Duncan C McElfresh

Curriculum Vitae

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Personal Information

Education

Ph.D. (in progress)	Applied Mathematics	University of Maryland, College Park	2021 (expected)
M.Sc.	Applied Physics	Colorado School of Mines	2013
B.Sc.	Engineering Physics	Colorado School of Mines	2013

Work Experience

Research Assistant — **University of Maryland, College Park, Computer Science Department** — **2017 - present**
Using optimization, machine learning, and market design to address problems in healthcare, housing, and public health. Advisor: Dr. John Dickerson.

Research Intern — **Facebook, Core Data Science** — **Summer 2019**
Used optimization, machine learning, and simulation to improve the notification strategy for Facebook's Blood Donation product. In collaboration with the Blood Donation product team.

Visiting Scholar — **University of Southern California, Center for Artificial Intelligence in Society (CAIS)** — **Summer 2018**
Applied optimization and machine learning to improve policies for allocating housing resources to homeless youth, with the Los Angeles Homeless Services Authority (LAHSA). With Dr. Phebe Vayanos.

Imagery Scientist — **National Geospatial-Intelligence Agency** — **2014 - 2019**
Developed analysis and exploitation techniques for remote sensing data. Built analysis tools for Envi and ArcMap, using IDL and Python

Consulting

FinRegLab	Studying applications of machine learning in financial services	**2020 - present**
Facebook (via Pro Unlimited)	Research Scientist with Facebook Core Data Science	**2018 - 2019**

Publications

Conference Publications

Highly-reviewed "top-tier" conferences.

1. **McElfresh, Duncan C**, Lok Chan, Kenzie Doyle, Walter Sinnott-Armstrong, Vincent Conitzer, Jana Schaich Borg, John P Dickerson, "Indecision modeling." *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI).* 2021
2. Haris Aziz, Ágnes Cseh, John P Dickerson, **Duncan C McElfresh**, "Optimal Kidney Exchange with Immunosuppressants." *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*. 2021
3. **McElfresh, Duncan C**, Michael Curry, Tuomas Sandholm, and John P Dickerson, "Improving Policy-Constrained Kidney Exchange via Pre-Screening." Advances in Neural Information Processing Systems 33: Annual Conference on Neural Information Processing Systems (NeurIPS), 2020
4. Saha, Debjani, Candice Schumann, **Duncan C McElfresh**, John P Dickerson, Michelle L Mazurek and Michael Carl Tschantz. "Measuring Non-Expert Comprehension of Machine Learning Fairness Metrics." *Proceedings of the Thirty-seventh International Conference on Machine Learning (ICML)*. 2020
5. **McElfresh, Duncan C**, Christian Kroer, Sergey Pupyrev, Eric Sodomka, Karthik Abinav Sankararaman, Zack Chauvin, Neil Dexter, John P Dickerson. "Matching Algorithms for Blood Donation" *The 21st ACM Conference on Economics and Computation (EC)*. 2020
6. Bidkhori, Hoda, John P Dickerson, Ke Ren, and **Duncan C McElfresh**. "Kidney exchange with Inhomogeneous Edge Existence Uncertainty." *Conference on Uncertainty in Artificial Intelligence (UAI)*. 2020
7. Chan, Lok, Kenzie Doyle, **Duncan C McElfresh**, Vincent Conitzer, John P Dickerson, Jana Schaich Borg and Walter Sinnott-Armstrong. "Artificial Artificial Intelligence: Measuring Influence of AI "Assessments" on Moral Decision-Making." *AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES).* 2020
8. Saha, Debjani, Candice Schumann, **Duncan C McElfresh**, John P Dickerson, Michelle L Mazurek and Michael Carl Tschantz. "Human Comprehension of Fairness in Machine Learning." *AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES).* 2020
9. **McElfresh, Duncan C**, Hoda Bidkhori, and John P Dickerson. "Scalable Robust Kidney Exchange." *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI).* 2019
10. **McElfresh, Duncan C**, and John P Dickerson. "Balancing lexicographic fairness and a utilitarian objective with application to kidney exchange." *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI).* 2018
11. Bach, Jörg-Hendrik, Arne-Freerk Meyer, **Duncan C McElfresh**, and Jörn Anemüller. "Automatic classification of audio data using nonlinear neural response models." *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. 2012

Working Papers

1. Phebe Vayanos, Duncan C McElfresh, Yingxiao Ye, John P Dickerson, and Eric Rice. "Active preference elicitation via adjustable robust optimization." *(Under review at Management Science.)*
2. McElfresh, Duncan C., Vincent Conitzer, and John P. Dickerson. "Ethics and Mechanism Design in Kidney Exchange."

Other Publications

1. Nanda, Vedant, Duncan C McElfresh, and John P Dickerson. "Learning to Explain Machine Learning." *Workshop on Operationalizing Human-centered Perspectives in Explainable AI (at CHI'21)*.
2. McElfresh, Duncan C, Samuel Dooley, Charles Cui, Kendra Griesman, Weiqin Wang, Tyler Will, Neil Sehgal and John Dickerson. "Can an Algorithm be My Healthcare Proxy?" *2020 International Workshop on Health Intelligence (at AAAI'20)*. (Workshop Paper.)
3. McElfresh, Duncan C, Christian Kroer, Sergey Pupyrev, Eric Sodomka, John P Dickerson. "Matching Algorithms for Blood Donation." *Workshop on Mechanism Design for Social Good (MD4SG).* 2019 (Workshop paper.)
4. McElfresh, Duncan C A Framework for Technically- and Morally-Sound AI. *Conference on Artificial Intelligence, Ethics, and Society (AIES)*. 2019 (Student program and poster.)
5. McElfresh, Duncan C. "Triplet exciton transport in the benzophenone-fluorene-naphthalene molecule." Colorado School of Mines, 2013 (Masters thesis.)

