Data, their shape and relations – why can we gain by understanding it?

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The concept of shape is often very fundamental. While common shapes can be very well understood by our brains, some of their basic mathematical descriptors have been proposed only recently. In this talk I will provide an intuitive introduction to topological data analysis – a field providing quantitative and qualitative descriptors of a shape of data of various dimensions. Initially I will focus on somewhat classical subjects like mapper and persistent homology, and later touch upon some highly effective algorithms to compute Euler characteristic profiles and mapper graphs representing relations between high dimensional datasets. A particular focus will be given to applications of topological data analysis in medical and physical sciences.