

Krystal Maughan

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Research Interests: Supersingular Isogeny Cryptography, Trustworthy AI

University of Vermont, PhD candidate Supersingular Isogeny Cryptography, Trustworthy AI	2019-present
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Peer-Reviewed Workshop Publications:

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| ❖ "Attribute Differential Privacy" (Pre-print available upon request)
(Maughan, K. and Near, J.) | 2021 |
| ❖ "Towards a Measure of Individual Fairness for Deep Learning"
(Maughan, K. and Near, J.) - presented as poster for MD4SG 2020 | 2020 |
| ❖ "Towards Audibility for Fairness in Deep Learning"
(Ngong, I., Maughan, K. and Near, J.)- presented as poster for AFCI at NeurIPS | 2020 |
| ❖ "Archipelago Pensée" (Maughan, K.)
- presented artwork and writing as a poster: RAIS (Resistance AI) at NeurIPS | 2020 |

RESEARCH EXPERIENCE:

Research Assistant (Vermont)	2021-2024
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Supervisors: Joe Near, Christelle Vincent: Research on Isogeny Graph Cryptography, VDFs, Elliptic Curves

Research Assistant (Vermont)	2019-2021
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Supervisor: Joe Near: Research on Provable Fairness and Privacy

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

Microsoft, Applied Scientist PhD Intern, Summer 2021 (Redmond: remote)	2021
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COSinE Mgmt DI R&D, Azure E+P Enterprise and Security DI

Confidential Project: Wrote Research Proposal, created Prototype and presented results

Mentored by P. Angulo, PhD.

Microsoft Research, Independent Contractor, Summer 2021 (New York: remote)	2021
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Reinforcement Learning Open Source Fest participant (1 of 12)

Vowpalwabbit, Integrate Estimator library into Azure Machine Learning (AML)

Mentored by C. Tan and A. Taymanov

Research Intern, Autodesk Summer 2020 (Pier 9, San Francisco: remote)	2020
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Research Intern for Forge Team, Renyi-Differential Privacy project

Graduate Writing Consultant, Fall 2020 (Vermont)	2020-2021
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Writing Mentor and Consultant for graduate students

Technical Writing Consultant for fields as broad as Materials Science to History

Teacher's Assistant, Fall/Spring 2019-2020 (Vermont)	2019-2020
Compiler Construction with Haskell (taught by Joe Near)	2020
Advanced Web Design (taught by Bob Erickson)	
Programming with Matlab (taught by Radhakrishna Dasari)	2019
Data Privacy with Jupyter, Python (taught by Joe Near)	

INVITED RESEARCH POSTER PRESENTATIONS

- ❖ "Towards Auditability of Individual Fairness for Deep Learning" 2021
Nordic Probabilistic Artificial Intelligence School 2021 (Prob AI)
- ❖ "Towards a Measure of Individual Fairness for Deep Learning" (**first author**) 2021
Mediterranean Machine Learning Summer School (M2L) (Winter cohort)
- ❖ Poster Presentation, 4th **MD4SGD 2020** Annual Proceedings 2020
"Towards a Measure of Individual Fairness for Deep Learning" (**first author**)
- ❖ Poster Presentation, Carnegie Mellon's (CMU) **AI for Social Good Symposium** 2020
"Examining Implicit Bias in Police Data: Lessons Learned about Reproducibility And Transparency in AI"
- ❖ "Towards Auditability for Fairness in Deep Learning" 2020
(Ngong, I., **Maughan, K.** and Near, J.)- presented as poster for **AFCI at NeurIPS**
(Algorithmic Fairness through the lens of Causality and Interpretability)
- ❖ Poster Presentation for **RAIS at NeurIPS** 2020
(1st Resistance AI Workshop Proceedings,) "Archipelago Pensée" (**first author**)

RESEARCH AWARDS

- ❖ Outstanding Poster Award for Brilliant Idea Category, "Towards a Measure of Auditability in Fairness for Deep Learning", Mediterranean Machine Learning Summer School (2021)

