# DATA SCIENCE INSTITUTE

# Data Science Community Hour

**Thursday April 15th, 4:30–5:30 pm via Zoom (click to join)**

**"Multiscale Methods in Action: From Machine Learning and Graphs to Realistic Future for Quantum Computing"** — Prof. Ilya Safro, CIS, UD.

In many real-world problems, a big scale gap can be observed between micro- and macroscopic scales of the problem because of the difference in mathematical (engineering, social, biological, physical, etc.) models and/or laws at different scales. The main objective of multiscale algorithms is to create a hierarchy of problems, each representing the original problem at different coarse scales with fewer degrees of freedom. We will discuss the multiscale frameworks for (nonlinear) support vector machines, and several optimization and mining problems on graphs along with their application on the near-term quantum devices. We will present a scalable multilevel framework for SVM that is based on the elements of algebraic multigrid and demonstrate a substantial improvement of the model training computational time, and other advantages.

**Dr. Ilya Safro** is an Associate Professor in the Department of Computer and Information Sciences. Before joining UD he was an Associate Professor in the School of Computing and Faculty Scholar in the School of Health Research at Clemson University, where he was a director of the Algorithms and Computational Science Lab. Dr. Safro received his PhD in Applied Mathematics and Computer Science in the Weizmann Institute of Science. In 2008-2012, Dr. Safro was a postdoc and Argonne scholar at Argonne National Laboratory with a joint appointment in the University of Chicago. His research interests include algorithms in machine learning, AI, NLP, network science, and quantum computing. Dr. Safro is an academic editor in the machine learning and network science areas of PLOS One and Algorithms. He is also a member of advisory boards of several companies. He has organized several week-long workshops on high-performance graph algorithms, tutorials and mini-symposia at SIAM conferences.

**Thursday April 22nd, 4:30–5:30 pm via Zoom (click to join)**

**"Topological Data Analysis: Uncovering the Shape of Data"**
— Jerome Roehm, Mathematical Sciences, UD

Data, in the form of point clouds, can take many different topological shapes, such as a circle, torus, or Klein Bottle. Understanding the topological structure of a vast, high dimensional data set can provide insights into the mechanisms involved in generating the data. The shape of data collected from a healthy patient may have a very different shape than data collected from a sick patient. In this talk, I will introduce topological data analysis tools, diving briefly into the mathematical foundations, before returning to a high level to discuss interesting examples of how TDA has been applied to the study of natural images, professional basketball, and more.

**Jerome Roehm** is a third year PhD student in the department of Mathematical Sciences at the University of Delaware. He is studying algebraic topology, data analysis, and applied combinatorics under his advisor, Dr. Chad Guisti. When not working on math, he enjoys cooking, cycling, and currently holds the title of North American wife carrying champion.