IS5 in R: Stats Starts Here (Chapter 4)

Margaret Chien and Nicholas Horton (nhorton@amherst.edu)

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Introduction and background

This document is intended to help describe how to undertake analyses introduced as examples in the Fifth Edition of *Intro Stats* (2018) by De Veaux, Velleman, and Bock. More information about the book can be found at http://wps.aw.com/aw_deveaux_stats_series. This file as well as the associated R Markdown reproducible analysis source file used to create it can be found at http://nhorton.people.amherst.edu/is5.

This work leverages initiatives undertaken by Project MOSAIC (http://www.mosaic-web.org), an NSF-funded effort to improve the teaching of statistics, calculus, science and computing in the undergraduate curriculum. In particular, we utilize the `mosaic` package, which was written to simplify the use of R for introductory statistics courses. A short summary of the R needed to teach introductory statistics can be found in the mosaic package vignettes (http://cran.r-project.org/web/packages/mosaic). A paper describing the mosaic approach was published in t he *R Journal*: https://journal.r-project.org/archive/2017/RJ-2017-024.

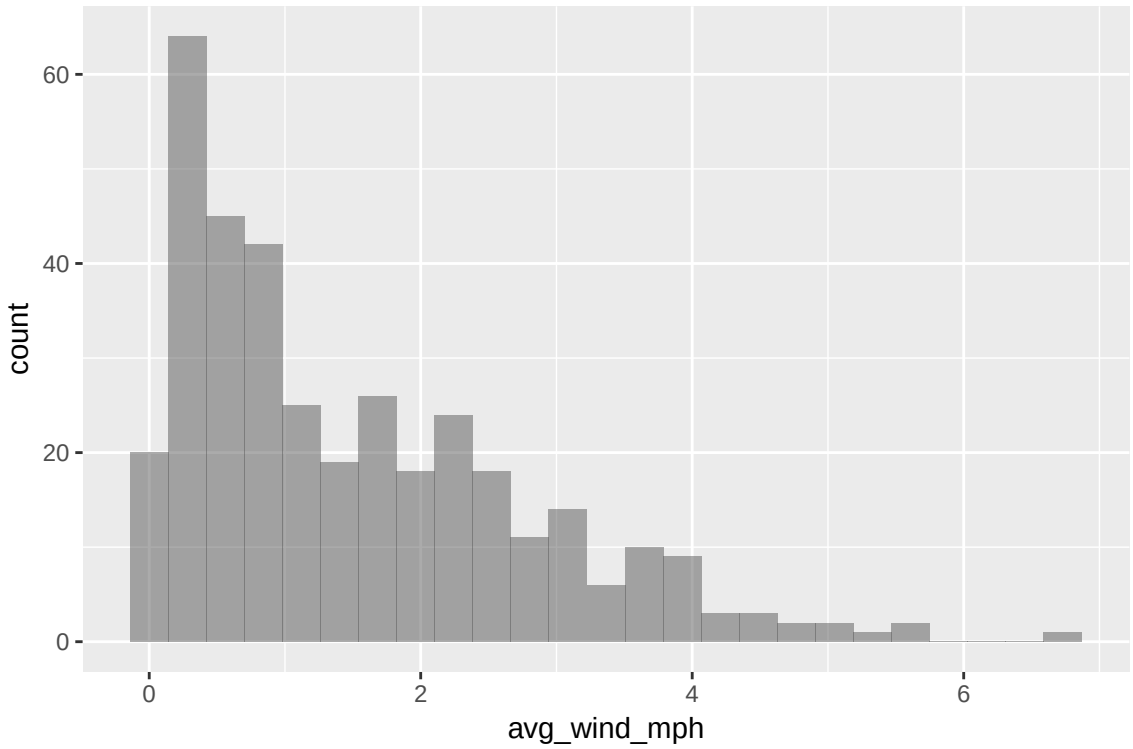
Chapter 4: Understanding and Comparing Distributions

```
library(mosaic)
library(readr)
library(janitor)
HopkinsForest <- read_csv("http://nhorton.people.amherst.edu/is5/data/Hopkins_Forest.csv") %>%
  clean_names()
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   Date = col_character(),
##   Year = col_integer(),
##   Month = col_integer(),
##   Day = col_integer(),
##   `Day of Year` = col_integer(),
##   `Max Sol Rad (w/m^2)` = col_integer(),
##   `Min Sol Rad (w/m^2)` = col_integer(),
##   `Total Sol Rad (w/m^2)` = col_integer(),
##   `Min Wind (mph)` = col_integer(),
##   `Max Barom (mb)` = col_integer(),
##   `Min Barom (mb)` = col_integer()
## )
```

```
## See spec(...) for full column specifications.
```

```
gf_histogram(~ avg_wind_mph, data = HopkinsForest)
```



