Patrizio Frosini

University of Bologna

A new approach to machine learning via group equivariant non-expansive operators and topological data analysis

ABSTRACT

In this talk we illustrate a new mathematical model for machine learning, which follows from the assumption that data cannot be studied directly, but only through the action of agents that transform them. In our framework each agent is represented by a group equivariant non-expansive operator acting on data. After endowing the space of agents with a suitable metric, we describe the main topological and geometrical properties of this space by means of methods developed for topological data analysis.

BIOGRAPHY

Patrizio Frosini received the PhD degree in Mathematics from the University of Florence in 1991. He is associate professor at the Department of Mathematics of the University of Bologna (Geometry). He is mainly interested in the study of the topological and metric properties concerning topological spaces and manifolds endowed with R^n-valued functions. He has introduced the concept of size function, precursor of the concept of persistent homology. As for this line of research, he is interested in the extension of the theory in the presence of the action of a subgroup G of the topological group of all self-homeomorphisms of the considered space, and in the study of the natural pseudodistance associated with G. He is also interested in multidimensional persistent topology and homology, and in the use of group equivariant non-expansive operators for topological data analysis and machine learning. He also studies the applications of the previous concepts to shape, image and data comparison.