

Multiple Variables Graphs and Tables

Fan Wang

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Contents

Multiple Variables Graphs and Tables	1
Two Continuous Variables	2
Two Categorical Variables	3
Continuous and Categorical Variable	4

Multiple Variables Graphs and Tables

Go to the [RMD](#), [R](#), [PDF](#), or [HTML](#) version of this file. Go back to [fan's REconTools Package](#), [R Code Examples Repository \(bookdown site\)](#), or [Intro Stats with R Repository \(bookdown site\)](#).

```
# For Data Manipulations
library(tidyverse)
# For Additional table output
# install.packages("knitr")
library(knitr)
```

Let's load in the dataset we created from the [in-class survey](#).

```
# Load the dataset using readr's read_csv
df_survey <- read_csv('data/classsurvey.csv')

# We have several factor variables, we can set them as factor one by one
df_survey[['gender']] <- as.factor(df_survey[['gender']])
# But that is a little cumbersome, we can use lapply, a core function in r to do this for all factors
factor_col_names <- c('gender', 'major', 'commute', 'games.any', 'econ')
df_survey[factor_col_names] <- lapply(df_survey[factor_col_names], as.factor)
# Check Variable Types
str(df_survey)

## tibble [10 x 10] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
## $ ID          : num [1:10] 1 2 3 4 5 6 7 8 9 10
## $ ROW         : num [1:10] 3 4 4 4 2 1 2 3 3 4
## $ COL         : num [1:10] 1 2 10 1 6 7 6 6 3 13
## $ gender      : Factor w/ 2 levels "FEMALE","MALE": 2 1 2 2 1 2 2 2 1 1
## $ years.in.houston: num [1:10] 21 21 22 22 20 3 25 20 5 20
## $ major       : Factor w/ 5 levels "CONSUMERSCIENCE",...: 2 3 2 2 2 5 2 1 4 2
## $ commute     : Factor w/ 1 level "YES": 1 1 1 1 1 1 1 1 1 1
## $ games.attended : num [1:10] 0 2 0 14 0 0 25 2 0 0
## $ games.any    : Factor w/ 2 levels "Has.Attended",...: 2 1 2 1 2 2 1 1 2 2
## $ econ        : Factor w/ 2 levels "ECON","Not.Econ": 1 2 1 1 1 2 1 2 2 1
## - attr(*, "spec")=
## .. cols(
## ..   ID = col_double(),
```

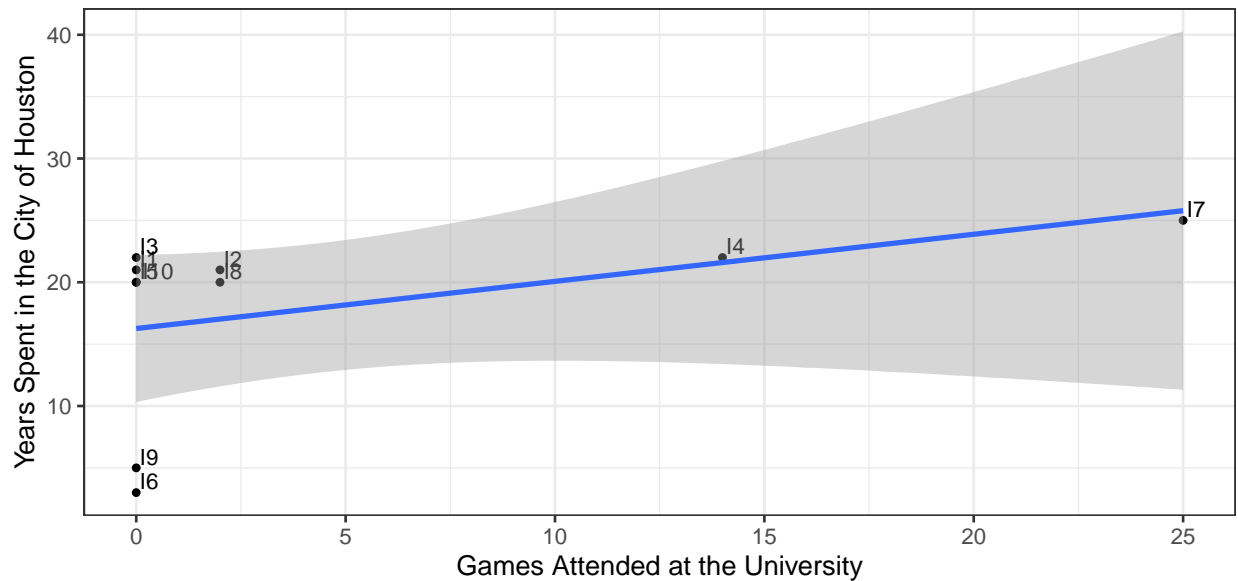
```
## .. ROW = col_double(),
## .. COL = col_double(),
## .. gender = col_character(),
## .. years.in.houston = col_double(),
## .. major = col_character(),
## .. commute = col_character(),
## .. games.attended = col_double(),
## .. games.any = col_character(),
## .. econ = col_character()
## .. )
```

