Dr. Hans Riess

Mathematical Engineer

✉ riess@gatech.edu ⬤ https://hansriess.com

ACADEMIC APPOINTMENTS

Research Scientist II Feb 2025 – Present
Georgia Institute of Technology
Atlanta, Georgia

Adjunct Instructor Aug 2024 – Dec 2024
College of Charleston
Charleston, South Carolina

Postdoctoral Associate Nov 2022 – Feb 2025
Duke University
Durham, North Carolina

Graduate Research Assistant Aug 2017 – Sep 2022
University of Pennsylvania
Philadelphia, Pennsylvania

GRANTS

Principal Investigator: Sheaf Enriched Autonomous Multi-Agent Netwoks (SEAMAN) Aug 2025 - Aug 2026
Defense Advanced Research Projects Agency (DARPA)
$180,687 • DARPA-EA-25-02-03

EDUCATION

Doctor of Philosophy 2022
University of Pennsylvania
Electrical and Systems Engineering
Thesis: Lattice Theory in Multi-Agent Systems • Advisor: Robert Ghrist

Bachelor of Science 2017
Duke University
Mathematics

TEACHING

MATH 103: Elementary Statistics Fall 2024
College of Charleston
Instructor of Record

Fuzzy Type Theory for Opinion Dynamics Summer 2022
Adjoint School
Teaching Assistant

MATH 810: Video Production for Mathematics Fall 2022
University of Pennsylvania
Teaching Assistant

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 hierarchial 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,.
  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)   June 2025
  Singapore

- **Towards categorical diffusion**.
  Toposes in Mondovi, Grothendieck Institute   September 2024
  Mondovi, Italy

- **Algebraic foundations of planning in multi-agent systems**.
  Joint Mathematics Meeting (JMM)   January 2024
  San Francisco, California

- **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 Neworks, Banff International Research Station (BIRS)   February 2023
  Banff, Canada

- **Towards geometry of lattice-valued sheaves**.
  Topology Geometry and Data Analysis Seminar, Ohio State University   November 2022
  Columbus, Ohio

- **Lattice-valued network sheaves**.
  Conference on Applied, Combinatorial, and Toric Topology, Institute for Mathematical Sciences 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**.
  Join Mathematics Meeting April 2022
  Online

- **Network sheaves valued in categories of adjunctions and their Laplacians**.
  Applied Category Theory July 2021
  Cambridge, UK

- **A lattice-theoretic Laplacian for cellular sheaves**.
  SIAM Computational Science and Engineering Conference March 2021
  Online

- **A Novel Graph Laplacian for Lattice-Valued Sheaves, with Applications to CNNs**.
  SIAM Conference on Mathematics of Data Science May 2020
  Online

SELECTED PROFESSIONAL SERVICE

Co-Chair Dec 2023
2023 IEEE Conference on Decision and Control
Game Theory I Session

Organizer May 2020 – Aug 2020
University of Pennsylvania
GRASP Game Theory Seminar

Volunteer Feb 2018 – Feb 2022
Duke University Alumni Association
Duke Alumni Admissions Advisory Committee

Organizer Aug 2018 – May 2019
University of Pennsylvania
Graduate Research Seminar in Applied Topology