Classified mixed logistic model prediction

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Abstract: "We develop a classified mixed logistic model prediction (CMLMP) method for clustered binary data by extending a method proposed by Jiang et al. (2018, J. Amer. Statist. Assoc.) for continuous outcome data. By identifying a class, or cluster, that the new observations belong to, we are able to improve the prediction accuracy of a probabilistic mixed effect associated with a future observation over the traditional method of logistic regression and mixed model prediction without matching the class. Furthermore, we develop a new strategy for identifying the class for the new observations by utilizing covariates information, which improves accuracy of the class identification. In addition, we develop a method of obtaining second-order unbiased estimators of the mean squared prediction errors (MSPEs) for CMLMP, which are used to provide measures of uncertainty. We prove consistency of CMLMP, and demonstrate finite-sample performance of CMLMP via simulation studies. Our results show that the proposed CMLMP method outperforms the traditional methods in terms of predictive performance. An application to medical data is discussed. This work is joint with Thuan Nguyen of Oregon Health & Science University, USA, Yihui Luan of Shandong University, China and Jiming Jiang of University of California, Davis, USA."