CASE STUDY: PREDATOR PREY SYSTEM

MODELLING AND SIMULATION

GRUPPE 5

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Introduction

- Population model: deer (x) + foxes (y)
- Different approaches:
  - Difference Equation Model
  - Cellular Automata

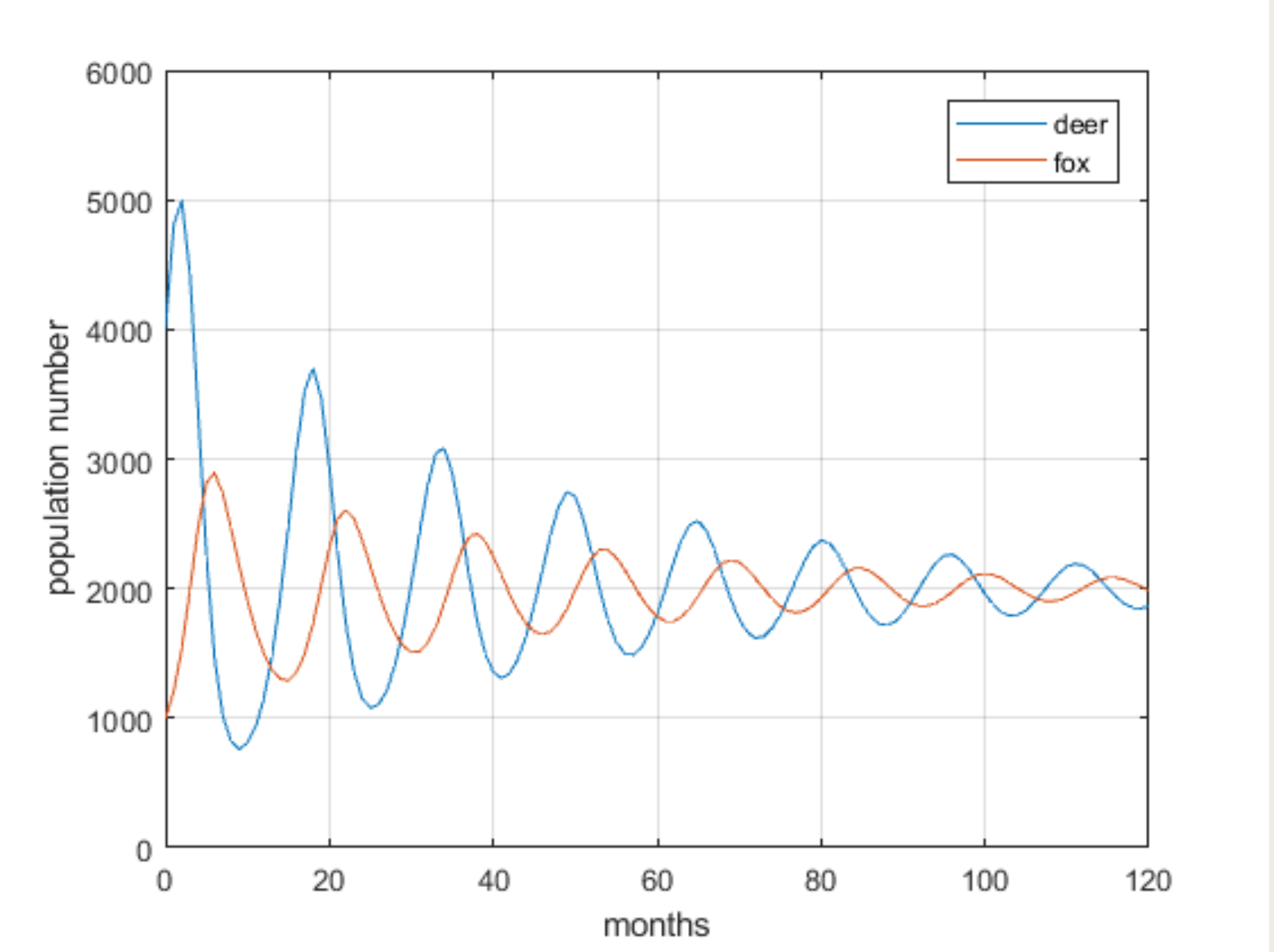
Difference Equation Model

$$x(n+1) = x(n) + h * [x(n) * \alpha * (M - x(n) - y(n)) - x(n)*y(n)*\beta]$$

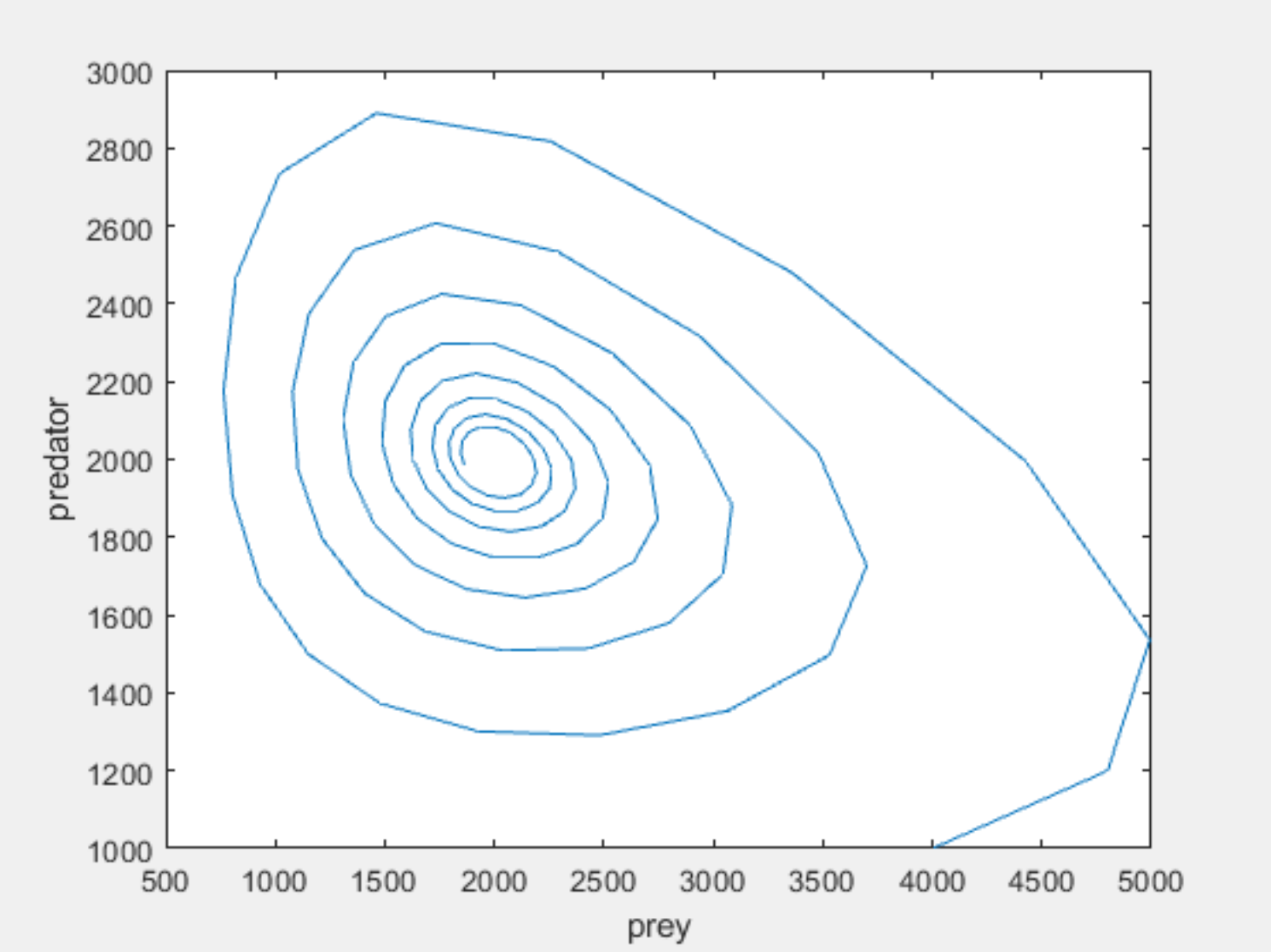
$$y(n+1) = y(n) + h * [y(n) * (\delta * x(n) - \gamma]$$

- α…deer growth
- β…deer reduction
- γ… fox reduction due to starving
- δ… fresh meat increase

Difference Equation Model



Difference Equation Model



Cellular Automata

- Rectangular forest
- 3 states (0-empty, 1-fox, 2-deer)
- Matrix update each month

Cellular Automata

- If cell empty → choose one random neighbor and check if cell is prey. If yes → the initial cell becomes prey with probability p_1.
- If cell is prey →choose one random neighbor and check if cell is predator. If yes → the neighbor eats up the prey and the cell becomes predator with probability p_2.
- If cell is predator → the predator dies with probability p_3.

Live Demo

Thank you for your attention!