Student name: Betty Wong
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Bike Sharing Data Exploration

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
#library(stats)

hour_2013 <- read.csv(file="D:/Capston/2013_Hour_By_Tract.csv", header=TRUE,
sep=",",
                      stringsAsFactors = FALSE)

hour_2013$dteday <- as.Date(hour_2013$dteday)
hour_2013$mday <- as.integer(format(hour_2013$dteday, "%d"))

hour_2013 <- subset(hour_2013, select = -c(yr, atemp))

str(hour_2013)

## 'data.frame':    399458 obs. of  17 variables:
##  $ dteday    : Date, format: "2013-01-01" "2013-01-01" ...
##  $ tractID   : int  2 8 16 17 19 21 29 30 32 36 ...
##  $ jday      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ season    : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ mth       : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ hr        : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ holiday   : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ weekday   : int  2 2 2 2 2 2 2 2 2 2 ...
##  $ workingday: int  0 0 0 0 0 0 0 0 0 0 ...
##  $ weather   : int  2 2 2 2 2 2 2 2 2 2 ...
##  $ temp      : num  3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 ...
##  $ humidity  : int  68 68 68 68 68 68 68 68 68 68 ...
##  $ windspeed : num  11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 ...
##  $ casual    : int  0 0 0 0 0 0 1 2 0 0 ...
##  $ registered: int  1 1 1 1 2 1 3 3 1 4 ...
##  $ cnt       : int  1 1 1 1 2 1 4 5 1 4 ...
##  $ mday      : int  1 1 1 1 1 1 1 1 1 1 ...

summary(hour_2013)

##      dteday              tractID           jday           season
##  Min.   :2013-01-01   Min.   :  1.00   Min.   :  1.0   Min.   :1.000
##  1st Qu.:2013-04-19   1st Qu.: 25.00   1st Qu.:109.0   1st Qu.:2.000
```

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```
##  Median :2013-07-14   Median : 40.00   Median :195.0   Median :3.000
##  Mean   :2013-07-09   Mean   : 44.47   Mean   :190.7   Mean   :2.596
##  3rd Qu.:2013-10-02   3rd Qu.: 67.00   3rd Qu.:275.0   3rd Qu.:4.000
##  Max.   :2013-12-31   Max.   :113.00   Max.   :365.0   Max.   :4.000
##       mth               hr           holiday           weekday
##  Min.   : 1.000   Min.   : 0.00   Min.   :0.00000   Min.   :0.000
##  1st Qu.: 4.000   1st Qu.: 9.00   1st Qu.:0.00000   1st Qu.:1.000
##  Median : 7.000   Median :14.00   Median :0.00000   Median :3.000
##  Mean   : 6.781   Mean   :13.22   Mean   :0.02707   Mean   :3.039
##  3rd Qu.:10.000   3rd Qu.:18.00   3rd Qu.:0.00000   3rd Qu.:5.000
##  Max.   :12.000   Max.   :23.00   Max.   :1.00000   Max.   :6.000
##    workingday        weather           temp          humidity
##  Min.   :0.0000   Min.   :1.000   Min.   :-8.90   Min.   : 12.0
##  1st Qu.:0.0000   1st Qu.:1.000   1st Qu.: 8.30   1st Qu.: 44.0
##  Median :1.0000   Median :2.000   Median :17.20   Median : 58.0
##  Mean   :0.6847   Mean   :1.702   Mean   :16.52   Mean   : 58.8
##  3rd Qu.:1.0000   3rd Qu.:2.000   3rd Qu.:24.40   3rd Qu.: 74.0
##  Max.   :1.0000   Max.   :4.000   Max.   :35.00   Max.   :100.0
##    windspeed         casual          registered          cnt
##  Min.   : 1.00   Min.   :  0.000   Min.   :  0.000   Min.   :  1.000
##  1st Qu.: 9.30   1st Qu.:  0.000   1st Qu.:  1.000   1st Qu.:  1.000
##  Median :14.80   Median :  0.000   Median :  3.000   Median :  3.000
##  Mean   :15.36   Mean   :  1.304   Mean   :  5.163   Mean   :  6.467
##  3rd Qu.:19.91   3rd Qu.:  1.000   3rd Qu.:  6.000   3rd Qu.:  7.000
##  Max.   :53.70   Max.   :241.000   Max.   :169.000   Max.   :289.000
##       mday
##  Min.   : 1.00
##  1st Qu.: 8.00
##  Median :16.00
##  Mean   :15.67
##  3rd Qu.:23.00
##  Max.   :31.00
```

```
par(mfrow = c(1, 2), mar = c(3, 3, 2, 0))

casual <- aggregate(casual~jday+hr, data=hour_2013, FUN=sum)
registered <- aggregate(registered~jday+hr, data=hour_2013, FUN=sum)
cnt <- aggregate(cnt~jday+hr, data=hour_2013, FUN=sum)

boxplot(casual$casual ~ casual$hr,
        main = "Casual users",
        las = 2, cex.axis = 0.75, xlab="hour",
        col = "orange"        )

boxplot(registered$registered ~ registered$hr,
        main = "Registered users",
        las = 2, cex.axis = 0.75, xlab="hour",
        col = "lightcoral")
```

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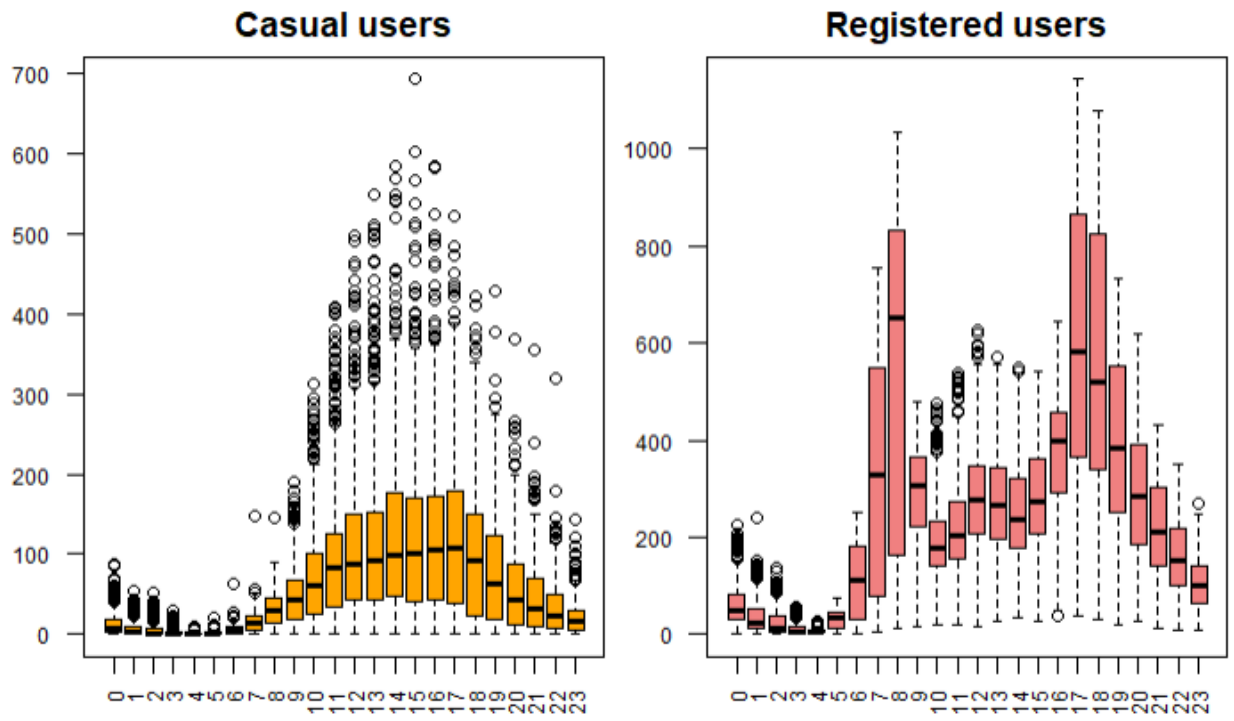


```
par(mfrow = c(1, 2), mar = c(3, 3, 2, 0))
boxplot(cnt$cnt ~ cnt$hr,
        main = "All users",
        las = 2, cex.axis = 0.75, xlab="hour",
        col = "forestgreen")
```

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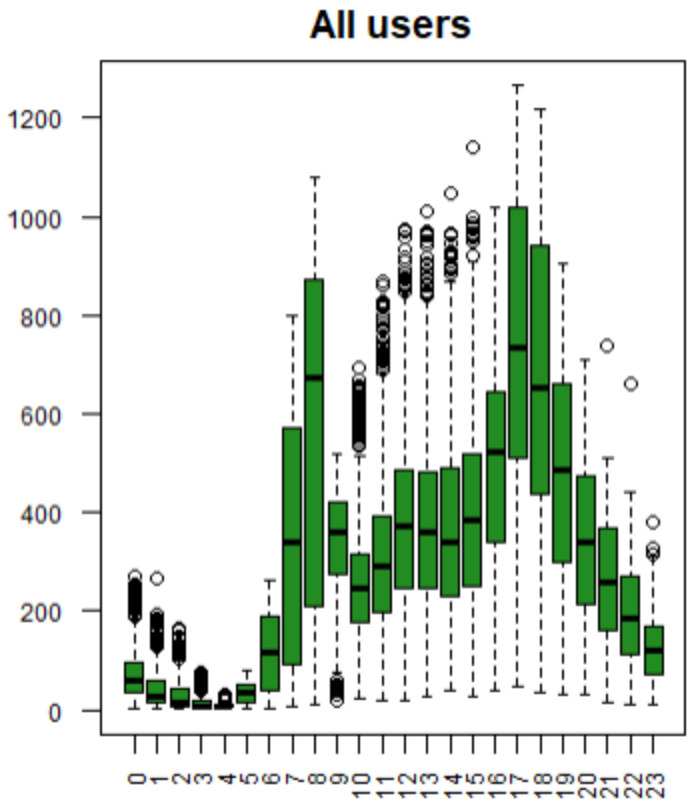


```
par(mfrow = c(1, 3), mar = c(4, 4, 2, 0))

hist(hour_2013$temp, col = "darkorange4", xlab = "Temperature", ylab = "Count
", main = NULL)
hist(hour_2013$humidity, col = "lightcoral", xlab = "Humidity", ylab = "Count
", main = NULL)
hist(hour_2013$windspeed, col = "lavenderblush4", xlab = "Windspeed", ylab =
"Count", main = NULL)

mtext("Distribution of data points over temp, humidity and windspeed", side =
3, line = -1.5, outer = TRUE, cex = 1.5)
```

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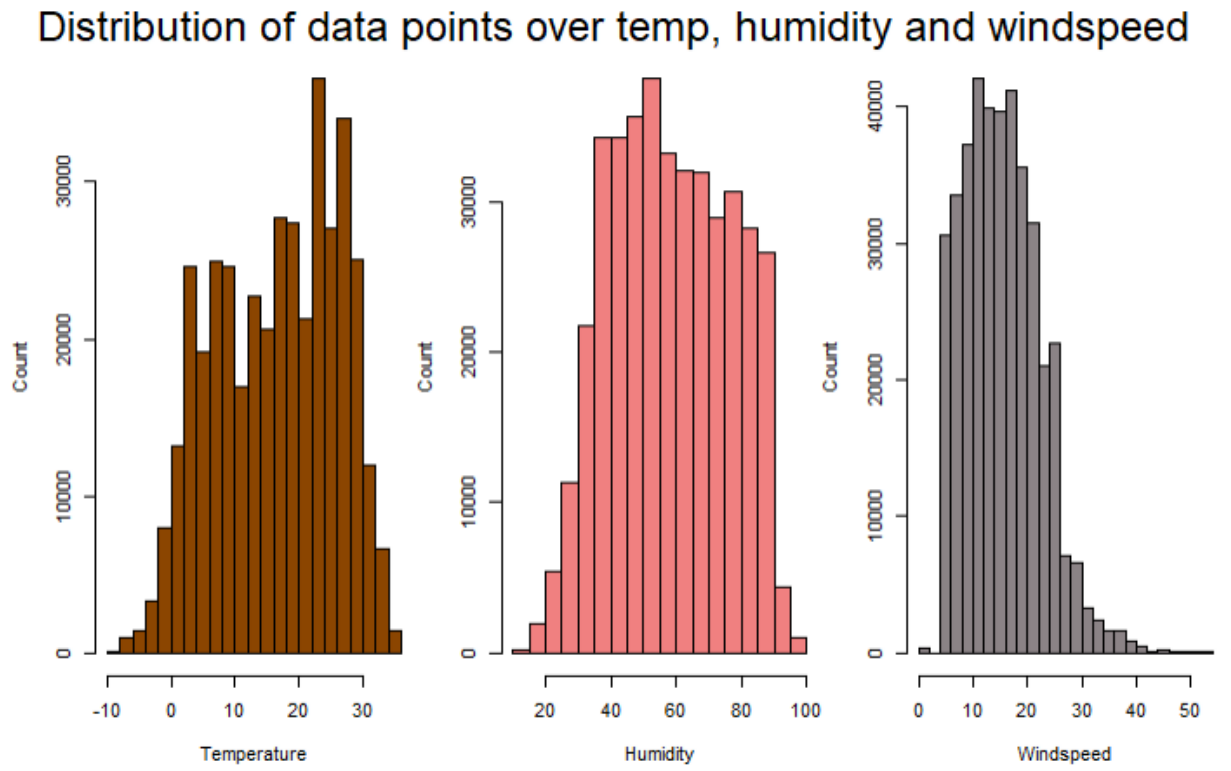


```
par(mfrow = c(1, 3), mar = c(4, 4, 2, 0))

hist(hour_2013$weather[hour_2013$casual > 0], col = "darkorange4", xlab = "Ca
sual users", ylab = "Count", main = NULL, xaxt ='n')
axis(side = 1, at = seq(1, 4, 1), labels = c("Very good", "Good", "Bad", "Wor
st"))
hist(hour_2013$weather[hour_2013$registered > 0], col = "lightcoral", xlab =
"Registered users", ylab = "Count", main = NULL, xaxt ='n')
axis(side = 1, at = seq(1, 4, 1), labels = c("Very good", "Good", "Bad", "Wor
st"))
hist(hour_2013$weather, col = "lavenderblush4", xlab = "All users", ylab = "C
ount", main = NULL, xaxt ='n')
axis(side = 1, at = seq(1, 4, 1), labels = c("Very good", "Good", "Bad", "Wor
st"))

mtext("Distribution of data points over weather", side = 3, line = -1.5, oute
r = TRUE, cex = 1.5)
```

