# Chapter 4
# Simulation of SIR Model


## ABSTRACT

*There is considerable discussion in the healthcare community around the world regarding many possible strategies to minimize the impact of the new coronavirus (COVID-19). Modeling and simulations are useful tools for estimating key parameters of transmission and for subsequent improvements in its management. Taking action at this early stage would allow policymakers to take appropriate remedial steps in order to limit the dreadful impact of the disease in the future. The aim of this chapter is to show how to simulate the SIR compartmental model and to estimate the parameters for knowing the status of the disease using real data with the help of matlab.*


## INTRODUCTION

In the SIR Model, a disease epidemic is simulated over time. Defining compartments according to the disease status of epidemics is a key aspect of this deterministic epidemic model. In this modeling application, there are a total of three differential equations that represent the rates of change of three variables over time.

The 3 variables are:

Susceptible (S): People who have never had the illness and are therefore susceptible to contracting it.

infected (I): An individual who is currently infected with an illness and is contagious.

DOI: 10.4018/978-1-7998-8343-2.ch004

Recovery (R): An individual who has already dealt with the illness and is immune.

So, the total population $N = S + I + R$.

The model is developed based on the following assumptions. Due to ignoring births and immigration, we consider the system closed. Those in the susceptible group tend to leave it over time after they become infected. Susceptible S(t) changes according to how many individuals are already infected, how many individuals are susceptible, and how much contact there is between susceptible and infected individuals. Consequently, each infected individual generates an average of b s(t) new infections per day, where b denotes the number of contacts sufficient to spread the infection on a daily basis. Additionally, in the case of infected samples, it is assumed that some proportion k of individuals may recover during a given period. An average recovery rate attributed to one-fourth is indicative of an average infection period of four days.

## Background

Cleve Moler (of the University of Mexico) invented MATLAB in the late 1970s, an environment and programming language for numerical computing. MathWorks (established in 1984) now owns and develops MATLAB.

There are four basic windows on the MATLAB desktop by default (Mathworks, n.d.):

Workspace: We display, in the Workspace window, all variables that are stored in the MATLAB environment.

Current Folder: MATLAB's Current Folder displays the directory in which the workspace was most recently opened.

Command Window: The Command Window can be viewed as the main interface with which the commands can be entered in MATLAB.

Command History: The Command History window keeps track of the commands that have been entered into the Command Window and their associated statuses.

The figure depicts Matlab editor