TUTORIAL

Statistical Science Meets Digital Health

Distributional Data Analysis in Digital Health

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Digital health is transforming clinical practice and driving the precision medicine paradigm to personalize healthcare. In this context, the new information collected is of a functional nature over time, and patients are monitored in real-life conditions. Therefore, classical time series techniques cannot be used for many modeling tasks, and users must focus on comparing the distributional differences of the biological time series. Distributional data analysis is a powerful tool for analyzing and validating new biomarkers emerging in digital health data.

The objective of this tutorial is to introduce the main tools of distributional data analysis for analyzing clinical data in digital health. The session consists of two parts. The first part is theoretical, where the main data analysis tools are introduced. The second part, using R code, demonstrates with real cases how to use these techniques in practice with relevant examples of wearable data.

Marcos Matabuena, a Spanish mathematician at Harvard University, specializes in mathematical models for digital medicine. He focuses on uncertainty quantification, survival analysis, and causal inference, crucial for predicting clinical events and optimizing treatments. In diabetes research, his models interpret continuous glucose monitor data. He also studies aging-related decline using wearable device data. Marcos developed the first uncertainty quantification framework for regression models in metric spaces and introduced 'glucodensity,' a functional representation for interpreting continuous glucose monitoring and wearable device data. He also created the first biclustering algorithm in RKHS spaces for complex data analysis.

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