

# NATHAN GENE SANDHOLTZ

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## CONTACT INFO

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## RESEARCH INTERESTS

Inverse optimization (inference and uncertainty quantification), decision analysis, Markov decision processes, and Bayesian modeling methods. Application areas include sports analytics, environmental applications, and cognitive science.

## EDUCATION

Simon Fraser University Aug 2020  
*Ph.D.*, Statistics Vancouver, BC  
– Advisors: Dr. Luke Bornn & Dr. Derek Bingham  
– Thesis: Modeling human decision-making in spatial and temporal systems

Brigham Young University Apr 2016  
*M.Sc.*, Statistics Provo, UT  
– Advisors: Dr. William Christensen & Dr. Candace Berrett  
– Thesis: Bayesian factor analysis with spatio-temporal dependence

Brigham Young University Aug 2012  
*B.Sc.*, Statistics Provo, UT  
– Cum Laude

## PROFESSIONAL POSITIONS

Brigham Young University Sep 2021–pres  
*Assistant Professor of Statistics* Provo, UT

University of Toronto Sep 2020–Aug 2021  
*Postdoctoral Fellow under Timothy Chan* Toronto, ON

Sacramento Kings May 2017–Apr 2020  
*Basketball Operations Analyst* Sacramento, CA

## PUBLICATIONS **Peer-Reviewed**

- 2020 | - Nathan Sandholtz, Jacob Mortensen, and Luke Bornn. Measuring spatial allocative efficiency in basketball. *Journal of Quantitative Analysis in Sports*, 1(ahead-of-print), 2020.
- Nathan Sandholtz and Luke Bornn. Markov decision processes with dynamic transition probabilities: An analysis of shooting strategies in basketball. *Annals of Applied Statistics*, 14(3):1122–1145, 2020.
- Candace Berrett, William F Christensen, Stephan R Sain, Nathan Sandholtz, David W Coats, Claudia Tebaldi, and Hedibert F Lopes. Modeling sea-level processes on the us atlantic coast. *Environmetrics*, 31(4):e2609, 2020

## Other Publications

- 2019 - Nathan Sandholtz, Jacob Mortensen, and Luke Bornn. Chuckers: Measuring lineup shot distribution optimality using spatial allocative efficiency models. *In the 13th Annual MIT Sloan Sports Analytics Conference*, 2019.
- 2018 - Nathan Sandholtz and Luke Bornn. Replaying the NBA. *In the 12th Annual MIT Sloan Sports Analytics Conference*, 2018.
- 2013 - Nathan Sandholtz, Lynn Langton, and Mike Planty. Hate crime victimization, 2003-2011. *U.S. Department of Justice, Special Report*, 2013.

## Working Papers

- 2021+ - Nathan Sandholtz, Yohsuke Miyamoto, Luke Bornn, and Maurice Smith. Inverse Bayesian optimization: Learning human search strategies in a sequential optimization task. <https://arxiv.org/abs/2104.09237>, 2021.
- Nathan Sandholtz, Lucas Wu, Martin Puterman, and Timothy Chan. An inverse optimization analysis of the fourth down decision in football.

## TALKS & POSTERS

### An Inverse Optimization Analysis of the Fourth Down Decision in Football

Oct 2021	BYU Statistics Department	Seminar	Provo, UT
Oct 2021	INFORMS Annual Meeting	Contributed	Virtual
Oct 2021	New England Symposium on Statistics in Sports	Contributed	Virtual
Jun 2021	CORS Annual Meeting	Contributed	Virtual
Feb 2021	Zelus Analytics	Invited	Virtual
Feb 2021	Applied Optimization Lab Meeting	Contributed	Virtual

### Learning Human Optimization Strategies in an Exploration vs. Exploitation Search Task

Jun 2021	CORS Annual Meeting	Contributed	Virtual
Sep 2020	Applied Optimization Lab Meeting	Contributed	Virtual
Aug 2020	Joint Statistical Meetings	Contributed	Virtual
Jun 2020	WNAR Student Paper Competition	Contributed	Virtual
Feb 2020	Joint UBC/SFU Statistics Seminar	Contributed	Vancouver, BC
Nov 2019	BYU Statistics Department	Seminar	Provo, UT