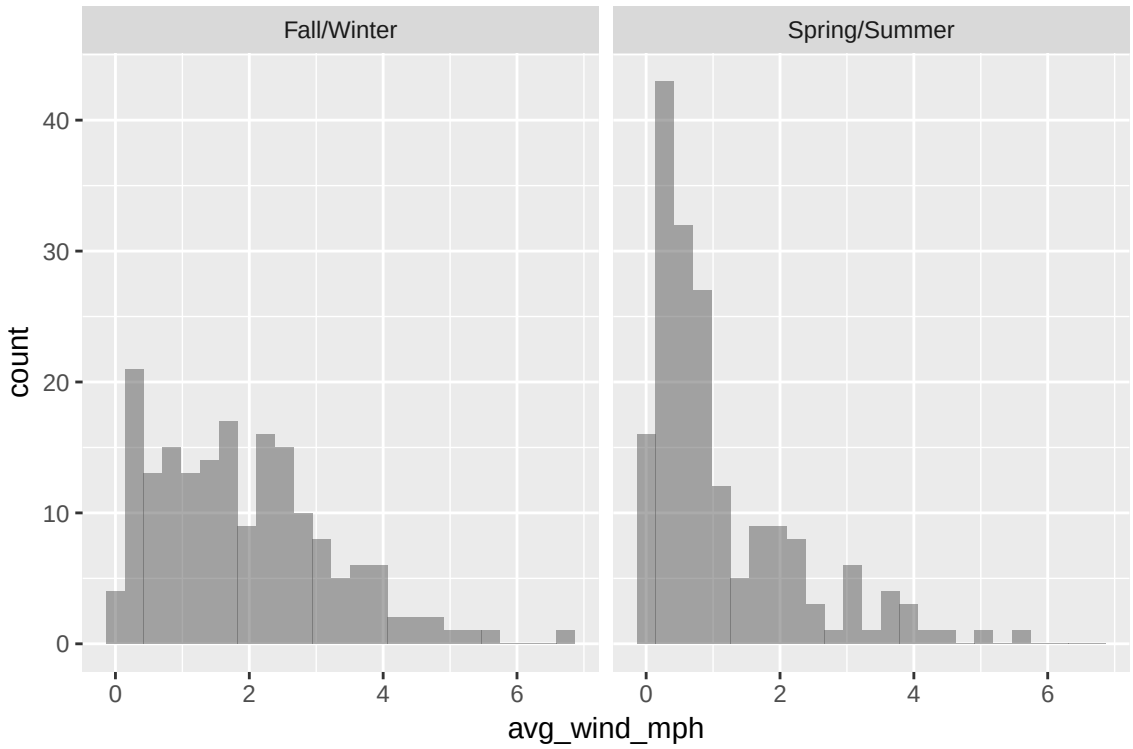

```
favstats(~ avg_wind_mph, data = HopkinsForest)
```

```
##  min   Q1 median   Q3  max     mean       sd   n missing
##    0 0.46   1.12 2.28 6.73 1.507808 1.260161 365       0
```

