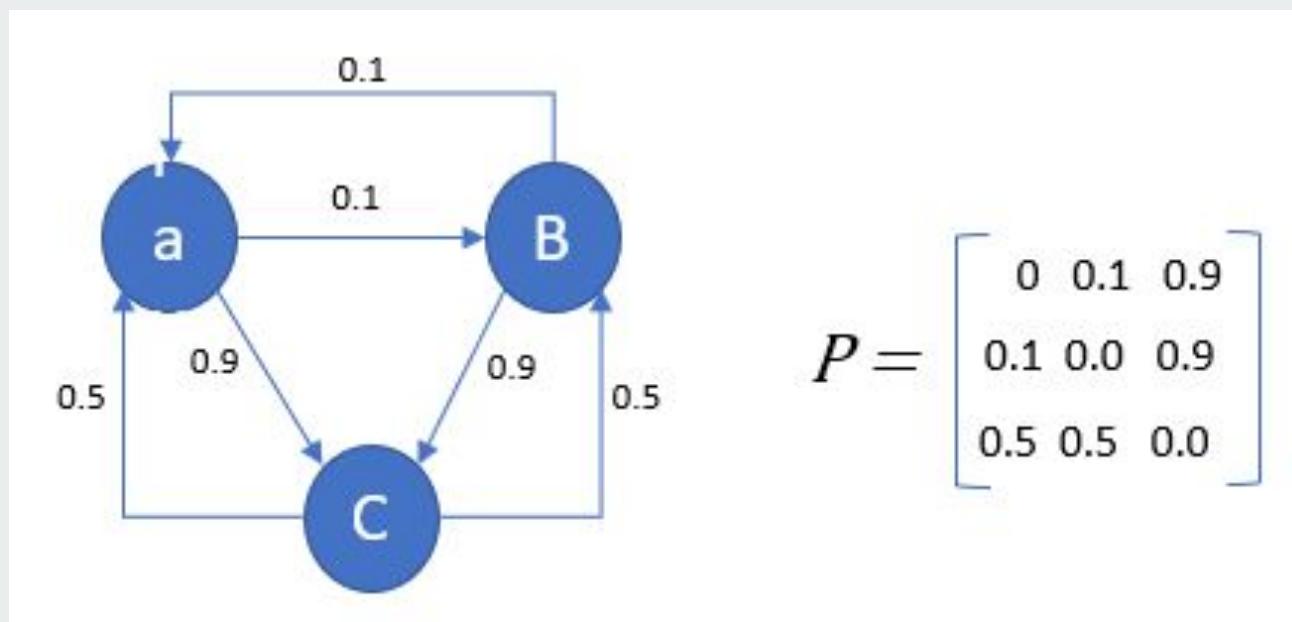


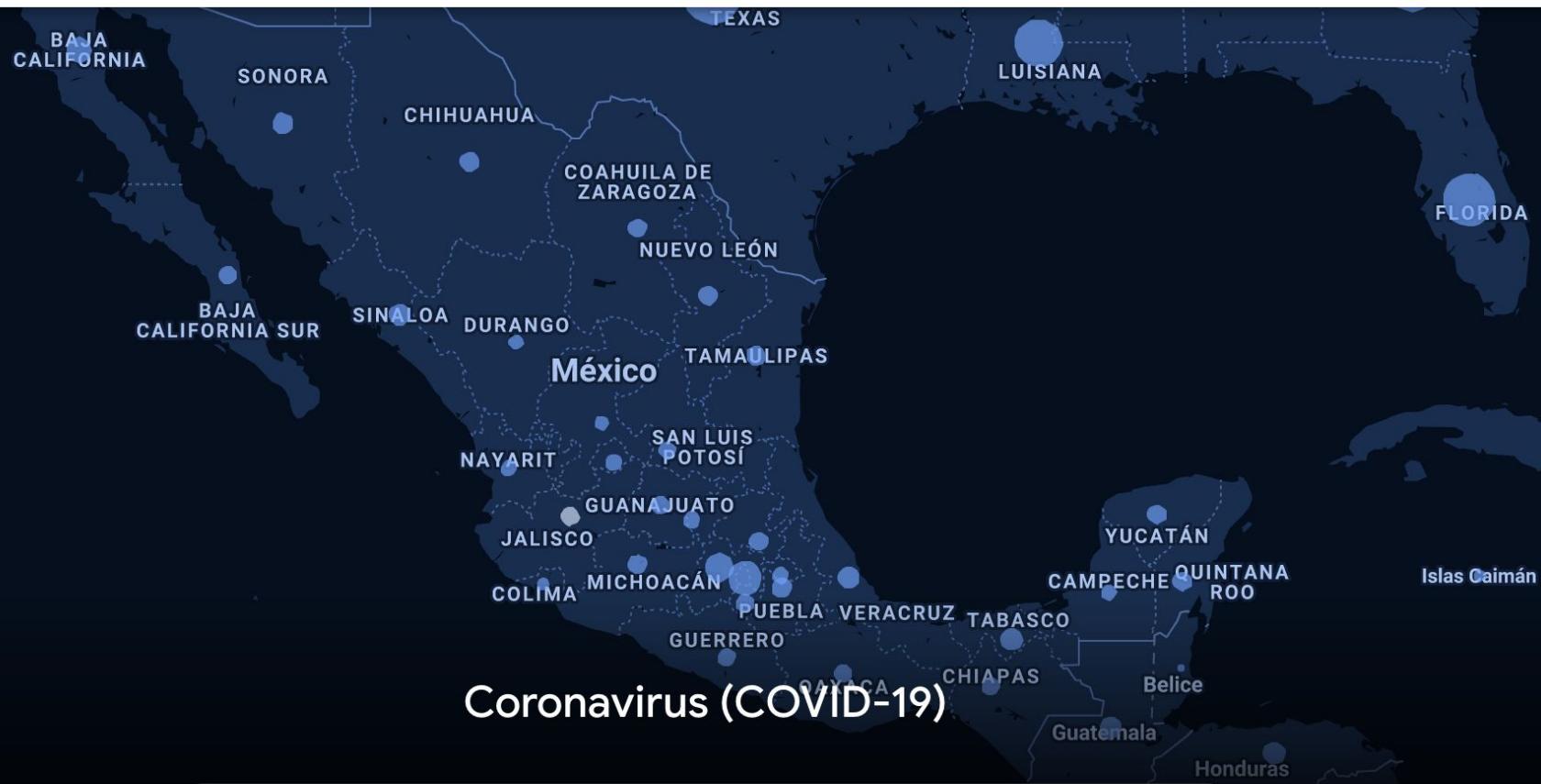


Modelo de comportamiento del virus SARS-CoV2 como caso de estudio

Daniela González
Guillermo Herrera

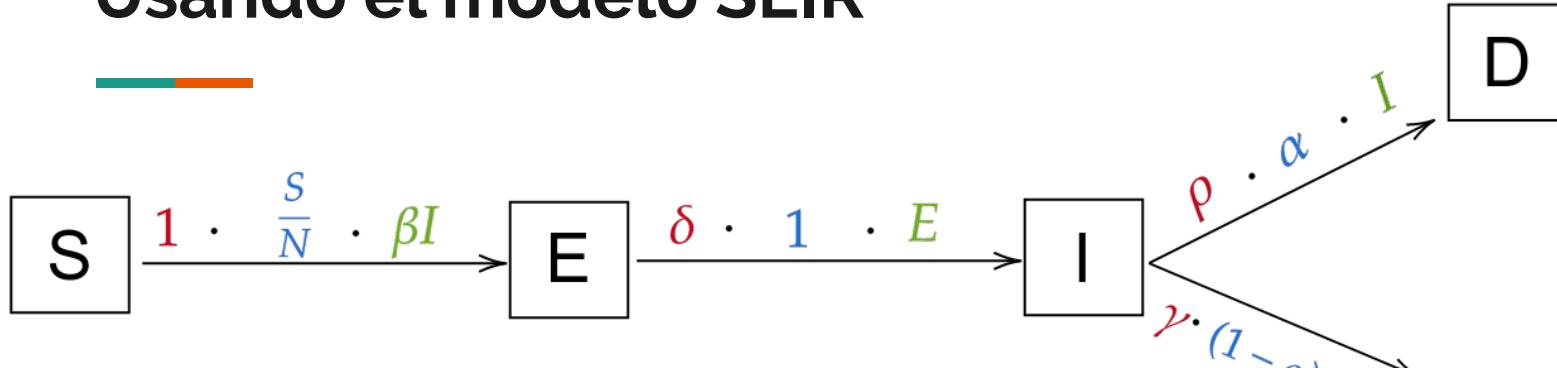
Markov Chains





Jalisco

Usando el modelo SEIR



$$\frac{dS}{dt} = -\beta \cdot I \cdot \frac{S}{N}$$

$$\frac{dE}{dt} = \beta \cdot I \cdot \frac{S}{N} - \delta \cdot E$$

$$\frac{dI}{dt} = \delta \cdot E - (1 - \alpha) \cdot \gamma \cdot I - \alpha \cdot \rho \cdot I$$

