

# Bengier Ülgen Kılıç

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## Education

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- **Ph.D. in Applied Mathematics** (Expected, March 2023)  
University at Buffalo, The State University of New York (SUNY), New York, USA
- **B.S. in Mathematics** (2017)  
Boğaziçi University, Istanbul, Turkey

## Work Experience

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**Graduate Research Assistant** – University at Buffalo, SUNY (2019–)

- [Donu-TDA](#): Unsupervised software for Donut-like Object segmentation Utilizing Topological Data Analysis
- [Temporal network analysis](#): A novel interlayer mapping of community evolution in temporal networks
- [Neuronal cascades](#): Computational framework for modeling neuronal dynamics on coupled network systems

**Graduate Teaching Assistant** – Department of Mathematics, University at Buffalo, SUNY (2017–)

- Math 141, College Calculus I Fall'18
- Math 142, College Calculus II Spring'18/Spring'21/Fall'22
- Math 241, College Calculus III Fall'19/Fall'21/Spring'22/Fall'22/Spring'23
- Math 309, Linear Algebra Spring'20
- Math 417, Survey of Multivariable Calculus Spring'22/Spring'23

**Adjunct Instructor** – Department of Mathematics, University at Buffalo, SUNY (2019,2020)

- [Math 131, Mathematical Analysis for Management](#) Summer'19
- [Math 231, College Calculus III](#) Summer'20

## Publications

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- **Kilic, B. Ü.**, Muldoon, S., Skeleton coupling: a novel interlayer mapping of community evolution in temporal networks, <https://arxiv.org/abs/2301.10860>, 2023.
- **Kilic, B. Ü.**, Taylor, D. Simplicial cascades are orchestrated by the multidimensional geometry of neuronal complexes. Communications Physics 5, 278 (2022), <https://doi.org/10.1038/s42005-022-01062-3>.

## Talks & Poster Presentations

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- Boston University, Dynamical Systems Seminar ([BU-DSS](#)) 2022  
(**Seminar Talk**) Thresholding and multi-body interactions orient cascades in spatially embedded networks.
- Contagion on Complex Social Systems ([CCSS](#)) 2022  
(**Contributed Talk**) A simplicial threshold model for higher-order cascades.
- Network Science Society ([Netsci2022](#)) 2022  
(**C. T.**) Simplicial cascades are orchestrated by the multidimensional geometry of neuronal complexes.
- Northeastern Regional Conference on Complex Systems ([NERCCS](#)) 2022  
(**C. T.**) Simplicial cascades are orchestrated by the multidimensional geometry of neuronal complexes.
- [Networks2021](#), A joint Sunbelt and NetSci conference 2021  
(**C. T.**) Higher-order flow channels of neuronal avalanches uncovered by topological data analysis of simplicial contagions.
- Northeastern Regional Conference on Complex Systems ([NERCCS](#)) 2021  
(**C. T.**) Characterization of communities in dynamic functional networks.  
(**C. T.**) Geometrical/topological data analyses reveal higher-order flow structures provide flow channels for neuronal avalanches.

- Northeastern Regional Conference on Complex Systems ([NERCCS](#)) 2019  
(**C. T.**) Biomedical image processing via persistent homology.
- Northeastern Regional Conference on Complex Systems ([NERCCS](#)) 2022  
(**Poster**) Skeleton coupling: novel method for choosing interlayer edges in temporal networks for dynamic community detection.
- Dynamics Days ([DD](#)) 2022  
(**Poster**) Cascades over simplicial complexes preferably follow geometrically reinforced channels.
- Society for Neuroscience ([SFN](#)) 2019  
(**Poster**) Cell detection and segmentation via persistent homology.

## Leadership and Organization

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- Directed Reading Program - Turkey ([DRP-Turkey](#)) 2022
  - Organized a directed reading program across over 10 countries, pairing over 50 undergraduate students with young researchers to work on topics in mathematics.
  - Wrote grant proposals and reports, performed exploratory data analysis.

## Professional Development

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- Neuromatch Academy Deep Learning summer workshop ([NMA-DL](#)) 2021
  - Developed and debugged a deep learning framework (utilizing LSTMs, encoders/decoders etc.) for NLP (sentiment analysis from tweets), and gained experience cleaning and optimizing text data for analysis.
- Topological insights in Neuroscience ([MSRI](#)) 2021
  - Participated in an interdisciplinary workshop.
- [TopoNets](#), Networks beyond pairwise interactions, Satellite @ Networks 2021 2021
  - Participated in a satellite workshop.
- Biology, Analysis, Geometry, Energies, Links ([bagel19](#)), IMA 2019
  - Participated in a two-week long workshop, presented posters.

## Awards, Honors and Scholarships

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- Obtained travel and lodging grant from University of Colorado at Boulder (\$1000), [CCSS](#). 2022
- Rewarded by honorable mention of the best poster award, [NERCCS](#). 2022
- Obtained travel and lodging grant from The Institute for Mathematics and Its Applications (\$750), [IMA](#). 2019
- Contributed to the project ‘Seizure control through state-specific manipulation of cell assemblies’ (NSF SMA-1734795).

## Reviews of Journal Papers

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- Frontiers in Physics
- Frontiers in Big Data

## Software Expertise

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- Python (Numpy, scikit-learn, NetworkX, PyTorch, Tensorflow, PySpark, Pandas, matplotlib, Plotly, ReadTheDocs), SQL, Apache Spark, AWS-Sagemaker, Cython, Matlab, SLURM,  $\text{\LaTeX}$ , Illustrator, MS Office, Github.

## Skills

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- **Machine learning:** Regression, Clustering, Decision trees, Classification, Dynamic community detection, Dimensional reduction, Network analysis, Time-series analysis, Topological data analysis.
- **Neural networks:** Deep Learning, Image Recognition (CNNs), Natural Language Processing (RNNs).
- **High performance computing:** Distributed computing, Parallel computing, Resilient distributed datasets (RDDs)

## Volunteer activity

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- Project mentor for ‘*Mathematics of deep learning*’ – ([Directed Reading Program, Turkey](#)) 2022
- Project mentor for ‘*Network analysis for real-world applications*’ – ([UB, Directed Reading Program](#)) 2022
- Project mentor for ‘*Graph theoretical analysis of brain networks*’ – ([Directed Reading Program, Turkey](#)) 2021

## Languages

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- Turkish (Native)
- English (Fluent)
- Greek (Elementary)

## References

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- **Sarah F. Muldoon** (Co-Advisor)  
Associate Professor, Department of Mathematics, CDSE Program, Neuroscience Program, University at Buffalo, SUNY  
(smuldoon@buffalo.edu)
- **Dane Taylor** (Co-Advisor)  
Assistant Professor, Department of Mathematics, CDSE Program, Univeristy at Buffalo, SUNY  
(danet@buffalo.edu)
- **Naoki Masuda** (Ph.D. Committee Member)  
Professor, Department of Mathematics, CDSE Program, University at Buffalo, SUNY  
(naokimas@buffalo.edu)