INSALATE DI MATEMATICA

presents

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Persistent Homology and Application to Music Classification

Abstract: Persistent homology is a computational tool which was created in the end of the 20th century for applied algebraic topology. The main idea is to understand the topological structure of a starting object by progressive approximations: for that we use simplicial theory and more precisely simplicial complexes and homology, which we will begin by remind the basis. In practice, we extract from our starting object a point cloud and we change it into a filtered simplicial complex by using an algorithm called the Vietoris-Rips filtration. Persistent homology then encodes the evolution of homology classes and more precisely their lifespan in the new created filtration. We will represent all these informations on a family of graphs called barcodes, from which we will be able to analyze or even compare several starting objects: this process is called Topological Data Analysis. As an illustration of persistent homology and TDA, we will see how we can apply it to classification of musical style.

Keywords: Persistent homology · simplicial theory · applied algebraic topology · topological data analysis · barcodes · music classification

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"Obvious" is the most dangerous word in mathematics.
(Eric Temple Bell)