STAT 5650 Statistical Learning and Data Mining 1 Spring 2020

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Final Project: Applying Prediction Methods to Hotel Data

200 Points — Due Friday 10/18/2019 (via Canvas by 11:59pm)

(i) **Prediction Methods:** After working with the data and reviewing the notes from Dr. Cutler on our project proposal we had to edit what methods of prediction we were going to apply against the data. Below is a list of methods that we were able to get to run against our hotel data set.

- Gradient Boosting Machines (GBM)
- Support Vector Machines (SVM)
- Random Forests
- Adaboost
- Classification Trees

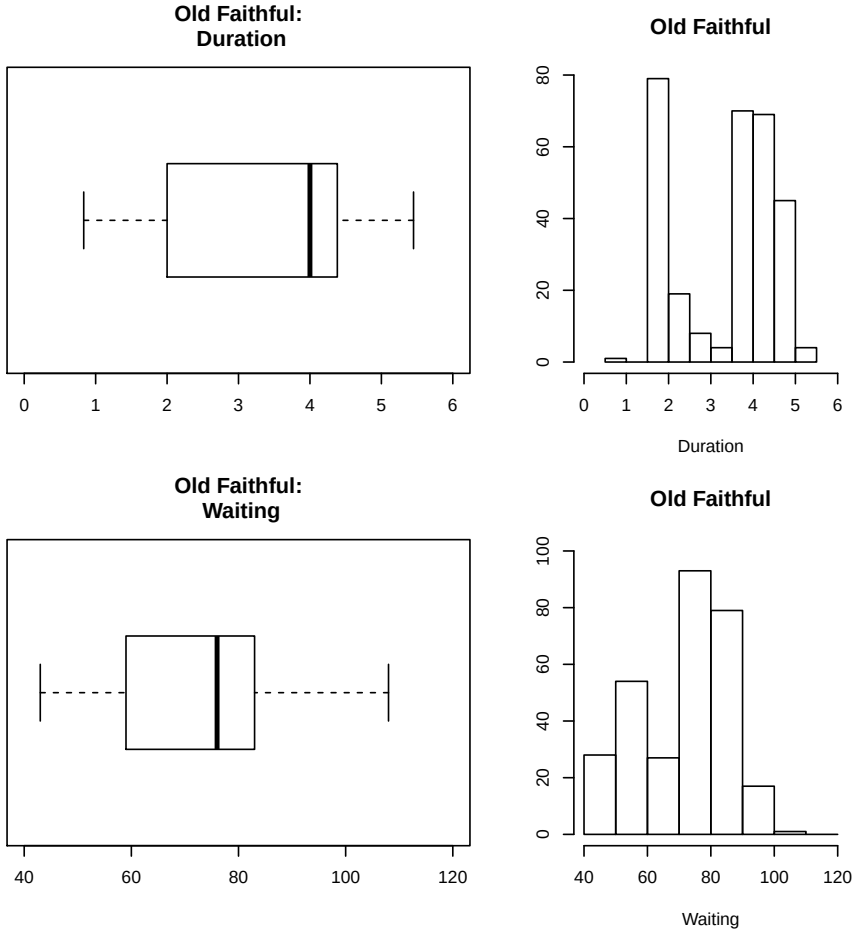
(ii) **Untuned Support Vector Machines:**

(iii) **Untuned Gradient Boosting Machines:**

(iv) **Question 2:** <Description of Question 2>

(a) (6 Points) Recreate the graphs (and layout) below using baseR. Use a ruler to check that the width and height proportions in your graphs match the ones I have used. I worked with integer multiples! Include your R code and the resulting graphs. Hint: You can create a new line via `\n` without any extra spaces before/after `\n`.

```
> grid <- matrix(c(1, 1, 1, 2, 2, 3, 3, 3, 4, 4),
+                nrow = 2, ncol = 5, byrow = TRUE)
> layout(grid)
> par(mar = c(4, 3, 4, 2))
> boxplot(geyser$duration,
+         horizontal = TRUE,
+         main = "Old Faithful:\n Duration",
+         ylim = c(0, 6))
> hist(geyser$duration,
+      main = "Old Faithful",
+      xlab = "Duration",
+      ylab = "Count",
+      xlim = c(0, 6))
> boxplot(geyser$waiting,
+         horizontal = TRUE,
+         main = "Old Faithful:\n Waiting",
+         ylim = c(40, 120))
> hist(geyser$waiting,
+      main = "Old Faithful",
+      xlab = "Waiting",
+      ylab = "Count",
+      xlim = c(40, 120),
+      ylim = c(0, 100),
+      breaks = seq(40, 120, by = 10))
```

