STATISTICAL PREDICTION FOR ANALYZING EPIDIMEOLOGICAL CHARACTERITICS OF COVID-19 USING COMPARATIVE MODELING

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Abstract

The global pandemic of coronavirus disease 2019 (COVID-19) has manipulated a deleterious impact throughout the multifaceted streams of the world as an unavoidable challenge. Though it is apparently observable that the regional communities implement several inclusive processes to break the infection chain while having no designated vaccine or cure, the absolute need for implementing cognitive decisions from global scale to individual-oriented scale has to be further cohesively addressed despite the fact of being hard-hit by the complex matrix of COVID-19 pandemic. These data-driven decisions should focus to substantially and effectively enhance the outcomes of self-isolation, physical distancing and proper sanitization especially in developing countries where the limited resources, both financial and personnel, act as obvious constraints to battle the growing spread of the pandemic. Thus, the importance of novel data-oriented models which uniquely assist to satisfy the decisive needs of this hour are utmost and indispensably applicable crucially in the resource-constrained environments. In this paper, we propose a novel integrated model for analyzing the characteristics of epidemiological curve of COVID-19 by utilizing an enhanced compartmental statistical prediction model which is developed conferring susceptible-infectious-susceptible (SIS) model, susceptible-infectious-removed (SIR) model, Dirichlet process model and the interpretive structural model. The proposed framework consists of a quantitative comparison between each model, extraction of parameter and feature representation, manipulation of correlation between the parameters and their corresponding values in relation to COVID-19 and the final statistical predictive outcomes. In the methodology, the quantitative comparison of each model is performed with respect to their mathematical basis and the extractive approach of parameter representation. Afterwards, each parameter is assigned to a specific weighted model in which correlation between those

parameters and COVID-19 is comparatively analyzed. Afterwards, the extracted parameters are fed into the developed referenced model for statistical prediction. The generation of predictive results is performed by utilizing the available epidemiological datasets of COVID-19 from John Hopkins University, United States. The performance of the model is evaluated using the accuracy, predictive error and the veracity of the obtained results with respect to the realistic data from the above datasets. It is observed that the performance of the proposed framework could significantly be improved by enhancing the precision of parameter extraction and the accuracy of parameter values which are fed into the proposed model. Therefore, it is evident to state that the proposed novel compartmental model ensures a firm foundation for realizing the unprocessed data in epidemiological curves in a more statistically modeled manner and thus, encouraging more data-driven decisions in health systems especially in pandemic situations.

Keywords: COVID-19; Epidemiological Curves; Comparative Modeling; Statistical Prediction