OTHER PRESENTATIONS

- ❖ Brown University [SUMS](https://sums.brown.edu/), Maths and Illusion: exhibited a fractal-inspired pop-up book (2021)

INVITED RESEARCH TALKS

- ❖ "Towards Audit-ability in Individual Fairness for Deep Learning" ; 2021
Career Mentoring Workshop: Grad Cohort for Women (1 of 30)
- ❖ "Towards a Measure of Individual Fairness for Deep Learning" ; 2021
Jane Street PhD Symposium
- ❖ "Towards a Measure of Individual Fairness for Deep Learning" ; 2021
Amazon Science internal presentation (with advisor Dr. J. Near)
- ❖ "Creating an end to end participatory data survey pipeline with 2020
variable constraints" (Data Economies and Governance MD4SG working group)
- ❖ "Towards a Measure of Individual Fairness for Deep Learning" ; 2020
Short Presentation given for UVM/CS++ Research Day (20 min talk)
- ❖ "Personalized Robotic Control using MISL" 2019
for UVM/CS++ Research Day (20 min talk)

GRANT WRITING / PROPOSALS

- ❖ Microsoft Research, Reinforcement Learning Open Source Festival Proposal 2021
(Awarded \$10,000)

GRANT WRITING / PROPOSALS

- ❖ CDS&E Computational and Data-Enabled Science and Engineering Database Grant Proposal for SageMaths (as Key Personnel) (PI Ben Hutz, PhD) (not awarded) 2020
- ❖ Google Summer of Code, Proposal to Haskell.org (Awarded \$6,000) 2018
- ❖ Helium Grant, (for exploring questions on the edge of mainstream thinking) (Awarded \$1000) 2018

MERIT-BASED MENTORSHIPS / RESEARCH MENTORSHIPS

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
Mentee, Women in Privacy and Security (WISP), D. Sharma, PhD	2021
Mentee, Global Outreach Mentorship with S. Gupta, PhD (EC 2020)	2020
Mentee, LatinX in AI Research Workshop Mentorship with J. Barajas, PhD (ICML 2020)	2020
Mentee, Mentored by Amal Ahmed, PhD (ICFP 2020)	2020
Mentee, Lighthouse3 AI Ethics Mentoring Externship with F. McEvoy (1 of 20 chosen)	2020
Mentee, Code2040 Fellowship with Ben Waber, PhD	2020

ACADEMIC REVIEWER

Reviewer, Springer AI and Ethics Journal	2020 - present
Reviewer, BlackAIR Summer Research Grant Program	2021
Reviewer, ICLR Distributed and Private Machine Learning workshop	2021
Committee Reviewer, HCI Track, GHC (Grace Hopper Conference)	2021
Reviewer, PML4DC (Practical ML for Developing Countries) workshop, ICLR	2021
Reviewer, Tapia Conference (Panels and Workshops)	2021
Reviewer for AFCI workshop at NeurIPS (Fairness and Accountability)	2020, 2021
Reviewer for Black in AI at NeurIPS workshop	2020
Reviewer and Programme Committee Member, LXAI@ICML Workshop	2020
Committee Reviewer, HCI Track, GHC (Grace Hopper Conference)	2020
Chair Reviewer, PML4DC (Practical ML for Developing Countries) workshop, ICLR	2020
Reviewer, Tapia Conference (Panels and Workshops)	2020
Reviewer, Travel Grant Applications, Black in AI for AAAI	2020

ACADEMIC JOURNALS (AI/Machine Learning)

Board Member, AI and Ethics, Springer	2020
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RESEARCH PhD INVITATIONS

Participant, GREPSEC V :	2021
- (Graduate Students in Privacy and Security Early Career Workshop)	
Participant, Nordic Probabilistic Artificial Intelligence School 2021: ProbAI	2021
- 1 of 60 scholarship recipients (27%)	
Participant, Doctoral Consortium, ACM FAccT :	2021
(ACM Conference on Fairness, Accountability and Transparency)	

