

CSE 246 Project COVID-19 Cultural and Intervention Exploration and Spread Forecasts

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Introduction

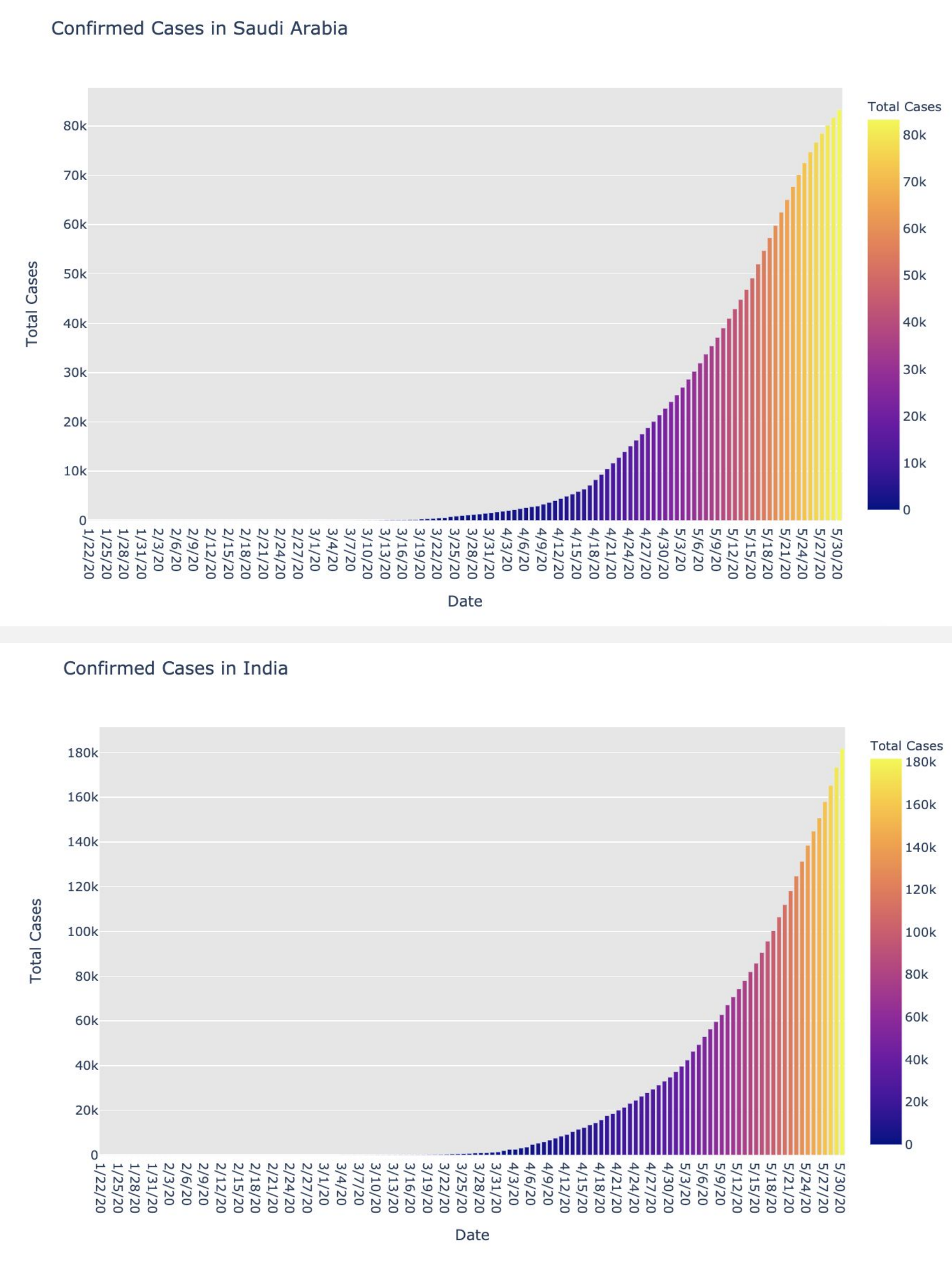
With the onset of COVID-19 affecting hundreds of thousands globally, we wanted to explore how cultural aspects play a role in the rate of infection and the spread of the virus. In addition, we are interested in using available COVID-19 data in order to perform time series forecasting and predict peak projections.

The goal of this project is to study the effect of social distancing and government intervention on the spread of the curve of COVID-19 and learn from the forecasted models whether our assumptions were valid by comparing those two methods of modeling a pandemic.

