chosen to design and teach curriculum for 10-day Summer course at the University of Texas at Austin (with S. Stueve, co-teaching fellow)*
  - *Provided salary and funded with accommodation, flight and stipend for supplies.*
- ❖ **Guest Lecturer**, "Privacy Law and Policy", University of Vermont (UVM) 2021
  - *Presented research work on Impacts of Data Leakage and Data Privacy*
- ❖ **Graduate Teaching Assistant**, University of Vermont (Fall / Spring) 2019-2020
  - Compiler Construction (with Haskell), Programming for Engineers (with Matlab), Data Privacy (Differential Privacy, K-anonymity, Machine Learning with Python),*
- ❖ **Graduate Teaching Assistant**, University of Vermont (Fall / Spring) 2019-2020
  - Advanced Web Design (Lead Teaching Assistant)*

### **GRANT WRITING / PROPOSALS (SELECTED)**

- ❖ *Summer of Bitcoin, "Price of Anarchy in Selfish Routing On the Lightning Network" (Research proposal with 0.4% acceptance rate, Awarded \$3,000)* 2022
- ❖ *COST Action Proposal OC-2021-1-25315 "Mathematics and Algorithmics of Group actions and Isogenies for Cryptography" (Secondary Proposer)* 2021

## **GRANT WRITING / PROPOSALS (SELECTED)**

- ❖ Microsoft Research, Reinforcement Learning Open Source Festival Proposal 2021  
(Awarded \$10,000)
- ❖ Google Summer of Code, Proposal to Haskell.org 2018  
(Awarded \$6,000)
- ❖ Helium Grant, (for exploring questions on the edge of mainstream thinking) 2018  
(1 of 11 chosen out of 700 applicants; Awarded \$1,000)

## **RESEARCH AWARDS (SELECTED)**

**2nd Place Winner**, Best Research Project (tie with X. Zhang), 2022  
UVM CS Research Day for “Price of Anarchy in Selfish Routing on the Lightning Network”  
**Best Poster**, Brilliant Idea Category, Mediterranean Machine Learning Summer School 2021

## **ACADEMIC REVIEWER (SELECTED)**

AAAI-24 Workshop on Privacy-Preserving Artificial Intelligence (2024), Safe and Trustworthy AI (STAI) at International Conference on Logic Programming 2023 (ICLP),  
Algorithmic Fairness through the Lens of Time at NeurIPS 2023 (AFT), AAAI 2023 Workshop on Privacy Preserving Artificial Intelligence (PPAI), PML4DC (Practical Machine Learning for Developing Countries), ICLR / NeurIPS: Algorithmic Fairness through the Lens of Causality and Privacy, ICLR Distributed and Private Machine Learning (DPML), Tiny Papers Workshop at ICLR 2023, Black in AI Workshop @ NeurIPS (2020-present), Springer’s AI Ethics Journal

## **REVIEWER (OTHER)**

Effective Haskell, by R. Skinner: book on Haskell programming.

## **SUMMER SCHOOLS**

**(all summer schools were fully funded: lodging, flight, registration provided)**

- Virtual Participant intern, Co-design Center for Quantum Advantage (C<sup>2</sup>QA) 2024
  - QIS 102 Applied Quantum Computing Summer School at Brookhaven National Laboratory (June 10th-June 28) (provided \$500 weekly stipend)
- Participant, QSim (Quantum Simulation) Summer School 2024
  - (August 8th through 11th, Rhode Island)
- Participant, SLMATH 1068, IBM Research Zurich, (Zurich, Switzerland) 2024
  - “Introduction to Quantum-Safe Cryptography” (June 24th to July 5th),
    - Covers lattice, code-based, isogeny-based and multivariate cryptography
    - Organised by Bootle J., and De Feo L.
- Participant, IAS/PCMI Graduate Research Summer School, (3 weeks) 2023
  - Topic of “Quantum Computing” covered algorithms, information theory, Cryptography and error-correcting codes.
- Participant, Twelfth Summer School on Formal Techniques + FMITF Bootcamp 2023
  - Two-week workshop in Atherton, California covering Alloy, PVS, Vampire And interactive proof checkers for applied formal methods domains

## **RESEARCH PhD INVITATIONS (ABRIDGED)**

Participant, 10th International Conference on Quantum Information and Quantum Control (CQIQC-X) at the Fields Institute (Toronto, Canada) 2024

