



Contribution ID: 5

Type: **not specified**

## **Detecting spatio-temporal anomalies in Italian mortality during the first year of the COVID-19 pandemic.**

*Monday, June 27, 2022 2:40 PM (20 minutes)*

From the perspective of anomaly detection when data are functional and spatially dependent, we explore death counts from all causes observed along 2020 in the provinces and municipalities of Italy. Our aim is to isolate the spatio-temporal perturbation brought by COVID-19 to the Country's expected process of mortality during the first two waves of the pandemic.

Within the framework of Object Oriented Spatial Statistics (O2S2), for each Italian province we represent yearly mortality data as the density of time of death in the province along the calendar year. These densities are then regarded as constrained functional data and embedded in the Bayes space  $B_2$ . We assess the local impact of the pandemic by comparing the actual density observed in 2020 with that predicted by a functional-on-functional linear model fitted in  $B_2$  and built on the mortality densities observed in previous years. Spatial downscaling of the provincial data down to the municipality level provides the support for the identification of spatial clusters of municipalities characterized by an anomalous mortality along the year.

The analysis illustrates a paradigm which could be extended to indexes different from death counts, measured at a granular spatio-temporal scale, and used as proxies for quantifying the local disruption generated by a shock, like that caused in Italy by the COVID-19 pandemic in 2020.

### **Keywords**

O2S2, functional data, anomaly detection.

**Primary author:** SECCHI, Piercesare (Politecnico di Milano - Department of Mathematics)

**Co-authors:** SCIMONE, Riccardo (Politecnico di Milano - Department of Mathematics); MENAFOGLIO, Alessandra (Politecnico di Milano - Department of Mathematics); SANGALLI, Laura (Politecnico di Milano - Department of Mathematics)

**Presenter:** SECCHI, Piercesare (Politecnico di Milano - Department of Mathematics)

**Session Classification:** CONTRIBUTED Clinical Statistics/Anomalies

**Track Classification:** Clinical trials and tests