Applying Sliding Window Techniques for Topological Data Analysis (TDA) of Temporal Geo-Data: Challenges and Optimizations

Claudia Leslie Arias Coquil[1]

[1]*Politecnico di Milano*

This talk introduces the initial scope of my thesis, which explores the use of sliding window techniques [1] for analyzing temporal geo-data. My work focuses on the Madagascar GDHY dataset, which includes crop yield data for four crops from 1981 to 2016, alongside the EVI dataset, which measures vegetation health. Each data point represents crop yield per hectare across Madagascar. I am currently employing geo-interpolation techniques to regularize the data resolution and using the Dask Python library to handle the computational challenges presented by the large dataset.

The main goal of the research is to apply Topological Data Analysis (TDA) to uncover complex patterns in the temporal data of crop yields. In this early stage, I am focusing on addressing computational challenges related to memory management and processing time, while optimizing the analysis process. This talk will discuss the methods being explored, the challenges faced, and the potential strategies for improving the efficiency and scalability of the analysis.

[1] Anish Rai, Buddha Nath Sharma, Salam Rabindrajit Luwang, Md.Nurujjaman, Sushovan Majhi. Identifying Extreme Events in the Stock Market: A Topological Data Analysis. *Chaos* **34** (2024), 10. https://doi.org/10.48550/arXiv.2405.16052