Hans Riess

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Education

Doctor of Philosophy **2017 - 2022**

Department of Electrical & Systems Engineering, University of Pennsylvania

Thesis: "Lattice Theory in Multi-Agent Systems"; Advisor: Robert Ghrist

Bachelor of Science **2013 - 2017**

Department of Mathematics, Duke University

Academic Appointments

Postdoctoral Associate **2022 - Present**

Department of Electrical and Computer Engineering, Duke University

Awards & Fellowships

Legget Family Endowed Fellowship, University of Pennsylvania **2014**

Ganster Fellowship, University of Pennsylvania **2013**

Journal Publications

- C. Battiloro, Z. Wang, *H. Riess*, P. Di Lorenzo, A. Ribeiro, (2023) "Tangent bundle convolutional learning: from manifolds to cellular sheaves and back", under review (conditionally accepted).
- *R. Ghrist, H. Riess, (2022) "Cellular sheaves of lattices and the Tarski Laplacian", *Homotopy Homology, & Applications, 24*(1), 325-345.
- *M. Cantazaro, J. Curry, J. Lazovskis, G. Malen, H. Riess, B, Wei, M. Zabka, (2020) "Moduli spaces of Morse functions for persistence", *Applied & Computational Topology*, *4*(3), 353-385.

Conference Proceedings

- H. Riess, G. Henselman-Petrusek, M. Munger, R. Ghrist, Z. Bell, M. Zavlanos, (2023) "Network preference dynamics using lattice theory", submitted.

*Authors listed alphabetically.

- M. Hayhoe, H. Riess (equal contribution), M. Zavlanos, V. Preciado, A. Ribeiro, (2023) "Transferable hypergraph neural networks via spectral similarity", to appear in *Machine Learning on Graphs Conference,* Proceedings of Machine Learning Research.
- H. Riess, M. Munger, M. Zavlanos, (2023) "Max-plus synchronization in decentralized trading systems", to appear in 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 Conference on Control & Decision Systems (CDC).*
- H. Riess, Y. Kantaros, G. Pappas, R. Ghrist, (2021) "A temporal-logic based hierarchical network connectivity controller", proceedings of *2021 SIAM Control Theory Conference.*

Preprint/Workshop/non-Archival

- H. Riess, J. Hansen, (2020) "Multidimensional persistence module classification via lattice-theoretic convolutions", *34th Neural Information Processing Systems (NeurIPS),* Workshop on Topological Data Analysis and Beyond.
- A. Parada-Mayorga, H. Riess, A. Ribeiro, R. Ghrist, (2020), "Quiver signal processing", *arXiv preprint arXiv:2010.11525*.

Invited Talks

- "Synchronizing tasks in multi-agent systems with max-plus algebra," Assured Autonomy in Contested Environments (AACE) program review,, Air Force Office of Scientific Research (AFSOR) (December 2023; Durham, NC).
- "Solutions of lattice diffusion equations and applications," Yu Group, Department of Statistics, University of California Berkeley (October 2023; online).
- "Negotiating tasks in multi-agent systems with max-plus algebra", Science of Autonomy, Office of Naval Research (ONR) annual program review (August 2023; Alexandria, Virginia).
- "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; Arlington, Virginia).
- "The Tarski Laplacian and beyond", University of Florida Topological Data Analysis Conference (February 2023; Gainesville, Florida).
- "Lattice theory in social choice and multi-agent systems", Applications of Hodge Theory on Networks, Banff International Research Station for Mathematical Innovation and Discovery (February 2023; Banff, Alberta, Canada).
- "Towards geometry of lattice-valued sheaves", Topology Geometry, & Data Analysis Seminar, Ohio State University (November 2022; Columbus, Ohio).
- "Lattice-valued network sheaves", Conference on Applied, Combinatorial, and Toric Topology (July 2022; online).

- "A sheaf Laplacian for lattice-valued sheaves", CIMAT Applied Geometry and Topology Seminar (June 2022; online).
- "Cellular sheaves of lattices and the Tarski Laplacian", Joint Mathematics Meeting (JMM), AMS Special Session on Statistics and Machine Learning Using Topology and Geometry, (April 2022; online).
- "Lattices and metapreference", Socio-Mathematics Program Review (BRO-SOMAII), US Department of Defense Basic Research Office (April 2022; Arlington, Virginia).
- "Semantics and syntactics", Socio-Mathematics Program Review (BRO-SOMAII), US Department of Defense Basic Research Office (April 2022; Arlington, Virginia).
- "Lattice theory in multi-agent systems", Workshop on Algebraic Combinatorics and Category Theory in Topological Data Analysis (March 2022; online).
- "Network sheaves valued in categories of adjunctions", Applied Category Theory Conference (July 2021; online).
- "A lattice-theoretic Laplacian for cellular sheaves", SIAM Computational Science and Engineering Conference (July 2021; online).
- "Tarski sheaves", Applied Topology in Albany Seminar (February 2021; online).
- "Cellular sheaves and the Tarski Laplacian", Quantum Group Seminar, University of Oxford (July 2020; online).
- "Cellular sheaves and the Tarski Laplacian", SIAM Mathematics of Data Science Conference (May 2020; online).

Teaching

- "Video Production for Mathematics", Univ. of Pennsylvania, Teaching Assistant (Fall 2021).
- "Introduction to Probability & Statistics", U. Penn., Teaching Assistant (Summer 2018).

Service

- Cochair, Game Theory I Session, 2023 IEEE Conference on Decision and Control (CDC).
- Peer review, SIAM Journal of Applied and Computational Geometry.
- Peer review, IEEE Transactions on Automatic Control.
- Peer review, Neural Information Processing Systems (NeurIPS).
- Organizer, GRASP Lab Game Theory Seminar.
- Organizer, Graduate Research Seminar in Applied Topology.
- Volunteer, Duke Alumni Admissions Advisory Committee.