Biomedical Informatics Grand Rounds

Wednesday, April 13th, 2022 3:00 pm – 4:00 pm

Topology-Based Graph Learning

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Remote Access
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Meeting ID: 956 1719 7636 Passcode: 924293

Bio: Bastian is the principal investigator of the AIDOS Lab at the Institute of AI for Health at Helmholtz Munich, Germany. His main research interests are developing multi-scale algorithms for analysing complex data sets, with a focus on biomedical applications and healthcare topics. Bastian is also enticed by finding new ways to explain neural networks using concepts from algebraic and differential topology. He is a big proponent of scientific outreach and enjoys blogging about his research, academia, supervision, and software development. Bastian received his M.Sc. degree in mathematics, as well as his Ph.D. in computer science, from Heidelberg University in Germany.

Abstract: Topological data analysis is starting to establish itself as a powerful and effective framework in machine learning, supporting the analysis of neural networks, but also driving the development of novel algorithms that incorporate topological characteristics. As a problem class, graph representation learning is of particular interest here, since graphs are inherently amenable to a topological description in terms of their connected components and cycles. This talk will provide an overview of how to address graph learning tasks using machine learning techniques, with a specific focus on how to make such techniques 'topology-aware.' We will discuss how to learn filtrations for graphs and how to incorporate topological information into modern graph neural networks, resulting in provably more expressive algorithms. This talk aims to be accessible to an audience of TDA enthusiasts; prior knowledge of machine learning is helpful but not required.

Educational Objects: Upon completion, participants should be able to:
- Learning about graph neural networks.
- Learning about topological features and their utility in machine learning.
- Understanding theoretical expressivity of graph neural network architectures.

Disclosure Statement: The faculty and planners have no relevant financial relationship with ineligible companies whose primary business is producing, marketing, selling, re-selling, or distributing health care products used by or on patients.

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