Exercise 4

In this exercise, you will implement a parameter recovery for the Rescorla-Wagner model. File TEMPLATE_EXERCISE4.IPYNB in Ilias provides a template for this exercise. Please submit your completed exercise as an .IPYNB file via Ilias until 16/05/2022. The file DATA.NPZ contains additional data needed for this exercise.

Exercise 4.1

We have discussed four different decision-making strategies in the previous lecture: accuracy maximization, the softmax-rule, probability matching and the sample-based rule. What are the parameters in each of these strategies?

Exercise 4.2

The template code provides a data-set of observed inputs and targets, as well as predictions made by an agent. Implement maximum likelihood estimation for this data-set using a grid search procedure over different learning rates in the Rescorla-Wagner model. Which learning rate was mostly likely to generate the given data-set?

Hint: you can assume a normally distributed log-likelihood with a mean given by the Rescorla-Wagner model and a constant standard deviation of 0.1 to measure goodness-of-fit.

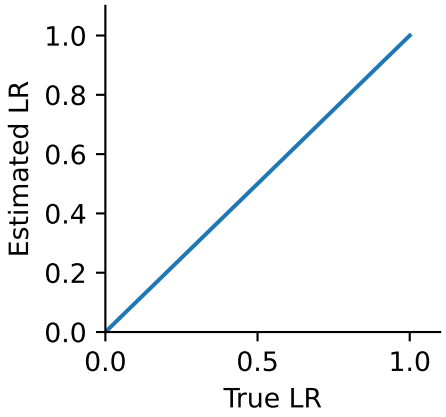
Solution: the learning rate should be somewhere around 0.6 to 0.65.

Exercise 4.3

Implement a parameter recovery procedure for the Rescorla-Wagner model. For this, you should generate data-sets using the GENERATE_DATA() function with $\alpha \in \{0.1, 0.2, \ldots, 1.0\}$. Plot the learning rate that was used to generate the data against that obtained from a maximum likelihood estimation. Is the learning rate parameter in the Rescorla-Wagner model recoverable?

Hint: you can assume a normally distributed log-likelihood with a mean given by the Rescorla-Wagner model and a constant standard deviation of 0.1 to measure goodness-of-fit.

The resulting plot should look something like this:



Exercise 4.4

What would you have to change in your code in order to run it on a data-set of choices from our two-alternative forced-choice paradigm (summarize in bullet points)?