Datasets

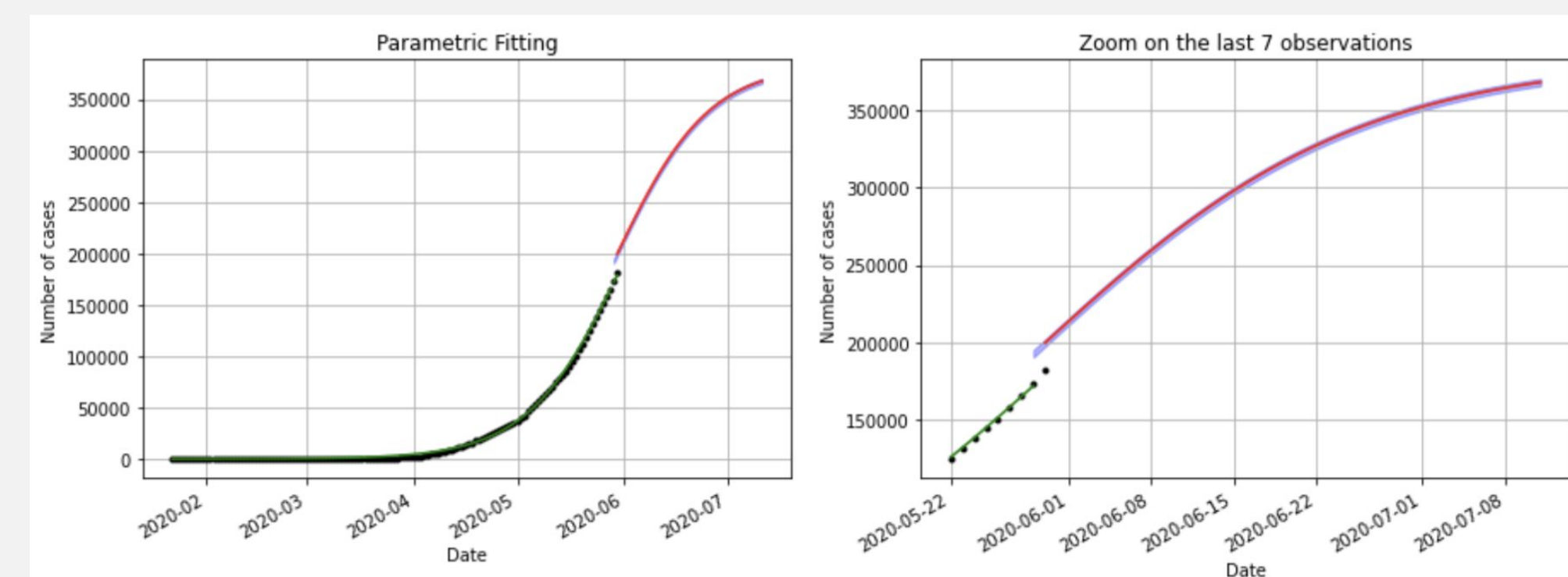


Exploratory Analysis

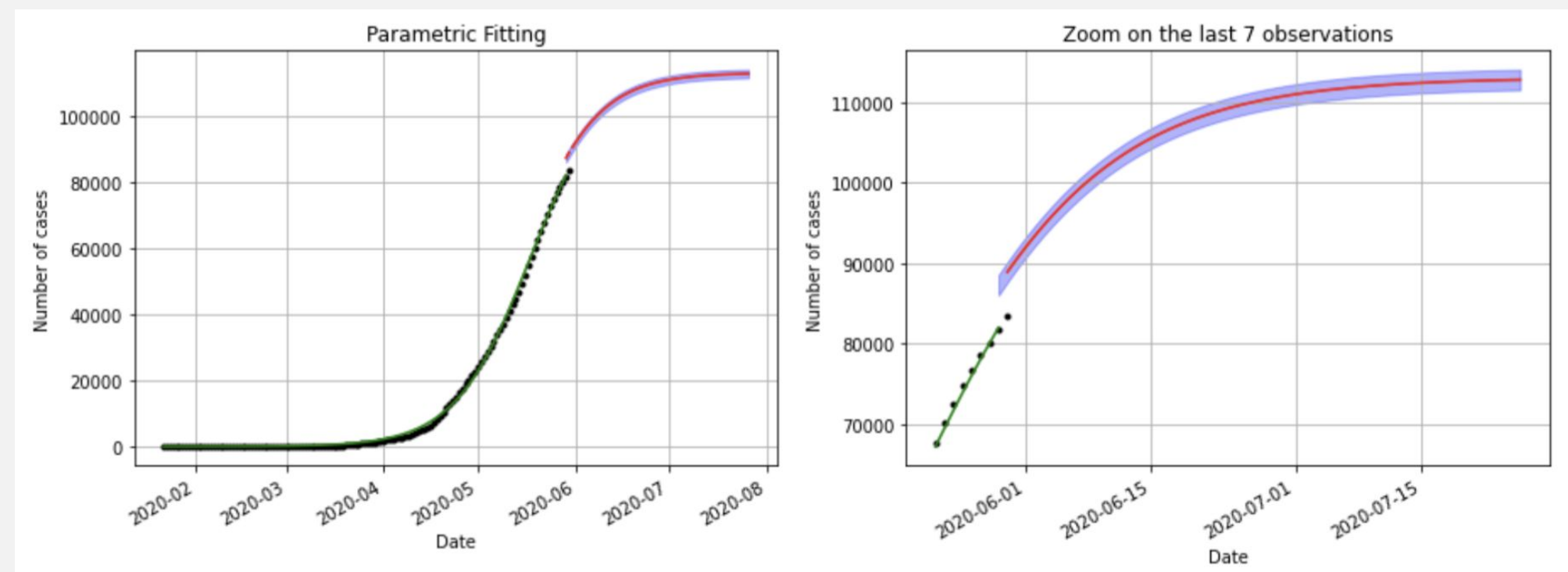


Methods and Results

India - Total Cases Logistic Fit



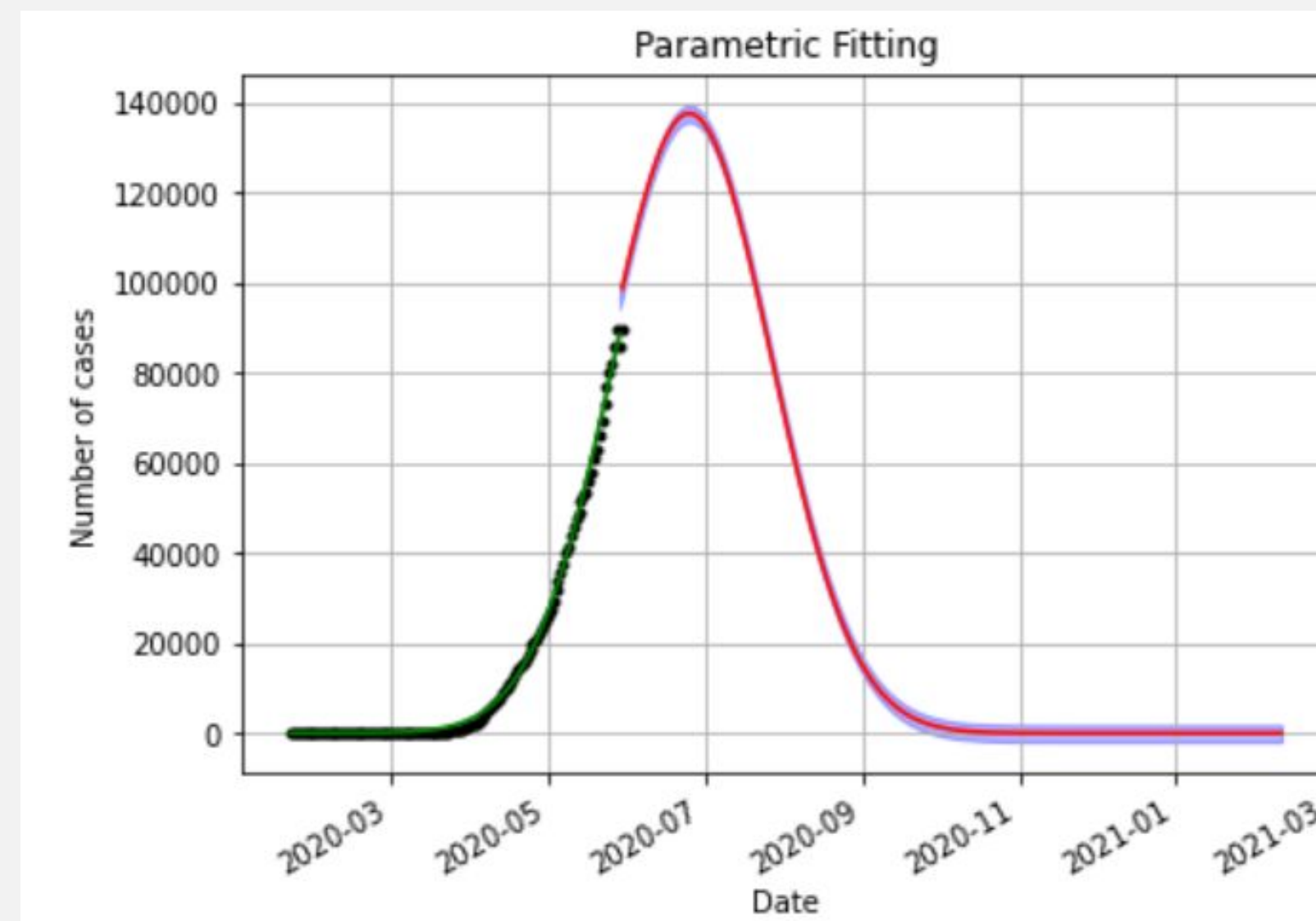
Saudi Arabia - Total Cases Logistic Fit



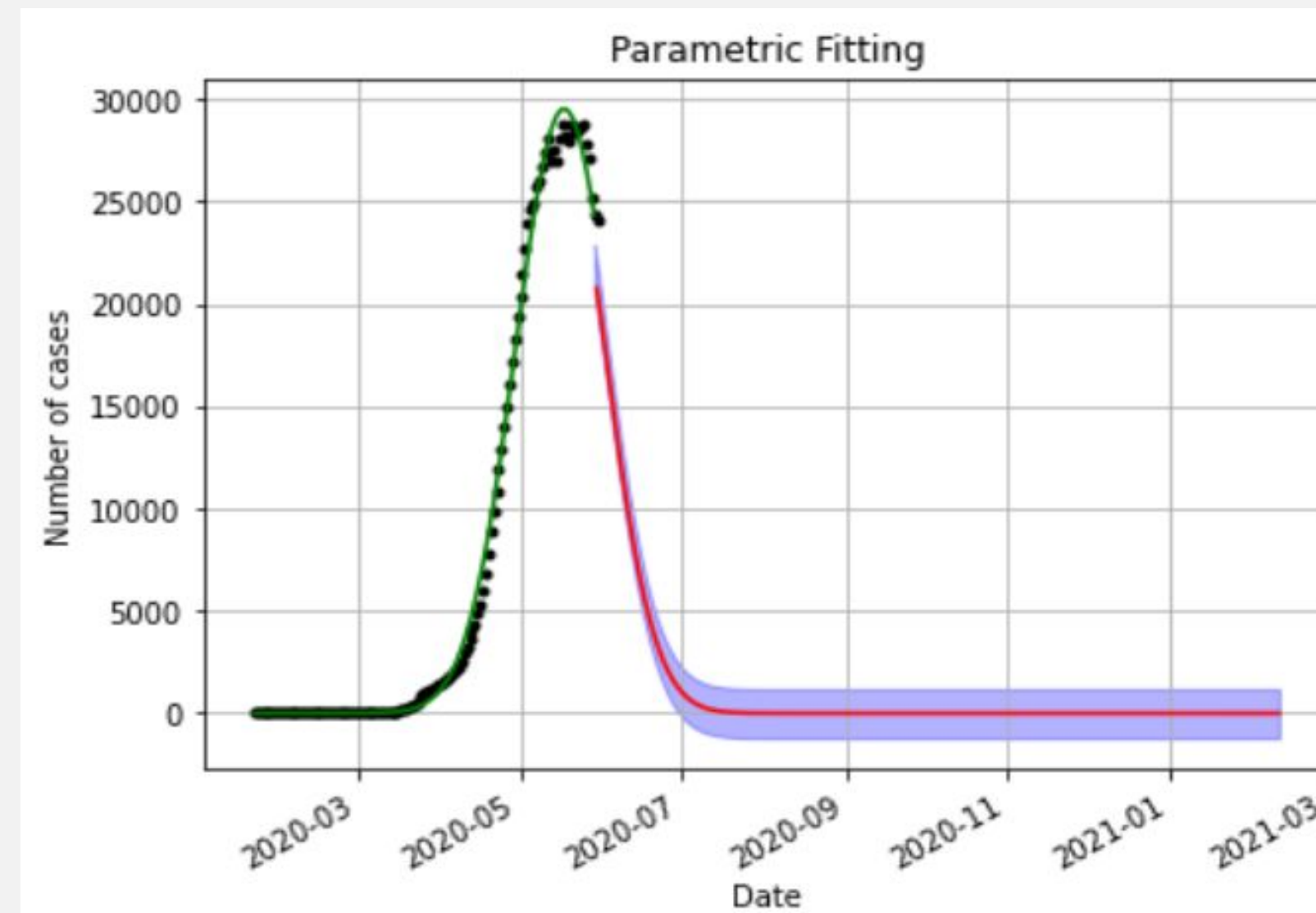
In order to forecast how COVID-19 is spreading in different countries, we used parametric curve fitting to find a best fit for our data. We used a logistic function for the total number of confirmed cases and a gaussian function for the total number of active cases.

With these two models, we were able to find the optimal parameters to minimize the error of the curve and obtain a forecast based on the trend of our data.