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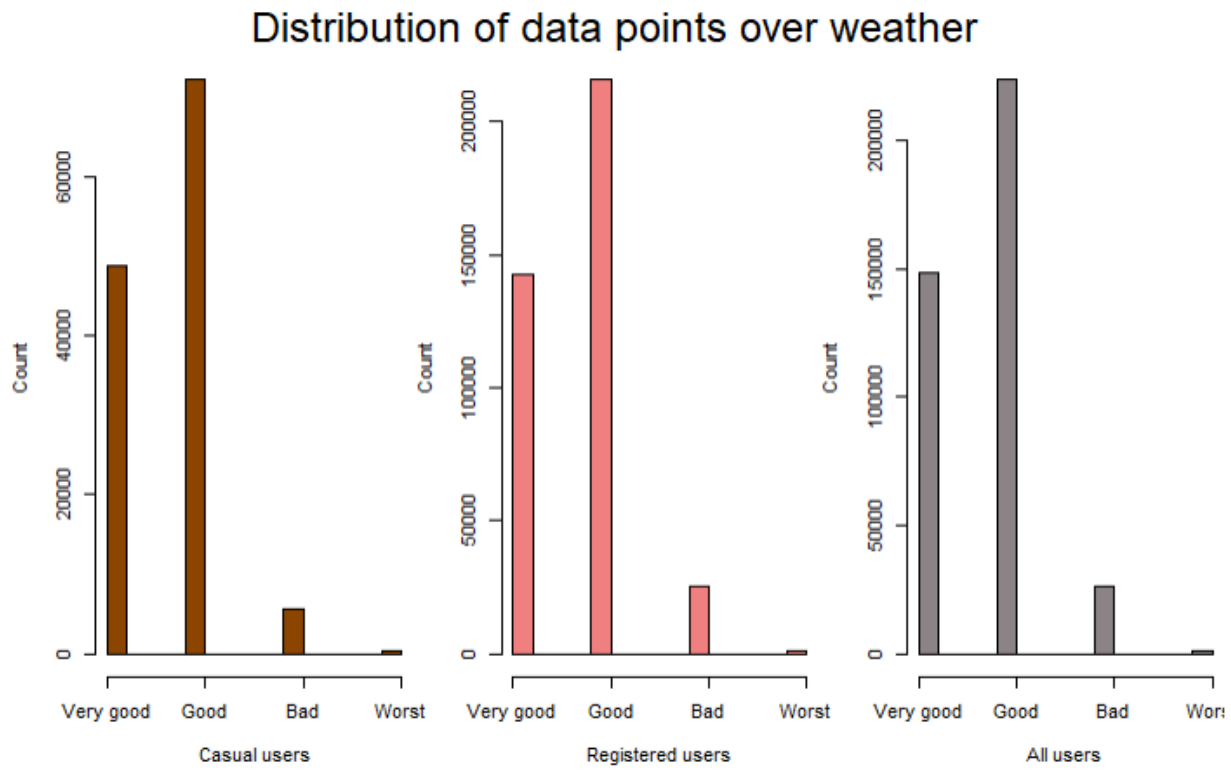


```
par(mfrow = c(1, 3), mar = c(4, 4, 2, 0))

hist(hour_2013$season[hour_2013$casual > 0], col = "darkorange4", xlab = "Cas
ual users", ylab = "Count", main = NULL, xaxt ='n')
axis(side = 1, at = seq(1, 4, 1), labels = c("Spring", "Summer", "Fall", "Win
ter"))
hist(hour_2013$season[hour_2013$registered > 0], col = "lightcoral", xlab = "
Registered users", ylab = "Count", main = NULL, xaxt ='n')
axis(side = 1, at = seq(1, 4, 1), labels = c("Spring", "Summer", "Fall", "Win
ter"))
hist(hour_2013$season, col = "lavenderblush4", xlab = "All users", ylab = "Co
unt", main = NULL, xaxt ='n')
axis(side = 1, at = seq(1, 4, 1), labels = c("Spring", "Summer", "Fall", "Win
ter"))

mtext("Distribution of data points over season", side = 3, line = -1.5, outer
= TRUE, cex = 1.5)
```

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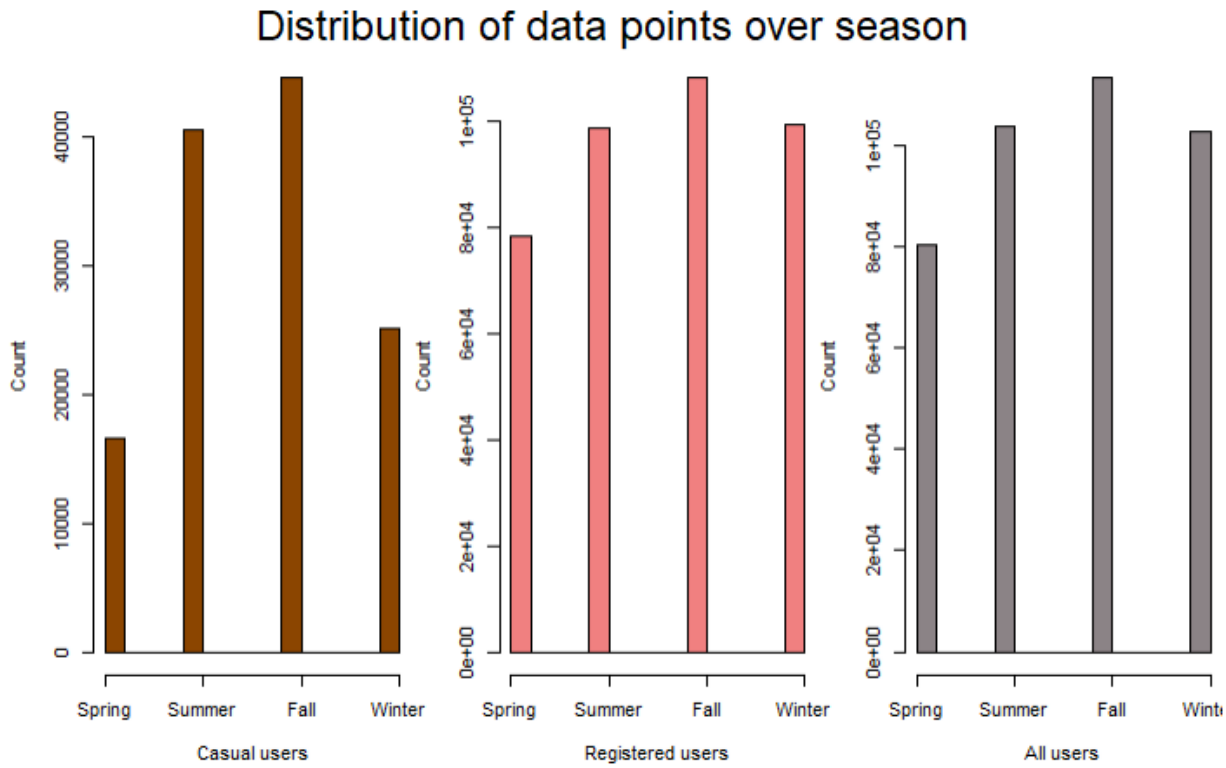


```
ly <- matrix(c(1,2,3,4,4,4), nrow = 2, ncol = 3, byrow = TRUE)
layout(mat = ly, heights = c(0.85, 0.15))
par(mar = c(0, 6, 4, 0))

casual <- aggregate(casual~hr+weather, data=hour_2013, FUN=sum)
registered <- aggregate(registered~hr+weather, data=hour_2013, FUN=sum)
cnt <- aggregate(cnt~hr+weather, data=hour_2013, FUN=sum)

boxplot(casual$casual ~ casual$weather,
        main = "Casual users",
        col = c("yellow", "orange", "forestgreen", "blue"),
        xaxt = "n", ylab = "bike count")
boxplot(registered$registered ~ registered$weather,
        main = "Registered users",
        col = c("yellow", "orange", "forestgreen", "blue"),
        xaxt = "n", ylab = "bike count")
boxplot(cnt$cnt ~ cnt$weather,
        main = "Total Count",
        col = c("yellow", "orange", "forestgreen", "blue"),
        xaxt = "n", ylab = "bike count")
mtext("Weather - 2013", side = 3, line = -1.5, outer = TRUE, cex = 1.5)

par(mar = c(0, 0, 0, 0))
plot(1, type = "n", axes=FALSE, xlab = "", ylab = "")
legend("center", inset = 0,
       legend = c("very good", "good", "bad", "very bad"),
```

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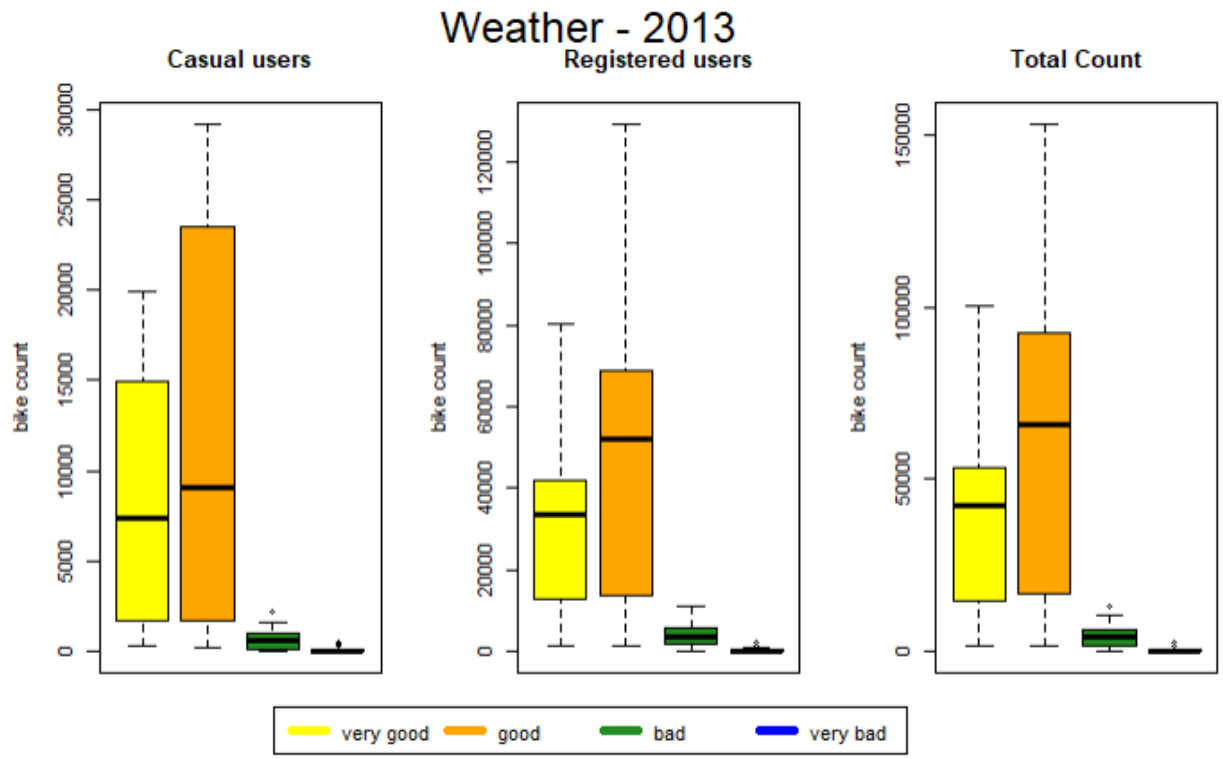
```
       col = c("yellow", "orange", "forestgreen", "blue"),
       lwd = 5, cex = 1, horiz = TRUE)
```



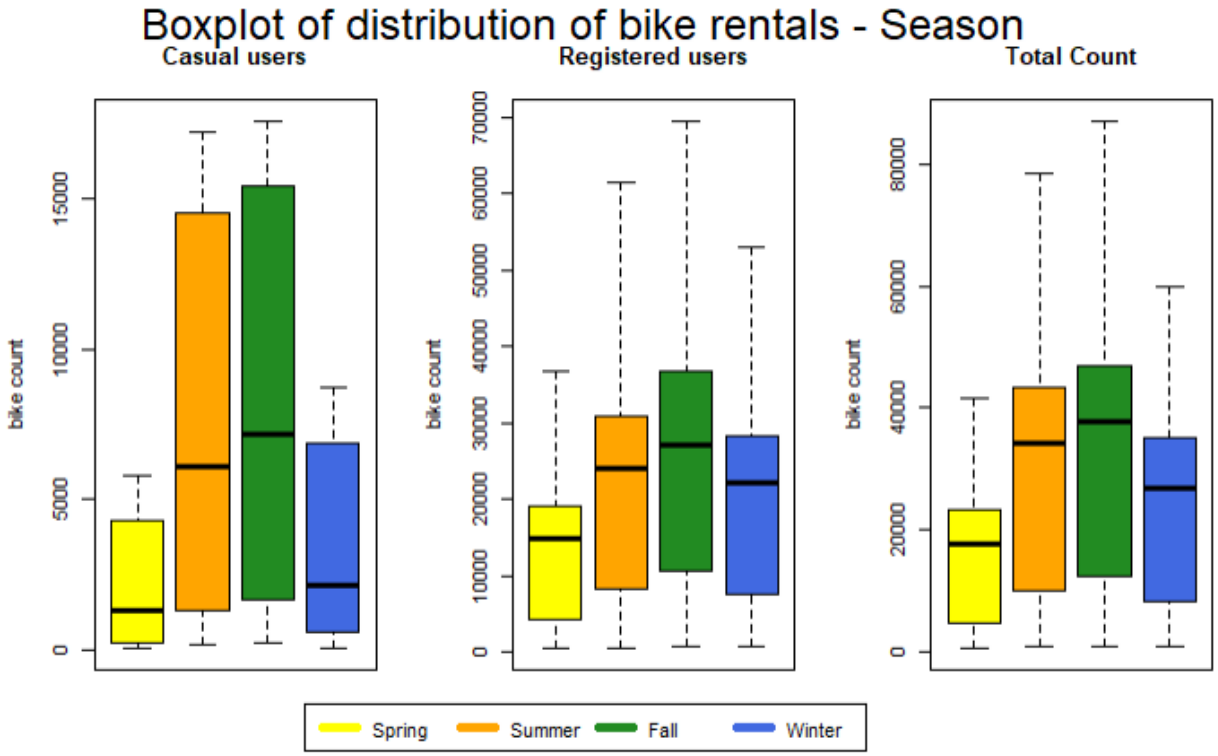

```
ly <- matrix(c(1,2,3,4,4,4), nrow = 2, ncol = 3, byrow = TRUE)
layout(mat = ly, heights = c(0.85, 0.15))
par(mar = c(0, 6, 4, 0))

casual <- aggregate(casual~hr+season, data=hour_2013, FUN=sum)
registered <- aggregate(registered~hr+season, data=hour_2013, FUN=sum)
cnt <- aggregate(cnt~hr+season, data=hour_2013, FUN=sum)

boxplot(casual$casual ~ casual$season,
        main = "Casual users",
        col = c("yellow", "orange", "forestgreen", "royalblue"),
        xaxt = "n", ylab = "bike count")
boxplot(registered$registered ~ registered$season,
        main = "Registered users",
        col = c("yellow", "orange", "forestgreen", "royalblue"),
        xaxt = "n", ylab = "bike count")
boxplot(cnt$cnt ~ cnt$season,
        main = "Total Count",
        col = c("yellow", "orange", "forestgreen", "royalblue"),
        xaxt = "n", ylab = "bike count")
mtext("Boxplot of distribution of bike rentals - Season", side = 3, line = -1
.5, outer = TRUE, cex = 1.5)

par(mar = c(0, 0, 0, 0))
```

```
plot(1, type = "n", axes=FALSE, xlab = "", ylab = "")
legend("center", inset = 0,
       legend = c("Spring", "Summer", "Fall", "Winter"),
       col = c("yellow", "orange", "forestgreen", "royalblue"),
       lwd = 5, cex = 1, horiz = TRUE)
```

