

Analyzing the impact of COVID-19 on seasonal infectious diseases using various models: SARIMAX, LSTM, and Hybrid SARIMAX-LSTM Model

Jeong Hwa SEO¹, Geun Soo JANG² and Hyo Jung LEE¹

1) *Department of Statistics, Kyungpook National University, Daegu, 41566, KOREA*

2) *Nonlinear Dynamics & Mathematical Application Center, Kyungpook National University, Daegu, 41566, KOREA*

Corresponding Author: Hyojung Lee, hjlee@knu.ac.kr

ABSTRACT

The need for intensified research into the seasonal infectious diseases are elevated due to the escalating impacts of climate change. Furthermore, the COVID-19 pandemic has exerted profound and unprecedented impact across society, public health, and the environment.

This study aims to estimate the number of infected cases for seasonal infectious diseases, including Influenza, Norovirus, Severe Fever with Thrombocytopenia Syndrome (SFTS), and Tsutsugamushi disease, and to identify outbreak periods integrating meteorological data from 2005 to 2023 in Republic of Korea. Additionally, this study investigates the impact of COVID-19 on the seasonal infectious diseases, aiming to understand how the pandemic has influenced their incidence and outbreak patterns.

To predict the incidence of seasonal infectious diseases and identify outbreak periods, we developed and employed three models: a seasonal autoregressive integrated moving average with exogenous variables (SARIMAX) model, a Long Short-Term Memory (LSTM) model, and a novel Hybrid model resulting from integration of SARIMAX and LSTM. New outbreak periods were determined using the change point detection (CPD) method, which identifies significant change in time-series data. The results of this study are expected that early detection of seasonal diseases enables timely health interventions, which are crucial for improving health outcomes and reducing the burden on healthcare systems.

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