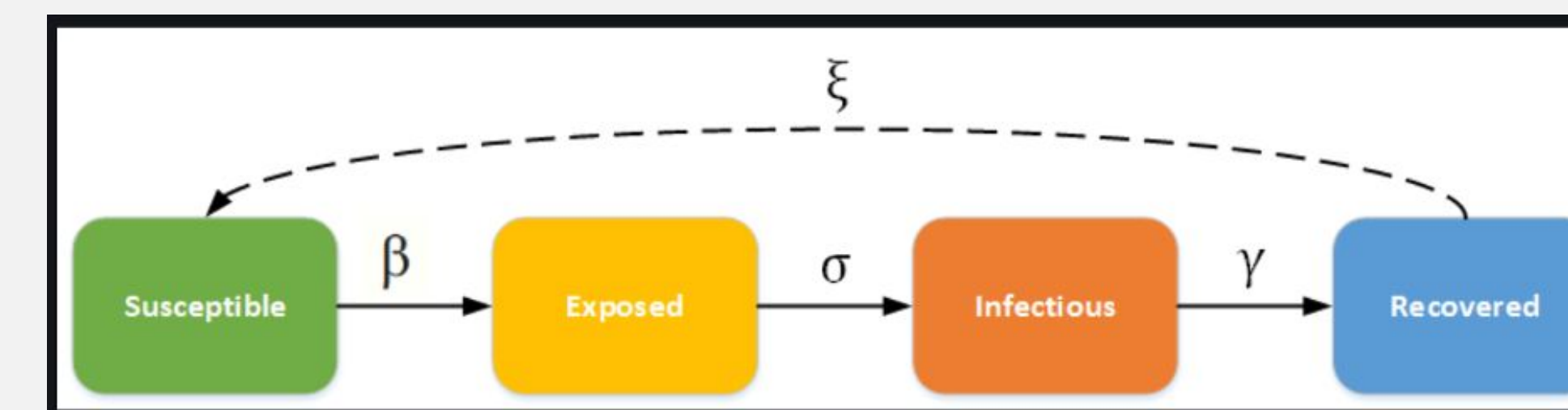
India - Active Cases Gaussian Fit



Saudi Arabia - Active Cases Gaussian Fit

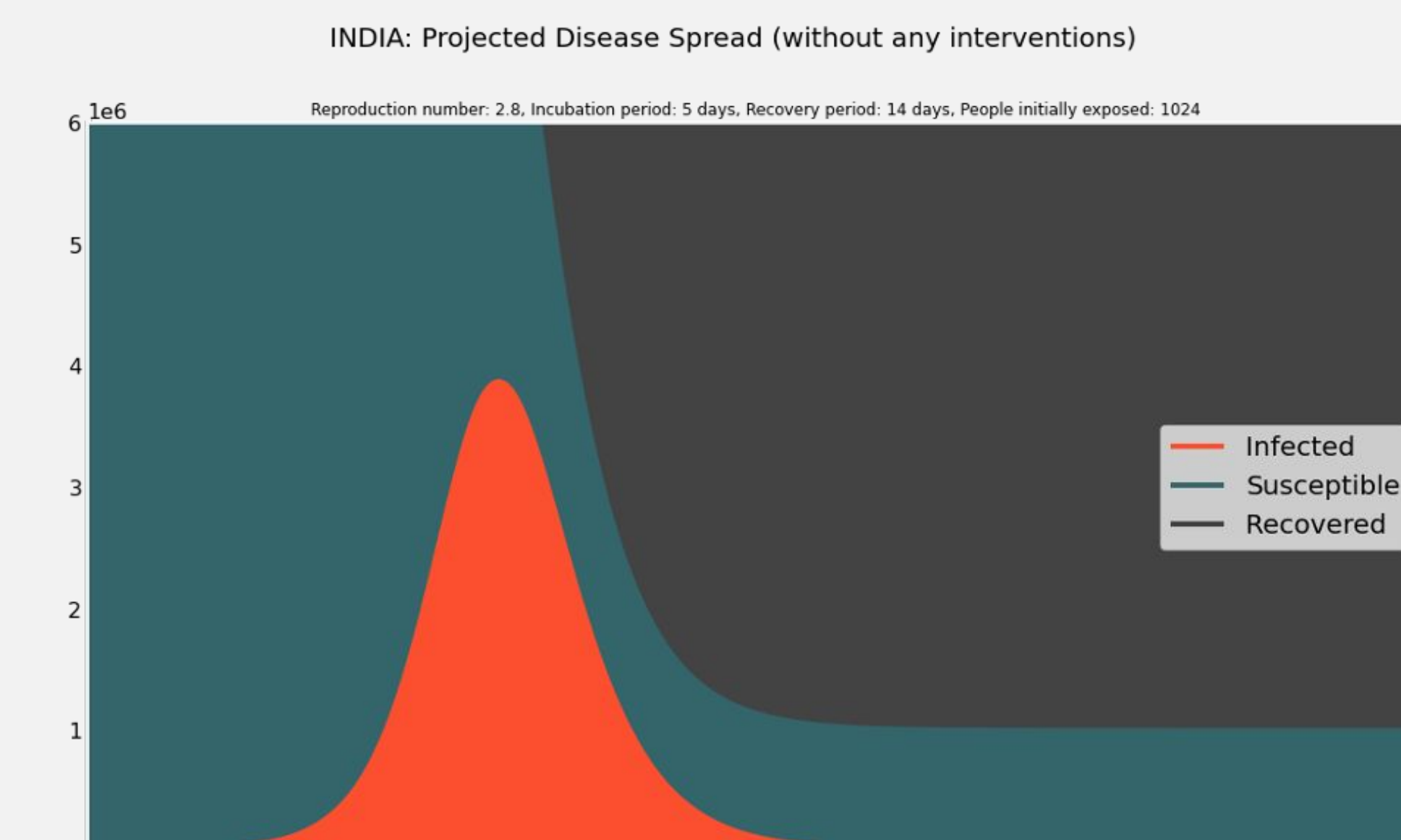


SEIR Model and Parameters

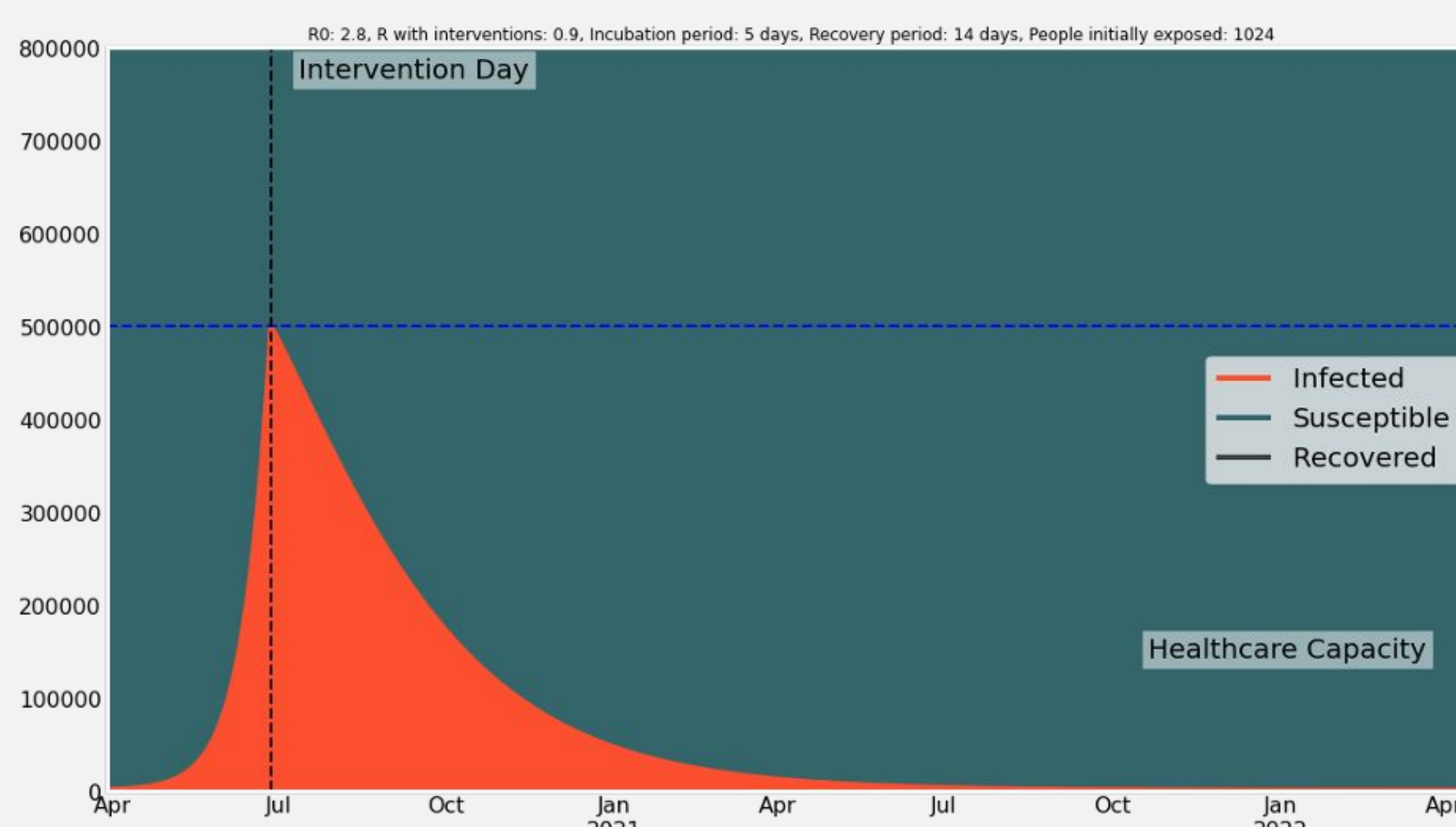


β = Infection Rate
