30 April 2022

To: Mor Peleg,

Editor-in-Chief, Journal of Biomedical Informatics

**Re**: Probabilistic forecasting of hourly Emergency Department arrivals

Dear Editor-in-Chief,

This study aims to generate probabilistic forecasts of the hourly arrivals in one of the major Emergency Departments in the UK. The research is motivated by a real forecasting problem faced by planners in using forecasts to inform rostering and scheduling. Moreover, there are a few limitations in the literature which encourage us to undertake this research and examine different forecasting approaches:

(i) Current approaches to forecast hourly ED arrivals do not fully consider the feature of data such as multiple seasonal cycles and changing profile over time;

(ii) Almost all research studies produce point forecasts and, at best, report prediction intervals. There is a lack of studies presenting the entire forecast distribution of hourly ED arrivals that better represent the uncertainty of future arrivals, providing a holistic picture of future demand for a planner;

(iii) most studies are not reproducible, as it is almost impossible to reapply the approaches without the help of the authors of those papers;

(iv) studies are limited in terms of the length of historical data used for training purposes and forecast performance evaluation and

(v) some studies in this area lack a rigorous experimental design, i.e. they do not use benchmark methods or report forecast accuracy.

Sincerely,

Bahman Rostami-Tabar, *Cardiff University*

Jethro Browell, *University of Glasgow*

Ivan Svetunkov, *Lancaster University*