

## Emily C. Hector

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Department of Statistics

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## RESEARCH INTERESTS

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### *Theory/Methods*

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

### *Applications*

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

## PROFESSIONAL POSITIONS

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Assistant Professor, Department of Statistics 2020-present  
North Carolina State University

Graduate Student Research Assistant, Department of Biostatistics 2015-2020  
University of Michigan  
Advisor: Karen E. Peterson, DSc and Peter X.-K. Song, PhD (2015-2018); Jian Kang, PhD (2018-2020)

## EDUCATION

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PhD Biostatistics 2020  
University of Michigan

Thesis: "Distributed estimation and inference for the analysis of big biomedical data"

Advisor: Peter X.-K. Song, PhD

MSc Biostatistics 2016  
University of Michigan

## AWARDS & HONORS

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1. *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)
2. *Excellence in Research Award*, awarded annually to one student in recognition of research excellence. Department of Biostatistics, University of Michigan (2019)
3. *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)
4. *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)
5. *Rackham Conference Travel Grant*, University of Michigan (2016, 2017, 2018, 2019)
6. *Outstanding First-Year Masters Student*, Department of Biostatistics, University of Michigan (2015)
7. *First Class Honors*, McGill University (2014)
8. *Natural Sciences and Engineering Research Council of Canada (NSERC) Undergraduate Student Research Award (USRA)*, McGill University (2013)
9. *J W McConnell Scholarship* (major award), McGill University (2011-2013)

## PUBLICATIONS

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### *Peer-reviewed journal articles*

1. **Hector EC**, Song PXX. Doubly distributed supervised learning and inference with high-dimensional correlated outcomes. Accepted, *Journal of Machine Learning Research* (2020+).
2. **Hector EC**, Song PXX. A distributed and integrated method of moments for high-dimensional correlated data analysis. *Journal of the American Statistical Association* (2020+). doi: 10.1080/01621459.2020.1736082.

3. 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. Jansen EC, **Hector EC**, Goodrich JM, Cantoral A, Téllez-Rojo MM, Basu N, Song P XK, Peterson KE. Mercury exposure in relation to sleep duration, timing, and fragmentation among adolescents in Mexico City.
2. **Hector EC**, Song P XK. Joint integrative analysis of multiple data sources with correlated vector outcomes.
3. Goodrich JM, **Hector EC**, Tang L, Labarre JL, Dolinoy DC, Mercado-Garcia A, Cantoral A, Song P XK, Téllez-Rojo MM, Peterson KE. Integrative analysis of gene-specific DNA methylation and untargeted metabolomics data from the ELEMENT cohort

## **SOFTWARE**

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*R packages*

1. DIQIF: Performs joint integrative regression analysis of multiple data sources with correlated vector outcomes. Regression parameters from each data source are estimated using quadratic inference functions, and parameters are selectively combined following a pre-specified partition using a meta-estimator similar in spirit to Hansen's generalized method of moments.
2. DDIMM: Performs doubly distributed and integrated method of moments regression for high-dimensional correlated responses. Outcomes and subjects are divided into blocks that are analysed using composite likelihood or generalized estimating equations. Block estimates are combined using a meta-estimator similar in spirit to Hansen's generalized method of moments.
3. 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).

## **TEACHING**

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**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)

## **PRESENTATIONS**

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### *Oral*

1. Distributed inference with correlated outcomes (invited). Department of Statistics Seminar (2019). North Carolina State University. Raleigh, North Carolina.
2. 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. Doubly distributed and integrated inference for correlated data with heterogeneous parameters. Joint Statistical Meetings (JSM) (2019). Denver, Colorado.
4. 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. 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. 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. Regression analysis for high-dimensional correlated outcomes. Joint meeting (2017). University of Notre Dame. South Bend, Indiana.

### *Poster*

1. Distributed quadratic inference functions. Joint Statistical Meetings (JSM) (2020). Held virtually.
2. A doubly distributed and integrated method of moments for high-dimensional correlated data analysis. Joint Statistical Meetings (JSM) (2018). Vancouver, Canada.
3. Regression analysis for high-dimensional correlated outcomes. Spatial Statistics Conference (2017). University of Lancaster. Lancaster, England.
4. Change in variance of IGF2 gene methylation associated with three metabolites. ENAR Spring Meeting (2016). Austin, Texas.

*Other*

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

## **SERVICE**

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University of Michigan, School of Public Health

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