Categorical Functional Data Analysis applied to Temporal Dominance of Sensations data

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Sensory analysis is a multidisciplinary field aiming at describing sensory perception and appreciation of food and non-food products by consumers. It features several experimental protocols including temporal ones. Among them, Temporal Dominance of Sensations (TDS) involves subjects indicating the dominant sensation among a list of descriptors (the categorical states of the stochastic process) at each moment throughout the tasting of an intake of the product.

Categorical functional data analysis (Deville J.C. and Saporta, 1979; Saporta, 1985) extends the traditional functional data analysis to temporal categorical data, making it particularly relevant for TDS data.

CFDA is now supported by a R-package (CFDA, Preda et al., 2021). Applied to TDS data, it produces a PCA-like map of the sensory evaluations of the products by the subjects (the trajectories) based on the sequences of sensations perceived. Each axis represents leading temporal patterns and the coordinates of sensory evaluations on these axes depict their main temporal characteristics. Then, those coordinates can be used as inputs for further statistical analyses such as clustering of subjects or discriminant analysis of products, both based on temporal perception.

This paper shows the application of CFDA on both a pedagogical dataset and a TDS dataset wherein subjects were connected to a gustometer delivering controlled temporal stimuli in the mouth of the subjects. Additionally, it discusses further opportunities and challenges associated with the application of functional data analysis to different other kinds of sensory data.

References

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