 σ = Incubation Rate
 γ = Recovery Rate
 ξ = Rate of being recovered and Susceptible again
 R_0 = Reproduction Number = β/γ

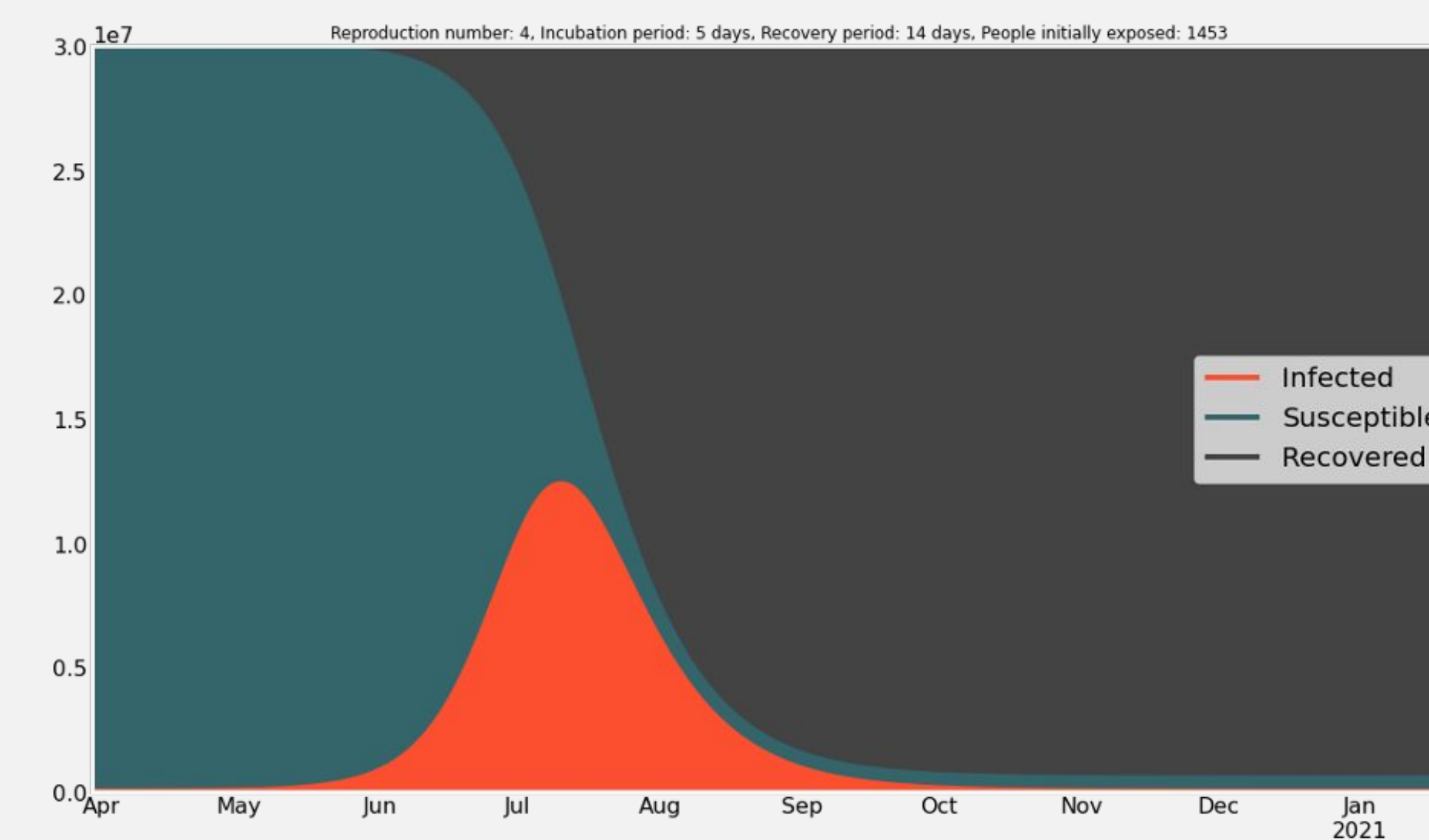
SEIR model for curve spread simulation For India and Saudi Arabia



