David Beers

Postdoctoral Scholar/Lecturer
University of California, Los Angeles
Department of Mathematics

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Google Scholar

Education

University of Oxford

- DPhil, Mathematics (Graduation date: 02 March 2024).
- Thesis: **Topology for trees and curves: theory and applications**
- Advisors: **Heather A. Harrington** and **Alain Goriely**.

Boston University

- BA/MA, Mathematics with Minor in Physics, *Summa Cum Laudae* (2019).

Appointments

- Postdoctoral Scholar/Lecturer, UCLA 2024–present (Mentor: **Mason Porter**)
- Postdoctoral Research Associate in Topological Data Analysis, University of Oxford, 2023–2024 (Mentors: **Heather A. Harrington** and **Ulrike Tillmann**)

Publications

1. David Beers and Jacob Leygonie. 2025. **The fiber of persistent homology for trees**. Journal of Applied and Computational Topology (JACT), Vol. 9: 22.
2. Anna M. Dowbaj, Aleksandra Sljukic, Armin Niksic, Cedric Landerer, Julien Delpierre, Haochen Yang, Aparajita Lahree, Ariane C. Kühn, David Beers, Helen M. Byrne, Sarah Seifert, Heather A. Harrington, Marino Zerial, Meritxell Hutch. 2025. **Mouse liver assembloids model periportal architecture and biliary fibrosis**. Nature, Vol. 644: 473–482.
3. Ramón Nartallo-Kaluarachchi, Paul Expert, David Beers, Alexander Strang, Morten L. Kringelbach, Renaud Lambiotte, Alain Goriely. 2024. **Decomposing force fields as flows on graphs reconstructed from stochastic trajectories**. Proceedings of the Third Learning on Graphs Conference (LoG 24), PMLR 269:4:1–4:26 ***(Best Paper Award)***.
4. Christian Goodbrake, David Beers, Travis B. Thompson, Heather A. Harrington, Alain Goriely. 2024. **Brain Chains as Topological Signatures for Alzheimer's Disease**. Journal of Applied and Computational Topology (JACT), Vol. 8: 1257–1298.
5. Jacob Leygonie and David Beers. 2022. **Fiber of Persistent Homology on Morse functions**. Journal of Applied and Computational Topology (JACT) Vol. 7: 89–102.
6. David Beers, Despoina Goniotaki, Diane P. Hanger, Alain Goriely, Heather A. Harrington. 2023. **Barcodes distinguishing morphology of neuronal tauopathy**. Physical Review Research, Vol. 5: 043006.
7. David Beers and Matt Szczesny. 2019. **Split Grothendieck rings of rooted trees and skew shapes via monoid representations**. Involve, Vol. 12, No. 8: 1379–1397.

Preprints

1. David Beers and Gillian Grindstaff. 2025. **Intrinsic Bottleneck Distance for Merge Trees**. arxiv.org/abs/2509.02755.

[1] Updated October 1, 2025

2. David Beers, Heather A. Harrington, Jacob Leygonie, Uzu Lim, Louis Theran. 2024. **Fibers of point cloud persistence**. arxiv.org/abs/2411.08201.
3. Lewis Marsh and David Beers. 2023. **Stability and Inference of the Euler Characteristic Transform**. arxiv.org/abs/2303.13200. To appear in Discrete & Computational Geometry
4. David Beers, Alain Goriely, Heather A. Harrington. 2022. **Stability of topological descriptors for neuronal morphology**. arxiv.org/abs/2211.09058.

Awards

- Best Paper Award: Learning on Graphs Conference 2024 (for **Decomposing force fields as flows on graphs reconstructed from stochastic trajectories**).
- Boston University College Prize for scholastic achievement in mathematics (2019).

Talks

1. *Rigidity and Level Sets of Persistent Homology.* SIAM Conference on Applied Algebraic Geometry (AG25): Rigidity and Data. July 8, 2025. Invited.
2. *Level Sets of Persistent Homology for Point Clouds.* Southern California Applied Math Symposium (SOCAMS) 2025. April 4, 2025.
3. *Fibers of Point Cloud Persistence.* Spires 2024, Oxford. August 9, 2024..
4. *Three Inverse Problems for Persistent Homology.* Applied Topology Seminar, EPFL. May 15, 2024. Invited.
5. *The Fiber of the Persistence map for Trees.* TDA Centre Meeting, University of Oxford. February 23, 2024.
6. *Stability of a Shape Transform for Curves.* Maths in Biology Day, Max Planck Institute for Mathematics in the Sciences, Leipzig. December 5, 2023.
7. *Inverse Problems in Persistent Homology.* SIAM Conference on Applied Algebraic Geometry (AG23): Algebraic Identifiability and its Applications. July 11, 2023. Invited.
8. *Topological methods for the brain: from single-cell to the connectome.* BrainNet 2023, Stockholm, Sweden. May 26, 2023. Invited.
9. *Topological methods for the brain: from single-cell to the connectome.* Joint Mathematics Meetings 2023: AMS Special Session on Data Science at the Crossroads of Analysis, Geometry, and Topology. January 5, 2023.
10. *Topological methods for the brain: from single-cell to the connectome.* TDA Centre Meeting, University of Oxford. November 11, 2022.
11. *The Fiber of Persistent Homology for Morse Functions.* Young Topologists Meeting, University of Copenhagen. July 19, 2022.
12. *What TDA can say about the morphology of diseased neurons.* 1st International Symposium on Aihara Moonshot Project. June 6, 2022. Invited.
13. *Graph Reconstruction by Discrete Morse Theory.* Analysis group, Wellcome Centre for Integrative Neuroimaging (WIN). September 27, 2021.

Community Engagement

I have given the following talks for community engagement:

1. *Understanding a Neuron through its Branches.* Pembroke College Maths Club, Oxford University. February 8, 2023. Invited.

Teaching Experience

UCLA

- Lecturer, Math 132: Complex Analysis for Applications (Fall 2025).
- Lecturer, Math 32B: Calculus of Several Variables (Spring 2025).
- Lecturer, Math 31B: Integration and Infinite Series (Fall 2024, Winter 2025).

University of Oxford

- Tutor, Computational Algebraic Topology (Spring 2024).
- Tutor, Metric Spaces and Complex Analysis (Fall 2023).
- Teaching Assistant, Algebraic Topology (Fall 2020, Fall 2021).
- Teaching Assistant, Computational Algebraic Topology (Spring 2021, Spring 2022).
- Teaching Assistant, Nonlinear Systems (Spring 2020).

Professional Service

- Panel Moderator: UCLA Undergraduate Research and Creativity Showcase (Spring 2025)
- Organizer of the Oxford Applied Topology Seminar (Fall 2023 – Spring 2024)

Referee Experience

I have been a referee for the following:

- Network Science
- La Matematica
- Conference Proceedings of ATMCS10
- Symposium on Computational Geometry (SoCG)

Programming

Expert in MATLAB, Python, and LaTeX. Experience with C and Fortran 90.