Two Continuous Variables

With two continuous/quantitative variables, we can generate a scatter plot. Crucially, each point of the scatter plot represents one individual, the location of that point indicates the x and y values of that individual. The x and y values could be the individual's test score and hours studied for example.

```
# We can draw a scatter plot for two continuous variables
# Control Graph Size
options(repr.plot.width = 4, repr.plot.height = 4)
# Draw Scatter Plot
# 1. specify x and y
# 2. label each individual by their ID, add letter I in front of value
# 3. add in trend line
scatter <- ggplot(df_survey, aes(x=games.attended, y=years.in.houston)) +
  geom_point(size=1) +
  geom_text(aes(label=paste0('I', ID)), size=3, hjust=-.2, vjust=-.2) +
  geom_smooth(method=lm) + # Trend line
labs(title = paste0('Scatter Plot of Two Continuous/Quantitative Variables'
                    , '\nIn Class Survey of 10 Students'),
      x = 'Games Attended at the University',
      y = 'Years Spent in the City of Houston',
      caption = 'In Class Survey') +
  theme_bw()
print(scatter)
```

Scatter Plot of Two Continuous/Quantitative Variables In Class Survey of 10 Students



In Class Survey

Two Categorical Variables

With two discrete/categorical variables, we can generate two-way frequency tables. This is very similar to what we did for one discrete variable, except now we have columns and rows, representing the categories of the two variables. The two variables could be gender and majors, we would write in each table cell the number of students who are male and econ majors, male and bio majors in for example the first column, and repeat this for girls in the second column.

We can tabulate Frequencies based on two categorical variables

```
df_survey %>%
  group_by(gender, econ) %>%
  summarize(freq = n()) %>%
  spread(gender, freq)
```

We can show the fraction of individuals in each of the four groups

```
df_survey %>%
  group_by(interaction(gender, econ)) %>%
  summarise(freq = n()) %>%
  mutate(fraction = freq / sum(freq))
```

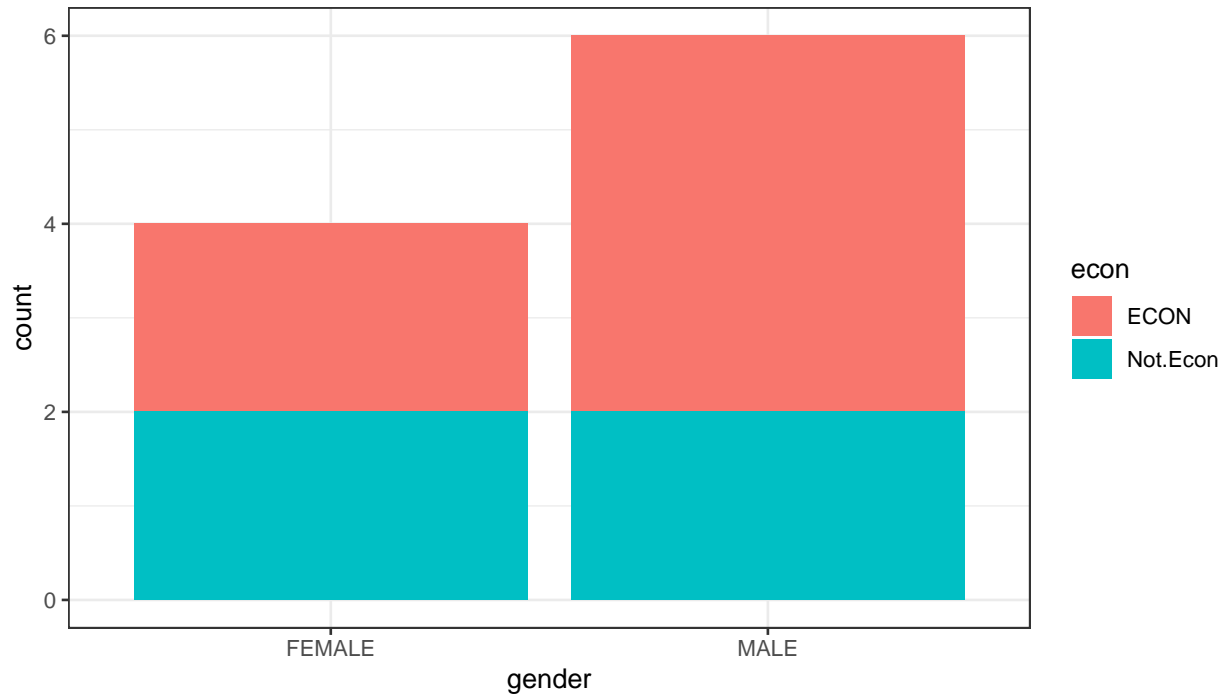
We can create stacked bar charts as well with the same data

