

# Selena Wang

*Network Science, Brain Imaging, Bayesian Analysis, Psychometrics.*

Updated: July 24, 2024  
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## MAJOR RESEARCH INTERESTS

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### Methodology

- Social network analysis, network neuroscience
- High dimensional data analysis, clustering
- Neuroimaging, connectome-behavior linking
- Imaging genetics, imaging-genetics linking
- Psychometrics, item response theory, latent factor models
- Data integration
- Statistical machine learning, statistical philosophy

### Application

- Children psychopathology and disorders
- Neurodegeneration through aging and Alzheimer's disease
- Social factor of learning, racial homophily
- International politics, networked military mobility, terrorist recruitment

## ACADEMIC APPOINTMENT

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### Indiana University

Assistant Professor, Department of Biostatistics and Health Data Science

Current

### Yale University

Postdoctoral Associate, Department of Biostatistics

2024

## EDUCATION

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### The Ohio State University

Ph.D. in Quantitative Psychology, Department of Psychology

2022

– Thesis: “Modeling dependence between a network and item responses.”

M.S. in Statistics

– Thesis: “Joint analysis of social and item response networks with latent space models.”

M.A. in Quantitative Psychology

– Thesis: “When reliability does not signal reliable detection of experimental effects.”

### University of Minnesota, Twin Cities

B.S. in Psychology, Summa cum Laude with Highest Distinction

2017

## PUBLICATIONS

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### 2024+

1. Xu, W., **Wang, S.**, Shen, L., & Zhao, Y. (n.d.). Collaborative survival analysis on predicting alzheimer's disease progression. *Under Review*.
2. **Wang, S.**, Paul, S., & Sweet, S. (n.d.). The co-varying dynamics between networks and item responses via latent vectors. *Being Revised*.
3. **Wang, S.**, Liu, Y., Xu, W., Tian, X., & Zhao, Y. (n.d.). Inference-based statistical network analysis uncovers star-like brain functional architectures for internalizing psychopathology in children. *Being Revised*. ([arXiv](#))
4. **Wang, S.**, Wang, Y., Xu, F. H., Shen, L., & Zhao, Y. (n.d.). Establishing group-level brain structural connectivity incorporating anatomical knowledge under latent space modeling. *Medical Image Analysis (Revision)*. ([arXiv](#), [code](#))

### 2024

5. Li, J. S., Tun, S. M., Ficek-Tani, B., Xu, W., **Wang, S.**, Horien, C., ... others (in press). Medial amygdalar tau is associated with anxiety symptoms in preclinical alzheimer's disease. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*.
6. Qiu, W., Chu, H., **Wang, S.**, Zuo, H., Li, X., Zhao, Y., & Ying, Z. (2024). Learning high-order relationships of brain regions. *ICML*.
7. Misra, S., Dawson, J., Kwan, P., Kasner, S. E., Grotta, J. C., Larsson, D., ... others (2024). Antiseizure medications in post-stroke seizures: A systematic review and network meta-analysis (p8-1.012). In *Neurology* (Vol. 102, p. 5192). ([paper](#))
8. Tian, X., Wang, Y., **Wang, S.**, Zhao, Y., & Zhao, Y. (2024). Bayesian mixed model inference for genetic association under related samples with brain network phenotype. *Biostatistics*. ([paper](#))

### 2023

9. **Wang, S.**, Paul, S., & De Boeck, P. (2023). Joint latent space model for social networks with multivariate attributes. *Psychometrika*, 1–31. ([paper](#), [code](#))
10. **Wang, S.**, De Boeck, P., & Yotobieng, M. (2023). Heywood cases in unidimensional factor models and item response models for binary data. *Applied Psychological Measurement*, 47(2), 141–154. ([paper](#), [arXiv](#))
11. Mishra, N. K., Kwan, P., Tanaka, T., Sunnerhagen, K. S., Dawson, J., Zhao, Y., ... others (2023). Clinical characteristics and outcomes of patients with post-stroke epilepsy: protocol for an individual patient data meta-analysis from the international post-stroke epilepsy research repository (ipserr). *BMJ open*, 13(11), e078684. ([paper](#))

## 2022

12. **Wang, S.** & Edgerton, J. (2022). Resilience to stress in bipartite networks: application to the islamic state recruitment network. *Journal of Complex Networks*, 10(4), cnac017. ([paper](#))
13. **Wang, S.** & De Boeck, P. (2022). Understanding the role of subpopulations and reliability in between-group studies. *Behavior Research Methods*, 1–16. ([paper](#))
14. **Wang, S.**, Wu, H., & Pek, J. (2022). Performance of alternative regression weights in the context of prediction versus inference (abstract). *Multivariate Behavioral Research*, 57(1), 163–163. ([abstract](#))

