Project Proposal

DATASCI 2G03: Scientific Computing

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1 Outlining problem

I chose to model the predator-prey system, which predicts the dynamic between predators and preys and how it affects the population of each group. Specifically, I will be using the Lotka-Volterra predator-prey model.

NOTE: Information regarding the model and equations were acquired from
https://www.cs.unm.edu/ forrest/classes/cs365/lectures/Lotka-Volterra.pdf

1.1 Equations

$$\frac{dx}{dt} = \alpha x - \beta xy \tag{1}$$

$$\frac{dy}{dt} = \delta xy - \gamma y \tag{2}$$

1.2 Variables

- x represents the population of the prey
- y represents the population of predators
- t represents time
- $\frac{dx}{dt}$ represents the instantaneous rates of the prey
- $\frac{dy}{dt}$ represents the instantaneous rates of the prey
- α represents a real constant that describes the prey's per capita growth rate
- β represents a real constant that describes the effect of the presence of predators on the prey growth rate
- δ represents a real constant that describes the effect of the presence of prey on the predator's growth rate
- γ represents a real constant that describes the predator's per capita death rate

2 How will I solve it?

I will be creating a program that will compute the output of the equations (the population changes for the predator and prey) depending on the change of time.

3 How to do testing

The program would be tested by first checking base cases (such as cases of the population of the predator and/or prey being 0) and also comparing the output of the program with real life data.