INDIA: Projected Disease Spread (with interventions after 90 days)

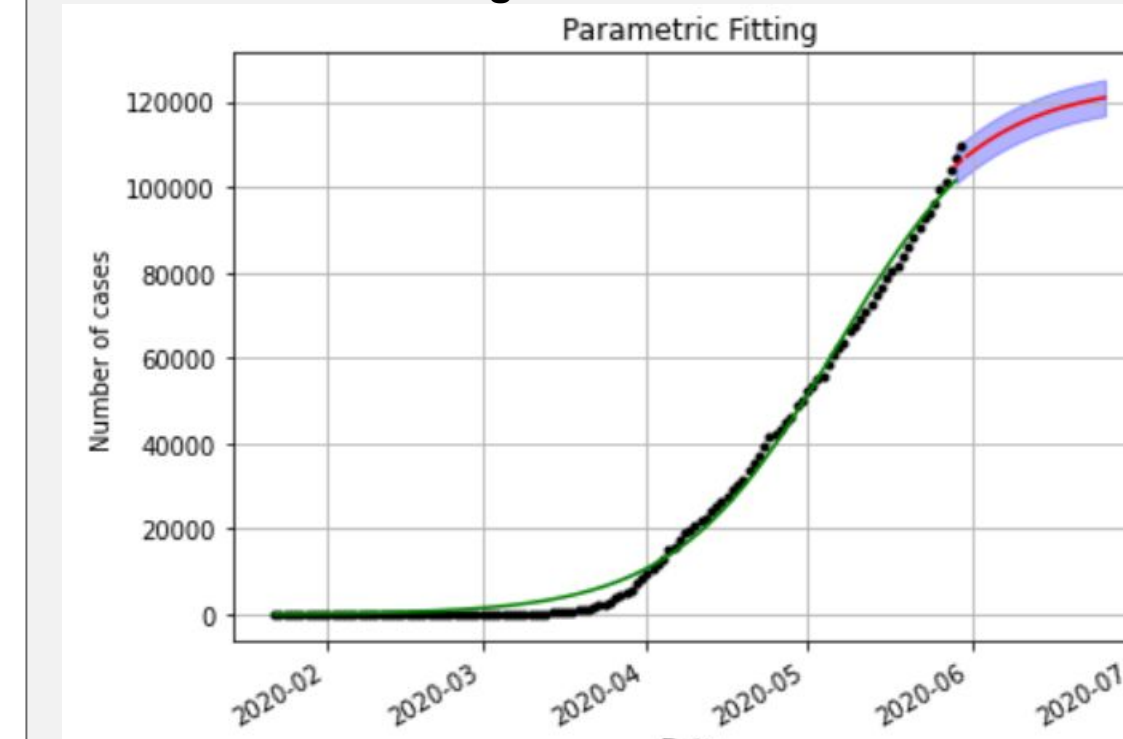


Saudi Arabia: Projected Disease Spread (without any interventions)

