Air Quality

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Based from the Coursera course "Reproducible Research" by Johns Hopkins University

The goal of this document is to provide an example of "literate statistical programming" by "weaving" together English text, R Code, and graphics provided by ggplot and R's builtin plotting capabilities.

"Literate statistical programming" with R Markdown files allows for "reproducible" research through the ability of the critic to

1. Download the markdown file
2. Re-run the analyses in R
3. Regenerate the HTML (or pdf)

In this document, we provide a regression analysis of air quality data.

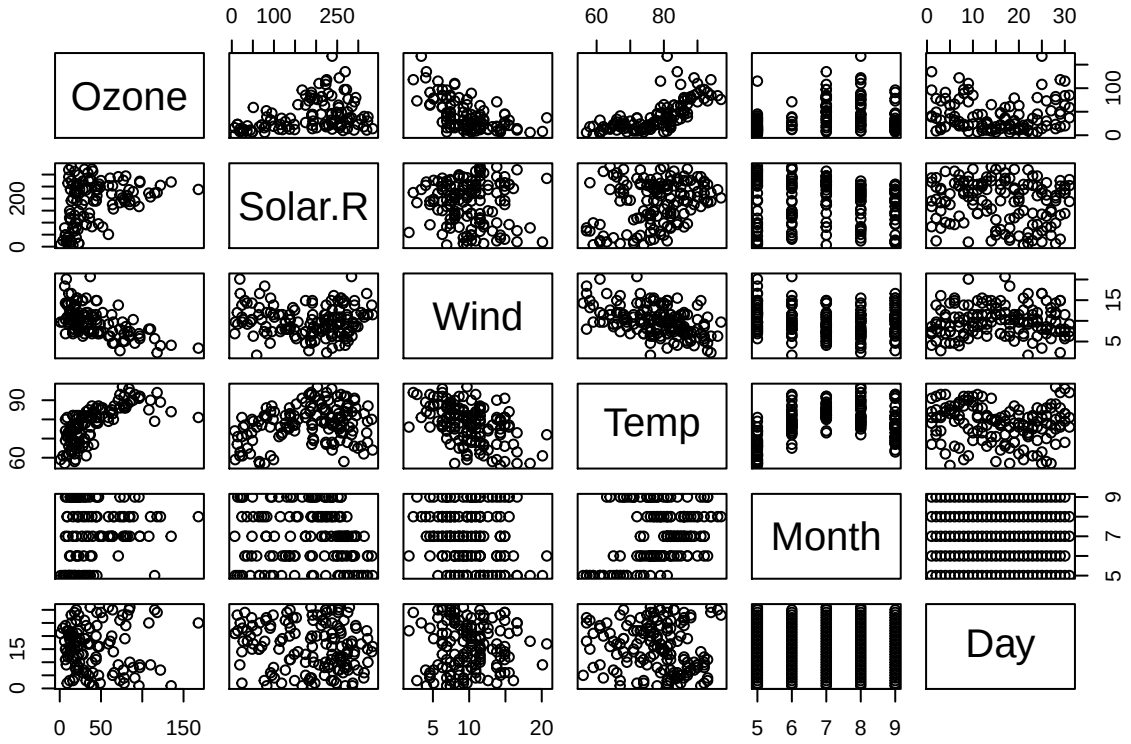
```
library(datasets)
data(airquality)
summary(airquality)
```

```
##      Ozone           Solar.R           Wind             Temp
##  Min.   :  1.00   Min.   :  7.0   Min.   : 1.700   Min.   :56.00
##  1st Qu.: 18.00   1st Qu.:115.8   1st Qu.: 7.400   1st Qu.:72.00
##  Median : 31.50   Median :205.0   Median : 9.700   Median :79.00
##  Mean   : 42.13   Mean   :185.9   Mean   : 9.958   Mean   :77.88
##  3rd Qu.: 63.25   3rd Qu.:258.8   3rd Qu.:11.500   3rd Qu.:85.00
##  Max.   :168.00   Max.   :334.0   Max.   :20.700   Max.   :97.00
##  NA's   :37       NA's   :7
##      Month            Day
##  Min.   :5.000   Min.   : 1.0
##  1st Qu.:6.000   1st Qu.: 8.0
##  Median :7.000   Median :16.0
##  Mean   :6.993   Mean   :15.8
##  3rd Qu.:8.000   3rd Qu.:23.0
##  Max.   :9.000   Max.   :31.0
##
```

As can be seen, the variables within the data set are Ozone levels, Solar Radiation levels, Wind, Temperature, Month, and Day measurements.

