Nathan Sandholtz

2181 WVB
Department of Statistics
Brigham Young University
Provo, UT 84602

Email: nsandholtz@stat.byu.edu
Website: https://statistics.byu.edu/directory/sandholtz-nate

Education

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

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

Brigham Young University — Provo, UT
B.Sc., Statistics, cum laude — *Aug 2012*

Brigham Young University—Hawaii — Laie, HI
2007

Experience

Assistant Professor — Provo, UT
Department of Statistics, Brigham Young University — *September 2021–Present*

Postdoctoral Fellow — Toronto, ON
Department of Mechanical and Industrial Engineering, University of Toronto — *September 2020–August 2021*
Advisor: Dr. Timothy C.Y. Chan

Research Assistant — Vancouver, BC
University of British Columbia — *May-August 2019*
Advisor: Dr. Martin Puterman

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

Graduate Student Researcher — Burnaby, BC
Simon Fraser University — *September 2016–August 2020*
Advisor: Dr. Luke Bornn

Internship — Provo, UT
Wavetronix LLC — *May-August 2015*

Graduate Student Researcher — Provo, UT
Brigham Young University — *January 2015–May 2016*
Advisors: Dr. Candace Berrett and Dr. William Christensen — *September 2012–May 2013*

Internship — Provo, UT
US Department of Justice, Bureau of Justice Statistics — *May-August 2012*

Research Assistant — Provo, UT
Brigham Young University — *May-August 2011*
Advisor: Dr. Kristi Phillips

Publications

Journal Articles

Robin M Pfister, Benjamin F Pfister, Ronald L Hager, **Nathan Sandholtz**, Daniel Abulafia, and David Bradshaw. From research to practice: bridging the implementation gap on the use of tranexamic acid in total knee arthroplasty. *Journal of Orthopaedic Surgery and Research*, 20(1):111, 2025

Nathan Sandholtz, Lucas Wu, Martin Puterman, and Timothy C. Y. Chan. Learning risk preferences in Markov decision processes: An application to the fourth down decision in the National Football League. *The Annals of Applied Statistics*, 18(4):3205 – 3228, 2024

Ethan Baron[††], **Nathan Sandholtz**, Devin Pleuler, and Timothy C. Y. Chan. Miss it like Messi: Extracting value from off-target shots in soccer. *Journal of Quantitative Analysis in Sports*, 20(1):37–50, 2024

Timothy C. Y. Chan, Craig Fernandes, Albert Loa, and **Nathan Sandholtz****. Case article—moneyball for murderball: Using analytics to construct lineups in wheelchair rugby. *INFORMS Transactions on Education*, 24(2):175–181, 2024

Nathan Sandholtz, Yohsuke Miyamoto, Luke Bornn, and Maurice A Smith. Inverse bayesian optimization: Learning human acquisition functions in an exploration vs exploitation search task. *Bayesian Analysis*, 18(1):1–24, 2023

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. *The 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

Conference Proceedings

Braden Eberhard, Jacob Miller[†], and **Nathan Sandholtz**. A machine learning approach to throw value estimation in professional ultimate frisbee. *In the 19th Annual MIT Sloan Sports Analytics Conference*, 2025

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

Nathan Sandholtz and Luke Bornn. Replaying the NBA. *In the 12th Annual MIT Sloan Sports Analytics Conference*, 2018

Other Publications

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

Nathan Sandholtz, Lynn Langton, and Mike Planty. Hate crime victimization, 2003-2011. *U.S. Department of Justice, Special Report*, 2013

Working Papers

Timothy C.Y. Chan, **Nathan Sandholtz**, and Nasrin Yousefi**. Uncertainty quantification in data-driven inverse optimization via bayesian inference. *Submitted*

Nathan Sandholtz, Ryan Hanson[†], Ron Hager, Stephanie Kovalchik, and Gilbert Fellingham. Stated, realized, and optimal aiming strategies for the tennis serve: Experimental evidence from collegiate athletes

Jared Fisher, **Nathan Sandholtz**, and Tyler Barlow[†]. A fatigue-aware adjusted plus-minus model for ncaa basketball

Nathan Sandholtz, Jared Fisher, Brylee Wilcox[†], and Sam Lee[†]. Is cross country a team sport? a bayesian hierarchical analysis of attached vs. unattached runners

Connor Thompson†, **Nathan Sandholtz**, Jacob Miller†, Bo Lin, Brian Hartman, and Timothy C. Y. Chan. A data-reweighting approach to the inverse markov decision process with unknown transition probabilities

† Mentored Brigham Young University student co-author
†† Mentored University of Toronto student co-author
∗∗ Denotes the authors are listed alphabetically.

