Regression Project.Rmd

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```
## Loading required package: memisc
## Loading required package: lattice
## Loading required package: MASS
##
## Attaching package: 'memisc'
##
## The following objects are masked from 'package:stats':
##
##     contr.sum, contr.treatment, contrasts
##
## The following objects are masked from 'package:base':
##
##     as.array, trimws
##
## Loading required package: pander
## Loading required package: ggplot2
## Loading required package: dplyr
##
## Attaching package: 'dplyr'
##
## The following objects are masked from 'package:memisc':
##
##     collect, query, rename
##
## The following object is masked from 'package:MASS':
##
##     select
##
## The following objects are masked from 'package:stats':
##
##     filter, lag
##
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
##
## Loading required package: knitr
```

Motor Trend Car Road Tests

Analysis of MT car data

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
```

```
lm0 <- lm(hp ~ wt, mtcars)
lm1 <- lm(qsec ~ hp, mtcars)
lm2 <- lm(qsec ~ wt, mtcars)
mtable123 <- mtable('Model 1' = lm0,
            'Model 2' = lm1,
            'Model 3' = lm2,
            summary.stats = c('R-squared','F','p','N'))
pander(mtable123)
```

	Model 1	Model 2	Model 3
(Intercept)	-1.82	20.56***	18.88***
	(32.32)	(0.54)	(1.10)
wt	46.16***		-0.32
	(9.63)		(0.33)
hp		-0.02***	
		(0.00)	
R-squared	0.43	0.50	0.03
F	23.00	30.19	0.94
p	0.00	0.00	0.34
N	32	32	32

Fit all variables against MPG

```
all_fit <- lm(mpg ~ . , data = cars)
all_fit_coef <- summary(all_fit)$coef
kable(all_fit_coef, caption="All Fit Coefficients")
```

Table 2: All Fit Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	12.30	18.72	0.66	0.52
cyl	-0.11	1.05	-0.11	0.92
disp	0.01	0.02	0.75	0.46
hp	-0.02	0.02	-0.99	0.33
drat	0.79	1.64	0.48	0.64

	Estimate	Std. Error	t value	Pr(>|t|)
wt	-3.72	1.89	-1.96	0.06
qsec	0.82	0.73	1.12	0.27
vs	0.32	2.10	0.15	0.88
am	2.52	2.06	1.23	0.23
gear	0.66	1.49	0.44	0.67
carb	-0.20	0.83	-0.24	0.81

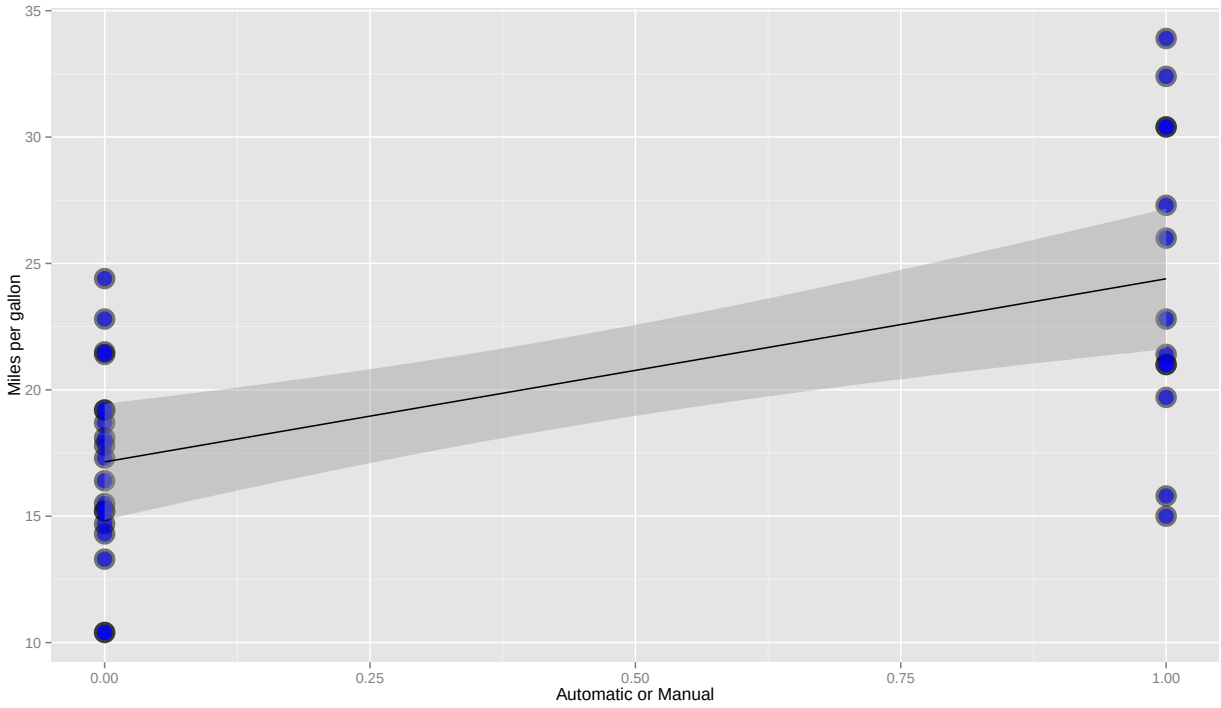
Fit automatic vs manual against MPG

```
# [, 9] am      Transmission (0 = automatic, 1 = manual)
am_fit <- lm(mpg ~ am, data = cars)
am_fit_coef <- summary(am_fit)$coef
kable(am_fit_coef, caption="All Fit Coefficients")
```