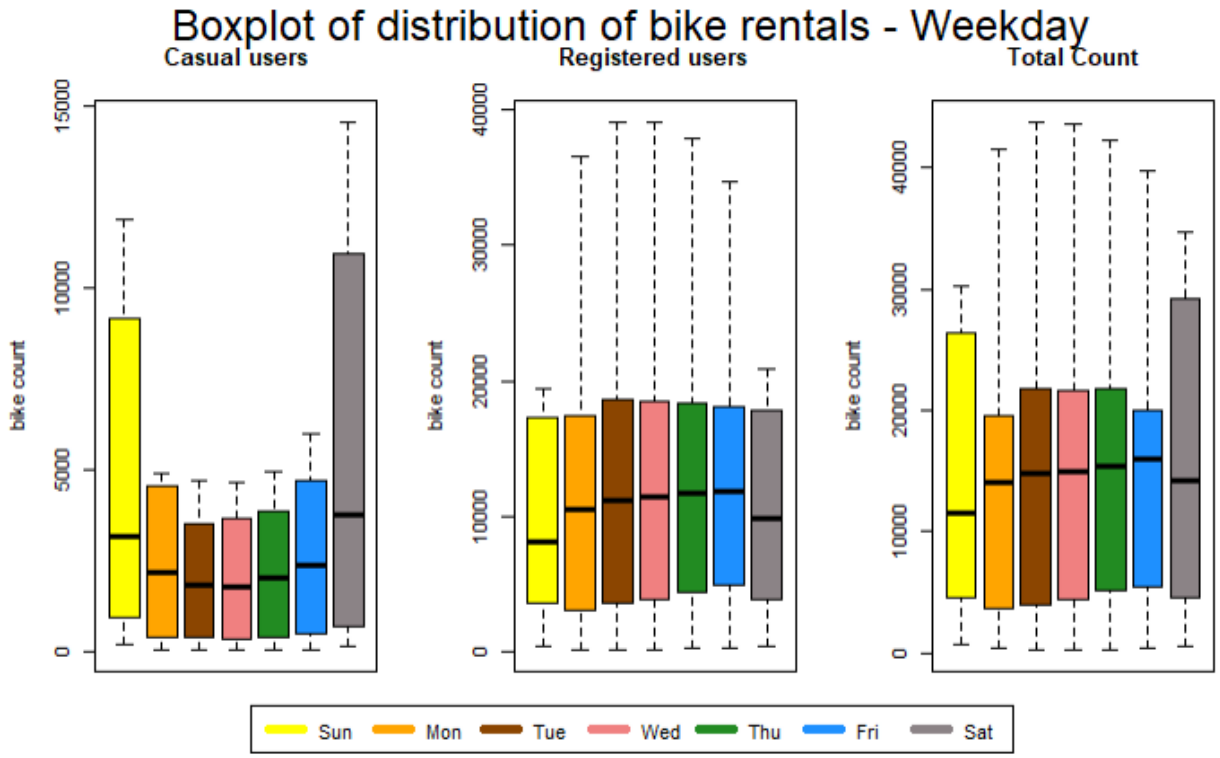



```
ly <- matrix(c(1,2,3,4,4,4), nrow = 2, ncol = 3, byrow = TRUE)
cols <- c("yellow", "orange", "darkorange4", "lightcoral", "forestgreen", "do
dgerblue", "lavenderblush4")
layout(mat = ly, heights = c(0.85, 0.15))
par(mar = c(0, 4, 4, 2))

casual <- aggregate(casual~hr+weekday, data=hour_2013, FUN=sum)
registered <- aggregate(registered~hr+weekday, data=hour_2013, FUN=sum)
cnt <- aggregate(cnt~hr+weekday, data=hour_2013, FUN=sum)

boxplot(casual$casual ~ casual$weekday,
        main = "Casual users",
        col = cols, xaxt = "n", ylab = "bike count")
boxplot(registered$registered ~ registered$weekday,
        main = "Registered users",
        col = cols, xaxt = "n", ylab = "bike count")
boxplot(cnt$cnt ~ cnt$weekday,
        main = "Total Count",
        col = cols, xaxt = "n", ylab = "bike count")
mtext("Boxplot of distribution of bike rentals - Weekday", side = 3, line = -
1.5, outer = TRUE, cex = 1.5)
```

```
par(mar = c(0, 0, 0, 0))
plot(1, type = "n", axes=FALSE, xlab = "", ylab = "")
legend("center", inset = 0,
       legend = c("Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat"),
       col = cols, lwd = 5, cex = 1, horiz = TRUE)
```




```
library(ggplot2)

data <- aggregate(cnt~mday, data=hour_2013, FUN=sum)
data$registered <- (aggregate(registered~mday, data=hour_2013, FUN=sum))$regi
stered
data$casual <- (aggregate(casual~mday, data=hour_2013, FUN=sum))$casual

p <- ggplot(data=data, aes(x=mday)) +
    geom_line(aes(y = cnt, color = 'Total')) +
    geom_point(aes(y = cnt, color = 'Total')) +
    geom_line(aes(y = registered, color = 'Registered')) +
    geom_point(aes(y = registered, color = 'Registered')) +
    geom_line(aes(y = casual, color = 'Casual')) +
    geom_point(aes(y = casual, color = 'Casual'))

p + ggtitle("Distribution of bike rentals according to day of Month") +
    xlab("Day of month") +
    ylab("Bike counts") +
    scale_color_manual("", breaks=c('Total','Registered','Casual'),
                       values = c('orange','dodgerblue','forestgreen'))
```

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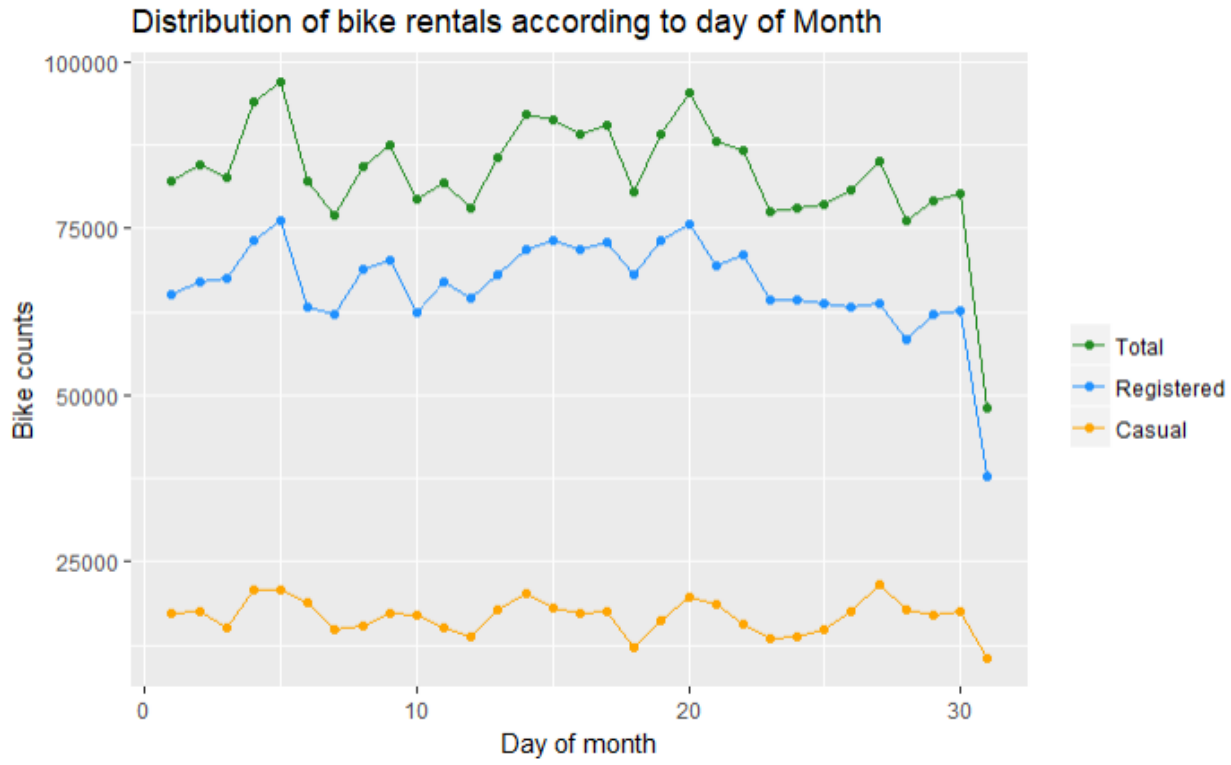
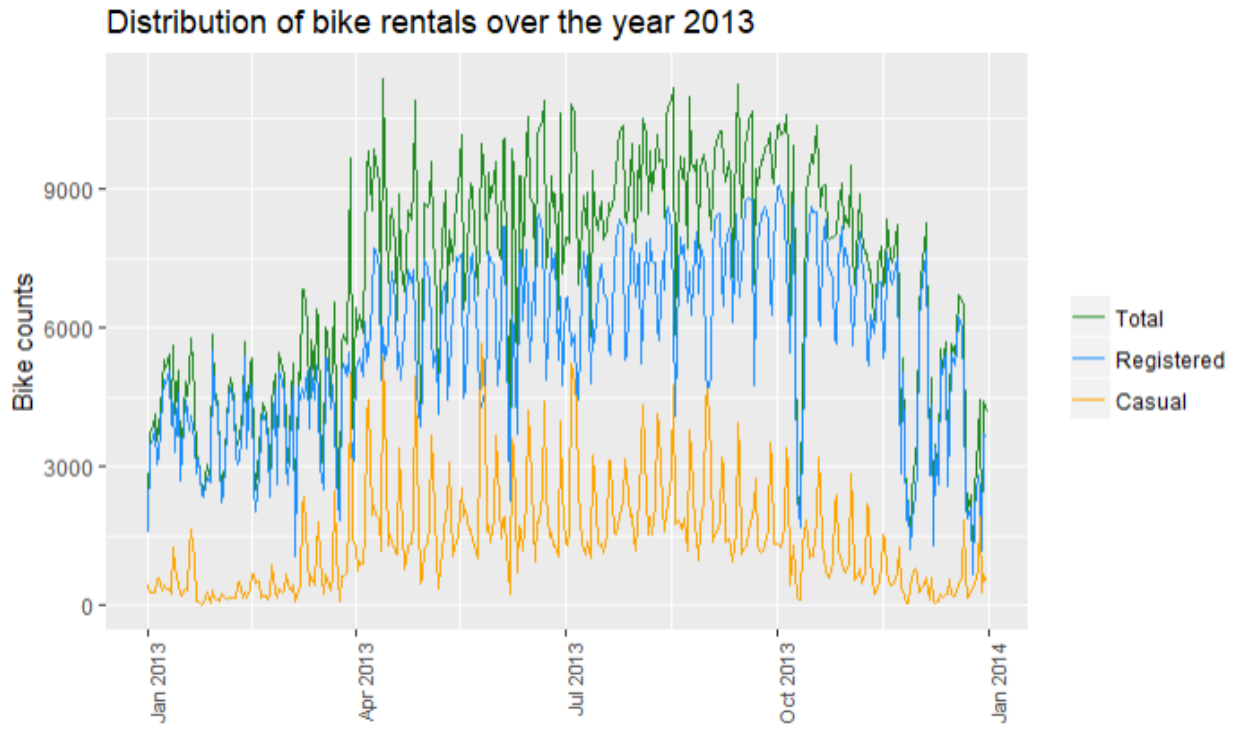
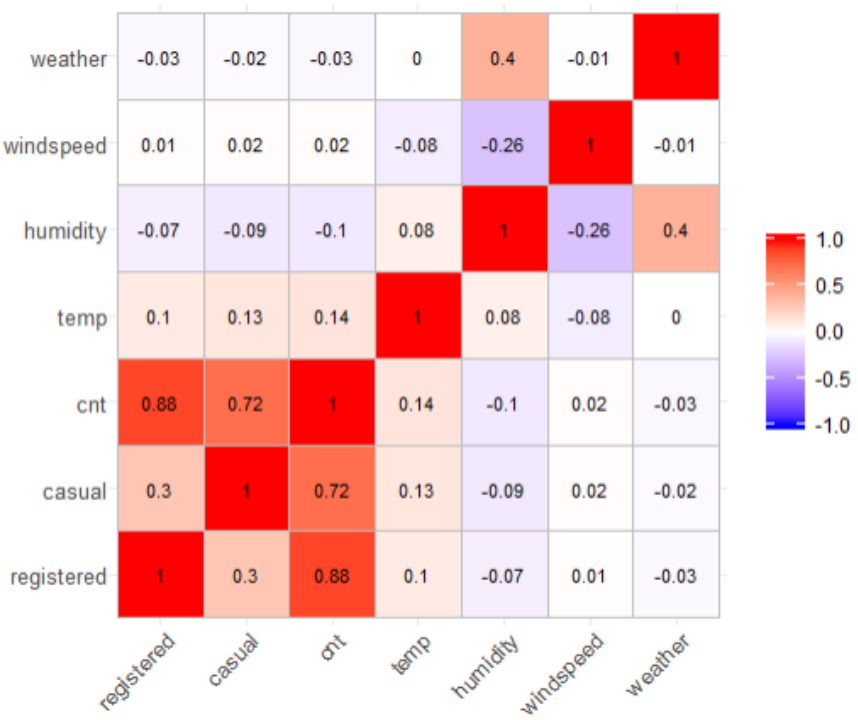



```
library(ggplot2)

data <- aggregate(cnt~dteday, data=hour_2013, FUN=sum)
data$registered <- (aggregate(registered~dteday, data=hour_2013, FUN=sum))$re
gistered
data$casual <- (aggregate(casual~dteday, data=hour_2013, FUN=sum))$casual

p <- ggplot(data=data, aes(x=dteday)) +
    geom_line(aes(y = cnt, color = 'Total')) +
#    geom_point(aes(y = cnt, color = 'Total')) +
    geom_line(aes(y = registered, color = 'Registered')) +
#    geom_point(aes(y = registered, color = 'Registered')) +
    geom_line(aes(y = casual, color = 'Casual'))
#    geom_point(aes(y = casual, color = 'Casual'))

p + ggtitle("Distribution of bike rentals over the year 2013") +
    xlab("") +
    ylab("Bike counts") +
    theme(axis.text.x = element_text(angle = 90, hjust =1, size=8)) +
    scale_color_manual("", breaks=c('Total','Registered','Casual'),
                       values = c('orange','dodgerblue','forestgreen'))
```



