

New statistical procedures for polytomous logistic regression models

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The polytomous logistic regression model is widely used in health and life sciences as well as in other different areas where we need to analyze a nominal qualitative response taking values in a set of unordered categories.

We many times come across data which are not collected on a random sampling, rather they have been collected through some more complex survey scheme like stratified sampling or cluster sampling, etc. (Castilla et al., 2016). In both cases, the classical approach is based on (pseudo) maximum likelihood estimator, which is the main base of most of the existing literature on logistic models. However, this estimator is clearly known to be non-robust with respect to the possible outliers in data.

In this talk we will present robust estimators under the PLRM with both random and complex survey based on the minimum divergence approach with the density power divergences (see Basu et al., 2011). We will study their asymptotic distribution and robustness properties, as well as define Wald-type tests statistics for linear hypotheses. Simulation studies provide further confirmation of the validity of the theoretical results established before. An approach for the data-driven selection of the tuning parameter is also proposed with empirical justifications (Castilla et al., 2017a,b).

References:

- [1] Castilla, E., Martín, N. and Pardo, L. (2016) Pseudo minimum phi-divergence estimator for multinomial logistic regression with complex sample design: <https://arxiv.org/abs/1606.01009>
- [2] Castilla, E., Ghosh, A., Martín, N. y Pardo, L. (2017a). New statistical robust procedures for polytomous logistic regression models. <https://arXiv:1704.07868>
- [3] Castilla, E., Ghosh, A., Martín, N. y Pardo, L. (2017b). Robust estimation for polytomous logistic regression with complex sample design: The density power divergence approach. *In preparation*.
- [4] Basu, A. , Shioya, H. and Park, C. (2011). The minimum distance approach. Monographs on Statistics and Applied Probability. *CRC Press, Boca Raton*.