

Himanshu Yadav

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CURRENT POSITION

- **Postdoctoral Research Associate** Minneapolis, MN, USA
Carlson School of Management, University of Minnesota (Advisor: Russell Funk) May 2026 – Present
 - Developing and applying mathematical and computational methods to understand how scientific knowledge evolves over time, with a focus on topological and geometric analysis of large-scale scientific literature.

EDUCATION

- **Ph.D. in Mathematics, University of Florida** Gainesville, FL, USA
Advisor: Peter Bubenik *GPA: 4.0/4.0* *Research: Topological Data Analysis (TDA)* Aug 2021 – May 2026
- **M.Sc. in Mathematics, Indian Institute of Technology Delhi** New Delhi, India
GPA: 10.0/10.0 *Distinction: Dean's List, Gold Medal* July 2018 – Aug 2020
- **B.Sc. (Hons.) in Mathematics, Hindu College, University of Delhi** New Delhi, India
GPA: 9.514/10.0 *Distinction: Dean's List* July 2015 – May 2018

PUBLICATIONS

Submitted research articles and preprints

- Himanshu Yadav, Alexander Wagner, and Peter Bubenik. Stabilizing localization of representative cycles, 24pp. arXiv:2510.12756 [math.AT]
- Himanshu Yadav, Thomas Bryan Smith, Peter Bubenik, and Christopher McCarty. What is missing from this picture? Persistent homology and mixup barcodes as a means of investigating negative embedding space, 34pp. arXiv:2510.14327 [cs.SI]
- Himanshu Yadav, Gisela D. Charó, and Davide Faranda. Topological Structure of the Cyclonic-Anticyclonic Interactions, 24pp. arXiv:2511.19938 [physics.ao-ph]

SKILLS

- **Languages:** Python, Julia, R, SQL, Kotlin, Slurm (Perlmutter supercomputer)
- **Cloud & Data Engineering:** AWS, Databricks, Apache Spark
- **Libraries & Tools:** NumPy, Pandas, Scikit-learn, TensorFlow, PyTorch, Keras, GUDHI, Ripser, Dash, Tableau
- **Methods:** Topological Data Analysis, Deep Learning, Machine Learning, Large Language Models, Mathematical Modeling, Time Series Analysis

RESEARCH EXPERIENCE

- **Summer Intern, Lawrence Berkeley National Laboratory** Berkeley, CA, USA
Applied Mathematics and Computational Research Division (Collaborator: Destinee Morrow) Summer 2024
 - Analyzed 51,865 clinical discharge notes from 14,915 OSA patients using the MIMIC-IV database on the *Perlmutter* supercomputer.
 - Applied BERTopic with GatorTron (LLM) embeddings for topic modeling; identified 350 initial topics refined to 166 clinically distinct categories via hierarchical clustering.
 - Conducted Kaplan-Meier survival analysis across identified themes, revealing differential patient survival rates over a 12-year horizon; presented findings at the *Computing Sciences Summer Session 2024*.
- **Participant, AMS Mathematics Research Communities** Buffalo, NY, USA
Climate and TDA, American Mathematical Society Summer 2024
 - Applied persistent homology to 73 years (1950–2022) of ERA5 sea-level pressure reanalysis data over the North Atlantic (22.5°N–70°N, 80°W–50°E) at 0.25°×0.25° daily resolution.
 - Developed sub- and superlevel filtrations to separately characterize cyclonic and anticyclonic structures; tracked features via Wasserstein-distance optimal matching, identifying the longest persistent cyclonic trajectory at 59 days (Jan–Mar 1966).
 - Found strong negative correlation (−0.573) between superlevel persistence and the NAO index; winter cyclonic features persist 35–38% longer than summer features. Results submitted to *Physica D: Nonlinear Phenomena*.
 - Tools: Python, GUDHI, xarray, netCDF4, Cartopy, SciPy, Scikit-learn, Pandas, Matplotlib.

- **Participant, Summer Data Science Boot Camp** Columbus, OH, USA
The Erdős Institute *Summer 2023*
 - Completed end-to-end data science training covering supervised (regression, classification) and unsupervised (dimensionality reduction, clustering) ML methods.
 - Collaborated on the project *Market Trends vs. News Media Sentiment*: built an NLP sentiment analysis pipeline to correlate financial market signals with news coverage patterns.
 - Tools: Python, Scikit-learn, Pandas, NumPy, NLTK/sentiment analysis libraries.
- **Research Assistant (NIH Grant funded)** Gainesville, FL, USA
Bureau of Economic and Business Research, University of Florida *2022 – 2023*
 - Developed a mathematical model using NLP, topic modeling, and TDA to optimize hiring and grant funding decisions for university administrators.
 - Presented researcher network findings at the *International Network for Social Network Analysis 2023* (Travel Award).

