Shiny app tutorial for PMed

`shiny` is a package for R to build interactive web apps, making sections of R code reactive. Shiny lets us use R to visualize data and incorportate those plots into a site.

Getting started with R

1. Download an R distribution from CRAN
2. Download Rstudio
    - explore Rstudio

R basics for today

Packages

```
install.packages("shiny")
library(shiny)
```

File paths: Working directory

```
getwd()
setwd([your path])
```

Assignment

```
x <- 5
x
```

```
## [1] 5
```

```
x = 7
x
```

```
## [1] 7
```

Vectors

```
x <- c(4,9,1,0)
x*3
```

```
## [1] 12 27  3  0
```

```
x[1:2]
```

```
## [1] 4 9
```

```r
x <- c(4,"four")
x
```

```
## [1] "4"    "four"
```

Lists

```r
x <- list(4,"four")
x
```

```
## [[1]]
## [1] 4
##
## [[2]]
## [1] "four"
```

```r
x <- list(value=4, word="four")

x$value
```

```
## [1] 4
```

```r
x[[1]]
```

```
## [1] 4
```

```r
x[["value"]]
```

```
## [1] 4
```

```r
x$french <- "quatre"
x$lower <- 1:3
x
```

```
## $value
## [1] 4
##
## $word
## [1] "four"
##
## $french
## [1] "quatre"
##
## $lower
## [1] 1 2 3
```

```r
x$lower <- seq(1,3.5,by=0.5)
x$isFour <- TRUE

x
```

```
## $value
## [1] 4
##
## $word
## [1] "four"
##
```

```
## $french
## [1] "quatre"
##
## $lower
## [1] 1.0 1.5 2.0 2.5 3.0 3.5
##
## $isFour
## [1] TRUE
```

Example: shiny default

Old Faithful geyser in Yellowstone National Park

- `File > New File > Shiny Web App ...`
  - `shiny::runApp('first-app')`
- Three functions:
  - ui()
  - server()
  - shinyApp()
- ui() define the inputs and displays the outputs
- server() defines the outputs with user-modified inputs
- shinyApp() takes both functions and excutes them, creating the web app
- Simple example using a built in dataset `faithful`
  - Waiting time between eruptions and the duration of the eruption for the Old Faithful geyser in Yellowstone National Park, Wyoming, USA.

Wait what are we plotting?

```
?faithful
names(faithful)
```

```
## [1] "eruptions" "waiting"
```

```
head(faithful)
```

```
##   eruptions waiting
## 1     3.600      79
## 2     1.800      54
## 3     3.333      74
## 4     2.283      62
## 5     4.533      85
## 6     2.883      55
```

Lets make this shiny app more interesting . . .

1. Change titles
   - change x value to be more readable ($waiting instead of [,2])
   - change plot title
   - remove "x" label
2. Add second histogram for second variable in dataset
3. Add second slider bar but make it a value input
4. Add titles to make it clear which is for which - p() vs h3()
   - add space with br()
5. Explore the relationship of time since last eruption and duration of eruption
   - plot regression line

```r
summary(lm(eruptions ~ waiting, data=faithful))
```

```
##
## Call:
## lm(formula = eruptions ~ waiting, data = faithful)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.29917 -0.37689  0.03508  0.34909  1.19329
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.874016   0.160143  -11.70   <2e-16 ***
## waiting      0.075628   0.002219   34.09   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4965 on 270 degrees of freedom
## Multiple R-squared:  0.8115, Adjusted R-squared:  0.8108
## F-statistic:  1162 on 1 and 270 DF,  p-value: < 2.2e-16
```

6. Oooh it looks like there are two groups.
    - add line to separate the two
7. Next steps ... do ML to find the best separatrix to maximize likelihood? minimize RMSE?

Example: DDx Dashboard

Let's build the DDx app from scratch

Example: PAWS

Data sets from Philadelphia Animal Welfare Society (PAWS), a non-profit rescue organization providing vet care and adoption services for stray and surrendered animals.

RLadies repo forked at: https://github.com/drscranto/2019_datathon

More to learn

- Preset dashboards `shinydashboard`
- Read data from an s3 bucket `aws.s3`
- Options for deploying a shiny web app
    - https://www.rstudio.com/products/shiny/shiny-server/
    - Hosting, security, and scaling
    - Easy deployment with `shinyapps.io`