İsmail Güzel

PhD Candidate
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Department of Mathematics
İstanbul Technical University
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Research Interests

- Topological Data Analysis, Dynamical Systems,
- Machine and Deep Learning Algorithms,
- Mathematical Finance, Time Series Analysis, Numerical Analysis

Education

2017– ongoing **Ph.D. in Mathematics Engineering**
Thesis: Topological Data Analysis and Machine Learning Algorithms
Advisor: Prof. Dr. Atabey Kaygun

2010 – 2014 **M.Sc. in Mathematics (with thesis)**
Dokuz Eylül University GPA: 3.88/4.00
Thesis: On highest eigenvalues of Regular Sturm-Liouville Problems
Advisor: Prof. Dr. Şennur Somali

2015 – 2016 **B.Sc (Major) in Mathematics**
Dokuz Eylül University GPA: 3.81/4.00
magna cum laude

2014 – 2015 **Pedagogical Formation in Mathematics**
Dokuz Eylül University

2012 – 2015 **B.Sc (Minor) in Statistics**
Dokuz Eylül University GPA: 3.29/4.00

2012 – 2013 **Exchange Program in Denmark Aarhus University** GPA: 3.66/4.00
Project: Solving equations via Eigenvalues and Eigenvectors
Advisor: Anders Nedergaard Jensen

Work Experience

2021 – 2022 Visiting Researcher(12 months), Michigan State University via TÜBİTAK 2214-A with Prof. Dr. Elizabeth Munch

2018 – present *Research and Teaching Assistant*, İstanbul Technical University

2019 – 2022 *Quantitative Analyst*, Algotecht

2020 – 2022 *Lecturer of Machine and Deep Learning Courses*, UcuncuBinYil

2015 – 2018 *Mathematics Teacher*, BAYSEM

Publications

Journal Papers

2022 Persistent Homology, Matroids and Cobordisms, arXiv 2022.
Güzel İ., Kaygun A.

2022 Classification of stochastic processes with topological data analysis, arXiv 2022.
Güzel İ., Kaygun A.

2022 *Detecting bifurcations in dynamical systems with CROCKER plots*, Chaos: An Interdisciplinary Journal of Nonlinear Science 2022. *This article was selected as Featured Article*
Güzel İ., Munch E., Khasawneh F.

2022 *A new non-archimedean metric on persistent homology*, Computational Statistics, 2022.
Güzel İ., Kaygun A.

2019 *Operator splitting methods for computation of eigenvalues of regular Sturm-Liouville problems*, Surveys in Mathematics and its Applications
Güzel İ., Adıyaman M., Somali S.

Conference Papers

2022 Classification of Stochastic Processes with Topological Data Analysis, BAŞARIM 2022 - 7th High-Performance Computing Conference, May 2022.
Güzel İ., Kaygun A.

2022 A Case Study on Identifying Bifurcation and Chaos with CROCKER Plots, Proceedings of TDA at SDM (SIAM Data Mining), April 2022.
Güzel İ., Munch E., Khasawneh F.

Posters

2021 *Bifurcation Analysis with CROCKER plots*, CMSE Student Research Symposium at Michigan State University, Nov 2021.
Güzel, İ., Munch. E., Khasawneh F.

2021 *Hierarchical Clustering and Zeroth Persistent Homology*, Institute for Mathematical and Statistical Innovation (MSI), May 2021.
Güzel, İ., Kaygun, A.

Scientific Activities

Seminar and Conference Talks

2022 Classification of Stochastic Processes with Topological Data Analysis, BAŞARIM2022, May 2022.

2022 A Case Study on Identifying Bifurcation and Chaos with CROCKER Plots, Proceedings of TDA: Applications of Topological Data Analysis to Data Science, Artificial Intelligence, and Machine Learning Workshop at SDM 2022.

2021 A Guided Tour of Data Science Ecosystem for Asset Managers Seminar at Quant Workshop: Developing an intraday trading strategy using order book data, machine learning and optimization, Chartered Financial Analyst (CFA) Istanbul Society in June 3-15, 2021

2016 *Computing Eigenvalues of Regular Sturm-Liouville Problems*, The 3rd Workshop of Association for Turkish Women in Maths. May, 27-29 Izmir, Turkey. (Joint with Ş. Somalı)

Attended and Selected Workshops, Courses

2022 Topological Data Visualization Workshop University of Iowa, May 16-20, 2022

2021 Computational Persistence ComPerWorkshop Purdue University, Nov 1-5, 2021

2021 Summer School: Theory and Practice of Deep Learning Gene Golub SIAM Summer School, July 19-30, 2021

2021 Quantum Information for Mathematics, Economics, and Statistics, Institute for Mathematical and Statistical Innovation (IMSI), May 24-28, 2021

2020 İMO2020 – Machine Learning in İstanbul (14 hours theoretical, 14 hours implementation), Mimar Sinan Fine Arts University, Feb 2020, Prof. Dr. Ş. İlker BİRBİL

Assisted Courses

2018 – 2021 Mathematics I

2018 – 2021 Mathematics II

Spring 2019 Introduction to Programming Languages (C)

Projects

2020 – ongoing The Scientific Research Projects İTÜ (PhD Thesis Project)

2021 – ongoing The Scientific and Technological Research Council of Türkiye (TÜBİTAK), Grant 2214.

Computer Skills

CAS Mathematica, SageMath

Computation Python, R, Julia, Matlab

Miscellaneous Linux, High-Performance Computing, Bash,
Office programs, LaTeX, Inkspace, Mathcha, IBM SPSS Statistics

Professional Service

Review

2022 Journal of Open Source Software, JOSS

2022 Topology, Algebra, Geometry in Machine Learning, ICML2022

2022 Geometrical and Topological Representation Learning, ICLR022

2021 Geometrical and Topological Representation Learning, ICLR2021

Scholarships

2017 – 2021 The Scientific and Technological Research Council of Türkiye, Grant 2211-A

2014 – 2016 Republic of Türkiye, State Scholarship (for masters education)

2011 – 2014 Zorlu Foundation Fellowship

Honors-Awards

2014 Graduate ranking first in Science Faculty, Dokuz Eylül University

2011 –2014 Certificate of high honor by Science Faculty Dean, Dokuz Eylül University

Languages

- Turkish (Native)
- English (Professional)

References

- Prof. Dr. Atabey Kaygun - *kaygun@itu.edu.tr*
- Assoc. Prof. Dr. Elizabeth Munch - *muncheli@msu.edu*
- Dr. Ayhan Yüksel, CFA, FRM, PRM - *ayhan.yuksel1@boun.edu.tr*
- Prof. Dr. Burak Saltoğlu - *burak.saltoglu@boun.edu.tr*