Table 3: All Fit Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	17.1	1.1	15.2	0
am	7.2	1.8	4.1	0

```
g_am = ggplot(cars, aes(x = am, y = mpg)) +
    ylab("Miles per gallon") +
    xlab("Automatic or Manual") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = am),size = 5, colour = "blue", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_am)
```



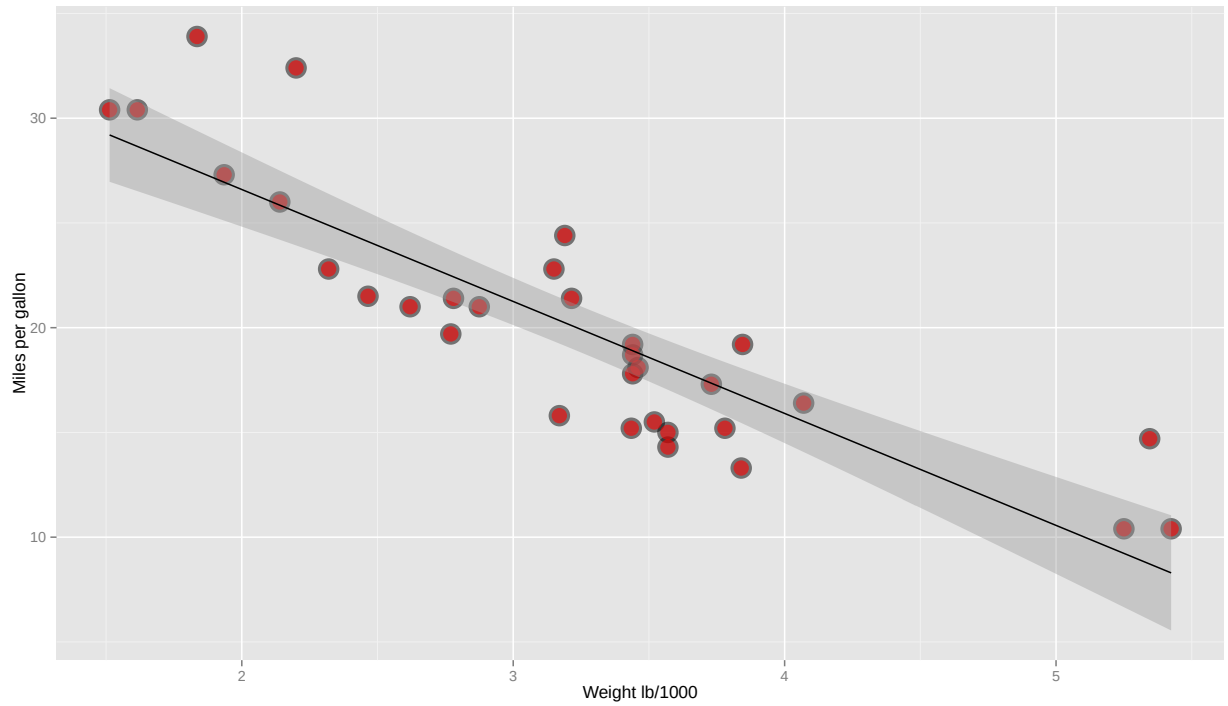
Fit Weight against MPG

```
# [, 6] wt      Weight (lb/1000)
wt_fit <- lm(mpg ~ wt, data = cars)
wt_fit_coef <- summary(wt_fit)$coef
kable(wt_fit_coef, caption="Weight Coefficients")
```

Table 4: Weight Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	37.3	1.88	19.9	0
wt	-5.3	0.56	-9.6	0

```
g_wt = ggplot(cars, aes(x = wt, y = mpg)) +
    ylab("Miles per gallon") +
    xlab("Weight lb/1000") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = wt),size = 5, colour = "red", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_wt)
```



