

Emily C. Hector

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RESEARCH INTERESTS

Theory/Methods

Distributed inference and estimation, Heterogeneous data integration, Estimating equations, High-dimensional data, Correlated data, Generalized method of moments, Divide-and-conquer, Composite likelihood, Parallel computing.

Applications

Brain imaging analysis, Environmental health science, Obesity, Metabolomics, Epigenetics, Children's health.

EDUCATION

PhD Biostatistics, University of Michigan	(expected 2020)
MSc Biostatistics, University of Michigan	(2016)
BSc Honors Probability and Statistics, McGill University	(2014)

RESEARCH EXPERIENCE

University of Michigan, School of Public Health

Graduate Student Research Assistant

Analysis of high-dimensional networked data: exploratory analyses of associations between genetic SNP data and metabolite measurements in two different datasets. Supervisor: Jian Kang, PhD (2018-present)

Analyst in the Data Management and Modeling Core of the Children's Environmental Health and Disease Prevention Center of the University of Michigan. Analysis of metabolomic, epigenetic, anthropometric and exposure data. Supervisors: Peter XK Song, PhD, and Karen E Peterson, DSc (2015-2018)

McGill University, Department of Mathematics and Statistics

Statistical Brain Imaging

Honors Research Project (Thesis): Examination of different statistical and computational brain image analysis techniques. Supervisors: Masoud Asgharian, PhD, Amir Shmuel, PhD, Montreal Neurological Institute (2013)

Observations of the NTU Multi-flow Coalition Game

Natural Sciences and Engineering Research Council of Canada (NSERC) Undergraduate Student Research Award (USRA). Supervisor: F. Bruce Shepherd, PhD (2013)

TEACHING EXPERIENCE

University of Michigan, School of Public Health

Graduate Student Instructor

Responsible for preparing and teaching two lectures (Linear Regression and Logistic Regression) for the 2019 Big Data Summer Institute (BDSI); recordings available online at the U-M BDSI 2019 Wiki accessible from <https://sph.umich.edu/bdsi/>. (2019)

BIOSTAT 503: Introduction to Biostatistics. Supervisor: Thomas Braun, PhD (2014)

AWARDS & HONORS

- Finalist, grant proposal submitted to the Second Joint Biostatistics-Statistics Research Retreat, Shark Tank for Research Ideas in Data Science and Statistics (STRIDES). Departments of Biostatistics and Statistics, University of Michigan (2020)
- *Excellence in Research Award*, awarded annually to one student in recognition of research excellence. Department of Biostatistics, University of Michigan (2019)
- *Gertrude M. Cox Scholarship, Honorable Mention*, sponsored by the American Statistical Association (ASA) Committee on Women in Statistics and the Caucus for Women in Statistics (CWS) (2019)
- *John Van Ryzin Award* for most outstanding paper submitted to the International Biometric Society (IBS) Eastern North American Region's (ENAR) Distinguished Student Paper Award Competition (2018)
- *Rackham Conference Travel Grant*, University of Michigan (2016, 2017, 2018, 2019)

- *Outstanding First-Year Masters Student*, Department of Biostatistics, University of Michigan (2015)
- *First Class Honors*, McGill University (2014)
- *Natural Sciences and Engineering Research Council of Canada (NSERC) Undergraduate Student Research Award (USRA)*, McGill University (2013)
- *J W McConnell Scholarship* (major award), McGill University (2011-2013)

PUBLICATIONS

Peer-reviewed journal articles

1. **Hector EC**, Song P XK. (2020+) A distributed and integrated method of moments for high-dimensional correlated data analysis. *Journal of the American Statistical Association*, accepted.
2. Perng W, **Hector EC**, Song P XK, Tellez Rojo MM, Raskind S, Kachman M, Cantoral A, Burant BF, Peterson KE. Metabolomic determinants of metabolic risk in Mexican adolescents. *Obesity (Silver Spring)* 2017. doi:10.1002/oby.21926

Journal articles under review

1. **Hector EC**, Song P XK. (2020+) Doubly distributed supervised learning and inference with high-dimensional correlated outcomes. In review.

Articles under preparation

1. **Hector EC**, Song P XK. (2020+) Distributed and integrated quadratic inference functions.
2. Goodrich JM, **Hector EC**, Tang L, Labarre J, Dolinoy DC, Mercado-Garcia A, Sánchez BN, Song P XK, Téllez-Rojo MM, Peterson KE. (2020+) Integrative analysis of DNA methylation and untargeted metabolomics data from the ELEMENT cohort.
3. Jansen EC, **Hector EC**, Goodrich JM, Cantoral A, Song P XK, Téllez-Rojo MM, Peterson KE. (2020+) Mercury exposure and sleep among adolescents in Mexico City.

