Model Documentation of the Lotka-Volterra (Predator-Prey) Model

1 Nomenclature

1.1 Nomenclature for Model Equations

x_1	population of prey
x_2	population of predators

2 Model Equations

State Vector:

$$\underline{x} = (x_1 \; x_2)^T$$

System Equations:

$$\dot{x}_1 = \alpha x_1 - \beta x_1 x_2 \tag{1a}$$
$$\dot{x}_2 = \gamma x_1 x_2 - \delta x_2 \tag{1b}$$

Parameters: $\alpha, \beta, \gamma, \delta$

2.1 Exemplary parameter values

Parameter Name	Symbol	Value	Range
reproduction rate of prey alone	α	1.3	$(0, \infty)$
mortality rate of prey per predator	β	0.9	$(0, \infty)$
mortality rate of predators	γ	0.8	$(0, \infty)$
reproduction rate of predators per prey	δ	1.8	$(0, \infty)$

3 Simulation

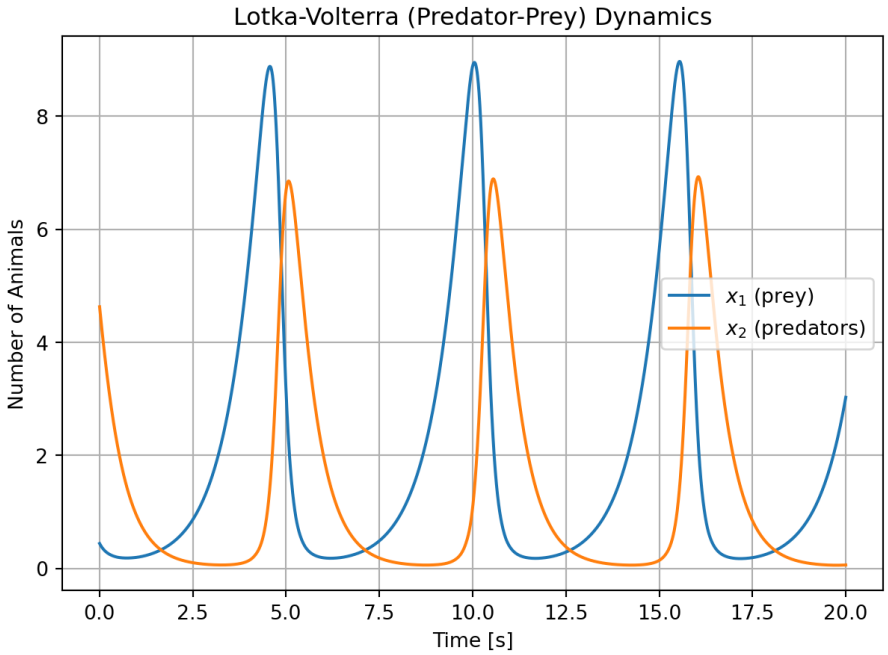

Figure 1: Simulation of the Lotka Volterra.

References

[1] Peter J. Wangersky: *Lotka-Volterra Population Models*, 1978, https://www.jstor.org/stable/2096748