

Sarah M. Weinstein

sarah.weinstein@pennmedicine.upenn.edu • smweinst.github.io

Research interests

statistical methods in neuroimaging, spatial statistics, causal inference, clinical trials.

Education

- 2018 – present **University of Pennsylvania, Perelman School of Medicine** – Philadelphia, PA
PhD, Biostatistics (expected 2023)
Mentors: Russell Shinohara, PhD and Kristin Linn, PhD
Thesis: Extracting and comparing patterns from multimodal neuroimaging data in the presence of nuisance variables.

MS, Biostatistics (2020)
Mentors: Alisa Stephens-Shields, PhD and Alexis Ogdie-Beatty, MD, MSCE
Thesis: Using observational data and propensity score modeling to simulate and improve design of trials in psoriatic arthritis.
- 2012 – 2016 **Columbia University, Columbia College** – New York, NY
BA (Cum Laude), double major in Statistics and Psychology

Awards and honors

- 2020 – 2023 **National Science Foundation Graduate Research Fellowship Program**
Recipient of three-year fellowship in Mathematical Sciences (Biostatistics). Awarded in 2018, funding in effect 2020-2023.
- 2022 **Department of Biostatistics, Epidemiology, and Informatics, University of Pennsylvania**
First place award recipient at Department’s annual Research Day for flash talk “Penalized Decomposition Using Residuals for Mitigating Nuisance Variables in Multivariate Pattern Analysis.”
- 2021 **American Statistical Association Section on Statistics in Imaging**
Student Paper Award (runner-up) for “A simple permutation-based test of intermodal correspondence.”
- 2017 **Society for Anesthesia and Sleep Medicine**
Second place abstract award.
- 2016 **Columbia University (Columbia College)**
Cum Laude.
- 2012 – 2016 **Columbia University (Columbia College)**
Dean’s List (every semester).

Teaching experience

- Fall 2022 – **Haverford College, Department of Mathematics and Statistics**
Spring 2023 Visiting Instructor of Mathematics and Statistics.

Spring 2020, **University of Pennsylvania, Department of Biostatistics, Epidemiology, and Informatics**
 Spring 2021 Teaching Assistant for Linear and Generalized Linear Models (BSTA 651).

Fall 2015 – **Columbia University, Department of Statistics**
 Spring 2016 Peer tutor in Statistics Help Room for undergraduates.
 Private tutor for undergraduate students enrolled in introductory statistics courses.

Research experience

2019 – present **Univeristy of Pennsylvania** – Philadelphia, PA
 Statistical analyst in research collaborations including topics in neuroscience, psychiatry, neurology, rheumatology.

2016 – 2018 **Hospital for Special Surgery** – New York, NY
 Research Data Analyst in the Department of Anesthesiology, Critical Care, and Pain Management.

2013 – 2016 **Columbia University Medical Center, Department of Psychiatry** – New York, NY
 Undergraduate Research Assistant in the Perinatal Pathways Lab of Catherine Monk, PhD.

