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Giovanni C. Porzio
Carla Rampichini
Chiara Bocci

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BAYESIAN NONPARAMETRIC DYNAMIC MODELING OF PSYCHOLOGICAL TRAITS

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ABSTRACT: This work focuses on investigating the evolution of different traits of psychosis during the COVID-19 pandemic. We develop a Bayesian nonparametric mixture model for multivariate categorical data, which characterizes the population' psychosis via a set of latent psychological profiles. Leveraging a time- and covariate-dependent stick-breaking construction for the mixture weights, the proposed specification characterizes the dynamic evolution of such latent traits across the pandemic, measuring the effect of subject-specific demographic information such as sex and age of the individuals.

KEYWORDS: Bayesian nonparametrics, categorical data, dynamic modeling, stick-breaking.

1 Introduction

Multivariate categorical data are routinely collected in a variety of applications (e.g., Agresti, 2003). Some common examples include surveys on opinions and feelings, where individuals are asked to fill in questionnaires reporting their level of agreement with different categorical items. This abundance of data has motivated a large literature on statistical models for high-dimensional categorical data, with penalized log-linear models (Nardi et al., 2012) and latent-structures (Lazarsfeld, 1950) being particularly popular in the literature (Aliverti and Dunson, 2020).

When the number of categorical variables increases, the number of free cells in the resulting contingency tables becomes extremely sparse, motivating novel approaches to provide compact representation of the observed structures. Bayesian nonparametric models are particularly appealing for this goal, leveraging on flexible specifications which adapt to the complexity of the observed data, characterizing uncertainty in a rigorous way (e.g., Dunson and Xing, 2009; Müller et al., 2015).

In this talk, we illustrate a Bayesian nonparametric dynamic model for the evolution of the population' psychosis during the COVID-19 pandemic.

According to the proposed model, a set of latent profiles characterizes the population-specific response patterns, while the individual propensity toward a specific profile is allowed to change in time and with subject-specific covariates, leveraging on a dependent stick-breaking construction for the mixture weights.

We illustrate the details of the proposed methodology and its application on the Italian population. Our empirical findings focus on the evolution of the psychosis across the pandemic and on the estimated sub-regional differences in terms of the impact of COVID-19 pandemic on the individual's psychology.

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