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SPADE4: Sparsity and Delay Embedding based Forecasting

Predicting the evolution of diseases is challenging, especially when the data availability is scarce and incomplete. The most popular tools for modelling and predicting infectious disease epidemics are compartmental models. They stratify the population into compartments according to health status and model the dynamics of these compartments using dynamical systems. However, these predefined systems may not capture the true dynamics of the epidemic due to the complexity of the disease transmission and human interactions. In order to overcome this drawback, we propose **Spa**rsity and **D**elay **E**mbedding based **Fore**casting (SPADE4) for predicting epidemics. SPADE4 predicts the future trajectory of an observable variable without the knowledge of the other variables or the underlying system. We use sparsity based random feature model to handle the data scarcity issue and employ Takens' delay embedding theorem to capture the nature of the underlying system from the observed variable. We show that our approach outperforms compartmental models when applied to both simulated and real data.