

NATHAN SANDHOLTZ

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Provo, UT 84602

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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|------|---|--|
| 2024 | - | Ethan Baron, Nathan Sandholtz, Devin Pleuler, and Timothy CY Chan. Miss it like messi: Extracting value from off-target shots in soccer. <i>To appear in Journal of Quantitative Analysis in Sports</i> , 2024. |
| | - | Timothy CY Chan, Craig Fernandes, Albert Loa, and Nathan Sandholtz. Case article—moneyball for murderball: Using analytics to construct lineups in wheelchair rugby. <i>INFORMS Transactions on Education</i> , 24(2):175–181, 2024. |
| 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. *Journal of Quantitative Analysis in Sports*, 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

- 2023 - Albert Loa, Craig Fernandes, Nathan Sandholtz, and Timothy C. Y. Chan. How to get away with murderball: An end-to-end analytics case study to construct lineups in wheelchair rugby. *OR/MS Today*, 50(2):29–34, 2023.
- 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

- 2024+ - Nathan Sandholtz, Lucas Wu, Martin Puterman, and Timothy Chan. Learning risk preferences in markov decision processes: An application to the fourth down decision in football. *Submitted to Annals of Applied Statistics*.
- Timothy Chan, Nathan Sandholtz, and Nasrin Yousefi**. Uncertainty quantification in inverse optimization. *In progress*.
- Nathan Sandholtz, Ron Hager, Stephanie Kovalchik, and Gilbert Fellingham. An experiment to investigate the spatial component of serving strategy in tennis. *In progress*.
- Nathan Sandholtz, Stephanie Kovalchik, Peter Tea, and Gilbert Fellingham. Noise-informed optimal serving strategies in tennis. *In progress*.
- Nathan Sandholtz, Connor Thompson, and Jacob Miller. Memory learning: A computational approach to estimating memory bias in human decision making. *In progress*.

** Denotes the authors are listed alphabetically.

PRESENTATIONSMoneyball for Murderball: Using Analytics to Construct Lineups in Wheelchair Rugby

Oct 2023	INFORMS 2023	Invited	Phoenix, AZ
Aug 2023	JSM 2023	Invited	Toronto, ON

Noise-informed Optimal Serving Strategies in Tennis

Feb 2024	Dagstuhl Seminar	Invited	Wadern, GER
Jun 2022	ISBA World Meeting	Invited	Montreal, QC
Jun 2022	CORS/INFORMS International Conf.	Contributed	Vancouver, BC

Uncertainty Quantification in Inverse Optimization

Jun 2022	ISBA World Meeting	Poster	Montreal, QC
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Learning Risk Preferences in MDPs: An Application to the Fourth Down Decision

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 Symp. on Statistics in Sports	Invited	Virtual
Jun 2021	CORS Annual Conf.	Contributed	Virtual
Feb 2021	Zelus Analytics	Invited	Virtual

Inverse Bayesian Optimization: Learning Human Acquisition Functions

Apr 2023	SIAM Northern States Section Conf.	Invited	Logan, UT
Jun 2021	CORS Annual Conf.	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 Conf.	Invited	Virtual
Sep 2019	New England Symp. on Statistics in Sports	Invited	Boston, MA
Jun 2019	SFU Sports Analytics Group	Invited	Burnaby, BC
May 2019	Statistical Society of Canada Annual Conf.	Invited	Calgary, AB
Feb 2019	Sloan Sports Analytics Conf.	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 Conf.	Poster	Montreal, QC
Feb 2018	Sloan Sports Analytics Conf.	Poster	Boston, MA
Sep 2017	Joint UBC/SFU Statistics Seminar	Contributed	Vancouver, BC
Sep 2017	New England Symp. on Statistics in Sports	Invited	Boston, MA
May 2017	Statistical Society of Canada Student Conf.	Contributed	Winnipeg, MB
Sep 2016	Cascadia Symp. 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 Conf.	Contributed	Provo, UT
Mar 2013	BYU Student Research Conf.	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.
- Stat 330 - Statistical Modeling 2, BYU
 - Semesters taught: Fall 2023, Winter 2024
 - Topics covered: Simple linear regression; multiple linear regression; logistic regression; classification and regression trees.

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
Xela Marchant	Masters	Research mentor	BYU	2024-pres
Connor Thompson	Undergrad	Research mentor	BYU	2024-pres
Sarah Whitaker	Undergrad	Research mentor	BYU	2023-pres
Brylee Wilcox	Undergrad	Research mentor	BYU	2023-pres
Sam Lee	Undergrad	Research mentor	BYU	2023-pres
Tyler Duke	Undergrad	Research mentor	BYU	2023-pres
Tyler Ward	Masters	Committee member	BYU	2023-pres
Elissa Bailey	Masters	Committee member	BYU	2023-pres
Ryan Hilton	Masters	Committee member	BYU	2023-pres
Will Melville	PhD	Committee member	BYU	2023-pres
Garrett Duncan	Masters	Committee member	BYU	2022-2023
Evan Miller	Undergrad	Research mentor	BYU	2022-2023
Garrett Duncan	Masters	Committee member	BYU	2022-2023
Jacob Miller	Masters	Committee chair	BYU	2022-2023
Spencer Young	Undergrad	Research mentor	BYU	2022
Jared Clark	Masters	Committee member	BYU	2022
Ryan Hanson	Masters	Committee chair	BYU	2021-2023
Ethan Baron	Undergrad	Research mentor	U. of Toronto	2021-2023
Zhekai Pang	Undergrad	Research mentor	U. of Toronto	2021
Albert Loa	Masters	Co-advisor	U. of Toronto	2020-2022
Coco Huang	Masters	Co-advisor	U. of Toronto	2020-2022
Kevin Zhu	Masters	Research mentor	U. of Toronto	2020

SERVICE

Professional Service

- Associate Editor, Journal of Quantitative Analysis in Sports (2023-pres)
- Program Chair, ASA Section on Statistics in Sports (2024)
- 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

- Seminar Organizing committee, BYU (2023-2024)
- Curriculum committee, BYU (2022-2024)
- 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, Journal of the Royal Statistical: Series C*
- 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