

DATA-BASED FORECASTING OF EPIDEMICS IN EARLY STAGES

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In early stages of epidemics, there is a great desire of valid hypotheses about the further development. The estimation of the future number of cases is very important for the planning of control measures, and of the required resources. Worst-case scenarios frequently overestimate consequences. Data-based forecasting by means of regression models can overcome this disadvantage but the variance of the estimator quickly increases outside the data region. 'Assessing uncertainty' is therefore one item within the established principles of forecasting.

In data-based prediction, uncertainty has at least two aspects: Uncertainty of the estimation and uncertainty of the model-validity. This paper consequently considers both of these aspects. Prediction intervals represent absolute measures of the accuracy of prediction, describing the uncertainty of estimation. Although a model may sufficiently describe the underlying dependence within the data-region, no evidence for the validity of the model is given outside this region. For this reason, the relative accuracy of prediction, depending on the model and on the given data set, quantifies the relation between the variances of the model residuals and of the predictive residuals as an additional measure of uncertainty. It implies information about the forecast horizon on which model-validity is being accepted at a given level.

This paper focuses on problems of selecting appropriate models for the data-based prediction in early stages of epidemics. The concept of goodness of fit does not suffice in forecasting. An extension of the considerations to measures of the absolute and relative accuracy of prediction is needed. The application of simple analytical growth models ensures a quick and stable forecast. Prediction intervals and the forecasting horizon are discussed at several data-examples to demonstrate chances and limits of data-based prediction of emerging epidemics. Along with the ongoing infection dynamics, a stepwise improved forecasting process can strongly support decision-making and the appropriate implementation of control measures.