$$\frac{dR}{dt} = (1 - \alpha) \cdot \gamma \cdot I$$

$$\frac{dD}{dt} = \alpha \cdot \rho \cdot I$$

Datos necesarios

- N: total population
- $S(t)$: number of people susceptible on day t
- $E(t)$: number of people exposed on day t
- $I(t)$: number of people infected on day t
- $R(t)$: number of people recovered on day t
- $D(t)$: number of people dead on day t
- β : expected amount of people an infected person infects per day
- D: number of days an infected person has and can spread the disease
- γ : the proportion of infected recovering per day ($\gamma = 1/D$)
- R_0 : the total number of people an infected person infects ($R_0 = \beta / \gamma$)
- δ : length of incubation period
- α : fatality rate
- ρ : rate at which people die (= 1/days from infected until death)

Fuentes



Estado de Jalisco

- *Total population ZMG*
- *Death rate in the ZMG*
- *Total number of confirmed, suspects, discarded and defuncions in ZMG*



Organización Mundial de la Salud

- *Number of days an infected person has the virus and can spread the disease*
- *Proportion of infected recovering per day*
- *Virus incubation period*



Centros de investigación:

- DataLab Community
- Data Science Monterrey
- Zapopan Lab
- SoCieDat Mexico

- *Rate of the number of people an infected person infects per day*

Datos necesarios

- $N = 6.220$ millones
 - $S(1) = N - 2$
 - $E(1) = 0$
 - $I(1) = 2$
 - $R(1) = 0$
 - $D(1) = 0$
 - β : expected amount of people an infected person infects per day
 - $\beta = R_0(t) * \gamma$
 - $D = 10$
 - $\gamma = 1/D$
 - $R_0 = 2.5$ (promedio global)
 - $\delta = 5.1$ days
 - $\alpha = 9.67\%$
 - $\rho = 1/10.5844$
- Datos obtenidos de la base de datos proporcionada por <https://coronavirus.gob.mx/datos/> acotados a Jalisco. (Datos incapaces de ser deducidos con los datos disponibles se obtuvieron de los datos globales)
*Nota: los datos disponibles son de pacientes en hospitales públicos

