Projet : PolytechCovidRisk

1 Contact

laurent.hardouin@univ-angers.fr
Nombre d'tudiants : 2
Nombre de groupes : pas de limite

2 Context

The SIR model is an example of a compartment model, i.e., the population is divided into several categories. For a given population, the size of three sub-populations over time t is studied: S(t) represents the proportion of healthy people at time t , I(t) the proportion of infected people, and R(t) the proportion of recovered people, $S(t) + I(t) + R(t)$ is equal to 1. It is important to differentiate between healthy and recovered persons: healthy persons have not yet been affected by the virus (Susceptible to be sick), whereas recovered persons are cured and therefore immune. In other words, recovered persons are no longer taken into account. Therefore, the SIR model is not directly concerned with predicting the mortality of the epidemic. The SIR model can therefore be represented by the following diagram :

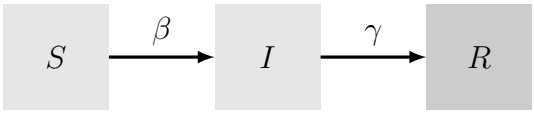

Figure 1: Three compartments S (Susceptible), I (Infectious), R (Recovered). β is the transmission rate, and γ the recovering rate.

The SIR model can be depicted as ordinary non linear differential equations an example of evolution is given inFigure 2. This phenomena will be studied in the "Model and Simulations" Course.

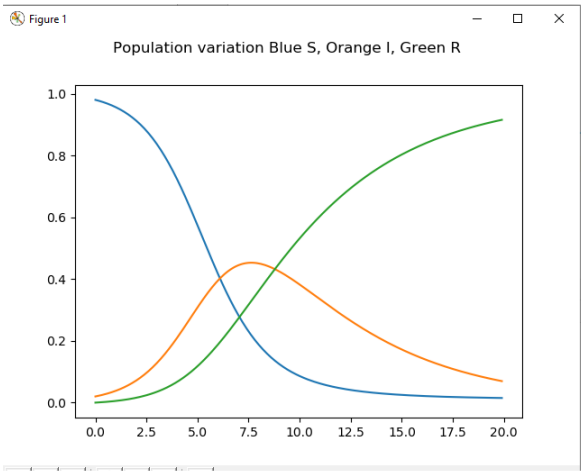

Figure 2: Example of variation for Susceptible, Infected and Recovered population.

3 Project

The aim of the project is to develop an application computing the probability to have a person with COVID in Polytech. For that you will use the model SIR fed automatically with the data from the government available from the following url : `https://www.data.gouv.fr/fr/datasets/donnees-hospitalieres-relatives-a-lepidemie-de-covid-19/` and the database of the students in Polytech. By coupling the both you should develop an application giving day by day the probability to cross the way of a person with the virus in the building or in your group. The application should be developed in Python first and a Web application could be envisaged in a second step.

The project will allow you to fulfil the requirement of the "Quitus Recherche", which is needed to get the Polytech engineer diploma (see the section 5.2 of the "rglement des tudes Polytech Angers" and the connected Annex).

Skills developed : Modelling of non linear system, probability, web programming.