Geometry in Data: Applications of Persistent Homology

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Persistent homology (PH) is the main tool of topological data analysis. It is a multi-scale method to find geometric structures in point clouds, analyze graph networks, real valued functions, or any finite metric space. This talk will give a short introduction, explain the insights PH can provide and relate these with statistical confidence bands. Since its invention at the beginning of the millennium PH has found applications in diverse fields, such as biology, materials science, cosmology, network analysis, image recognition, time series analysis or manifold learning. A handful of representative applications will be explained to understand the possibilities and constraints of PH. The talk will finish with some hints to usable software and literature for further studies.