Estimating age-demographic trends based on Renyi entropy

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Entropic measures play an essential role in various fields such as economics, informatics, engineering, medicine and physics. Most known entropy is Shannon entropy introduced in 1948. Since then many new entropic measures have been introduced, such as Tsallis, Varma, relative and weighted entropies. A generalization of Shannon entropy is Renyi entropy which we will use to estimate the demographic trends of Romania's population. According to many studies, Romania has a large mobility, within and outside the country. Predicting demographic trends is a crucial and open research topic. In 2015, Zhao G.S et al. [1] proposed an entropy-based method for demographic research which involved three stages. We extend this method by introducing Renyi entropy into the equation. This method takes into account the age-dependent structure of the population.

Keywords: demographic trends; entropic measures; age-dependent structure

References:

[1] Zhao, Guang-She, Yi Xu, Guoqi Li, and Zhao-Xu Yang. "An entropy-based method for estimating demographic trends." In Evolving and Adaptive Intelligent Systems (EAIS), 2015 IEEE International Conference on, pp. 1-8. IEEE, 2015.

Latest frontiers in grouped-ordinal data dependence analysis

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The bivariate dependence analysis is strongly supported in literature by a wide set of measures, including the Pearson's r, the Kendall's τ_b and the Spearman's r_s correlation coefficients among others. Currently, we are

assisting to an explosion in the availability of ordinal data due to widespread attitudinal surveys. In many cases, survey scales are also built on responses that are observed to belong to certain groups on a continuous scale (grouped variable). Given h groups, the measurement problem may be addressed by encoding each group through a label (from 1 to h) and, subsequently, by assigning rank one to all the units included in the first ordered group and finally rank h to those included in the h-th ordered group. In such a way, the assessment of the direct or inverse dependence relationship may be carried out through Spearman's rS (e.g. Spearman [3]) or Kendall's τb (e.g. Kendall [2]) coefficients which are based on the correlation between the ranks of two variables and on the pairs of concordant and discordant values of two variables, respectively. This results in neglecting the original continuous nature of the grouped variable, since the information from the grouped variable has to be reduced to its ordinal information, too. A crucial issue is then related to dependence relationship studies when one variable is ordinal and the other variable is grouped. The "Monotonic Dependence Coefficient" (MDC), recently proposed by Ferrari and Raffinetti [1], is here re-formalized for the case of grouped and ordinal variables. Through a Monte Carlo simulation study, some basic hints about the new MDC coefficient performance in specific scenarios are given even in comparison with Spearman's and Kendall's coefficients. The contribution ends with an application to drug-expenditure data incurred by the Italian system for public health assistance, whose aim is to illustrate the role of age differences in the allocation of drug expenditure both by considering overall patients and single sub-groups, differing in terms of gender.

Keywords: dependence analysis, grouped data, ordinal data, Monte Carlo simulation

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Hybrid multiple imputation for incomplete household surveys