

# Dr. Hans Riess

Mathematical Engineer

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## ACADEMIC APPOINTMENTS

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

## GRANTS

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

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

## TEACHING

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

## PUBLICATIONS

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### 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

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- **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 Networks, 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  
Online 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  
Online May 2020

## SELECTED PROFESSIONAL SERVICE

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- 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