Framework for enhancing the estimation of model parameters for data with a high level of uncertainty

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Abstract

Reliable data is essential to obtain adequate simulations for forecasting the dynamics of epidemics. In this context, several political, economic, and social factors may cause inconsistencies in the reported data, which reflect the capacity for realistic simulations and predictions. In the case of COVID-19, for example, such uncertainties are mainly motivated by large-scale underreporting of cases due to reduced testing capacity in some locations. In order to mitigate the effects of noise in the data used to estimate parameters of models, we propose strategies capable of improving the ability to predict the spread of the diseases. Using a compartmental model in a COVID-19 study case, we show that the regularization of data by means of Gaussian Process Regression can reduce the variability of successive forecasts, improving predictive ability. We also present the advantages of adopting parameters of compartmental models that vary over time, in detriment to the usual approach with constant values.

Full Text

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