RESEARCH PhD INVITATIONS

Participant, CRAFT workshop at ACM FAccT	2021
<ul style="list-style-type: none">- Inspecting algorithms ins social media platforms- Rethinking Demographic Data Infrastructures for Algorithmic Fairness	
Participant, CHIMe CHI Mentoring Workshop Symposium	2021
Participant, Mediterranean Machine Learning Summer School (M2L) (Winter cohort)	2021
Participant, Isogeny-Based Cryptography Winter School	2021
Participant, Post-Quantum Networks Workshop	2021
Participant, PRIMA Summer School	2021
<ul style="list-style-type: none">- Rational curves and moduli spaces in arithmetic geometry	
Initiative for Cryptocurrencies and Contracts (IC3) Blockchain Bootcamp	2021
<ul style="list-style-type: none">- Worked on group project : Fairness consensus for Miner Extractable Value (MEVs)- Implemented Aequitas protocol from paper with authors for fairness simulation- One of top four winning teams chosen	
Participant, Scottish Programming Languages and Verification School	2021
Participant, Winter Institute in Computational Social Science (WICSS)	2021
Invited Participant, "Key themes for informing a Research Roadmap", The Alan Turing Institute:	2021
<ul style="list-style-type: none">- Invited Participant, "Threats and Opportunities for AI in Cybersecurity"- Invited Participant, "Society-centric approaches to AI challenges in- Invited Participant, "Environmental Enables for AI challenges in	2021 2021 2021
Participant, Self Organizing Conference on Machine Learning (SOCML)	2021
<ul style="list-style-type: none">- Machine Learning, and Privacy session, Moderated by U. Erlingsson- organized by I. Goodfellow (1 of 9 chosen)	2021
Simons Institute, Innovations in Theoretical Computer Science (ITCS)	2021
Simons Institute, Geometric Methods in Optimization and Sampling Bootcamp	2021

MERIT-BASED GRANTS / SCHOLARSHIPS

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
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
Participant, Algorithmic Game Theory Mentoring Workshop (AMW) (co-located with EC 2020)	2020
WiML ICML Travel Funding Grant (sponsor QuantumBlack)	2020
BRAID Funding to attend Grace Hopper Conference (courtesy of UVM)	2020
Udacity's Machine Learning Scholarship for Microsoft Azure	2020
NCWIT Change Leader Scholar	2019-2021
Code2040 2020 Fellow (1 of 80)	2019
NCAS Workshop participant (NASA Community College Aerospace Scholars)	2016
Who's Who/ Peggy Williams Memorial Scholarship/ Best BFA Award (Best of Major)	2008

OTHER GRANTS/ FELLOWSHIPS

<i>IEEE Symposium on Security and Privacy (student travel grant, complimentary ticket)</i>	2021
<i>4th Annual ZK-Proof Workshop (complimentary ticket)</i>	2021
<i>WISP Privacy+Security Conference</i>	2021
- <i>EU Data Law / De-Identification Workshop (Scholarship via WISP)</i>	
<i>ICERM (Brown University) Variable Precision in Mathematical & Scientific Thinking</i>	2020
<i>RWC2020 (Real World Crypto: registration, flight, lodging) Grant via IACR</i>	2020
<i>CRA-WP Grad Cohort for Women (covers registration: remote)</i>	2019, 2021
<i>CRA-WP Grad Cohort for Underrepresented Minorities (flight, registration, lodging)</i>	2019
<i>Neurips Conference Travel Grant (includes free registration)</i>	2019
<i>Sage-Days-104 : To work on SageMath Software: Arithmetic Dynamics</i>	2019
<i>Simons Institute (Berkeley) Error-Correcting Codes and High-Dimensional Expansion Boot Camp (attendee)</i>	2019
<i>ICERM (Brown University) Encrypted Search Workshop Grant (Lodging provided)</i>	2019
<i>Cornell Number Theory Conference Grant (Lodging provided)</i>	2019
<i>NASA L'Space NPWEE Concept Proposal writing programme participant</i>	2019
<i>NASA L'Space Proposal/Review Academy (patentable research proposal for funding)</i>	2019
<i>NASA L'Space Academy (virtual team & mentorship with NASA scientists Level 1)</i>	2019
<i>MSRI (Mathematical Sciences Research Institute) Grants to attend:</i>	
<i>Optimal Transport and applications to machine learning and statistics</i>	2020
<i>Connections for Women:</i>	2019
- <i>Derived Algebraic Geometry, Birational Geometry and Moduli Spaces workshop</i>	
- <i>Introductory Workshop: Derived Algebraic Geometry and Birational Geometry And Moduli Spaces</i>	
<i>Racket Summer School (National Science Foundation Grant)</i>	2018-2019
<i>PLMW (Programming Languages Mentorship Workshop)</i>	2018
<i>ICFP (International Conference Functional Programming)</i>	
<i>PLMW(Programming Languages Mentorship Workshop)</i>	2018
<i>PLDI (Programming Languages Design and Implementation)</i>	
<i>OPLSS (Oregon Programming Languages Summer School Grant) - declined offer</i>	2018

