



Statistical and Computational Challenges in Probabilistic Ensemble Forecasting for Infectious Disease

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Infectious disease outbreaks cause substantial annual morbidity and mortality worldwide. Accurate forecasts of key features of seasonal epidemics, such as the timing and severity of the peak incidence in a given season, can inform public health response to outbreaks.

This talk will provide a brief overview of a central motivating application: probabilistic forecasting of seasonal influenza outbreaks in the US. I will present our work in building and evaluating ensemble approaches, each of which combines over 20 separate probabilistic component models into a single probabilistic forecast. During the Northern hemisphere winter influenza season, the forecasts from the FluSight Network are publicly reported by the CDC as part of an official weekly communication to inform health practitioners about seasonal influenza trends. Current and past forecasts are available via an interactive data visualization at <http://flusightnetwork.io>.

This will be followed by discussion of important methodological challenges faced in this field and new collaborative initiatives to address them. These topics will include:

- developing new ensemble methodologies for combining probabilistic forecasts of outbreaks
- using Gaussian Processes with hierarchical structure to develop pathogen-specific forecasts
- using network modeling approaches to incorporate spatial structure in forecasts
- improving spatial probabilistic forecasts by enforcing hierarchical coherence
- standardizing forecast data curation
- forecasting infectious diseases in Germany, in collaboration with the Robert Koch Institut

Bio:

Nicholas G. Reich, Associate Professor of Biostatistics at the University of Massachusetts - Amherst, is a visiting scholar at the LMU-Munich Statistics Department from October 2019 through July 2020, supported by an Alexander von Humboldt Fellowship. He received a PhD in Biostatistics from Johns Hopkins School of Public Health in 2010. His research team at UMass has developed statistical methods and open-source tools for creating probabilistic, ensemble forecasts of infectious disease outbreaks in real-time. Dr. Reich is the director of an Influenza Forecasting Center of Excellence, funded by the U.S. Centers for Disease Control and Prevention (CDC). Lab website: <https://reichlab.io>