

Introduction to Mathematics for Data Science

Personal Assignment 1

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1 Question 1

1.1 Modelling Bird Population Decline Due to Invasive Snakes

To model the bird population over time until extinction, I use a logistic growth model, which is commonly used to describe population growth and decline. The logistic growth model is expressed as:

$$P(t) = \frac{K}{1 + \frac{K-P_0}{P_0} \cdot e^{-rt}}$$

Where:

- $P(t)$ is the population at time t .
- K is the carrying capacity, representing the maximum sustainable population size.
- P_0 is the initial population at $t = 0$.
- r is the growth rate parameter.
- t is time.

In your scenario, the bird population is declining due to the invasive snake species, so you'll need to use a negative growth rate ($r < 0$). The population starts at a certain level (P_0) and gradually approaches zero as time progresses.

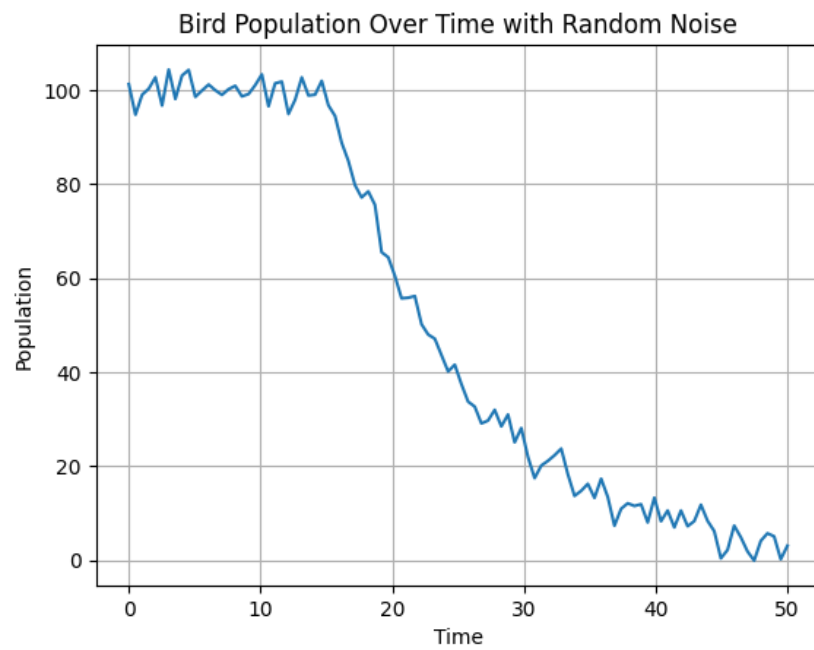


Figure 1: Bird Prediction Graph

Here's a Python function that models the bird population over time using the logistic growth model and plots it: