MARIA POPE

PHD CANDIDATE

INDIANA UNIVERSITY | POPEME@IU.EDU

EDUCATION AND TRAINING

INDIANA UNIVERSITY
Bloomington, IN | Anticipated Graduation: May 2025

Doctor of Philosophy in Program in Neuroscience, Informatics: Complex Networks and Systems

UNIVERSITY OF NOTRE DAME
Notre Dame, IN | Graduation: January 2020

Bachelor of Science in Neuroscience and Behavior, Program of Liberal Studies

RESEARCH INTERESTS

Broadly, my research interests are on the complex dynamics of brain activity and the development of methods to analyze time-varying brain data. My research has two major directions:

- Understanding how the structure of the brain's anatomical network constrains its ongoing activity, which I investigate using a combination of empirical data and computational modeling.
- Characterizing the information content of brain dynamics using tools from information theory, with a particular focus on higher-order, synergistic interactions.

Throughout my research I strive to adhere to the principles of open science through open sharing of all code and data and to support under-represented groups in STEM through involvement with societies like the Society for Women in Network Science.

AWARDS, FELLOWSHIPS, AND ACHIEVEMENTS

Society for Neuroscience Trainee Professional Development Award (2024)
Program in Neuroscience Spring Travel Award (2024)
Entropy Best ECR Presentation Award at CNS*2023 (2023)
NSF Graduate Research Fellowship Program Fellow (2022- present)
NSF Complex Networks and Systems NRT Program Fellow (2020-2022)
Graduated cum Laude from University of Notre Dame (2020)
Glynn Family Honors Program (2015-2020)
Notre Dame Club of Cincinnati Scholarship (2015)
PEO STAR Scholarship (2015)

PUBLICATIONS

*INDICATES SHARED FIRST AUTHORSHIP

Pope, M., Varley, T.F., Puxeddu, M.G., Faskowitz, J., Sporns, O. (2024). Time-varying synergy/redundancy dominance in the human cerebral cortex. *bioRxiv.*

Puxeddu, M.G., **Pope, M.**, Varley, T.F., Faskowitz, J., Sporns, O. (2024). Leveraging multivariate information for community detection in functional brain networks. *bioRxiv.*

Varley, T.F., Havert, D., Fosque, L., Alipour, A., Weerawongphrom, N., Naganobori, H., O'Shea, L., **Pope, M.**, Beggs, J. (2024). The serotonergic psychedelic N, N-dipropyltryptamine alters information-processing dynamics in cortical neural circuits. *Network Neuroscience.*

Ragone, E., Tanner, J., Jo, Y., Esfahlani, F. Z., Faskowitz, J., **Pope, M.**, Coletta, L., Gozzi, A., Betzel, R.F. (2024). Modular subgraphs in large-scale connectomes underpin spontaneous co-fluctuation 'events' in mouse and human brains. *Communications Biology,* **7**(1), 126.

Pope, M., Seguin, C., Varley, T.F., Faskowitz, J., Sporns, O. (2023). Co-evolving dynamics and topology in a coupled oscillator model of resting brain function. *NeuroImage,* 250,118971.

Varley, T.F., **Pope, M.**, Puxeddu, M.G., Faskowitz, J., Sporns, O. (2023). Partial entropy decomposition reveals higher-order structures in human brain activity. *Proceedings of the National Academy of Sciences,* 120(30), e2300888120..

Pope, M.*, Varley, T.F.*, Faskowitz, J., Sporns, O. (2022). Multivariate information theory uncovers synergistic subsystems of the human cerebral cortex. *Communications Biology*, 6(1), 451 .

Chumin, E. J., Faskowitz, J., Esfahlani, F. Z., Jo, Y., Merritt, H., Tanner, J., Cutts, S. A., **Pope, M.**, Betzel, R.F., Sporns, O. (2022). Cortico-subcortical interactions in overlapping communities of edge functional connectivity. *NeuroImage,* 250, 118971.

Pope, M., Fukushima, M., Betzel, R. & Sporns, O. (2021). Modular origins of high-amplitude co-fluctuations in fine-scale functional connectivity dynamics. *Proceedings of the National Academy of Sciences,* 118(46), e2109380118.