Figure 1

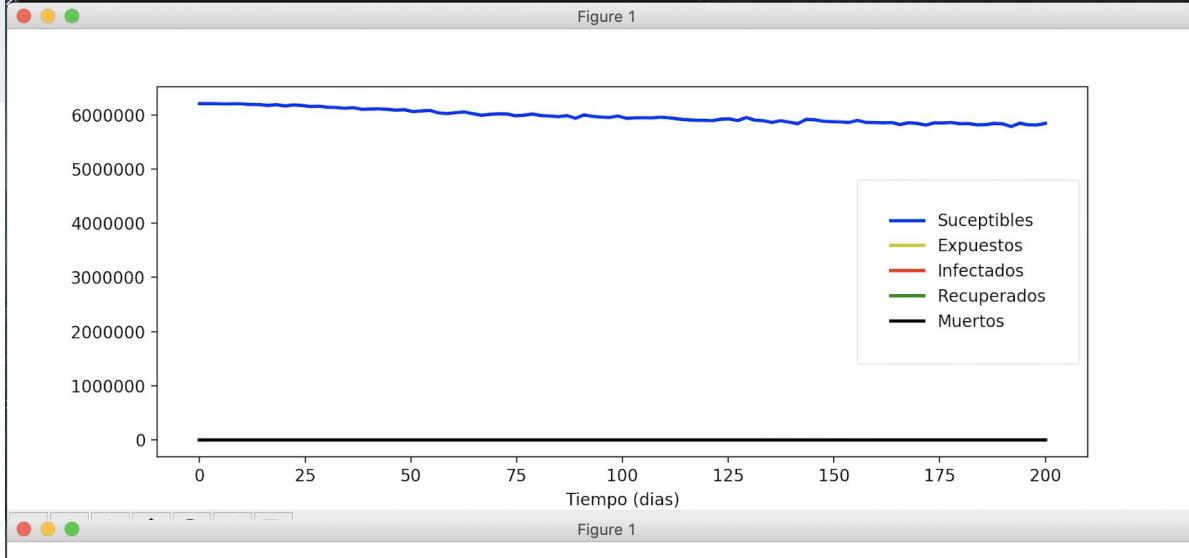


Figure 1

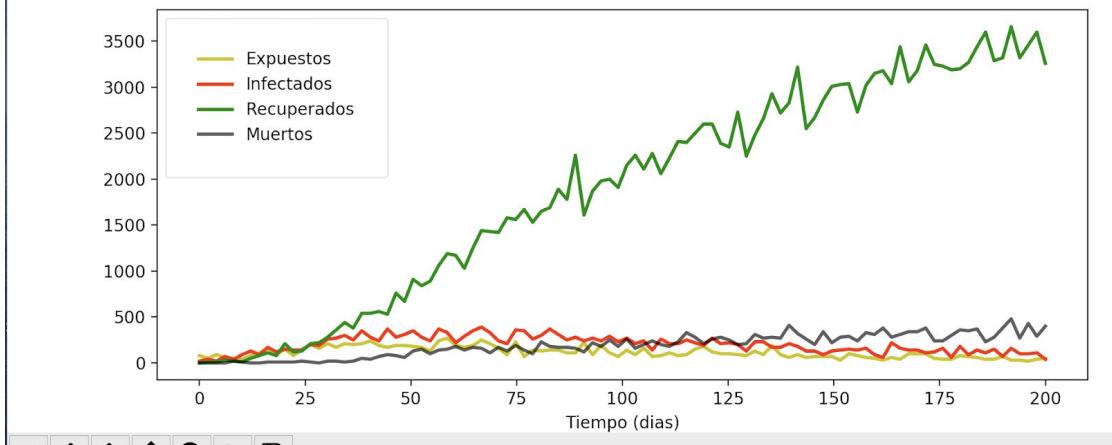
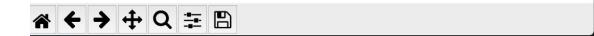
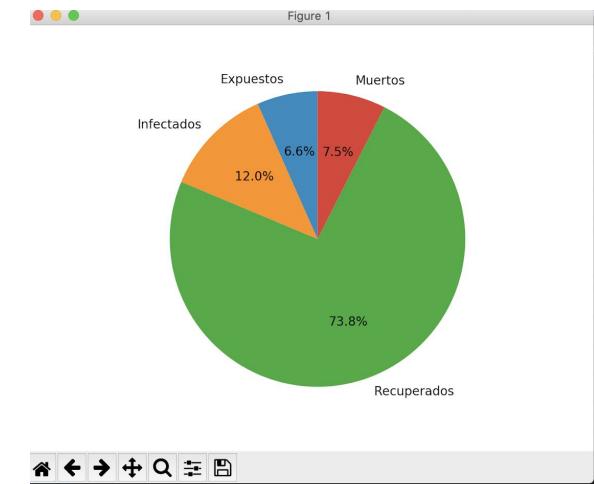


