Data Manipulation with R

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R Markdown

This is a **slidy** presentation generated using **R Markdown** in

Things to keep in mind about R

It is more a scripting language than programming language

R is optimized for vectorization (what the heck does that mean?)

Generally avoid looping operations:

```
data <- seq(1, 10000, by = 1)
data_squared <- NULL
 system.time(
       for(i in data){
       data_squared[i] <- data[i]^2
 })
```

```
##    user  system elapsed
##   0.173   0.006   0.179
```

```
# Vectorization is faster
system.time(data_squared <- data^2)
```

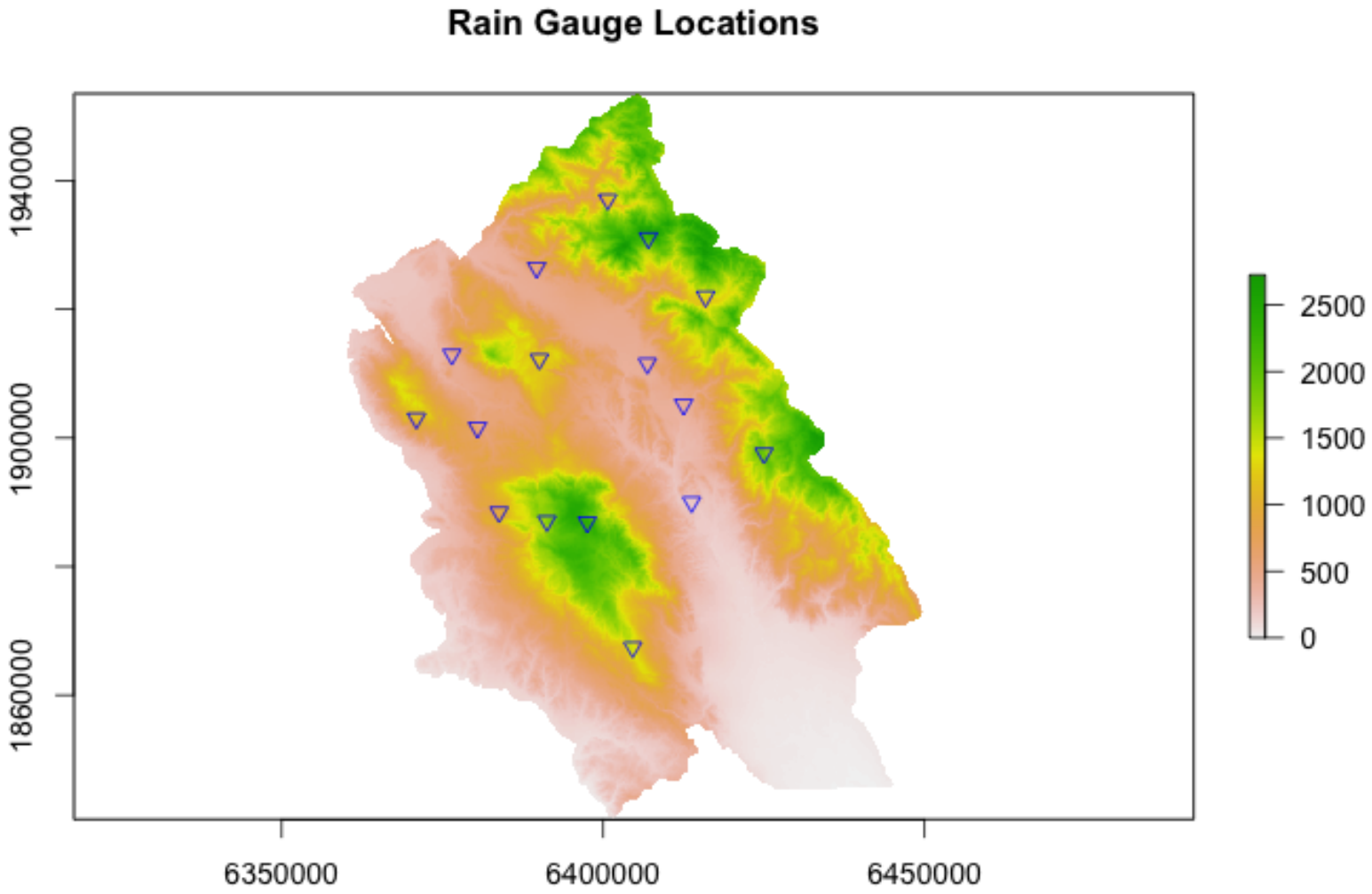
Getting data into R

Single files are pretty simple with built-in functions, e.g.

```
my_data1 <- read.csv("pathname/mydata.csv")# Read csv file
my_data2 <- read.table("pathname/mydata.txt")# Read text fi
```

What about a bunch of files with the same data format?