Presentations & Invited Talks

- "Kidney Exchange, AI, and Bioethics." Cleveland Fellowship in Advanced Bioethics Weekly Conference. 2021 (Invited talk.)
- McElfresh, Duncan C, Christian Kroer, Sergey Pupyrev, Eric Sodomka, and John P Dickerson. "Matching Algorithms for Blood Donation." *INFORMS Annual Meeting*. 2019
- McElfresh, Duncan C, Phebe Vayanos, Eric Rice, and John P Dickerson. "Optimizing Public Policy for Homelessness Assistance." *INFORMS Annual Meeting*. 2019
- "AI & Advance Care Planning: Challenges and Opportunities." *Arizona Bioethics Network Annual Conference*. 2019 (Invited talk.)
- McElfresh, Duncan C, Phebe Vayanos, and John P Dickerson. "Robust Active Preference Elicitation for Learning Policy Priorities." *INFORMS Revenue Management & Pricing Workshop*. 2019
- McElfresh, Duncan C, and John P. Dickerson. "Balancing lexicographic fairness and a utilitarian objective with application to kidney exchange." Presented at:
    - AAAI 2018 Computational Sustainability session (main technical track)
    - AAAI 2018 Health Intelligence workshop
- McElfresh, Duncan C, Cassi Carley. "Who Gets the Kidney?" Demonstration of preference modeling and preference aggregation methods applied to kidney allocation. Participants explore their preference models and discuss how these methods might help align algorithms with human values. *We Robot Conference*. 2018

Workshops, Tutorial, and Panels

- "Games, Agents, and Incentives." Workshop at AAMAS (2021), organized with Haris Aziz, Sofia Ceppi, John P Dickerson, Hadi Hosseini, Omer Lev, Nicholas Mattei, and Yair Zick.
- "Matching Market Design in the Real World." Invited session at the Auctions cluster of the INFORMS Annual Meeting (2020). Organized with John P Dickerson.
- "Optimization & Learning Approaches to Resource Allocation for Social Good." Half-day tutorial, with Faez Ahmed, Sanmay Das, John P Dickerson, and Bryan Wilder. Presented at:
    - The International Joint Conference on Artificial Intelligence (IJCAI) 2020.
    - The Conference on Artificial Intelligence (AAAI) 2020.
- "Ok Google: Who Gets the Kidney?: Artificial Intelligence and Transplant Algorithms." Panel presentation and discussion at the annual meeting of the American Society of Bioethics and Humanities (ASBH) 2018. With Dr. Patricia Mayer, Dr. Gabriel Schnickel, and John P Dickerson.

Service

Professional Service and Outreach

Workshop Organizer	Games, Agents, and Incentives Workshop (AAMAS)	2021
PC : Conferences	NeurIPS	2020
	AAAI	2020, 2021
	AAMAS	2020
PC : Workshops	AAMAS OptLearnMAS	2020
	IJCAI workshop on AI for Social Good	2019
	NeurIPS workshop on ML and the Physical Sciences	2019
	NeurIPS workshop on AI for Social Good	2019
Reviewer: Journals	EJOR, JAIR	
Poster Session Co-Organizer	Workshop on Mechanism Design for Social Good (MD4SG)	2020
Proposal Reviewer	ACM/EC Global Challenges in Economics and Computation (GCEC)	2020
Red Judge	IBM Watson AI XPRIZE	2019
Neutral Observer	IBM Watson AI XPRIZE	2019 - 2020
Site Coordinator, Mentor	Girls Excelling in Math and Science (GEMS) of Prince George's County, MD *Coordinating volunteers, lesson planning, and running weekly after-school STEM-focused activities for middle school girls.*	2018 - 2019

Organization and Governance

Working Group Co-Organizer	Mechanism Design for Social Good (MD4SG): Working Group on Algorithms, Law, and Policy.	2020 - present
Working Group Co-Organizer	Mechanism Design for Social Good (MD4SG): Working Group on Bias, Discrimination, and Fairness.	2019 - 2020
Student Council Member	Department of Applied Mathematics Student Council *Organizing & managing departmental seminars, outreach events, new student orientation, and social events*	2018 - 2020
Department Representative	University of Maryland Graduate Student Government *Representing applied mathematics students in the graduate student government; drafting legislation; lobbying for graduate student interests; bringing opportunities to math graduate students; funding graduate student events and projects.*	2016 - 2018

Awards

Science, Mathematics, and Research for Transformation (SMART) Scholarship.	Full tuition support, $25,000 annual stipend, and summer internships with DoD agencies, through completion of my BS and MS in Engineering & Applied Physics. Administered by the Department of Defense.	2011-2014

Programming Languages

Fluent in : Python, Matlab, IDL/ENVI
Familiar with : Java, SQL, Bash
Exposure to : C++, Fortran

https://github.com/duncanmcelfresh