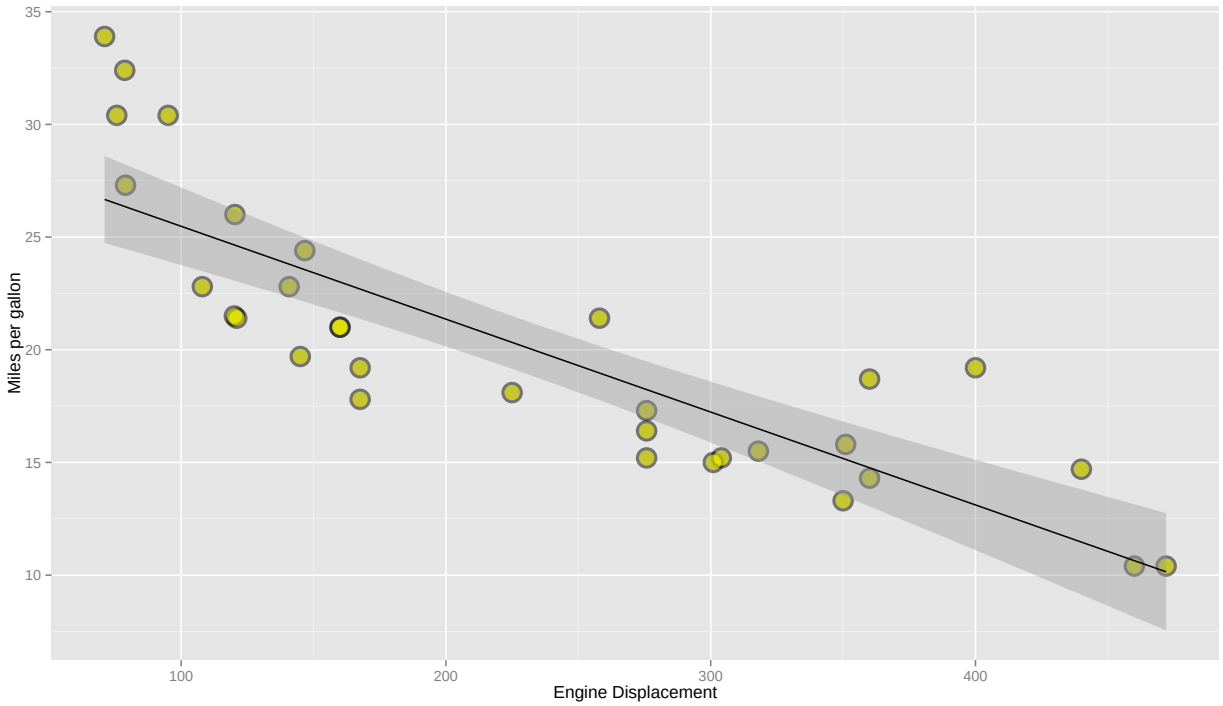
Fit engine displacement against MPG

```
# [, 3] disp    Displacement (cu.in.)
disp_fit <- lm(mpg ~ am + gear, data = cars)
disp_fit_coef <- summary(disp_fit)$coef
kable(disp_fit_coef, caption="Displacement Coefficients")
```

Table 5: Displacement Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	16.86	6.5	2.59	0.01
am	7.14	3.0	2.42	0.02
gear	0.09	2.0	0.04	0.97

```
g_disp = ggplot(cars, aes(x = disp, y = mpg)) +
    ylab("Miles per gallon") +
    xlab("Engine Displacement") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = disp),size = 5, colour = "yellow", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_disp)
```