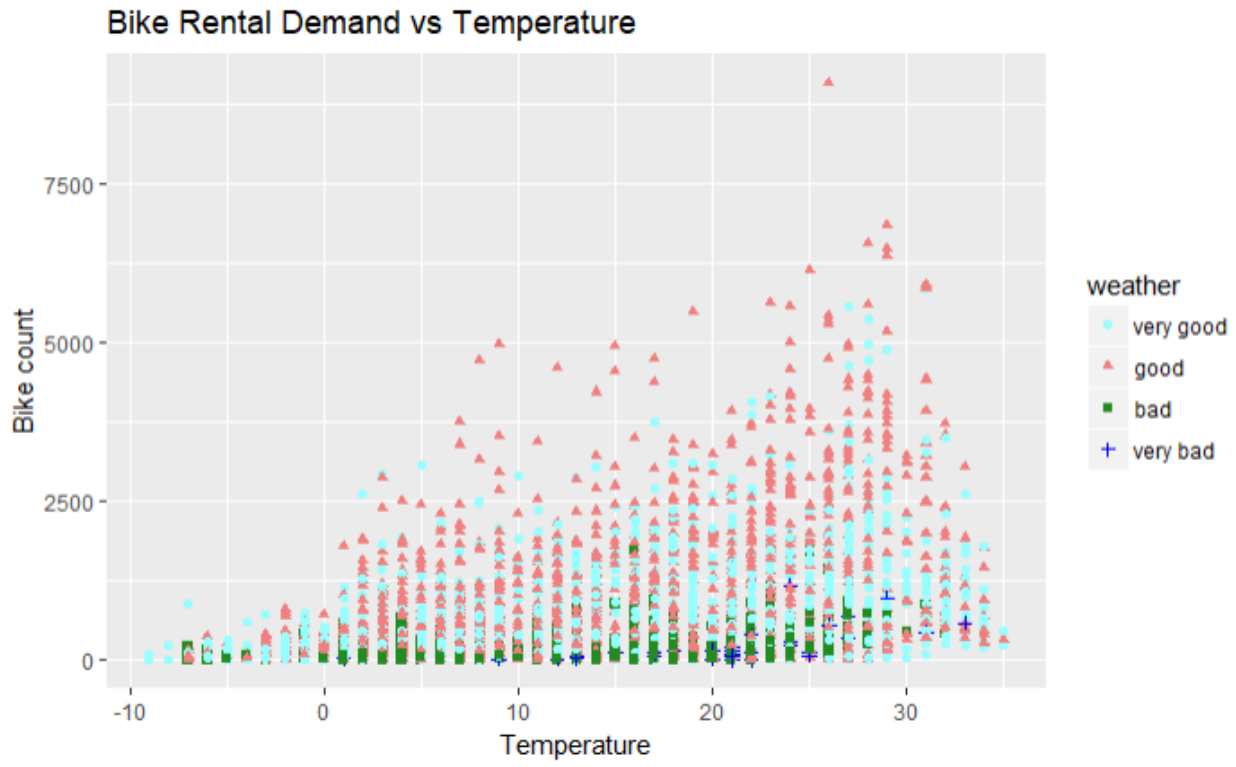

```
library(ggcorrplot)

## Warning: package 'ggcorrplot' was built under R version 3.4.2

library(polycor)

## Warning: package 'polycor' was built under R version 3.4.2

bike <- subset(hour_2013, select = c(registered, casual, cnt, temp, humidity,
windspeed, weather))
a <- hetcor(bike, ML = TRUE, std.err = TRUE, pd = TRUE, use = "complete.obs")

## Warning in hetcor.data.frame(bike, ML = TRUE, std.err = TRUE, pd = TRUE, :
## the correlation matrix has been adjusted to make it positive-definite

ggcorrplot(a["correlations"]$correlations, hc.order = FALSE, lab = TRUE,
           legend.title = "", lab_size = 3) +
  theme(axis.text.x = element_text(size = 10, angle = 45, margin=margin(-2,0,
0,0)),
        axis.text.y = element_text(size = 10, margin=margin(0,-2,0,0)))
```




```
hour_2013$tractID <- factor(hour_2013$tractID)
hour_2013$mth <- factor(hour_2013$mth,
                        levels = c(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12),
                        labels = c("Jan", "Feb", "Mar", "Apr", "May", "Jun",
"Jul", "Aug", "Sep", "Oct", "Nov", "Dec"),
                        ordered = TRUE)
hour_2013$hr <- factor(hour_2013$hr,
                        levels = c(0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,
17,18,19,20,21,22,23),
                        ordered = TRUE)
hour_2013$weekday <- factor(hour_2013$weekday,
                            levels = c(0, 1, 2, 3, 4, 5, 6),
                            labels = c("Sun", "Mon", "Tue", "Wed", "Thu", "F
ri", "Sat"))
hour_2013$workingday <- factor(hour_2013$workingday,
                               levels = c(0, 1),
                               labels = c("nonworkday", "workday"))
hour_2013$holiday <- factor(hour_2013$holiday)
hour_2013$weather <- factor(hour_2013$weather,
                            levels = c(1, 2, 3, 4),
                            labels = c("very good", "good", "bad", "very bad
"),
                            ordered = TRUE)
str(hour_2013)

## 'data.frame':    399458 obs. of  17 variables:
##  $ dteday    : Date, format: "2013-01-01" "2013-01-01" ...
##  $ tractID   : Factor w/ 113 levels "1","2","3","4",..: 2 8 16 17 19 21 29
```

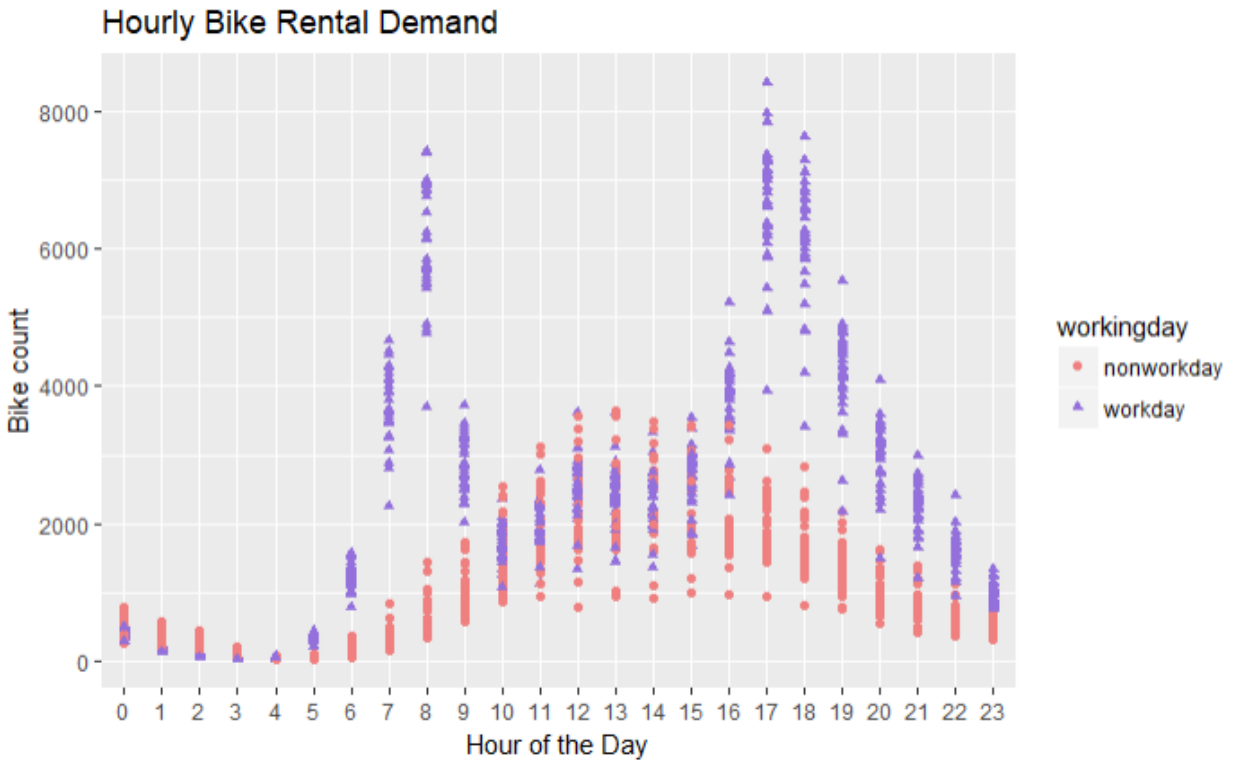
```
30 32 36 ...
##  $ jday      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ season    : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ mth       : Ord.factor w/ 12 levels "Jan"<"Feb"<"Mar"<..: 1 1 1 1 1 1 1
1 1 1 ...
##  $ hr        : Ord.factor w/ 24 levels "0"<"1"<"2"<"3"<..: 1 1 1 1 1 1 1 1
1 1 ...
##  $ holiday   : Factor w/ 2 levels "0","1": 2 2 2 2 2 2 2 2 2 2 ...
##  $ weekday   : Factor w/ 7 levels "Sun","Mon","Tue",..: 3 3 3 3 3 3 3 3 3
3 ...
##  $ workingday: Factor w/ 2 levels "nonworkday","workday": 1 1 1 1 1 1 1 1
1 1 ...
##  $ weather   : Ord.factor w/ 4 levels "very good"<"good"<..: 2 2 2 2 2 2 2
2 2 2 ...
##  $ temp      : num  3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 ...
##  $ humidity  : int  68 68 68 68 68 68 68 68 68 68 ...
##  $ windspeed : num  11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 11.1 ...
##  $ casual    : int  0 0 0 0 0 0 1 2 0 0 ...
##  $ registered: int  1 1 1 1 2 1 3 3 1 4 ...
##  $ cnt       : int  1 1 1 1 2 1 4 5 1 4 ...
##  $ mday      : int  1 1 1 1 1 1 1 1 1 1 ...
```

```
library(ggplot2)

data <- aggregate(cnt~temp+weather+hr, data=hour_2013, FUN=sum)

p <- ggplot(data, aes(round(temp, digits = 0), cnt,
                      group = weather, colour = weather,
                      shape = weather)) +
  geom_point() +
  xlab("Temperature") +
  ylab("Bike count") +
  ggtitle("Bike Rental Demand vs Temperature")

p + scale_colour_manual("weather",
                        values = c("darkslategray1", "lightcoral", "forestgre
en", "blue"))
```

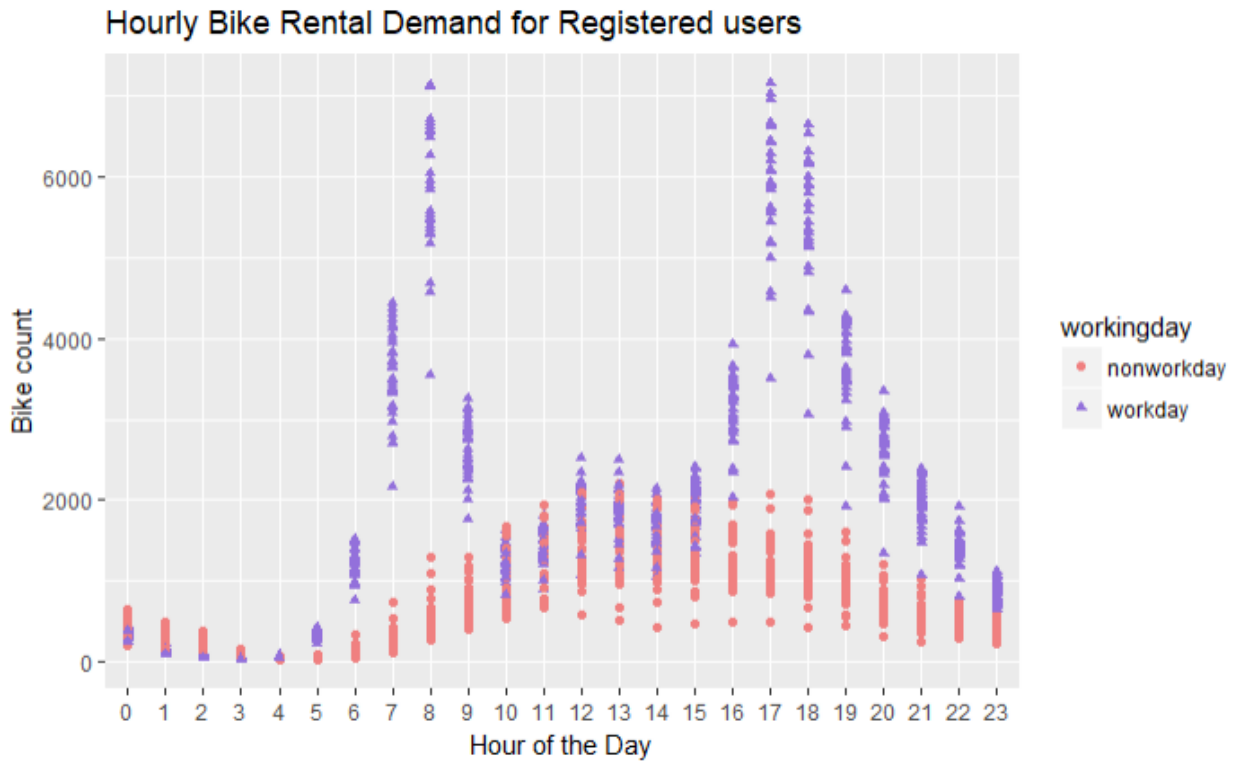



```
library(ggplot2)

data <- aggregate(cnt~workingday+hr+mday, data=hour_2013, FUN=sum)

p1 <- ggplot(data, aes(hr, cnt,
                       group = workingday, colour = workingday,
                       shape = workingday)) +
  geom_point() +
  xlab("Hour of the Day") +
  ylab("Bike count") +
  ggtitle("Hourly Bike Rental Demand")
p1 + scale_colour_manual(values = c("lightcoral", "mediumpurple"))
```

Student name: Betty Wong
Student number: 500-802-428




```
library(ggplot2)
data <- aggregate(registered~workingday+hr+mday, data=hour_2013, FUN=sum)

p <- ggplot(data, aes(hr, registered,
                      group = workingday, colour = workingday,
                      shape = workingday)) +
  geom_point() +
  xlab("Hour of the Day") +
  ylab("Bike count") +
  ggtitle("Hourly Bike Rental Demand for Registered users")
p + scale_colour_manual(values = c("lightcoral", "mediumpurple"))
```




```
library(ggplot2)
data <- aggregate(casual~workingday+hr+mday, data=hour_2013, FUN=sum)

p <- ggplot(data, aes(hr, casual,
                      group = workingday, colour = workingday,
                      shape = workingday)) +
  geom_point() +
  xlab("Hour of the Day") +
  ylab("Bike count") +
  ggtitle("Hourly Bike Rental Demand for Casual users")
p + scale_colour_manual(values = c("lightcoral", "mediumpurple"))
```

