

# CS 598AK Fall 2021

## Homework 1

due by email to [alexkirlik@gmail.com](mailto:alexkirlik@gmail.com) 1 week after date assigned

In this homework assignment, you will demonstrate the statistical techniques discussed in *Experimental Human-Computer Interaction*, chapter 5 - 5.2.1. and the book's Appendix A2.

You are provided with an Excel file ("Homework1.xlsx") which contains the data you will use to perform the analysis and within it the currently blank worksheets where you should show your solutions to the following questions.

You are to submit 2 files for grading – please include your UI NETID in their file NAMES:

1. A filled out "Homework1.xlsx" file, which contains worksheets labeled "Question 1" through "Question 4" to show your solution and work.
2. A PDF file containing narrative explanations for the solutions for the questions.

You are to base your calculations on chapter 5 - 5.2.1 and the formulas listed in Appendix A2.

You are NOT to use any statistical packages, such as R or SPSS, nor any statistical add-ons.

The purpose of this assignment is to perform the analysis and demonstrate the process by showing your work. You may use Excel, Google Sheets, or other spreadsheet software to complete the assignment, but submission of your analysis must be as an Excel file (for stats) and a PDF file (for narrative answers to the questions posed).

Frank wanted to understand how a particular feature affected the spatial reasoning, time, and error rate of players of a game. The attached Excel file shows the data Frank collected. He created two versions of the game called FeatureOn and FeatureOff. He split his participants into two conditions where half played each game. Participants in the FeatureOn condition are shown on the left side of the Excel file with Participant IDs from 1100 and participants in the FeatureOff condition are shown on the right side with Participant IDs from 101200.

After playing for one session, all participants took a battery of test to measure their spatial reasoning score. This is the column of data labeled "Score 1" in the Excel file. After an additional session, participants took the same battery of tests. This is the column of data labeled "Score 2." Upon completion of both sessions, the time and error rate were recorded in the columns labeled "Time" and "Error." Please answer the four questions below.

1. Plot the means for each of the four data values for each condition (a total of eight means) using bar charts. Place the graphs one underneath the other on the sheet in the "Homework1.xlsx" file labeled "Question 1." In the PDF file, write a short paragraph about the possible similarities and differences between the FeatureOn and FeatureOff conditions for each measure. You should also discuss how error bars would help to interpret these similarities or differences. You do not need to add error bars to your graphs.
2. Plot histograms of each of the four data values for each condition (a total of 8 histograms). Place the graphs one underneath the other on the sheet labeled "Question 2." If your spreadsheet software cannot produce histograms, you should use Google Sheets, as the feature is available. In the PDF file, write a short paragraph about the assumption of normality of each measure. Explain one alternative method for testing the normality other than by visual inspection. You do not have to perform any nonvisual normality tests.
3. Perform repeated measure two-tailed t-tests on these measure(s) with  $p=0.05$ . Show your work on the sheet labeled "Question 3." In the PDF file, write a short paragraph explaining why one would perform t-tests on these measure(s) and whether or not the test(s) were significant. When reporting the significance of the t-tests, you may follow the format used below Figure 5.6 on page 132. You may be required to perform multiple t-tests to provide a complete solution.
4. Perform independent measure two-tailed t-tests on these measure(s) with  $p=0.05$ . Show your work on the sheet labeled "Question 4." In the PDF file, write a short paragraph explaining why one would perform t-tests on these measure(s) and whether or not the test(s) were significant. When reporting the significance of the t-tests, you may follow the format used below Figure 5.6 on page 132. You may be required to perform multiple t-tests to provide a complete solution.