graph size

```
options(repr.plot.width = 3, repr.plot.height = 2)
```

Graph

```
stacked.bar.plot <- ggplot(df_survey) +
  geom_bar(aes(x=gender, fill=econ)) +
  theme_bw()
print(stacked.bar.plot)
```



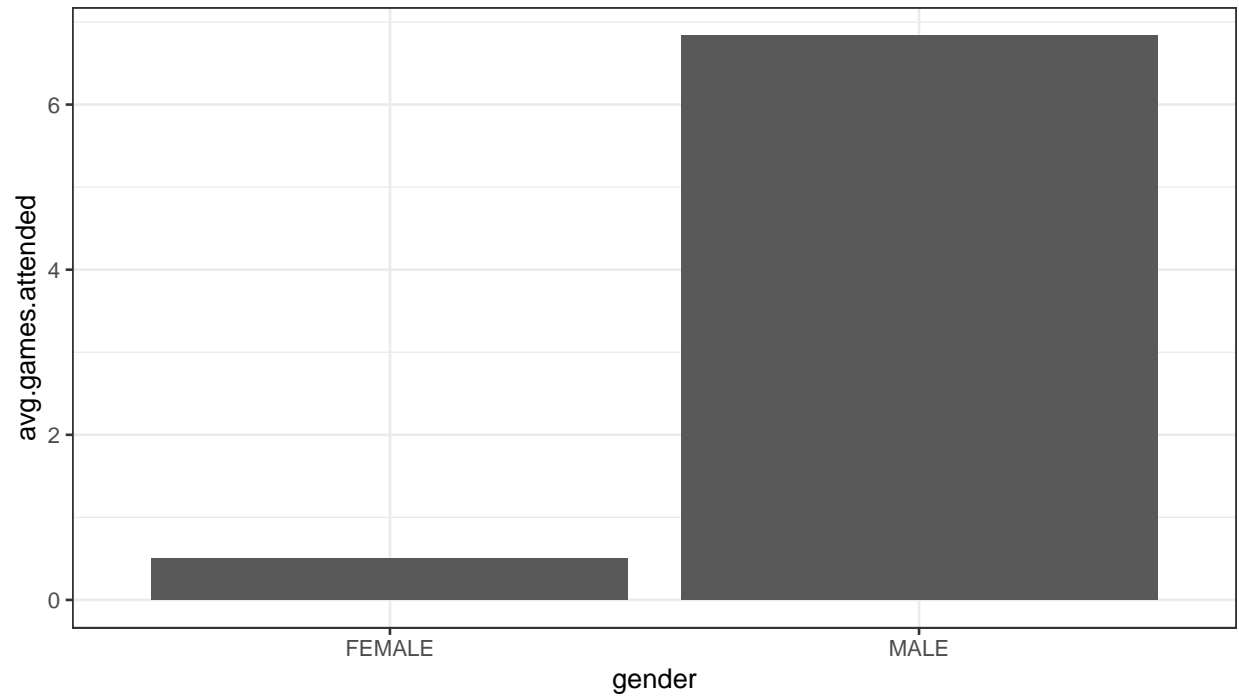
Continuous and Categorical Variable

Average Across Groups We can look at the average game attendance by female and male students in our sample, using a bar plot, where the height of the bars now represent the average of the *games.attended* variable for each group.

