

Exercise 5

In this exercise, you will compare different models on a given data-set of choices. File `TEMPLATE_EXERCISE5.IPYNB` in Ilias provides a template for this exercise. Please submit your completed exercise as an `.IPYNB` file via Ilias until 23/05/2022. The file `DATA_EXERCISE5.NPZ` contains additional data needed for this exercise.

The provided data-set contains records of 20 participants each doing 15 tasks of the two-alternative forced-choice paradigm. Each task consisted of 10 choices. In each trial, participants were presented with two four-dimensional input stimuli (stored in the `INPUTS` variable) and had to pick the most valuable stimulus. Participant choices are stored in the `CHOICES` variable, in which a value of 1 indicates that the participant has chosen option *A* in the corresponding trial and task. They are provided with feedback about the true values of both options after each decision. This feedback is stored in the `TARGETS` variable.

Exercise 5.1

What is the BIC of a random policy (picking both options with equal probability) for this data-set?

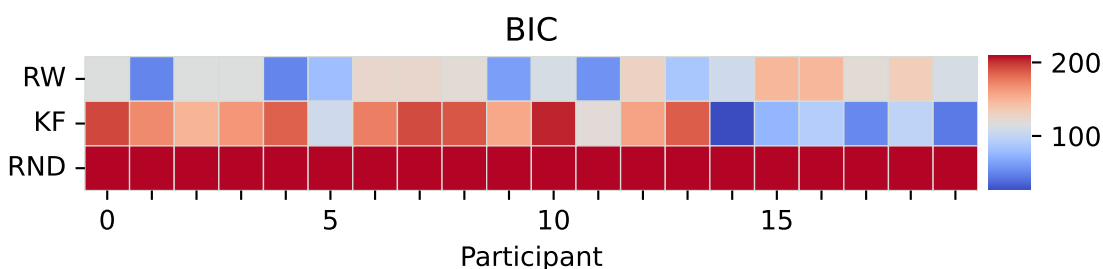
Exercise 5.2

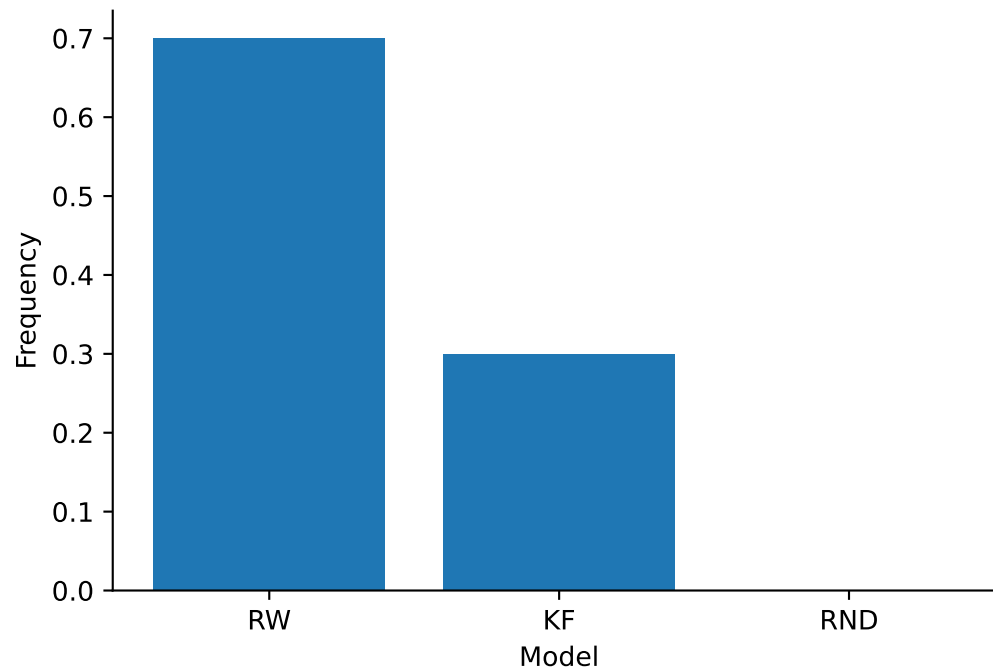
Compute the BIC values the following models:

- Rescorla-Wagner model with an ε -greedy choice rule.
- Kalman filter with an ε -greedy choice rule.
- Random policy.

Report the BIC values summed across participants for each of these models. Furthermore, plot the BIC values for each individual model and participant. Finally, plot how frequently each model offers the best explanation for the participants. Which of the considered models is winning this model comparison?

The resulting plots should look similar to this:





Note that details may vary depending on implementation details.

Exercise 5.3

Use the summed BIC values from the last exercise to approximate posterior probabilities over models. You may assume a uniform prior over models. Report the resulting posterior probabilities.

Solution: The posterior probability of the Rescorla-Wagner model is around 1.0, and consequently the posterior probabilities of the other models are around 0.0.