

# Bradley Vigil

Applied and Computational Topology | Data Science | Mathematical Neuroscience



## Research Overview

My interdisciplinary research develops theory and models to understand the mathematical properties and structure of complex systems.

I am particularly interested in interdisciplinary questions regarding biological processes expressing both continuous and network features. My research praxis fuses mathematical modeling, differential equations, computational topology, data science and interdisciplinary collaboration to target challenging problems from epilepsy and neurodegenerative disease to climate change and biodiversity.

## Awards and Notoriety

2024-2025 **Quad Fellow (IIE):** *website*

2023-2025 **Charles S. Peirce Fellow**

2023-2024 **Hildebrand Fellow**

2023-2023 **ICERM Travel Grant** \$1,145.82

2019-2023 **Texas Presidential Scholar**

2019-2023 **Texas Merit Scholar**

## Professional Affiliations

**AMA** American Mathematical Association

**AMS** American Mathematical Society

**NAM** Natl Assoc of Mathematicians

**SIAM** Soc of Appl and Industrial Mathematics

## Contact

✉ [bradley.z.vigil@ttu.edu](mailto:bradley.z.vigil@ttu.edu)

☎ +1 806.742.2566

Texas Tech University

Dept. of Mathematics and Statistics

1108 Memorial Circle

Lubbock, Texas. 79409

## Education

2022-Present	<b>Ph.D. Mathematics</b> <b>Texas Tech University</b> <i>Quad Fellow, Hildebrand Graduate Fellow, Peirce Graduate Fellow, Presidential Scholar</i>	📍 Lubbock, Texas
2021-2022	<b>M.Sc. Mathematics</b> <b>Texas Tech University</b> <i>Presidential Scholar, Merit Scholar</i>	📍 Lubbock, Texas
2019-2021	<b>B.Sc. Mathematics</b> <b>Texas Tech University</b> <i>Presidential Scholar, Merit Scholar</i> Minor in Economics	📍 Lubbock, Texas

## Academic Appointments

2021-Present	<b>Distinguished Grad. Res. Asst.</b> <i>Texas Tech Graduate College Dept. of Mathematics and Statistics</i> → Applied and Computational Topology, → Data-driven Mathematical Modeling, → Mathematical Neuroscience	📍 Lubbock, Texas
2021-Present	<b>Grad. Instructor</b> <i>Dept. of Mathematics and Statistics</i> → Instructor of record: Calculus II; Ordinary Diff. Eqn. → Offline and online multimodal curriculum → Large lecture leadership experience	📍 Lubbock, Texas

## Academic Presentations

November, 2023	<b>SIAM TX-LA</b> <i>Co-organizer for mini-symposium Title of talk: Networks, Topology, Data and Pathology</i> University of Louisiana at Lafayette (invited)	📍 Lafayette, Louisiana
September, 2023	<b>Department of Bio. Eng.</b> <i>Fundamentals of mathematical modeling and machine learning in drug resistant pediatric epilepsy</i> University of Texas at Arlington (invited)	📍 Arlington, Texas
March, 2023	<b>Groups and Dynamics Conference</b> <i>Dynamics, Dysfunction and Degeneration: The mathematics of Alzheimer's disease</i> The University of Texas at Austin (accepted)	📍 Austin, Texas

## Scientific and Research Computing

<b>Data Science, Machine Learning</b>	<b>Python:</b> <i>Proficient</i> <b>GUDHI:</b> <i>Journeyman</i> <b>Tensorflow:</b> <i>Apprentice</i>
<b>Modeling and Simulation</b>	<b>Python :</b> <i>Proficient</i> <b>Matlab:</b> <i>Proficient</i> <b>C/C++:</b> <i>Journeyman</i> <b>Mathematica:</b> <i>Journeyman</i>
<b>Academic Writing</b>	<b>Latex :</b> <i>Proficient</i>

Extracurricular Activity

Dream Center (Lubbock, TX)

→ Initiated the development of cooking classes for low economic families designed to provide key insights into how diet is tied to Alzheimer’s disease

→ Collaborated with horticulturists to develop lists of healthy and affordable foods that can grow in the climate of the Texas panhandle

Math Circle (Texas Tech Univ.)

→ For middle and high school math students  
→ Provides challenging problems  
→ Encourages excitement for mathematics

Math Club (Texas Tech Univ.)

→ Discuss grad school applications with undergrads  
→ Discuss grad school life with undergrads

Topological Data Analysis Workshops

→ Hosted workshops for faculty and grad students for an introduction to the theory and computational tools for topological data analysis  
→ Jupyter notebook available *here*




ASPCA

→ Aided at the animal shelter by cleaning animal kennels and caring for the animals

Publications

1. Travis B. Thompson, **Bradley Z. Vigil**, Robert S. Young. *Alzheimer’s disease and the mathematical mind*. Brain Multiphysics, 2024, doi.org/10.1016/j.brain.2024.100094
2. **Bradley Z. Vigil**, Travis B. Thompson, Robert S. Young. *NPC and GPC reveal hidden structure in the persistent homology of propagation*. (In preparation).
3. Robert Young, Naresh Sah, **Bradley Vigil**, Komoraiah Palle, Sharilyn Almodovar, Yifan Wang, Amanda Laubmeier and Travis Thompson. *Decoding Cancer’s Defenses: Employing data-driven mathematical modeling to decipher cancer resistance..* (In preparation).

Academic Workshops

April, 2024	<b>Python: Topological Data Analysis II</b>  Lubbock, Texas <i>Institute for Studies in Pragmaticism</i> Texas Tech University (organized)
March, 2024	<b>Python: Topological Data Analysis I</b>  Lubbock, Texas <i>Institute for Studies in Pragmaticism: flyer</i> Texas Tech University (organized)
October, 2023	<b>Topology and Geometry in Neuroscience</b>  Providence, Rhode Island <i>Institute for Computational and Experimental Research in Mathematics (ICERM): website</i> Brown University (accepted)