Output - Version B

Dataset: NFLStandings2016

Details:

Final (end-of-season) standings for ALL TEAMS in the National Football League (NFL) from the 2016 regular season, along with a summary of each team's season statistics. Each team played 16 games against the other teams in the NFL. Note: All professional American football teams play in the NFL, and every team is assigned to either the AFC or NFC Conference within the League.

Variable Descriptions:

Var1 = *WinPct* Proportion of games won (Wins/16) by the team

Var2 = *Conference* Conference: AFC (Group 1) or NFC (Group 2)

Var3 = *YardsAgainst* Total yards gained against the team

Var4 = *YardsFor* Total yards gained by the team

Var5 = *TDs* Number of touchdowns scored by the team

Var6 = *NetPts* Points scored by the team - Points scored against the team

```
summary(select(NFLStandings2016, WinPct, YardsFor, YardsAgainst, TDs, NetPts))
```

```
##      WinPct          YardsFor     YardsAgainst       TDs            NetPts
##  Min.   :0.0630   Min.   :4203   Min.   :4821   Min.   :24.00   Min.   :-188
##  1st Qu.:0.3982   1st Qu.:5316   1st Qu.:5350   1st Qu.:35.00   1st Qu.: -21
##  Median :0.5155   Median :5614   Median :5584   Median :40.50   Median :  17
##  Mean   :0.5002   Mean   :5606   Mean   :5606   Mean   :40.84   Mean   :   0
##  3rd Qu.:0.6328   3rd Qu.:5877   3rd Qu.:5907   3rd Qu.:47.25   3rd Qu.:  38
##  Max.   :0.8750   Max.   :6816   Max.   :6502   Max.   :63.00   Max.   : 191
```

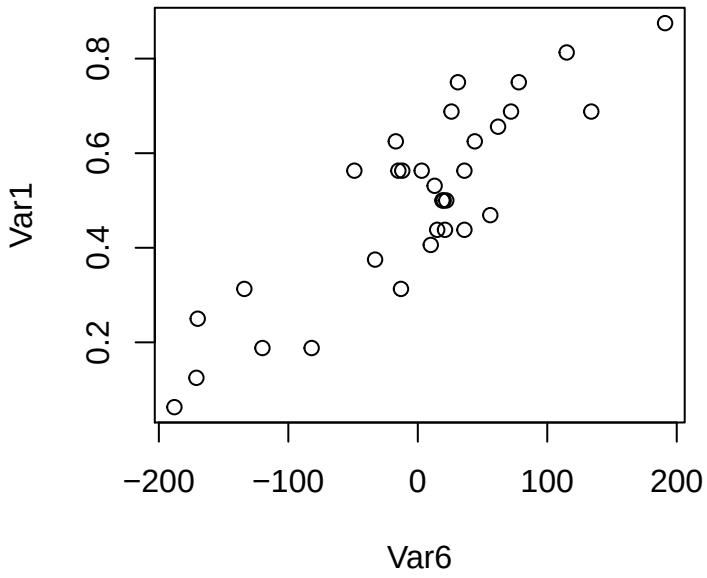
```
head(select(NFLStandings2016, WinPct, Conference, YardsFor, YardsAgainst, TDs, NetPts))
```

```
##   WinPct Conference YardsFor YardsAgainst TDs NetPts
## 1  0.875        AFC     6179         5222  51    191
## 2  0.813        NFC     6027         5502  49    115
## 3  0.750        AFC     5488         5896  42     78
## 4  0.750        AFC     5973         6002  47     31
## 5  0.688        NFC     6653         5939  63    134
## 6  0.688        NFC     5291         5435  36     26
```

```
cor(select(NFLStandings2016, WinPct, YardsFor, YardsAgainst, TDs, NetPts))
```

```
##                  WinPct  YardsFor YardsAgainst       TDs     NetPts
## WinPct        1.0000000 0.4595405   -0.1657968 0.5097821  0.8696170
## YardsFor      0.4595405 1.0000000    0.1921515 0.8127634  0.6571890
## YardsAgainst -0.1657968 0.1921515    1.0000000 0.2904103 -0.2363913
## TDs           0.5097821 0.8127634    0.2904103 1.0000000  0.6966342
## NetPts        0.8696170 0.6571890   -0.2363913 0.6966342  1.0000000
```

```
plot(Var1~Var6,data=NFLStandings2016)
```




```
lm1 <- lm(Var1~Var6,data=NFLStandings2016); summary(lm1)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6, data = NFLStandings2016)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.16105 -0.07337 -0.01001  0.08386  0.18727
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.5002500  0.0177565  28.173  < 2e-16 ***
## Var6        0.0020155  0.0002089   9.647 1.05e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1004 on 30 degrees of freedom
## Multiple R-squared:  0.7562, Adjusted R-squared:  0.7481
## F-statistic: 93.07 on 1 and 30 DF,  p-value: 1.049e-10
```