## 2021-2019

15. **Wang, S.** (2021). Recent integrations of latent variable network modeling with psychometric models. *Frontiers in Psychology*, 12. ([paper](#))
16. Jamrozik, A., Clements, N., Hasan, S. S., Zhao, J., Zhang, R., Campanella, C., ... others (2019). Access to daylight and view in an office improves cognitive performance and satisfaction and reduces eyestrain: A controlled crossover study. *Building and Environment*, 165, 106379. ([paper](#))

## GRANT EXPERIENCES

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- **Trajectory-based Multimodality Brain-age Delta AD Prediction across Life Span (2023)**  
Agency: National Institute of Aging  
Status: Pending  
Role: Principle Investigator
- **Gender and racial measurement bias in vocational interest assessment (2016-2017)**  
Agency: UROP Grant, University of Minnesota  
Amount: 2,100  
Status: Completed  
Role: Principle Investigator

## TEACHING

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- **Lead instructor of the course** at the Ohio State University (SEI available) Fall 2020, Spring 2021  
*Introduction to Psychology (PSYCH 1100)*
  - Lead online courses during pandemic
  - Develop syllabus
  - Design course assignments
  - Deliver live lectures
- **Teaching Assistant** at the Ohio State University Fall 2018 –Spring 2020  
*Quantitative and Statistical Methods in Psychology (PSYCH 3321)*  
*Data Analysis in Psychology (PSYCH 2220)*
  - Design and grade course assignments
  - Quest lecture at weekly lab and review sessions
  - Tutor students and hold office hours

## SOFTWARES

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- **jISM**: An R package estimating joint latent space models for social networks and multivariate attributes using a fast inference approach.  
Link: <https://github.com/selenashuowang/jISM.git>
- **ABCModel**: An R package estimating the attributes-informed brain connectivity model.  
Link: <https://github.com/selenashuowang/ABCModel.git>
- **LatentSNA**: An R package estimating the latent variables-assisted statistical network analysis model.  
Link: <https://github.com/selenashuowang/LatentSNA.git>

## HONOURS, AWARDS AND FELLOWSHIPS

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- DETxDigital Harbor Fellowship in Computational Psychometrics, Duolingo English Test 2021
- Finalist, Student Paper Competition, IISA 2021
  - Project: Joint latent space model for social networks with high-dimensional multivariate attributes.
- Ray Travel Award (for Service and Scholarship), Graduate Student Council, Ohio State 2020
- Graduate Student Conference Presentation Award, Ohio State 2018, 2019
- The International Meeting of the Psychometric Society Travel Award 2019
  - Project: The integration of social network analysis with psychometric models.
- Algorithms for Threat Detection (ATD) Travel Award 2018
  - Project: Joint Analysis of Social and Item Response Networks with Latent Space Models.
- College of Arts and Sciences Division of Social and Behavioral Sciences (SBS) Fellowship, Ohio State 2018
- Distinguished University Fellowship, Ohio State 2017, 2022
- Donald G. Paterson Award, Minnesota Psychological Association 2017
- Innovative Community Building Grants Award, University of Minnesota 2016
- Undergraduate Research Opportunities Program Grant, University of Minnesota 2016
  - Project: Gender and racial measurement bias in vocational interest assessment.
- Global Excellence Scholarship, University of Minnesota (4-years of in-state tuition) 2013

## TALKS

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### Invited Presentations

1. **S. Wang**, “Detect Imaging Biomarkers with Statistical Network Analysis”, *University of Illinois Urbana-Champaign, Urbana-Champaign, January, 2024.*
2. **S. Wang**, “Detect Imaging Biomarkers with Statistical Network Analysis”, *Rush University, Chicago, January, 2024.*
3. **S. Wang**, “Detect Imaging Biomarkers with Statistical Network Analysis”, *Indiana University, Indianapolis, January, 2024.*
4. **S. Wang**, “Detect Imaging Biomarkers with Statistical Network Analysis”, *University of Minnesota, Online, December, 2023.*
5. **S. Wang**, “Detect Imaging Biomarkers with Statistical Network Analysis”, *University of Utah, Online, November, 2023.*

