Hans Riess, Ph.D.

MACHINE LEARNING · COMPLEX SYSTEMS

hans.riess@duke.edu · @hansmriess · hansriess.com

EXPERIENCE

Postdoctoral Associate **2022- Present**

Department of Electrical and Computer Engineering, Duke University

Integrated path signatures with graph neural networks for spatiotemporal time series analysis.
Discovered a novel synchronization algorithm for networked systems.

EDUCATION

Doctor of Philosophy **2017-2022**

Department of Electrical & Systems Engineering, University of Pennsylvania

Pioneered novel approach of extracting global insights into complex systems using algebraic lattices.
Developed transferable hypergraph neural networks using tools from spectral graph theory.

THESIS, "LATTICE THEORY IN MULTI-AGENT SYSTEMS" • ADVISOR, ROBERT GHRIST

Bachelor of Science **2013-2017**

Department of Mathematics, Duke University

Analyzed large hurricane dataset with topological data analysis in DATA+ summer program.
Completed the Ph.D.-level mathematics sequences in abstract algebra and topology.

DUKE JAZZ ENSEMBLE • DUKE SYMPHONY ORCHESTRA

SELECTED PUBLICATIONS

- **H. Riess**, M. Veveakis, M. Zavlanos, (2024) "Path signatures and graph neural networks for slow earthquake analysis: better together?" Submitted.
- M. Hayhoe, **H. Riess** (equal contribution), M. Zavlanos, V. Preciado, A. Ribeiro, (2023) "Transferable hypergraph neural networks via spectral similarity." Second Machine Learning on Graphs (LoG) Conference.
- **H. Riess**, M. Munger, M. Zavlanos, (2023) "Max-plus synchronization in decentralized trading systems." Proceedings of *62st IEEE Conference on Control & Decision Systems (CDC)*.
- C. Battiloro, Z. Wang, **H. Riess**, P. Di Lorenzo, A. Ribeiro, (2022) "Tangent bundle filters and neural networks: from manifolds to cellular sheaves and back." Proceedings of *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).*
- **H. Riess**, R. Ghrist, (2022) "Diffusion of information on networked lattices by gossip." Proceedings of *61st IEEE Conference on Control & Decision Systems (CDC).*
- **H. Riess**, R. Ghrist (2022) "Cellular sheaves of lattices and the Tarski Laplacian." *Homotopy Homology, & Applications, 24*(1), 325-345.
- **H. Riess**, Y. Kantaros, G. Pappas, R. Ghrist, (2021) "A temporal-logic based hierarchical network connectivity controller." Proceedings of *2021 SIAM Control Theory Conference.*

PUBLIC SPEAKING

- "Negotiating tasks in multi-agent systems with max-plus algebra", Science of Autonomy Program Review, Office of Naval Research (August 2023).
- "Social information: perspectives from max-plus algebra and lattice theory", Socio-Mathematics Program Review (BRO-SOMAII), US Department of Defense Basic Research Office (April 2023).

SELECTED COURSES

- Linear Systems Theory
- Convex Optimization
- Data Mining
- Principles of Deep Learning
- Graph Neural Networks
- Information Theory

PROGRAMMING LANGUAGES

Python ★★★★ MATLAB ★★★☆ Julia ★★☆☆ C++ ★★☆☆