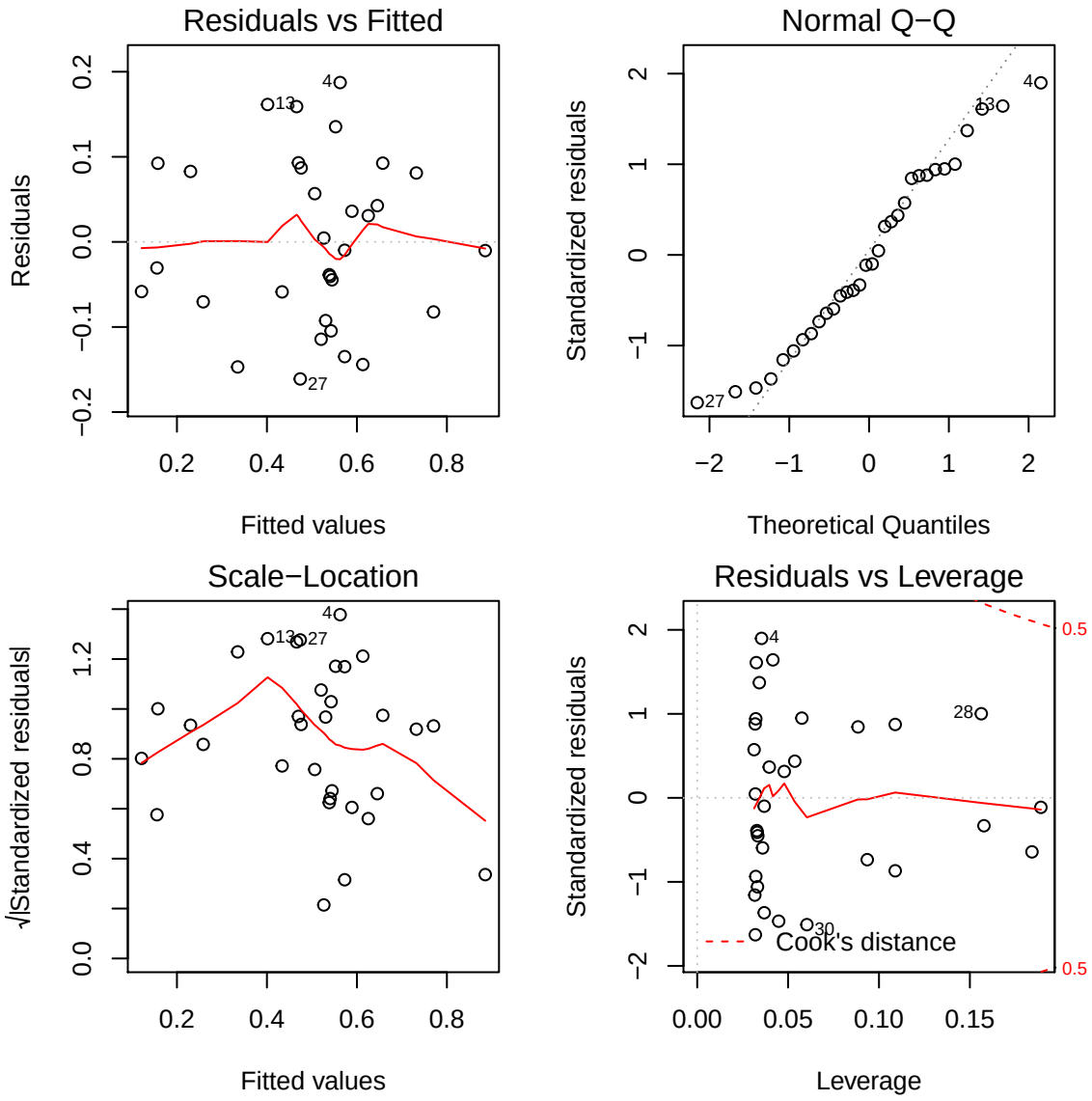
```
predict.lm(lm1,newdata=data.frame("Var6"=4.00),interval = "confidence", level=0.90)
```

```
##         fit       lwr      upr
## 1 0.5083122 0.4781414 0.538483
```

```
predict.lm(lm1,newdata=data.frame("Var6"=4.00),interval = "prediction", level=0.90)
```

```
##         fit       lwr       upr
## 1 0.5083122 0.3351799 0.6814444
```

