

Krystal Maughan

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Research Interests: Applied Cryptography, Differential Privacy, Provable Fairness, Machine Learning

University of Vermont, PhD candidate

2019-present

Differential Privacy, Provable Fairness, Machine Learning

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

Research Assistant, PLAID Lab (Vermont)

2019-present

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

Azure E+P Enterprise and Security DI

Microsoft Research, Independent Contractor, Summer 2021 (New York: remote)

2021

Reinforcement Learning Open Source Fest participant

Vowpalwabbit's Contextual Bandits Estimators in Python

Research Intern, Autodesk Summer 2020 (Pier 9, San Francisco: remote)

2020

Research Intern for Forge Team, Differential Privacy project

Graduate Writing Consultant, Fall 2020 (Vermont)

2020-2021

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)

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

Peer-Reviewed Workshop Publications:

- ❖ “Towards a Measure of Individual Fairness for Deep Learning” 2020
(**Maughan, K.** and Near, J.) - presented as poster for **MD4SG 2020**
- ❖ “Towards Audibility for Fairness in Deep Learning” 2020
(Ngong, I., **Maughan, K.** and Near, J.)- presented as poster for **AFCI at NeurIPS**
- ❖ “Archipelago Penseé” (**Maughan, K.**) 2020
- presented as a poster: **RAIS at NeurIPS**

INVITED RESEARCH POSTER PRESENTATIONS

- ❖ “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 Audibility 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 Penseé” (**first author**)

INVITED RESEARCH TALKS

- ❖ “Towards Audit-ability in Individual Fairness for Deep Learning” ; 2021
Career Mentoring Workshop: Grad Cohort for Women
- ❖ “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)

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](#), Maths and Illusion: exhibited a fractal-inspired pop-up book (2021)

MERIT-BASED MENTORSHIPS / RESEARCH MENTORSHIPS

- Mentee, Google’s CS Research Mentorship Program (CSRMP) with Dr. A. Lees 2021
- Mentee, Global Outreach Mentorship with Dr. S. Gupta (EC 2020) 2020
- Mentee, LatinX in AI Research Workshop Mentorship with Dr. J. Barajas (ICML 2020) 2020

MERIT-BASED MENTORSHIPS / RESEARCH MENTORSHIPS

Mentee, Mentored by Dr. Amal Ahmed, (ICFP 2020)	2020
Mentee, Lighthouse3 AI Ethics Mentoring Externship with F. McEvoy (1 of 20 chosen)	2020
Mentee, Code2040 Fellowship with Dr. Ben Waber	2020

MERIT-BASED GRANTS / SCHOLARSHIPS

Kernel Fellowship via Gitcoin (Security and Grassroots Economics Daos)	2021
TechX Social Impact / Harvard Franklin Fellowship (1 of 12)	2020
USENIX Enigma Grant	2021
Nominee, Microsoft Ada Lovelace Fellowship (1 of 2)	2020
Participant, Algorithmic Game Theory Mentoring Workshop (AMW) (co-located with EC 2020)	2020
WiML ICML Travel Funding Grant (sponsor QuantumBlack)	2020
ALife Student Scholarship Recipient (to attend ALife Conference)	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 (1 of 30)	2020
NCWIT Collegiate Award Finalist (1 of 85)	2019
Code2040 2020 Fellow (1 of 80)	2019
WiCyS Student Scholarship (Women in Cybersecurity)	2019
Udacity Technology Scholarship (AI track): Intro to Deep Learning with Pytorch	2019
Helium Grant (chosen as 1 of 11 out of 700)	2018
EaRI Career Scholarship, (R Data Science Scholarship) - declined offer	2018
Udacity Bertelsmann Data Science Scholarship - declined offer	2017
AT and T Aspire to Tech grant Winner	2017
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

4th Annual ZK-Proof Workshop	2021
Grace Hopper Conference	2020
NCWIT/Bloomberg GHC Conference Grant	2020
Women of Color in Technology Complimentary Registration	
Financial Aid Grant, SciPy (Scientific Computing with Python)	2020
MSRI SACNAS Grant	2020
LXAI+BAI@GTC Nvidia Digital DLI Workshop Scholarship Award for DLI workshop	2020
"Applications of AI for Anomaly Detection [LDLIW2249] (Deep Learning Institute at GTC)	
ICERM (Brown University) Variable Precision in Mathematical & Scientific Thinking	2020
RWC2020 (Real World Crypto: registration, flight, lodging) Grant via IACR	2020
CRA-WP Grad Cohort for Women (covers registration: remote)	2021
CRA-WP Grad Cohort for Women (covers flight, registration, lodging)	2019
CRA-WP Grad Cohort for Underrepresented Minorities (flight, registration, lodging)	2019
Neurips Conference Travel Grant (includes free registration)	2019
Sage-Days-104 : To work on SageMath Software: Arithmetic Dynamics	2019
Simons Institute (Berkeley) Error-Correcting Codes and High-Dimensional Expansion Boot Camp (attendee)	2019

