Bayesian Inference Spectral Methods and Condition-Number Analysis for Epidemic Spread Modelling in Ghana 2006

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Abstract

This study aims to model epidemic spread in Ghana during a specific period by employing Bayesian inference techniques combined with spectral methods and condition-number analysis. Bayesian inference was applied using spectral decomposition on the adjacency matrix derived from contact networks. Condition numbers were analysed to assess model stability and sensitivity to input data variations. Spectral methods provided a clear distinction between communities with high and low susceptibility, while condition-number analysis highlighted the robustness of the models under varying conditions. The findings underscored the effectiveness of the proposed spectral decomposition approach in identifying key transmission pathways within Ghana's population structure. Future work should explore extensions to incorporate real-world data from additional health surveillance systems and validate against independent datasets. The analytical core is $\hat{\{y\}}t = mathcal\{F\}(xt;\theta)$ with $\hat{\{\theta\}} = argmin_\theta L(\theta)$, and convergence is established under standard smoothness conditions.

ABSTRACT-ONLY PUBLICATION

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