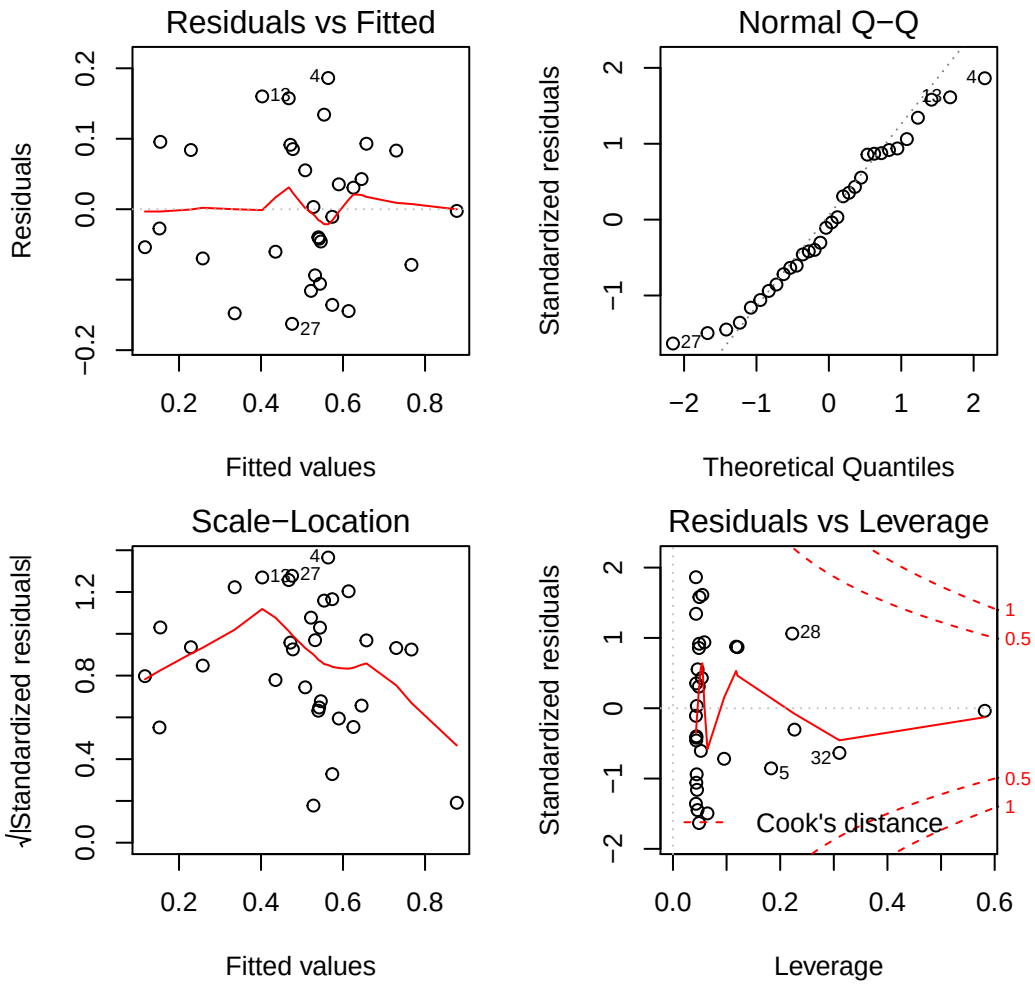
```
par(mar=c(4,4,2,2)); par(mfrow=c(2,2)); plot(lm1)
```


