

# CPSC 444 Tutorial: Experiments 2

## Description:

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- This tutorial will allow you to perform basic t-tests and 2-way ANOVAs on the soft keyboard data from the last tutorial.

## Objectives:

- By the end of the tutorial, you will be able to:
  - Run very simple paired t-tests and 2-way ANOVAs.
  - Understand effects of sample size / design decisions on statistical significance (power).
  - Interpret statistical results and provide implications for these results.
  - Start writing a standard HCI-style experiment report.

## Deliverables:

- A marked individual assignment follows from this tutorial. See the Assignment 1 description on the course website.

## Tentative Schedule:

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- Quiz + discussion (~15 min)
- Conduct two t-tests (~25 min)
  - Share your results and interpretations with the class.
- Conduct a Two-way ANOVA (~30 min)
  - Share your results and interpretations with the class.
- Questionnaire and subjective results analysis (~10 min)
  - Going back to your original paired t-test, eyeball the data or do some rough analysis to understand if there's a link between the questionnaire responses / preference ratings and actual performance.
  - Groups will be expected to share their interpretations.
- The TA will review the assignment requirements (~10 min)

## Procedure

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### How to load the VBA ToolPak in Excel 2010:

1. Click File tab on the menu bar, then click Options. Excel Options pop up will appear.
2. Click Add-Ins. Then select "Excel Add-ins" from Manage: pulldown menu (near bottom) and then click Go... button.
3. In the Add-Ins available box, select the Analysis ToolPak check box, and then click OK.
  - **Tip:** If Analysis ToolPak is not listed in the Add-Ins available box, click Browse to locate it.

- 4. If you get prompted that the Analysis ToolPak is not currently installed on your computer, click Yes to install it.
- 5. After you load the Analysis ToolPak, the Data Analysis command is available in the Analysis group on the Data tab.
  - **Note:** to include Visual Basic for Application (VBA) functions for the Analysis ToolPak, you load the Analysis ToolPak VBA add-in the same way that you load the Analysis ToolPak. In the Add-ins available box, select the Analysis ToolPak VBA check box, and then click OK.

## Data Analysis

### t-test

Open the comprehensive data file which contains all data from the last tutorial (supplied by TA), and using only the data from your group, run one paired t-test on the task time data summary table and one paired t-test on the error data summary table.

- Select Data tab on menu bar, then Data Analysis (If this isn't there, load Analysis Toolpak VBA add-in.)
- Select t-Test: Paired Two Sample for Means.
- Variable Range 1 is the first column of data (e.g., Time Alphabetic Average) and Variable Range 2 is the second column (e.g., Time Phone Average).
- Hypothesized mean difference = 0 (this is the null hypothesis).
- Click OK. The results are shown on a new worksheet. There are both one-tailed and two-tailed p-values given.
- Interpret what your results mean. For example, the alphabetic keypad is significantly slower.

When finished, perform a second paired t-test again with the time dependent variable, but using the larger table that contains all students' data. Each group will use a different sample size (the TA will appoint a unique sample size to each group).

- Once all groups have finished, the TA will bring the class together and each group will report their one-tailed p-value, degrees of freedom (df), and number of observations (n).

### ANOVA

We are going to use two factors now: (1) type of keyboard and (2) experience with cell phone text entry. Run a two-factor ANOVA for the time dependent variable. Repeat for the error dependent variable if you have time.

- Select Data tab on menu bar, then Data Analysis
- Select Anova Two-Factor With Replication.
- For Input Range select the cells surrounded by dashed red line, including one of the heading rows.
- Change Rows per sample to the number of subjects that are in each level of Experience.
- Click OK. The fourth table contains the basic ANOVA results. The row "Sample" shows the difference between levels of Experience, while the row labelled "Columns" shows the difference between the types of keypads. The row "Interaction" tells us whether there is a significant interaction between Experience and Type of Keypad.
- What might your new results might mean? Interpret your new p values for Sample and

Column main effects (experience and type of keyboard, respectively) and for the interaction effect, if one exists.

-- [RockLeung](#) - 17 Feb 2011

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