

Research interest

I am interested in the areas listed below and their applications to Biology.

- Topological data analysis
- Artificial intelligence
- Statistics

Employment

Aug 2023 - present **Applied machine learning postdoctoral fellow**,
H. Lee Moffitt Cancer Center & Research Institute. Advisor: Dr. Ghulam Rasool.

Education

2018–2023 **Ph.D., Mathematics**,
University of Florida. Advisor: Dr. Peter Bubenik.

2016–2018 **M.Sc., Mathematics (with Distinction)**,
Ivan Franko National University of Lviv. Advisor: Dr. Mykhailo Zarichnyi.

2012–2016 **B.S., Mathematics (with Distinction)**,
Ivan Franko National University of Lviv. Advisor: Dr. Mykhailo Zarichnyi.

Honors & Awards

Jun-Aug 2022 Summer Graduate Research Fellowship, University of Florida Center for Applied Mathematics

2020 Chat Yin Ho Scholarship, University of Florida Department of Mathematics

Sep 2014 - May 2015 Scholarship of the Verkhovna Rada of Ukraine

2012 2nd place in the National Ukrainian competition of reasearch works of the Minor Academy of Sciences

2010 3rd place in the National Ukrainian Olympiad in Mathematics

Publications

* indicates authors listed alphabetically

Published

2021 **Topological data analysis of *C. elegans* locomotion and behavior**,
Ashleigh Thomas, Kathleen Bates, Alexander Elchesen, Iryna Hartsock, Hang Lu, and Peter Bubenik,
Front. Artif. Intell., 4:668395. doi: 10.3389/frai.2021.668395.

Under review

2022 **Topological and metric properties of spaces of generalized persistence diagrams**,
**Peter Bubenik and Iryna Hartsock*, arXiv:2205.08506.

Topological data analysis of pattern formation of human induced pluripotent stem cell colonies,
Iryna Hartsock, Eunbi Park, Jack Toppen, Elena Dimitrova, Melissa Kemp, Peter Bubenik, and Daniel Cruz.

Preprints

2022 **Learning on persistence diagrams as Radon measures**,
**Alex Elchesen, Iryna Hartsock, Jose Perea, and Tatum Rask*, arxiv:2212.08295.

Presentations

Invited talks

- Mar 2023 AMS Spring Southeast Sectional Meeting, Georgia Tech
Topological and metric properties of spaces of generalized persistence diagrams
- Mar 2023 AMS Spring Southeast Sectional Meeting, Georgia Tech
Topological data analysis of pattern formation of human induced pluripotent stem cell colonies
- Jan 2023 Joint Mathematics Meetings, Boston, MA
Learning on persistence diagrams as Radon measures
- Feb 2022 FSU/UF Topology and Geometry Meeting, University of Florida
Topological and metric properties of spaces of generalized persistence diagrams
- Nov 2021 AMS Fall Southeast Sectional Meeting, University of South Alabama (online)
*Topological data analysis of *C. elegans* locomotion and behavior*
- Oct 2020 Association for Women in Mathematics, University of Florida (online)
Introduction to Topological data analysis

Contributed talks

- Aug 2021 2nd Graduate Student Conference: Geometry and Topology meet Data Analysis and Machine Learning (online)
*Topological data analysis of *C. elegans* locomotion and behavior*
- Jul 2021 Young Topologist Meeting, KTH Royal Institute of Technology and Stockholm University (online)
Topological properties of the space of persistence diagrams
- Sep 2017 International Conference in Functional Analysis dedicated to the 125th anniversary of Stefan Banach, Ivan Franko National University of Lviv
On asymptotic sublogarithmic dimension

Posters

- Jul 2023 Young Topologist Meeting, EPFL, Switzerland
Learning on persistence diagrams as Radon measures
- Oct 2022 Women in Scientific Computing on Complex Physical and Biological Systems, University of Florida
Topological data analysis of pattern formation of human induced pluripotent stem cell colonies
- May 2022 2022 SCMB Workshop on Discrete and Topological Models in Molecular Biology, University of South Florida
Topological data analysis of pattern formation of human induced pluripotent stem cell colonies
- Dec 2021 Southeast Center for Mathematics and Biology Symposium, Georgia Tech (online)
*Topological data analysis of *C. elegans* locomotion and behavior*

