Data Regression

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Data Analysis about Ozone Data

Read the data

```
setwd(setwd("/Users/Gracie/Dropbox/BigData"))
mydata<-read.csv("ozone_data.csv")
```

Create Linear Regression Model

```
summary(lm(Ozone~Temp+Wind,data=mydata))

## 
## Call:
## lm(formula = Ozone ~ Temp + Wind, data = mydata)
## 
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -42.156 -13.216  -3.123  10.598  98.492 
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -67.3220    23.6210  -2.850  0.00524 ** 
## Temp          1.8276     0.2506   7.294 5.29e-11 ***
## Wind         -3.2948     0.6711  -4.909 3.26e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 21.73 on 108 degrees of freedom
## Multiple R-squared:  0.5814, Adjusted R-squared:  0.5736 
## F-statistic: 74.99 on 2 and 108 DF,  p-value: < 2.2e-16
```

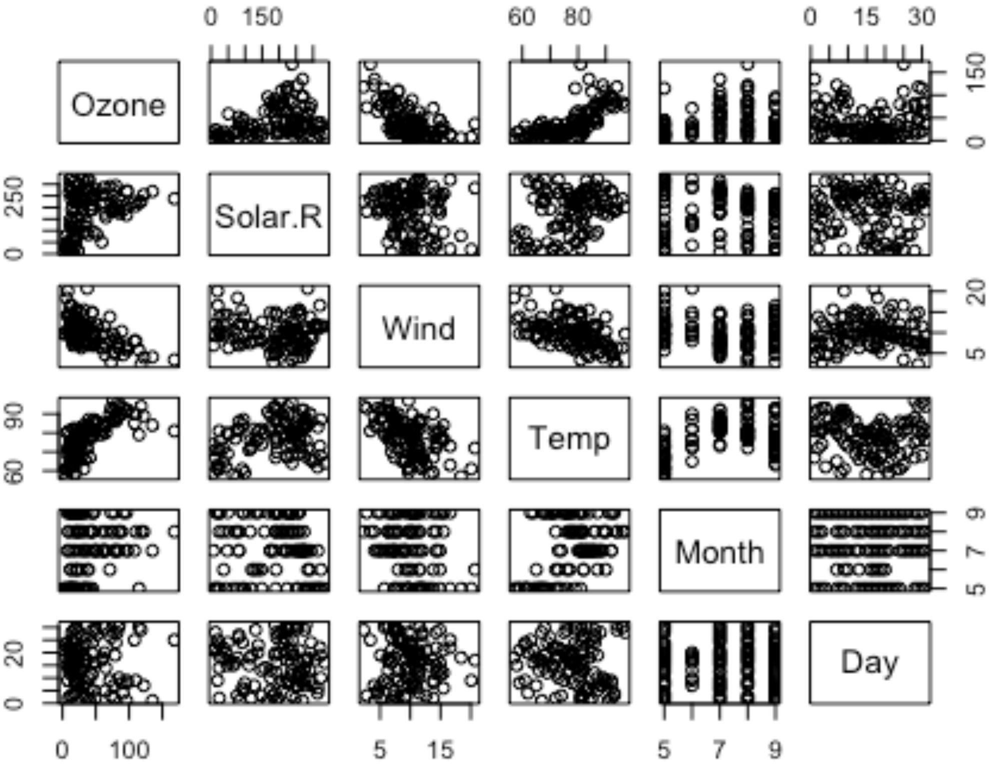
From the summary we get regression model is as follows:

$y = -71.0332 + 1.8402\text{Temp} - 3.0555\text{Wind}$

The R^2 value is 0.5611, it is a fair but not a very good model.

Explore the data by drawing correlation plot and calculate Pearson's correlation coefficient

```r
pairs(mydata)
```



```r
cor(mydata)
```

```
##                Ozone     Solar.R        Wind       Temp        Month
## Ozone    1.000000000  0.34834169 -0.61249658  0.6985414  0.142885168
## Solar.R  0.348341693  1.00000000 -0.12718345  0.2940876 -0.074066683
## Wind    -0.612496576 -0.12718345  1.00000000 -0.4971897 -0.194495804
## Temp     0.698541410  0.29408764 -0.49718972  1.0000000  0.403971709
## Month    0.142885168 -0.07406668 -0.19449580  0.4039717  1.000000000
## Day     -0.005189769 -0.05775380  0.04987102 -0.0965458 -0.009001079
##                  Day
## Ozone   -0.005189769
## Solar.R -0.057753801
## Wind     0.049871017
## Temp    -0.096545800
## Month   -0.009001079
## Day      1.000000000
```

From the plot and the correlation value, we could see that Wind and Temp have relative greater effects on Ozone value. Let's try another model add predictor Temp*Wind

```
summary(model1<-lm(Ozone~Temp+Wind+Temp*Wind,data=mydata))

## 
## Call:
## lm(formula = Ozone ~ Temp + Wind + Temp * Wind, data = mydata)
## 
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -40.930 -11.193  -3.034   8.193  97.456 
## 
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -239.8918    48.6200  -4.934 2.97e-06 ***
## Temp           4.0005     0.5935   6.741 8.26e-10 ***
## Wind          13.5975     4.2835   3.174 0.001961 ** 
## Temp:Wind     -0.2173     0.0545  -3.987 0.000123 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 20.37 on 107 degrees of freedom
## Multiple R-squared:  0.6355, Adjusted R-squared:  0.6253 
## F-statistic: 62.19 on 3 and 107 DF,  p-value: < 2.2e-16
```

We could see that we had increased the R^2 by adding the multiplicated predictor.

```
#Calculate 95% confidence interval
confint(model1,conf.level=0.95)

##                    2.5 %       97.5 %
## (Intercept) -336.2751998 -143.5084539
## Temp           2.8240024    5.1770536
## Wind           5.1059971   22.0889184
## Temp:Wind     -0.3253122   -0.1092398
```

Hypothesis Test about Ozone value

H0:Value of Ozone in population is >=50 H1:Value of Ozone in population is <50

```
newdata<-mydata[(1)]
t.test(newdata,alternative="less",mu=50)

## 
##  One Sample t-test
## 
## data:  newdata
## t = -2.5015, df = 110, p-value = 0.006919
## alternative hypothesis: true mean is less than 50
## 95 percent confidence interval:
##      -Inf 47.33835
## sample estimates:
## mean of x
##   42.0991
```

Since P-value 0.006919 is less than alpha=0.05, we should reject the null hypothesis. The Ozone value in population should be less then 50.