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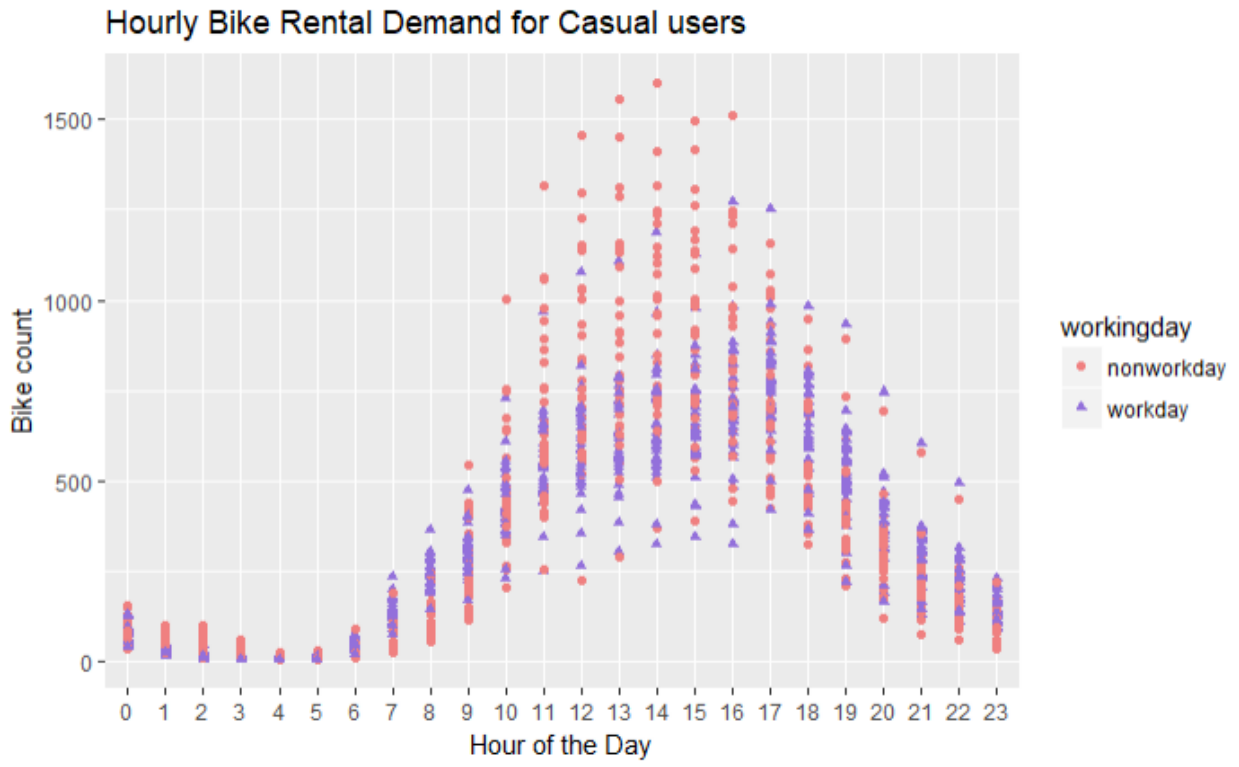
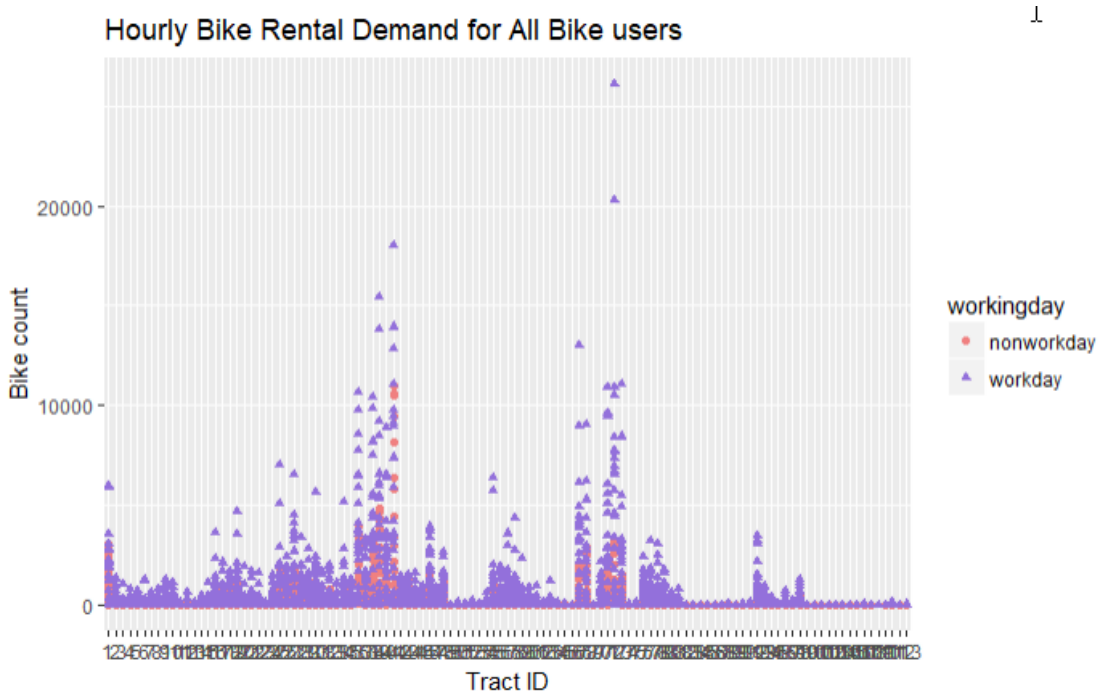



```
library(ggplot2)
data <- aggregate(cnt~tractID+hr+workingday, data=hour_2013, FUN=sum)

p <- ggplot(data, aes(tractID, cnt,
                      group = workingday, colour = workingday,
                      shape = workingday)) +
  geom_point() +
  xlab("Tract ID") +
  ylab("Bike count") +
  ggtitle("Hourly Bike Rental Demand for All Bike users")
p + scale_colour_manual(values = c("lightcoral", "mediumpurple"))
```




```
library(ggplot2)

data <- aggregate(registered~tractID+hr+workingday, data=hour_2013, FUN=sum)

p <- ggplot(data, aes(tractID, registered,
                      group = workingday, colour = workingday,
                      shape = workingday)) +
  geom_point() +
  xlab("Tract ID") +
  ylab("Bike count") +
  ggtitle("Hourly Bike Rental Demand for Registered users")
p + scale_colour_manual(values = c("lightcoral", "mediumpurple"))
```

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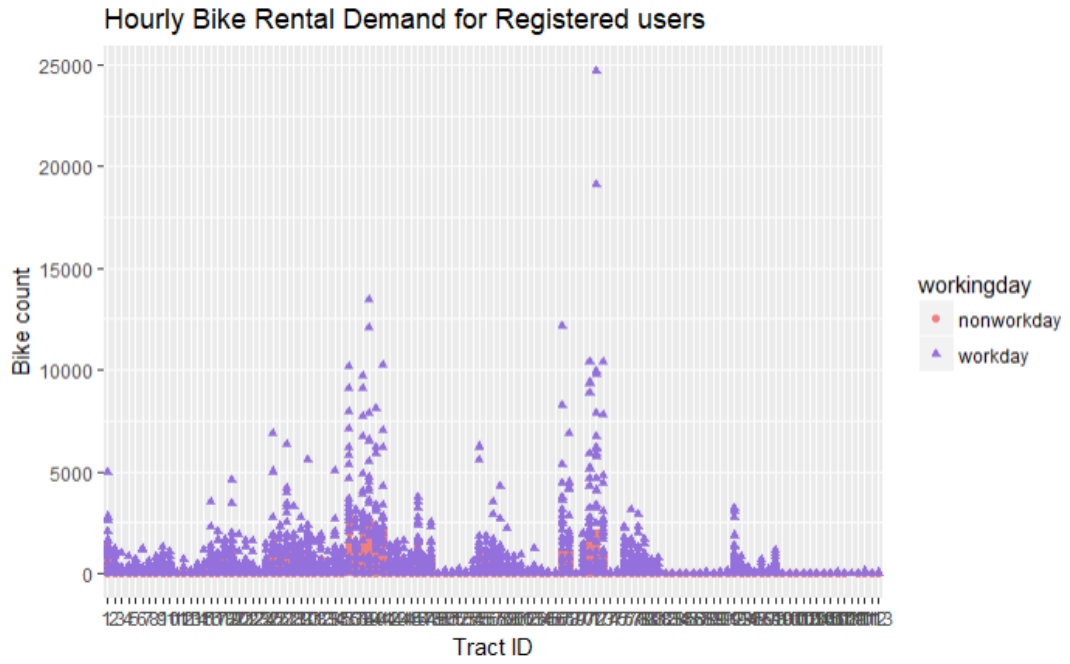
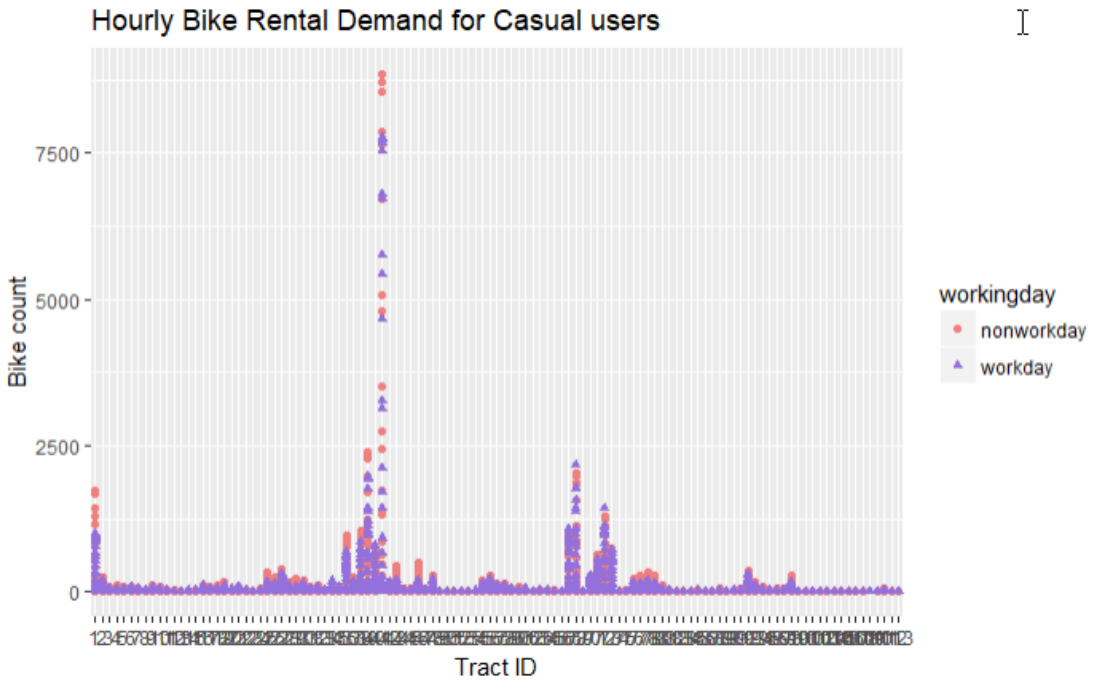



```
library(ggplot2)
data <- aggregate(casual~tractID+hr+workingday, data=hour_2013, FUN=sum)

p <- ggplot(data, aes(tractID, casual,
                      group = workingday, colour = workingday,
                      shape = workingday)) +
  geom_point() +
  xlab("Tract ID") +
  ylab("Bike count") +
  ggtitle("Hourly Bike Rental Demand for Casual users")
p + scale_colour_manual(values = c("lightcoral", "mediumpurple"))
```




```
minmax <- function(x) {
    return ((x - min(x)) / (max(x) - min(x)))
}
stdize <- function(x) {
    return (x / sd(x))
}

hour_2013 <- read.csv(file="D:/Capston/2013_Hour_By_Tract.csv", header=TRUE,
sep=",",
                      stringsAsFactors = FALSE)

hour_2013$dteday <- as.Date(hour_2013$dteday)
hour_2013$mday <- as.integer(format(hour_2013$dteday, "%d"))

hour_2013 <- subset(hour_2013, select = -c(dteday, yr, atemp))

hour_2013$tractID <- apply(as.matrix(hour_2013$tractID), 2, minmax)

hour_2013$hr <- apply(as.matrix(hour_2013$hr), 2, stdize)
hour_2013$weekday <- apply(as.matrix(hour_2013$weekday), 2, stdize)
hour_2013$weather <- apply(as.matrix(hour_2013$weather), 2, stdize)
hour_2013$temp <- apply(as.matrix(hour_2013$temp), 2, stdize)

hour_2013$windspeed <- log1p(hour_2013$windspeed)
hour_2013$casual <- log1p(hour_2013$casual)
hour_2013$registered <- log1p(hour_2013$registered)
```

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```
str(hour_2013)
```

```
## 'data.frame':    399458 obs. of  16 variables:
##  $ tractID   : num [1:399458, 1] 0.00893 0.0625 0.13393 0.14286 0.16071 ..
.
##  $ jday      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ season    : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ mth       : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ hr        : num [1:399458, 1] 0 0 0 0 0 0 0 0 0 0 ...
##  $ holiday   : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ weekday   : num [1:399458, 1] 0.999 0.999 0.999 0.999 0.999 ...
##  $ workingday: int  0 0 0 0 0 0 0 0 0 0 ...
##  $ weather   : num [1:399458, 1] 3.33 3.33 3.33 3.33 3.33 ...
##  $ temp      : num [1:399458, 1] 0.348 0.348 0.348 0.348 0.348 ...
##  $ humidity  : int  68 68 68 68 68 68 68 68 68 68 ...
##  $ windspeed : num  2.49 2.49 2.49 2.49 2.49 ...
##  $ casual    : num  0 0 0 0 0 ...
##  $ registered: num  0.693 0.693 0.693 0.693 1.099 ...
##  $ cnt       : int  1 1 1 1 2 1 4 5 1 4 ...
##  $ mday      : int  1 1 1 1 1 1 1 1 1 1 ...
```

```
summary(hour_2013)
```

```
##      tractID.V1           jday           season           mth
##  Min.   :0.0000000   Min.   :  1.0   Min.   :1.000   Min.   : 1.000
##  1st Qu.:0.2142857   1st Qu.:109.0   1st Qu.:2.000   1st Qu.: 4.000
##  Median :0.3482143   Median :195.0   Median :3.000   Median : 7.000
##  Mean   :0.3881064   Mean   :190.7   Mean   :2.596   Mean   : 6.781
##  3rd Qu.:0.5892857   3rd Qu.:275.0   3rd Qu.:4.000   3rd Qu.:10.000
##  Max.   :1.0000000   Max.   :365.0   Max.   :4.000   Max.   :12.000
##        hr.V1           holiday           weekday.V1        workingday
##  Min.   :0.000000   Min.   :0.00000   Min.   :0.0000000   Min.   :0.0000
##  1st Qu.:1.528959   1st Qu.:0.00000   1st Qu.:0.4993343   1st Qu.:0.0000
##  Median :2.378380   Median :0.00000   Median :1.4980029   Median :1.0000
##  Mean   :2.245595   Mean   :0.02707   Mean   :1.5174958   Mean   :0.6847
##  3rd Qu.:3.057918   3rd Qu.:0.00000   3rd Qu.:2.4966715   3rd Qu.:1.0000
##  Max.   :3.907339   Max.   :1.00000   Max.   :2.9960058   Max.   :1.0000
##      weather.V1          temp.V1          humidity       windspeed
##  Min.   :1.663926   Min.   :-0.938404   Min.   : 12.0   Min.   :0.6931
##  1st Qu.:1.663926   1st Qu.: 0.875140   1st Qu.: 44.0   1st Qu.:2.3321
##  Median :3.327853   Median : 1.813544   Median : 58.0   Median :2.7600
##  Mean   :2.831367   Mean   : 1.742316   Mean   : 58.8   Mean   :2.7064
##  3rd Qu.:3.327853   3rd Qu.: 2.572702   3rd Qu.: 74.0   3rd Qu.:3.0402
##  Max.   :6.655705   Max.   : 3.690351   Max.   :100.0   Max.   :4.0019
##      casual         registered          cnt               mday
##  Min.   :0.0000   Min.   :0.0000   Min.   :  1.000   Min.   : 1.00
##  1st Qu.:0.0000   1st Qu.:0.6931   1st Qu.:  1.000   1st Qu.: 8.00
##  Median :0.0000   Median :1.3863   Median :  3.000   Median :16.00
##  Mean   :0.3943   Mean   :1.4314   Mean   :  6.467   Mean   :15.67
```

```
##  3rd Qu.:0.6931   3rd Qu.:1.9459   3rd Qu.:  7.000   3rd Qu.:23.00
##  Max.   :5.4889   Max.   :5.1358   Max.   :289.000   Max.   :31.00

library(partykit)

## Warning: package 'partykit' was built under R version 3.4.2

## Loading required package: grid

library(grid)


train=hour_2013[as.integer(substr(hour_2013$mday,9,10))<21,]
test=hour_2013[as.integer(substr(hour_2013$mday,9,10))>20,]

model = ctree(casual ~ tractID, data = hour_2013 )

print(model)