Figure 1

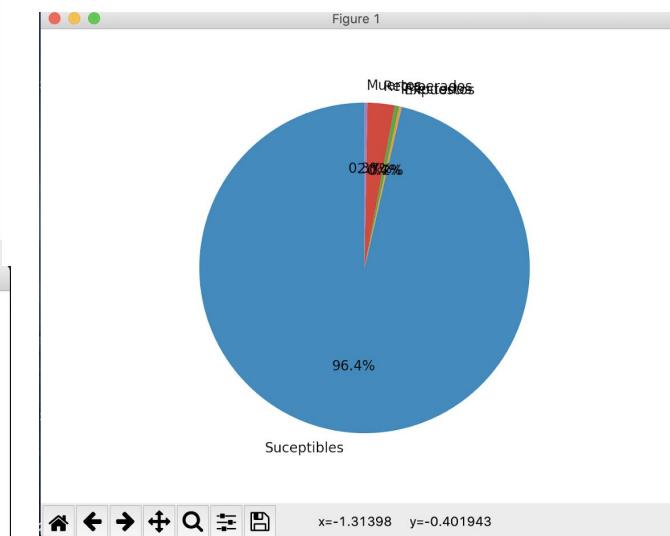
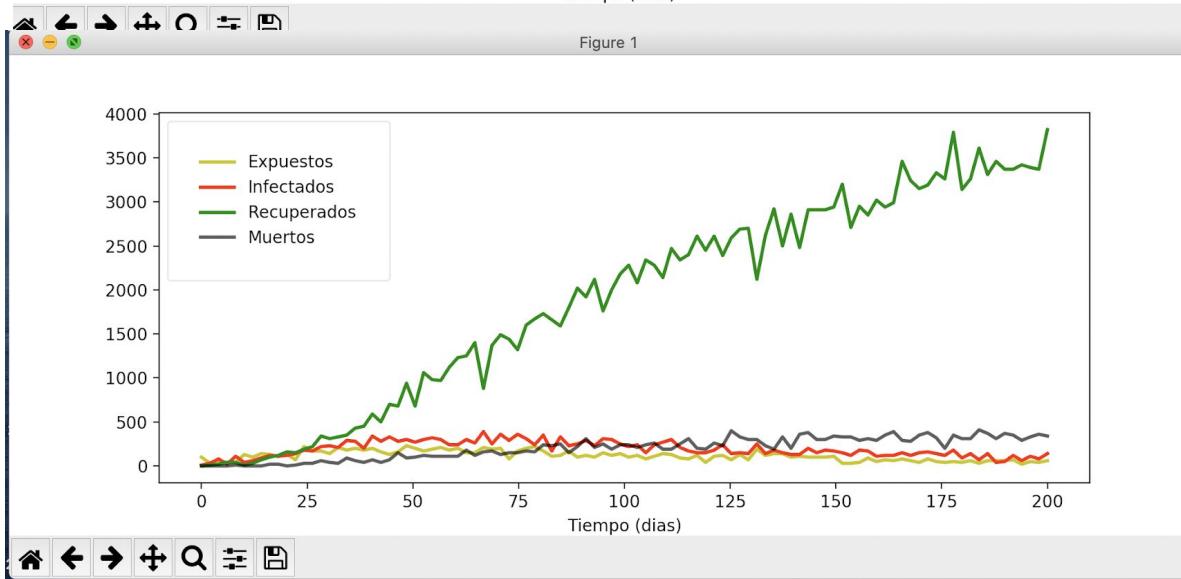
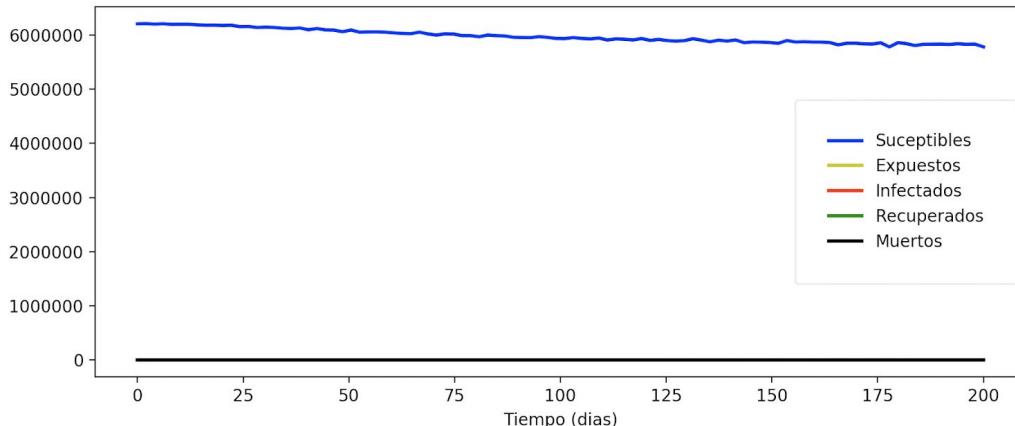