## **RESEARCH PhD INVITATIONS (ABRIDGED)**

Participant, Underrepresented Students in Topology and Algebra Research Symposium 2024

- USTARS: granted lodging, travel, meals (University of Iowa)

Virtual Participant, Summer of Quantum, Laboratory for Physical Sciences (LPS) (2 wks) 2023

- Qubit fundamentals, hardware, Quantum Algorithms, error-correcting codes

Participant, QSim Summer School (Rhode Island) (Rhode Island, United States) 2024

Mentee, Supervised Program for Alignment Research (SPAR) 2024

- Chosen to work on research for Satisfia research project by PI Heitzig J.

Virtual Participant, "Connecting Heavy Tails and Differential Privacy in Machine Learning" 2024

- Hosted by the Alan Turing Institute and the Newton Gateway for Mathematics

Participant, WIN6, (mentors: Lauter K., Newton R.) 2023

- Research project at BIRS, to be published in 10th WIN proceedings 2024 (Banff, Canada)
- Received award for lodging, travel (~1 of 42) (March 26th to March 31st)

Participant, American Institute of Mathematics (AIM) workshop on 2024

"Post-Quantum Group-Based Cryptography" (Pasadena, California) (\$750 funding)

Participant, Hausdorff Research Institute for Mathematics, "Formal Mathematics" (Lean) 2024

- Given housing, funding for flight (1100 Euro)

Participant, BIRS, Isogeny-based cryptography Banff research workshop 2023

- Co-organized by de Quehen, Petit C. and Martindale C.

Participant, SQInT Chemistry Fellowship (to attend Southwest Quantum Information 2023

Invited Participant, 2023 Fields Medal Student Symposium, Birkar C., (Virtual) 2023

Participant, Quantum Workshop at North Carolina State (Nov 18-19) 2023

Participant, High Assurance Cryptographic Software (HACS) (Toronto, Canada) 2024

- Received funding for flight, lodging, and granted free registration (\$1200 funding)

Participant, IPAM "Machine Assisted Proofs" (Feb 13-17), (Los Angeles, California) 2023

- Formal methods at the intersection of Pure Mathematics and Computer Science
- Received award for lodging, waived registration

(organized by E. Abraham, J. Avigad, J. Ellenberg, M. Heule, T. Tao, K. Buzzard, T. Gowers)

Participant, PCMI Graduate Summer School (1 of 50), "Quantum Computation" (3 weeks) 2023

- Awarded full funding (housing, registration, flight) (July 16-August 5th)
- Coursework on: Quantum and quantum-inspired linear algebra,
- Quantum fourier transforms and quantum information theory, LDPC codes
- Topological aspects of quantum codes, quantum hamiltonian complexity
- Quantum learning theory

Participant, Rethinking Number Theory (4th edition) 2023

- Collaborative research in Number Theory (June 12th to 23rd and beyond)
- Organized by A. Serrano López, M. West, H. Goodson

Participant, Twelfth Summer School on Formal Techniques + FMITF Bootcamp 2023

- Received admission, housing and funding for flight
- Labs using Vampire Theorem Prover, Alloy, TPTP, PVS, Easycrypt
- Guest lecture on Paxos by L. Lamport (May 23rd to June 2nd) (Menlo College, Atherton)

Participant, ICERM's LMFDB, Computation and Number Theory (LuCaNT) workshop 2023

- (Provided housing, registration)

Invited Participant, Lorentz Center, "Machine-Checked Proofs", Leiden, the Netherlands 2023

- Lean Workshop, Funding (provided housing, funding for travel)

