May 15th, 12:00 PM

Machine learning methods to forecast temporal pattern of Aedes mosquito species using meteorological variables in Ontario, Canada

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Recent outbreaks of mosquito-borne diseases warrant us to understand better how different mosquito species survive and transmit infectious pathogens in different ecological settings. *Aedes (Ae)* species such as *Ae. aegypti* and *Ae. albopictus* are the principal vectors of dengue, chikungunya, yellow fever, and Zika viruses. Despite this, there is a significant knowledge gap exists on how these species survive, maintain their abundance and transmit pathogens under different climatic conditions. In this study, we developed time series models and machine learning method to predict the *Aedes* species in different medical units in Ontario, Canada. The observed mosquito trap data have obtained from the Department of Public Health, Ontario, Canada from 2003 to 2016. We developed a time series model- Autoregressive integrated moving average (ARIMA) and ensemble machine learning method- Random Forest (RF) to forecast *Aedes* abundance. We accounted for two meteorological variables: temperature and rainfall impact on the *Aedes* abundance in the different medical units. Our results suggest that RF outperforms over ARIMA model in predicting the temporal *Aedes* abundance. The implication of developing forecasting methods for *Aedes* species is three folds, first, these models predict how different meteorological variables changes the abundance within a temperate region, second, the forecast of the models will explain the outbreaks of different mosquito-borne diseases in the Ontario region, and third, these models inform targeted mosquito control efforts based on the temporal mosquito abundance prediction.