##
## Model formula:
## casual ~ tractID
##
## Fitted party:
## [1] root
## |   [2] tractID <= 0.30357
## |   |   [3] tractID <= 0: 0.995 (n = 6837, err = 6625.6)
## |   |   [4] tractID > 0
## |   |   |   [5] tractID <= 0.20536
## |   |   |   |   [6] tractID <= 0.00893: 0.387 (n = 4486, err = 1431.4)
## |   |   |   |   [7] tractID > 0.00893
## |   |   |   |   |   [8] tractID <= 0.08929
## |   |   |   |   |   |   [9] tractID <= 0.02679
## |   |   |   |   |   |   |   [10] tractID <= 0.01786: 0.219 (n = 3143, err = 535.4)
## |   |   |   |   |   |   |   [11] tractID > 0.01786: 0.199 (n = 4195, err = 704.6)
## |   |   |   |   |   |   [12] tractID > 0.02679: 0.165 (n = 24379, err = 3229.4)
## |   |   |   |   |   [13] tractID > 0.08929
## |   |   |   |   |   |   [14] tractID <= 0.125
## |   |   |   |   |   |   |   [15] tractID <= 0.09821: 0.110 (n = 2087, err = 174.2)
## |   |   |   |   |   |   |   [16] tractID > 0.09821: 0.075 (n = 6102, err = 341.1)
## |   |   |   |   |   |   [17] tractID > 0.125
## |   |   |   |   |   |   |   [18] tractID <= 0.16071
## |   |   |   |   |   |   |   |   [19] tractID <= 0.15179
## |   |   |   |   |   |   |   |   |   [20] tractID <= 0.13393: 0.173 (n = 6633, err = 866.9)
## |   |   |   |   |   |   |   |   |   [21] tractID > 0.13393
## |   |   |   |   |   |   |   |   |   |   [22] tractID <= 0.14286: 0.126 (n = 5889, err = 550
.8)
## |   |   |   |   |   |   |   |   |   |   [23] tractID > 0.14286: 0.147 (n = 6426, err = 723.
5)
## |   |   |   |   |   |   |   |   |   [24] tractID > 0.15179: 0.227 (n = 7005, err = 1249.1)
## |   |   |   |   |   |   |   |   [25] tractID > 0.16071
## |   |   |   |   |   |   |   |   |   [26] tractID <= 0.16964: 0.097 (n = 4387, err = 324.3)
## |   |   |   |   |   |   |   |   |   [27] tractID > 0.16964: 0.129 (n = 14167, err = 1396.0)
## |   |   |   |   [28] tractID > 0.20536
## |   |   |   |   |   [29] tractID <= 0.23214
## |   |   |   |   |   |   [30] tractID <= 0.22321
## |   |   |   |   |   |   |   [31] tractID <= 0.21429: 0.355 (n = 7429, err = 2059.4)
## |   |   |   |   |   |   |   [32] tractID > 0.21429: 0.293 (n = 6881, err = 1711.3)
```

```
## |   |   |   |   |   [33] tractID > 0.22321: 0.478 (n = 7480, err = 2809.0)
## |   |   |   |   [34] tractID > 0.23214
## |   |   |   |   |   [35] tractID <= 0.25893
## |   |   |   |   |   |   [36] tractID <= 0.25
## |   |   |   |   |   |   |   [37] tractID <= 0.24107: 0.220 (n = 6893, err = 1234.3)
## |   |   |   |   |   |   |   [38] tractID > 0.24107: 0.252 (n = 6761, err = 1409.7)
## |   |   |   |   |   |   [39] tractID > 0.25: 0.292 (n = 7295, err = 1810.1)
## |   |   |   |   |   [40] tractID > 0.25893
## |   |   |   |   |   |   [41] tractID <= 0.28571: 0.156 (n = 14320, err = 1773.6)
## |   |   |   |   |   |   [42] tractID > 0.28571
## |   |   |   |   |   |   |   [43] tractID <= 0.29464: 0.257 (n = 6917, err = 1415.1)
## |   |   |   |   |   |   |   [44] tractID > 0.29464: 0.217 (n = 4408, err = 745.8)
## |   [45] tractID > 0.30357
## |   |   [46] tractID <= 0.35714
## |   |   |   [47] tractID <= 0.34821
## |   |   |   |   [48] tractID <= 0.32143
## |   |   |   |   |   [49] tractID <= 0.3125: 0.837 (n = 7888, err = 5425.4)
## |   |   |   |   |   [50] tractID > 0.3125: 0.301 (n = 7348, err = 1834.0)
## |   |   |   |   [51] tractID > 0.32143
## |   |   |   |   |   [52] tractID <= 0.33929
## |   |   |   |   |   |   [53] tractID <= 0.33036: 0.885 (n = 7701, err = 5818.4)
## |   |   |   |   |   |   [54] tractID > 0.33036: 1.256 (n = 7477, err = 8984.7)
## |   |   |   |   |   [55] tractID > 0.33929: 0.731 (n = 7422, err = 5055.3)
## |   |   |   [56] tractID > 0.34821: 2.199 (n = 6942, err = 15274.7)
## |   |   [57] tractID > 0.35714
## |   |   |   [58] tractID <= 0.58036
## |   |   |   |   [59] tractID <= 0.50893
## |   |   |   |   |   [60] tractID <= 0.47321
## |   |   |   |   |   |   [61] tractID <= 0.41964: 0.232 (n = 38286, err = 8923.8)
## |   |   |   |   |   |   [62] tractID > 0.41964: 0.069 (n = 5907, err = 320.5)
## |   |   |   |   |   [63] tractID > 0.47321
## |   |   |   |   |   |   [64] tractID <= 0.49107
## |   |   |   |   |   |   |   [65] tractID <= 0.48214: 0.266 (n = 6396, err = 1387.9)
## |   |   |   |   |   |   |   [66] tractID > 0.48214: 0.347 (n = 5876, err = 1860.2)
## |   |   |   |   |   |   [67] tractID > 0.49107: 0.235 (n = 12803, err = 2438.3)
## |   |   |   |   [68] tractID > 0.50893
## |   |   |   |   |   [69] tractID <= 0.5625: 0.134 (n = 16191, err = 1710.1)
## |   |   |   |   |   [70] tractID > 0.5625
## |   |   |   |   |   |   [71] tractID <= 0.57143: 0.109 (n = 1158, err = 108.6)
## |   |   |   |   |   |   [72] tractID > 0.57143: 0.074 (n = 414, err = 25.9)
## |   |   |   [73] tractID > 0.58036
## |   |   |   |   [74] tractID <= 0.64286
## |   |   |   |   |   [75] tractID <= 0.59821
## |   |   |   |   |   |   [76] tractID <= 0.58929: 0.981 (n = 7138, err = 6057.9)
## |   |   |   |   |   |   [77] tractID > 0.58929: 1.120 (n = 6454, err = 7387.9)
## |   |   |   |   |   [78] tractID > 0.59821
## |   |   |   |   |   |   [79] tractID <= 0.625
## |   |   |   |   |   |   |   [80] tractID <= 0.61607
## |   |   |   |   |   |   |   |   [81] tractID <= 0.60714: 0.092 (n = 66, err = 5.0)
## |   |   |   |   |   |   |   |   [82] tractID > 0.60714: 0.393 (n = 4953, err = 1966.8)
## |   |   |   |   |   |   |   [83] tractID > 0.61607: 0.637 (n = 7571, err = 4018.2)
## |   |   |   |   |   |   [84] tractID > 0.625
## |   |   |   |   |   |   |   [85] tractID <= 0.63393: 1.052 (n = 7733, err = 7001.9)
## |   |   |   |   |   |   |   [86] tractID > 0.63393: 0.779 (n = 7029, err = 4839.9)
## |   |   |   |   [87] tractID > 0.64286
## |   |   |   |   |   [88] tractID <= 0.66071: 0.133 (n = 1470, err = 157.9)
## |   |   |   |   |   [89] tractID > 0.66071
## |   |   |   |   |   |   [90] tractID <= 0.86607
## |   |   |   |   |   |   |   [91] tractID <= 0.85714
## |   |   |   |   |   |   |   |   [92] tractID <= 0.83929
## |   |   |   |   |   |   |   |   |   [93] tractID <= 0.80357: 0.287 (n = 34573, err = 8543.3
```

```
)
## |   |   |   |   |   |   |   |   |   [94] tractID > 0.80357
## |   |   |   |   |   |   |   |   |   |   [95] tractID <= 0.8125: 0.493 (n = 5942, err = 2360
.6)
## |   |   |   |   |   |   |   |   |   |   [96] tractID > 0.8125: 0.277 (n = 8588, err = 1930.
3)
## |   |   |   |   |   |   |   |   |   [97] tractID > 0.83929
## |   |   |   |   |   |   |   |   |   [98] tractID <= 0.84821: 0.142 (n = 2471, err = 298.7)
## |   |   |   |   |   |   |   |   |   [99] tractID > 0.84821: 0.226 (n = 1716, err = 285.0)
## |   |   |   |   |   |   |   |   [100] tractID > 0.85714: 0.434 (n = 4766, err = 1761.7)
## |   |   |   |   |   |   |   [101] tractID > 0.86607: 0.192 (n = 3059, err = 457.3)
##
## Number of inner nodes:    50
## Number of terminal nodes: 51
```

```
model = ctree(registered ~ tractID, data = hour_2013 )

print(model)
```

```
##
## Model formula:
## registered ~ tractID
##
## Fitted party:
## [1] root
## |   [2] tractID <= 0.6875
## |   |   [3] tractID <= 0.20536
## |   |   |   [4] tractID <= 0: 1.764 (n = 6837, err = 4237.3)
## |   |   |   [5] tractID > 0
## |   |   |   |   [6] tractID <= 0.125
## |   |   |   |   |   [7] tractID <= 0.08036
## |   |   |   |   |   |   [8] tractID <= 0.0625
## |   |   |   |   |   |   |   [9] tractID <= 0.00893: 1.005 (n = 4486, err = 1333.2)
## |   |   |   |   |   |   |   [10] tractID > 0.00893
## |   |   |   |   |   |   |   |   [11] tractID <= 0.04464
## |   |   |   |   |   |   |   |   |   [12] tractID <= 0.01786: 0.848 (n = 3143, err = 645.7)
## |   |   |   |   |   |   |   |   |   [13] tractID > 0.01786: 0.947 (n = 12037, err = 2355.9)
## |   |   |   |   |   |   |   |   [14] tractID > 0.04464
## |   |   |   |   |   |   |   |   |   [15] tractID <= 0.05357: 0.821 (n = 2892, err = 530.8)
## |   |   |   |   |   |   |   |   |   [16] tractID > 0.05357: 0.890 (n = 3012, err = 488.7)
## |   |   |   |   |   |   [17] tractID > 0.0625
## |   |   |   |   |   |   |   [18] tractID <= 0.07143: 1.153 (n = 5064, err = 1352.9)
## |   |   |   |   |   |   |   [19] tractID > 0.07143: 1.053 (n = 4566, err = 969.3)
## |   |   |   |   |   [20] tractID > 0.08036
## |   |   |   |   |   |   [21] tractID <= 0.11607: 0.818 (n = 6232, err = 804.2)
## |   |   |   |   |   |   [22] tractID > 0.11607: 0.921 (n = 2960, err = 543.8)
## |   |   |   |   [23] tractID > 0.125
## |   |   |   |   |   [24] tractID <= 0.16071
## |   |   |   |   |   |   [25] tractID <= 0.15179
## |   |   |   |   |   |   |   [26] tractID <= 0.13393: 1.424 (n = 6633, err = 2463.8)
## |   |   |   |   |   |   |   [27] tractID > 0.13393
## |   |   |   |   |   |   |   |   [28] tractID <= 0.14286: 1.272 (n = 5889, err = 1775.6)
## |   |   |   |   |   |   |   |   [29] tractID > 0.14286: 1.362 (n = 6426, err = 2086.3)
## |   |   |   |   |   |   [30] tractID > 0.15179: 1.645 (n = 7005, err = 3336.1)
## |   |   |   |   |   [31] tractID > 0.16071
## |   |   |   |   |   |   [32] tractID <= 0.19643
## |   |   |   |   |   |   |   [33] tractID <= 0.1875
## |   |   |   |   |   |   |   |   [34] tractID <= 0.16964: 1.052 (n = 4387, err = 1065.9)
## |   |   |   |   |   |   |   |   [35] tractID > 0.16964
## |   |   |   |   |   |   |   |   |   [36] tractID <= 0.17857: 1.160 (n = 5664, err = 1478.4)
```

```
## |   |   |   |   |   |   |   |   [37] tractID > 0.17857: 1.073 (n = 3876, err = 970.8)
## |   |   |   |   |   |   |   [38] tractID > 0.1875: 0.877 (n = 633, err = 105.2)
## |   |   |   |   |   |   [39] tractID > 0.19643: 1.309 (n = 3994, err = 1371.4)
## |   |   [40] tractID > 0.20536
## |   |   |   [41] tractID <= 0.35714
## |   |   |   |   [42] tractID <= 0.30357
## |   |   |   |   |   [43] tractID <= 0.25893
## |   |   |   |   |   |   [44] tractID <= 0.23214
## |   |   |   |   |   |   |   [45] tractID <= 0.22321
## |   |   |   |   |   |   |   |   [46] tractID <= 0.21429: 1.851 (n = 7429, err = 4084.1)
## |   |   |   |   |   |   |   |   [47] tractID > 0.21429: 1.488 (n = 6881, err = 2470.8)
## |   |   |   |   |   |   |   [48] tractID > 0.22321: 1.914 (n = 7480, err = 4378.8)
## |   |   |   |   |   |   [49] tractID > 0.23214
## |   |   |   |   |   |   |   [50] tractID <= 0.25
## |   |   |   |   |   |   |   |   [51] tractID <= 0.24107: 1.550 (n = 6893, err = 2825.8)
## |   |   |   |   |   |   |   |   [52] tractID > 0.24107: 1.491 (n = 6761, err = 2612.8)
## |   |   |   |   |   |   |   [53] tractID > 0.25: 1.710 (n = 7295, err = 3678.1)
## |   |   |   |   |   [54] tractID > 0.25893
## |   |   |   |   |   |   [55] tractID <= 0.28571
## |   |   |   |   |   |   |   [56] tractID <= 0.27679
## |   |   |   |   |   |   |   |   [57] tractID <= 0.26786: 1.183 (n = 5243, err = 1501.9)
## |   |   |   |   |   |   |   |   [58] tractID > 0.26786: 1.389 (n = 6242, err = 2232.0)
## |   |   |   |   |   |   |   [59] tractID > 0.27679: 1.060 (n = 2835, err = 670.9)
## |   |   |   |   |   |   [60] tractID > 0.28571
## |   |   |   |   |   |   |   [61] tractID <= 0.29464: 1.571 (n = 6917, err = 3166.4)
## |   |   |   |   |   |   |   [62] tractID > 0.29464: 1.287 (n = 4408, err = 1476.8)
## |   |   |   |   [63] tractID > 0.30357
## |   |   |   |   |   [64] tractID <= 0.3125: 2.446 (n = 7888, err = 6497.7)
## |   |   |   |   |   [65] tractID > 0.3125: 2.053 (n = 36890, err = 31713.4)
## |   |   |   [66] tractID > 0.35714
## |   |   |   |   [67] tractID <= 0.58036
## |   |   |   |   |   [68] tractID <= 0.50893
## |   |   |   |   |   |   [69] tractID <= 0.47321
## |   |   |   |   |   |   |   [70] tractID <= 0.41964
## |   |   |   |   |   |   |   |   [71] tractID <= 0.39286
## |   |   |   |   |   |   |   |   |   [72] tractID <= 0.375
## |   |   |   |   |   |   |   |   |   |   [73] tractID <= 0.36607: 1.180 (n = 5357, err = 143
0.3)
## |   |   |   |   |   |   |   |   |   |   [74] tractID > 0.36607: 1.330 (n = 5919, err = 2038
.0)
## |   |   |   |   |   |   |   |   |   [75] tractID > 0.375
## |   |   |   |   |   |   |   |   |   |   [76] tractID <= 0.38393: 1.168 (n = 4912, err = 125
5.6)
## |   |   |   |   |   |   |   |   |   |   [77] tractID > 0.38393: 1.078 (n = 4452, err = 856.
5)
## |   |   |   |   |   |   |   |   [78] tractID > 0.39286
## |   |   |   |   |   |   |   |   |   [79] tractID <= 0.40179: 1.806 (n = 6879, err = 3600.1)
## |   |   |   |   |   |   |   |   |   [80] tractID > 0.40179
## |   |   |   |   |   |   |   |   |   |   [81] tractID <= 0.41071: 1.064 (n = 4928, err = 905
.9)
## |   |   |   |   |   |   |   |   |   |   [82] tractID > 0.41071: 1.472 (n = 5839, err = 2575
.2)
## |   |   |   |   |   |   |   [83] tractID > 0.41964
## |   |   |   |   |   |   |   |   [84] tractID <= 0.46429: 0.708 (n = 4005, err = 245.7)
## |   |   |   |   |   |   |   |   [85] tractID > 0.46429: 0.926 (n = 1902, err = 293.3)
## |   |   |   |   |   |   [86] tractID > 0.47321
## |   |   |   |   |   |   |   [87] tractID <= 0.48214: 1.641 (n = 6396, err = 3632.8)
## |   |   |   |   |   |   |   [88] tractID > 0.48214
## |   |   |   |   |   |   |   |   [89] tractID <= 0.49107: 1.323 (n = 5876, err = 1984.7)
## |   |   |   |   |   |   |   |   [90] tractID > 0.49107
## |   |   |   |   |   |   |   |   |   [91] tractID <= 0.5: 1.460 (n = 6287, err = 2632.6)
```

