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Organization: Washington University

Review #5

Proposal Number:	1152472
NSF Program:	Political Science
Principal Investigator:	Montgomery, Jacob
Proposal Title:	Collaborative Research on Ensemble Methods for the Prediction of Political Outcomes
Rating:	Multiple Rating: (Excellent/Very Good)

REVIEW:

What is the intellectual merit of the proposed activity?

The authors propose a project that will make ensemble Bayesian model averaging (EBMA) techniques more accessible to a wide array of social science topics and to the researchers currently exploring those topics. They will do this by writing freely-available statistical software using the R statistics program that will implement both maximum-likelihood and Bayesian versions of EBMA. They propose to provide accessible explanations of both how to apply EBMA methods to social science research and how to how implement these methods using the new software. Further, they will extend these current methods to be used on data forms highly relevant to social sciences, such as binary, event count, and censored outcome data. The project outlined in this proposal will allow researchers to more easily and frequently use advanced forecasting techniques and to use such techniques on data and topics in forms where current methods cannot be used.

There is intellectual merit in extending current EBMA techniques to a wider variety of data forms. Increasing the number of distributions that EBMA can be applied to will greatly increase the number of topics that EBMA can be applied to generate sophisticated forecasting models.

I also see great intellectual merit in the authors proposal to generate a fully Bayesian versions of EBMA methods. Bayesian methods have so technical and efficiency advantages to currently-used EM methods, as the authors point out in their proposal. The ability to generate Bayesian posterior density functions will allow for a wider variety of diagnostics and analysis than are available in EM estimations.

Other topics of improvement suggested by the authors, such as the consideration of vintage data, missing data, and alternative weightings, as all important topics that are likely to improve the estimation and comparison of forecasting models.

What are the broader impacts of the proposed activity?

Improving researchers' ability to create accurate forecasting models using EBMA techniques is likely to have great positive impacts for social science research. Improving EBMA methods will allow researchers to improve their ability to predict future events across a vast array of topics. As the authors argue in their proposal, improving forecasting methods in political science, and other social sciences, has important implications for the potential impact that political science research has on policy-makers and policy implementation. As researchers improve their ability to forecast future events, research becomes more relevant to public discourse.

The authors provide a good demonstration of the importance of forecasting across a range of political science topics in their proposal. They show how existing EBMA methods can already improve forecasting predictions over current methods in three areas: insurgency forecasting; U.S. presidential elections prediction; and U.S. Supreme Court case outcome forecasting. The improvements to EBMA proposed by the authors will further improve forecasting estimates, further improving the value of political science

researchers to relevant policy-makers.

Perhaps to broadest impact of the proposed project would be the creation of open source software for estimating EBMA forecasting models. Such software would greatly increase the number of researchers that could apply EBMA models to their own area of research. I believe that this would lead to an important increase in use of forecasting techniques in social science research. Publicly available MCMC-based software, coupled with detailed instructions and examples of how the software can be used, would likely to be used in various subfields of political science and likely to be used by others academic disciplines as well.

The various features of the proposed software, as outlined in section 4 of the proposal, will improve researchers' ability to estimate and analyze forecasting models as compared to currently available software. These technical improvement are an important potential contribution to the current forecasting literature.

In total, improvements in the ability of researchers to estimate forecasting models and improvements in the accessibility of the such models are likely to lead to social scientists improving their ability to use research to inform and influence policymakers.

Additionally, the project will provide an excellent training opportunity to the graduate students involved in it.

Summary Statement

For the reasons discussed above, I find the proposed project to have great merit and recommend that it be given support.

The only improvement I might like to see in the proposal is a more detailed description of how Bayesian implementations of EBMA will improve on the EM methods the authors feature in their application examples included in the current proposal.

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