Data-driven dynamic clustering framework for mitigating the adverse economic impact of Covid-19 lockdown practices

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ABSTRACT

The COVID-19 disease has once again reiterated the impact of pandemics beyond a biomedical event with potential rapid, dramatic, sweeping disruptions to the management, and conduct of everyday life. Not only the rate and pattern of contagion that threaten our sense of healthy living but also the safety measures put in place for containing the spread of the virus may require social distancing. Three different measures to counteract this pandemic situation have emerged, namely: (i) vaccination, (ii) herd immunity development, and (iii) lockdown. As the first measure is not ready at this stage and the second measure is largely considered unreasonable on the account of the gigantic number of fatalities, a vast majority of countries have practiced the third option despite having a potentially immense adverse economic impact. To mitigate such an impact, this paper proposes a data-driven dynamic clustering framework for moderating the adverse economic impact of COVID-19 flare-up. Through an intelligent fusion of healthcare and simulated mobility data, we model lockdown as a clustering problem and design a dynamic clustering algorithm for localized lockdown by taking into account the pandemic, economic and mobility aspects. We then validate the proposed algorithms by conducting extensive simulations using the Malaysian context as a case study. The findings signify the promises of dynamic clustering for lockdown coverage reduction, reduced economic loss, and military unit deployment reduction, as well as assess potential impact of uncooperative civilians on the contamination rate. The outcome of this work is anticipated to pave a way for significantly reducing the severe economic impact of the COVID-19 spreading. Moreover, the idea can be exploited for potentially the next waves of corona virus-related diseases and other upcoming viral life-threatening calamities.

KEYWORDS

Covid-19; Dynamic clustering; Lockdown; Pandemic

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