6. **S. Wang**, “Detect Imaging Biomarkers with Statistical Network Analysis”, *St Children’s Research Hospital, Online*, November, 2023.
7. **S. Wang**, “Detect Imaging Biomarkers with Statistical Network Analysis”, *Georgia Tech University, Atlanta*, November, 2023.
8. **S. Wang**, “The integration of psychometric and network models for behavior and neuroscience research”, *University of Maryland, College Park*, April, 2023.
9. **S. Wang**, “The integration of psychometric and network models for educational research”, *Michigan State University*, February, 2023.
10. **S. Wang**, “The integration of psychometric and network models for educational research”, *University of Nebraska, Lincoln*, January, 2023.
11. **S. Wang**, J.R. Lockwood, and Y. Attali, “Fitting psychometric models to digital-first assessment”, *Duolingo English Test*, August, 2021.
12. **S. Wang**, S. Paul, and P. De Boeck, “Joint latent space model for social networks with high-dimensional multivariate attributes.”, *International Indian Statistical Association Conference*, May, 2021.
13. **S. Wang**, S. Paul, J. Logan, and P. De Boeck, “Joint modeling of network and psychometric data”, *International Meeting of Psychometric Society*, July, 2019.

## National & Regional Conferences

14. **S. Wang**, Y. Wang, F. Xu, C. Fredericks, L. Shen and Y. Zhao, “Sex-specific topological structure associated with dementia via latent space estimation (poster)”, *The Alzheimer’s Association International Conference*, August, 2024.
15. **S. Wang**, Y. Wang, F. Xu, C. Fredericks, L. Shen and Y. Zhao, “Sex-specific topological structure associated with dementia via latent space estimation”, *Statistical Methods in Imaging Conference 2024*, May, 2024.
16. **S. Wang**, Y. Liu, W. Xu, X. Tian and Y. Zhao, “Inference-based statistical network analysis uncovers star-like brain functional architectures for internalizing psychopathology in children”, *Eastern North American Region Spring Meeting 2024*, March, 2024.
17. **S. Wang**, Zhang, X., Y. Liu, W. Xu, X. Tian and Y. Zhao, “Unveiling Star-Like Brain Networks in Adolescent Internalizing Psychopathology: An Inference-Based Statistical Approach (Poster)”, *Neuroscience Track Brunch and Poster Sessions*, February, 2024.
18. **S. Wang**, Y. Wang, F. Xu, L. Shen and Y. Zhao, “Establishing group-level brain structural connectivity incorporating anatomical knowledge under latent space modeling”, *Statistical Methods in Imaging Conference 2023*, May, 2023.
19. W. Qiu, **S. Wang**, X. Li, Y. Zhao, R. Ying, “Understanding Interactions of ROIs via Learnable Hyperedges (Poster)”, *Organization for Human Brain Mapping*, July, 2023.
20. **S. Wang**, Y. Wang, F. Xu, L. Shen and Y. Zhao, “Identifying Gender based Neuromarkers of Alzheimer’s Disease Using ABC Network Model” (Poster), *Organization for Human Brain Mapping*, July, 2023.
21. P. De Boeck **S. Wang** and S. Cho, “Binary Time Series for Eye Fixations: The Quality of Parameter Estimates”, *National Council on Measurement in Education Conference*, April, 2023.
22. P. De Boeck and **S. Wang**, “Pervasive measurement bias”, *Quantitative Methodology Center 2022 Conference*, June, 2022.
23. **S. Wang**, J.R. Lockwood, and Y. Attali, “Fitting psychometric models to digital-first assessment”, *National Council on Measurement in Education*, April, 2022.

24. **S. Wang**, S. Paul, and P. De Boeck, “Modeling classroom outcome with network analysis”, *National Council on Measurement in Education*, April, 2022, cancelled.
25. **S. Wang**, S. Paul, and P. De Boeck, “Joint latent space model for social networks with high-dimensional multivariate attributes”, *International Meeting of Psychometric Society*, July, 2021.
26. **S. Wang**, S. Paul, J. Logan, and P. De Boeck, “Joint modeling with network analysis and psychometrics”, *Geometry and Topology meet Data Analysis and Machine Learning*, May, 2019.
27. **S. Wang**, S. Paul, J. Logan, P. De Boeck, “Joint Analysis of Social and Item Response Networks with Latent Space Models”, *Algorithms for Threat Detection (ATD)*, November, 2018.
28. **S. Wang** and P. De Boeck, “Does low reliability lead to low replication rates?”, *International Meeting of Psychometric Society*, July, 2018.
29. **S. Wang**, B. Wiernik and B. Morgan, “Gender measurement bias versus trait differences in vocational interest assessment.”, *Society for Industrial and Organizational Psychology conference*, April, 2017
30. C.D. Nye, J. J. Prasad, J.C.Bradburn, F.Elizondo, W.M.J.Phan, R.Amrhein, S.Cho, J.Rounds, B.M.Wiernik, **S.Wang**, B.Morgan, C.J.M.We, E.Wetzel, D.Ispas, “New directions for vocational interest research in organizations.”, *Society for Industrial and Organizational Psychology conference*, April, 2017

