Regression Models Assignment

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Executive Summary

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"

"Quantify the MPG difference between automatic and manual transmissions"

Based on the final model fitting results, we can conclude that:

1. As wt increases per 1000lb (0.5 tons), the mpg will decrease by 2.5.

2. MpG will decrease very slighly with HP increase.

3. cyl increases from 4 to 6 to 8, will cause MpG to decrease by 3 and 2 times respectively.

4. Automatic gearing has higher MpG compared to manual gearing.

Data Analysis

```
library(ggplot2)
data(mtcars)
attach(mtcars)
```

```
## The following object is masked from package:ggplot2:
##
##      mpg
```

This first look at the data shows us that HP and MpG are inversely related and manual transmission cars are generally more fuel efficient.

```
mtcars$amf[am==0]='AUT'
mtcars$amf[am==1]='MAN'
print(qplot(x=wt, y=mpg, colour=am, facets=.~amf, data=mtcars,main="MpG vs. Weight/Gearing"))
```
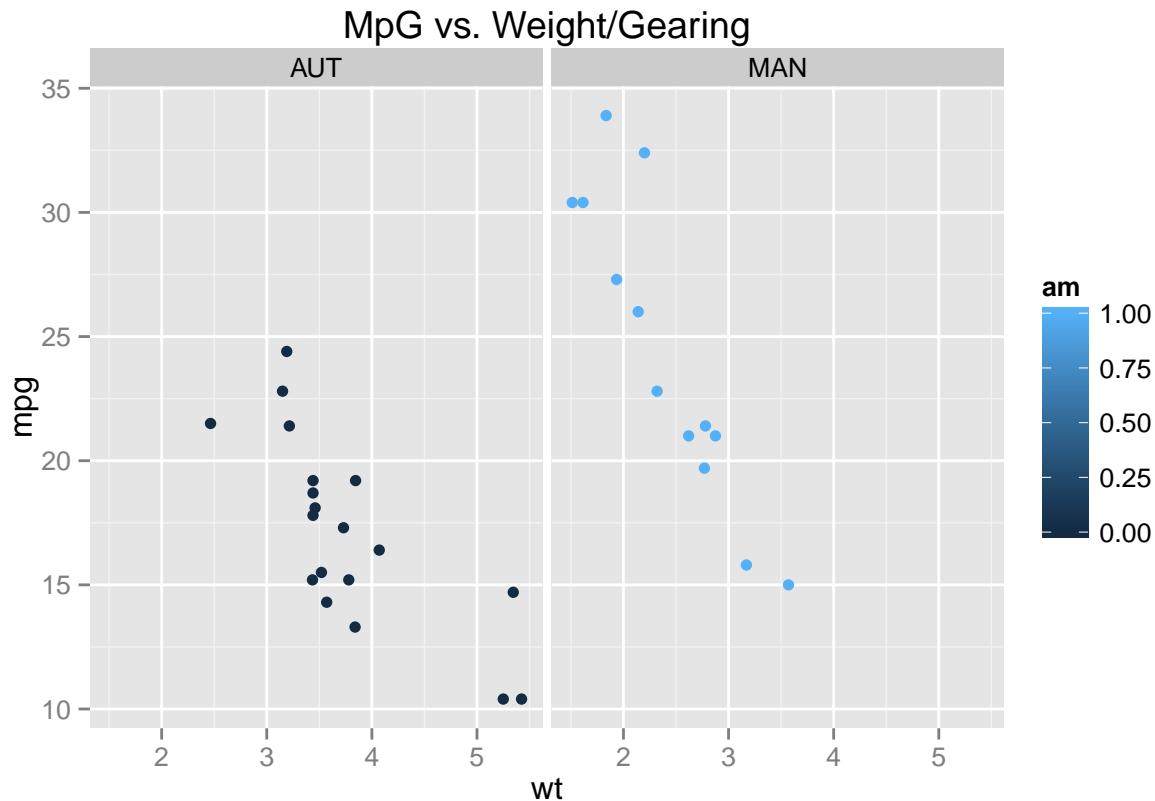
Looking further we see that manual transmission cars tend to have smaller weight and use less fuel.

Making our model

We will perform linear regression with all variables, and then perfom stepwise model selection to select the best predictors. cyl, am, hp and wt will be included in the final model.

```
fit<-glm(mpg~as.factor(cyl) + as.factor(vs) + as.factor(am) + as.factor(gear) + as.factor(carb) + disp
library(MASS)
step <- stepAIC(fit, direction="both")
step$anova
```

