Krystal Maughan

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Research Interests: Differential Privacy, Provable Fairness, Machine Learning

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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

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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**

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**	

Peer-Reviewed Workshop Publications:

- ❖ *"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*

Mentee, Mentored by Dr. Amal Ahmed, (ICFP 2020)   *2020*

Mentee, Lighthouse3 AI Ethics Mentoring Externship with F. McEvoy (1 of 20 chosen)   *2020*

MERIT-BASED MENTORSHIPS / RESEARCH MENTORSHIPS

Mentee, Code2040 Fellowship with Dr. Ben Waber	*2020*

MERIT-BASED GRANTS / SCHOLARSHIPS

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*
EaRl 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

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 "Applications of AI for Anomaly Detection [LDLIW2249] (Deep Learning Institute at GTC)	*2020*
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*
ICERM (Brown University) Encrypted Search Workshop Grant (Lodging provided)	*2019*
Cornell Number Theory Conference Grant (Lodging provided)	*2019*
NASA L'Space NPWEE Concept Proposal writing programme participant	*2019*
NASA L'Space Proposal/Review Academy (patentable research proposal for funding)	*2019*

OTHER GRANTS/ FELLOWSHIPS

NASA L'Space Academy (virtual team & mentorship with NASA scientists Level 1)	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
PLDI (Programming Languages Design and Implementation)	
OPLSS (Oregon Programming Languages Summer School Grant) - declined offer	2018

ACADEMIC REVIEWER

Reviewer, Springer AI and Ethics Journal	2020 - present
Reviewer, ICLR Distributed and Private Machine Learning workshop	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
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
Reviewer, Travel Grant Applications, Clojure Conj (2 rounds)	2017

ACADEMIC SERVICE (AI/Machine Learning)

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

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   *2020*
COO of Impossible Foods"
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]():   *2021*
(ACM Conference on Fairness, Accountability and Transparency)
Participant, CRAFT workshop at ACM FAccT   *2021*
  - Inspecting algorithms ins social media platforms
  - Rethinking Demographic Data Infrastructures for Algorithmic Fairness
Participant, Mediterranean Machine Learning Summer School ([M2L]()) (Winter cohort)   *2021*
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   *2021*
Cybersecurity", The Alan Turing Institute

RESEARCH PhD INVITATIONS

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, 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*
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)

ONLINE LEARNING (SELECTED)

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 Orange County Workshops *2021*
- *Modeling Normally Distributed Data with Repeated Measures (February)*
- *Transforming Data into Dashboards with Tableau (March)*
- *R Virtual Science Hackathon (April) (project-based)*

R Nimble virtual short course (C. Paciorek) *2021*
- *Basic concepts on converting BUGS and JAGS models*
- *MCMC sampling, model components for Bayesian non-parametric distributions*

University of Vanderbilt Regression Modeling Strategies Short Course *2021*
- *Four day course on regression modeling and causal models*
- *Linear models, logistic and ordinal regression (F. Harrell, Jr., PhD, D. Levy, PhD)*

Brown University Applied Mathematics *2021*
- *Contributed Artwork to SUMS on Mathematics and Illusion*
- *(SUMS: Symposium for Undergraduates in Mathematical Sciences)*

ONLINE LEARNING (SELECTED)

Gray Area Festival Workshops   *2020*
- *Conceptual Cartography with Mapbox*
- *Data Visualization: Theory to Practice*

Pioneer Works   *2020*
- *Data Visualization as Activism (S. Lavigne)*
- *Feminist Data Set (with C. Sinders)*
- *AI + Creativity (A. Miller, D. Geers and A. Dorsen)*

FutureLearn
- *"Empire: The Controversies of British Imperialism"*   *2020*
- *The Laws of Digital Data, Content and Artificial Intelligence*   *2020*
- *"Functional Programming in Haskell"*   *2017*

Wendy's Subway
- *Reading workshop with Che Gossett on Abolitionist Insurgencies*   *2020*
  (led by C. Gossett, with lecture guest F. Moten)
- *Unsettling Historical Common Sense*

The Improv Group   *2020*
- *Storytelling for Technologists*