

# Regression Models Course Project

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## Context

You work for Motor Trend, a magazine about the automobile industry. Looking at a data set of a collection of cars, they are interested in exploring the relationship between a set of variables and miles per gallon (MPG) (outcome). They are particularly interested in the following two questions:

- Is an automatic or manual transmission better for MPG?
- Quantifying how different is the MPG between automatic and manual transmissions?

## Data Processing

### Load and Test Data

Data extracted from Motor Trend Magazine 1974. Data is on fuel consumption and 10 aspects of automobile performance for 32 '73 to '74 models.

```
library(datasets)
mpgData <- with(mtcars, data.frame(mpg, am))
mpgData$am <- factor(mpgData$am, labels = c("Automatic", "Manual"))
#summary(mpgData)
```

### Is an automatic or manual transmission better for MPG?

```
summary(mpgData[mpgData$am == "Automatic",])
```

```
##      mpg      am
## Min.   :10.4 Automatic:19
## 1st Qu.:14.9 Manual   : 0
## Median :17.3
## Mean   :17.1
## 3rd Qu.:19.2
## Max.   :24.4
```

```
summary(mpgData[mpgData$am == "Manual",])
```

```
##      mpg      am
## Min.   :15.0 Automatic: 0
## 1st Qu.:21.0 Manual   :13
```

```
## Median :22.8
## Mean   :24.4
## 3rd Qu.:30.4
## Max.   :33.9
```

## Quantifying how different is the MPG between automatic and manual transmissions?

```
fit <- lm(mpg ~ as.integer(am), data=mpgData)
summary(fit)

##
## Call:
## lm(formula = mpg ~ as.integer(am), data = mpgData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.392 -3.092 -0.297  3.244  9.508
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      9.90        2.63   3.77 0.00072 ***
## as.integer(am)    7.24        1.76   4.11 0.00029 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.9 on 30 degrees of freedom
## Multiple R-squared:  0.36,    Adjusted R-squared:  0.338
## F-statistic: 16.9 on 1 and 30 DF,  p-value: 0.000285
```

## Results

Manual is better than automatic in terms of MPG by 7.2449.

## Appendix

### MPG between automatic and manual transmissions

```
par(mfrow=c(1,2))
with(mpgData,{
  boxplot(mpg ~ am,
    ylab = "miles per gallon (MPG)")
  plot(mpg ~ as.integer(am),
    xlab = "Automatic (1) or Manual(2)",
    ylab = "miles per gallon (MPG)")
  abline(fit, col=2)
})
```

