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A comparison of SIR and SEIR epidemiological models for COVID-19 transmission in India with emphasis on non-pharmaceutical intervention

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Abstract

The models on disease transmission are useful in planning decisions on pandemic, resource allocation and implementation of non-pharmaceutical intervention. The SEIR differs from SIR model with an additional exposure period due to the incubation period of COVID-19 during which individuals are not yet infectious. I have applied Bayesian approach with Monte Carlo Markov Chain (MCMC) sampling on SEIR and SIR epidemiological models using python code PymC3 to study the dynamics of COVID-19 pandemic in India, assess the effectiveness of non-pharmaceutical measures from March to October 2020, and generate predictions on daily new and cumulative infected cases. The accuracy of prediction was computed by symmetric mean absolute prediction error (SMAPE) and mean squared relative prediction error (MSRPE); comparison between the relative performance of SEIR and SIR models were made using relative mean squared prediction error (MSPE). Pearson correlation coefficient was determined to investigate the agreement between projected and observed data for model fit and comparison using MCMC, the Bayesian leave one out (LOO) estimate of the expected log point wise predictive density (ELPD LOO) was also calculated. The lower LOO score and standard error of ELPD LOO less than one represented model compatibility. Both SIR and SEIR models are applicable to Indian COVID-19 data, and because of the log normal distribution of the incubation period in SEIR model, the transmission and recovery rates are higher compared to the SIR model.

Biography:

Manisha Mandal is currently working as a Professor in the MGM Medical College, Kishanganj, India

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1. "Indigenous Probiotic Lactobacillus Isolates Presenting Antibiotic like Activity against Human Pathogenic Bacteria V (5(2):31.

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