# **Krystal Maughan**

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Github: https://github.com/kammitama5

Tel: 607.342. 6970

Blog: https://kammitama5.github.io/

Research Interests: Applied Cryptography, Privacy, Provable Fairness, Machin	ne Learning
University of Vermont, PhD candidate	2019-presen
Applied Cryptography, Fully-Homomorphic Encryption, Differential Privacy, Provable Fa Learning	airness, Machine
Skills: Python, R, Haskell, Matlab, Sage, LaTeX, Jupyter, SQL, AWS, PySpark, Sparkly	yr, Tensorflow, C
Research Assistant, PLAID Lab (Vermont)	2019-presen
Supervisor: Joe Near: Research on Provable Fairness and Privacy	
Using Machine Learning. Funded via Amazon Research Award (2020-2022 PI: J. Near	; D. Darais)
Research Assistant, C. Vincent (Vermont)	2021-presen
Fully Homomorphic Encryption, Applied Cryptography Research	
Microsoft, Applied Scientist PhD Intern, Summer 2021 (Redmond: remote)	2021
Azure E+P Enterprise and Security DI, mentored by Dr. P. Angulo	
Microsoft Research, Independent Contractor, Summer 2021 (New York: remote)	2021
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
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
A	0040

2019

Apple, Inc.: Software Engineering Intern (Sunnyvale)

	VANT WORK EXPERIENCE	
_	le Summer of Code: Developer for Haskell.org (remote)	2018
/lozill	a: Increasing Rust's Reach Developer (remote)	2018
Peer-l	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" ( <b>Maughan, K</b> .)	2020
	- presented as a poster: RAIS at NeurIPS	
VVIT	ED 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) Al for Social Good Symposium	2020
	"Examining Implicit Bias in Police Data: Lessons Learned about Reproducibility	
	And Transparency in Al"	
*	"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 Al Workshop Proceedings,) "Archipelago Penseé" (first author)	
NVIT	ED 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)	

### 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 <u>SUMS</u>, 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, AiC Connectors Program with Facebook with Dr. O. Dalleleau	2021
Mentee, Global Outreach Mentorship with Dr. S. Gupta (EC 2020)	2020
Mentee, Global Outreach Mentorship with Dr. 3. Gupta (LC 2020)  Mentee, LatinX in Al Research Workshop Mentorship with Dr. J. Barajas (ICML 2020)	2020
• • • • • • • • • • • • • • • • • • • •	2020
Mentee, Mentored by Dr. Amal Ahmed, (ICFP 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 Block III via Gitcoin (Security and Grassroots Economics Daos)	2021
Gitcoin Scholarship for Women (for Kernel Fellowship Block III)	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)	2020
(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  NCWIT Change Leader Scholar	2020
-	2021
NCWIT Change Leader Scholar (1 of 30)	2019
NCWIT Collegiate Award Finalist (1 of 85)	
Code2040 2020 Fellow (1 of 80)	2019
WiCyS Student Scholarship (Women in Cybersecurity)	2019
Udacity Technology Scholarship (Al 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	
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)	2021
Grace Hopper Conference	2020
NCWIT/Bloomberg GHC Conference Grant	2020
-	2020
Women of Color in Technology Complimentary Registration  Financial Aid Grant, SciPty (Scientific Computing with Puthon)	2020
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)	

OTHER GRANTS/ FELLOWSHIPS	
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	2019
Expansion Boot Camp (attendee)	
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
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
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Racket Summer School (National Science Foundation Grant) PLMW (Programming Languages Mentorship Workshop)	2018-2019 2018
Racket Summer School (National Science Foundation Grant) PLMW (Programming Languages Mentorship Workshop) ICFP (International Conference Functional Programming)	2018
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# ACADEMIC SERVICE (Al/Machine Learning)

Reviewer, Travel Grant Applications, Clojure Conj (2 rounds)

