

Dr. Hans Riess

Mathematical Engineer

✉ riess@gatech.edu <https://hansriess.com>

ACADEMIC APPOINTMENTS

Research Scientist II <i>Georgia Institute of Technology</i> Atlanta, Georgia	Feb 2025 – Present
Adjunct Instructor <i>College of Charleston</i> Charleston, South Carolina	Aug 2024 – Dec 2024
Postdoctoral Associate <i>Duke University</i> Durham, North Carolina	Nov 2022 – Feb 2025
Graduate Research Assistant <i>University of Pennsylvania</i> Philadelphia, Pennsylvania	Aug 2017 – Sep 2022

GRANTS

Principal Investigator: Sheaf Enriched Autonomous Multi-Agent Networks (SEAMAN) <i>Defense Advanced Research Projects Agency (DARPA)</i> \$180,687 • DARPA-EA-25-02-03	Aug 2025 - Aug 2026
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EDUCATION

Doctor of Philosophy <i>University of Pennsylvania</i> Electrical and Systems Engineering Thesis: Lattice Theory in Multi-Agent Systems • Advisor: Robert Ghrist	2022
Bachelor of Science <i>Duke University</i> Mathematics	2017

TEACHING

MATH 103: Elementary Statistics <i>College of Charleston</i> Instructor of Record	Fall 2024
Fuzzy Type Theory for Opinion Dynamics <i>Adjoint School</i> Teaching Assistant	Summer 2022
MATH 810: Video Production for Mathematics <i>University of Pennsylvania</i> Teaching Assistant	Fall 2022

PUBLICATIONS

Journal Article

- Claudio Battiloro, Zhiyang Wang, Hans Riess, Paolo Di Lorenzo, Alejandro Ribeiro.
Tangent bundle convolutional learning: from manifolds to cellular sheaves and back.
IEEE Transactions on Signal Processing, Vol. 72, pp. 1892-1909, 2024 [\[URL\]](#)
- Robert Ghrist, Hans Riess.
Cellular sheaves of lattices and the Tarski Laplacian.
Homology, Homotopy and Applications, Vol. 24, Issue 1, pp. 325-345, 2022 [\[URL\]](#)
(Authors listed alphabetically)
- Michael Catanzaro, Justin Curry, Brittany Fasy, Jānis Lazovskis, Greg Malen, Hans Riess, Bei Wang, Matthew Zabka.
Moduli spaces of Morse functions for persistence.
Journal of Applied and Computational Topology, Vol. 4, Issue 3, pp. 335-385, 2020 [\[URL\]](#)
(Authors listed alphabetically)

Conference Proceedings

- Tyler Hanks, Hans Riess, Samuel Cohen, Trevor Gross, Hatthew Hale, James Fairbanks.
Distributed multi-agent coordination over cellular sheaves.
IEEE 64th Conference on Decision and Control (to appear), 2025 [\[URL\]](#)
- Xenia Konti, Hans Riess, Manos Giannopoulos, Yi Shen, Michael Pencina, Nicoleta Economou, Michael Zavlanos.
Distributionally robust clustered federated learning: a case study in healthcare.
IEEE 63rd Conference on Decision and Control (CDC), pp. 4164-4172, 2024 [\[URL\]](#)
- Hans Riess, Gergory Henselman-Petrusek, Michael Munger, Robert Ghrist, Zachary Bell, Michael Zavlanos.
Network preference dynamics using lattice theory.
American Control Conference (ACC), pp. 2802-2808, 2024 [\[URL\]](#)
- Claudio Battiloro, Zhiyang Wang, Hans Riess, Paolo Di Lorenzo, Alejandro Ribeiro.
Tangent bundle filters and neural networks: from manifolds to cellular sheaves and back.
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2023 [\[URL\]](#)
- Hans Riess, Michael Munger, Michael Zavlanos.
Max-plus synchronization in decentralized trading systems.
62nd IEEE Conference on Decision and Control (CDC), pp. 221-227, 2023 [\[URL\]](#)
- Mikhail Hayhoe, Hans Riess, Michael Zavlanos, Victor Preciado, Alejandro Ribeiro.
Transferable hypergraph neural networks via spectral similarity.
The Second Learning on Graphs Conference, 2023 [\[URL\]](#)
- Hans Riess, Robert Ghrist.
Diffusion of information on networked lattices by gossip.
IEEE 61st Conference on Decision and Control (CDC), pp. 5946-5952, 2022 [\[URL\]](#)
- Hans Riess, Yiannis Kantaros, George Pappas, Robert Ghrist.
A temporal logic-based hierarchical network connectivity controller.
SIAM Conference on Control and its Applications, pp. 17-24, 2021 [\[URL\]](#)