Residuals vs Fitted
Residuals
Fitted values
Normal Q−Q
Standardized residuals
Theoretical Quantiles
Scale−Location
√|Standardized residuals|
Fitted values
Residuals vs Leverage
Standardized residuals
Cook's distance
Leverage

```r
lm2 <- lm(Var1~Var6 + I(Var6^2),data=NFLStandings2016); summary(lm2)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6 + I(Var6^2), data = NFLStandings2016)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.162656 -0.072123 -0.006593  0.084338  0.186192
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.018e-01  2.202e-02  22.791  < 2e-16 ***
## Var6         2.007e-03  2.230e-04   9.001 6.79e-10 ***
## I(Var6^2)   -2.127e-07  1.744e-06  -0.122    0.904
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1021 on 29 degrees of freedom
## Multiple R-squared:  0.7564, Adjusted R-squared:  0.7396
## F-statistic: 45.01 on 2 and 29 DF,  p-value: 1.282e-09
```

```r
par(mar=c(4,4,2,2)); par(mfrow=c(2,2)); plot(lm2)
```



```
lm3 <- lm(Var1~Var6+Var4+Var3,data=NFLStandings2016); summary(lm3)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6 + Var4 + Var3, data = NFLStandings2016)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.167877 -0.074146  0.005797  0.062296  0.183538
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  7.208e-01  2.812e-01   2.563   0.0160 *
## Var6         2.535e-03  3.024e-04   8.382 4.06e-09 ***
## Var4        -1.103e-04  4.957e-05  -2.226   0.0342 *
## Var3         7.101e-05  4.808e-05   1.477   0.1509
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0955 on 28 degrees of freedom
## Multiple R-squared:  0.7943, Adjusted R-squared:  0.7723
## F-statistic: 36.04 on 3 and 28 DF,  p-value: 9.446e-10
```

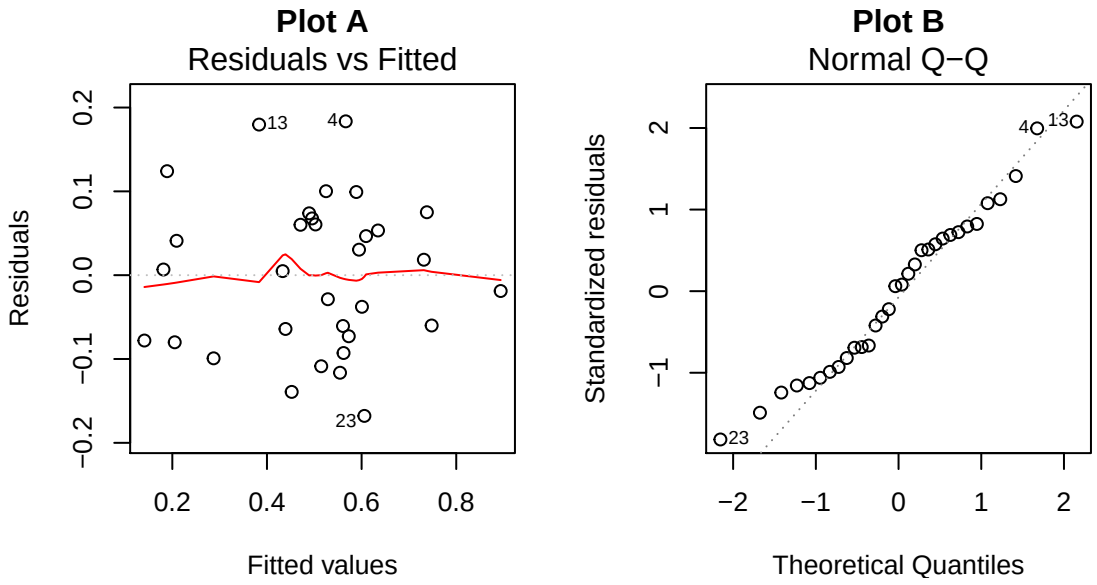
```
vif(lm3)
```

```
##     Var6     Var4     Var3
## 2.317338 2.271720 1.366957
```

```
confint(lm3)
```

```
##                      2.5 %        97.5 %
## (Intercept)  1.447924e-01  1.296874e+00
## Var6         1.915267e-03  3.154123e-03
## Var4        -2.118830e-04 -8.821572e-06
## Var3        -2.748262e-05  1.694978e-04
```