Seminars

- Jul 2023 Topology and its applications, Ivan Franko National University of Lviv
Learning on persistence diagrams
- Oct 2022 Systems Medicine Seminar, University of Florida
Topological data analysis and its applications to biological data
- Oct 2022 Topology and Dynamics Seminar, University of Florida
Learning on persistence diagrams as Radon measures
- Apr 2022 Topology and Dynamics Seminar, University of Florida
Paths in spaces of generalized persistence diagrams
- Mar 2022 Biomathematics Seminar, Florida State University (online)
*Topological data analysis of *C. elegans* locomotion and behavior*
- Mar 2021 Topology and Dynamics Seminar, University of Florida (online)
Properties of the space of persistence diagrams
- Jul 2019 Topology and its applications, Ivan Franko National University of Lviv
Introduction to Topological data analysis

Conferences & workshops attended

- Aug 2023 Research Collaboration Workshop: Women in Data Science and Mathematics, IPAM, LA
- Aug 2022 Algebraic Topology and Topological Data Analysis: A Conference in Honor of Gunnar Carlsson, IMA University of Minnesota
- Jun 2022 MRC Conference: Data Science at the Crossroads of Analysis, Geometry, and Topology, Java Center NY
- Jan 2022 Topological Data Analysis workshop, University of Florida
- Apr 2021 Topological Data Analysis, IMSI (online)
- Jun 2020 Workshop on Topological Data Analysis, Fields Institute (online)
- Jan 2020 Topological Data Analysis workshop, University of Florida
- Nov 2019 AMS Southeast Sectional Meeting, University of Florida
- Jun 2019 The 1st Midwest Graduate Student Conference: Geometry and Topology meets Data Analysis and Machine Learning, Ohio State University
- May 2019 NSF-CBMS Conference and Software Day on Topological Methods in Machine Learning and Artificial Intelligence, College of Charleston
- Jan 2019 South-East Center for Mathematics and Biology Annual Symposium, Georgia Tech
- Aug 2018 TRIPODS Summer Bootcamp: Topology and Machine Learning, ICERM at Brown University

Teaching activities

- 2018 – 2022 Teaching assistant at University of Florida.
I was leading discussion sections of the following courses:
- Precalculus Algebra with Trigonometry
 - Analytic Geometry and Calculus 1
 - Survey of Calculus 1
 - Analytic Geometry and Calculus 2
 - Analytic Geometry and Calculus 3
- I was instructor of the following course:
- Trigonometry (online)
- Oct 2021 – Preparing grade school students and high school students from Orlando Math Circle to Math Olympiads
Dec 2022

Mentoring

Mentoring undergraduate students

- Mar 2021 – Jenesis Escobar, *Topological Data Analysis and Deep Learning*
Dec 2021
- Oct 2021 – Jiun Cho, *Topological data analysis*
Dec 2022
- Jan 2022 – Ryan Elkind, *Topological data analysis*
Dec 2022

Certificates

- Oct 2022 Introduction to Genomic Technologies, Johns Hopkins University (through Coursera)
- Jun 2022 Fundamentals of Deep Learning, NVIDIA Deep Learning Institute
- May 2017 Certificate of successful completion of International Joint Certificate Program “Selected Topics in Computational Mathematics” Ivan Franko National University of Lviv (Ukraine) and Julius Maximilian University of Würzburg (Germany)

Service

Aug 2022 - Organizer of the TDA seminar at UF, Gainesville

Apr 2023

Mar 2022 Organizer of math games for high school students from Orlando Math Circle at UF, Gainesville

Sep 2019 Facilitator at the Julia Robinson Mathematics Festival, Gainesville

Skills

Languages Ukrainian (native), Russian (fluent), English (fluent)

Computer R, Python (familiar with PyTorch and TensorFlow libraries), GitHub, LaTeX skills