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METHODS OF COMPARTMENTAL MODELS CALIBRATION USING NEURAL NETWORK AND DATA SAMPLING APPROACHES

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In this paper, the study is comparison SEIR model calibration using data sampling and neural networks approaches to forecast the dynamics of COVID-19 incidence and evaluation of the effectiveness of control measures. The sought hyper parameters are incubation period rate, transmission rate, recovery rate.

Introduction. In the context of the global pandemic COVID-19, the development of computational technologies for justification of decisions on the introduction and removal of control measures, as well as to assess the possible effect of their introduction, including through the joint application of machine learning and mathematical modelings, is relevant. It is necessary to accurately select the parameters of the epidemiological model. An inaccurate choice can lead to a distortion of the simulation result, which leads to an incorrect prediction. It is proposed to use data sampling and neural network approaches to calculate these parameters.

Main part. Research was divided into two tracks. For the first way SEIR model was combined with Metropolis-Hastings algorithm. It will approximate distribution using subsamples of source data. For the second way model was calibrated with Physics Informed Neural Network approach. This neural network use different equations as a learning function. Both methods was implemented and tested on the simulated data.
At the second step both implementation was tested on the real-world data. The results was analysed and compared.

Conclusion. The practical application of the selected algorithms for calibrating the epidemiological model of the spread of COVID-19 will greatly simplify and speed up the analysis of the development of the epidemic. Comparative analysis of Metropolis-Hastings algorithm and Physics Informed Neural Network will help to choose the best approaches for solving the calibration problem.

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