

# Duncan C McElfresh

## Curriculum Vitae

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## Education

- 2021 Ph.D. Applied Mathematics, University of Maryland, College Park  
Dissertation Title: Practical Algorithms for Resource Allocation and Decision Making  
Dissertation Advisor: John P Dickerson
- 2013 M.Sc. Applied Physics, Colorado School of Mines
- 2013 B.Sc. Engineering Physics, Colorado School of Mines

## Work Experience

- 2021 - Present *Postdoctoral Fellow*, Stanford University & VA Palo Alto Health Care System  
VA Fellowship in Health Services Research and Development.
- 2021 - Present *Machine Learning Researcher*, [Abacus.ai](https://abacus.ai)  
Studying meta-learning and explainability.
- 2017 - 2021 *Graduate Research Assistant* (Computer Science), University of Maryland, College Park  
Using optimization, machine learning, and market design to address applied problems of resource allocation and decision making. Advised by John P Dickerson.
- Summer 2019 *Research Intern*, Facebook, Core Data Science  
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.
- Summer 2018 *Visiting Scholar*, University of Southern California  
[Center for Artificial Intelligence in Society](#) (CAIS)  
Applied optimization and machine learning to improve policies for allocating housing resources to homeless youth, with the Los Angeles Homeless Services Authority (LAHSA).
- 2014 - 2016 *Imagery Scientist*, National Geospatial-Intelligence Agency  
Developed analysis and exploitation techniques for remote sensing data. Built analysis tools using Envi, ArcMap, IDL, and Python.

## Consulting

- 2022 - Present [Abacus.AI](https://abacus.ai)  
AutoML and recommender systems research.
- 2020 - 2021 [FinRegLab](https://finreglab.com)  
Studying applications of machine learning in financial services.

2018 - 2019 Facebook (via Pro Unlimited)  
Research Scientist with Facebook Core Data Science.

## Publications & Presentations

### Conference Publications

*This section contains papers published in competitive “top-tier” Computer Science conferences. These conferences are the primary publication venue for Computer Science, they are subject to rigorous peer review, and acceptance rates are typically between 15% and 30%. Entries marked with “A” use alphabetical author ordering, which is common in operations research and theoretical computer science, and “\*” indicates equal lead-author effort. Otherwise author ordering reflects the authors’ level of contribution, which is common in AI and ML.*

1. **D.C. McElfresh**\*, S. Khandagale\*, J. Valverde\*, J.P. Dickerson, C. White, “On the Generalizability and Predictability of Recommender Systems.” *Advances in Neural Information Processing Systems 36: Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2022
2. **D.C. McElfresh**, L. Chan, K. Doyle, W. Sinnott-Armstrong, V. Conitzer, J.S. Borg, J.P. Dickerson, “Indecision modeling.” *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*. 2021
3. (A) H. Aziz, Á. Cseh, J.P. Dickerson, **D.C. McElfresh**, “Optimal Kidney Exchange with Immunosuppressants.” *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*. 2021
4. **D.C. McElfresh**, M. Curry, T. Sandholm, and J.P. Dickerson, “Improving Policy-Constrained Kidney Exchange via Pre-Screening.” *Advances in Neural Information Processing Systems 34: Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2020
5. D. Saha, C. Schumann, **D.C. McElfresh**, J.P. Dickerson, M.L. Mazurek and M.C. Tschantz. “Measuring Non-Expert Comprehension of Machine Learning Fairness Metrics.” *Proceedings of the Thirty-seventh International Conference on Machine Learning (ICML)*. 2020
6. **D.C. McElfresh**, C. Kroer, S. Pupyrev, E. Sodomka, K.A. Sankararaman, Z. Chauvin, N. Dexter, J.P. Dickerson. “Matching Algorithms for Blood Donation” *The 21st ACM Conference on Economics and Computation (EC)*. 2020
7. (A) H. Bidkhor, J. P. Dickerson, K. Ren, and **D.C. McElfresh**. “Kidney exchange with Inhomogeneous Edge Existence Uncertainty.” *Conference on Uncertainty in Artificial Intelligence (UAI)*. 2020
8. L. Chan, K. Doyle, **D.C. McElfresh**, V. Conitzer, J.P. Dickerson, J.S. Borg and W. 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
9. D. Saha, C. Schumann, **D.C. McElfresh**, J. P. Dickerson, M.L. Mazurek and M.C. Tschantz. “Human Comprehension of Fairness in Machine Learning.” *AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES)*. 2020
10. **D.C. McElfresh**, H. Bidkhor, and J.P. Dickerson. “Scalable Robust Kidney Exchange.” *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*. 2019
11. **D.C. McElfresh**, and J.P. Dickerson. “Balancing lexicographic fairness and a utilitarian objective with application to kidney exchange.” *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*. 2018
12. J. Bach, A. Meyer, **D.C. McElfresh**, and J. 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. **D.C. McElfresh**, C. Kroer, S. Pupyrev, E. Sodomka, K.A. Sankararaman, Z. Chauvin, N. Dexter, J.P. Dickerson. “Matching Algorithms for Blood Donation” (*Under review.*)
2. P. Vayanos, **D.C. McElfresh**, Y. Ye, J.P. Dickerson, and E. Rice. “Active preference elicitation via adjustable robust optimization.” (*Reject & Resubmit at Management Science.*)