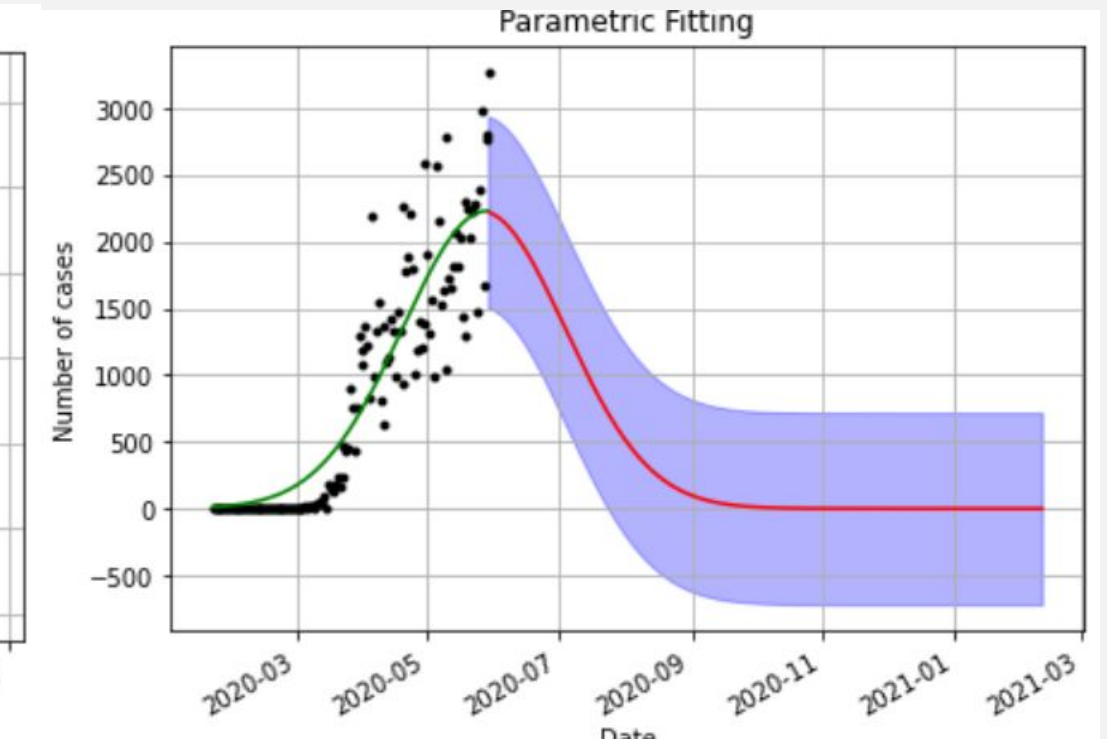


State Results

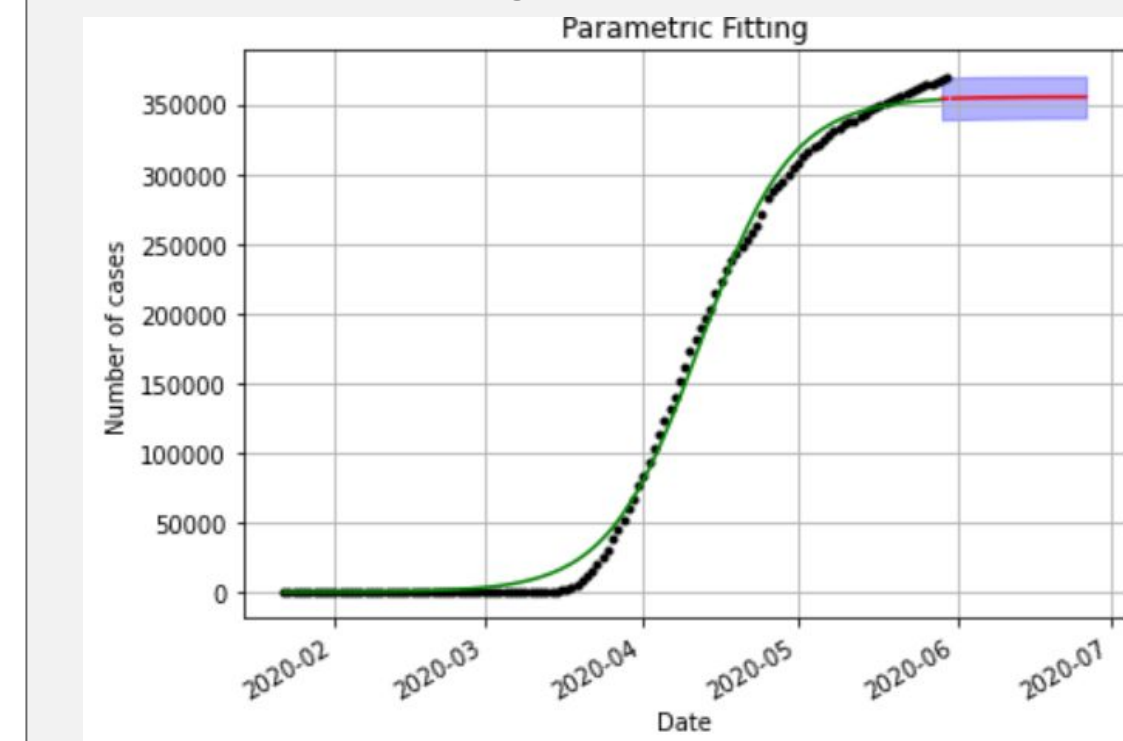
California - Logistic Fit of Total Cases



