01 - Introduction

HCI/PSYCH 522
Iowa State University

January 17, 2022

HCI/PSYCH 522

HCI 522: Scientific Methods in Human Computer Interaction
(Cross-listed with PSYCH). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Prereq: PSYCH 521 and STAT 101 or equivalent
Basics of hypothesis testing, experimental design, analysis and interpretation of data, and the ethical principles of human research as they apply to research in human computer interaction.

HCI/PSYCH 521

HCI 521: Cognitive Psychology of Human Computer Interaction
(Cross-listed with PSYCH). (3-0) Cr. 3.

Prereq: Graduate classification or instructor approval
Biological, behavioral, perceptual, cognitive and social issues relevant to human computer interactions.

STAT 101

STAT 101: Principles of Statistics
(3-2) Cr. 4. F.S.SS.

Prereq: 1 1/2 years of high school algebra
Statistical concepts in modern society; descriptive statistics and graphical displays of data; the normal distribution; data collection (sampling and designing experiments); elementary probability; elements of statistical inference; estimation and hypothesis testing; linear regression and correlation; contingency tables.
Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

HCI/PSYCH 521

What did you learn from HCI/PSYCH 521?

STAT 101 or equivalent

What did you learn from STAT 101 or equivalent?

- ~~Elementary~~ Probability
  - Independence
  - Conditional probability
  - Bayes' Rule
- Distributions
  - Binomial
  - Normal
- Data Collection
  - Random sampling
  - Randomized experiments
- ~~Elements of~~ Statistical Inference
  - Frequentist?
  - Bayesian???
- Estimation and hypothesis testing
  - p-value
  - Confidence interval?
- Statistical Models
  - Linear regression
  - Multiple regression???
  - Logistic regression???
  - Poisson regression???

HCI/PSYCH 522

HCI 522: Scientific Methods in Human Computer Interaction

Basics of hypothesis testing, experimental design, analysis and interpretation of data, and the ethical principles of human research as they apply to research in human computer interaction.

R

R is

a free, open-source programming language and software environment for statistical computing and graphics.

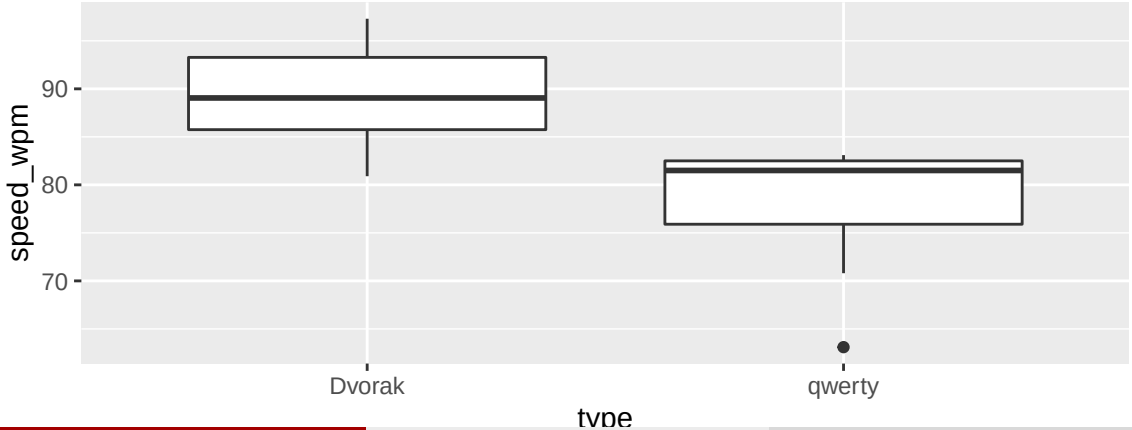
```
keyboard <- read.csv("keyboard.csv")
t.test(speed_wpm ~ type, data = keyboard)

##
##  Welch Two Sample t-test
##
## data:  speed_wpm by type
## t = 5.4349, df = 28.421, p-value = 8.07e-06
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   6.681054 14.754779
## sample estimates:
## mean in group Dvorak mean in group qwerty
##             89.33125             78.61333
```