```
## |   |   |   |   |   |   |   |   [92] tractID > 0.5: 1.488 (n = 6516, err = 2794.4)
## |   |   |   |   |   [93] tractID > 0.50893
## |   |   |   |   |   |   [94] tractID <= 0.51786: 1.096 (n = 4833, err = 1267.3)
## |   |   |   |   |   |   [95] tractID > 0.51786
## |   |   |   |   |   |   |   [96] tractID <= 0.55357
## |   |   |   |   |   |   |   |   [97] tractID <= 0.52679: 0.939 (n = 3820, err = 689.2)
## |   |   |   |   |   |   |   |   [98] tractID > 0.52679
## |   |   |   |   |   |   |   |   |   [99] tractID <= 0.54464
## |   |   |   |   |   |   |   |   |   |   [100] tractID <= 0.53571: 0.866 (n = 3088, err = 49
8.5)
## |   |   |   |   |   |   |   |   |   |   [101] tractID > 0.53571: 0.757 (n = 354, err = 38.8
)
## |   |   |   |   |   |   |   |   |   [102] tractID > 0.54464: 0.895 (n = 2857, err = 570.2)
## |   |   |   |   |   |   |   [103] tractID > 0.55357: 0.700 (n = 2811, err = 226.1)
## |   |   |   |   [104] tractID > 0.58036
## |   |   |   |   |   [105] tractID <= 0.64286
## |   |   |   |   |   |   [106] tractID <= 0.61607
## |   |   |   |   |   |   |   [107] tractID <= 0.59821
## |   |   |   |   |   |   |   |   [108] tractID <= 0.58929: 2.004 (n = 7138, err = 6154.8)
## |   |   |   |   |   |   |   |   [109] tractID > 0.58929: 1.827 (n = 6454, err = 4597.0)
## |   |   |   |   |   |   |   [110] tractID > 0.59821
## |   |   |   |   |   |   |   |   [111] tractID <= 0.60714: 0.650 (n = 66, err = 4.1)
## |   |   |   |   |   |   |   |   [112] tractID > 0.60714: 1.259 (n = 4953, err = 1849.4)
## |   |   |   |   |   |   [113] tractID > 0.61607
## |   |   |   |   |   |   |   [114] tractID <= 0.63393
## |   |   |   |   |   |   |   |   [115] tractID <= 0.625: 2.191 (n = 7571, err = 6356.5)
## |   |   |   |   |   |   |   |   [116] tractID > 0.625: 2.487 (n = 7733, err = 9309.9)
## |   |   |   |   |   |   |   [117] tractID > 0.63393: 1.911 (n = 7029, err = 5374.3)
## |   |   |   |   |   [118] tractID > 0.64286
## |   |   |   |   |   |   [119] tractID <= 0.66071
## |   |   |   |   |   |   |   [120] tractID <= 0.65179: 0.666 (n = 312, err = 26.6)
## |   |   |   |   |   |   |   [121] tractID > 0.65179: 0.711 (n = 1158, err = 124.2)
## |   |   |   |   |   |   [122] tractID > 0.66071
## |   |   |   |   |   |   |   [123] tractID <= 0.67857
## |   |   |   |   |   |   |   |   [124] tractID <= 0.66964: 1.417 (n = 6095, err = 2261.9)
## |   |   |   |   |   |   |   |   [125] tractID > 0.66964: 1.443 (n = 6362, err = 2517.9)
## |   |   |   |   |   |   |   [126] tractID > 0.67857: 1.336 (n = 6056, err = 2419.6)
## |   [127] tractID > 0.6875
## |   |   [128] tractID <= 0.82143
## |   |   |   [129] tractID <= 0.80357
## |   |   |   |   [130] tractID <= 0.71429
## |   |   |   |   |   [131] tractID <= 0.69643: 1.102 (n = 5066, err = 1647.9)
## |   |   |   |   |   [132] tractID > 0.69643
## |   |   |   |   |   |   [133] tractID <= 0.70536: 0.956 (n = 4225, err = 763.4)
## |   |   |   |   |   |   [134] tractID > 0.70536: 0.859 (n = 2345, err = 370.5)
## |   |   |   |   [135] tractID > 0.71429
## |   |   |   |   |   [136] tractID <= 0.79464: 0.527 (n = 3036, err = 474.0)
## |   |   |   |   |   [137] tractID > 0.79464: 0.700 (n = 1388, err = 197.2)
## |   |   |   [138] tractID > 0.80357
## |   |   |   |   [139] tractID <= 0.8125: 1.436 (n = 5942, err = 3034.1)
## |   |   |   |   [140] tractID > 0.8125: 0.962 (n = 4507, err = 942.2)
## |   |   [141] tractID > 0.82143
## |   |   |   [142] tractID <= 0.85714
## |   |   |   |   [143] tractID <= 0.84821
## |   |   |   |   |   [144] tractID <= 0.83929
## |   |   |   |   |   |   [145] tractID <= 0.83036: 0.815 (n = 3196, err = 535.6)
## |   |   |   |   |   |   [146] tractID > 0.83036: 0.547 (n = 885, err = 134.9)
## |   |   |   |   |   [147] tractID > 0.83929: 0.875 (n = 2471, err = 447.5)
## |   |   |   |   [148] tractID > 0.84821: 0.674 (n = 1716, err = 215.5)
## |   |   |   [149] tractID > 0.85714
## |   |   |   |   [150] tractID <= 0.86607: 1.043 (n = 4766, err = 1441.5)
```

```
## |   |   |   |   [151] tractID > 0.86607
## |   |   |   |   |   [152] tractID <= 0.97321
## |   |   |   |   |   |   [153] tractID <= 0.91071: 0.557 (n = 454, err = 56.2)
## |   |   |   |   |   |   [154] tractID > 0.91071: 0.672 (n = 1165, err = 132.2)
## |   |   |   |   |   [155] tractID > 0.97321
## |   |   |   |   |   |   [156] tractID <= 0.98214: 0.870 (n = 906, err = 149.1)
## |   |   |   |   |   |   [157] tractID > 0.98214
## |   |   |   |   |   |   |   [158] tractID <= 0.99107: 0.602 (n = 83, err = 9.6)
## |   |   |   |   |   |   |   [159] tractID > 0.99107: 0.686 (n = 451, err = 51.6)
##
## Number of inner nodes:    79
## Number of terminal nodes: 80
```

```
model = ctree(cnt ~ tractID, data = hour_2013 )
```

```
print(model)
```

```
##
## Model formula:
## cnt ~ tractID
##
## Fitted party:
## [1] root
## |   [2] tractID <= 0.30357
## |   |   [3] tractID <= 0: 10.541 (n = 6837, err = 750309.7)
## |   |   [4] tractID > 0
## |   |   |   [5] tractID <= 0.20536
## |   |   |   |   [6] tractID <= 0.125
## |   |   |   |   |   [7] tractID <= 0.08036: 2.356 (n = 35200, err = 122820.6)
## |   |   |   |   |   [8] tractID > 0.08036
## |   |   |   |   |   |   [9] tractID <= 0.11607
## |   |   |   |   |   |   |   [10] tractID <= 0.09821
## |   |   |   |   |   |   |   |   [11] tractID <= 0.08929: 1.616 (n = 1003, err = 993.2)
## |   |   |   |   |   |   |   |   [12] tractID > 0.08929: 1.825 (n = 2087, err = 4619.2)
## |   |   |   |   |   |   |   [13] tractID > 0.09821
## |   |   |   |   |   |   |   |   [14] tractID <= 0.10714: 1.283 (n = 903, err = 515.4)
## |   |   |   |   |   |   |   |   [15] tractID > 0.10714: 1.523 (n = 2239, err = 1832.6)
## |   |   |   |   |   |   [16] tractID > 0.11607: 1.919 (n = 2960, err = 7072.5)
## |   |   |   |   [17] tractID > 0.125
## |   |   |   |   |   [18] tractID <= 0.16071
## |   |   |   |   |   |   [19] tractID <= 0.15179
## |   |   |   |   |   |   |   [20] tractID <= 0.13393: 4.353 (n = 6633, err = 95897.1)
## |   |   |   |   |   |   |   [21] tractID > 0.13393
## |   |   |   |   |   |   |   |   [22] tractID <= 0.14286: 3.387 (n = 5889, err = 42904.8)
## |   |   |   |   |   |   |   |   [23] tractID > 0.14286: 3.844 (n = 6426, err = 53827.8)
## |   |   |   |   |   |   [24] tractID > 0.15179: 5.998 (n = 7005, err = 194450.0)
## |   |   |   |   |   [25] tractID > 0.16071
## |   |   |   |   |   |   [26] tractID <= 0.19643
## |   |   |   |   |   |   |   [27] tractID <= 0.1875
## |   |   |   |   |   |   |   |   [28] tractID <= 0.16964: 2.449 (n = 4387, err = 21205.2)
## |   |   |   |   |   |   |   |   [29] tractID > 0.16964
## |   |   |   |   |   |   |   |   |   [30] tractID <= 0.17857: 2.910 (n = 5664, err = 29576.4
)
## |   |   |   |   |   |   |   |   |   [31] tractID > 0.17857: 2.532 (n = 3876, err = 21027.0)
## |   |   |   |   |   |   |   [32] tractID > 0.1875: 1.810 (n = 633, err = 1177.3)
## |   |   |   |   |   |   [33] tractID > 0.19643: 3.677 (n = 3994, err = 39681.4)
## |   |   |   [34] tractID > 0.20536
## |   |   |   |   [35] tractID <= 0.23214
## |   |   |   |   |   [36] tractID <= 0.22321
## |   |   |   |   |   |   [37] tractID <= 0.21429: 8.078 (n = 7429, err = 402719.0)
```

```
## |   |   |   |   |   |   [38] tractID > 0.21429: 4.852 (n = 6881, err = 90817.3)
## |   |   |   |   |   [39] tractID > 0.22321: 8.926 (n = 7480, err = 390881.3)
## |   |   |   |   [40] tractID > 0.23214
## |   |   |   |   |   [41] tractID <= 0.25893
## |   |   |   |   |   |   [42] tractID <= 0.25
## |   |   |   |   |   |   |   [43] tractID <= 0.24107: 5.170 (n = 6893, err = 117760.0)
## |   |   |   |   |   |   |   [44] tractID > 0.24107: 4.864 (n = 6761, err = 103665.5)
## |   |   |   |   |   |   [45] tractID > 0.25: 6.699 (n = 7295, err = 265526.1)
## |   |   |   |   |   [46] tractID > 0.25893
## |   |   |   |   |   |   [47] tractID <= 0.28571
## |   |   |   |   |   |   |   [48] tractID <= 0.27679
## |   |   |   |   |   |   |   |   [49] tractID <= 0.26786: 3.036 (n = 5243, err = 32013.1)
## |   |   |   |   |   |   |   |   [50] tractID > 0.26786: 4.139 (n = 6242, err = 68253.9)
## |   |   |   |   |   |   |   [51] tractID > 0.27679: 2.494 (n = 2835, err = 12214.6)
## |   |   |   |   |   |   [52] tractID > 0.28571
## |   |   |   |   |   |   |   [53] tractID <= 0.29464: 5.578 (n = 6917, err = 177060.9)
## |   |   |   |   |   |   |   [54] tractID > 0.29464: 3.693 (n = 4408, err = 38525.3)
## |   [55] tractID > 0.30357
## |   |   [56] tractID <= 0.35714
## |   |   |   [57] tractID <= 0.34821: 14.382 (n = 37836, err = 7857486.6)
## |   |   |   [58] tractID > 0.34821: 31.858 (n = 6942, err = 9448557.2)
## |   |   [59] tractID > 0.35714: 5.761 (n = 190560, err = 16135348.3)
##
## Number of inner nodes:    29
## Number of terminal nodes: 30
```

```
library(partykit)
library(grid)

model = ctree(casual ~ hr, data = hour_2013 )

print(model)
```

```
##
## Model formula:
## casual ~ hr
##
## Fitted party:
## [1] root
## |   [2] hr <= 1.35907
## |   |   [3] hr <= 1.18919
## |   |   |   [4] hr <= 0.50965
## |   |   |   |   [5] hr <= 0: 0.236 (n = 9997, err = 2229.0)
## |   |   |   |   [6] hr > 0: 0.203 (n = 15251, err = 2634.7)
## |   |   |   [7] hr > 0.50965
## |   |   |   |   [8] hr <= 1.01931: 0.084 (n = 25626, err = 1665.9)
## |   |   |   |   [9] hr > 1.01931: 0.163 (n = 20696, err = 2681.6)
## |   |   [10] hr > 1.18919: 0.250 (n = 23234, err = 5102.5)
## |   [11] hr > 1.35907
## |   |   [12] hr <= 3.05792
## |   |   |   [13] hr <= 1.52896: 0.336 (n = 21814, err = 7921.9)
## |   |   |   [14] hr > 1.52896
## |   |   |   |   [15] hr <= 2.71815
## |   |   |   |   |   [16] hr <= 1.69884: 0.480 (n = 19995, err = 11186.0)
## |   |   |   |   |   [17] hr > 1.69884
## |   |   |   |   |   |   [18] hr <= 2.54826
## |   |   |   |   |   |   |   [19] hr <= 2.03861: 0.553 (n = 41790, err = 27635.5)
## |   |   |   |   |   |   |   [20] hr > 2.03861: 0.569 (n = 63312, err = 46008.5)
## |   |   |   |   |   |   [21] hr > 2.54826: 0.520 (n = 22175, err = 15502.4)
## |   |   |   |   [22] hr > 2.71815
```