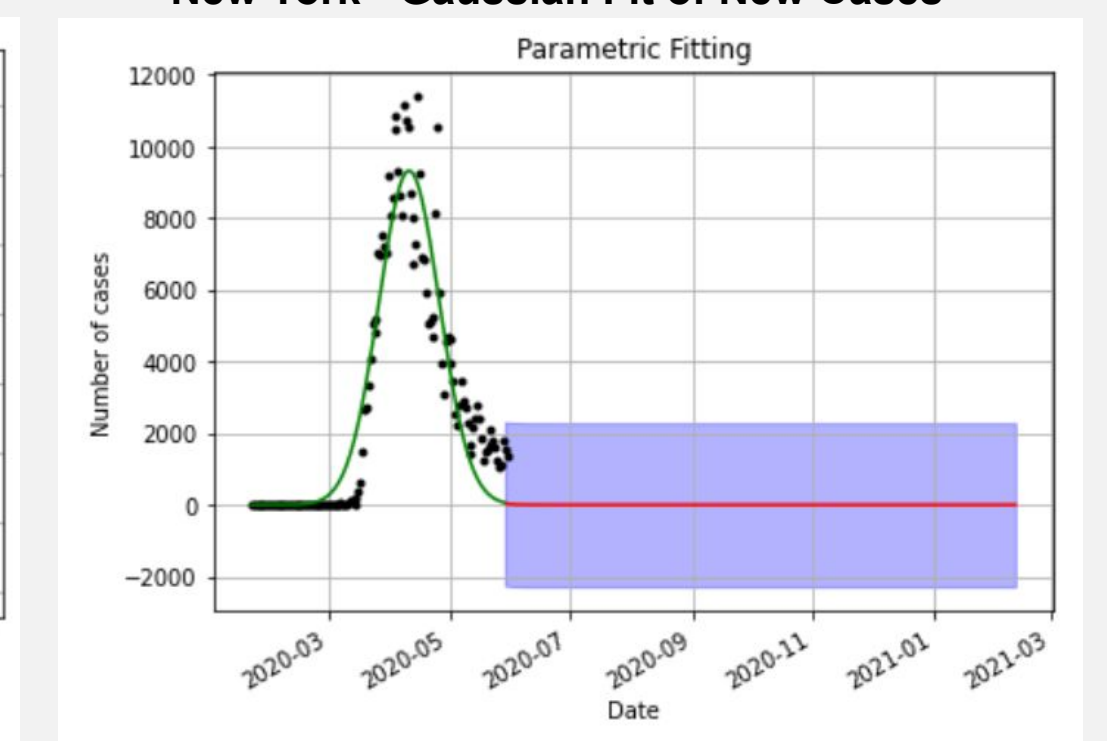
California - Gaussian Fit of New Cases



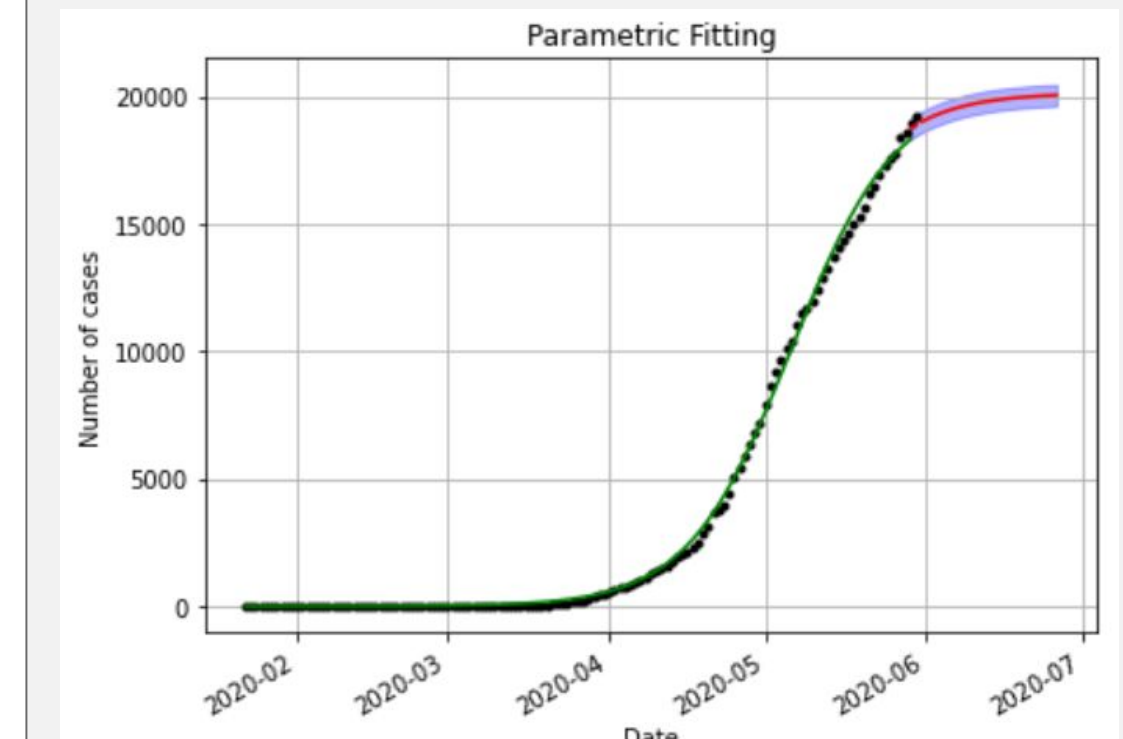
New York - Logistic Fit of Total Cases



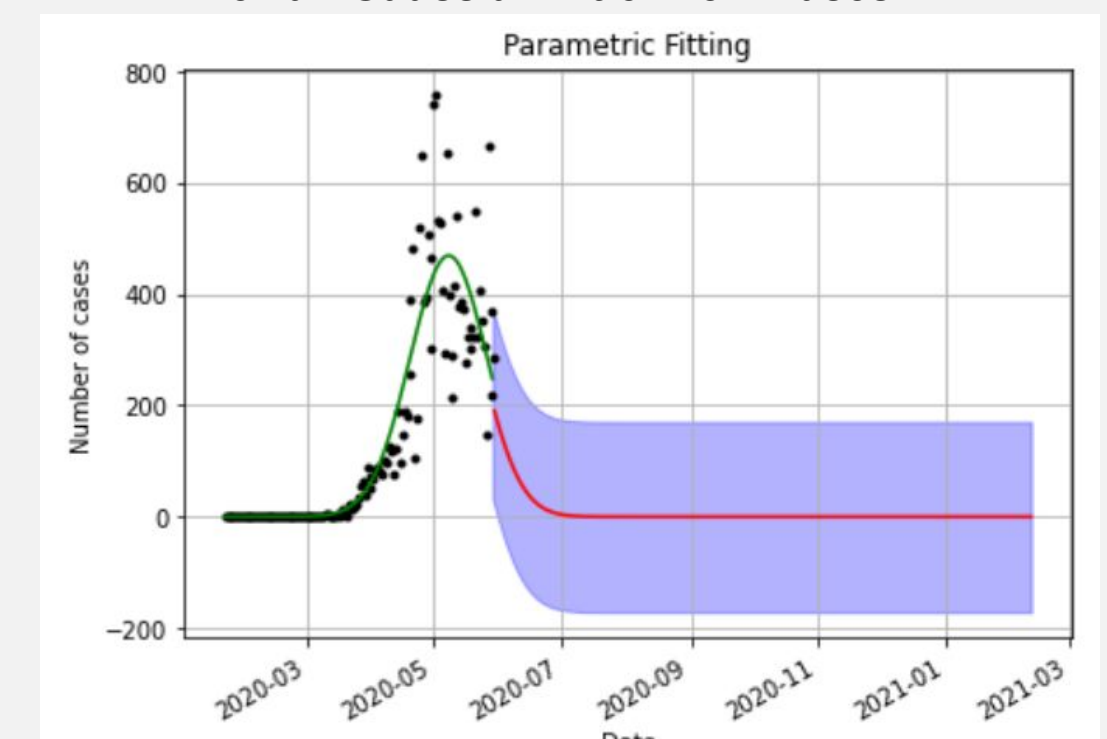
New York - Gaussian Fit of New Cases



Iowa - Logistic Fit of Total Cases



Iowa - Gaussian Fit of New Cases



Discussion and Conclusion

Looking at the forecasts vs the simulation of the spread in Saudi Arabia, we can infer the effects of social distancing and government intervention as the forecasts assert our assumptions about their effect.