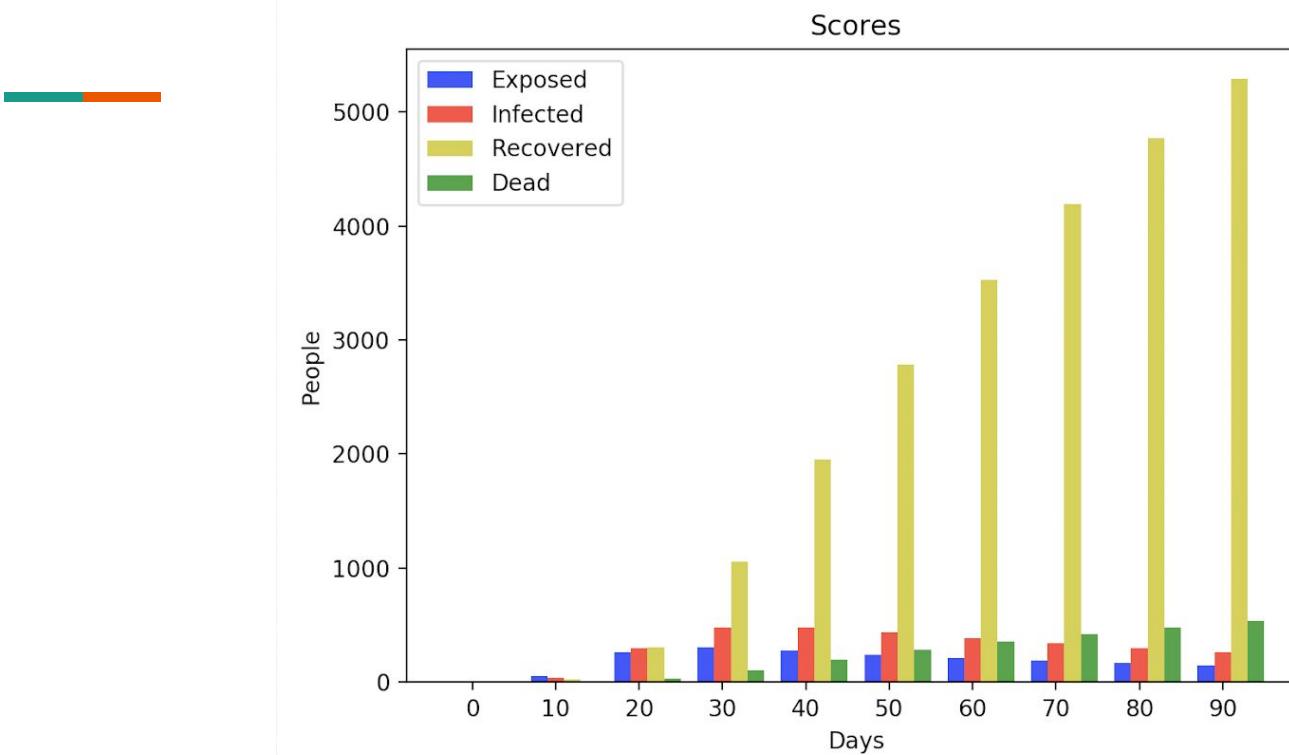
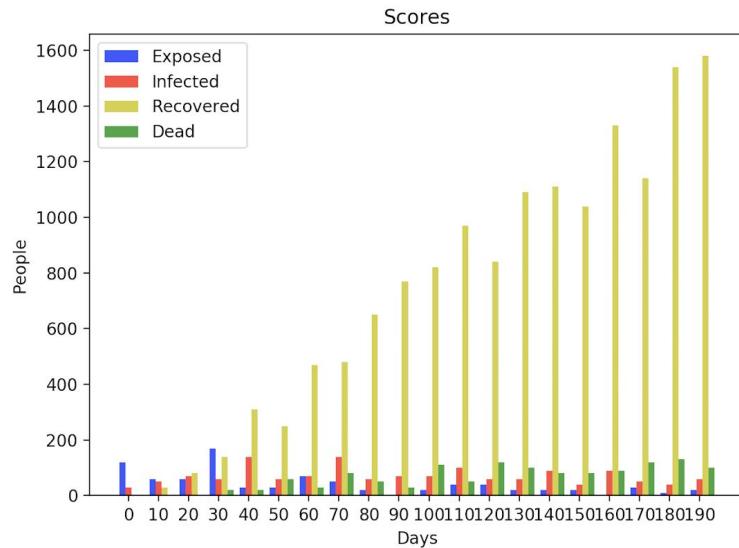
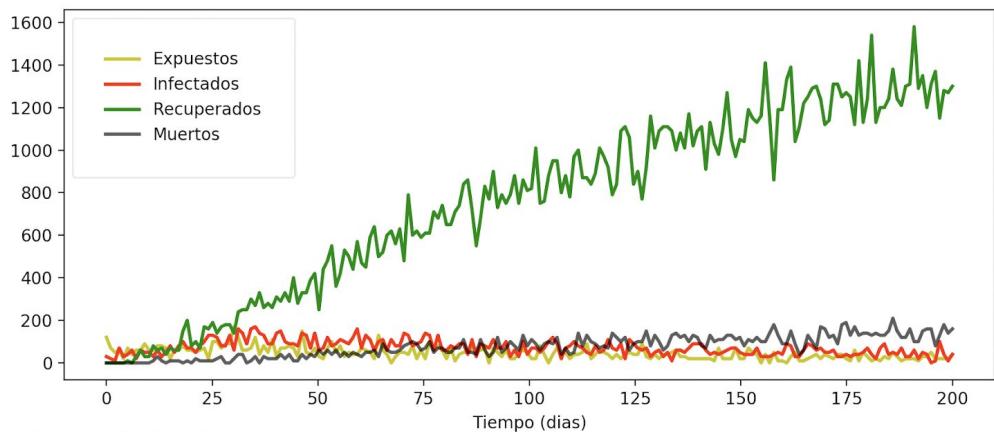


