

# Exercise sheet 1

## Interactive Systems - SoSe 24

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All exercises that are not explicitly declared as group assignments must be completed individually and handed in individually. Identical submissions will be treated as plagiarism.

Submission until Monday 08.04. at 23:59 via <https://assignments.hci.uni-hannover.de/SoSe2024/ISy>.  
The submission must consist of a single zip file containing all necessary files. Please remove umlauts from file names.

### Preparation: Installation of Python and Jupyter Notebook

Install Anaconda with Python 3.9: <https://www.anaconda.com/products/distribution#Downloads>

The Anaconda distribution includes all relevant components for the exercise Jupyter Notebook, Python 3.9 and relevant Python packages (NumPy, pandas, matplotlib, seaborn, etc.). Alternatively, you can also set up an appropriate environment yourself.

### Preparation: Installation of Java

A Java installation is required to run the Reaction Time Experiment. The JDK must be version 11. You can obtain this from several sources:

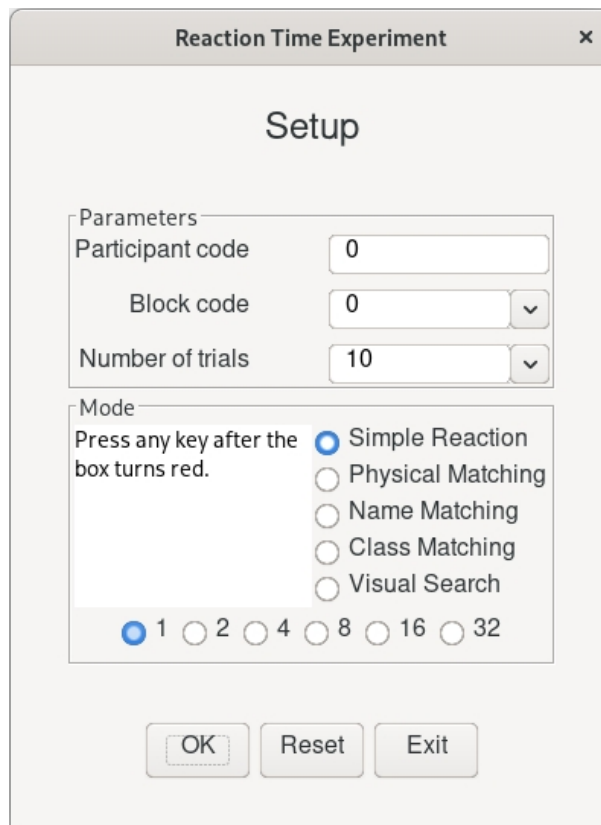
- <https://www.oracle.com/java/technologies/downloads/#java11>
- <https://www.microsoft.com/openjdk#11>
- <https://docs.aws.amazon.com/corretto/latest/corretto-11-ug/downloads-list.html>

## Task 1: Reaction times (25 points)

Download the file ReactionTimeExperiment.jar from Stud.IP. Start the program either by double-clicking on it or on the command line with :

```
$ java -jar ReactionTimeExperiment.jar
```

The following dialog should now appear:



Now carry out the "Simple Reaction", "Physical Matching", "Name Matching" and "Class Matching" tests with yourself as the test subject as follows:

- Generate a random participant code at <https://www.random.org>. Use 100000 as the minimum and 1000000 as the maximum value. Make a note of your code and ensure that you use it for each experiment.
- Generate a random sequence in which you carry out the tests. To do this, use <https://www.random.org/lists/>. Make a note of the generated sequence.
- Execute 3 blocks for each test. Select block code 1 for the first block, code 2 for the second block and code 3 for the third block.
- Perform 10 runs (trials) in each block.
- Be as **fast and as accurate as possible** in each pass.
- In total: 4 attempts x 3 blocks x 10 passes = 120 keystrokes.

Please enter "j" with the **index finger of your right hand** (match) and "k" with the **middle finger of your right hand** (no match). This will allow you to examine later whether there is an effect of handedness.

The program closes automatically after completion of each block. A CSV file is created for each block, e.g. (Participant: 964678, Block: 01, Experiment: PM):

ReactionTimeExperiment-P964678-B01-PM.csv

Copy all results into a single file. This should now contain 120 lines (30 lines for each experiment) and the header line. Add your participant code in a further column. Add the respective block number as an additional column (1-3). Add another column in which the experiment carried out is noted (CM, PM, NM, SR). Add another column to this file in which the order of the experiments is noted (1-4). Add another column to record whether you are left-handed, right-handed or ambidextrous (r, l or b), as well as a column containing your age and a column containing your gender (f, m or d). The final table should therefore consist of the columns "time", "keys", "matches", "errors", "participant", "block", "exp",

"order", "handed", "age" and "gender".

You can do this manually, with a program such as Excel or with Python.

Cut and paste your data from your CSV file into the following spreadsheet:

[https://docs.google.com/spreadsheets/d/1WBpnhI\\_C96u3IQ5Qpulw1csWjGcQet-TiYBgXsmMhlo/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1WBpnhI_C96u3IQ5Qpulw1csWjGcQet-TiYBgXsmMhlo/edit?usp=sharing)

The results of all testers are to be collected in this spreadsheet. Various statistical evaluations are to be applied to this data in later exercises. Make sure that you do not overwrite any existing entries. Keep your own CSV file for safety reasons.

Use Jupyter Notebook for a simple evaluation. Read in your CSV file as Panda's DataFrame. Calculate the average times for each of the four trials for your entries. Now also calculate the average times and standard deviations for each block and each trial separately. Is there a recognizable learning effect across the three blocks?

Visualize the data as a Seaborn bar plot with a 95% confidence interval. Create one plot per experiment with one bar per block.

The solution to the task includes:

- **Submission system:** CSV file with your data, the order of the experiments, whether left- or right-handed and information on age and gender
- **Delivery system:** A Jupyter notebook file (\*.ipynb) with the average times for each trial (across all blocks), average times and standard deviation per trial and block, a short description of whether a learning effect occurred and the visualization.
- **Shared spreadsheet:** Your entries from your CSV file added.

## Task 2: Visual search (20 points)

Now carry out the visual search with the test program. Carry out 3 blocks of 10 passes each (in this order) for 1, 2, 4, 8, 16 and 32 elements.

In total: 6 sizes x 3 blocks x 10 passes = 180 keystrokes.

Please enter "j" with the **index finger of your right hand** (character occurs in the search set) and "k" with the **middle finger of your right hand** (character does not occur in the search set). This will allow you to check later whether there is an effect of handedness.

Merge the data into one file as in task 1. Add the same columns from task 1. Due to the fixed order, you can set "order" to 1-6 and infer the number of elements later.

Enter the data back into the shared spreadsheet.

Calculate the average times and standard deviations for each search variable. Visualize the data as a Seaborn barplot with a 95% confidence interval for each search variable.

The solution to the task includes:

- **Submission system:** CSV file with your data, the order of the experiments, whether left- or right-handed and information on age and gender
- **Delivery system:** a Python notebook file (\*.ipynb) that gives the average times and standard deviation for each search size.
- **Shared spreadsheet:** CSV file with your data, the order of the experiments and whether left- or right-handed added.