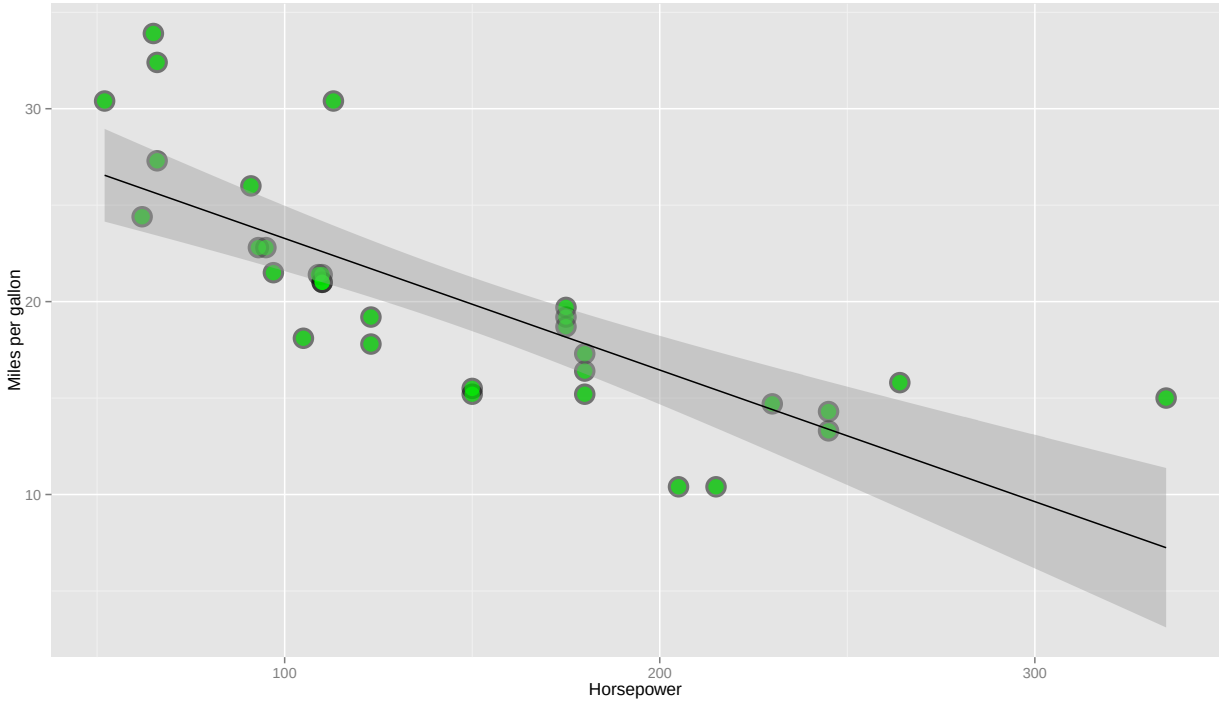
Fit Gross horsepower against MPG

```
# [, 4] hp      Gross horsepower
hp_fit <- lm(mpg ~ hp, data = cars)
hp_fit_coef <- summary(hp_fit)$coef
kable(hp_fit_coef, caption="Horsepower Coefficients")
```

Table 6: Horsepower Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	30.10	1.63	18.4	0
hp	-0.07	0.01	-6.7	0

```
g_hp = ggplot(cars, aes(x = hp, y = mpg)) +
    ylab("Miles per gallon") +
    xlab("Horsepower") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = hp),size = 5, colour = "green", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_hp)
```



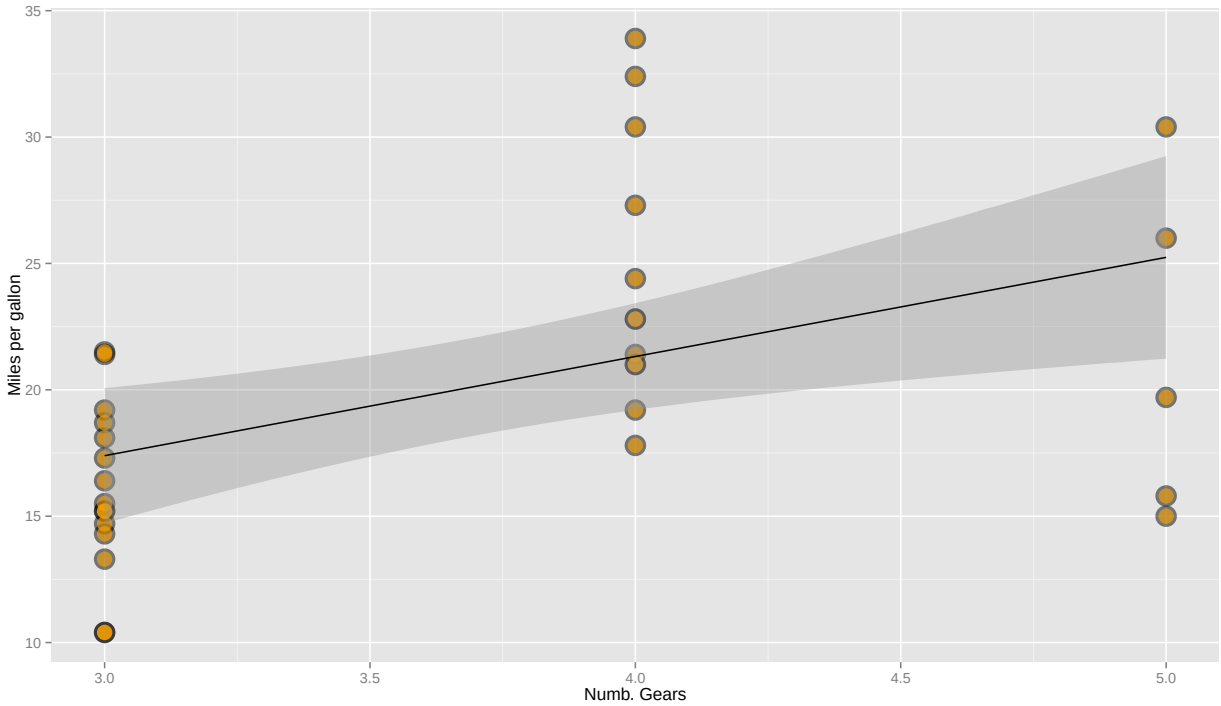
Fit number of gears against MPG

```
# [,10] gear    Number of forward gears
gr_fit <- lm(mpg ~ gear, data = cars)
gr_fit_coef <- summary(gr_fit)$coef
kable(gr_fit_coef, caption="Numb. Gears Coefficients")
```