```
## |   |   |   |   |   [23] hr <= 2.88803: 0.497 (n = 23257, err = 15423.8)
## |   |   |   |   |   [24] hr > 2.88803: 0.461 (n = 23191, err = 13279.2)
## |   |   [25] hr > 3.05792
## |   |   |   [26] hr <= 3.39769
## |   |   |   |   [27] hr <= 3.2278: 0.418 (n = 21852, err = 11055.6)
## |   |   |   |   [28] hr > 3.2278: 0.368 (n = 19874, err = 8628.7)
## |   |   |   [29] hr > 3.39769
## |   |   |   |   [30] hr <= 3.73745
## |   |   |   |   |   [31] hr <= 3.56757: 0.338 (n = 17915, err = 6907.1)
## |   |   |   |   |   [32] hr > 3.56757: 0.304 (n = 15918, err = 5360.0)
## |   |   |   |   [33] hr > 3.73745: 0.256 (n = 13561, err = 3537.5)
##
## Number of inner nodes:    16
## Number of terminal nodes: 17
```

```
model = ctree(registered ~ hr, data = hour_2013 )

print(model)
```

```
##
## Model formula:
## registered ~ hr
##
## Fitted party:
## [1] root
## |   [2] hr <= 1.01931
## |   |   [3] hr <= 0.84942
## |   |   |   [4] hr <= 0.33977
## |   |   |   |   [5] hr <= 0: 1.032 (n = 9997, err = 2921.5)
## |   |   |   |   [6] hr > 0
## |   |   |   |   |   [7] hr <= 0.16988: 0.949 (n = 7083, err = 1881.8)
## |   |   |   |   |   [8] hr > 0.16988: 0.891 (n = 5043, err = 1276.0)
## |   |   |   [9] hr > 0.33977
## |   |   |   |   [10] hr <= 0.67954
## |   |   |   |   |   [11] hr <= 0.50965: 0.762 (n = 3125, err = 491.7)
## |   |   |   |   |   [12] hr > 0.50965: 0.654 (n = 2615, err = 211.0)
## |   |   |   |   [13] hr > 0.67954: 0.830 (n = 8034, err = 854.7)
## |   |   [14] hr > 0.84942: 1.151 (n = 14977, err = 4590.7)
## |   [15] hr > 1.01931
## |   |   [16] hr <= 3.39769
## |   |   |   [17] hr <= 2.71815
## |   |   |   |   [18] hr <= 1.35907
## |   |   |   |   |   [19] hr <= 1.18919: 1.560 (n = 20696, err = 13354.3)
## |   |   |   |   |   [20] hr > 1.18919: 1.819 (n = 23234, err = 18835.5)
## |   |   |   |   [21] hr > 1.35907
## |   |   |   |   |   [22] hr <= 2.54826
## |   |   |   |   |   |   [23] hr <= 1.52896: 1.466 (n = 21814, err = 11480.5)
## |   |   |   |   |   |   [24] hr > 1.52896
## |   |   |   |   |   |   |   [25] hr <= 1.86873
## |   |   |   |   |   |   |   |   [26] hr <= 1.69884: 1.286 (n = 19995, err = 8930.8)
## |   |   |   |   |   |   |   |   [27] hr > 1.69884: 1.342 (n = 20441, err = 10680.4)
## |   |   |   |   |   |   |   [28] hr > 1.86873: 1.415 (n = 84661, err = 50034.1)
## |   |   |   |   |   [29] hr > 2.54826: 1.555 (n = 22175, err = 16055.6)
## |   |   |   [30] hr > 2.71815
## |   |   |   |   [31] hr <= 3.2278
## |   |   |   |   |   [32] hr <= 3.05792: 1.757 (n = 46448, err = 43867.6)
## |   |   |   |   |   [33] hr > 3.05792: 1.637 (n = 21852, err = 15521.3)
## |   |   |   |   [34] hr > 3.2278: 1.487 (n = 19874, err = 11841.5)
## |   |   [35] hr > 3.39769
## |   |   |   [36] hr <= 3.73745
```

```
## |   |   |   |   [37] hr <= 3.56757: 1.396 (n = 17915, err = 9328.2)
## |   |   |   |   [38] hr > 3.56757: 1.297 (n = 15918, err = 6997.8)
## |   |   |   [39] hr > 3.73745: 1.158 (n = 13561, err = 4653.6)
##
## Number of inner nodes:    19
## Number of terminal nodes: 20
```

```
model = ctree(cnt ~ hr, data = hour_2013 )
```

```
print(model)
```

```
##
## Model formula:
## cnt ~ hr
##
## Fitted party:
## [1] root
## |   [2] hr <= 1.01931
## |   |   [3] hr <= 0.84942
## |   |   |   [4] hr <= 0.33977
## |   |   |   |   [5] hr <= 0: 2.803 (n = 9997, err = 85720.4)
## |   |   |   |   [6] hr > 0
## |   |   |   |   |   [7] hr <= 0.16988: 2.395 (n = 7083, err = 42561.3)
## |   |   |   |   |   [8] hr > 0.16988: 2.207 (n = 5043, err = 24936.7)
## |   |   |   [9] hr > 0.33977
## |   |   |   |   [10] hr <= 0.50965: 1.673 (n = 3125, err = 5437.4)
## |   |   |   |   [11] hr > 0.50965
## |   |   |   |   |   [12] hr <= 0.67954: 1.191 (n = 2615, err = 755.8)
## |   |   |   |   |   [13] hr > 0.67954: 1.524 (n = 8034, err = 6521.7)
## |   |   [14] hr > 0.84942: 2.892 (n = 14977, err = 103124.3)
## |   [15] hr > 1.01931: 7.067 (n = 348584, err = 43787176.0)
##
## Number of inner nodes:    7
## Number of terminal nodes: 8
```

```
library(party)
```

```
## Warning: package 'party' was built under R version 3.4.2

## Loading required package: mvtnorm

## Loading required package: modeltools

## Loading required package: stats4

## Loading required package: strucchange

## Loading required package: zoo

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric

## Loading required package: sandwich

##
## Attaching package: 'party'
```

```
## The following objects are masked from 'package:partykit':
##
##     cforest, ctree, ctree_control, edge_simple, mob, mob_control,
##     node_barplot, node_bivplot, node_boxplot, node_inner,
##     node_surv, node_terminal
```

```
library(grid)
```

```
model = ctree(casual ~ mth, data = hour_2013 )
```

```
print(model)
```

```
##
##   Conditional inference tree with 7 terminal nodes
##
## Response:  casual
## Input:  mth
## Number of observations:  399458
##
## 1) mth <= 2; criterion = 1, statistic = 27.619
##   2) mth <= 1; criterion = 1, statistic = 131.729
##     3)*  weights = 27071
##   2) mth > 1
##     4)*  weights = 24476
## 1) mth > 2
##   5) mth <= 10; criterion = 1, statistic = 2516.534
##     6) mth <= 3; criterion = 0.994, statistic = 7.674
##       7)*  weights = 28675
##     6) mth > 3
##       8) mth <= 9; criterion = 1, statistic = 366.427
##         9)*  weights = 216738
##       8) mth > 9
##         10)*  weights = 37866
##   5) mth > 10
##     11) mth <= 11; criterion = 1, statistic = 460.016
##       12)*  weights = 34209
##     11) mth > 11
##       13)*  weights = 30423
```

```
model = ctree(registered ~ mth, data = hour_2013 )
```

```
print(model)
```

```
##
##   Conditional inference tree with 4 terminal nodes
##
## Response:  registered
## Input:  mth
## Number of observations:  399458
##
## 1) mth <= 3; criterion = 1, statistic = 166.548
##   2) mth <= 2; criterion = 1, statistic = 21.387
##     3)*  weights = 51547
##   2) mth > 2
##     4)*  weights = 28675
## 1) mth > 3
##   5) mth <= 11; criterion = 1, statistic = 286.971
##     6)*  weights = 288813
```

```
##   5) mth > 11
##     7)*  weights = 30423
```

```
model = ctree(cnt ~ mth, data = hour_2013 )
```

```
print(model)
```

```
##
##   Conditional inference tree with 6 terminal nodes
##
## Response:  cnt
## Input:  mth
## Number of observations:  399458
##
## 1) mth <= 3; criterion = 1, statistic = 120.197
##   2) mth <= 2; criterion = 1, statistic = 192.863
##     3) mth <= 1; criterion = 0.96, statistic = 4.232
##       4)*  weights = 27071
##     3) mth > 1
##       5)*  weights = 24476
##   2) mth > 2
##     6)*  weights = 28675
## 1) mth > 3
##   7) mth <= 10; criterion = 1, statistic = 1044.76
##     8)*  weights = 254604
##   7) mth > 10
##     9) mth <= 11; criterion = 1, statistic = 343.136
##       10)*  weights = 34209
##     9) mth > 11
##       11)*  weights = 30423
```

```
library(party)
library(grid)
```

```
model = ctree(casual ~ temp, data = hour_2013 )
```

```
print(model)
```

```
##
##   Conditional inference tree with 22 terminal nodes
##
## Response:  casual
## Input:  temp
## Number of observations:  399458
##
## 1) temp <= 1.170369; criterion = 1, statistic = 21449.617
##   2) temp <= 0.759158; criterion = 1, statistic = 3255.359
##     3) temp <= 0.3163158; criterion = 1, statistic = 946.066
##       4) temp <= -0.2952281; criterion = 1, statistic = 172.516
##         5) temp <= -0.5271931; criterion = 0.999, statistic = 10.55
##           6)*  weights = 1915
##         5) temp > -0.5271931
##           7)*  weights = 2482
##       4) temp > -0.2952281
##         8) temp <= 0.1159825; criterion = 1, statistic = 20.646
##           9)*  weights = 17624
##         8) temp > 0.1159825
##           10)*  weights = 16773
##     3) temp > 0.3163158
```

```
##       11) temp <= 0.4639299; criterion = 1, statistic = 69.262
##         12)*  weights = 18555
##       11) temp > 0.4639299
##         13) temp <= 0.5904562; criterion = 0.97, statistic = 4.697
##           14)*  weights = 12919
##         13) temp > 0.5904562
##           15)*  weights = 20221
##   2) temp > 0.759158
##     16) temp <= 0.9384037; criterion = 1, statistic = 127.211
##       17) temp <= 0.8751405; criterion = 0.997, statistic = 8.982
##         18)*  weights = 11275
##       17) temp > 0.8751405
##         19)*  weights = 6108
##     16) temp > 0.9384037
##       20)*  weights = 22854
## 1) temp > 1.170369
##   21) temp <= 2.699229; criterion = 1, statistic = 3608.468
##     22) temp <= 1.876807; criterion = 1, statistic = 431.72
##       23) temp <= 1.581579; criterion = 1, statistic = 37.4
##         24)*  weights = 42104
##       23) temp > 1.581579
##         25) temp <= 1.760825; criterion = 0.999, statistic = 10.229
##           26)*  weights = 20678
##         25) temp > 1.760825
##           27)*  weights = 14445
##     22) temp > 1.876807
##       28) temp <= 2.572702; criterion = 0.965, statistic = 4.47
##         29) temp <= 2.319649; criterion = 1, statistic = 14.891
##           30)*  weights = 48789
##         29) temp > 2.319649
##           31)*  weights = 44812
##       28) temp > 2.572702
##         32)*  weights = 18807
##   21) temp > 2.699229
##     33) temp <= 2.86793; criterion = 1, statistic = 68.647
##       34) temp <= 2.815211; criterion = 1, statistic = 20.005
##         35)*  weights = 18166
##       34) temp > 2.815211
##         36)*  weights = 8325
##     33) temp > 2.86793
##       37) temp <= 3.511106; criterion = 0.98, statistic = 5.387
##         38) temp <= 3.226422; criterion = 0.965, statistic = 4.449
##           39)*  weights = 37646
##         38) temp > 3.226422
##           40)*  weights = 12666
##       37) temp > 3.511106
##         41) temp <= 3.574369; criterion = 0.99, statistic = 6.709
##           42)*  weights = 940
##         41) temp > 3.574369
##           43)*  weights = 1354
```

```
model = ctree(registered ~ temp, data = hour_2013 )

print(model)
```

```
##
##   Conditional inference tree with 10 terminal nodes
##
## Response:  registered
## Input:  temp
```

```
## Number of observations:  399458
##
## 1) temp <= 0.8224212; criterion = 1, statistic = 4767.385
##   2) temp <= 0.2952281; criterion = 1, statistic = 766.937
##     3) temp <= 0; criterion = 1, statistic = 68.748
##       4) temp <= -0.1159825; criterion = 1, statistic = 20.142
##         5)*  weights = 8759
##       4) temp > -0.1159825
##         6)*  weights = 4860
##     3) temp > 0
##       7)*  weights = 24975
##   2) temp > 0.2952281
##     8) temp <= 0.4639299; criterion = 1, statistic = 83.211
##       9) temp <= 0.3479474; criterion = 0.999, statistic = 10.405
##         10)*  weights = 6519
##       9) temp > 0.3479474
##         11)*  weights = 12236
##     8) temp > 0.4639299
##       12)*  weights = 37981
## 1) temp > 0.8224212
##   13) temp <= 2.635965; criterion = 1, statistic = 948.456
##     14) temp <= 1.402334; criterion = 1, statistic = 119.561
##       15)*  weights = 57437
##     14) temp > 1.402334
##       16) temp <= 2.45672; criterion = 0.992, statistic = 7.06
##         17)*  weights = 132110
##       16) temp > 2.45672
##         18)*  weights = 26335
##   13) temp > 2.635965
##     19)*  weights = 88246
```

```
model = ctree(cnt ~ temp, data = hour_2013 )

print(model)
```

```
##
##   Conditional inference tree with 15 terminal nodes
##
## Response:  cnt
## Input:  temp
## Number of observations:  399458
##
## 1) temp <= 1.159825; criterion = 1, statistic = 7789.468
##   2) temp <= 0.4639299; criterion = 1, statistic = 1486.247
##     3) temp <= 0.1159825; criterion = 1, statistic = 237.439
##       4) temp <= 0; criterion = 0.986, statistic = 6.02
##         5)*  weights = 13619
##       4) temp > 0
##         6) temp <= 0.1054386; criterion = 0.963, statistic = 4.341
##           7) temp <= 0.06326317; criterion = 1, statistic = 14.776
##             8)*  weights = 3492
##           7) temp > 0.06326317
##             9)*  weights = 103
##         6) temp > 0.1054386
##           10)*  weights = 4807
##     3) temp > 0.1159825
##       11)*  weights = 35328
##   2) temp > 0.4639299
##     12) temp <= 0.8224212; criterion = 1, statistic = 112.662
##       13) temp <= 0.6431755; criterion = 0.989, statistic = 6.539
```

```
##         14)*  weights = 19238
##       13) temp > 0.6431755
##         15)*  weights = 18743
##     12) temp > 0.8224212
##       16)*  weights = 29267
## 1) temp > 1.159825
##   17) temp <= 2.635965; criterion = 1, statistic = 1402.144
##     18) temp <= 1.518316; criterion = 1, statistic = 118.238
##       19)*  weights = 40927
##     18) temp > 1.518316
##       20) temp <= 1.897895; criterion = 0.998, statistic = 9.936
##         21)*  weights = 42547
##       20) temp > 1.897895
##         22)*  weights = 103141
##   17) temp > 2.635965
##     23) temp <= 2.86793; criterion = 1, statistic = 48.29
##       24) temp <= 2.751948; criterion = 0.979, statistic = 5.343
##         25)*  weights = 17886
##       24) temp > 2.751948
##         26)*  weights = 17754
##     23) temp > 2.86793
##       27) temp <= 3.511106; criterion = 0.971, statistic = 4.788
##         28)*  weights = 50312
##       27) temp > 3.511106
##         29)*  weights = 2294
```