Section 4.1: Displays for Comparing Groups

Histograms

```
HopkinsForest <- HopkinsForest %>%
  mutate(catmonth = ifelse(month <= 9 & month >= 4, "Spring/Summer", "Fall/Winter"))
gf_histogram(~ avg_wind_mph, data = HopkinsForest) %>%
  gf_facet_wrap(~ catmonth)
```




```
favstats(~ avg_wind_mph | catmonth, data = HopkinsForest)
```

```
##        catmonth  min   Q1 median     Q3  max     mean       sd   n missing
## 1   Fall/Winter 0.02 0.84   1.72 2.6575 6.73 1.904176 1.287233 182       0
## 2 Spring/Summer 0.00 0.35   0.71 1.6150 5.47 1.113607 1.102176 183       0
```

Example 4.1: Comparing Groups with Stem-And-Leaf

```
NestEgg <- read_csv("http://nhorton.people.amherst.edu/is5/data/Nest_Egg_Index.csv") %>%
  clean_names()
```

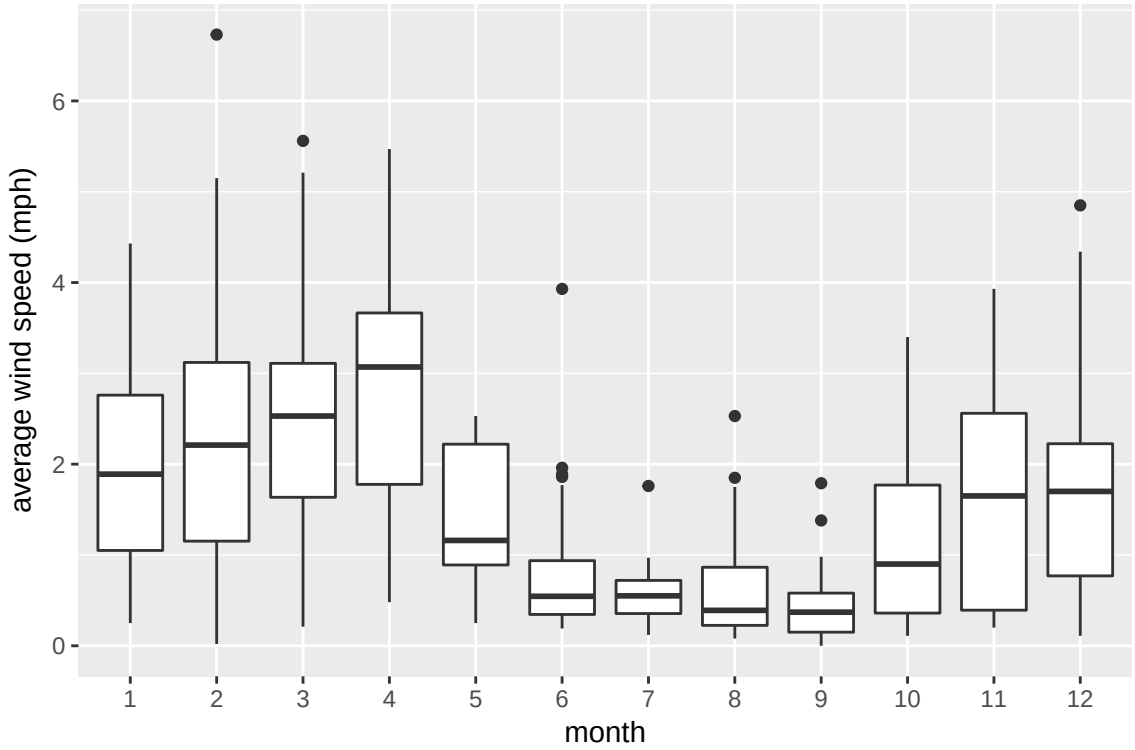
```
## Parsed with column specification:
## cols(
##   State = col_character(),
##   Nest.Egg.Index = col_double(),
##   Region = col_character()
## )
```

```
with(NestEgg, stem(nest_egg_index)) # not sure how to group by region
```

```
##
##   The decimal point is 1 digit(s) to the right of the |
##
##    8 | 57789
##    9 | 0123344
##    9 | 667777888899
##   10 | 0012233333344
##   10 | 5566779
##   11 | 122444
```