Table 7: Numb. Gears Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	5.6	4.9	1.1	0.26
gear	3.9	1.3	3.0	0.01

```
g_gr = ggplot(cars, aes(x = gear, y =mpg)) +
    ylab("Miles per gallon") +
    xlab("Numb. Gears") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = gear),size = 5, colour = "orange", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_gr)
```



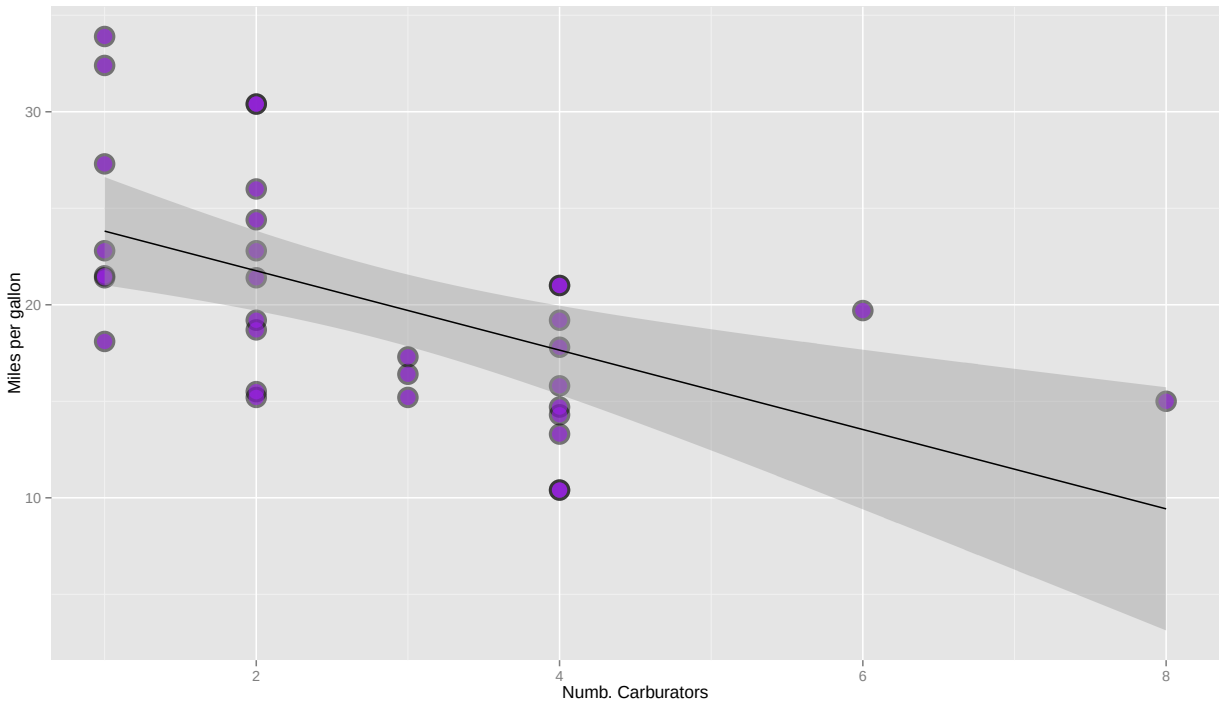
Fit number of carburators against MPG

```
# [,11] carb    Number of carburetors
carb_fit <- lm(mpg ~ carb, data = cars)
carb_fit_coef <- summary(carb_fit)$coef
kable(carb_fit_coef, caption="Numb. Carburator Coefficients")
```

Table 8: Numb. Carburator Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	25.9	1.84	14.1	0
carb	-2.1	0.57	-3.6	0

```
g_carb = ggplot(cars, aes(x = carb, y =mpg)) +
    ylab("Miles per gallon") +
    xlab("Numb. Carburators") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = carb),size = 5, colour = "purple", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_carb)
```