Getting data into R



Getting data into R - multiple files

I have a directory with annual data files over 10 years

```
files <- list.files("Rain_Gauge/2_RG_EXPORTS", pattern="*.c
                    full.names=TRUE)
is.vector(files)
```

```
## [1] TRUE
```

```
class(files)
```

```
## [1] "character"
```

```
length(files)
```

```
## [1] 112
```

```
head(files, 3)
```

Getting data into R - multiple files

Read all the files in the vector "files" into a single data frame

```
library(plyr)# `ldply()` function reads a list, returns a c
library(data.table)# `fread()` function
rg_data <- ldply(files, function(i){fread(i)})
class(rg_data)
```

```
## [1] "data.frame"
```

```
head(rg_data, 3)
```

```
##         id       date     time events daily_events hourly
## 1 annadel 11/12/2003 13:00:00     NA           NA
## 2 annadel 11/12/2003 14:00:00     NA           NA
## 3 annadel 11/12/2003 15:00:00     NA           NA
```

Find out more about the data set

```
str(rg_data)
```

```
## 'data.frame':    1174694 obs. of  6 variables:
##  $ id           : chr  "annadel" "annadel" "annadel" "an
##  $ date         : chr  "11/12/2003" "11/12/2003" "11/12/
##  $ time         : chr  "13:00:00" "14:00:00" "15:00:00"
##  $ events       : int  NA NA NA NA NA NA NA NA NA NA ...
##  $ daily_events : int  NA NA NA NA NA NA NA NA NA NA ...
##  $ hourly_events: int  0 0 0 0 0 0 0 0 0 0 ...
```

Dealing with dates and time

I want to be able to group and sort by dates and times

Join `date` and `time` columns into new variable `date_time`

```
rg_data$date_time <- paste(rg_data$date, rg_data$time, sep=
class(rg_data$date_time)
```

```
## [1] "character"
```

Dealing with dates and time

Convert date_time into format interpretable by the computer (POSIX)

```
rg_data$date_time <- strptime(rg_data$date_time, format="%m
                                        tz="UTC")
class(rg_data$date_time)
```

```
## [1] "POSIXlt" "POSIXt"
```

```
head(rg_data, 3)
```

```
##        id       date     time events daily_events hourly
## 1 annadel 11/12/2003 13:00:00     NA            NA
## 2 annadel 11/12/2003 14:00:00     NA            NA
## 3 annadel 11/12/2003 15:00:00     NA            NA
##             date_time
## 1 2003-11-12 13:00:00
## 2 2003-11-12 14:00:00
## 3 2003-11-12 15:00:00
```

Dealing with dates and time

Create `year`, `month`, and `day` variables for grouping > - Many functions can't handle POSIX formatted date/time

These functions come from the `data.table` package

```
rg_data$year <- year(rg_data$date_time)# extracts year
rg_data$month <- month(rg_data$date_time)# extracts month
rg_data$day <- mday(rg_data$date_time)# extracts day of mon
head(rg_data, 3)
```

```
##         id       date     time events daily_events hourly
## 1 annadel 11/12/2003 13:00:00     NA            NA
## 2 annadel 11/12/2003 14:00:00     NA            NA
## 3 annadel 11/12/2003 15:00:00     NA            NA
##             date_time year month day
## 1 2003-11-12 13:00:00 2003    11  12
## 2 2003-11-12 14:00:00 2003    11  12
## 3 2003-11-12 15:00:00 2003    11  12
```

Subset and summarize data

Create dataset of daily precipitation in inches

```
library(dplyr)
dy_rg_data <- rg_data %>%
      select(id, date, year, month, day, events) %>%
      group_by(id, year, month, day) %>%
      summarize(daily_events=length(events), daily_ppt=leng
str(dy_rg_data)
```

```
## Classes 'grouped_df', 'tbl_df', 'tbl' and 'data.frame':
##  $ id           : chr  "annadel" "annadel" "annadel" "ann
##  $ year         : int  2003 2003 2003 2003 2003 2003 2003
##  $ month        : int  11 11 11 11 11 11 11 11 11 11 ...
##  $ day          : int  12 13 14 15 16 17 18 19 20 21 ...
##  $ daily_events: int  11 24 43 32 38 24 24 24 24 24 ...
##  $ daily_ppt    : num  0.11 0.24 0.43 0.32 0.38 0.24 0.24
##  - attr(*, "vars")=List of 3
##   ..$ : symbol id
```

Subset and summarize data

Add a date interpretable by the computer

```
dy_rg_data$date <- as.Date(
      with(dy_rg_data, paste(as.character(year), as.charact
                             as.character(day), sep="/")),
      format = "%Y/%m/%d")
class(dy_rg_data$date)
```