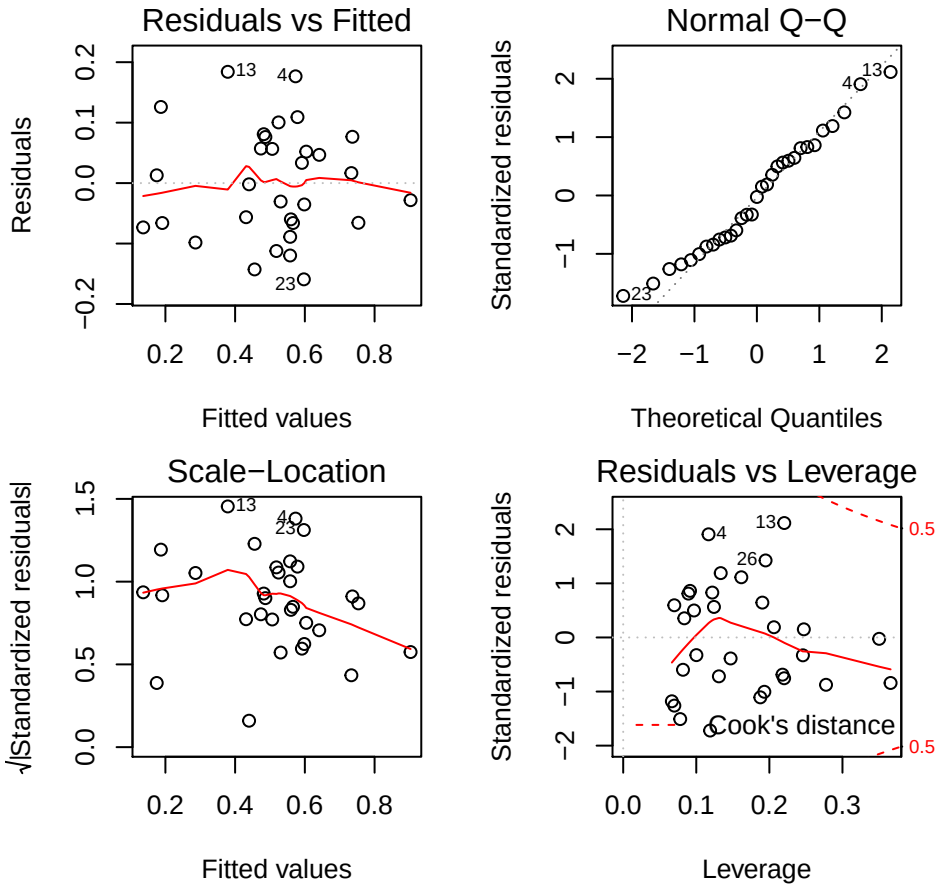
```
par(mar=c(4,4,4,2)); par(mfrow=c(2,2)); plot(lm3, which=1, main="Plot A"); plot(lm3, which=2, main="Plo
```



```
lm4 <- lm(Var1~Var6+Var4+Var3+Var2,data=NFLStandings2016); summary(lm4)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6 + Var4 + Var3 + Var2, data = NFLStandings2016)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.159202 -0.066052 -0.002025  0.066676  0.184066
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  6.590e-01  3.117e-01   2.115   0.0442 *
## Var6         2.540e-03  3.132e-04   8.107 1.38e-08 ***
## Var4        -9.958e-05  5.483e-05  -1.816   0.0809 .
## Var3         7.172e-05  4.964e-05   1.445   0.1604
## Var2NFC     -9.065e-03  3.632e-02  -0.250   0.8049
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09855 on 26 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.7855, Adjusted R-squared:  0.7525
## F-statistic:  23.8 on 4 and 26 DF,  p-value: 2.283e-08
```

```
par(mar=c(4,4,2,2)); par(mfrow=c(2,2)); plot(lm4)
```



Output - Version A

Dataset: NBAPlayers2019

Details:

Final (end-of-season) summary for 193 NBA (National Basketball Association) basketball players from the 2018-2019 regular season. Includes all NBA players who averaged more than 24 minutes per game that season.

