

# Variational learning

Homework | Agent-based modelling, Konstanz, 2024

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1. Simulate five variational learners for 1000 learning steps with learning rate  $\gamma = 0.01$  in a learning environment characterized by the probabilities  $P1 = 0.4$ ,  $P12 = 0.5$  and  $P2 = 0.1$  (these are the probabilities that were used in the lecture). Plot the five trajectories in the same plot.

 Tip

To draw into an already existing plot, use `plot!()` instead of `plot()`.

2. Repeat the above exercise, but this time with five learners with  $\gamma = 0.001$ , and then with five learners with  $\gamma = 1$ .
3. Now repeat both of the above points, but this time in an environment characterized by probabilities  $P1 = 0.1$ ,  $P12 = 0.5$  and  $P2 = 0.4$ .
4. Based on your observations, what would you say is the effect of
  - a. the learning rate parameter?
  - b. the probabilities of occurrence of the different types of string?
5. By consulting the [Plots.jl documentation](#), modify your trajectory plots so that
  - a. the trajectory is represented by points instead of lines
  - b. the x-axis is labelled “learning iteration”
  - c. the y-axis is labelled “probability of G1”
  - d. the plot title is “A variational learning trajectory”