

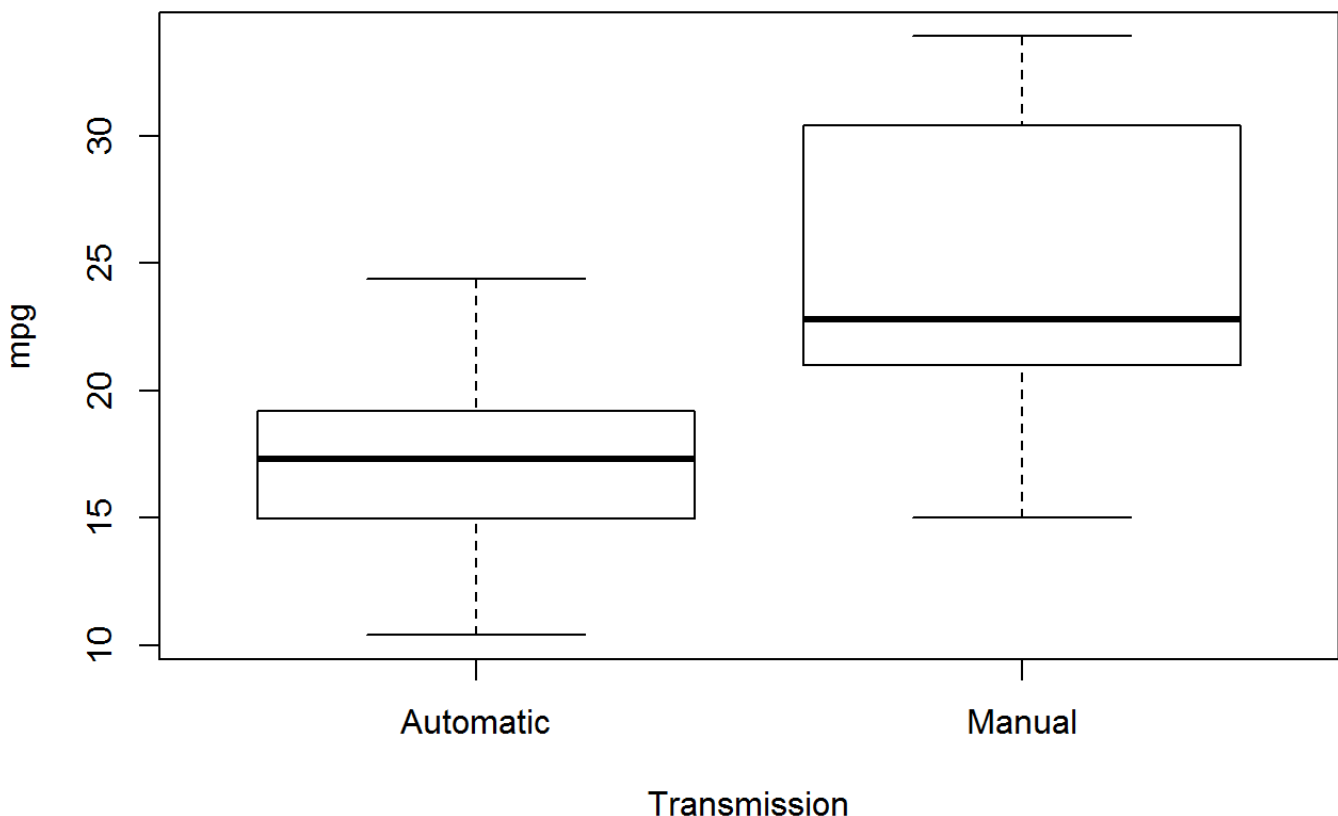
# Regression Model Project

## Data

- Source : Henderson and Velleman (1981), Building multiple regression models interactively. Biometrics, 37, 391–411.
- Description : The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973–74 models).
- Format : A data frame with 32 observations on 11 variables. [, 1] mpg Miles/(US) gallon [, 2] cyl Number of cylinders [, 3] disp Displacement (cu.in.) [, 4] hp Gross horsepower [, 5] drat Rear axle ratio [, 6] wt Weight (lb/1000) [, 7] qsec 1/4 mile time [, 8] vs V/S [, 9] am Transmission (0 = automatic, 1 = manual) [,10] gear Number of forward gears [,11] carb Number of carburetors

## Load mtcars data and some basic exploratory data analyses

```
data(mtcars) # Load mtcars data
boxplot(mtcars$mpg~mtcars$am,xlab="Transmission",names=c("Automatic","Manual"),ylab="mpg") # Exploratory data analyses
```



# Interpret the coefficient

```
fit <- lm(mpg~am,data=mtcars) # Regression  
summary(fit)
```

```
##  
## Call:  
## lm(formula = mpg ~ am, data = mtcars)  
##  
## Residuals:  
##      Min       1Q   Median       3Q      Max   
## -9.3923 -3.0923 -0.2974  3.2439  9.5077   
##  
## Coefficients:  
##              Estimate Std. Error t value Pr(>|t|)      
## (Intercept)   17.147      1.125   15.247 1.13e-15 ***  
## am              7.245      1.764    4.106 0.000285 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Residual standard error: 4.902 on 30 degrees of freedom  
## Multiple R-squared:  0.3598, Adjusted R-squared:  0.3385   
## F-statistic: 16.86 on 1 and 30 DF,  p-value: 0.000285
```

The mpg mean of automatic transmission is 17.147. The change in mpg mean for manual transmission to automatic transmission is 7.245.

```
Auto <- mtcars[mtcars[,9]=="0",]  
Manu <- mtcars[mtcars[,9]=="1",]  
n1 <- length(Auto$am) ; n2 <- length(Manu$am)  
mean1 <- mean(Auto$mpg); mean2 <- mean(Manu$mpg)  
var1 <- ((n1-1)/n1)*var(Auto$mpg); var2 <- ((n2-1)/n2)*var(Manu$mpg)  
df <- n1+n2-2  
sp <- sqrt(((n1-1)*var1+(n2-1)*var2)/df)  
(mean1-mean2)+c(-1,1)*qt(0.975,df=df)*sp*sqrt(1/n1+1/n2)
```

```
## [1] -10.723682 -3.766197
```

## Result

The confidence interval of the difference in mean mpg between automatic transmission and manual transmission is between -10.723682 and -3.766197 (within 95% confident). Therefore, the difference between automatic transmission and manual transmission is significant.

## Attachment: residual plot and diagnostis

```
par(mfrow=c(2,2))
plot(fit)
```

