# Ben Chugg

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## Research Interests

• Sequential analysis and anytime-valid inference (game-theoretic statistics, supermartingales, e-processes, hypothesis testing)
• Applications to algorithm and experimental design (online learning, bandits, statistical learning theory)

## Education

2022– Ph.D. in Machine Learning, Carnegie Mellon University
Advisor: Aaditya Ramdas.

2018–19 M.Sc. in Mathematics (MFoCS), University of Oxford
Advisor: Renaud Lambiotte. Distinction.
Thesis: The Graph-Simplex Correspondence and its Algorithmic Foundations.

2014–18 B.Sc. in Mathematics and Computer Science. University of British Columbia
Thesis advisor: William Evans. Combined Honours with Distinction.
Thesis: A Model for Computing in Dynamic, Resource-Limited Environments.

## Selected Experience

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|---|---|---|
| 2021–2022 | Lead Research Analyst, RegLab, Stanford Law School | Stanford, USA |
| 2019–2021 | Research Fellow, RegLab, Stanford Law School | Stanford, USA |
| 2018 | Research Intern, RIKEN Center for Advanced Intelligence Project | Tokyo, Japan |
| 2018 | Visiting Researcher, AUB Center for Advanced Mathematical Sciences | Beirut, Lebanon |
| 2016–2017 | NSERC Research Assistant, UBC Algorithms Lab | Vancouver, Canada |

## Selected Awards

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| 2022-2024 | NSERC Postgraduate Scholarship–Doctoral (PGS D) |
| 2022-2024 | NSERC Graduate Scholarship–Doctoral (CGS D) (Declined) |
| 2018 | Mona Leith Memorial Scholarship |
| 2018 | Percy Walter Perris Scholarship |
| 2018 | Undergraduate Teaching Assistant Award (Computer Science) |
| 2017 | Shirley Snelgrove and John Yule Scholarship |
| 2017 | NSERC USRA for research in stochastic reaction networks |
| 2016 | NSERC USRA for research in graph theory |
| 2014-2018 | University of British Columbia Dean's list |
| 2014 | University of British Columbia Chancellor Scholar |

# Publications

## Journal Papers

(j.5) Ben Chugg, Hongjian Wang, Aaditya Ramdas. A unified recipe for (time-uniform) PAC-Bayes bounds. *Journal of Machine Learning Research*, 2023.

(j.4) Caleb Robinson, Ben Chugg, Brandon Anderson, Juan M. Lavista Ferres, Daniel E. Ho. Mapping Industrial Poultry Operations at Scale with Deep Learning and Aerial Imagery. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing.* 2022.

(j.3) Ben Chugg*, Brandon Anderson*, Seiji Eicher, Sandy Lee, Daniel E. Ho. Enhancing Environmental Enforcement with Near Real-Time Monitoring: Likelihood-Based Detection of Structural Expansion of Intensive Livestock Farms. *Journal of Applied Earth Observation and Geoinformation.* 2021

(j.2) Ben Chugg*, Lisa Lu*, Derek Ouyang*, Benjamin Anderson, Raymond Ha, Alexis D'Agostino, Anandi Sujeer, Sarah L. Rudman, Analilia Garcia, Daniel E. Ho. Evaluation of Allocation Schemes of COVID-19 Testing Resources in a Community-Based Door-to-Door Testing Program. *Journals of the American Medical Association, Health Forum.* 2021.

(j.1) Ben Chugg, William Evans, Kelvin Wong. Simultaneous Visibility Representations of Undirected Pairs of Graphs. *Journal of Computational Geometry.* 2021.

## Conference Proceedings

N.B. Full-length, peer-reviewed conference papers are the norm in CS/ML.

(c.9) Ben Chugg, Santiago Cortes-Gomez, Bryan Wilder, Aaditya Ramdas. Auditing Fairness by Betting. *Neural Information Processing Systems.* 2023. **Spotlight**

(c.8) Ben Chugg, Peter Henderson, Jacob Goldin, Daniel E. Ho. Entropy Regularization for Population Estimation. *AAAI Conference on Artificial Intelligence.* 2023. **Oral**

(c.7) Peter Henderson, Ben Chugg, Brandon Anderson, Kristen Altenburger, Alex Turk, John Guyton, Jacob Goldin, Daniel E. Ho. Integrating Reward Maximization and Population Estimation: Sequential Decision-Making for Internal Revenue Service Audit Selection. *AAAI Conference on Artificial Intelligence.* 2023. **Oral**

(c.6) Ben Chugg,* Nicolas Rothbacher,* Alex Feng, Xiaoqi Long, Daniel E. Ho. Detecting Environmental Violations with Satellite Imagery in Near Real Time: Land Application Under the Clean Water Act. *Conference on Information and Knowledge Management.* 2022.