ACADEMIC SERVICE

<i>Co-chair, ICLR Diversity, Equity and Inclusion</i>	2022
<i>Privacy Enhancing Technologies Symposium, Student Co-Organizer</i>	2021
<i>Black in AI Logistics Co-Chair (NeurIPS)</i>	2020
<i>WiML Senior Program and Mentorship Co-Chair, WiML (NeurIPS)</i>	2020
<i>Committee Member, Zoom Infrastructure, EMNLP</i>	2020
<i>Session Facilitator, ICML 2020 for "Recommender System Research in Industry" (1 of 2)</i>	2020
<i>Volunteer ACL (Association of Computational Linguistics)</i>	2020
<i>Co-organizer, ACL (Association of Computational Linguistics) Black in AI Socials</i>	2020
<i>Volunteer, ICML 2020 (International Conference on Machine Learning)</i>	2020
<i>Volunteer, EC'20 (Economics and Computation)</i>	2020
<i>Volunteer, ICLR (International Conference on Learning Representations)</i>	2020
<i>Member, MD4SG (Mechanism Design for Social Good); Education working group</i>	2020
<i>Member, MD4SG Data and Governance working group</i>	2020
<i>Chair, AAAI Black in AI Annual Lunch</i>	2020

ACADEMIC SERVICE

Panelist, AAAI Try AI Workshop	2020
Invited Panelist, CRAFT workshop, FAT* conference (declined offer)	2020
Panelist, PhD recruiting event (included multiple schools, sponsored by CodePath)	2020
Student Volunteer, ICFP (International Conference Functional Programming)	2020
Student volunteer, ICFP (International Conference Functional Programming)	2018
Student volunteer, PLDI (Programming Languages Design and Implementation)	2018
Student volunteer, POPL (Principles of Programming Languages)	2018
Student volunteer, SPLASH	2018
(Systems, Programming, Languages, and Applications) (declined offer)	

INDUSTRY PhD INVITATIONS

Participant, JP Morgan, Advancing Black Pathways in AI & Quantitative Modeling Summit	2021
Participant, Facebook, Amplified: Above & Beyond Computer Science Program (PhDs)	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)	2021
Participant, JP Morgan, Advancing Black Pathways in Data Science	2021
Participant, TwoSigma Mock Interview Day for Early Career Women in STEM	2021
Participant, Adobe, "The Future of Creativity" (Virtual)	2020
Participant, Microsoft Research, Frontiers in Machine Learning (Redmond, remote)	2020
Participant, Discover Bloomberg: Women in Engineering event (New York, remote)	2020
Participant, Twitter PhD ML Flock Event (New York, Boston office)	2019

RELEVANT WORK EXPERIENCE

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 (remote)	2018
Mozilla: Increasing Rust's Reach Developer (remote)	2018

