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Principal component analysis for compositional data in votes of the peruvian presidential election 2021

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Abstract: The purpose of this work is to present a compositional data methodology to analyze votes data from Peruvian elections by electoral circumscriptions. Principal Component analysis is adopted in multiparty data by considering a centered log-ratio transformation. The methodology is applied to data from the Peruvian presidential election in the first round of the year 2021. Results show that the electoral data is naturally compositional, and the proportion of votes is more important than even the existing number of votes. Additionally, we identify a polarization of the votes by circumscriptions in Peru which can be explained by considering two components: conservative-progressive parties and new-old parties. Finally, we analyze the 2 principal components taking in consideration the scores and their variation, so they need to be normalized for better interpretation. Afterwards, we propose a Beta regression model, it is elaborated considering as covariates the main indicators of human development (health, education, and income) and as response variables the scores.