## Other Publications

1. **D.C. McElfresh**, K. Bracamontes, P. Mayer, “Universal Ethics Evaluation of ICU Patients: A Model.” *Journal of Hospital Ethics (JoHE)*. Vol. 8 Num. 3, 2022
2. **D.C. McElfresh**. “Practical Algorithms for Resource Allocation and Decision Making.” *University of Maryland*, 2021. Doctoral Dissertation.
3. **D.C. McElfresh**, M. Curry, S. Booker, M. Stuart, D. Stewart, T. Sandholm, and J.P. Dickerson. “Who can be matched via kidney exchange?” (abstract). *Am J Transplant*. 2021; 21 (suppl 3).
4. **D.C. McElfresh**, M. Curry, S. Booker, M. Stuart, D. Stewart, T. Sandholm, and J.P. Dickerson. “Improving Policy-constrained Kidney Exchange Via Pre-screening.” (abstract). *Am J Transplant*. 2021; 21 (suppl 3).
5. V. Nanda, **D.C. McElfresh**, and J.P. Dickerson. “Learning to Explain Machine Learning.” *Workshop on Operationalizing Human-centered Perspectives in Explainable AI (at CHI21)*.
6. **D.C. McElfresh**, S. Dooley, C. Cui, K. Griesman, W. Wang, T. Will, N. Sehgal and J.P. Dickerson. “Can an Algorithm be My Healthcare Proxy?” *2020 International Workshop on Health Intelligence (at AAAI20)*. (Workshop Paper.)
7. **D.C. McElfresh**, C. Kroer, S. Pupyrev, E. Sodomka, J.P. Dickerson. “Matching Algorithms for Blood Donation.” *Workshop on Mechanism Design for Social Good (MD4SG)*. 2019 (Workshop paper.)
8. **D.C. McElfresh**. “Triplet exciton transport in the benzophenone-fluorene-naphthalene molecule.” *Colorado School of Mines*, 2013. Masters thesis.

## Presentations & Invited Talks

1. “Improving Policy-Constrained Kidney Exchange via Pre-Screening.” *INFORMS Annual Meeting*. 2021. With M. Curry, S. Booker, M. Stuart, D. Stewart, T. Sandholm, and J.P. Dickerson.
2. “Kidney Exchange, AI, and Bioethics.” Cleveland Clinic Fellowship in Advanced Bioethics Weekly Conference. 2021 (Invited talk.)
3. “Matching Algorithms for Blood Donation.” *INFORMS Annual Meeting*. 2019. With Christian Kroer, Sergey Pupyrev, Eric Sodomka, and John P Dickerson.
4. “Optimizing Public Policy for Homelessness Assistance.” *INFORMS Annual Meeting*. 2019. With Phebe Vayanos, Eric Rice, and John P Dickerson.
5. “AI & Advance Care Planning: Challenges and Opportunities.” *Arizona Bioethics Network Annual Conference*. 2019 (Invited talk.)
6. “Robust Active Preference Elicitation for Learning Policy Priorities.” *INFORMS Revenue Management & Pricing Workshop*. 2019. With Phebe Vayanos, and John P Dickerson.

7. "Balancing lexicographic fairness and a utilitarian objective with application to kidney exchange." At:
  - AAAI 2018 Computational Sustainability session (main technical track)
  - AAAI 2018 Health Intelligence workshop
8. "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 help align algorithms with human values. *We Robot Conference*. 2018. With Cassi Carley.

## Workshops, Conference Sessions, and Panels

1. "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.
2. "Matching Market Design in the Real World." Invited session at the Auctions cluster of the INFORMS Annual Meeting (2020). Organized with John P Dickerson.
3. "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.
4. "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 Patricia Mayer, Gabriel Schnickel, and John P Dickerson.

## Awards

- 2021 *University of Maryland College of Computer, Natural, and Mathematical Sciences (CMNS) Board of Visitors Outstanding Graduate Student Award.*  
Annual award (\$5,000) given to one CMNS doctoral student who has advanced to candidacy, for scholarly and research excellence.
- 2011 - 2014 *Science, Mathematics, and Research for Transformation (SMART) Scholarship.*  
Full tuition support, \$25,000 annual stipend, and summer internships with Defense agencies, through completion of my BS and MS in Engineering & Applied Physics. Administered by the US Department of Defense.

## Service

### Conferences

SPC	AAMAS ('22)
PC	NeurIPS ('20, '21, '22), AAAI ('20, '21, '23), EAAMO ('21, '22)
Poster Session Co-Organizer	Workshop on Mechanism Design for Social Good (MD4SG) ('20)
Proposal Reviewer	ACM/EC Global Challenges in Economics and Computation (GCEC) ('20)

## Journals

Reviewer EJOR, JAIR, TEAC

## Professional Service

Working Group Member	The 2022 National Heart, Lung, and Blood Institute's (NHLBI) Blood Epidemiology and Clinical Therapeutics Branch's State of the Science (SoS) meetings in Transfusion Medicine. Member of the working group on Novel Data Science Techniques and Applications in Blood Banking/Transfusion Medicine, and Donors and the Supply.	2021 - 2022
Red Judge	IBM Watson AI XPRIZE	2019
Neutral Observer	IBM Watson AI XPRIZE	2019 - 2020

## Mentoring

Site Coordinator, Mentor	Girls Excelling in Math and Science (GEMS) of Prince George's County, MD	2018 - 2019
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## Organization and Governance

2020 - 2021	<i>Co-Organizer</i> , Mechanism Design for Social Good (MD4SG): Working Group on Algorithms, Law, and Policy.
2019 - 2020	<i>Co-Organizer</i> , Mechanism Design for Social Good (MD4SG): Working Group on Bias, Discrimination, and Fairness.
2018 - 2020	<i>Student Council Member</i> , Department of Applied Mathematics Student Council Organizing & managing departmental seminars, outreach events, new student orientation, and social events.
2016 - 2018	<i>Department Representative</i> , 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.

## Programming Languages

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