NON-ACADEMIC SERVICE

Invited Finalist Judge, Technovation, AI for Good	2021
Participant, Git Contributors Inclusion Summit	2020
Reviewer, Code2040 Application Essays	2020
Reviewer, OpenMined Differential Privacy articles	2020
Judge, DataKind, Data.org, Inclusive Growth and Recovery Challenge	2020
Google Developer Student Club Lead (for University of Vermont)	2019
Reviewer, Travel Grant Applications, Clojure Conj (2 rounds)	2017

PRESS

Featured in the "Black Girls CODE the Future" Coloring Book	2021
NCWIT, chosen (1 of 2) to Congratulate Dr. Gladys West for Pioneer Award (virtual)	2021
MacArthur Foundation profile on Black in AI organization's Impact	2021
VentureBeat "AI needs systemic solutions to systemic bias, injustice and inequality"	2020
Featured by Women of Silicon Valley, June Edition, 16 "Caribbean Techies"	2020
Featured by Women of Silicon Valley, May Edition	2020

INDUSTRY TALKS

Interviewed for CareerGirls.org Boston (videographed at MIT)	2019
Student Presenter for Microsoft Research's Reinforcement Learning Open Source Fest	2021
Invited Panelist, Springer AI and Ethics Board for The Algol Conference	2021
Invited Panelist, Technovation AI Prize	2021
Featured by Coursera (Learner Story)	2017
Speaker, EGG on Air Conference (human-centred AI)	2020
Speaker, EGG at Morgan State (talk on Human-centred AI and research)	2020
Presenter, VentureBeat's Transform 2020 Wrap-up for panel on Ethics and AI	2020
Moderator, VentureBeat's Transform 2020 panel on Ethics and AI	2020
Interviewed for Podcast, The Data Standard	2020
Interviewed for OpenMined course (Privacy-Preserving Machine Learning and Fairness)	2020
Interviewed for YouTube Series, Tech Girl Thursdays	2020
Interviewed for Podcast, Women of Silicon Valley	2020
Invited Panelist, Career Girls AI Virtual Camp	2020-2021
Invited Speaker, Autodesk Design (Boston Office) on Differential Privacy	2020
Interviewed for Podcast on Black in AI (1 of 2 persons), iPhone Life Interview	2020
Invited Speaker, Sister to Sister International, Inc (STSI) on AI, Privacy, Ethics	2020
Invited Panelist, Morehouse@Momentum Coding School, "The Data Don't Lie"	2020
Invited Guest, Corecursive Podcast (Technical Podcast)	2020
Featured Session Clip, End of Year Corecursive Podcast (Technical Podcast)	2020
Women in Data Science talk "Why conferences matter" (40 min NeurIPS inspired talk)	2020
"Magic Gnomes: A GHC Compiler talk (5-minute talk at Github for Sentry's Show & Tell)	2019
"Denotational Semantics" (2 minute Lightning Talk for Meetup group)	2018
"Recap of Google I/O 2018" (20 minute presentation at Google Developer Group LA)	2018

OTHER (NON-INDUSTRY) TALKS

"Isogeny Graph Cryptography", School for Poetic Computation, Re-learning to love Maths	2021
"Isogeny Graph Cryptography", School for Poetic Computation, "Learning to Love Maths"	2021
Invited Panelist, Peer-connected Undergraduate Research Exploration in Computer and Information Science and Engineering (PRECISE)	2021
University of Vermont, CIS196, Privacy Law Research Talk	2021
BlackAIR Research Grant speaker	2021
MIT Hacking Racism in Healthcare Challenge (keynote speaker)	2020
PLAID Lab speaker, "What Scientists can learn from Artists"	2020
PLAID Lab Speaker, "Information Theory: from Spacecraft to Blockchain"	2021
CS Crew Project talk : contributing to Maths software (CodeWorld, SageMaths)	2019
CS Crew GSoC talk (40-minute talk about Google Summer of Code and Internships)	2019
University of Vermont, CS293 Technical Interviewing Workshop Talk	2019