Boxplots

```
gf_boxplot(avg_wind_mph ~ as.factor(month), data = HopkinsForest) %>%
  gf_labs(x = "month", y = "average wind speed (mph)")
```



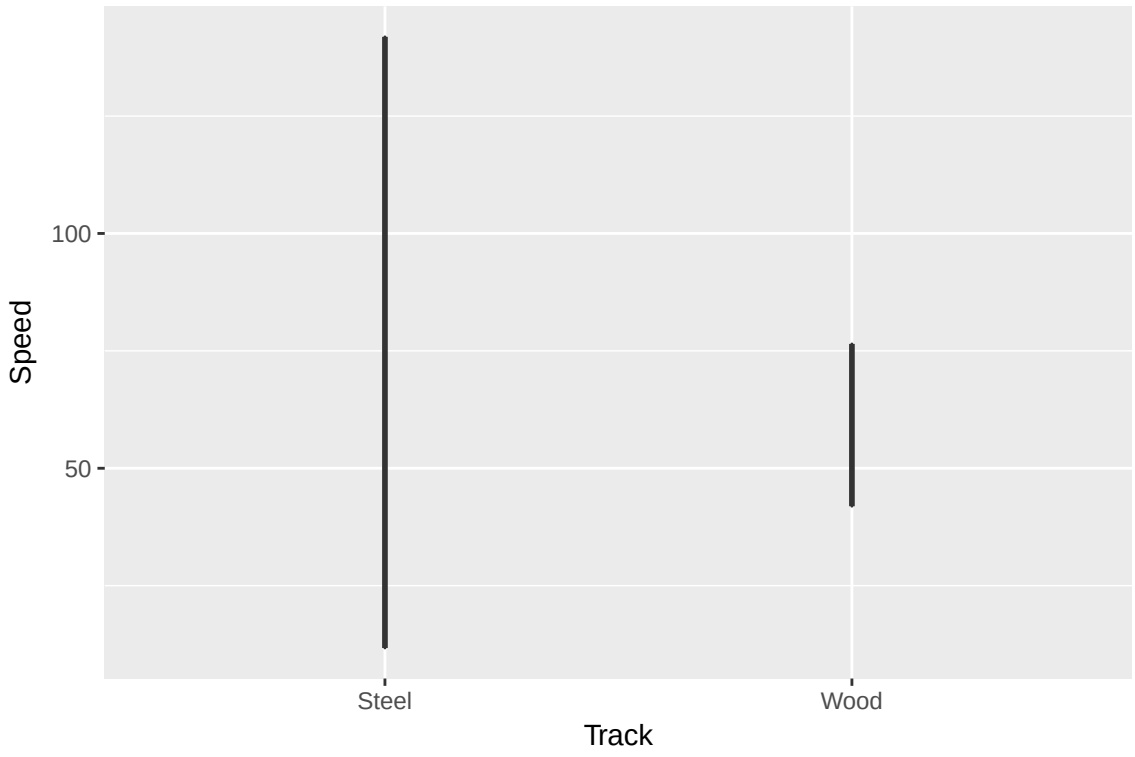
Example 4.2: Comparing Groups with Boxplots

```
Coasters <- read_csv("http://nhorton.people.amherst.edu/is5/data/Coasters_2015.csv")
```

```
## Parsed with column specification:
## cols(
##   Name = col_character(),
##   Park = col_character(),
##   Track = col_character(),
##   Speed = col_double(),
##   Height = col_double(),
##   Drop = col_double(),
##   Length = col_double(),
##   Duration = col_integer(),
##   Inversions = col_integer()
## )
```

```
gf_boxplot(Track ~ Speed, data = Coasters) %>%
  gf_refine(coord_flip()) # not sure how to make these not lines
```

```
## Warning: position_dodge requires non-overlapping x intervals
```




```
# XX MC to fix
```