Figure 1



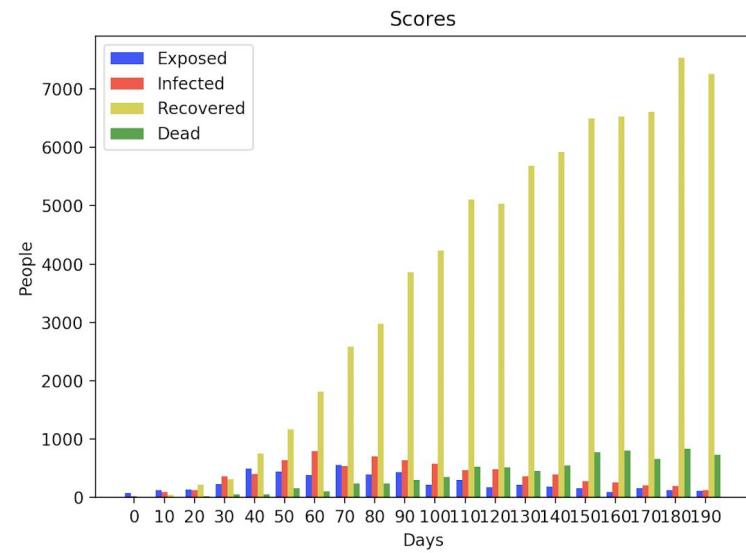
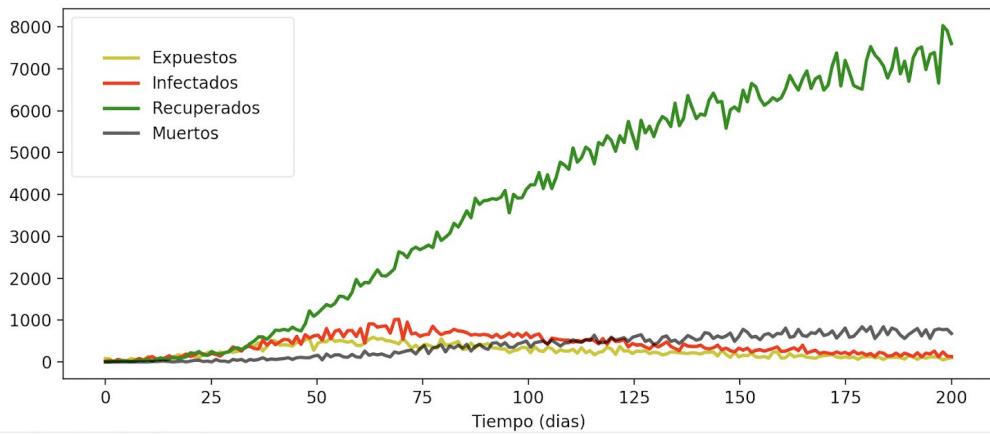


Lockdown 10 days



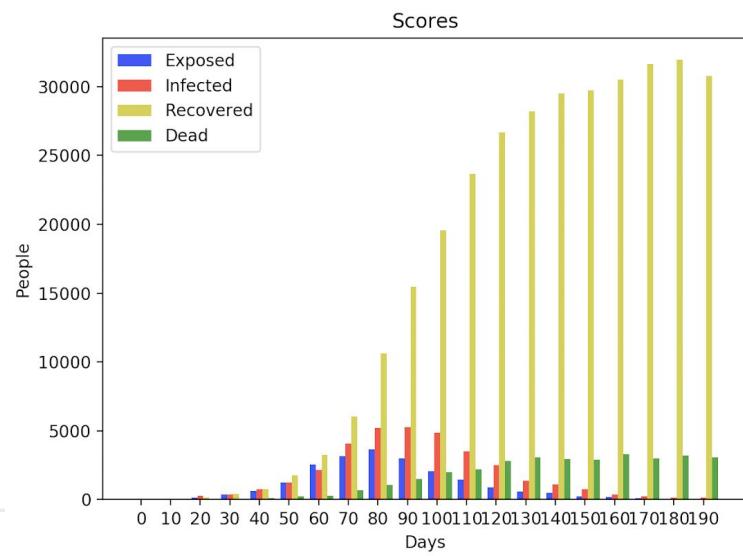
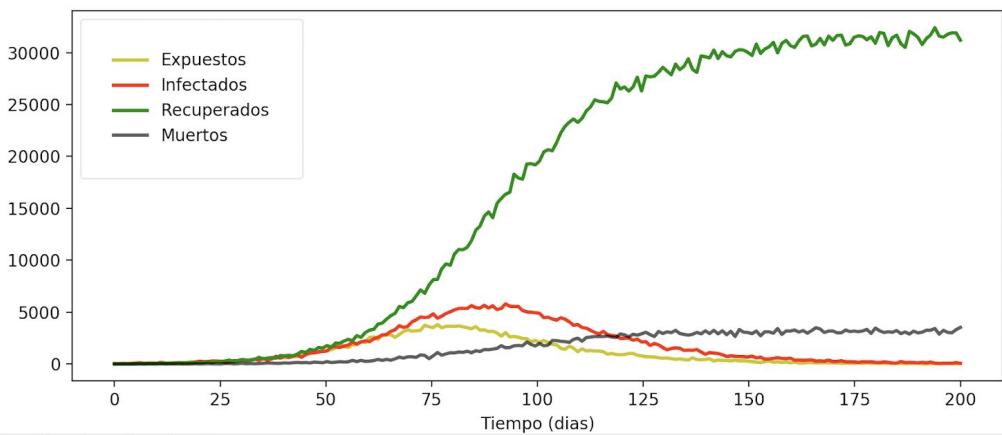