## **RESEARCH PhD INVITATIONS (ABRIDGED)**

Invited Participant, High Assurance Crypto Software (HACS) (Tokyo, Japan)	2023
- (Post-quantum) cryptographic verification workshop (conflicted with WIN6)	
Invited Participant, CrossFyre at Eurocrypt (Lyon, France)	2023
- Cryptography, Robustness and Provably Secure Schemes for Female Young Researchers: presented research poster	
(Received funding for accommodation, registration and flight courtesy of PQ-Shield)	
Participant, Arizona Winter School, "Abelian Varieties"	2024
- Abelian Varieties (Tucson, AZ)	
Participant, Arizona Winter School, "Point Counting and Applications" (J. Pila)	2023
- Applications of Point-counting for algebraic points of bounded degree (Tucson, AZ)	
Virtual Participant, "Algebraic Cycles, L-Values, and Euler Systems": MSRI	2023
- Originally granted registration but opted for virtual attendance	
Virtual Participant, Research Institute for Mathematical Sciences (RIMS)	2023
- Zeta functions and their representations	
Participant, 1st Roots of Unity reunion, American Institute of Mathematics, Pasadena CA	2023
Participant, Doctoral Consortium at ACM Richard Tapia Conference (Washington, D.C.)	2022
Participant, 1st Roots of Unity Summer School: Arithmetic Geometry group (fully-funded)	2022
- focus on Arithmetic Geometry and Arithmetic Statistics with six PhD students	
Invited to proceeding AWM Research Symposium at University of Minnesota (UMN))	2022
Invited Participant, IAS/ Park City Mathematics Institute (PCMI)	2022
- Graduate Summer School, Computational Number Theory (fully-funded: declined offer)	
Virtual Participant, BIRS, Algebraic Methods in Coding Theory and Communication	2022
Virtual Participant, COGENT: Cohomology, Geometry and Explicit Number Theory	2022
Virtual Participant, Stinson66: New Advances in Designs, Codes and Cryptography	2022
Virtual Participant, Arizona Winter School, Southwest Arithmetic Geometry Center	2022
- Automorphic Forms beyond GL <sub>2</sub> : Unitary Groups Study Group (mentor E. Eischen)	
Virtual Participant, West Coast Number Theory (WCNT): Problems in Number Theory	2021
Selected Participant, GREPSEC VI (1 of 42)	2023
Participant, GREPSEC V:	2021
- (Graduate Students in Privacy and Security Early Career Workshop)	
Participant, Isogeny-Based Cryptography Winter School	2021
Participant, Post-Quantum Networks Workshop	2021
Participant, PRIMA Summer School	2021
- Rational curves and moduli spaces in arithmetic geometry	

## **MERIT-BASED GRANTS / FELLOWSHIPS / SCHOLARSHIPS (ABRIDGED)**

Fellow, SQInT Chemistry Fellowship (to attend Southwest Quantum Information And Technology (SQInT) (flight, housing and registration covered) (1 of 5)	2023
Fellow, Institute for Logic and Data Science (ILDS) Coq and Lean Autumn School	2023
- Part of the Working Formal Methods Symposium (Bucharest, Romania)	
SOUPS 2023 Grant for Black Computer Science Students (USENIX 2023)	2023
Initiative for Cryptocurrencies and Contracts (IC3) Blockchain Bootcamp	2021
- Worked on group project : Fairness consensus for Miner Extractable Value (MEVs)	
- Implemented Aequitas protocol from paper with authors for fairness simulation	

**MERIT-BASED GRANTS / FELLOWSHIPS / SCHOLARSHIPS (ABRIDGED)**

Participant, Self Organizing Conference on Machine Learning (SOCML)	2021
- Machine Learning, and Privacy session, Moderated by U. Erlingsson	2021
- organized by I. Goodfellow (1 of 9 chosen)	
(Privacy Engineering Practice and Respect) PEPR Grant, S&P Oakland	2022
Fellow, BlackComputeHER (2022-2023) (1 of 11 )	2022
Scholarship winner (to attend Richard Tapia Celebration of Diversity in Computing)	2022
- (registration, flight, hotel costs, Washington D.C. courtesy BNY Mellon)	
Google Grace Hopper Conference (GHC) Scholarship	2021
WISP & Black Hat USA Briefings Scholarship (1 of 25)	2021
Kernel Fellowship Block III via Gitcoin (Security: Zero Knowledge Proofs project)	2021
Gitcoin Scholarship for Women (for Kernel Fellowship Block III)	2021
She256 Mentorship focused on ZK Snarks (6 months)	2021

