Recency, Response Time, and Confidence in Item Recognition

Assignemt 2
Haydn Herrema, Michael Jacob Kahana

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Part 1: Experiment

The first part of this assignment will be a research experience, where you will participate as a subject in a recognition memory experiment. This experiment was designed for your educational benefit, to give you an idea of what experimental design and data collection look like in memory science. Before you run in the experiment you will be asked whether you "consent" to participating (your data will not be shared with anyone, and while your honest, attentive, effortful participation will be used in your grade for the course, your performance will not). If you don't wish to participate, you can fulfill this requirement by writing a one-page report on a continuous recognition memory experiment published in a scientific journal described from the perspective of a participant.

At the beginning of the experiment you will receive a random "ID number" certifying your participation. Copy that ID number down immediately; you will not be shown it again. If you do not copy that number down, you will need to complete the experiment a second time. Enter that ID number (and only that ID number) in Canvas for your Part 1 assignment submission (or alternatively submit your report if you do not consent to completing the study).

To run in the experiment, please link to this URL Course Experiments and click the button for "experiment 1" to link to the experiment. Make sure to turn off ad blockers, tracking blockers, and pop-up blockers in your browser (or potentially, VPNs) or the experiment will not run (you will likely see a blank webpage in this case).

Part 2: Data Analyses

The second part of this assignment will involve analyzing data from the same experiment you participated in (specifically, data from students in last year's class!). On Canvas (under "Files/Assignments/Assignment_2"), you will find a excel workbook, a python notebook, and a folder of data sets (which includes a spreadsheet assigning each student to a unique data set). Download your specific data set and either the excel workbook or python notebook.

If you are using excel, load your data into the workbook by selecting the empty "raw_data" sheet and doing: Data → From Text/CSV → select the csv file → Load To → Existing Worksheet (raw_data!A1).

If you are using python, make sure to update the data loading command to match the name of your csv file.

Data Description

Once loaded, the data will appear as a table in excel or a pandas dataframe in pyython. Each row represents one experimental trial, and the five columns are:

1. Subject index;

2. Timestamp;

3. Confidence rating (`1`= sure "New Item", `8`=sure "Old Item");

4. Study-test lag (the number of items intervening between when an item was studied and when it was tested; a lag of one indicates that the item was tested immediately after it was studied). A lag of zero means an event is the first presentation of a word (i.e. a "new" word). You can construct a column indicating old or new by just checking whether this column is equal to zero or not.

5. Reaction time (blank cells indicate time-out trials) in milliseconds.

Questions:

Understanding and measuring memory rely on the ability to analyze and interpret scientific data. Here you will learn to carry out basic analyses of the recognition memory dataset by answering these questions.

This is not a group project. It is important that you write your own code or functions to obtain your results. If you have questions, please post them to Ed Discussion. Each of you will be given a unique dataset to analyze, so the correct answers will be unique to your assignment.

For each of the problems that ask you to provide graphs, please make sure that your graph has clearly labeled X and Y axes. In other respects try to match the formatting of the graphs in our book (e.g., appropriate ranges for variables, etc.). For questions requiring a numeric response, report answers with three decimal points ($X.YYY$). For questions that do not ask for quantities varied across multiple confidence level thresholds, use the threshold given in the experiment of 4.

1. For the first 5 subjects in your data set (i.e., the ones with the 5 lowest subject IDs), calculate a ROC curve for each subject and plot of the resulting curves. Include all 5 curves on a single plot with a legend showing the subject indices (which may not be numbered 1 to 5 since you have been given a random subset of subjects to analyze).

2. Calculate a between-subject average ROC curve, averaged across all subjects. To produce the average ROC, first calculate the HR and FAR *for each individual subject* and then average these across subjects.

3. Averaged across all subjects (i.e., "between-subject average"), plot the hit rate as a function of study-test lag. In your write-up, comment on

the results – do we see a clear effect and does it match what you would expect? Make a hypothesis/draw a conclusion from the data.

4. Averaged across all subjects (i.e., "between-subject average"), report the mean reaction time for hits, false alarms, misses, and correct rejections. In your write-up comment on the results – do we see a clear effect and does it match what you would expect? make a hypothesis/draw a conclusion from the data.

Submission

Submit either your excel workbook (.xlsx) or your python notebook (.ipynb) that contains all of your work and your results. Make sure to specify your answers where prompted by the template. Also, submit a write up that contains your graphs/results, as well as a description of how you obtained them (i.e., state what you did in your excel functions/python code in English). For the questions that specifically ask you to scientifically reason about what you find in the write-up, think about possible psychological effects that led to your results. Save your report as a PDF (make a word doc and then export as PDF) and submit it along with your work.