## Stochastic Epidemic Model Construction Based on the Network Modeling: Applications of a Korean COVID-19 Pandemic Data

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## Abstract:

Modeling epidemics using contact networks represents a significant advancement over classical compartmental models. This presentation explores the capability of the edgebased compartmental model (EBCM), which is selected for its ability to compactly represent contact networks to extract information about the underlying contact structure using epidemic data at the population level. We integrate the EBCM with dynamic survival analysis (DSA), employing data gathered from individuals' infection and recovery times. Our methodology successfully reconstructs the underlying network structure by utilizing synthetic outbreak data generated from simulations on known networks. Although there are strong correlations between the infection rate and the average degree of connectivity, the posterior distributions consistently estimate the actual parameter values accurately. We applied this proposed method to real-world datasets from the COVID-19 pandemic in Seoul. This application allowed us to estimate both epidemic and network parameters, leading to an accurate reconstruction of the observed epidemic curves.