Graz University of Technology

Institut fuer Geometrie

Gastvortrag

13.02.2017, 10:30

Seminarraum 2 Geometrie (Kopernikusgasse 24, 4.Stock)

Topological Data Analysis through Homology and Discrete Morse Theory

Ulderico Fugacci

(Universitaet Kaiserslautern)

In almost all areas of modern applied sciences, data analysis is facing the challenge of extracting useful and relevant features from even larger, high-dimensional and noisy data. Topological Data Analysis (TDA) is a new discipline, spanning algebraic topology and computational geometry, aimed to address these needs. One of the claims in TDA is that data has shape and the shape matters. In a nutshell, TDA gives a general framework to analyze data from this new point of view allowing the retrieval of geometrical but coordinate-free information. Two of the most relevant tools in TDA consist of homology and discrete Morse theory. Specifically, homology and its recent development, called persistent homology, provide the topological information of a shape including connectivity and the classification of loops, handles, and voids within the space. Discrete Morse theory, on the other hand, is a powerful tool to handle shapes by providing a morphology- and homology-consistent model of the space to be analyzed. In the talk, we will introduce these two tools focusing our attention on their mutual connections and on the possibility to exploit them for efficiently retrieving the core information from large-size and high-dimensional data.

Michael Kerber