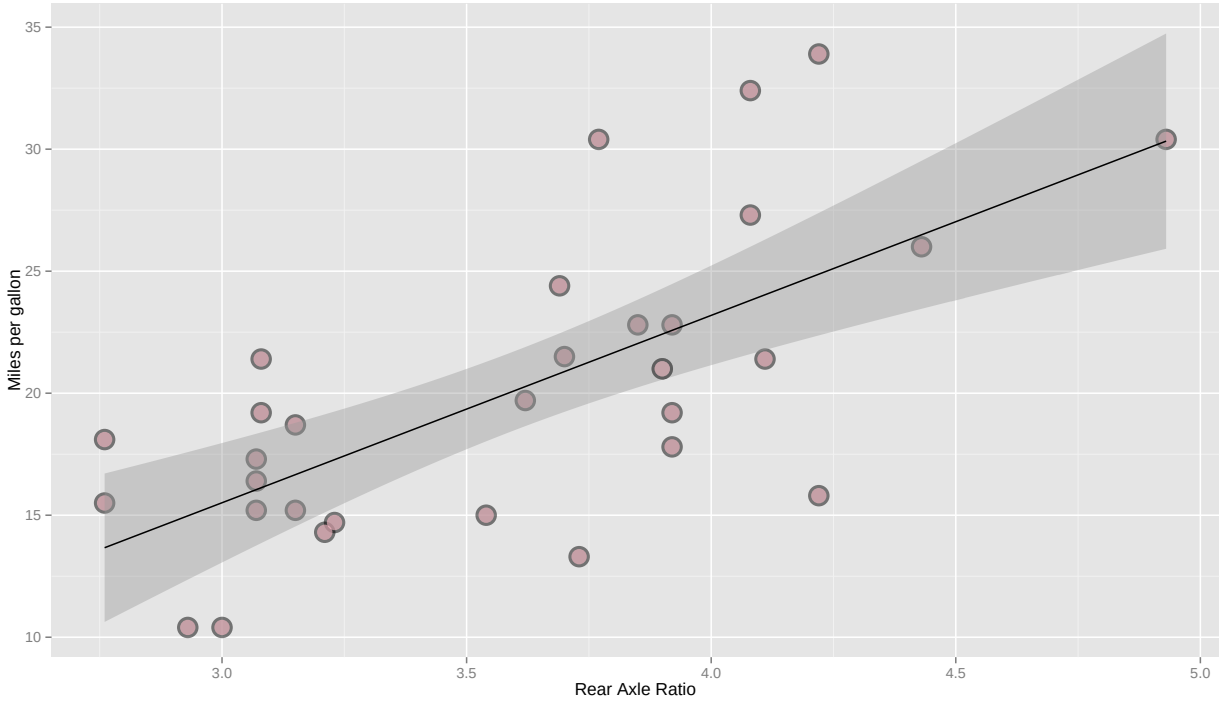
Fit Rear Gear Ratio against MPG

```
# [, 5] drat    Rear axle ratio
drat_fit <- lm(mpg ~ drat, data = cars)
drat_fit_coef <- summary(drat_fit)$coef
kable(drat_fit_coef, caption="Rear Gear Ratio Coefficients")
```

Table 9: Rear Gear Ratio Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-7.5	5.5	-1.4	0.18
drat	7.7	1.5	5.1	0.00

```
g_drat = ggplot(cars, aes(x = drat, y =mpg)) +
    ylab("Miles per gallon") +
    xlab("Rear Axle Ratio") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = drat),size = 5, colour = "pink", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_drat)
```



