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Tadahiro Taniguchi

taniguchi@i.kyoto-u.ac.jp

# Preface

This Google Drive is a place to share the data, programs, and related materials used in the experiment for the paper "Co-Creative Learning via Metropolis-Hastings Interaction between Humans and AI".

It contains the following:

* The complete program set for the web application (oTree) used to conduct the experiment.
* All experimental data collected through the crowdsourcing platform (CrowdWorks).
* Python programs used for the analysis of the results reported in the paper, including the calculation of ARI, the calculation of agreement scores via bipartite matching, and parameter estimation.
* Documentation, including the instructions presented to the participants and descriptions of each column in the raw data.

# Data Description

This section explains the data files used or generated in the experiment.

#### **1. "hists"-related files**

These are files storing distribution data.

* **gibs\_hists\_100**: The posterior distribution inferred by the target Gibbs sampling.
* **MH\_A\_hists\_100**: Results from a computer simulation where agent A (human side) used the Metropolis-Hastings (MH) method.
* **other\_B\_hists\_100**: Results from a computer simulation where agent B (agent side) also used the MH method.
* **sA\_hists\_90nin**: The inferred posterior distribution for the Human. The condition is identified by the participant's ID.
* **sB\_hists\_90nin**: The inferred posterior distribution for the Agent. The condition is identified by the participant's ID.

#### **2. oTree**

* Refers to the experimental program used for the web service.

#### **3. otree\_ab**

* Presumed to be data related to "agreement" under each experimental condition.

#### **4. otree r**

* This is a series of data on "acceptance probability". It is presumed to be the data for "r" for each participant.

#### **5. Dataset**

* **ALL**: Data containing all attributes.
* **A\_D5**: Feature values for the human side.
* **B\_D5**: Feature values for the agent side.
* **shin**: The ground truth IDs.

#### **6. Summary**

* Contains the plotted results, such as graphs and figures.

#### **7. File List**

* **all\_apps\_wide-2024-02-28.csv**: The complete data file from the crowdsourcing platform.
* **data description**: This description file itself.
* **oTree.zip**: A complete set of the experimental programs and related files.

# Column Information

**all\_apps\_wide-2024-02-28.csv** contains all data collected in the experiment. Below are the main columns found in the experimental data and their descriptions. Any columns not listed below were not used in the analysis for this experiment.

#### **participant Information**

This includes information about each participant.

* **participant.id\_in\_session**: The participant's ID.
* **participant.code**: The participant's ID.
* **participant.\_index\_in\_pages**: The index of the page the participant is currently on (810 is the last).
* **participant.\_max\_page\_index**: The index of the last page (810).
* **participant.\_current\_app\_name**: The name of the application the participant is currently using.
* **participant.\_current\_page\_name**: The name of the page the participant is currently on.
* **participant.time\_started\_utc**: Time taken for the experiment.
* **participant.payoff**: Payment based on game content; however, this was not used in this experiment.
* **participant.order\_list**: A list of the display order for the observed images.
* **participant.LambdaB**: The initial Lambda value for the computer model.
* **participant.muB**: The initial mu value for the computer model.
* **participant.sB**: The initial sign for the computer model.
* **participant.sitaB**: The initial theta value for the computer model.
* **participant.cB**: The initial category for the computer model.
* **participant.com\_model**: The computer's model (0: MH method, 1: Always-Accept, 2: Always-Reject).

#### **session Information**

This includes information about the overall experimental session.

* **session.code**: The session ID.
* **session.config.name**: The name of the experimental application.

#### **introduction Part Information**

This includes information collected during the introductory part of the experiment.

* **introduction.1.player.CrowdWorks\_ID**: The participant's CrowdWorks ID.
* **introduction.1.player.sex**: The participant's gender.
* **introduction.1.player.age**: The participant's age.
* **introduction.1.player.is\_accepted**: Whether the participant consented to the experiment (1: consented, 0: did not consent).

#### **communication Part Information**

This includes information from each step and round during the naming game.

* **communication.{n}.player.my\_sign**: The sign proposed by the participant.
* **communication.{n}.player.com\_sign**: The sign proposed by the computer.
* **communication.{n}.player.my\_accept**: Whether the participant accepted the computer's proposal.
* **communication.{n}.player.com\_accept**: Whether the computer accepted the participant's proposal.
* **communication.{n}.player.img{0-9}\_sign**: The sign that the participant assigned to each image (img0 to img9).
* **communication.{n}.player.com\_img{0-9}\_cat**: The category into which the computer classified each image (img0 to img9).
* **communication.{n}.player.com\_img{0-9}\_sign**: The sign that the computer assigned to each image (img0 to img9).
* **communication.{n}.player.order\_{A/B/C}{0-9}**: A variable that holds the order of images arranged by the participant via drag and drop.
* **communication.{n}.player.r**: The computer's acceptance probability.
* **communication.{n}.subsession.round\_number**: The current round number.

#### **end Part Information**

This includes information collected at the end of the experiment.

* **end.1.player.anket\_**: Results from the free-text survey.
* **end.1.player.finished**: Whether the experiment was completed successfully.

# Program

Below is a list of the Python programs used for analyzing the experimental results.

1. **ARI\_kappa\_otree\_9onin.py**: A program to calculate the Adjusted Rand Index (ARI) and Kappa coefficient from the experimental results of all 90 participants (before filtering).
2. **gurafu\_yobi\_human\_cpu\_otree\_hon.py**: A program to create various graphs from the filtered experimental results.
3. **mabiki\_test.py**: A program that was likely used to investigate which participants to filter from the dataset.
4. **nibu\_90nin\_100\_mabiki\_(MH\_MH) (MH\_ALLaccept) (MH\_ALLreject).py**: A program to calculate the bipartite matching between the classification results of the human/computer and the results from Gibbs sampling, using the filtered data.
5. **nibu\_90nin\_100\_mabiki.py**: This is presumed to be a program with the same purpose as the one described in #4.
6. **nibu\_90nin\_100.py**: A program to calculate the bipartite matching between the human/computer classification results and the Gibbs sampling results, using the data before filtering.
7. **nibu\_90nin.p**: A program to calculate bipartite matching on the data before filtering, apparently used when there are 10 Gibbs sampling results.
8. **otree\_datayomikomi\_test.py**: A program used for testing the process of reading the experimental results from a CSV file.
9. **param\_suiron\_hon\_yobi\_human\_cpu\_otree\_hon.py**: A program that applies the participants' experimental results to a model to infer parameters, and then calculates and saves values such as acceptance probability.
10. **T-test.py**: A program used to test the function for performing a T-test.
11. **fitting.py**: A program that fits the experimental results to a y=ax+b model to find the coefficients a and b.