R packages

1. DIMM: Performs distributed and integrated method of moments regression for high-dimensional correlated responses. Divides outcomes into blocks, analyses blocks using composite likelihood, and combines estimators using a one-step update or an optimal generalized method of moments (GMM).

2. DDIMM: Performs doubly distributed and integrated method of moments regression for high-dimensional correlated responses. Divides outcomes and subjects into blocks, analyses blocks using composite likelihood or generalized estimating equations, and combines estimators using a one-step update or an optimal GMM.

CONFERENCE PRESENTATIONS

Oral

1. **Hector EC**, Song PXX. Distributed inference with correlated outcomes (invited). *Department of Statistics Seminar* (2019). North Carolina State University. Raleigh, North Carolina.
2. **Hector EC**, Song PXX. A unifying framework for distributed and integrated inference with high-dimensional correlated outcomes. Workshop on *BFF (Bayes, Fiducial and Frequentist) paradigm in data integration, machine learning and applications* (2019). Ann Arbor, Michigan.
3. **Hector EC**, Song PXX. Doubly distributed and integrated inference for correlated data with heterogeneous parameters. *Joint Statistical Meetings (JSM)* (2019). Denver, Colorado.
4. **Hector EC**, Song PXX. A distributed and integrated method of moments for high-dimensional correlated data analysis (invited). Workshop on *Recent Developments in Statistical Theory and Methods Based on Distributed Computing* (2018). Casa Matemática Oaxaca (CMO), Banff International Research Station for Mathematical Innovation and Discovery. Oaxaca, Mexico. Recording available at <http://www.birs.ca/events/2018/5-day-workshops/18w5089/videos>.
5. **Hector EC**, Song PXX. A distributed and integrated method of moments for high-dimensional correlated data analysis. *ENAR Spring Meeting* (2018). John Van Ryzin Award winner. Atlanta, Georgia.
6. **Hector EC**, Song PXX. A distributed and integrated method of moments for high-dimensional correlated data analysis. *University of Michigan Data Science Research Forum* (2017). Michigan Institute for Data Science (MIDAS). Ann Arbor, Michigan. Recording available at <https://www.youtube.com/watch?v=SGPPfX2T4dI>.
7. **Hector EC**, Song PXX. Regression analysis for high-dimensional correlated outcomes. *Joint meeting* (2017). University of Notre Dame. South Bend, Indiana.
8. **Hector EC**, Shepherd FB. An Introduction to Linear Programming and Applications to Research. *Student Summer Colloquium* (2013). McGill University. Montreal, Canada.

Poster

1. **Hector EC**, Song PXX. A Doubly Distributed and Integrated Method of Moments for High-Dimensional Correlated Data Analysis. *Joint Statistical Meetings (JSM)* (2018). Vancouver, Canada.
2. **Hector EC**, Song PXX. Regression analysis for high-dimensional correlated outcomes. *Spatial Statistics Conference* (2017). University of Lancaster. Lancaster, England.
3. **Hector EC**, Goodrich JM, Tang L, Perng W, Dolinoy DC, Mercado-Garcia A, Hu H, Tellez-Rojo MM, Peterson KE, Song PXX. Change in variance of IGF2 gene methylation associated with three metabolites. *ENAR Spring Meeting* (2016). Austin, Texas.

Other

Hector EC. Panel Discussant. *Fifth Bayesian, Fiducial and Frequentist (BFF5) Conference: Foundations of Data Science* (2018). Ann Arbor, Michigan.

SERVICE

University of Michigan, School of Public Health

- Faculty Search Committee, Student representative (2019-2020)
- Biostatistics Computing, Social Media and Website Reform Committee, Student representative (2018-2019)
- Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS), Lead member, Planning Committee (2017-2018).
- Fifth Bayesian, Fiducial, and Frequentist (BFF5) Conference, Member, Planning Committee (2017-2018).
- Biostatistics Brown Bag Seminar, Member (2014-2018), President (2016-2018).
- STATCOM (Statistics in the Community at Michigan) (2015-2017).

PROGRAMMING SKILLS

R, Rcpp, SAS, Python.

LANGUAGES

- English (native speaker)
- French (native speaker)
- Spanish (professional proficiency)