PROJECTS

- **Patient Clustering and Survival Analysis (WISE Study)**: Applied the Mapper algorithm (UMAP projection + DBSCAN clustering) to 132 clinical variables from 819 women in the Women’s Ischemia Syndrome Evaluation (WISE) dataset. Identified two clinically distinct patient phenotypes (Cluster A: $n = 386$; Cluster B: $n = 433$) with significantly different long-term mortality profiles, validated via Kaplan-Meier analysis and log-rank tests. Tools: Python, KeplerMapper, UMAP, DBSCAN, Lifelines, Scikit-learn, Pandas. Presented at *American College of Cardiology 2024*.
- **Sleep State Detection** : Developed a pipeline for detecting sleep onset and wake from wrist-worn accelerometer time series data using TDA-enhanced feature engineering. Applied time series analysis and ML classification on the Healthy Brain Network dataset to improve automated sleep staging. Tools: Python, Jupyter, Scikit-learn, NumPy, Pandas.

TEACHING EXPERIENCE

- **Instructor**: Survey of Calculus 2 (MAC2234), Fall 2024
- **Instructor**: Elementary Differential Equations (MAP2302), Summer 2022
- **Teaching Assistant**: Elementary Differential Equations (MAP2302), Summer 2025
- **Teaching Assistant**: Mathematical Thinking (MGF1130), Spring 2025
- **Teaching Assistant**: Precalculus Algebra and Trigonometry (MAC1147), Summer 2024
- **Teaching Assistant**: Analytic Geometry and Calculus II (MAC2312), Spring 2023
- **Teaching Assistant**: Analytic Geometry and Calculus I (MAC2311), Fall 2022 & Spring 2022
- **Teaching Assistant**: Mathematics for Liberal Arts I (MGF1106), Fall 2021

MENTORING

- Mentored undergraduate students **Isaac Wachsmann** and **Megan Sin** on the topic of “Topology and Data.”

CONFERENCE ORGANIZATION

- **ComPer 2026 — Sixth Workshop on Computational Persistence** Gainesville, FL, USA
University of Florida *December 7–11, 2026 (provisional)*
- **Topological Data Analysis Seminar (Organizer)** Gainesville, FL, USA
University of Florida *Fall 2025*

CONFERENCES (TALK)

- **JMM 2026 — Session on TDA for Non-linear Dynamics** Washington, DC, USA
Walter E. Washington Convention Center *January 4–7, 2026*
- **AMS 2025 Spring Southeastern Sectional Meeting** Clemson, SC, USA
Clemson University *March 8–9, 2025*
- **AMS 2024 Fall Southeastern Sectional Meeting** Savannah, GA, USA
Georgia Southern University (cancelled) *October 5–6, 2024*
- **SUNBELT 2023** Portland, OR, USA
International Network for Social Network Analysis (Travel Award) *June 27–July 1, 2023*
- **South Central Topology Conference II** San Marcos, TX, USA
Texas State University (Travel Award) *February 11–12, 2023*

CONFERENCES (POSTER PRESENTATION)

- **Algebraic Topology: Methods, Computation, & Science (ATMCS)**
Montana State University (Accepted) Bozeman, MT, USA
July 21–25, 2025
- **Conference on Applications of Dynamical Systems**
SIAM: Society for Industrial and Applied Mathematics (Accepted) Denver, CO, USA
May 11–15, 2025
- **Southeast Center for Mathematics and Biology**
Georgia Tech Atlanta, GA, USA
April 10–11, 2025
- **Computing Sciences Summer Session 2024**
Lawrence Berkeley National Laboratory (Travel Award) Berkeley, CA, USA
August 6–7, 2024
- **Topological Data Analysis Week 2024**
Kyoto University (Travel Award) Kyoto, Japan
July 31–August 4, 2024

CONFERENCES ATTENDED

- **Topological Data Analysis Conference (UFTDA2024)**
University of Florida Gainesville, FL, USA
February 8–9, 2024
- **Randomness in Topology and its Applications**
Institute for Mathematical and Statistical Innovation (Travel Award) Chicago, IL, USA
March 20–24, 2023
- **Topological Data Analysis Conference (UFTDA2023)**
University of Florida Gainesville, FL, USA
February 23–24, 2023
- **Measure-theoretic Approaches & Optimal Transportation in Statistics**
Institute Henri Poincaré Paris, France
November 21–25, 2022
- **CBMS Conference on Topological Data Analysis and Persistence Theory**
Valdosta State University Valdosta, GA, USA
August 8–12, 2022
- **FSU-UF Joint Topology and Geometry Meeting**
University of Florida Gainesville, FL, USA
February 11–12, 2022
- **University of Florida TDA Conference (UFTDA2022)**
University of Florida Gainesville, FL, USA
January 20–21, 2022

LEADERSHIP

- **Team Management:** Led a team of 50 individuals implementing an innovative pedagogical approach for primary education of underprivileged children, recognized by iCONGO and the United Nations.