Predicting Dengue Outbreaks: A Dynamic Approach with Variable Length Markov Chains and Exogenous Factors

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Variable Length Markov Chains with Exogenous Covariates (VLMCX) are stochastic models that use Generalized Linear Models to compute transition probabilities, considering both the state history and time-dependent exogenous covariates. The beta-context algorithm selects a relevant finite suffix (context) for predicting the next symbol, estimating flexible tree-structured models by aggregating irrelevant states. This enables the model to incorporate exogenous covariates over time. This research extends the beta-context algorithm to include both time-dependent and time-invariant exogenous covariates, using data from multiple sources. Each data source has its own Markov chain, allowing for a comprehensive understanding of the process behavior across various situations, such as different geographic locations. We assume that all sources are independent and share identical parameters, exploring contexts within each source to compute transition probabilities and form a unified tree. This approach eliminates the need for spatial-dependent structural considerations. Our motivation is to investigate how previous dengue rates, weather conditions, and socioeconomic factors impact subsequent dengue rates across municipalities in Brazil, offering insights into dengue transmission dynamics. Joint work with Marilia Gabriela Rocha.

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