(c.5) Peter Henderson*, Ben Chugg*, Brandon Anderson, Daniel E. Ho. Beyond Ads: Sequential Decision-Making Algorithms in Law and Public Policy. *ACM Symposium on Computer Science and Law.* 2022.

(c.4) Hooman Hashemi, Ben Chugg, Anne Condon. Composable Computation in Leaderless, Discrete Chemical Reaction Networks. *International Conference on DNA Computing and Molecular Programming.* 2020. **Journal invite**

(c.3) Ben Chugg, William Evans, Kelvin Wong. Simultaneous Visibility Representations of Undirected Pairs of Graphs. *Canadian Conference on Computational Geometry.* 2020. **Journal invite**

(c.2) Ben Chugg, Takanori Maehara. Submodular Stochastic Probing with Prices. *International Conference on Control, Decision, and Information Technologies.* 2019.

(c.1) Ben Chugg, Anne Condon, Hooman Hashemi. Output-Oblivious Stochastic Chemical Reaction Networks. *International Conference on Principles of Distributed Systems.* 2018.

## Workshops & Preprints

### Preprints

(p.1) Ben Chugg, Hongjian Wang, Aaditya Ramdas. Time-uniform confidence spheres for means of random vectors. 2023.

### Workshop Papers

N.B. Workshops in CS/ML are peer-reviewed but have much higher acceptance rates than conferences

(w.3) Peter Henderson, Ben Chugg, Brandon Anderson, Kristen Altenburger, Alex Turk, John Guyton, Jacob Goldin, Daniel E. Ho. Integrating Reward Maximization and Population Estimation: Sequential Decision-Making for Internal Revenue Service Audit Selection. *ICML Workshop on Adaptive Experimental Design in the Real World.* 2022. **Spotlight**

(w.2) Ben Chugg, Daniel E. Ho. Reconciling Risk Reduction and Prevalence Estimation in Public Health Using Batched Bandits. *NeurIPS Workshop on Machine Learning in Public Health.* 2021. **Oral**

(w.1) Peter Henderson*, Ben Chugg*, Brandon Anderson, Daniel E. Ho. Beyond Ads: Sequential Decision-Making Algorithms in Public Policy. *NeurIPS Workshop on Causal Inference Challenges in Sequential Decision Making: Bridging Theory and Practice.* 2021.

## Teaching

### Teaching Assistant

| | |
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| 2024 | 10-800: Game-theoretic probability, statistics and learning, CMU |
| 2017, 2018 | CPSC 420/500: Advanced algorithm design and analysis, UBC |
| 2017 | CPSC 320: Intermediate algorithm design and analysis, UBC |
| 2017 | CPSC 221: Basic algorithms and data structures, UBC |

## Talks

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|---|---|---|
| 2023 | Entropy Regularization for Population Estimation. | AAAI |
| 2021 | Batched Bandits for Public Health | NeurIPS ML4PH |
| | Artificial Intelligence for Clean Water | Sci-Pol Conf |
| 2020 | Composable Computation in Leaderless, Discrete CRNs. | DNA |
| | Simultaneous Visibility Representations of Undirected Pairs of Graphs. | CCCG |
| 2019 | The Graph-Simplex Correspondence. | Oxford Maths Inst. |
| | Submodular Stochastic Probing with Prices. | CODIT |
| | Output-Oblivious Stochastic Chemical Reaction Networks. | OxCSC |
| 2018 | Output-Oblivious Stochastic Chemical Reaction Networks. | OPODIS |
| 2017 | Unconstrained Submodular Maximization in MapReduce. | CUCSC |

## Reviewing

Electronic Journal of Statistics (2023-)

## Other

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|---|---|
| *Tools* | LaTeX, Python, PyTorch, TensorFlow 2, GCP, Azure, Bash, GEE, Matlab, R, C++, Java |
| *Citizenship* | Canadian |
| *Linguistics* | Fluent in English (Native) and French. Awarded the DELF (Diplôme d'études en langue française) certificate in 2012. |
| *Misc.* | Better with a hacky-sack than you'd think. |