Capturingthe Spread of COVID-19 in India: A modelling approach

Shiv Narayan Nishad, Naresh Kumar, Sujit Bhattacharya

CSIR-NISTADS
Email for correspondance: s.nishad@nistads.res.in

Extended Abstract

The Government of India has taken strong policy interventions for controlling the spread of the novel coronavirus, COVID19. One of the key interventions has been to go for a nationwide lockdown from 25 March till 14 April; a twenty one day lockdown period. It becomes imperative for the Government to monitor the number of coronavirus cases in India and other related statistics for informing and taking further policy action. A wide range of steps are being taken in this regard by the government. This study is motivated by this. Using mathematical modelling approach, the paper examines the trend of number of cases of coronavirus over a period of time, including the lockdown period. The study explores various functions/models such as polynomial, Gompertz, and modified Gompertz functions to deduct which of the model is best fit for the trend (**see Figure 1**). The trend forecast is further validated for robustness and prediction. The model demonstrates that a much higher growth in number of cases would have happened had the lockdown not been implemented (**see Figure 2**). The forecast provides some indication of trend in the near future. The paper concludes by discussing that it is not prudent to make a long term forecast at this stage, along with discussing the complexity of modelling a pandemic disease.

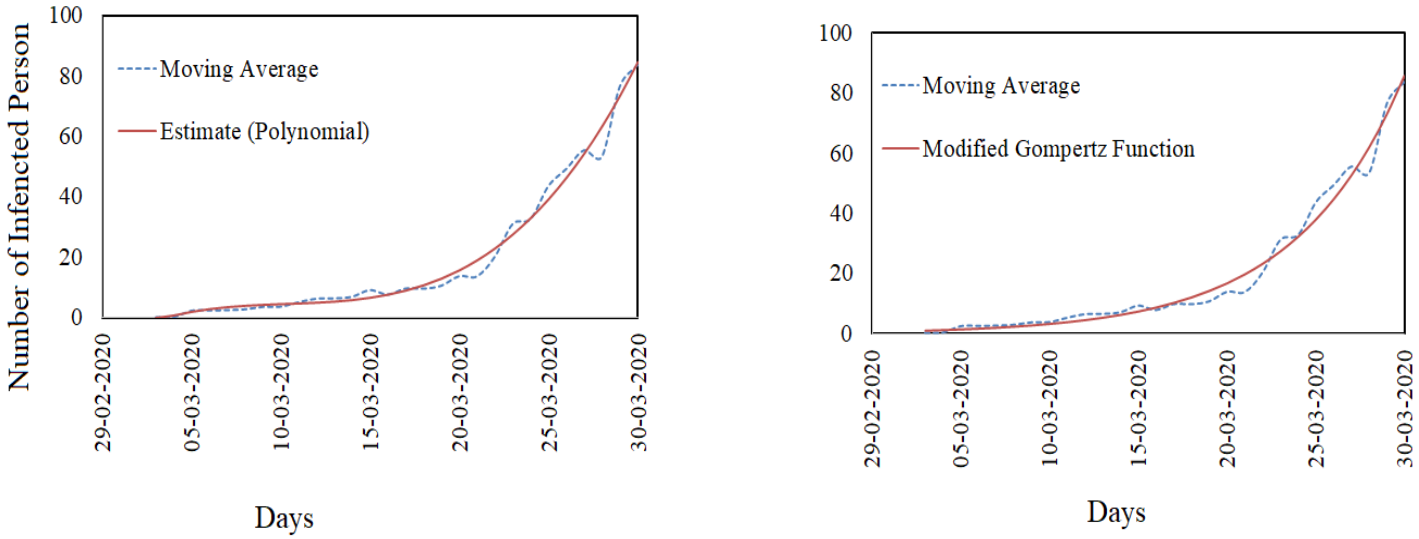

Figure-1: Simulation of daily infected person using Polynomial and Modified Gompertz function. The solid line represents the simulated value against the observed values
Data Source: *https://www.worldometers.info/coronavirus/country/india/*

Note: Moving average is taken for 7 days to smooth out short-term fluctuations

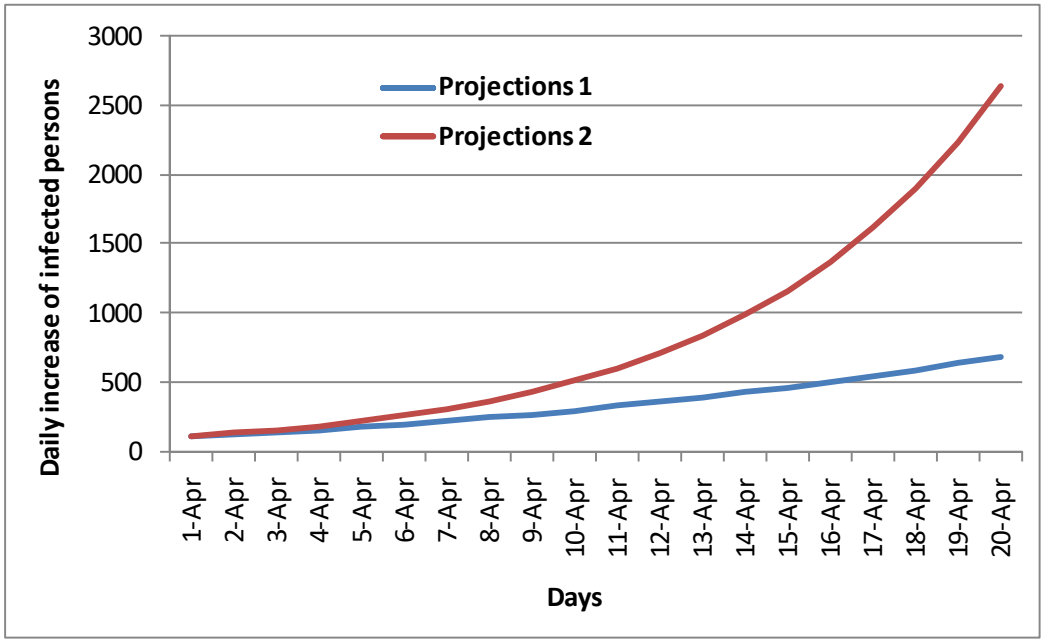

Figure-2: Projected no. of infected persons under controlled (Projection 1) & uncontrolled (Projection 2) conditions**.**

Projection 1; are made using Polynomial function as it gives best fit to the empirical data capturing lockdown and social distancing phase.

Projection 2: are made using Modified Gompertz function as it is well known and widely used in many aspects of biology. It is frequently used to describe the growth of animals and plants, as well as the number or volume of bacteria and cancer cells. The Gompertz function captures unrestrained biological process. Since COVID-19, is a contagious disease so it is assumed this function can capture better pattern of spreading COVID-19, ***if restrictions are not imposed.***