R graphics

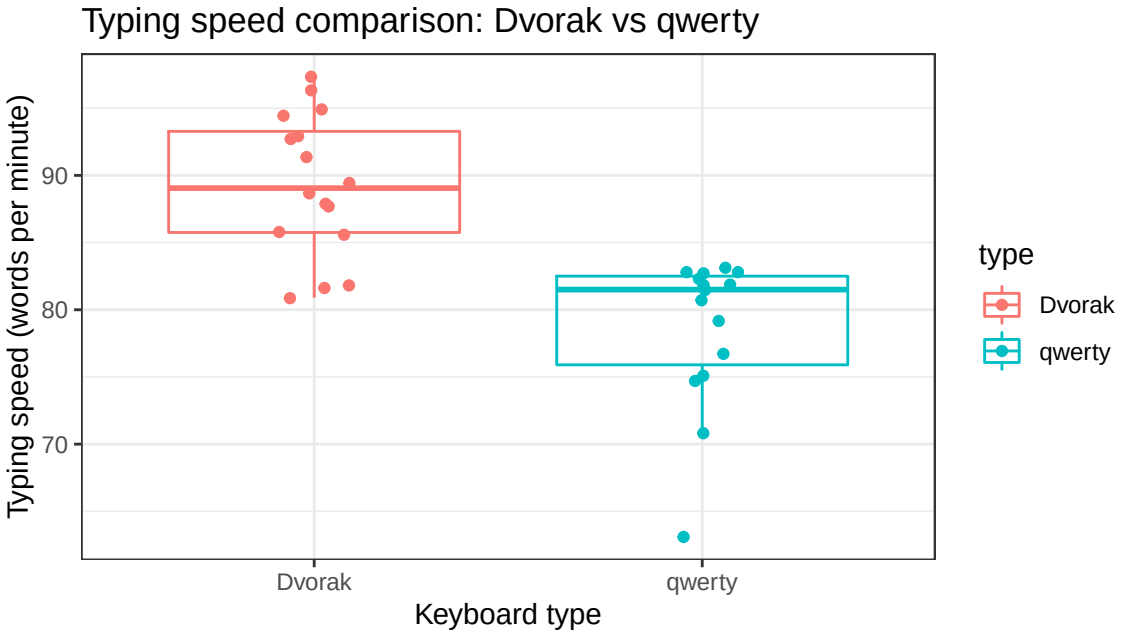
```r
library("ggplot2") # use install.packages("ggplot2") to install this package

ggplot(keyboard, aes(type, speed_wpm)) + geom_boxplot()
```



R graphics - improved

```
ggplot(keyboard, aes(type, speed_wpm, color = type)) +
  geom_jitter(width = 0.1) +
  geom_boxplot(outlier.shape = NA, fill = NA) +
  labs(x = "Keyboard type",
       y = "Typing speed (words per minute)",
       title = "Typing speed comparison: Dvorak vs qwerty") +
  theme_bw()
```


Typing speed comparison: Dvorak vs qwerty
Typing speed (words per minute)
90
80
70
Dvorak
qwerty
Keyboard type
type
Dvorak
qwerty

R GUI (default)

R Console

~/git/jarad.github.com/courses/hci522/slides/01-

Help Search

```
> setwd("~/git/jarad.github.com/courses/hci522/slides/01-Introduction/")
2022-01-17 16:54:13.456 R[18442:368701] +[NSSavePanel _warmUp] attempted warmup
> library("ggplot2")
>
> keyboard <- read.csv("keyboard.csv")
> t.test(speed_wpm ~ type, data = keyboard)

    Welch Two Sample t-test

data:  speed_wpm by type
t = 5.4314, df = 28.422, p-value = 8.147e-06
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
  6.679138 14.758828
sample estimates:
mean in group Dvorak mean in group qwerty
            89.33155             78.61256

>
> ggplot(keyboard, aes(type, speed_wpm, color = type)) +
+   geom_jitter(width = 0.1) +
+   geom_boxplot(outlier.shape = NA, fill = NA) +
+   labs(x = "Keyboard type",
+        y = "Typing speed (words per minute)",
+        title = "Typing speed comparison: Dvorak vs qwerty") +
+   theme_bw()
>
```

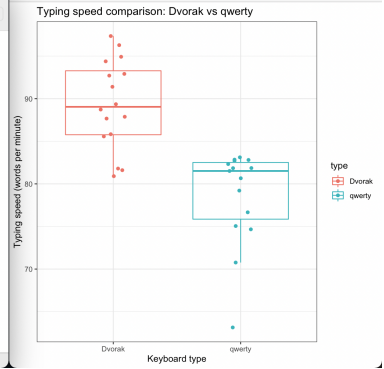
keyboard.R

<functions>

Help search

```
1  library("ggplot2")
2
3  keyboard <- read.csv("keyboard.csv")
4  t.test(speed_wpm ~ type, data = keyboard)
5
6  ggplot(keyboard, aes(type, speed_wpm, color = type)) +
7    geom_jitter(width = 0.1) +
8    geom_boxplot(outlier.shape = NA, fill = NA) +
9    labs(x = "Keyboard type",
10        y = "Typing speed (words per minute)",
11        title = "Typing speed comparison: Dvorak vs qwerty") +
12   theme_bw()
13
```

Quartz 2 [*]



jarad.github.com - master - RStudio

keyboard.R

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12   theme_bw()
13
```

Environment | History | Connections | Git | Tutorial

Import Dataset | List

R | Global Environment

Data

keyboard	31 obs. of 2 variables

Console | Terminal | Jobs

~/git/jarad.github.com/courses/hci522/slides/01-Introduction/

```
Type 'q()' to quit R.

> setwd("courses/hci522/slides/01-Introduction/")
> library("ggplot2")
> keyboard <- read.csv("keyboard.csv")
> t.test(speed_wpm ~ type, data = keyboard)

        Welch Two Sample t-test

data:  speed_wpm by type
t = 5.4314, df = 28.422, p-value = 8.147e-06
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```

Files | Plots | Packages | Help | Viewer

Zoom | Export | Publish