2017

ACADEMIC SERVICE (Al/Machine Learning)	
Privacy Enhancing Technologies Symposium, Student Co-Organizer	2021
Black in Al Logistics Co-Chair (NeurlPS)	2020
WiML Senior Program and Mentorship Co-Chair, WiML (NeurlPS)	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 Al 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 (Al/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	
Invited 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
GRANT WRITING / PROPOSALS	
	2020
CDS&E Computational and Data-Enabled Science and Engineering  Database Grant Proposal for SageMaths (as Key Personnel) (PI Ben Hutz)	2020
Database Grant Froposarior Gayeniatris (as Ney Fersonner) (Fr Den Frutz)	

## WRITING / PUBLICATIONS / POSTS

WRITING / PUBLICATIONS / POSTS	
Contributor, Wikipedia: WikiProject Women in Red/Al 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, Nordic Probabilistic Artificial Intelligence School 2021: ProbAl	2021
Participant, Doctoral Consortium, <u>ACM FAccT</u> :	2021
(ACM Conference on Fairness, Accountability and Transparency)	2021
Participant, CRAFT workshop at ACM FAccT	2021
	2021
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- Rethinking Demographic Data Infrastructures for Algorithmic Fairness	2024
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, Summer Institute in Computational Social Science (SICSS)	2021
Howard-Mathematica (declined offer)	
Participant, Winter Institute in Computational Social Science (WICSS)	2021
Invited Participant, "Key themes for informing a Research Roadmap",	2021
The Alan Turing Institute	
Invited Participant,"Threats and Opportunities for AI in Cybersecurity"	2021
Invited Participant, "Society-centric approaches to AI challenges in	2021
Cybersecurity", The Alan Turing Institute	
Invited Participant, "Environmental Enables for AI challenges in	2021
Cybersecurity", The Alan Turing Institute	
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
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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
DDECC	
PRESS	0004
Featured in the "Black Girls CODE the Future" Coloring Book	2021
VentureBeat "Al 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

## **PRESS**

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 Al	2020
Moderator, VentureBeat's Transform 2020 panel on Ethics and Al	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 Al 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	
University of Vermont, CIS196, Privacy Law Research Talk	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 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
Data Privacy; taught by Joe Near using Python (Fall)	2019

#### CLASSES (PhD)

Software Verification; taught by David Darais using Agda (Fall)	2019
Computer Human Interaction; taught by Josh Bongard (Fall)	2019

#### **CLASSES (AUDIT)**

Stanford EE 374 : Internet-Scale Consensus in the Blockchain Era

- 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 V	'alley;
guests included Dr. Simone Browne, Stephanie Dinkins and Rashida Richardson)	
Stanford ICME Summer NLP in Deep Learning Workshop	2020
Participant, IBM Qiskit Global Quantum Computing Summer School	2020
Participant, PL+HCl 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

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

WORKSHOPS (RELATED)	
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)	
ONLINE LEARNING (SELECTED)	
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)	
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	
- Rea Tajiri's workshop on Archival Practices - Speculative Imaginings	2021
- Reading workshop with Che Gossett on Abolitionist Insurgencies	2020
(led by C. Gossett, with lecture guest F. Moten, contributed to published Zine)	
- Unsettling Historical Common Sense	
D&I (Diversity and Inclusion) Invitations (Academic Conferences):	
KDD 2020 D&I Grant (free registration)	2020
ECCV 2020 (free registration courtesy Google Research)	2020
HACKATHONS	
R Data Hackathon 2021, <u>First Place</u> , "Cast and Gender Roles in Movie Data"	2021
- Our group won First place at the R Data Hackathon 2021 for Best Visualization	

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

AppSec (LA) 2019, TechTogetherBoston 2020, Twilio's Signal Conf 2019, Curry On! 2019, RustConf 2018, EARL Seattle 2018 (declined offer), 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

#### **NON-ACADEMIC MEMBERSHIP**

Community Board, Black In Al Member, Women in Number Theory 2020-present 2018-present