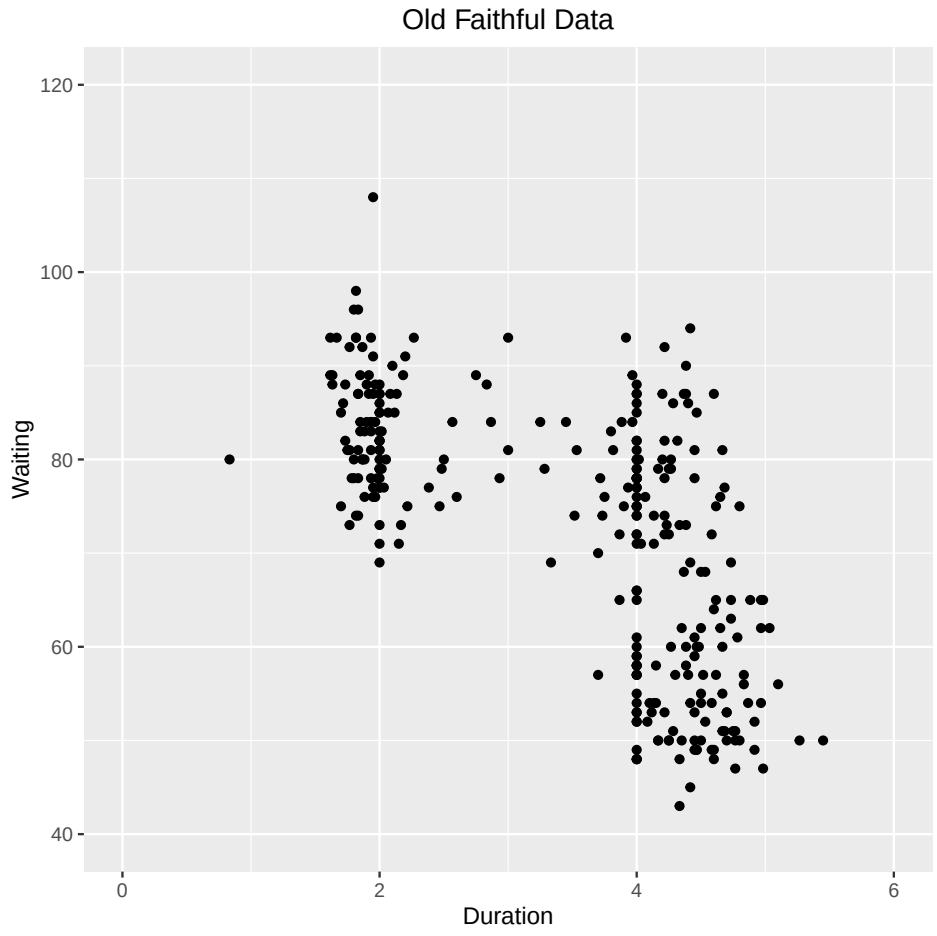


Refernces:

- https://www.statmethods.net/advgraphs/layout.html
- https://stackoverflow.com/questions/31319942/change-the-size-of-a-plot-when-plotting-multiple-plots-in-r
- https://www.youtube.com/watch?v=Z3V4Pbxeahg