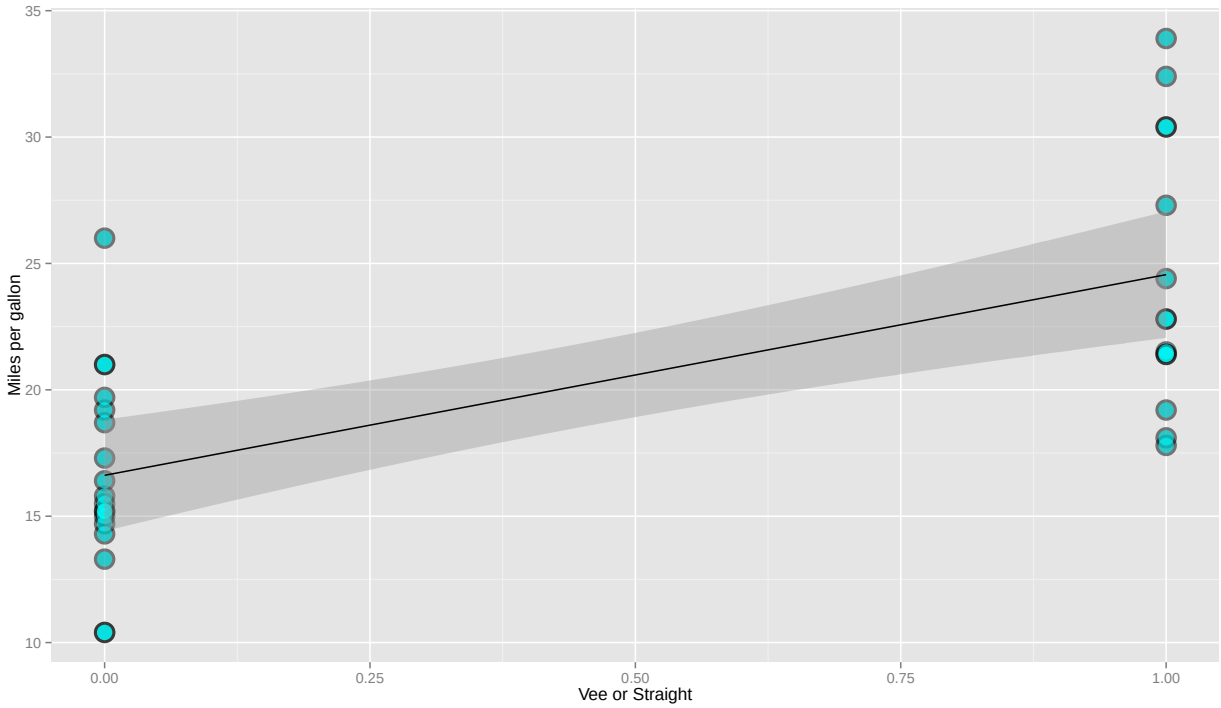
Fit Vee vs Straight against MPG

```
# [, 8] vs      V/S
vs_fit <- lm(mpg ~ vs, data = cars)
vs_fit_coef <- summary(vs_fit)$coef
kable(vs_fit_coef, caption="Vee vs Straight Coefficients")
```

Table 10: Vee vs Straight Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	16.6	1.1	15.4	0
vs	7.9	1.6	4.9	0

```
g_vs = ggplot(cars, aes(x = vs, y =mpg)) +
    ylab("Miles per gallon") +
    xlab("Vee or Straight") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = vs),size = 5, colour = "cyan", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_vs)
```



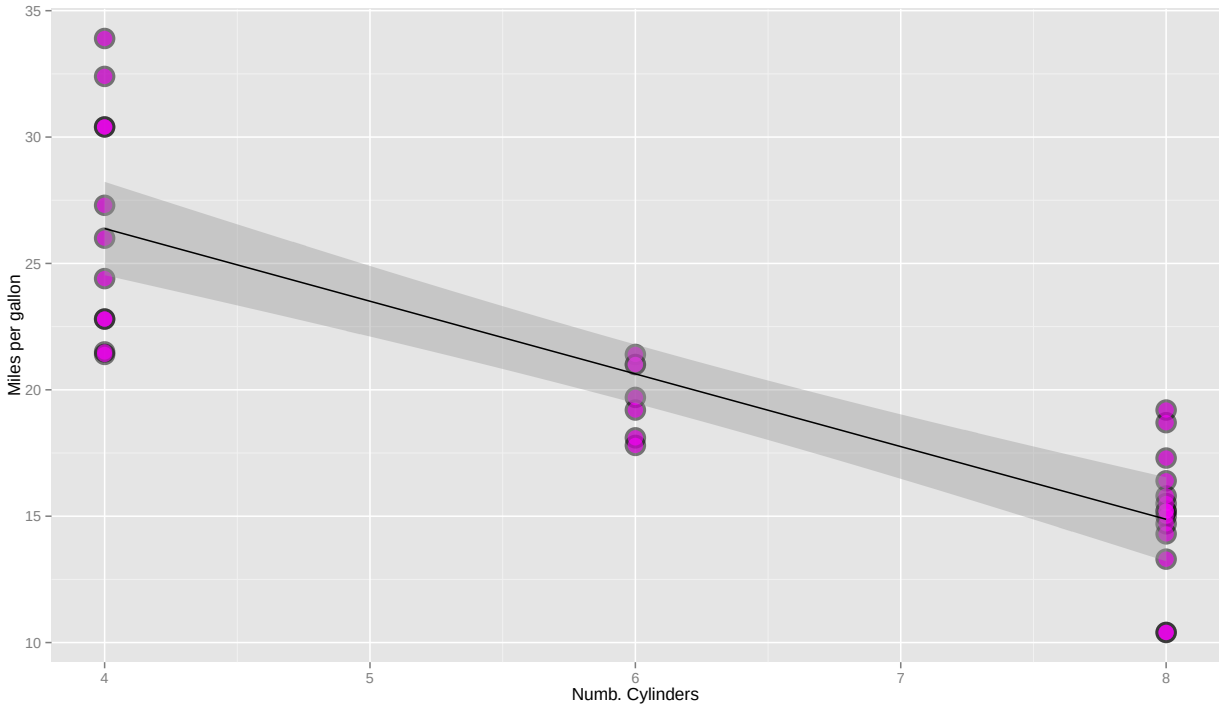
Fit number of cylinders against MPG

```
# [, 2] cyl     Number of cylinders
cyl_fit <- lm(mpg ~ cyl, data = cars)
cyl_fit_coef <- summary(cyl_fit)$coef
kable(cyl_fit_coef, caption="Numb. Cylinders Coefficients")
```