**OTHER GRANTS/ FELLOWSHIPS (ABRIDGED)**

Quantum Information Processing (QIP) Student Stipend	2024
USENIX Security Conference 2021 (via USENIX Diversity Grant via GREPSEC V)	2021
TechX Social Impact / Harvard Franklin Fellowship (1 of 12)	2020
USENIX Enigma Grant	2021
NCAS Workshop participant (NASA Community College Aerospace Scholars)	2016
Who's Who/ Peggy Williams Memorial Scholarship/ Best BFA Award (Best of Major)	2008
Northeast Combinatorics, Discrete Maths Day (lodging)	2022
Upstate Number Theory Conference 2021 (lodging provided)	2021
IEEE Symposium on Security and Privacy (student travel grant, complimentary ticket)	2021
4th Annual ZK-Proof Workshop (complimentary ticket)	2021
WISP Privacy+Security Conference	2021
- EU Data Law / De-Identification Workshop (Scholarship via WISP)	
ICERM (Brown University) Variable Precision in Mathematical & Scientific Thinking	2020
RWC2020 (Real World Crypto: registration, flight, lodging) Grant via IACR	2020
PL+HCI Swimmer Summer School (on Programming Languages and Usability)	2020
Sage-Days-104 : To work on SageMath Software: Arithmetic Dynamics	2019
Simons Institute (Berkeley) Error-Correcting Codes and High-Dimensional	2019
Expansion Boot Camp (attendee)	
ICERM (Brown University) Encrypted Search Workshop Grant (Lodging provided)	2019
Cornell Number Theory Conference Grant (Lodging provided)	2019
MSRI (Mathematical Sciences Research Institute) Grants to attend:	
Optimal Transport and applications to machine learning and statistics	2020
Connections for Women:	2019
- Derived Algebraic Geometry, Birational Geometry and Moduli Spaces workshop	
- Introductory Workshop: Derived Algebraic Geometry and Birational Geometry	
And Moduli Spaces	
Racket Summer School (National Science Foundation Grant)	2018-2019
PLMW (Programming Languages Mentorship Workshop)	2018
ICFP (International Conference Functional Programming)	
PLMW(Programming Languages Mentorship Workshop)	2018

## **OTHER GRANTS/ FELLOWSHIPS (ABRIDGED)**

PLDI (Programming Languages Design and Implementation)  
OPLSS (Oregon Programming Languages Summer School Grant) - declined offer 2018

## **INSTITUTIONAL PROSPECTIVE FACULTY PhD INVITATIONS**

- ❖ Invited Participant, Rochester Institute of Technology: RIT Pathways to RIT (Pathways from PhD to Faculty programme) 2023
- ❖ Invited Participant, Rochester Institute of Technology: Pathways to RIT Computing edition 2023

## **INDUSTRY PhD INVITATIONS (ABRIDGED)**

Participant, Goldman Sachs' Women's Possibilities Summit (~10% of 11,000 applicants) 2024  
Participant, Adobe's Experience Day for Research 2023  
Participant, Goldman Sachs HackerRank Prep 2023  
Participant, Meta's Uniting Scholars in Research (Menlo Park, Palo Alto) (1 of 35) 2022  
Virtual Participant, Jane Street's Preview Program, The Game Show / Trading Games 2022  
Virtual Participant, Adobe's Experience Day: Research Track (Emerging Devices) (1 of 35) 2022  
Participant, Facebook, Amplified: Above & Beyond Computer Science Program (PhDs) 2021  
Participant, Facebook's Amplified: Virtual Vivid in Research (1 of 30) 2021  
Participant, Galois 1st Summer School on Trustworthy Machine Learning (1 of 35) 2021  
Participant (via CSRMP), Google PhD Fellowship Summit 2021  
Participant, Jane Street PhD Symposium (New York, remote) (Quant Research) 2021  
Participant, TwoSigma Mock Interview Day for Early Career Women (Quant Research) 2021  
Participant, Twitter PhD ML Flock Event (New York, Boston office) 2019

## **GRADUATE SCHOOL INTERNSHIPS**

**Visa Research**, Staff Research Scientist Intern, Advanced Cryptography Group 2024  
**JP Morgan**, Quantitative AI Research, Summer Associate (New York) (1 of 10) 2022  
**Summer of Bitcoin**, Blockchain (Lightning Network) PhD Research intern (remote) 2022  
**Microsoft Research**, Independent Contractor, Summer 2021 (New York: remote) 2021  
**Microsoft**, PhD Intern, Summer 2021 (Redmond: remote) 2021  
**Autodesk**, PhD Intern, Summer 2020 (Pier 9, San Francisco: remote) 2020

## **RELEVANT WORK / INDUSTRY EXPERIENCE (Pre-Grad school)**

**Mercury Banking (Haskell fintech)** : Software Engineering Intern (San Francisco) 2019  
**Apple, Inc.:** Software Engineering Intern (Sunnyvale) 2019  
**Google Summer of Code:** Developer for Haskell.org 2018  
**Mozilla:** Increasing Rust's Reach Developer 2018