Peer-reviewed publications

- 2022 **Penalized Decomposition Using Residuals (PeDecURe) for Feature Extraction in the Presence of Nuisance Variables**
SM Weinstein, C Davatzikos, J Doshi, KA Linn, RT Shinohara, for the Alzheimer’s Disease Neuroimaging Initiative (ADNI).
Biostatistics (accepted).
- 2022 **Impact of a Virtual Wellness Program on Quality-of-Life Measures for Patients Living with MS During the COVID-19 Pandemic.**
 D Jacobs, N Garland, V Zimmerman, **SM Weinstein**, E Reilly.
International Journal of MS Care (accepted).
- 2022 **Voxel-wise Intermodal Coupling Analysis of Two or More Modalities using Local Covariance Decomposition**
 F Hu, **SM Weinstein**, EB Baller, AM Valcarcel, A Adebimpe, A Raznahan, DR Roalf, TE Robert-Fitzgerald, V Gonzenbach, RC Gur, RE Gur, S Vandekar, JA Detre, KA Linn, A Alexander-Bloch, TD Satterthwaite, RT Shinohara.
Human Brain Mapping.
- 2022 **Dissociable multi-scale patterns of development in personalized brain networks.**
 AR Pines, B Larsen, Z Cui, VJ Sydnor, MA Bertolero, A Adebimpe, AF Alexander-Bloch, C Davatzikos, DA Fair, RC Gur, RE Gur, H Li, MP Milham, TM Moore, K Murtha, L Parkes, SL Thompson-Schill, S Shanmugan, RT Shinohara, **SM Weinstein**, DS Bassett, Y Fan, TD Satterthwaite.
Nature Communications.
- 2021 **A simple permutation-based test of intermodal correspondence.**
SM Weinstein, SN Vandekar, A Adebimpe, TM Taper, T Robert-Fitzgerald, RC Gur, RE Gur, A Raznahan, TD Satterthwaite, AF Alexander-Bloch, RT Shinohara.
Human Brain Mapping.
- 2021 **Simulation-based design of pragmatic trials in psoriatic arthritis using propensity scores.**
SM Weinstein, LC Coates, PS Helliwell, A Ogdie, AJ Stephens-Shields.
Clinical Trials.

- 2021 **Multiple sclerosis diagnosis: Knowledge gaps and opportunities for educational intervention in neurologists in the United States.**
AJ Solomon, M Kaisey, SC Krieger, S Chahin, RT Naismith, **SM Weinstein**, RT Shinohara, BG Weinshenker.
Multiple Sclerosis Journal.
- 2020 **Modifiable factors associated with postoperative delirium after hip fracture repair: an age-stratified retrospective cohort study.**
J Poeran, C Cozowicz, N Zubizarreta, **SM Weinstein**, SG Deiner, RM Leipzig, JI Friedman, J Liu, M Mazumdar, SG Memtsoudis.
European Journal of Anaesthesiology.
- 2019 **Risk factors for postoperative delirium in patients undergoing lower extremity joint arthroplasty: a retrospective population-based cohort study.**
SG Memtsoudis, C Cozowicz, N Zubizarreta, **SM Weinstein**, J Liu, DH Kim, LA Poultides, MM Berger, M Mazumdar, J Poeran.
Regional Anesthesia & Pain Medicine.
- 2019 **Perioperative impact of sleep apnea in a high-volume specialty practice with a strong focus on regional anesthesia: a database analysis**
L Pichler, **SM Weinstein**, C Cozowicz, J Poeran, J Liu, LA Poultides, JN Saleh, SG Memtsoudis.
Regional Anesthesia & Pain Medicine.
- 2019 **Non-opioid analgesic modes of pain management are associated with reduced postoperative complications and resource utilisation: a retrospective study of obstructive sleep apnoea patients undergoing elective joint arthroplasty.**
C Cozowicz, J Poeran, N Zubizarreta, J Liu, **SM Weinstein**, L Pichler, M Mazumdar, SG Memtsoudis.
British journal of anaesthesia.
- 2018 **Lack of association between levels and length of intraoperative controlled hypotension and acute kidney injury in total hip arthroplasty patients receiving neuraxial anesthesia.**
SM Weinstein, JT YaDeau, SG Memtsoudis.
Regional Anesthesia & Pain Medicine.
- 2018 **Neuraxial anaesthesia techniques and postoperative outcomes among joint arthroplasty patients: is spinal anaesthesia the best option?**
SM Weinstein, LR Baaklini, J Liu, LA Poultides, C Cozowicz, J Poeran, JN Saleh, SG Memtsoudis.
British journal of anaesthesia.
- 2018 **Postoperative delirium in total knee and hip arthroplasty patients: a study of perioperative modifiable risk factors.**
SM Weinstein, LA Poultides, LR Baaklini, EE Mörwald, C Cozowicz, JN Saleh, MB Arrington, J Poeran, N Zubizarreta, SG Memtsoudis.
British journal of anaesthesia.

