ASU **School of Mathematical and Statistical Sciences**
Arizona State University

MEMORANDUM

DATE: 05/09/2024

TO: Faculty and Students

FROM: Professor(s)   Robert McCulloch

Chair/Co-Chairs of   Bradley Bush

Defense for the   PhD   in Applied Mathematics

Committee Members

Hedibert Lopes
Regan Damron
Richard Hahn
Shuang Zhou

DEFENSE ANNOUNCEMENT

Candidate: Bradley Bush

Defense Date: Monday, 6/3/2024

Defense Time: 10:00 AM

Virtual Meeting Link: https://asu.zoom.us/my/bradleybush?omn=82440129633
In Person: WXLR Wexler Hall (Tempe) Room A206

Title: Monitoring Sentiment: Extending Latent Dirichlet Allocation to a Hierarchical Bayesian State Space Model

Please share this information with colleagues and other students, especially those studying in similar fields. Faculty and students are encouraged to attend. The defending candidate will give a 40-minute talk, after which the committee members will ask questions. There may be time for questions from those in attendance. Guests are primarily invited to attend as observers and will be excused when the committee begins its deliberations or if the committee wishes to question the candidate privately.

ABSTRACT
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ABSTRACT

In an age of modern technology, attempting to understand change in sentiment in target populations through the lens of social media is becoming both complex and commonplace. This study seeks to visually quantify change in sentiment of English speaking X users (formally know as Twitter) with regards to the current Russia-Ukraine conflict.

A Bayesian hierarchical model is presented in which one of the hyper-parameters is made to be time varying using a state space model specification. Gibbs Sampling is used as the approximation method during the posterior inference step of the Latent Dirichlet Allocation algorithm and Forward Filtering Backward Sampling is used inside of Gibbs sampling when drawing for the state variable, the hyper-parameter that was made time varying.

Examples of the full state space model with X data along with a special case scenario (where the time varying hyper-parameter is not Markov, but simply *iid*) using both X data and simulated data are given with discussion.