Bengier Ülgen Kılıç

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Doctoral Research

" My research pertains to complex networks, dynamical systems, topological & geometrical data analyses and mathematical modeling. I aim to integrate existent theory and models to explain the behavior of recently emerging data in interdisciplinary domains, particularly in computational neuroscience."

Education

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

Software Expertise

- **Expert:** Python, Cython, Matlab, SLURM, LaTeX, Illustrator, Microsoft Office, Jupyter notebooks Numpy, scikit learn, PyTorch, Plotly, Pandas, ReadTheDocs, matplotlib, NetworkX, iGraph
- **Intermediate:** Azure, SQL, HTML, CSS, Git

Skills

- **Statistical Analysis:** Linear Regression, Clustering, Classification, Community Detection, Network Analysis.
- **Machine Learning:** Deep Learning, Image Recognition (CNNs), Natural Language Processing (RNNs).
- **High-performance computing:** Distributed Computing.

Work Experience

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

- Pursued high-impact journal publications, gave talks in major conferences and presented papers in journal club meetings.
- Ran multiple research projects, conducted interdisciplinary scientific research, reviewed the literature, analyzed data.
- Built algorithms and models, developed codebases for research pipelines, prepared documentations.
- Gained collaboration skills, analytical problem solving ability, organizational & communication skills and high autonomy.
- Obtained high-level knowledge in network-data analytics, topological & geometrical data analyses, computational neuroscience, data-oriented modeling, state detection, complex graphs, dynamical systems, spreading processes.

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

- Tutored and mentored undergraduate students, graded exams, held office hours.
- Taught undergraduate courses in mathematics key to STEM curriculum.
  - Math 141, College Calculus I — Fall'18
  - Math 142, College Calculus II — Spring'18/Spring'21/Fall'22
  - Math 231, College Calculus III — Fall'19/Fall'21/Spring'22
  - Math 309, Linear Algebra — Spring'20
  - Math 417, Survey of Multivariable Calculus — Spring'22

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

- Administered undergraduate courses in mathematics.
  - Math 131, Mathematical Analysis for Management — Summer'19
  - Math 231, College Calculus III — Summer'20

Publications

- **B. U. Kilic** and D. Taylor. Simplicial cascades are orchestrated by the multidimensional geometry of neuronal complexes. arXiv preprint, arXiv:2201.02071, 2022.
- **B. U. Kilic** and S. Muldoon. Skeleton coupling: a novel method for choosing interlayer edges in temporal networks for dynamic community detection, 2022 (*In Preparation*).

Talks & Poster Presentations

- 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

- (**Organizer**) Directed Reading Program - Turkey (DRP-Turkey) 2022

Professional Development

- (**Interactive participant**) Neuromatch Academy Deep Learning summer workshop (NMA-DL) 2021
- (**Participant**) Topological insights in Neuroscience (MSRI) 2021
- (**Participant**) TopoNets, Networks beyond pairwise interactions, Satellite @ Networks 2021 2021
- (**Participant**) SIAM Conference on Applications of Dynamical Systems (DS21) 2021
- (**Participant**) Biology, Analysis, Geometry, Energies, Links (bagel19), IMA 2019

Awards, Honors and Scholarships

- 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).

Volunteer activity

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

Languages

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

References

- **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)