Table 11: Numb. Cylinders Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	37.9	2.07	18.3	0
cyl	-2.9	0.32	-8.9	0

```
g_cyl = ggplot(cars, aes(x = cyl, y =mpg)) +
    ylab("Miles per gallon") +
    xlab("Numb. Cylinders") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = cyl),size = 5, colour = "magenta", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(g_cyl)
```



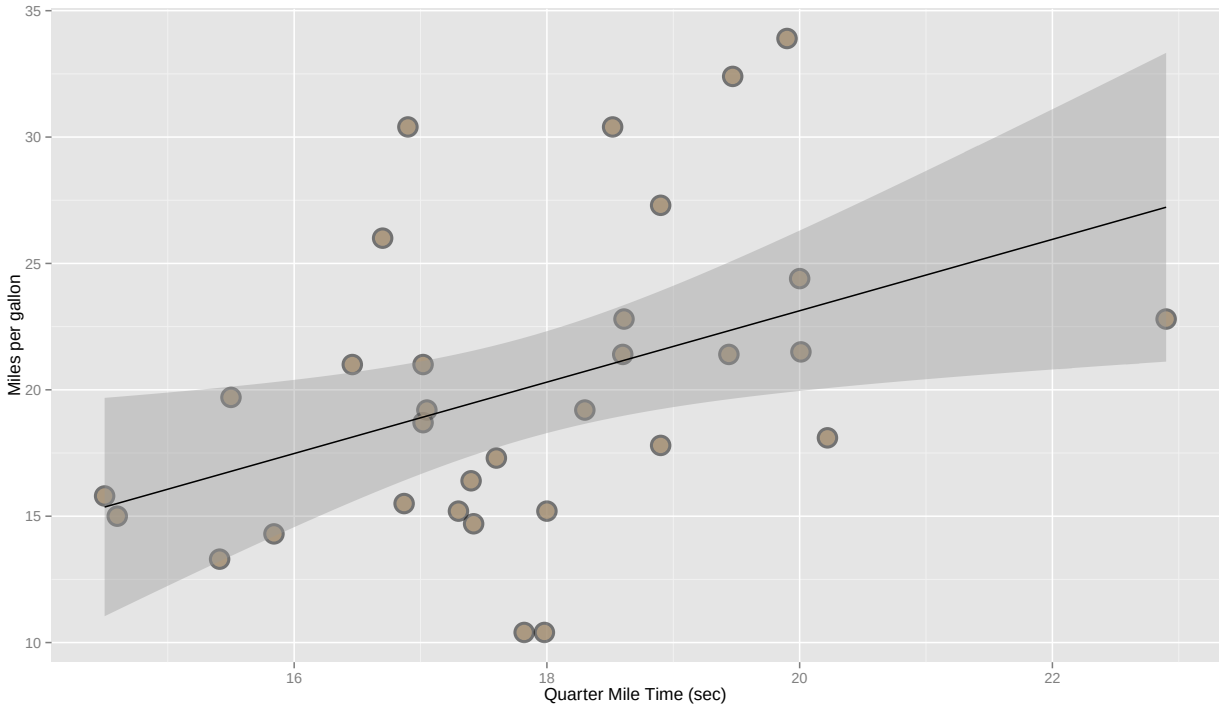
Fit Quarter Mile Time against MPG

```
# [, 7] qsec    1/4 mile time
qsec_fit <- lm(mpg ~ qsec, data = cars)
qsec_fit_coef <- summary(qsec_fit)$coef
kable(qsec_fit_coef, caption="Quarter Mile Time Coefficients")
```

Table 12: Quarter Mile Time Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-5.1	10.03	-0.51	0.61
qsec	1.4	0.56	2.53	0.02

```
qsec_cyl = ggplot(cars, aes(x = qsec, y =mpg)) +
    ylab("Miles per gallon") +
    xlab("Quarter Mile Time (sec)") +
    geom_point(aes(y=mpg), size = 7, colour = "black", alpha=0.5) +
    geom_point(aes(x = qsec),size = 5, colour = "tan", alpha=0.6) +
    geom_smooth(method = "lm", colour = "black")
print(qsec_cyl)
```


35
30
25
20
15
10
Miles per gallon
16
18
20
22
Quarter Mile Time (sec)