Variable Descriptions:

Var1 = *Points* Total number of points scored during the season

Var2 = *Age30* Player age (under 30, 30 or older)

Var3 = *Starts* Games started

Var4 = *Rebounds* Total rebounds

Var5 = *FTPct* Free throw percentage (free throws made/free throws attempted)

Var6 = *MinPerGame* Minutes played per game

```
summary(select(NBAPlayers2019, Points, Age30, Starts, Rebounds, FTPct, MinPerGame))
```

```
##      Points           Age30         Starts         Rebounds
##  Min.   :  17.0   30+    :149   Min.   : 0.00   Min.   :   3.0
##  1st Qu.: 633.0   under30: 44   1st Qu.:29.00   1st Qu.: 216.0
##  Median : 925.0                 Median :56.00   Median : 314.0
##  Mean   : 980.8                 Mean   :51.07   Mean   : 358.3
##  3rd Qu.:1284.0                 3rd Qu.:74.00   3rd Qu.: 461.0
##  Max.   :2818.0                 Max.   :82.00   Max.   :1232.0
##      FTPct          MinPerGame
##  Min.   :0.4170   Min.   :24.00
##  1st Qu.:0.7260   1st Qu.:26.80
##  Median :0.7890   Median :28.80
##  Mean   :0.7737   Mean   :29.53
##  3rd Qu.:0.8390   3rd Qu.:31.90
##  Max.   :0.9280   Max.   :36.90
```

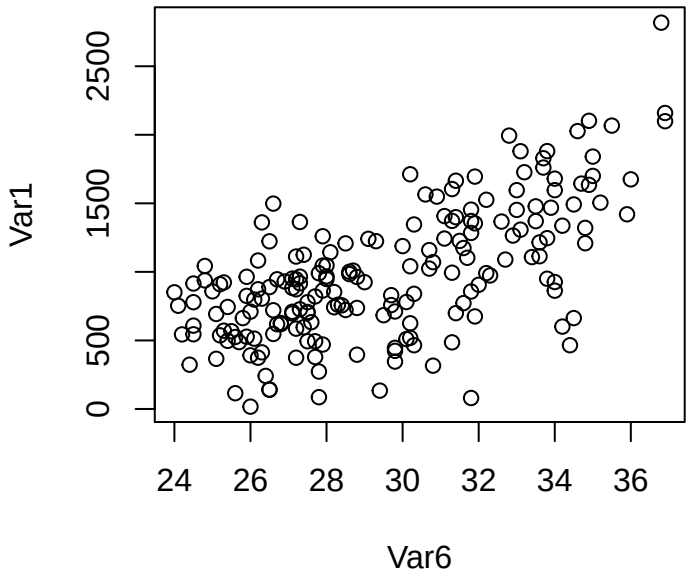
```
head(select(NBAPlayers2019, Points, Age30, Starts, Rebounds, FTPct, MinPerGame))
```

```
##   Points   Age30 Starts Rebounds FTPct MinPerGame
## 1   1108     30+     80      760 0.500       33.4
## 2   1727 under30     81      744 0.847       33.2
## 3    873     30+     80      672 0.709       26.2
## 4    760     30+     81      610 0.867       28.3
## 5    346     30+     40      251 0.578       29.8
## 6   1994     30+     72      898 0.729       32.8
```

```
cor(select(NBAPlayers2019, Points, Starts, Rebounds, FTPct, MinPerGame))
```

```
##               Points    Starts   Rebounds      FTPct MinPerGame
## Points     1.0000000 0.5766275  0.5334326  0.3099756  0.6532564
## Starts     0.5766275 1.0000000  0.4817078  0.1955007  0.6100101
## Rebounds   0.5334326 0.4817078  1.0000000 -0.1355427  0.3270084
## FTPct      0.3099756 0.1955007 -0.1355427  1.0000000  0.1256977
## MinPerGame 0.6532564 0.6100101  0.3270084  0.1256977  1.0000000
```

```r
plot(Var1~Var6,data=NBAPlayers2019)
```




```r
lm1 <- lm(Var1~Var6,data=NBAPlayers2019); summary(lm1)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6, data = NBAPlayers2019)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1116.30  -195.14    16.66   233.18  1147.71
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1818.31     236.20  -7.698 7.22e-13 ***
## Var6           94.80       7.95  11.924  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 363.2 on 191 degrees of freedom
## Multiple R-squared:  0.4267, Adjusted R-squared:  0.4237
## F-statistic: 142.2 on 1 and 191 DF,  p-value: < 2.2e-16
```

