Predict Covid-19 Spread from April-September in 2021 by using ODE and Bisection Method

Charita Ampharpai

Mahidol University International College

December 1, 2025

Introduction

- Let N be the population in 2021 $= 70{,}000{,}000$ people.
- Let γ be the recovery rate:

$$\gamma = 1/\text{recovery days}$$

Since recovery ≈ 8 days $\Rightarrow \gamma = 1/8 = 0.125$.

- Let β be the infection rate (speed of spread) $\rightarrow R_t = \beta/\gamma$.
- To find the best β, I used SSE to minimize the error:

$$\text{SSE}(\beta) = \sum_{t=0}^{n} (I_{\text{real}}(t) - I_{\text{model}}(t, \beta))^2$$

Where:

- **SSE(β):** Total sum of squared errors.
- $I_{\text{real}}(t)$: Number of infected people on day t (Red dot).
- $I_{\text{model}}(t, \beta)$: Number of infected people predicted by the equation on day t (Blue line).

Data

- Use the Data from Kaggle:
  https://www.kaggle.com/sudalairajkumar/
  novel-corona-virus-2019-dataset

- Calculate the active cases:

$$\text{Active} = \text{Confirmed} - \text{Deaths} - \text{Recovered}$$

Result

- $\beta = R_0 \times \gamma = 5.08 \times 0.125 = 0.635$
- Source for Beta: https: //www.researchgate.net/publication/353790276
- The lower bound is 0.10 and upper bound is 0.70
- By theory, $\beta = 0.635$, but the actual spread virus in Thailand $= 1.6$. So it means that it can be prevent by lockdown $\approx 70\%$.