### Measuring Spatial Allocative Efficiency in Basketball

Oct 2020	Carnegie Mellon Sports Analytics Conference	Invited	Virtual
Sep 2019	New England Symposium on Statistics in Sports	Contributed	Boston, MA
Jun 2019	SFU Sports Analytics Group	Invited	Burnaby, BC
May 2019	Statistical Society of Canada Annual Conference	Invited	Calgary, AB
Feb 2019	Sloan Sports Analytics Conference	Poster	Boston, MA

### MDPs with Dynamic Transition Probabilities: Shooting Strategies In Basketball

Jul 2018	Joint Statistical Meetings	Contributed	Vancouver, BC
Jun 2018	Statistical Society of Canada Student Conference	Poster	Montreal, QC
Feb 2018	Sloan Sports Analytics Conference	Poster	Boston, MA
Sep 2017	Joint UBC/SFU Statistics Seminar	Contributed	Vancouver, BC
Sep 2017	New England Symposium on Statistics in Sports	Contributed	Boston, MA
May 2017	Statistical Society of Canada Student Conference	Contributed	Winnepeg, MB
Sep 2016	Cascadia Symposium on Statistics in Sports	Poster	Vancouver, BC

Bayesian Factor Analysis with Spatiotemporal Dependence Applied to Sea Level Rise

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Oct 2016	Joint UBC/SFU Statistics Seminar	Contributed	Vancouver, BC
Mar 2016	ENVR/EnviBayes	Poster	Columbus, OH
Mar 2015	BYU Student Research Conference	Contributed	Provo, UT
Mar 2013	BYU Student Research Conference	Contributed	Provo, UT

**TEACHING  
EXPERIENCE**

**Department of Statistics and Actuarial Science, SFU**

– *Teaching Assistant:*

- Introduction to Stochastic Processes (Spring 2018)

– *Statistics Workshop* (Fall 2016, Spring 2019)

- Provided assistance for over 6 undergraduate statistics courses

**Department of Statistics, BYU**

– *Teaching Assistant:*

- Mixed Models (Winter 2016)
- Linear Models (Fall 2015)
- Methods of Survey Sampling (Fall 2012)
- Inference (Winter 2012)
- Discrete Probability (Winter 2012)

**SERVICE**

**Peer Review**

2021		<i>International Journal of Forecasting, Annals of Operations Research</i>
2020		<i>International Journal of Forecasting, Harvard Data Science Review</i>

**Conferences**

- Session organizer and chair, INFORMS (10/2021)
- Co-organizer, Semi-annual Joint UBC/SFU Statistics Seminar (03/2019)
- Session chair, Joint Statistical Meetings (07/2019)
- Organizer, Semi-annual Joint UBC/SFU Statistics Seminar (11/2018)

**Graduate School**

- Vice President, SFU Statistics Graduate Student Caucus (2017–2019)
- Social Event Coordinator, SFU Statistics Graduate Student Caucus (2016–2017)
- Vice President, BYU Mu Sigma Rho Honors Society (2012–2013)

**OTHER  
EMPLOYMENT**

**Internships**

- US Department of Justice, Bureau of Justice Statistics Summer 2012
- Wavetronix Summer 2015

**Research Assistantships**

- Martin Puterman (*University of British Columbia*) Summer 2019
- Kristi Phillips (*BYU*) Summer 2011

**HONORS &  
AWARDS**

**Graduate**

- Randy Sitter Graduate Scholarship, SFU Dept. of Statistics, \$3600 CAD (02/2020)
- Professional Development Grant, SFU Grad Student Society, \$500 CAD (02/2018)
- Best Paper Award, SSC Student Conference, \$150 CAD (05/2017)
- Special Graduate Entrance Scholarship, SFU, \$18000 CAD annually (2016–2020)
- Provost Prize of Distinction, SFU, \$4500 CAD annually (2016–2020)

**Undergraduate**

- Junior Fellow, Joint Program in Survey Methodology, \$5000 USD (06/2012)

- Harold Glen Clark Scholarship, BYU, full-tuition, (2011–2012)
- Dean's List, BYU College of Physical and Mathematical Sciences, (2008 & 2011)
- Robert C. Byrd Honors Scholarship, \$1500 annually USD (2007–2011)
- Athletic Scholarship, Cross-country, BYU-Hawaii, half-tuition (Fall 2007)