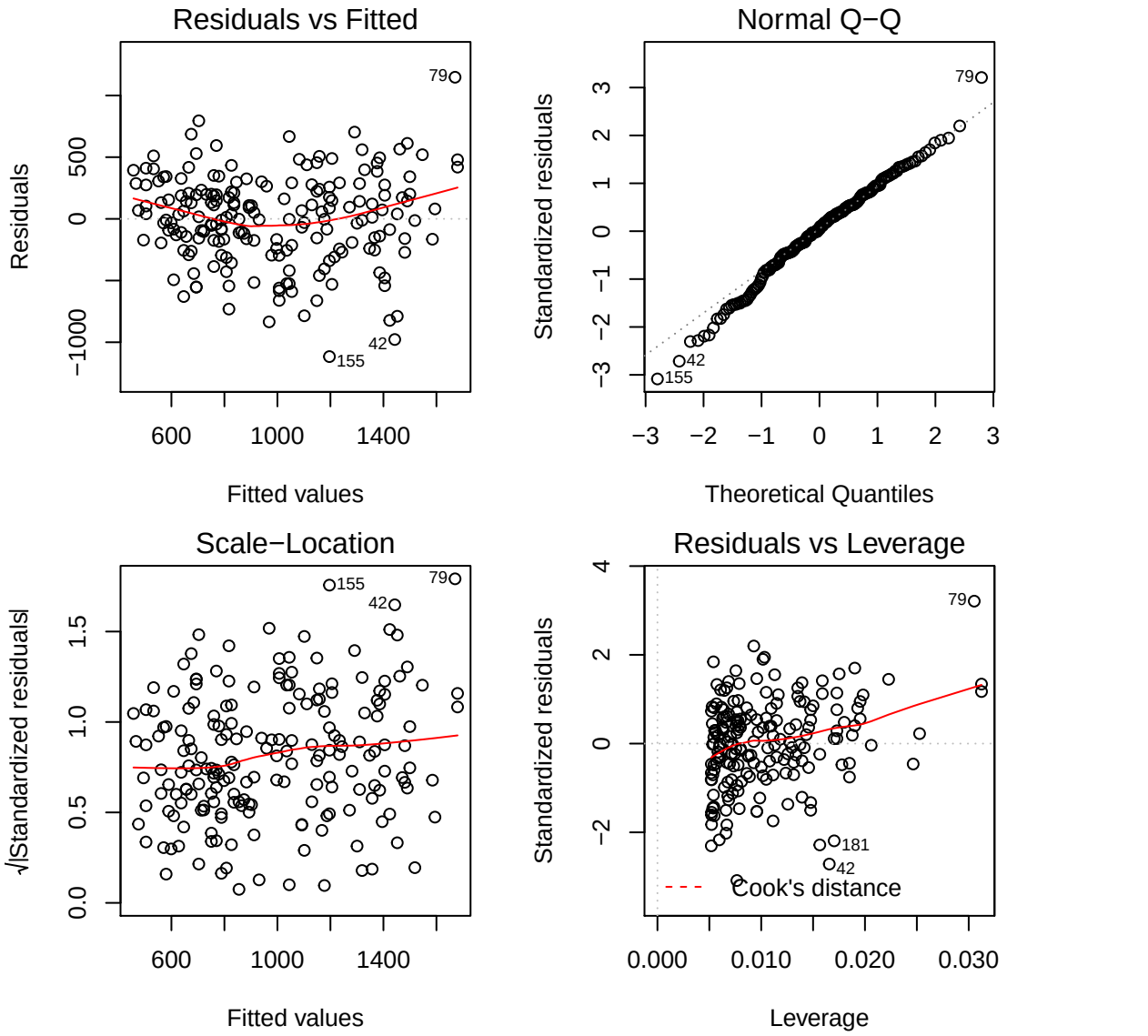
```r
predict.lm(lm1,newdata=data.frame("Var6"=34.00),interval = "confidence", level=0.90)
```

```
##        fit      lwr      upr
## 1 1404.855 1331.904 1477.806
```

```r
predict.lm(lm1,newdata=data.frame("Var6"=34.00),interval = "prediction", level=0.90)
```

```
##        fit      lwr      upr
## 1 1404.855 800.1852 2009.525
```