CLASSES (PhD)

Doctoral Research with advisors Joe Near and Christelle Vincent	2021-present
Abstract Algebra: Focusing on Fields, taught by Christelle Vincent (Spring)	2022
Elementary Number Theory, taught by Christelle Vincent (Spring)	2022
Abstract Algebra I taught by Puck Rombach (Commutative Group theory) (Fall)	2021
Abstract Algebra III taught by Christelle Vincent : Prep for Maths Quals (Fall)	2021

CLASSES (PhD)

<i>(Post-quantum) Mathematical Cryptography, taught by Christelle Vincent (Spring)</i>	2021
<i>Privacy, Law and Policy, taught by Ryan Kriger (Spring)</i>	2021
<i>Secure Distributed Computation; taught by Joe Near using Python (Fall)</i>	2020
<i>Machine Learning; taught by Safwan Wshah using Python (Spring)</i>	2020
<i>Doctoral Research with advisors Joe Near and David Darais (Spring, Fall)</i>	2019-2020
<i>Data Privacy; taught by Joe Near using Python (Fall)</i>	2019
<i>Software Verification; taught by David Darais using Agda (Fall)</i>	2019
<i>Computer Human Interaction; taught by Josh Bongard (Fall)</i>	2019

CLASSES (AUDIT)

<i>Stanford EE 374 : Internet-Scale Consensus in the Blockchain Era</i>	2021
- Taught by Dr. David Tse through Stanford University	
- Audited class, scribed for Lecture 11, Spring 2021	

CLASSES (RELATED)

<i>Rewriting the Code (RTC) Blockchain Basics + Developer Workshop</i>	2021
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WORKSHOPS (RELATED)

<i>R Orange County Book Club (8 weeks Open Statistics)</i>	2021
- Presented review of chapter 4 and exercises for chapter 7	
<i>R Orange County Book Club (6 weeks Mastering Spark with R)</i>	2021
- Presented Chapters 10 and 11 (Distributed R, Extensions in Spark using R)	
<i>R Orange County Book Club (6 weeks Text Mining with R)</i>	
- Presented Chapter 7 (Twitter data Case Study in Text Mining with R)	
- Presented R code exercises relevant to assigned chapters	
<i>R Orange County Workshops</i>	2021
- Modeling Normally Distributed Data with Repeated Measures (February)	
- Transforming Data into Dashboards with Tableau (March)	
- R Virtual Science Hackathon (April) (project-based)	
<i>R Nimble virtual short course (C. Paciorek)</i>	2021
- Basic concepts on converting BUGS and JAGS models	
- MCMC sampling, model components for Bayesian non-parametric distribution	
<i>University of Vanderbilt Regression Modeling Strategies Short Course</i>	2021
- Four day course on regression modeling and causal models	
- Linear models, logistic and ordinal regression (F. Harrell, Jr., PhD, D. Levy, PhD)	

HACKATHONS

<i>R Data Hackathon 2021, <u>First Place</u>, "Cast and Gender Roles in Movie Data"</i>	2021
- Our group won First place at the R Data Hackathon 2021 for Best Visualization	
<i>Initiative for Cryptocurrencies and Contracts (IC3) Blockchain Bootcamp</i>	2021
- Worked on group project : Fairness consensus for Miner Extractable Value (MEVs)	
- Implemented Aequitas protocol from paper with authors for fairness simulation	
- One of top four winning teams chosen	

Skills: Python, R, Haskell, Matlab, Sage, (learning Rust), LaTeX, Jupyter, SQL, AWS, PySpark, Sparklyr, Tensorflow, Git

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>2020-2021</i>

NON-ACADEMIC MEMBERSHIP

<i>Community Board, Black In AI</i>	<i>2020-present</i>
<i>Member, Women in Number Theory</i>	<i>2018-present</i>
<i>Member, She256</i>	<i>2021-present</i>
<i>Member, Women in Security and Privacy (WISP)</i>	<i>2020-present</i>