

# Slytherin

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## First difference equations modeling challenge

### lab 1

### Findings

Through the exercise of modeling this challenge we found some amusing things related to the corruption in Colombia and all over the world and learned how to model a difference equation on python through investigation.

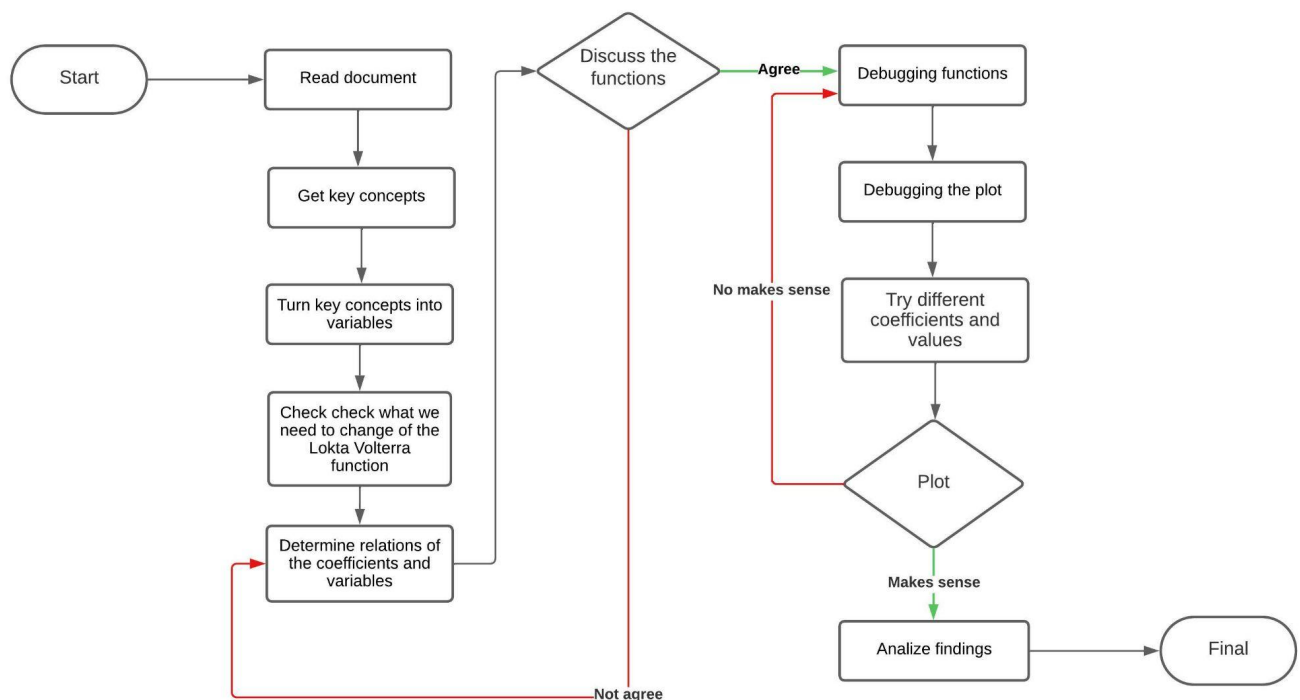
**Investigation:** Corruption sets colombia back around 17.000 millions of dollars annually rounding about the 21% of the national budget, due to this Colombia is placed 98th over 175 countries who are classified in the international transparency agency, some of the main ways that corruption presents itself are using the budget for private or personal reasons, charging a fee for the doing or not doing of a public functionary duties, nepotism and bribes, this acts of corruption occur more often in the executive branch of the government.

**Modeling:** We choose to define the variables through what we thought to be the best way to guide and give shape to the model, in relation to the lotka volterra model we transform the number of preys to number of corrupt officials, number of predators to the budget size, and a new variable regarded as the money lost due to corruption, the amount destined to the budget every year is conditioned by the number of corrupt functionaries and vice versa , on the other hand the

quantity of stolen money depends of the budget and its corruption coefficient depending of the branch that its affected by.

alpha is the percentage of propagation of the corrupt officers, beta what percentage of the budget is affected by corruption, and gamma is how the corruption changes the amount of the destined budget annually, delta is what percentage is stolen from the budget by each functionary.

## Flowchart



## How well does the model perform and final results.

Reviewing the graphs we concluded that the annual budget isn't that dependent of the stolen money due to corruption, and is more dependent of the macroeconomic status of the country, just like the reality, there is an equilibrium point where the number of stolen money doesn't affect

the budget anymore in a simulation using the corruption values data we can see that when the percentage of corrupt officers is around 0.6 and the percentage of stolen money is 0.003 due to this value we can conclude that the model misrepresents the stolen money where the real percentage of stolen money is 0.21 of the PIB and 0.05 of the annual budget.

We see an opportunity for improvement by checking the data more thoroughly for modeling a more accurate model, have more precise coefficients and compare this model with an already existing model to interpolate it and tune it to gain more precision.

