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EPIDEMIOLOGICAL-ECONOMICAL PANDEMIC MANAGEMENT BY A SPATIO-TEMPORAL MATHEMATICAL MODEL

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We present a model that considers the severity of the disease and the heterogeneity of contacts between the population in complex space-time dynamics. Using mathematical and computational methods, the applied tool was developed to analyze and manage the COVID-19 pandemic (from an epidemiological and an economic point of view), with a particular focus on population heterogeneity in terms of age, susceptibility, symptom severity, social dynamics, and work status. Our model is an extended graph-based spatial-temporal SIR model, allowing multidimensional analysis of non-pharmaceutical interventions' (NPI) impact on the pandemic spread while assessing the economic losses caused by it. The model has been evaluated in three countries, obtaining an average mean square error of 0.047 over a full month of the basic reproduction number (R_0). The goal of this study is to create a theoretical framework for crisis management that integrates accumulated epidemiological and economical considerations. An applied result is an open-source program for predicting the outcome of several NPI policies for future researchers and developers who can use and extend our model.

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