

# BORA JIN

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 Department of Statistical Science, Duke University, Durham, NC 27708

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## RESEARCH INTERESTS

Environmental health, spatial statistics, multivariate data, hierarchical models, latent variables, Bayesian methods

## EDUCATION

### Ph.D. Candidate in Statistical Science

Duke University

Advisors: Amy H. Herring, David Dunson

**2018 – 2022 (expected)**

Durham, NC, USA

### Master of Applied Statistics

Korea University, 4.25 Grade Point Average (4.5 Scale)

**2015 – 2017**

Seoul, SOUTH KOREA

### Bachelor of Economics in Statistics

Korea University, 4.3 Grade Point Average (4.5 Scale)

**2011 – 2015**

Seoul, SOUTH KOREA

## RESEARCH EXPERIENCE

***Effects of Short-term Air Pollution on COVID-19***  
*with Dunson, D.*

**Present**

- Build a Bayesian model to predict effects of PM2.5 with and without wildfires.
- Include information about dynamics of wildfires and their progression into a Gaussian process (GP) using multiple directed acyclic graphs (DAG).
- Investigate the short-term effect of PM2.5 on respiratory diseases including COVID-19.

***Prediction for Per- and polyfluoroalkyl Substances in relation to Stream Networks***  
*with Herring, A.H.*

**Present**

- Develop a predictive spatial model for per- and polyfluoroalkyl substances (PFAS) in public water system (PWS) along with uncertainty quantification.
- Identify upstream and downstream information of PWSs in relation to the nearest stream network and construct a corresponding DAG.
- Fit a multivariate GP using the DAG, incorporating external factors such as known sources or known relationship between PFAS compounds.

***Bayesian Matrix Completion for Hypothesis Testing***

**2019 – 2020**

*with Dunson, D., Rager, J.E., Reif, D., Engel, S.M., Herring, A.H.*

- Adapted Bayesian heteroscedastic nonparametric regression to a multiple hypothesis testing framework.
- Imposed a generalized latent factor model to form a non-exchangeable prior for testing.
- Developed a matrix completion method for a latent matrix.
- Tackled sparsity of the ToxCast data using hierarchical framework.
- Enabled prediction for non-tested chemical's activity.
- Broadened the definition of activity including heteroscedasticity.

***Master's thesis on Bayesian Methods***  
***Korea University***

**March 2015 – February 2017**  
**Seoul, SOUTH KOREA**

- Applied Bayesian inference for a seemingly unrelated regression model and examined novel statistical methods on an extended instrumental variables model with random effects using the MCMC method.
- Employed the extension to a nonparametric model using cosine basis functions and the Dirichlet process location-scale mixture for a great deal of flexibility on the proposed model.
- Conducted a real data application explaining Annex I Parties variations in compliance to the Kyoto Protocol.

***Prediction of Carbon Emissions in Industrial Setting***  
***Korean Environment Ministry***

**June 2016 – August 2016**  
**Seoul, SOUTH KOREA**

- Trained toward a generalist dealing with global environmental issues in both national and international settings through the 8<sup>th</sup> International Environmental Expert Training Program.
- Applied statistical prediction analysis in studying afforestation practices within industrial complex areas.
- Developed strategic programs to implement carbon reduction targets of industrial complexes.

***Clustering of Cancer Patients' Symptoms***  
***College of Nursing at Chungnam National University***

**March 2016 – August 2016**  
**Seoul, SOUTH KOREA**

- Conducted clustering analysis to see if symptoms are divided into particular clusters as expected in a theory.
- Measured the effect of symptom clusters on the quality of life through physical functions.
- Provided expertise on all aspects from the interpretation of statistical results to the presentation of statistics and graphics.

***Emotionality of Language in Online Platforms***  
***MezzoMedia & SungKyunKwan University***

**October 2014 – March 2015**  
**Seoul, SOUTH KOREA**

- Contributed to the development of a Korean morphological analyser.
- Embedded factor analysis and principal component analysis to determine appropriate weights of frequently used morphemes based on their verbal and social context.
- Designed and interpreted quantitative research examining the emotionality of language in online platforms.

## **WORK EXPERIENCE**

### **ENVIRONMENTAL STATISTICS**

***Internship in Chemicals and Waste***  
***UN Environment***

**February 2017 – August 2017**  
**Geneva, SWITZERLAND**

- Managed national reports that Parties are obliged to submit under Basel and Stockholm Conventions and analysed national reporting data so as to identify regional patterns and temporal trends.
- Designed a query system to facilitate proper visualizations and the use of collected data from national reports.
- Participated in the formulation of indicators with regards to Sustainable Development Goals.

## **BIG DATA & FINANCE**

***Internship in the Division of Budget and Finance  
International Atomic Energy Agency***

**January 2018 – July 2018  
Vienna, AUSTRIA**

- Managed data compliance of requests for all types of procurement and payment in the Agency.
- Analysed collected data as a member of Master Data Management Team.
- Assisted a clean-up project of the Agency's bank and branch pages through Oracle sql and MS Access.
- Published monthly infographics on activities of the whole division.

***Internship in Banking and Finance, Market Surveillance Department  
Korea Exchange (KRX)***

**June 2014 – July 2014  
Seoul, SOUTH KOREA**

- Focused upon the detection of unfair transactions, particularly with regards to high turnover volume accounts.
- Conducted data management including updating, arranging and organising big data.
- Participated in developing case-specific restrictions and market-wide regulatory practices.

## **TEACHING EXPERIENCE**

***Teaching Assistant  
Duke University***

**January 2019 – May 2019  
Durham, NC, USA**

- Statistics (STA250)

***Teaching Assistant  
Korea University***

**September 2015 – December 2015  
Seoul, SOUTH KOREA**

- Introduction to Probability Theory (STAT201)
- Topics in Mathematical Statistics (STAT412)

***Mentoring in Mathematics  
Samsung***

**January 2013  
Seoul, SOUTH KOREA**

## **KEY SKILLS**

- R, MATLAB, Python, SAS, MySQL, MS Office, LATEX
- English (Professional Proficiency), Korean (Native)

## **HONOURS**

Global Korea Scholarship	2018 – 2020
First Prize in the Graduate Paper Section at the Korean Statistical Society's Annual Conference	2016
Yangcheon Foundation Scholarship for Academic Excellence	2016
So-Mang Presbyterian Church Scholarship for Academic Merit	2016
Second Prize in the Graduate Poster Section at the Korean Statistical Society's Annual Conference	2015
The Dean's Award for Academic Merit	2011 – 2014
Ministry of Gender Equality and Family Affairs Minister's Honour Award	2012
Seoul National University President's Prize	2011

## **PUBLICATIONS**

**Jin, B.**, Dunson, D., Rager, J.E., Reif, D., Engel, S.M., Herring, A.H. (2020+). Bayesian Matrix Completion for Hypothesis Testing. *submitted* [ArXiv](#)

## **WORKING PAPERS**

Jin, B., Dunson, D. Effects of short-term air pollution on COVID-19.

Jin, B., Herring, A.H. Prediction for Per- and polyfluoroalkyl substances in relation to stream networks.