Special Thematic Issue for the journal *Current Chinese Computer Science*

Title of the Thematic Issue

Topological Data Analysis: Topology as a Paradigm for Machine Learning and Data Mining

Section Editor: Gilson Antonio Giraldi

Guest Editor: Mauren Louise Sguario Coelho de Andrade

- **Scope of the Thematic Issue:**

Nowadays, big data systems require processing, representation, and analysis of large amount of digital information, possibly sampled from nonlinear manifolds. In this context, topology and geometry provide powerful approaches to infer robust qualitative and quantitative information about the data structure. Moreover, before data analysis and information extraction/retrieval, we must resolve neighborhood relationships in order to build a data covering towards a geometric data representation.

Specifically, in the direction of using topology as a paradigm for data mining, we shall emphasize the development of tools based on algebraic topology elements, like persistent homology, for studying fundamental features and structures built on top of the data. Once topology is resolved, manifold learning techniques can be applied to embed nonlinear data in lower dimensional spaces for compact representation and analysis. The result of this pipeline, combining topology and geometry, allows a robust data interpretation with relevant consequences regarding sampling theory, similarity computation, pattern recognition and, more recently, deep learning.

The main goal of this special issue is to explore topological concepts for data analysis, data representation, information extraction and retrieval. We encourage original submissions that combine topological and/or geometric concepts, data representation techniques, machine learning and statistical methods, for extracting meaningful information from high-dimensional data spaces. Review articles, that describe the current state of the art in topological data analysis, are welcome as well. Papers are published upon acceptance, regardless of the Special Issue publication date.

Keywords: Topological Data Analysis; Deep Learning; Scientific Visualization; Manifold Learning; Signal Analysis; Multivariate Statistics; Data Mining; Computational Topology.

Sub-topics:

Potential topics include but are not limited to the following:

- Topological data analysis of deep architectures in machine learning
- Topology and geometry as a paradigm to analyze deep learning algorithms
- Scientific visualization and topological data analysis
- Data models integrating topology and geometry, multivariate statistics and sampling theory
- Data mining and analysis based on topology and geometry
- Learning topology and manifolds for data analysis
- Computational topology and algorithms for data analysis
- Topology and geometry for signal and video analysis
- Software engineering for topological data analysis systems

Schedule:

- ✧ Thematic issue submission deadline: 31 August 2020

Contacts:

Guest Editor Name: Mauren Louise Sguario Coelho de Andrade
Affiliation: Federal Technological University of Paraná, Ponta Grossa Campus
Email: *mlsguario@utfpr.edu.br*