**Abstract**

### With the rise of the COVID-19 pandemic, mathematicians have endeavored to model the situation to forecast the spread of the disease across different countries. One of the models that has been used for several decades to illustrate similar situations is the SIR model, where S, I, and R stand for Susceptible, Infected, and Recovered individuals, respectively. The disease can spread from S to I at a rate denoted by Beta, and individuals recover at a rate denoted by Gamma. In this project, we aim to enhance the SIR model by incorporating opinion dynamics, thereby increasing the model's complexity. This addition reflects how individuals' ideas or actions can influence the opinions and behaviors of others within a population. **Introduction**

In this project, we use the SIR model to illustrate how a disease can spread through a population. We demonstrate how susceptible individuals become infected through interactions with infected individuals, and at what rate the infected individuals recover. This eventually leads to a majority of the population recovering, with a small minority remaining either susceptible or infected. This model is based on the assumption that initially, the majority of the population is susceptible, and infected individuals will eventually recover and gain immunity to the disease, resulting in herd immunity by the end of the assumed period.Consequently, the infected population tends to zero over time, while the population of recovered individuals becomes the majority. This dynamic results in a scenario where the infection diminishes and the majority of the population is ultimately recovered.

Additionally, in terms of opinion dynamics, we assigned each individual a number from the set of integers, denoted as the "Z" set (Z\mathbb{Z}Z). We assumed that each individual initially has a random idea from the "Z" set. Through interactions, besides the epidemiological state, individuals who meet will have their ideas reversed. Consequently, the opinion number of each individual will be inverted during the process.