## **OTHER (ACADEMIC) TALKS (ABRIDGED)**

"Experimental Investigation of Lehmer's Conjecture for Elliptic Curves", (20 minutes) 2024  
- Talk at the Arizona Winter School, on the topic of Abelian Varieties.  
- Joint with Clark J. M., Dombrowsky C., Irazo M. C., Katz S., Orvis E., (SW-AWS)  
Invited Talk, Carnegie Mellon University Graduate Computer Science Seminar (20 mins) 2024  
- "Post-Quantum Secure Recursive Proofs of Isogeny Knowledge with Reduced Time Complexity; a case for Formal Methods", SSSG seminar



## **OTHER (ACADEMIC) TALKS (ABRIDGED)**

Simons Institute, Quantum Fault Tolerance workshop Lightning Talk (10 mins)	2024
Presenter, Google CSRMP, "Quantum backtracking and implications to cryptography"	2023
Number Theory in Quantum, American Institute of Mathematics (AIM),	2023
Roots of Unity Workshop, Caltech (Pasadena, Los Angeles)	
"Compositional Isogeny Schemes", Tapia Doctoral Consortium (45 minutes)	2022
"A Journey through Unboundedness of ranks of Elliptic Curves", (15 minute talk)	2022
Roots of Unity Workshop (joint talk with O. Del Guercio and M. Bustos Gonzalez)	
Brown University, Fair February talk on Security, Privacy, Fairness (30 minutes)	2022
Meetup "Math for Math's Sake", Virtual Lightning Talk (10-15 minutes)	2022
"Isogenies, Elliptic Curves and Random Walks on Random Graphs	
"Composable Forgetful Isogenies", Google CSRMP Research Alumni Talk (30 minutes)	2022
"Price of Anarchy in Selfish Routing", Graph Theory and Spectral Graph Theory (15 min)	2022
"Price of Anarchy in Selfish Routing", Google CSRMP Research Alumni Talk (30 minutes)	2022
CS Research Day, "Price of Anarchy in Selfish Routing", UVM (16 min)	2022
"Composable Forgetful Isogeny Graph Cryptography", Google CSRMP Research	2021
"Isogeny Cryptography", School for Poetic Computation, Re-learning to love Maths	2021
PLAID Lab Speaker, "Information Theory: from Spacecraft to Blockchain"	2021

## **INDUSTRY TALKS (ABRIDGED)**

"Isogeny-Based Cryptography", JP Morgan AI Research Cryptography Group (1 hour)	2022
JP Morgan AI Research Weekly Technical Meeting, (New York) (20 min)	2022
JP Morgan AI Research Reading Group Meeting (30 min)	2022
JP Morgan Summer Symposium (10 min)	2022
Women Who Code: SageMath: "Computational (Pure) Mathematics/Graph Theory"	2022
- Lightning Talk (2-4 min)	
"Prediction Sensitivity for Fairness in AI", Jane Street Symposium (15 minutes)	2021
"Renyi-Differential Privacy", Autodesk UX Group (20 minutes)	2020

## **MERIT-BASED MENTORSHIPS / RESEARCH MENTORSHIPS (SELECTED)**

Mentee, Goldman Sachs Possibilities Mentorship, Noonan, H.	2024
Mentee, Black Scholars Doctoral Mentorship	2023
- Mentor: K. Clark, PhD.	
Mentee, Institute for African-American Mentoring in Computing Sciences (IAAMCS)	2023
- Mentor: J. Gilbert, PhD	
Mentee, LXAI Computer Vision (LXCV) at CVPR (Computer Vision) workshop	2023
- Mentor: F. N. Paravecino, PhD (Research collaborations)	
Mentee, Algorithmic Game Theory Workshop (AGT), Economics and Computation	2022
- (mentor: H. Zhang, PhD), paper dissection and Ask me Anything session	
Mentee, MD4SG Mentorship Program, with J. Finocchiaro, PhD (1 of 3)	2022-2023
Mentee, AiC Connectors Program with Facebook, with S. Lim, PhD	2022
Mentee, BlackComputeHer Fellowship, with Y. Rankin, PhD, A. Robinson, M.Ed	2022
Mentee, Microsoft's Tech Resilience (mentors: O. Kroshkina, M. Ward)	2022
Mentee, Google's CS Research Mentorship Program (CSRMP) with A. Lees, PhD	2021
Mentee, AiC Connectors Program with Facebook with O. Dalleleau, PhD	2021
Mentee, She256 Blockchain Group with P. Mishra, PhD	2021