Manuscripts under review

- 2022+ **Spatially-enhanced clusterwise inference for testing and localizing intermodal correspondence**
SM Weinstein, SN Vandekar, EB Baller, D Tu, A Adebimpe, TM Tapera, RC Gur, RE Gur, JA Detre, A Raznahan, AF Alexander-Bloch, TD Satterthwaite, RT Shinohara, JY Park.
bioRxiv. Revision requested by *NeuroImage*.
- 2022+ **Similarity-Based Multimodal Regression**
AA Chen, **SM Weinstein**, A Adebimpe, RC Gur, RE Gur, KR Merikangas, TD Satterthwaite, RT Shinohara, H Shou.
bioRxiv.
- 2022+ **Development of Top-Down Cortical Propagations in Youth**
AR Pines, AS Keller, B Larsen, M Bertolero, A Ashourvan, DS Bassett, M Cieslak, S Covitz, Y Fan, E Feczko, A Houghton, A R Rueter, T Tapera, J Vogel, **SM Weinstein**, RT Shinohara, D Fair, T Satterthwaite.
bioRxiv.
- 2022+ **Patient-reported experience of multiple sclerosis diagnosis is associated with subsequent disclosure and concealment**
VM Leavitt, AM Kever, **SM Weinstein**, RT Shinohara, H Schmidt, SM Aoun, A Solari, AJ Solomon.

Select presentations

- 06/2022 **Penalized decomposition using residuals for confounding mitigation in multivariate pattern analysis**
Organization for Human Brain Mapping (OHBM) conference (Glasgow, Scotland).
- 05/2022 **Adjusting for nuisance variables in neuroimaging studies via penalized decomposition using residuals**
Statistical Methods in Imaging (SMI) conference (Nashville, TN).
- 03/2022 **Penalized decomposition using residuals for confounding control and enhanced pattern extraction in neuroimaging**
Eastern North American Region of the International Biometrics Society conference (Houston, TX).
- 12/2021 **Permutation testing of network enrichment in neuroimaging**
Computational and Methodological Statistics (London, UK; virtual talk to hybrid audience).
- 08/2021 **A simple permutation-based test of intermodal correspondence**
Joint Statistical Meetings student paper award session (virtual talk).
- 08/2021 **Permutation-based tests of intermodal similarity within functional brain networks**
Guest speaker at Vanderbilt Biostatistics neuroimaging research group seminar (Nashville, TN)
- 06/2021 **Permutation-based testing of intermodal correspondence within large-scale functional networks**
Organization for Human Brain Mapping conference (virtual poster presentation).
- 03/2021 **A simple permutation-based test of intermodal correspondence**
Eastern North American of the International Biometric Society conference (virtual talk).
- 08/2020 **Two-stage stratified PCA for dimension reduction and nuisance variable mitigation**
Joint Statistical Meetings (virtual poster presentation).

03/2020 **Two-stage PCA for dimension reduction and mitigation of nuisance variable associations**
Eastern North American of the International Biometric Society conference (virtual talk).

Professional memberships

2022 – present Institute of Mathematical Statistics
2020 – present Organization for Human Brain Mapping
2019 – present American Statistical Association
2019 – present American Statistical Association Section on Statistics in Imaging
2019 – present Eastern North American Region of the International Biometric Society (ENAR IBS)

Professional activity

08/2022 Topic Contributed Session Organizer at Joint Statistical Meetings (JSM) 2022
Session: Statistical Advances in Dimension Reduction and Feature Interpretability in Neuroimaging (Washington, DC)
05/2022 Session Chair at 2022 Statistical Methods in Imaging (SMI) Conference
Session: Statistical analysis of high-dimensional neuroimaging data (Nashville, TN)
03/2021 Session Chair at Eastern North American Region of the International Biometric Society (ENAR IBS) conference
Session: Contributed Papers: Machine Learning (virtual)

Technical skills

R, Python, MATLAB