Dhruv Kohli

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Education

2025–Present	**Postdoc.**, Applied and Computational Mathematics, Princeton University Advisor: Amit Singer
2021–25	**Ph.D.**, Computational Mathematics, University of California San Diego Advisors: Alex Cloninger and Gal Mishne
2018–20	**M.S.**, Computational Mathematics, University of California San Diego
2012–16	**B.Tech.**, Mathematics & Computing, Indian Institute of Technology Guwahati

Research Interests

My research focuses on developing novel algorithms to analyze and uncover meaningful structures within high-dimensional data. My overarching objective is to obtain low-dimensional representations of the data by decomposing it into well-behaved regions that are easy to parameterize. To advance these goals, I often utilize tools from differential geometry, spectral graph theory, optimization, and optimal transport. In addition to providing stability and convergence guarantees for these algorithms, my work also focuses on their efficient and scalable implementation.

Publications

Preprints

1. Kohli†, D., Robertson†, S., Cloninger, A. & Mishne, G. Robust Tangent Space Estimation via Laplacian Eigenvector Gradient Orthogonalization. *arxiv:2510.02308* (2025).
2. Kohli, D., He, J., Holtz, C., Mishne, G. & Cloninger, A. Robust estimation of boundary using doubly stochastic scaling of Gaussian kernel. *arXiv:2411.18942* (2024).
3. Kohli, D., Nieuwenhuis, J. S., Cloninger, A., Mishne, G. & Narain, D. RATS: Unsupervised manifold learning using low-distortion alignment of tangent spaces. *bioRxiv* (2024).
4. Kohli, D., Cloninger, A. & Mishne, G. Tear and repulsion enabled registration of point clouds (2024).

Journal Articles

1. Robertson†, S., Kohli†, D., Mishne, G. & Cloninger, A. On a generalization of Wasserstein distance and the Beckmann problem to connection graphs. *SIAM Journal on Scientific Computing* **47,** A2774–A2800 (2025).
2. Kohli, D., Mishne, G. & Cloninger, A. Non-degenerate rigid alignment in a patch framework. *arXiv:2303.11620; to appear in SIAM Journal on Optimization* (2023).
3. Kohli, D., Cloninger, A. & Mishne, G. LDLE: Low Distortion Local Eigenmaps. *Journal of Machine Learning Research* **22,** 1–64 (2021).
4. Kohli, D. & Rabin, J. M. Asymmetric expansion preserves hyperbolic convexity. *Journal of Geometry* **111,** 33 (2020).
5. Kohli, D. & Rabin, J. M. Radial expansion preserves hyperbolic convexity and radial contraction preserves spherical convexity. *Journal of Geometry* **110,** 1–13 (2019).

† equal contribution

Peer-reviewed Conference Proceedings

1. Kohli, D., Das, B. C., Gopalakrishnan, V. & Iyer, K. N. *Learning rotation invariance in deep hierarchies using circular symmetric filters* in *2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (2017), 2846–2850.

Patents

1. Ichapurapu, R., Inti, D. L. N. S., Kohli, D. & Subramanian, A. *Interactive physical placement of devices for optimal motion sensing using channel state information (CSI)*. US Patents 12120534-B1 (2024).

Software

pyLDLE2 Our python package containing implementation of (a) linear and spectral methods for constructing low-dimensional local views of the data, and (b) spectral, semidefinite, and other iterative techniques for globally aligning these local views.

Awards & Honors

2025 Travel grant for NSF CompMath Meeting 2025 at University of Utah
2021–25 UCSD Halıcıoğlu Data Science Institute (HDSI) PhD Fellowship
2021–25 UCSD Department of Mathematics, James B. Ax Fellowship
2017 Ranked 18 across country in entrance exam for Master in Statistics organized by Indian Statistical Institute, Kolkata
2014 Ranked 1 across the country in CUDA Coding Challenge India organized by Nvidia in High Performance Computing Conference [Code]

Conferences & Presentations

Talks

Dec 2025 Robust Tangent Space Estimation via Laplacian Eigenvector Gradient Orthogonalization. *New Perspectives in Advancing Graph Machine Learning*, *NeurIPS*, *San Diego*.
Jan 2025 From Local Views to Global Embedding: Methods in Bottom-Up Manifold Learning. *IDEAS Seminar*, *Program in Applied and Computational Mathematics*, *Princeton*.
Mar 2024 Tear and repulsion enabled registration of point clouds for manifold learning. *Dagstuhl Seminar 24122 on Low-Dimensional Embeddings of High-Dimensional Data: Algorithms and Applications*, *Wadern*, *Germany*.
Apr 2023 A bottom-up manifold learning framework to embed closed and non-orientable manifolds into their intrinsic dimensions. *Southern California Applied Mathematics Symposium*, *UC Irvine*.

Posters

Oct 2024 Tear and repulsion enabled registration of point clouds. *SIAM Conference on Mathematics of Data Science* (Atlanta, US).
Sep 2024 Robust estimation of boundary using doubly stochastic kernel. *NSF site visit*, *The Institute for Emerging CORE Methods in Data Science (EnCORE)* (UC San Diego).
Mar 2023 Reliable neural manifold decoding using low-distortion alignment of tangent spaces. *Computational and Systems Neuroscience (COSYNE)* (Montreal, Canada).
Oct 2022 Fast alignment of local eigenmaps for a guaranteed low distortion global embedding. *Fall Fourier Talks*, *Norbert Wiener Center* (University of Maryland).
Mar 2021 Low Distortion Local Eigenmaps. *SoCal ML and NLP Symposium* (UC San Diego).

Industrial Experience

2024	PhD AI research intern, GM Cruise, Remote, US.
2020-21	Software engineer (ML), Amazon.com Services, Inc., Sunnyvale, US.
2016-17	Software engineer (ML), Samsung Research Institute, Bangalore, India.
2015	Research Intern, Microsoft Research, Bangalore, India.
2014	International Neuroinformatics Coordinating Facility via Google Summer of Code.

Teaching Assistant Experience

DSC 205	Geometry of Data
MATH 170A	Numerical Linear Algebra
MATH 170B	Numerical Approximation and Nonlinear Equations
MATH 183	Statistical Methods
MATH 20E	Vector Calculus
MATH 11	Calculus Based Probability and Statistics

Reviewer

2024	SIAM Journal on Mathematics of Data Science