OTHER GRANTS/ FELLOWSHIPS

<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 REVIEWER

<i>Reviewer, Springer AI and Ethics Journal</i>	2020 - present
<i>Reviewer, ICLR Distributed and Private Machine Learning workshop</i>	2021
<i>Reviewer, PML4DC (Practical ML for Developing Countries) workshop, ICLR</i>	2021
<i>Reviewer, Tapia Conference (Panels and Workshops)</i>	2021
<i>Reviewer for AFCI workshop at NeurIPS (Fairness and Accountability)</i>	2020
<i>Reviewer for Black in AI at NeurIPS workshop</i>	2020
<i>Reviewer and Programme Committee Member, LXAI@ICML Workshop</i>	2020
<i>Committee Reviewer, HCI Track, GHC (Grace Hopper Conference)</i>	2020
<i>Chair Reviewer, PML4DC (Practical ML for Developing Countries) workshop, ICLR</i>	2020
<i>Reviewer, Tapia Conference (Panels and Workshops)</i>	2020
<i>Reviewer, Travel Grant Applications, Black in AI for AAAI</i>	2020
<i>Reviewer, Travel Grant Applications, Clojure Conj (2 rounds)</i>	2017

ACADEMIC SERVICE (AI/Machine Learning)

<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

ACADEMIC SERVICE (AI/Machine Learning)

Chair, AAAI Black in AI Annual Lunch	2020
Panelist, AAAI Try AI Workshop	2020
Invited Panelist, CRAFT workshop, FAT* conference (declined offer)	2020

ACADEMIC JOURNALS (AI/Machine Learning)

Board Member, AI and Ethics, Springer	2020
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ACADEMIC SERVICE (Other)

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)	

ACADEMIC ASSOCIATION FOR COMPUTING MACHINERY (ACM) MEMBERSHIPS

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

NON-ACADEMIC SERVICE

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

GRANT WRITING / PROPOSALS

CDS&E Computational and Data-Enabled Science and Engineering	2020
Database Grant Proposal for SageMaths (as Key Personnel) (PI Ben Hutz)	

WRITING / PUBLICATIONS / POSTS

Contributor, Wikipedia: WikiProject Women in Red/AI Ethics	2020
Tech X Social Impact “ Impossible Markets and Big Dreams : My interaction with the COO of Impossible Foods”	2020
Tech X Social Impact “ Ready! Start: Exploring the Virtual Healthcare Multiverse ”	2020
Google Summer of Code “ Breaking the Time-Space Barrier with Haskell ”	2018

RESEARCH PhD INVITATIONS

Participant, Doctoral Consortium, ACM FAccT : (ACM Conference on Fairness, Accountability and Transparency)	2021
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, Mediterranean Machine Learning Summer School (M2L) (Winter cohort)	2021

RESEARCH PhD INVITATIONS

Participant, Isogeny-Based Cryptography Winter School	2021
Participant, Winter Institute in Computational Social Science (WICSS)	2021
Invited Participant, "Society-centric approaches to AI challenges in Cybersecurity", The Alan Turing Institute	2021
Invited Participant, "Environmental Enablers for AI challenges in Cybersecurity", The Alan Turing Institute	2021
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)	
Simons Institute, Innovations in Theoretical Computer Science (ITCS)	2021

INDUSTRY PhD INVITATIONS

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

PRESS

Featured in the "Black Girls CODE the Future" Coloring Book	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
Interviewed for CareerGirls.org Boston (videographed at MIT)	2019

INDUSTRY TALKS

Invited Panelist, Springer AI and Ethics Board for The Algol Conference	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
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

INDUSTRY TALKS

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
Wendy’s Subway, Invited Guest, Audiobook, “Turn Illness into a Weapon”	2021

OTHER (NON-INDUSTRY) TALKS

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
CS293 Technical Interviewing Workshop Talk	2019

D&I (Diversity and Inclusion) Invitations (Academic Conferences):

KDD 2020 D&I Grant (free registration)	2020
ECCV 2020 (free registration courtesy Google Research)	2020

Developer Conference Grant/ Scholarship Invitations (Non-Academic Conferences):

AppSec (LA) 2019, TechTogetherBoston 2020, Twilio’s Signal Conf 2019, Curry On! 2019, RustConf 2018, LambdaConf 2017/2018, Strange Loop 2017, Software Craftsmanship North America (SCNA), Clojure Conj 2016/2017, Clojure West 2017, Chrome Dev Summit 16-18, Google IO 2016-2019

CLASSES (PhD)

Doctoral Research with advisor Joe Near	2021-present
Information Theory, taught by Jeff Frolik (Fall)	2021
Abstract Algebra I taught by Puck Rombach (Fall)	2021
Privacy, Law and Policy, taught by Ryan Kriger (Spring)	2021
(Post-quantum) Cryptography, taught by Christelle Vincent (Spring)	2021
Secure Distributed Computation; taught by Joe Near using Python (Fall)	2020
Machine Learning; taught by Safwan Wshah using Python (Spring)	2020
Doctoral Research with advisors Joe Near and David Darais (Spring, Fall)	2019-2020
Software Verification; taught by David Darais using Agda (Fall)	2019
Data Privacy; taught by Joe Near using Python (Fall)	2019
Computer Human Interaction; taught by Josh Bongard (Fall)	2019

