Matthew Eichhorn

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Education

Cornell University August 2019 - Present
Ph.D. Candidate, Applied Mathematics
Masters of Science (2022) GPA: 4.179

University at Buffalo, *The State University of New York* August 2015 - May 2019
Bachelors of Science, Mathematics and Computer Science GPA: 4.0
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

- 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.

Preprints

- 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).

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 — Spring 2018 - Fall 2019

- 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 — Fall 2016 - Fall 2017

- 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 — Summer 2023
- *Co-Instructor*: CS 2800, Discrete Structures — Fall 2022, 2023
- *Teaching Assistant*: CS 2111, Programming Practicum (Java) — Spring 2022
- *Teaching Assistant*: CS 4820, Introduction to Analysis of Algorithms — Spring 2020, 2021
- *Facilitator*: Math Department Teaching Assistant Training — Fall 2021
- *Teaching Assistant*: MATH 1106, Calculus for the Life Sciences — Spring 2020, 2021

University at Buffalo

- *Teaching Assistant*: CSE 191, Discrete Structures — Fall 2017
- *Teaching Assistant*: CSE 250, Data Structures — Spring 2017, 2018
- *Teaching Assistant*: MTH 241, Calculus 3 — Spring 2017
- *Teaching Assistant*: MTH 141, Calculus 1 — Fall 2016

Employment Experience

Cornell Active Learning in Mathematics, Cornell University — Summers 2020-2022
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 — Summers 2021, 2022
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 — August 2017 - May 2019
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

Graduate Teaching Award, Cornell Computer Science Department — Fall 2021
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