Conclussions

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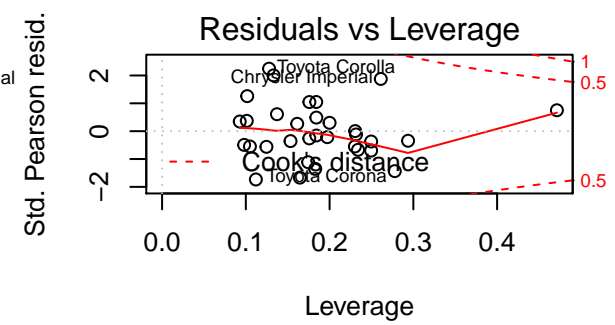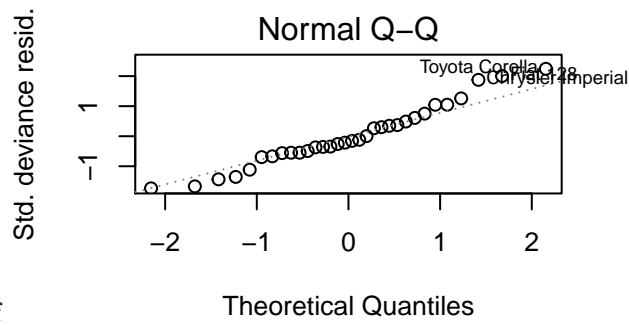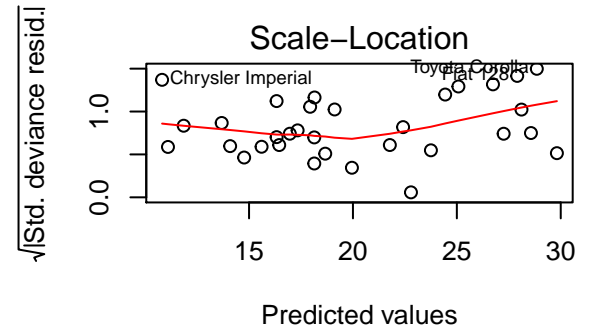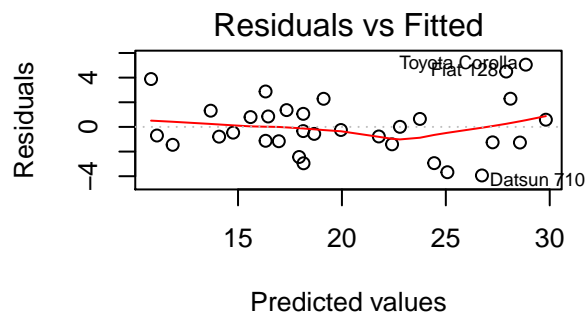
Appendix

Initial Explorations

```
plot(hp, mpg, pch=am,col=259,bg=7,
  xlab="Horsepower", cex=1.2,
  ylab="Miles per gallon", main="MpG vs. HP /Gearing")
legend("topright", c("AUT","MAN"), pch=c(0,1))
```
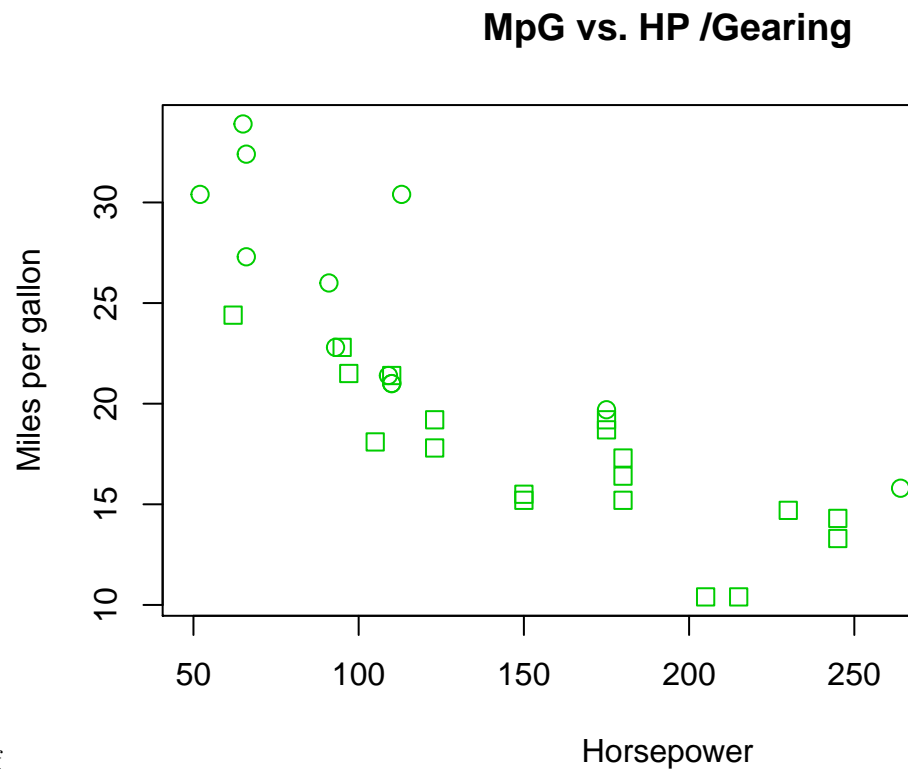

dependencies and exploring the data show-1.pdf

Final model

```
fit2<-glm(mpg ~ as.factor(cyl) + as.factor(am) + hp + wt, data=mtcars)
layout(matrix(c(1,2,3,4),2,2))
plot(fit2)
```

Residuals vs Fitted

Residuals

Toyota Corolla
Fiat 128
Datsun 710

Predicted values

Scale–Location

√|Std. deviance resid.|

Chrysler Imperial
Toyota Corolla
Fiat 128

Predicted values

Normal Q–Q

Std. deviance resid.

Toyota Corolla
Fiat 128
Chrysler Imperial

Theoretical Quantiles

Residuals vs Leverage

Std. Pearson resid.

Toyota Corolla
Chrysler Imperial
Cook's distance
Toyota Corona

1
0.5
0.5

Leverage

final model-1.pdf

Full Report also available at:

RPubs

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