Grants/Funding

Internal

Proposal Title	AI-Assisted Decision-making for Stochastic Spatial Tasks with Imperfect Execution
Funding Source	BYU Interdisciplinary Research (IDR) Origination Awards
My Role	Co-PI
Collaborators	Chris Archibald (PI), Stefania Ashby (Co-PI)
Year Submitted	2025
Proposed Budget	$40,000
Result	Funded

Presentations

Is Cross Country a Team Sport? A Statistical Perspective

BYU Kennedy Center Lecture Series	Seminar	*Mar 2026*	*Provo, UT*
Symposium on Data Science & Statistics	Contributed	*May 2025*	*Salt Lake City, UT*

Investigating the Spatial Component of Serving Strategies in Tennis

Joint Statistical Meetings	Invited	*Aug 2025*	*Nashville, TN*
International Conference on Statistics and Data Science	Invited	*Jun 2025*	*Vancouver, BC*
Conference on Predictive Inference in Sports Statistics	Invited	*Jun 2025*	*Ames, IA*
Cascadia Symposium on Statistics in Sports	Invited	*Sep 2024*	*Vancouver, BC*
BYU Statistics Department	Seminar	*Sep 2024*	*Provo, UT*
Joint Statistical Meetings	Contributed	*Aug 2024*	*Portland, OR*
Dagstuhl Seminar	Invited	*Feb 2024*	*Wadern, GER*
ISBA World Meeting	Invited	*Jun 2022*	*Montreal, QC*
CORS/INFORMS International Conference	Contributed	*Jun 2022*	*Vancouver, BC*

Uncertainty Quantification in Inverse Optimization

Joint Statistical Meetings	Contributed	*Aug 2026*	*Boston, MA*
ISBA World Meeting	Poster	*Jun 2022*	*Montreal, QC*

Learning Risk Preferences in MDPs: An Application to the Fourth Down Decision in the NFL

FEPSAC Congress	Invited	*Jul 2024*	*Innsbruck, AUS*
BYU IDeA Labs	Invited	*Oct 2022*	*Provo, UT*
BYU Statistics Department	Seminar	*Oct 2021*	*Provo, UT*
INFORMS Annual Meeting	Contributed	*Oct 2021*	*Virtual*
New England Symposium on Statistics in Sports	Invited	*Oct 2021*	*Virtual*
CORS Annual Conference	Contributed	*Jun 2021*	*Virtual*
Zelus Analytics	Invited	*Feb 2021*	*Virtual*

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

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

Inverse Bayesian Optimization: Learning Human Acquisition Functions

SIAM Northern States Section Conference	Invited	*Apr 2023*	*Logan, UT*

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

Measuring Spatial Allocative Efficiency in Basketball

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

MDPs with Dynamic Transition Probabilities: Shooting Strategies in Basketball

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

Bayesian Factor Analysis with Spatiotemporal Dependence Applied to Sea Level Rise

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

Teaching

Courses taught

Stat 497R - IDR Research Group in Stochastic Spatial Tasks	*Fall 2025, Winter 2026*
Stat 251 - Introduction to Bayesian Statistics, BYU	*Fall 2025*
Stat 497R - Sports Analytics Reading Group, BYU	*Fall 2024, Winter 2025*
Stat 330 - Statistical Modeling 2, BYU	*Fall 2023, Winter 2024, Fall 2024, Winter 2025, Fall 2025*
Stat 250 - Applied R Programming, BYU	*Winter 2022, Winter 2023, Winter 2025, Winter 2026*

Teaching Assistant

Stat 380 - Introduction to Stochastic Processes, SFU	*Spring 2018*
Statistics Workshop, SFU	*Fall 2016, Spring 2019*
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

Advisor

Brett Pedersen, MS Statistics — September 2025–Present
Project title: *TBD (Modeling Serve Execution and Optimality in the Australian Open)* — *Brigham Young University*

Connor Thompson, MS Statistics — September 2024–Present
Project title: *Importance Learning: A Data Driven Approach to the Inverse MDP* — *Brigham Young University*

Jacob Miller, MS Statistics — January 2022–April 2023
Project title: *A Novel Inverse Optimization Approach to the Fourth Down Decision in Football* — *Brigham Young University*

Ryan Hanson, MS Statistics — September 2021–April 2023
Project title: *Noise-Informed Optimums Expanded to Tennis* — *Brigham Young University*

On Committee

Tyler Barlow, MS Statistics — September 2025–pres
Project title: *TBD (Fatigue Adjusted Plus-Minus)* — *Brigham Young University*

Jared Grooms, MS Statistics — September 2024–April 2025
Project title: *"Modeling Likelihood Differences in Professional Tennis Rally Distributions"* — *Brigham Young University*

Maycee Robison, MS Statistics — September 2024–April 2025
Project title: *"Bootstrapping Failure Time Distributions Through a Multidimensional Convolutional Method"* — *Brigham Young University*

