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Dynamic Bayesian influenza forecasting in the United States with hierarchical discrepancy (with discussion). (English) Zbl 1416.62612

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Summary: Timely and accurate forecasts of seasonal influenza would assist public health decision-makers in planning intervention strategies, efficiently allocating resources, and possibly saving lives. For these reasons, influenza forecasts are consequential. Producing timely and accurate influenza forecasts, however, have proven challenging due to noisy and limited data, an incomplete understanding of the disease transmission process, and the mismatch between the disease transmission process and the data-generating process. In this paper, we introduce a dynamic Bayesian (DB) flu forecasting model that exploits model discrepancy through a hierarchical model. The DB model allows forecasts of partially observed flu seasons to borrow discrepancy information from previously observed flu seasons. We compare the DB model to all models that competed in the CDC's 2015–2016 and 2016–2017 flu forecasting challenges. The DB model outperformed all models in both challenges, indicating the DB model is a leading influenza forecasting model.

MSC:

62P10 Applications of statistics to biology and medical sciences; meta analysis
62M20 Inference from stochastic processes and prediction
92C60 Medical epidemiology

Keywords:

probabilistic forecasting; hierarchical modeling; discrepancy; influenza

Software:

CODA; FRED; GitHub; JAGS; R; rjags

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