PRESENTATIONS

ORAL

(* indicates invited talk)

*Northwestern University Complex Systems Seminar, Fall 2024

*Society for Industrial and Applied Mathematics, Discrete Math 2024 | Title: Uncovering higher-order interactions in the cortex: applications of multivariate information theory

NetSci 2024 | Title: Time-varying synergy/ redundancy dominance in the human cerebral cortex

Information Theory Workshop at CNS*2023 | Title: Multivariate Information Theory Uncovers Synergistic Subsystems of the Human Cerebral Cortex

*ShineLab, University of Sydney, 2023 | Title: Co-evolving dynamics and topology in a coupled oscillator model of resting brain function

Women in Network Science & Diversify Netsci 2022 | Lightning Talk: Multivariate Information Theory Uncovers Synergistic Subsystems of the Human Cerebral Cortex

POSTER

Network Neuroscience Satellite @ NetSci 2024 | Title: Time-varying synergy/redundancy dominance in the human cerebral cortex

Meeting of the Greater Indiana Society for Neuroscience 2023 | Title: Co-evolving dynamics and topology in a coupled oscillator model of resting brain function

Network Neuroscience Satellite @ NetSci 2023 | Title: Co-evolving dynamics and topology in a coupled oscillator model of resting brain function

Women in Network Science @ NetSci 2023 | Title: Co-evolving dynamics and topology in a coupled oscillator model of resting brain function

Main Conference, NetSci 2023 | Title: Co-evolving dynamics and topology in a coupled oscillator model of resting brain function

Society for Neuroscience, Neuroscience 2022 | Title: Time-varying structural connectivity in a Kuramoto phase-oscillator model of functional connectivity

Network Neuroscience Satellite @ NetSci 2021 | Modular origins of high-amplitude co-fluctuations in fine-scale functional connectivity dynamics

University of Notre Dame Fall Undergraduate Research Fair 2019 | Title: Hot Spots for Thought: Emergent Neural Dynamics and the Subgraphs that Contribute to Them

Flatley Center for Undergraduate Scholarly Engagement Undergraduate Research and Experiential Learning Showcase 2019 | Title: Hot Spots for Thought: Emergent Neural Dynamics and the Subgraphs that Contribute to Them

OTHER RESEARCH EXPERIENCE

Undergraduate Independent Research | Project: Hot Spots for Thought: Emergent Dynamics and the Subgraphs that Contribute to Them | Funder: Glynn Family Honors Program, University of Notre Dame | Advisors: Douglas Hofstadter and Olaf Sporns

Undergraduate Thesis | Title: Origami as Data Separation: An Artificial Network that Folds and Cuts | University of Notre Dame, Department of Applied Computational Mathematics and Statistics | Advisor: Robert Rosenbaum

Research Assistant (2017-2019) | University of Notre Dame, Department of Psychology | Advisor: Kathleen Eberhard

MENTORSHIP

Rudra Patel, undergraduate research (2024-present), Network analysis of functional connectivity during sleep deprivation.

Nadine Templeton, undergraduate research (2021-2023), Applications of multivariate information theory to fMRI data.

Gregory Bond, undergraduate research (2020), Studying structure-function relationships through dynamic modeling

TEACHING EXPERIENCE

Guest Lecturer on Information Theory for INFO-I501, Graduate Level Introduction to Informatics (2023, 2024)

Guest Lecturer on Brain Dynamic Modeling for PSY-P457, The Connected Brain (2024)

ACADEMIC SERVICE AND SOCIETY MEMBERSHIPS

Program in Neuroscience Award Committee (2024-present)

Department of Psychological and Brain Sciences Hiring Committee | Graduate Student Representative (2023)

Program in Neuroscience Curriculum Committee (2023-present) | Graduate Student Representative

Ad Hoc Reviewer for:

- Nature Neuroscience (2024 – present)
- NeuroImage (2023 – present)
- Network Neuroscience (2023 – present)
- Scientific Reports (2024-present)

Indiana Graduate Workers Coalition | Representative for the Program in Neuroscience and Psychological and Brain Sciences (2021-2023)

Graduate and Professional Student Government | Representative for Program in Neuroscience (2021-2022)

Active member of the following academic societies:

- Society for Women in Network Science
- Society for Neuroscience
- Organization for Computational Neuroscience
- Network Science Society
- Society for Industrial and Applied Mathematics

SCIENTIFIC OUTREACH

Center for Excellence for Women in Technology Graduate Student Panelist (2024)

Center for Excellence for Women in Technology Women's Research Poster Competition, Volunteer Judge (2024)

Skype-a-Scientist Volunteer Scientist (2024-current)

Indiana University Graduate School Research Day Panelist (2023)

COMMUNITY SERVICE

Bloomington Cooperative Living | Board Member (2020 – 2022)

- Made financial and directional decisions for nonprofit providing affordable housing in Bloomington, Indiana

Imani Unidad | Peer-to-Peer Facilitator (2019)

- Facilitated discussions of health and wellness with inmates at local prison

St. Adalbert's School | Volunteer Tutor (2016-2017)

- Tutored middle school Latinx girls in STEM subjects