

## **A Unified Approach to Goodness-of-fit Tests with Application to Small Area Estimation**

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### **Abstract**

We develop a method originally proposed by R. A. Fisher into a general procedure, called tailoring, for deriving goodness-of-fit tests that are guaranteed to have a chi square asymptotic null distribution. We apply the method to small area estimation for detecting potential model misspecification. Three tests are proposed using the tailoring method. We evaluate performance of the tests both theoretically and empirically. Our empirical results suggest that the proposed tests are more accurate in size and have higher power than existing tests. This work is joint with Mahmoud Torabi of the University of Manitoba, Canada.

## **Classified Mixed Logistic Model Prediction**

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### **Abstract**

We develop a classified mixed model prediction (CMMP) method for clustered binary data by extending a method proposed by Jiang *et al.* (2016) 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 probability associated with a mixed effect as well as binary outcome of future observation over the traditional method of logistic regression (LR). Furthermore, we propose an improvement of CMMP by incorporating covariate information in match the class. This allows the new method, called classified mixed logistic model prediction (CMLMP), to outperform the traditional mixed logistic model prediction without matching the class. We prove consistency of CMLMP method, and demonstrate finite-sample performance of CMLMP via simulation studies. An application to medical data is considered. This work is joint with Hanmei Sun and Yihui Luan of Shandong University, China, and Jiming Jiang of the University of California, Davis, USA.