Lockdown 40 days





Lockdown 80 days



Conclusiones

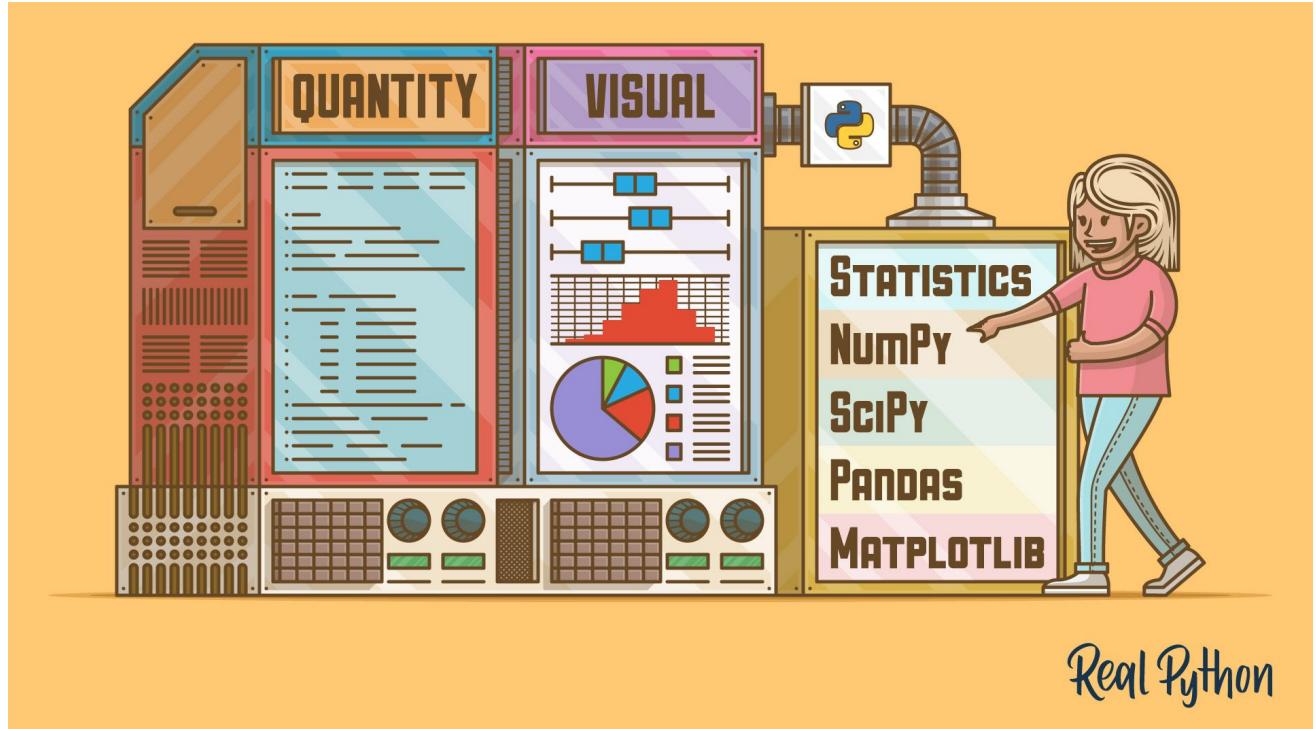


Imagen obtenida de:
<https://realpython.com/python-statistics/>

Referencias

Código:

- https://github.com/memoherreraacosta/modelo_seir
- https://github.com/memoherreraacosta/modelo_seir/blob/master/Model_refactored_by_Daniela.ipynb

Estado de Jalisco:

- Boletines de prensa de Salud: <https://ssi.jalisco.gob.mx/prensa/noticia/9036>
- Población Jalisco y ZMG: <https://www.jalisco.gob.mx/es/jalisco/guadalajara>

Organización Mundial de la Salud:

- Reporte de información del virus:
https://www.who.int/docs/default-source/coronavirus/situation-reports/20200402-sitrep-73-covid-19.pdf?sfvrsn=5ae25bc7_4#:~:text=The%20incubation%20period%20for%20COVID,occur%20before%20symptom%20onset.

Observatorio COVID:

- Reporte de los datos observados: <https://datoscovid.mx/>