- Hans Riess, Jakob Hansen, Robert Ghrist.
Multidimensional persistence module classification via lattice-theoretic convolutions.
NeurIPS Topological Data Analysis and Beyond Workshop, 2020 [\[URL\]](#)

Preprint

- Robert Ghrist, Miguel Lopez, Paige Randall North, Hans Riess.
Categorical diffusion of weighted lattices.
arXiv:2501.03890, 2025 [\[URL\]](#)
(Authors listed alphabetically)
- Robert Ghrist, Julian Gould, Miguel Lopez, Hans Riess.
Clearing sections of lattice liability networks.
arXiv:2010.11525, 2025 [\[URL\]](#)
(Authors listed alphabetically)
- Hans Riess, Manolis Veveakis, Michael Zavlanos.
Path signature and graph neural networks for slow earthquake analysis: better together?.
arXiv:2402.03558, 2024 [\[URL\]](#)
- Alejandro Parada-Mayorga, Hans Riess, Robert Ghrist, Alejandro Ribeiro.
Quiver signal processing.
arXiv:2010.11525, 2020 [\[URL\]](#)

Thesis

- Hans Riess.
Lattice theory in multi-agent systems.
Ph.D., University of Pennsylvania, 2022 [\[URL\]](#)

SELECTED INVITED TALKS

- **Categories of sheaves for optimization: from multi-stage to distributed.**
IMS-NTU Joint Workshop on Applied Geometry for Data Sciences (Part II)
Cincinnati, Ohio June 2025
- **Towards categorical diffusion.**
Toposes in Mondovi, Grothendieck Institute
Mondovi, Italy September 2024
- **Algebraic foundations of planning in multi-agent systems.**
Joint Mathematics Meeting (JMM)
San Francisco, California January 2024
- **The Tarski Laplacian and beyond.**
University of Florida Topological Data Analysis Conference
Gainesville, Florida February 2023
- **Lattice theory in social choice and multi-agent systems.**
Applications of Hodge Theory on Networks, Banff International Research Station (BIRS)
Banff, Canada February 2023
- **Towards geometry of lattice-valued sheaves.**
Topology Geometry and Data Analysis Seminar, Ohio State University
Columbus, Ohio November 2022

- **Lattice-valued network sheaves.**
Conference on Applied, Combinatorial, and Toric Topology, Institute for Mathematical Sciences
Singapore July 2022
- **A sheaf Laplacian for lattice-valued sheaves.**
CIMAT Applied Geometry and Topology Seminar
Online June 2022
- **Cellular sheaves of lattices and the Tarski Laplacian.**
Join Mathematics Meeting
Online April 2022
- **Network sheaves valued in categories of adjunctions and their Laplacians.**
Applied Category Theory
Cambridge, UK July 2021
- **A lattice-theoretic Laplacian for cellular sheaves.**
SIAM Computational Science and Engineering Conference
Online March 2021
- **A novel graph Laplacian for lattice-valued sheaves.**
SIAM Conference on Mathematics of Data Science
Cincinnati, Ohio May 2020

SELECTED PROFESSIONAL SERVICE

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| Co-Chair
<i>2023 IEEE Conference on Decision and Control</i>
Game Theory I Session | Dec 2023 |
| Organizer
<i>University of Pennsylvania</i>
GRASP Game Theory Seminar | May 2020 – Aug 2020 |
| Volunteer
<i>Duke University Alumni Association</i>
Duke Alumni Admissions Advisory Committee | Feb 2018 – Feb 2022 |
| Organizer
<i>University of Pennsylvania</i>
Graduate Research Seminar in Applied Topology | Aug 2018 – May 2019 |