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Impact of data structure, availability and noise distribution on practical and structural identifiability of an SEIR model

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Identifiability is an essential prerequisite for system identification, which can be approached from a structural or practical view. Practical identifiability analysis focuses on characterizing the uncertainty in parameter estimates considering the data deficiencies used to calibrate the model. Structural (theoretical) identifiability aims to establish whether the model parameters can be uniquely determined based on the model structure and from observation of the input-output behavior of the model. In this study, we explored both structural and practical identifiability of a Susceptible-Exposed-Infected-Recovered (SEIR) model. We examine the structural identifiability of the SEIR model with different combination of input data and compare them with the practical identifiability of the model. We further investigate the practical identifiability of the SEIR model with respect to different observable data, data frequency, and noise distributions. The practical identifiability is performed by both Monte Carlo simulations (MC) and a correlation matrix approach (CM). Our results show that practical identifiability depends on the observable data and data frequency, and the region of the parameter space. In addition, we compare and distinguish the practical identifiability from MC approach and the correlation index from CM approach.