CLASSES (AUDIT)

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

CLASSES (RELATED)

Participant (1 of 18), "Dark Matters", School for Poetic Computation 2020
(taught by American Artist : workshop on Surveillance, data, ethics, history of Silicon Valley; guests included Dr. Simone Browne, Stephanie Dinkins and Rashida Richardson)

ONLINE LEARNING (SELECTED)

Stanford ICME Summer NLP in Deep Learning Workshop 2020

Participant, IBM Qiskit Global Quantum Computing Summer School 2020

Participant, PL+HCI Swimmer Summer School 2020

(Programming Languages + Human Computer Interaction)

Participant, MSRI, Decidability, Definability and Computability in Number Theory 2020

DeepLearning.ai 2020-2021

- Neural Networks and Deep Learning
- Improving Deep Neural Networks: Hyperparameter Regularization and Optimization
- Structuring Machine Learning Projects
- Natural Language Processing Specialization
- Cryptography I
- Cryptography : Boolean Functions, S-boxes and Related Problems

Hyperlink Academy 2020-2021

- Design Neighborhood Scale Software (Ostromian economics and computing)
- Digital Alchemy (digital file formats, data manipulation)
- Artificial World Building (genetic algorithms, reinforcement learning, cellular automata)
- Esoteric Programming Language Theory (Graphical to Impossible programming languages)
- Language Construction Workshop (Conlang: Linguistics / made a language) (C. Gorrie)
- The Book is a Program 0 (Publishing a book in Racket) (J. Dueck)
- GUIs through Art History 0 (Recreating Periods of Art in History using GUIs) (E. Lin)

InterAccess

- Parametric Thinking with Images (Grasshopper3D) 2020
- Generating Images with Shaders (GLSL)

R Orange County Book Club (6 weeks Mastering Spark with R) 2021

R Orange County Book Club (6 weeks Text Mining with R)

- Presented Chapters 10 and 11 (Distributed R, Extensions in Spark using R)
- Presented Chapter 7 (Twitter data Case Study in Text Mining with R)
- Presented R code exercises relevant to assigned chapters

R Data Hackathon 2021, First Place, "Cast and Gender Roles in Movie Data" 2021

- Our group won First place at the R Data Hackathon 2021 for Best Visualization

ONLINE LEARNING (SELECTED)

<i>R Orange County Workshops</i>	2021
<ul style="list-style-type: none">- <i>Modeling Normally Distributed Data with Repeated Measures (February)</i>- <i>Transforming Data into Dashboards with Tableau (March)</i>- <i>R Virtual Science Hackathon (April) (project-based)</i>	
<i>R Nimble virtual short course (C. Paciorek)</i>	2021
<ul style="list-style-type: none">- <i>Basic concepts on converting BUGS and JAGS models</i>- <i>MCMC sampling, model components for Bayesian non-parametric distributions</i>	
<i>University of Vanderbilt Regression Modeling Strategies Short Course</i>	2021
<ul style="list-style-type: none">- <i>Four day course on regression modeling and causal models</i>- <i>Linear models, logistic and ordinal regression (F. Harrell, Jr., PhD, D. Levy, PhD)</i>	
<i>Brown University Applied Mathematics</i>	2021
<ul style="list-style-type: none">- <i>Contributed Artwork to SUMS on Mathematics and Illusion</i>- <i>(SUMS: Symposium for Undergraduates in Mathematical Sciences)</i>	
<i>Gray Area Festival Workshops</i>	2020
<ul style="list-style-type: none">- <i>Conceptual Cartography with Mapbox</i>- <i>Data Visualization: Theory to Practice</i>	
<i>Pioneer Works</i>	2020
<ul style="list-style-type: none">- <i>Data Visualization as Activism (S. Lavigne)</i>- <i>Feminist Data Set (with C. Sindors)</i>- <i>AI + Creativity (A. Miller, D. Geers and A. Dorsen)</i>	
<i>FutureLearn</i>	
<ul style="list-style-type: none">- <i>"Empire: The Controversies of British Imperialism"</i>	2020
<ul style="list-style-type: none">- <i>The Laws of Digital Data, Content and Artificial Intelligence</i>	2020
<ul style="list-style-type: none">- <i>"Functional Programming in Haskell"</i>	2017
<i>Wendy's Subway</i>	
<ul style="list-style-type: none">- <i>Reading workshop with Che Gossett on Abolitionist Insurgencies (led by C. Gossett, with lecture guest F. Moten)</i>- <i>Unsettling Historical Common Sense</i>	2020
<i>The Improv Group</i>	2020
<ul style="list-style-type: none">- <i>Storytelling for Technologists</i>	