Matthew Eichhorn

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EDUCATION

Cornell University Ph.D. Candidate, Applied Mathematics Masters of Science (2022)

University at Buffalo, The State University of New York Au Bachelors of Science, Mathematics and Computer Science Honors College, Dean's List Thesis: Neural Networks for Plant Species Recognition in Street View Imagery

Relevant Coursework

Algorithm (General, Online, Approximation), Market Design, Game Theory, Networks, Probability, Abstract Algebra, Combinatorics, Logic, Numerical Analysis, Functional Analysis

PUBLICATIONS

- Cortez, M., Eichhorn, M., and Yu C.L., "Exploiting neighborhood interference with low order interactions under unit randomized design." arXiv preprint arXiv:2208.05553 (2022).
- Banerjee, S., Eichhorn, M., and Kempe, D., "Allocating with Priorities and Quotas: Algorithms, Complexity, and Dynamics", In Proceedings of 24th ACM Conference on Economics and Computation (EC), 2023.
- Eichhorn, M., Banerjee, S., and Kempe, D., "Online Team Formation Under Different Synergies", International Conference on Web and Internet Economics (WINE), 2022: 78-95.
- Cortez, M., Eichhorn, M., and Yu, C.L., "Staggered rollout designs enable causal inference under interference without network knowledge", Advances in Neural Information Processing Systems (NeurIPS), 2022.
- Ringland, J., Bohm, M., Baek, S.R., and **Eichhorn, M.**, "Automated survey of selected common plant species in Thai homegardens using Google Street View imagery and a deep neural network", Earth Science Informatics (ESI), 2021: 179-191.
- Dao T., Sohoni N., Gu A., **Eichhorn, M.**, Blonder A., Leszczynski M., Rudra R., and Ré C., "Kaleidoscope: An Efficient, Learnable Representation For All Structured Linear Maps", In Proceedings of 8th International Conference on Learning Representations (ICLR), 2020
- Dao, T., Gu, A., **Eichhorn, M.**, Rudra, A., Ré, C., "Learning Fast Algorithms for Linear Transforms Using Butterfly Factorizations", In Proceedings of 36th International Conference on Machine Learning (ICML), 2019: 1517-1527.
- Karan, S., **Eichhorn, M.**, Hurlburt, B., Iraci, G. and Zola, J., "Fast Counting in Machine Learning Applications", In Proceedings of 34th Uncertainty in Artificial Intelligence (UAI), 2018: 540-549.

August 2019 - Present

GPA: 4.179

August 2015 - May 2019 GPA: 4.0

CONFERENCE PARTICIPATION

Invited Talks:

- "The Algorithmic Landscape of Priority-Respecting Allocations", INFORMS Annual Meeting. Indianapolis, IN, October 2022.
- "Simple yet Efficient Estimators for Network Causal Inference Even When the Network is Unknown", American Causal Inference Conference (ACIC). Berkeley, CA, May 2022.
- "Mind your Ps and Qs: Allocation with Priorities and Quotas", Symposium on Foundations of Responsible Computing (FORC). Cambridge, MA, June 2022.

Posters

- "Low-Degree Outcomes and Clustered Designs: Combining Design and Analysis for Causal Inference under Interference", Causal Inference for Engineers workshop at ACM Federated Computing Research Conference (FCRC). Orlando, FL, June 2023.
- "Exploiting Neighborhood Interference with Low Order Interactions under Unit Randomized Design", American Causal Inference Conference (ACIC). Austin, TX, May 2023.
- "Casual Inference with Neighborhood Interference and Low-Order Interactions", NeurIPS 2022 Workshop on Causality for Real-world Impact. New Orleans, LA, December 2022.

UNDERGRADUATE RESEARCH EXPERIENCE

Computer Science Department, University at Buffalo Spring 2018 - Summer 2019

- Compare neural network architectures through lens of arithmetic circuit complexity
- Explore theory for efficient neural networks utilizing structured matrices

Project GLASS, University at Buffalo

- Assess utility of Google Street View imagery to survey gardening practices in Thailand
- Heavily modify existing Neural Network architectures to assist in crop detection
- Develop Python and JavaScript utilities for image tagging and data processing

SCoRe Group, University at Buffalo

- Devised efficient methods to answer counting queries in Bayesian networks
- Implemented heavily-optimized C++ data structures to efficiently answer queries

TEACHING EXPERIENCE

Cornell University

- Instructor: ENGRI 1101, Engineering Applications of Operations Research
- Co-Instructor: CS 2800, Discrete Structures
- Teaching Assistant: CS 2111, Programming Practicum (Java)
- Teaching Assistant: CS 4820, Introduction to Analysis of Algorithms
- *Facilitator*: Math Department Teaching Assistant Training
- Teaching Assistant: MATH 1106, Calculus for the Life Sciences

Spring 2018 - Fall 2019

Fall 2016 - Fall 2017

Spring 2022 Spring 2020, 2021 Fall 2021 Spring 2020, 2021

Summer 2023 Fall 2022, 2023

University at Buffalo

- Teaching Assistant: CSE 191, Discrete Structures
- Teaching Assistant: CSE 250, Data Structures
- Teaching Assistant: MTH 241, Calculus 3
- Teaching Assistant: MTH 141, Calculus 1

EMPLOYMENT EXPERIENCE

Cornell Active Learning in Mathematics, Cornell University

Content Designer

- Developed class activities, course assignments, and readings to facilitate active instruction in an introductory calculus course.
- Created seven new workshops and projects for a linear algebra course through which students apply class concepts to problems from other disciplines.
- Developed a sequence of applied homework exercises to introduce relevant techniques from numerical analysis and algorithm design in an advanced linear algebra course.
- Worked with outside consultants to visualize student survey data in R as part of the department's active learning initiative.

Computer Science Department, Cornell University

Course Developer

- Aided in the revision of the introductory discrete math course, including the writing of over 200 pages of course notes.
- Developed all materials for a new support course on discrete mathematics, including over 90 pages of notes and instructor guides and 100 exercises.
- Assisted in training the undergraduate facilitators for the course.

The Math Place, UB Undergraduate Learning Center Math Tutor

- Tutor students in subjects ranging from algebra and trigonometry to calculus
- Develop study strategies and crafted practice problems to aid students in test preparation

AWARDS AND RECOGNITION

Community Leadership Award, Cornell Diversity Programs in Engineering	Summer 2023
Dean's Undergraduate Achievement Award, UB SEAS	Spring 2019
Undergraduate Researcher Award, UB Computer Science Department	Spring 2019
Dean's Outstanding Senior Award, UB College of Arts and Sciences	Spring 2019
Harriet F. Montague Award, UB Math Department	Fall 2018
Summer Math Scholarship, UB Math Department	Summer 2018
Grace W. Capen Academic Award, University at Buffalo	Spring 2017
Presidential Scholar, UB Honors College	Class of 2019

Fall 2017 Spring 2017, 2018 Spring 2017 Fall 2016

Summers 2020-2022

August 2017 - May 2019

Summers 2021, 2022