Here is a plot of each pair of variables against one another.

```
pairs(airquality)
```



We will test a regression model of Ozone versus Temperature.

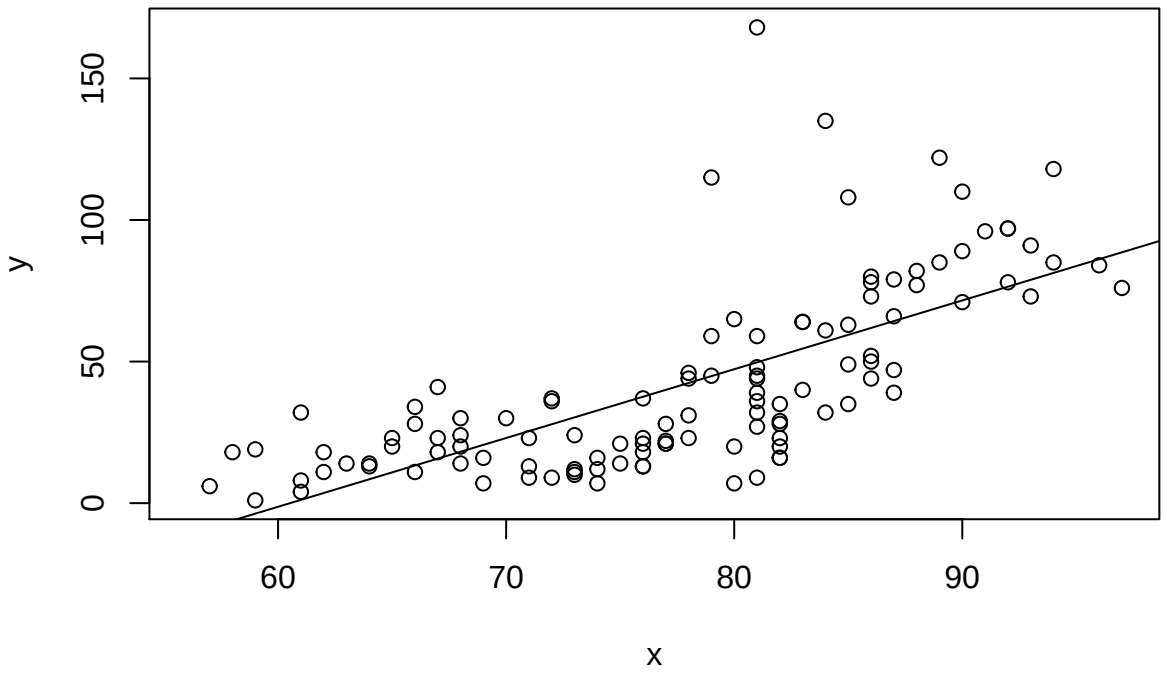
```
library(stats)
fit <- lm(Ozone ~ Temp, airquality)
summary(fit)
```

```
##
## Call:
## lm(formula = Ozone ~ Temp, data = airquality)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -40.729 -17.409  -0.587  11.306 118.271
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -146.9955    18.2872  -8.038 9.37e-13 ***
## Temp           2.4287     0.2331  10.418  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 23.71 on 114 degrees of freedom
##   (37 observations deleted due to missingness)
## Multiple R-squared:  0.4877, Adjusted R-squared:  0.4832
## F-statistic: 108.5 on 1 and 114 DF,  p-value: < 2.2e-16
```

Next, we plot the regression line.

```r
x <- airquality$Temp
y <- airquality$Ozone

plot(x,y)
abline(fit)
```



We can see that temperature may be a good predictor for Ozone levels, leading us to believe that increasing temperatures may positively correlate to increasing Ozone levels.