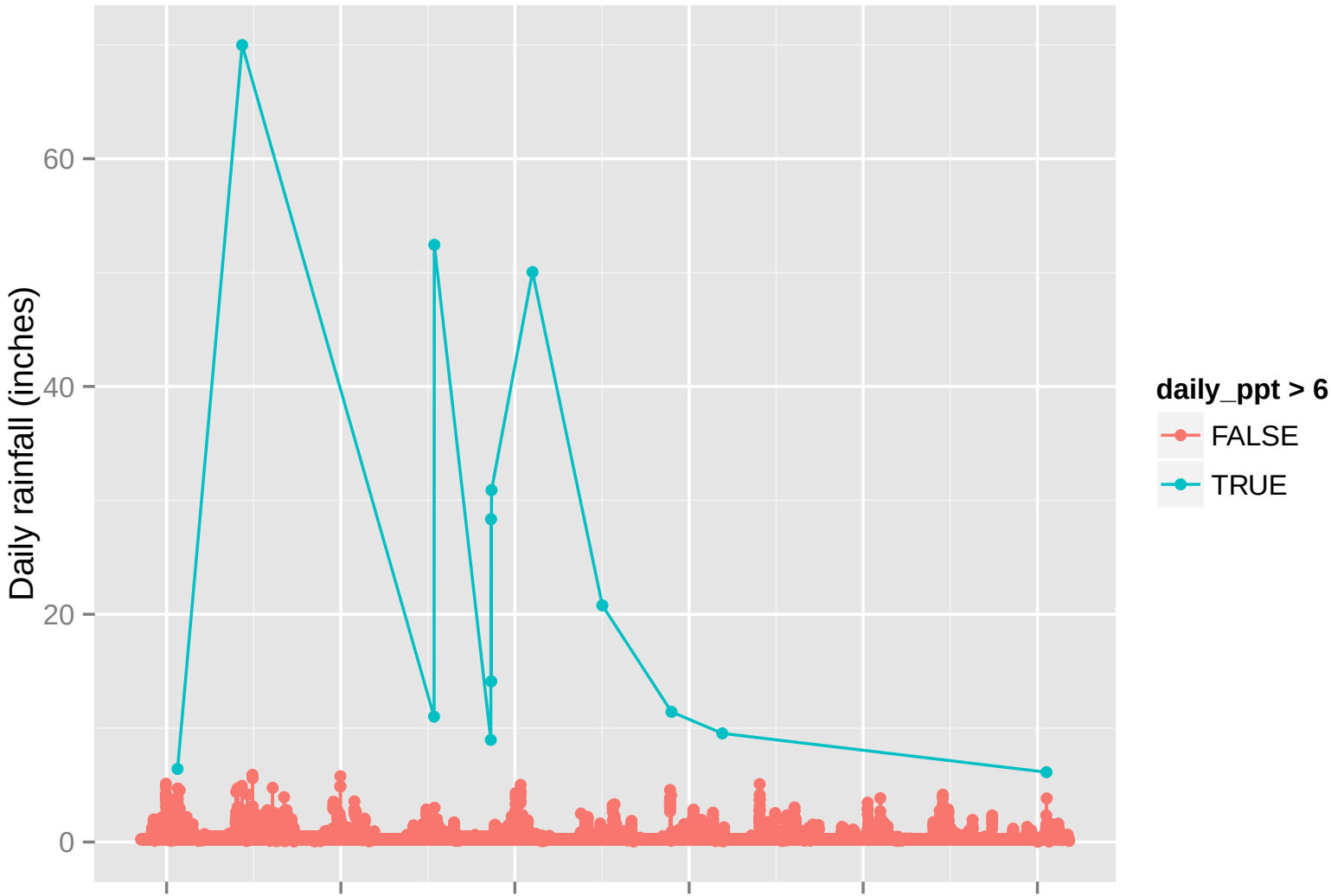
```
## [1] "Date"
```

```
summary(dy_rg_data)
```

```
##        id                year          month
##  Length:34870       Min.   :2003   Min.   : 1.000   Min.
##  Class :character   1st Qu.:2005   1st Qu.: 4.000   1st
##  Mode  :character   Median :2008   Median : 7.000   Medi
##                     Mean   :2008   Mean   : 6.613   Mean
##                     3rd Qu.:2011   3rd Qu.:10.000   3rd
```

Plot rainfall data

```
library(ggplot2)
qplot(date, daily_ppt, data = dy_rg_data, geom = c("point",
      ylab = "Daily rainfall (inches)", color = daily_ppt >
```



Re-plot rainfall data without ouliers

```
qplot(date, daily_ppt,
      data = dy_rg_data %>% filter(daily_ppt < 6),
      geom = c("point","line"), ylab = "Daily rainfall (inc
      color = year) +
      theme_bw()
```