

**Dhruv Kohli**  
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🌐 <https://dhruvkohli.github.io>

## Education

- 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 decompose data 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 establishing noise stability and convergence guarantees for these algorithms, my work also encompasses their efficient and scalable implementation.

## Publications

† → Equal contribution

### Preprints

1. **Kohli, Dhruv**, Cloninger, A. & Mishne, G. Tearing and Repulsion Enabled Registration of Point Clouds (2024).  
– Under review at *Journal of Machine Learning Research*.
2. **Kohli, Dhruv**, Nieuwenhuis, J. S., Cloninger, A., Mishne, G. & Narain, D. RATS: Unsupervised manifold learning using low-distortion alignment of tangent spaces. *bioRxiv* (2024).  
– Under review at *Science*.
3. **Kohli, Dhruv**, Mishne, G. & Cloninger, A. Non-degenerate Rigid Alignment in a Patch Framework. *arXiv:2303.11620* (2023).  
– Revision under review at *SIAM Journal on Optimization*.
4. Robertson<sup>†</sup>, S., **Kohli<sup>†</sup>, Dhruv**, Mishne, G. & Cloninger, A. On a Generalization of Wasserstein Distance and the Beckmann Problem to Connection Graphs. *arXiv:2312.10295* (2023).  
– Revision under review at *SIAM Journal on Scientific Computing*.

### Journal Articles

1. **Kohli, Dhruv**, Cloninger, A. & Mishne, G. LDLE: Low Distortion Local Eigenmaps. *Journal of Machine Learning Research* **22**, 1–64 (2021).
2. **Kohli, Dhruv** & Rabin, J. M. Asymmetric expansion preserves hyperbolic convexity. *Journal of Geometry* **111**, 33 (2020).
3. **Kohli, Dhruv** & Rabin, J. M. Radial expansion preserves hyperbolic convexity and radial contraction preserves spherical convexity. *Journal of Geometry* **110**, 1–13 (2019).

### Peer-reviewed Conference Proceedings

1. **Kohli, Dhruv**, 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, Dhruv** & 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

- 2021–25 UCSD Halicioğlu 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

- 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).

## Teaching Assistant Experience

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

## **Reviewer**

2024        SIAM Journal on Mathematics of Data Science

## **Industrial Experience**

2024        GM Cruise, Remote, US.

2020-21     Amazon.com Services, Inc., Sunnyvale, US.

2016-17     Samsung Research Institute, Bangalore, India.

2015        Microsoft Research, Bangalore, India.

2014        International Neuroinformatics Coordinating Facility via Google SOC, India.

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