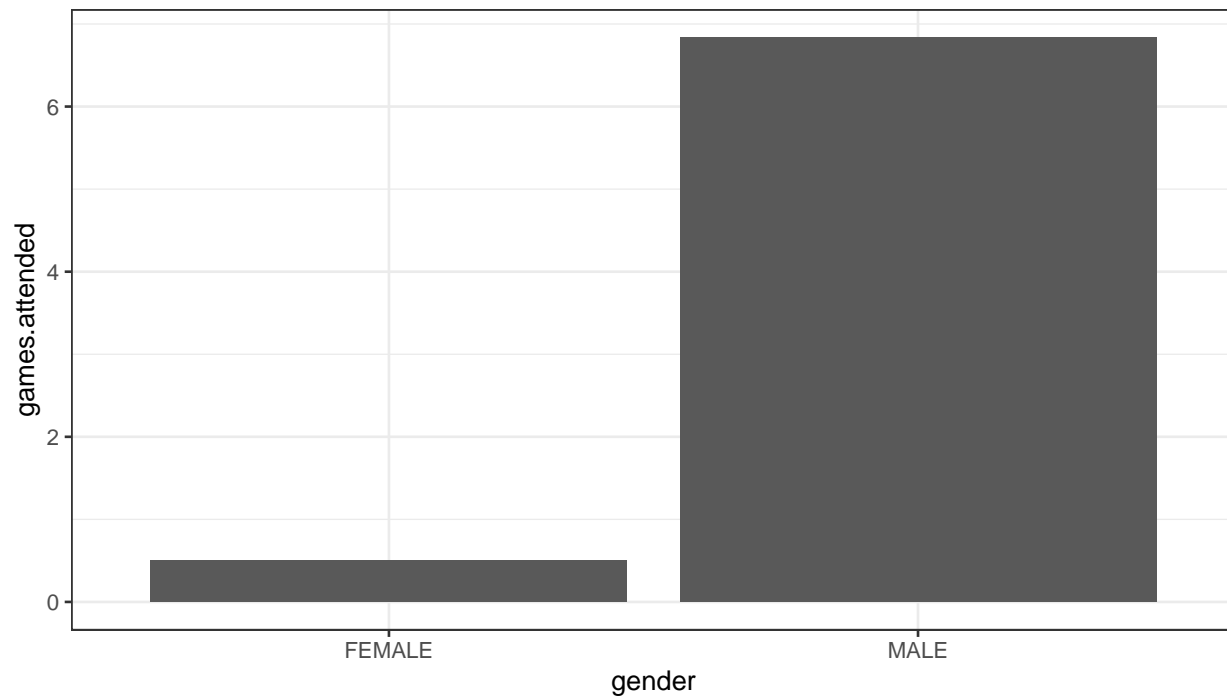
```
# We can first find the group averages
df_gender_avg_games <- df_survey %>%
  group_by(gender) %>%
  summarise (avg.games.attended = mean(games.attended))

df_gender_avg_games

# We can graph based on df_gender_avg_games
# Sizing the Figure Here
options(repr.plot.width = 2, repr.plot.height = 2)
# Plot, stat = identity means to plot the value in avg.games.attended for each gender
group.means <- ggplot(df_gender_avg_games) +
  geom_bar(aes(x=gender, y=avg.games.attended), stat = 'identity') +
  theme_bw()
print(group.means)
```



```
# But it is a little cumbersome to do this in two steps, we can do it in one step
# Sizing the Figure Here
options(repr.plot.width = 2, repr.plot.height = 2)
# Plot directly from df_survey, summary over x for y
# The result looks the same
group.means.joint <- ggplot(df_survey) +
  geom_bar(aes(x=gender, y=games.attended), stat = "summary", fun.y = "mean") +
  theme_bw()
print(group.means.joint)
```



Average Across Two Groups: Gender and Majors What is the average game attendance for male and female, econ and non-econ majors? We have 2 female econ majors, 2 female non-econ majors, 4 male econ majors and 2 male non-econ majors, and their average game attendances are: 0, 1, 9.75 and 1 games.

We can calculate the statistics as a table, and also show obs in each group

```
df_survey %>%
  group_by(gender, econ ) %>%
  summarise (avg.games.attended = mean(games.attended), N.count = n())
```

Let's Show these Visually

```
options(repr.plot.width = 4, repr.plot.height = 2)
```

Plot directly from df_survey

Using fill for econ, this means econ or not will fill up with different colors

Still caculate average

Postion "dodge" means that econ and non-econ wil be shown next to each other

By default position is to stack different fill groups on top of each other.

```
two.group.means <- ggplot(df_survey) +
  geom_bar(aes(x=gender, y=games.attended, fill=econ),
    stat = "summary", fun.y = "mean", position = "dodge") +
  theme_bw()
print(two.group.means)
```