Step-By-Step Example: Comparing Groups

```
Cups <- read_csv("http://nhorton.people.amherst.edu/is5/data/Cups.csv")
```

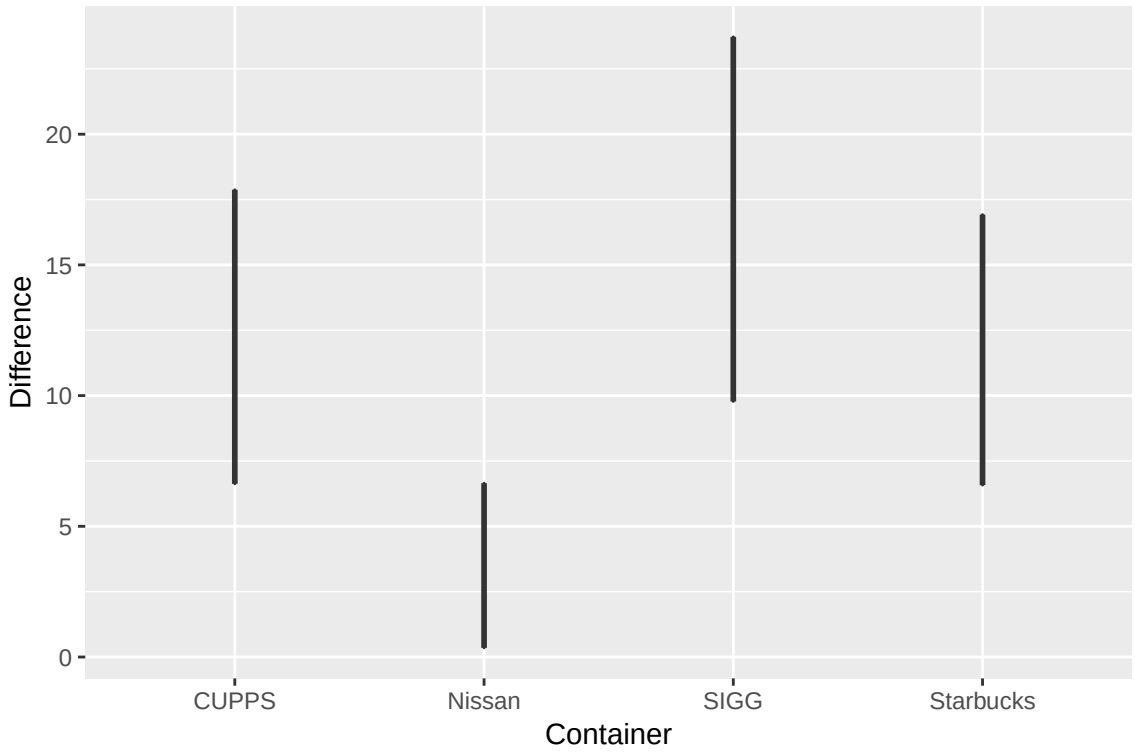
```
## Parsed with column specification:
## cols(
##   Difference = col_double(),
##   Container = col_character()
## )
```

```
favstats(~ Difference | Container, data = Cups)
```

```
##   Container min    Q1 median     Q3  max    mean       sd n missing
## 1     CUPPS   6  6.00   8.25 12.625 18.5 10.1875 5.202592 8       0
## 2    Nissan   0  1.25   2.00  3.750  7.0  2.7500 2.507133 8       0
## 3      SIGG   9 11.75  14.25 21.125 24.5 16.0625 5.900590 8       0
## 4 Starbucks   6  6.75   8.50 13.625 17.5 10.2500 4.551295 8       0
```

```
gf_boxplot(Container ~ Difference, data = Cups) %>%
  gf_refine(coord_flip())
```

```
## Warning: position_dodge requires non-overlapping x intervals
```



Just Checking

Section 4.2: Outliers

Section 4.3: Re-Expressing Data: A First Look