## Colloquiums & Symposiums

31. **S. Wang** and J. Edgerton, “Disrupting terrorist recruitment: Network knockouts of Islamic State recruiters.”, *OSU Psychological Studies Quantitative Colloquium*, 2021.
32. **S. Wang** and J. Edgerton, “Disrupting terrorist recruitment: Network knockouts of Islamic State recruiters.”, *OSU Political Science Studies Methodological Colloquium*, 2021.
33. **S. Wang** and P. De Boeck, “Understand reliability with the reliability paradox.”, *OSU Psychological Studies Quantitative Colloquium*, 2020.
34. **S. Wang**, S. Paul, J. Logan, and P. De Boeck, “A joint modeling framework for social network analysis and psychometrics”, *OSU Psychological Studies Quantitative Colloquium*, 2019.
35. **S. Wang** and P. De Boeck, “The role of reliability in the replication crisis.”, *OSU Psychological Studies Quantitative Colloquium*, 2018.
36. **S. Wang**, “Applications of differential item functioning analysis with item response theory.”, *Undergraduate Research Symposium*, April, 2016.

## STUDENT MENTEES (GRADUATE)

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### **Yunhe Liu**

Master student, Biostatistics, Yale University

- Training in high speed computing, coding, statistics methodology and paper writing

### **Yiting Wang**

Master student, Biostatistics, Yale University

- Training in coding, simulation and paper writing
- Now PhD student of Statistics at University of Virginia

### **Xinzhi Zhang**

Master student, Biostatistics, Yale University

- Training in coding, simulation and data analysis

## RELEVANT EXPERIENCES

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### Department of Biostatistics/Yale University

Postdoctoral Associate

2022-2024

- Predictive Bayesian methods for fMRI, behavior and genetics data
- Write scientific publications with strong methodology components.
- Mentor master students of biostatistics to conduct scientific research.
- Present in professional statistical conferences.
- Manage multiple statistical projects and coordinate collaborations.

### Assessment Team/Duolingo English Test

Computational Psychometrics fellow

Summer 2021

- Estimation of IRT parameters for AI-generated test items.
- Perform simulations with multidimensional IRT models.
- Write a proposal accepted and presented at NCME.
- Give a company-wide presentation.

### Well Living Lab/Mayo Clinic & Delos Research Company

Data Analyst Intern

Summer 2017

- Wellness in the workspace.
- Collect and clean the Stroop Test data and record Inhibition Reaction Time Data.
- Liaise between behavioral scientists and administrative staff to ensure success of the studies.

## SKILLS

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- **Software:** R, Python, SAS, Github, FLEXMirt, Mplus, SPSS
- **Statistical Frameworks:** Network Analysis, Bayesian Inference, Latent Variable Models, Generalized Linear Models, Variational Inference, Statistical Machine learning
- **Psychometrics:** Classical Test Theory, Item Response Theory, Item and Test analyses, Differential Item Functioning, Multidimensional Item Response Theory, Covariance Structure Models, Factor Analysis
- **Soft Skills:** Communication, Project Management, Documentation, Public Speaking, Team Collaboration

## SERVICES

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- **Ad Hoc Review**

*Biostatistics*

*Biometrics*

*Journal of Educational Measurement*

*Developmental Science*

*Big Data Mining*

*President's Research Excellence (PRE) program Catalyst concept papers*

*National Council on Measurement in Education*

- **Conference**

*Chair session, SMI 2024*

*Organize session on Statistical Methods for Brain Connectomes, SMI 2024 (Speakers include Dr. Dayu Sun, Dr. Yaotian Wang and Dr. Zhiling Gu)*

*Organize session on Statistical Methods for Brain Connectomes, SMI 2023 (Speakers include Dr. Yi Zhao and Dr. R.J. Liu)*

*Chair for parallel sessions, International Meeting of Psychometric Society (2018,2021)*

*Planning committee, Translational Data Analytics Institute Fall Forum (2021)*

- **School/Departmental**

*Graduate Student Diversity, Equality and Inclusivity Committee, Ohio State University (2021)*

*Quantitative Psychology Group, Ohio State University (2019)*

*Discussion Panel, the Office of Diversity and Inclusion, Ohio State University (2019)*

*Psychology Diversity Council, University of Minnesota (2016)*

*International and LGBTQA: A Panel Discussion, University of Minnesota (2015)*

*Orientation committee, International Student and Scholar Services, University of Minnesota (2015)*

- **Professional Organizations**

*Columbus Metropolitan Library (2020)*

*American Statistical Association, the Caucus for Women in Statistics (2019)*

*State Science Day (2019)*