## **MERIT-BASED MENTORSHIPS / RESEARCH MENTORSHIPS (SELECTED)**

Mentee, Women in Privacy and Security (WISP), D. Sharma, PhD	2021
Mentee, Algorithmic Game Theory (AGT), Economics and Computation Conference	2020
- Global Outreach Mentorship with S. Gupta, PhD (EC 2020)	
Mentee, Mentored by A. Ahmed, PhD,	2020-present
- ICFP 2020, ACM SIGPLAN-Mentorship, organized by T. Ringer	

## **CLASSES (TRANSFER CREDIT)**

University of Waterloo via Fields Academy, Algebraic Graph Theory and Quantum Computing (by Godsil C., PhD)	2024
- Quantum walks and Quantum homomorphisms, automorphisms and colouring	
- Also invited to and attended Godsil75	

## **CLASSES (AUDIT)**

Stanford / Fields Institute: Meanders and Meandric Systems (mini-course)	2024
- Random combinatorial structures and limits (Borga J.) relating to quantum gravity	
QIndia: Fundamentals of Quantum Operations	2023-2024
- Amplitude Amplification, Phase Estimation, HHL and Shor's Algorithm	
- Capstone project on Amplitude Estimation	
Zaiku Group, Software Verification Course (online)	2023
- Class focused on Quantum Formalism, functional programming and Software verification for Homotopic Minds (taught by B. Ahrens, PhD)	
Final project involved formalising a SAT solver using Lean 3	
Zaiku Group, Quantum Formalism	2023
- Mathematical Tools of Quantum Mechanics	
- Topics Included: Hilbert Spaces, Quantum Mechanics	
- Teachers: Ramirez E., PhD, Arnott M., PhD	
Preliminary Arizona Winter School, "Abelian Varieties over Finite Fields", by L. Dembele	2023
Preliminary Arizona Winter School, Model Theory and Applications, taught by R. Nagloo	2022-2023
QWorld QClass 551: Quantum Software Development with Classiq	2023
- Quantum Algorithm Research Project under mentorship of a Principal Investigator	
- Requires project written manuscript (1 out of 80 accepted from ~400 applicants)	
- Received Classiq Bootcamp certificate (10/13/23)	
QWorld QClass 23/24: Introductory and Intermediate Level Quantum Courses	2023
- Quantum Algorithms with Classiq, Quantum Key Distribution,	
- Introduction to Quantum Algorithms, Quantum Error Correction,	
- Quantum Annealing, Topological Quantum Computing, Quantum Games	
- Classiq Bootcamp (implementation of quantum challenges daily)	
- Included workshop on Training on PennyLane and QML by Xanadu (organized by QWorld, in conjunction with the University of Latvia)	
Stanford: EE 374 : Internet-Scale Consensus in the Blockchain Era (Spring)	2021
- Information Theory class focused on scalability and protocols in Blockchain	
- Taught by D. Tse, PhD through Stanford University	
- Audited class, scribed for Lecture 11, Spring 2021	

## CLASSES (AUDIT)

*Matroids & Polytopes, Theory of Algebraic Differential Equations, Elementary Number Theory, Fundamentals of Mathematics, Extremal Graph Theory, Model Theory and Applications*

- IBM Qiskit Global Summer School (Quantum Computation using Qiskit) 2020

## Book Clubs:

*Quantum Pseudorandomness (2024)\*, Reed-Muller (RM) Codes (2024)\*, Quantum Cryptography (2024)\*<sup>1</sup>, Quantum Computing (2022), Quantum Computing and Quantum Information (2022-2023: study group with Mathematicians, Physicists and Computer Scientists), HDX Expander Graphs (2022-2023)*

## HACKATHON (Quantum Computing)

2023-2024

- Project: "Quantum project using noisy intermediate-scale quantum (NISQ) Devices"
  - Project on homomorphic encryption for federated quantum models using Genomic DNA data (team of 3).
  - Used Qiskit, PennyLane, Flwr, Tenseal, implemented Differential Privacy And Homomorphic encryption to win First place (\$10,000 team award)

**Skills:** Python, LaTeX, SageMaths, Qiskit, Classiq, Haskell, Matlab, Jupyter, Pytorch, SQL, AWS, Azure, PySpark, Git, Lean (3; not 4...yet!), Z3, writing proofs.