Will Melville, PhD Computer Science — September 2022–December 2025
Dissertation title: *Game-Theoretically Optimal Strategies in Baseball* — *Brigham Young University*

Tyler Ward, MS Statistics — September 2023–April 2024
Project title: *"Using Shot Location Transitions to Discover Tennis Player Strategies"* — *Brigham Young University*

Elissa Bailey, MS Statistics — September 2023–April 2024
Project title: *"Structure Learning of Bayesian Networks from Posterior Sample Inference"* — *Brigham Young University*

Ryan Hilton, MS Statistics — September 2023–April 2024
Project title: *"Comparison of Methods to Create Functional Brain Connectivity Networks"* — *Brigham Young University*

Garrett Duncan, MS Statistics — September 2022–April 2023
Project title: *"COVID-19 hotspot detection in a university setting"* — *Brigham Young University*

Jared Clark, MS Statistics — September 2021–April 2022
Project title: *"A Multidimensional Convolutional Bootstrapping Method for the Analysis of Degradation Data"* — *Brigham Young University*

Albert Loa, MS Statistics — September 2020–December 2022
Project title: *"Simulation-based Analysis of Points Systems in Accumulative and Independent Sports"* — *University of Toronto*

Coco Huang, MS Statistics — September 2020–December 2022
Project title: *"Constructing Points Systems in Accumulative and Independent Sports via Bayesian Regression"* — *University of Toronto*

Undergraduate Research Mentoring

Name	Project	Notes	Location	Dates
Chance Day	Optimal PK targets in Soccer		BYU	2025
Hailey Peterson	Optimal PK targets in Soccer		BYU	2025
Sam Balls	Optimal PK targets in Soccer		BYU	2025
Sarah Whitaker	Team Effect in Cross Country	Presented at SDSS 2025	BYU	2023-2025
Brylee Wilcox	Team Effect in Cross Country	Presented at JSM 2025	BYU	2023-2025
Connor Thompson	Data-reweighting Inverse MDP	Presented at JSM 2024	BYU	2024
Sam Lee	Team Effect in Cross Country		BYU	2023-2024
Tyler Duke	Team Effect in Cross Country		BYU	2023-2024
Evan Miller	Tennis Serving Strategy		BYU	2022-2023
Spencer Young	Tennis Serving Strategy		BYU	2022
Ethan Baron	Off-target Shots in Soccer	Co-author on JQAS paper	U. of Toronto	2021-2023
Zhekai Pang	Inverse Optimization UQ		U. of Toronto	2021
Kevin Zhu	NBA Usage Curves		U. of Toronto	2020

Service

Professional Service

- Session co-organizer, JSM (08/2026)
- Abstract reviewer, ASA Virtual Sports Analytics Conference (03/2026)
- NSERC Discovery Grant External Reviewer (09/2025)
- Program Committee Member - Machine Learning and Data Mining for Sports Analytics Workshop / ECML PKDD (2024)
- Program Chair, ASA Section on Statistics in Sports (2024)
- 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)

Editorial Service

- Associate Editor, Journal of Statistics and Data Science in Sports (2026-pres)
- Associate Editor, Journal of Quantitative Analysis in Sports (2023-pres)
- Peer Review:

  2026: *Journal of Sports Analytics, The Annals of Applied Statistics*

  2025: *Journal of Quantitative Analysis in Sports, INFORMS Journal on Data Science*

  2024: *International Journal of Sports Science & Coaching, The Annals of Applied Statistics*

  2023: *Data Mining and Knowledge Discovery, Advances in Statistical Analysis*, *Journal of the Royal Statistical Society: Series C*

  2022: *Minds and Machines*

  2021: *International Journal of Forecasting, Annals of Operations Research*

  2020: *Harvard Data Science Review*

Departmental Service

- Program Stewardship Review Coordinator, BYU (2022-pres)
- Curriculum committee, BYU (2022-pres)
- Learning outcomes coordinator, BYU (2022-pres)
- Stat 250 course coordinator, BYU (2022-pres)
- Sports Analytics Reading Group Organizer (2022-pres)
- Seminar organizing committee, BYU (2023-2025)
- Scholarships committee, BYU (2021-2022)

Honors & Awards

- Kennedy Center Faculty Fellow, Brigham Young University, $4,000 USD (Winter 2026)
- BYU Dept. of Statistics Early Career Research Award, $8,000 USD (2024-2025)
- INFORMS 2022 Case Competition Winner, $500 USD (10/2022)
- Randy Sitter Graduate Scholarship, SFU Dept. of Statistics, $3,600 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, $18,000 CAD annually (2016–2020)
- Provost Prize of Distinction, SFU, $4,500 CAD annually (2016–2020)
- Junior Fellow, Joint Program in Survey Methodology, $5,000 USD (06/2012)