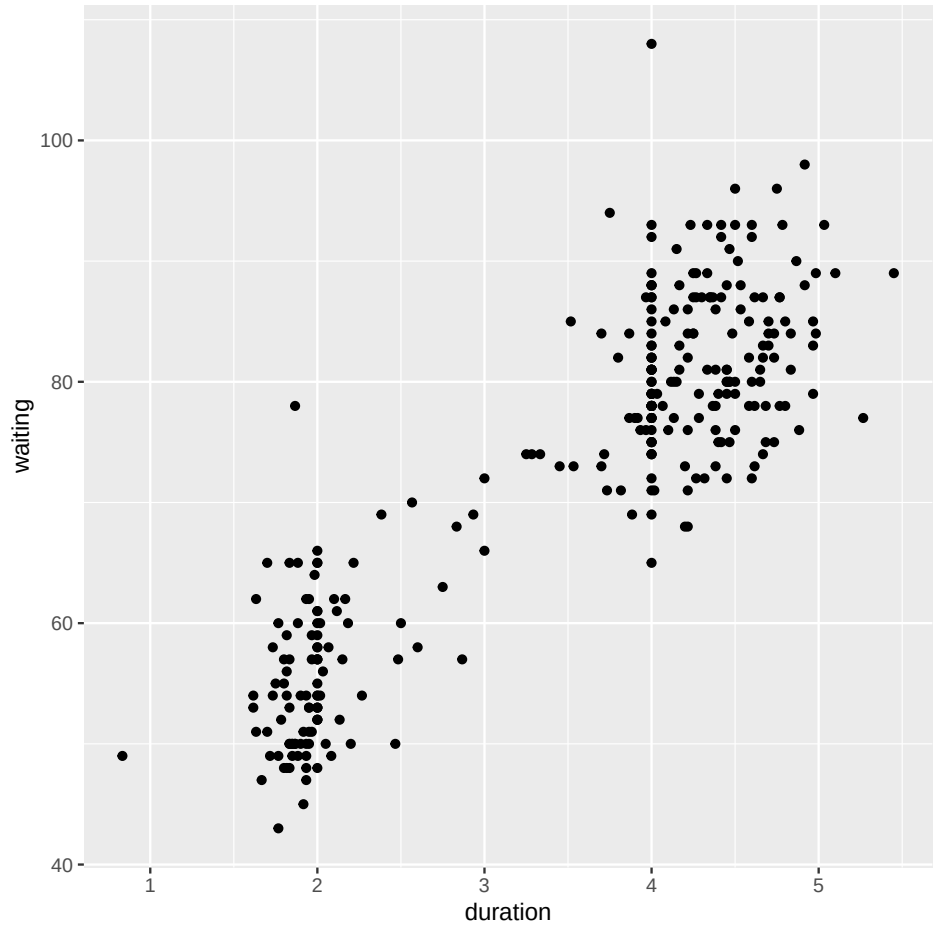
(b) (2 Points) Recreate the graph below using ggplot2. Include your R code and the resulting graph.

```
> ggplot(geyser, aes(x=duration, y=waiting)) +
+   geom_point() +
+   xlab("Duration") +
+   ylab("Waiting") +
+   xlim(0, 6) +
+   ylim(40, 120) +
+   ggtitle("Old Faithful Data") +
+   theme(plot.title = element_text(hjust = 0.5))
```



(c) (2 Points) Doesn't the scatterplot in (b) above look rather different than the scatterplot in Question 1 (j)? Note that the help page for *geyser* states `waiting numeric Waiting time for this eruption` and `The waiting time was incorrectly described as the time to the next eruption in the original files, and corrected for MASS version 7.3-30.` Use this information to create a basic scatterplot for the *geyser* data that matches the overall appearance in Question 1 (j). Include your R code and the resulting graph. No need to refine this scatterplot.

```
> duration <- geyser$duration[1:298]
> waiting <- geyser$waiting[2:299]
> df <- data.frame(duration, waiting)
> ggplot(df, aes(x = duration, y = waiting )) +
+          geom_point()
```



Answer: The geyser data appears to have a negative correlation with three clusters where the faithful data has a positive correlation with 2 clusters.

General Instructions

(i) <Instruction 1>

(ii) <Instruction 2>