

# Krystal Maughan

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Research Interests: *Differential Privacy, Provable Fairness, Machine Learning*

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<b>University of Vermont, PhD candidate</b> <i>Differential Privacy, Provable Fairness, Machine Learning</i>	<b>2019-present</b>
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**Skills:** Python, R, Haskell, Matlab, Sage, LaTeX, Jupyter, SQL, AWS, PySpark, Sparklyr, Tensorflow, Git

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<b>Research Assistant, PLAID Lab (Vermont)</b> Supervisor: Joe Near: Research on Provable Fairness and Privacy Using Machine Learning. Funded via Amazon Research Award (2020-2022 PI: J. Near, D. Darais)	<b>2019-present</b>
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<b>Microsoft, Applied Scientist PhD Intern, Summer 2021 (Redmond: remote)</b>	<b>2021</b>
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<b>Research Intern, Autodesk Summer 2020 (Pier 9, San Francisco: remote)</b> Research Intern for Forge Team, Differential Privacy project	<b>2020</b>
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<b>Graduate Writing Consultant, Fall 2020 (Vermont)</b> Writing Mentor and Consultant for graduate students Technical Writing Consultant for fields as broad as Materials Science to History	<b>2020-2021</b>
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<b>Teacher's Assistant, Fall/Spring 2019-2020 (Vermont)</b> Compiler Construction with Haskell (taught by Joe Near) Advanced Web Design (taught by Bob Erickson) Programming with Matlab (taught by Radhakrishna Dasari) Data Privacy with Jupyter, Python (taught by Joe Near)	<b>2019-2020</b> 2020 2019
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## RELEVANT WORK EXPERIENCE

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

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## Peer-Reviewed Workshop Publications:

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| ❖ "Towards a Measure of Individual Fairness for Deep Learning"<br>(Maughan, K. and Near, J.) - presented as poster for <b>MD4SG 2020</b>      | 2020 |
| ❖ "Towards Audibility for Fairness in Deep Learning"<br>(Ngong, I., Maughan, K. and Near, J.)- presented as poster for <b>AFCI at NeurIPS</b> | 2020 |
| ❖ "Archipelago Pensée" (Maughan, K.)<br>- presented as a poster: <b>RAIS at NeurIPS</b>   | 2020 |

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## 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)

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## 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
- 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

**MERIT-BASED GRANTS / SCHOLARSHIPS**

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**

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
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

## **OTHER GRANTS/ FELLOWSHIPS**

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

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## **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

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## **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

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## **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

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

## **RESEARCH PhD INVITATIONS**

Participant, Doctoral Consortium, <a href="#">ACM FAccT</a> : (ACM Conference on Fairness, Accountability and Transparency)	2021
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 ( <a href="#">M2L</a> ) (Winter cohort)	2021
Participant, Isogeny-Based Cryptography Winter School	2021
Participant, Winter Institute in Computational Social Science ( <a href="#">WICSS</a> )	2021
Invited Participant, "Society-centric approaches to AI challenges in Cybersecurity", The Alan Turing Institute	2021
Participant, Self Organizing Conference on Machine Learning ( <a href="#">SOCML</a> )	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 ( <a href="#">ITCS</a> )	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**

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

## **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
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 (taught by American Artist : workshop on Surveillance, data, ethics, history of Silicon Valley; guests included Dr. Simone Browne, Stephanie Dinkins and Rashida Richardson)	2020
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**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 (Programming Languages + Human Computer Interaction)	2020
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	



## ONLINE LEARNING (SELECTED)

Hyperlink Academy	2020-2021
<ul style="list-style-type: none"><li>- <i>Design Neighborhood Scale Software</i> (Ostromian economics and computing)</li><li>- <i>Artificial World Building</i> (genetic algorithms, reinforcement learning, cellular automata)</li><li>- <i>Esoteric Programming Language Theory</i> (Graphical to Impossible programming languages)</li><li>- <i>Language Construction Workshop</i> (Conlang: Linguistics / made a language) (C. Gorrie)</li><li>- <i>The Book is a Program 0</i> (Publishing a book in Racket) (J. Dueck)</li><li>- <i>GUIs through Art History 0</i> (Recreating Periods of Art in History using GUIs) (E. Lin)</li></ul>	
InterAccess	
<ul style="list-style-type: none"><li>- <i>Parametric Thinking with Images</i> (Grasshopper3D) 2020</li><li>- <i>Generating Images with Shaders</i> (GLSL)</li></ul>	
R Orange County Book Club (6 weeks Mastering Spark with R)	2021
R Orange County Book Club (6 weeks Text Mining with R)	
<ul style="list-style-type: none"><li>- <i>Presented Chapters 10 and 11</i> (Distributed R, Extensions in Spark using R)</li><li>- <i>Presented Chapter 7</i> (Twitter data Case Study in Text Mining with R)</li><li>- <i>Presented R code exercises relevant to assigned chapters</i></li></ul>	
R Orange County Workshops	2021
<ul style="list-style-type: none"><li>- <i>Modeling Normally Distributed Data with Repeated Measures</i> (February)</li><li>- <i>Transforming Data into Dashboards with Tableau</i> (March)</li><li>- <i>R Virtual Science Hackathon</i> (April) (project-based)</li></ul>	
R Nimble virtual short course (C. Paciorek)	2021
<ul style="list-style-type: none"><li>- <i>Basic concepts on converting BUGS and JAGS models</i></li><li>- <i>MCMC sampling, model components for Bayesian non-parametric distributions</i></li></ul>	
University of Vanderbilt Regression Modeling Strategies Short Course	2021
<ul style="list-style-type: none"><li>- <i>Four day course on regression modeling and causal models</i></li><li>- <i>Linear models, logistic and ordinal regression</i> (F. Harrell, Jr., PhD, D. Levy, PhD)</li></ul>	
Brown University Applied Mathematics	2021
<ul style="list-style-type: none"><li>- <i>Contributed Artwork to SUMS on Mathematics and Illusion</i></li><li>- <i>(SUMS: Symposium for Undergraduates in Mathematical Sciences)</i></li></ul>	
Gray Area Festival Workshops	2020
<ul style="list-style-type: none"><li>- <i>Conceptual Cartography with Mapbox</i></li><li>- <i>Data Visualization: Theory to Practice</i></li></ul>	
Pioneer Works	2020
<ul style="list-style-type: none"><li>- <i>Data Visualization as Activism</i> (S. Lavigne)</li><li>- <i>Feminist Data Set</i> (with C. Sinderson)</li><li>- <i>AI + Creativity</i> (A. Miller, D. Geers and A. Dorsen)</li></ul>	



## **ONLINE LEARNING (SELECTED)**

### *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*

- *Storytelling for Technologists* 2020