

NATHAN SANDHOLTZ

CONTACT INFO

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RESEARCH INTERESTS

Inverse optimization, Markov decision processes, decision analysis, and Bayesian modeling. 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
Department of Statistics Provo, UT
Assistant Professor

University of Toronto Sep 2020–Aug 2021
Department of Mechanical and Industrial Engineering Toronto, ON
Postdoctoral Fellow

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

PUBLICATIONS **Peer-Reviewed**

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|------|---|--|
| 2023 | - | Timothy C. Y. Chan, Craig Fernandes, Albert Loa, and Nathan Sandholtz**. Moneyball for murderball: Using analytics to construct lineups in wheelchair rugby. <i>INFORMS Transactions on Education</i> , In press, 2023. |
| | - | Nathan Sandholtz, Yohsuke Miyamoto, Luke Bornn, and Maurice A Smith. Inverse bayesian optimization: Learning human acquisition functions in an exploration vs exploitation search task. <i>Bayesian Analysis</i> , 18(1):1–24, 2023. |
| 2020 | - | Nathan Sandholtz, Jacob Mortensen, and Luke Bornn. Measuring spatial allocative efficiency in basketball. <i>Journal of Quantitative Analysis in Sports</i> , 16(4):271–289, 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

- 2023+ - Ethan Baron, Nathan Sandholtz, Devin Pleuler, and Timothy Chan. Extracting predictive value from off-target shots in soccer. *Submitted*.
- Nathan Sandholtz, Lucas Wu, Martin Puterman, and Timothy Chan. Risk measure inference in markov decision processes: An application to the fourth down decision in football.
- Timothy Chan, Nathan Sandholtz, and Nasrin Yousefi**. Uncertainty quantification in inverse optimization.
- Nathan Sandholtz, Ron Hager, Stephanie Kovalchik, and Gilbert Fellingham. Learning noise-informed optimal serving strategies in tennis.

** Denotes the authors are listed alphabetically.

TALKS & POSTERS

Learning Noise-informed Optimal Serving Strategies in Tennis

Jun 2022	ISBA World Meeting	Invited	Montreal, QC
Jun 2022	CORS/INFORMS International Conference	Contributed	Vancouver, BC

Uncertainty Quantification in Inverse Optimization

Jun 2022	ISBA World Meeting	Poster	Montreal, QC
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Risk Measure Inference in MDPs: An Analysis of the Fourth Down Decision in Football

Oct 2022	BYU IDeA Labs	Invited	Provo, UT
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 Conference	Contributed	Virtual
Feb 2021	Zelus Analytics	Invited	Virtual

Inverse Bayesian Optimization: Learning Human Acquisition Functions

Jun 2021	CORS Annual Conference	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

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

HONORS & AWARDS

- INFORMS 2022 Case Competition Winner, \$500 USD (10/2022)
- 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)
- Junior Fellow, Joint Program in Survey Methodology, \$5000 USD (06/2012)

TEACHING

Instructor of Record

- Stat 250 - Applied R Programming, BYU
 - Semesters taught: Winter 2022, Winter 2023
 - Topics covered: basic programming skills; data cleaning and wrangling in R; introductory statistical analysis and graphics; simulation of fundamental statistical concepts.

Graduate Teaching Assistance

- Statistics Workshop, SFU (Fall 2016, Spring 2019)

– Teaching Assistant:

- Stat 380 - Introduction to Stochastic Processes, SFU (Spring 2018)
- Stat 537 - Mixed Models, BYU (Winter 2016)
- Stat 535 - Linear Models, BYU (Fall 2015)
- Stat 234 - Methods of Survey Sampling, BYU (Fall 2012)
- Stat 340 - Inference, BYU (Winter 2012)
- Stat 240 - Discrete Probability, BYU (Winter 2012)

**STUDENT
MENTORING**

	Degree	Role	Location	Dates
Jacob Miller	Masters	Committee Chair	BYU	2022-pres
Spencer Young	Undergrad	Research mentor	BYU	2022
Jared Clark	Masters	Committee Member	BYU	2022
Ryan Hanson	Masters	Committee Chair	BYU	2021-pres
Albert Loa	Masters	Co-advisor	U. of Toronto	2020-2022
Coco Huang	Masters	Co-advisor	U. of Toronto	2020-2022
Ethan Baron	Undergrad	Research mentor	U. of Toronto	2021-2022
Zhekai Pang	Undergrad	Research mentor	U. of Toronto	2021
Kevin Zhu	Masters	Research mentor	U. of Toronto	2020

SERVICE

Professional Service

- Program Chair Elect, ASA Section on Statistics in Sports (2023)
- 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)

Departmental Service

- Curriculum committee, BYU (2022-2023)
- Scholarships committee, BYU (2021-2022)
- Sports Analytics Reading Group Organizer (Winter 2022, 2023)

Peer Review

- 2023: *Data Mining and Knowledge Discovery, Advances in Statistical Analysis*
- 2022: *Minds and Machines*
- 2021: *International Journal of Forecasting, Annals of Operations Research*
- 2020: *Harvard Data Science Review*

**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