David Beers

University of Oxford
Mathematical Institute

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Education

University of Oxford

- DPhil, Mathematics (2023).
- Advisors: **Heather A. Harrington** and **Alain Goriely**.

Boston University

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

Appointments

- Postdoctoral Research Associate in Topological Data Analysis, University of Oxford, 2023-present

Publications and Preprints

1. Jacob Leygonie and David Beers. 2022. **Fiber of Persistent Homology on Morse functions**. Journal of Applied and Computational Topology (JACT).
2. David Beers, Despoina Goniotaki, Diane P. Hanger, Alain Goriely, Heather A. Harrington. 2023. **Barcodes distinguishing morphology of neuronal tauopathy**. Physical Review Research.
3. David Beers and Jacob Leygonie. 2023. **The fiber of persistent homology for trees**. arxiv.org/abs/2303.16176.
4. Lewis Marsh and David Beers. 2023. **Stability and Inference of the Euler Characteristic Transform**. arxiv.org/abs/2303.13200.
5. David Beers, Alain Goriely, Heather A. Harrington. 2022. **Stability of topological descriptors for neuronal morphology**. arxiv.org/abs/2211.09058.
6. Christian Goodbrake, David Beers, Travis B. Thompson, Heather A. Harrington, Alain Goriely. 2022. **Brain Chains as Topological Signatures for Alzheimer's Disease**. arxiv.org/abs/2208.12748.

Talks

1. *Inverse Problems in Persistent Homology.* SIAM Conference on Applied Algebraic Geometry (AG23): Algebraic Identifiability and its Applications. July 11, 2023. Invited.
2. *Topological methods for the brain: from single-cell to the connectome.* BrainNet 2023, Stockholm, Sweden. May 26, 2023. Invited.
3. *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.

[1] Updated October 30, 2023

4. *Topological methods for the brain: from single-cell to the connectome.* TDA Centre Meeting, University of Oxford. November 11, 2022.

5. *The Fiber of Persistent Homology for Morse Functions.* Young Topologists Meeting, University of Copenhagen. July 19, 2022.

6. *What TDA can say about the morphology of diseased neurons.* 1st International Symposium on Aihara Moonshot Project. June 6, 2022. Invited.

7. *Graph Reconstruction by Discrete Morse Theory.* Analysis group, Wellcome Centre for Integrative Neuroimaging (WIN). September 27, 2021.

8. *Computing Persistent Homology.* TDA group, University of Oxford. October 23, 2020.

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

University of Oxford

- 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

- Organizer of the Oxford Applied Topology Seminar (Fall 2023 - present)

Referee Experience

I have been a referee for the following:

- Symposium on Computational Geometry (SoCG)

Programming

Expert in MATLAB and LaTeX. Previous experience in Python, C, and Fortran 90.

Awards

- Boston University College Prize for scholastic achievement in mathematics (2019).