**Quantum benchmarking tools:** Qualtran, Bench-Q, pyLiqtr, OpenFermion, PennyLane

## PRESS (SELECTED)

Blogpost for the Mathematical Association of America (MAA) Grad Student Blog (April) 2024  
Publication Featured in Montreal AI Ethics Institute (MAIEI) newsletter 2022  
Publication work Featured in BitMEX Research blog 2022  
Featured / interviewed in articles / media by Coursera, NASA-JPL, Google, Udacity, 2016-present  
The MacArthur Foundation, Venture Beat, The Data Standard, Corecursive Podcast, OpenMined, Career Girls, Dataiku, Scott Hanselman's Podcast, BlackComputeHer, NASA Tech Briefs (40th anniversary), Variety, ACM SPLASH 2022 PLMW Perspectives, the Los Angeles Times, Black Girls Code colouring book on Women Scientists, Women of Silicon Valley, CareerGirls, The Summer of Bitcoin experience (SBOE), Technovation, Rewriting the Code, Montreal AI Ethics Institute, QC-AI Meetup, etc.

## LEADERSHIP and SERVICE (SELECTED)

Co-Workshop Organizer, Tiny Papers Track at ICLR (Vienna, Austria) 2024  
Student Volunteer, IEEE International Conference on Quantum Computing 2023  
And Engineering (QCE)  
(Junior) Program Committee, Safe and Trustworthy AI (STAI) at the International 2023  
Conference on Logic Programming (ICLP)  
Co-Committee / Area Chair, Broadening Participation and Tiny Papers Workshop at 2023  
International Conference of Learning Representation (ICLR)  
Co-Committee, Broadening Participation and Co-Submitting Summer School at 2022  
International Conference of Learning Representation (ICLR)  
Program Committee, BlackAIR Programme 2021

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<sup>1</sup> Denotes Reading Clubs as a Visiting Scholar at Simons Institute for their Quantum, Fault Tolerant Computing workshop in Spring 2024.

## **LEADERSHIP and SERVICE (SELECTED)**

Virtual Co-Organizer, Women in Machine Learning, Black In AI at NeurIPS (NeurIPS)	2020
Virtual Volunteer Chair, Empirical Methods in Natural Language Processing (EMNLP)	2020
Virtual Student Volunteer, International Conference of Machine Learning (ICML)	2020
Virtual Student Volunteer, International Conference of Functional Programming (ICFP)	2020
Student Volunteer, Programming Languages and Design Conference (PLDI)	2018
Student Volunteer, International Conference of Functional Programming (ICFP)	2018
Invited Student Volunteer, SIGPLAN conference on Systems, Programming, Languages and Applications (SPLASH) (declined offer)	2018
Student Volunteer, Principles of Programming Languages (POPL)	2017

## **ACADEMIC ASSOCIATION FOR COMPUTING MACHINERY (ACM) MEMBERSHIPS**

<i>Student Member, International Association of Cryptologic Research (IACR)</i>	<i>2020-present</i>
<i>SIGecom Special Interest Group on Economics and Computation</i>	<i>2020-present</i>

## **NON-ACADEMIC MEMBERSHIP**

<i>Member, Quantum Resource Estimation Group</i>	<i>2023-present</i>
<i>Member, Isogeny Research Club</i>	<i>2023-present</i>
<i>Member, Women in Cryptography</i>	<i>2023-present</i>
<i>Student Member, IEEE Computer Society Technical Committee on Security and Privacy</i>	<i>2021-present</i>
<i>Member, Women in Number Theory</i>	<i>2018-present</i>
<i>Member, QVNTS (Quebec-Vermont Number Theory Seminar)</i>	<i>2021-present</i>
<i>Member, Women in Combinatorics</i>	<i>2021-present</i>
<i>Member, Association for Women in Mathematics</i>	<i>2021-present</i>
<i>Member, She256</i>	<i>2021-present</i>
<i>Member, Women in Security and Privacy (WISP)</i>	<i>2020-present</i>
<i>Member, IEEE Information Theory Society, Santa Clara Valley Chapter</i>	<i>2016-present</i>