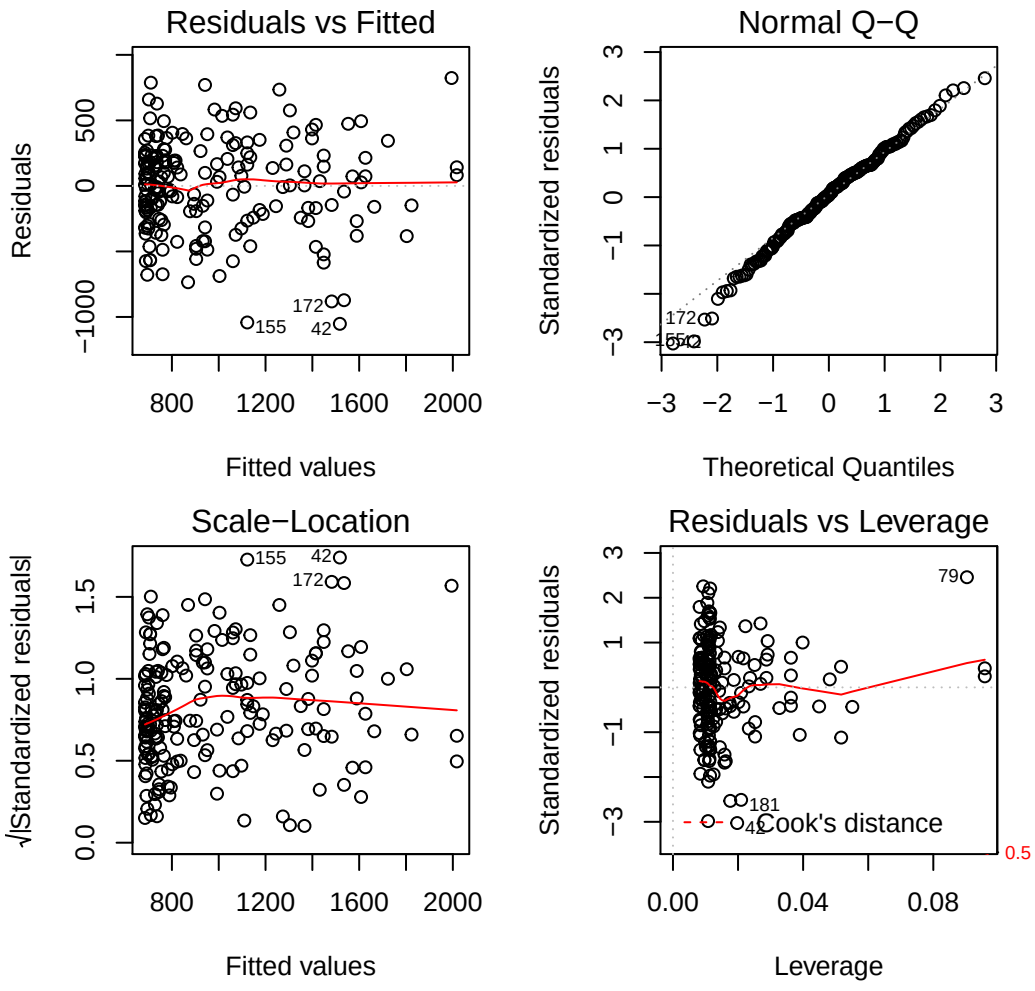
```
par(mar=c(4,4,2,2)); par(mfrow=c(2,2)); plot(lm1)
```



```r
lm2 <- lm(Var1~Var6 + I(Var6^2),data=NBAPlayers2019); summary(lm2)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6 + I(Var6^2), data = NBAPlayers2019)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1052.52  -192.82    14.97   224.54   823.34
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 6504.528   2215.171   2.936 0.003731 **
## Var6        -466.328    148.750  -3.135 0.001992 **
## I(Var6^2)      9.342      2.473   3.777 0.000212 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 351.2 on 190 degrees of freedom
## Multiple R-squared:  0.4668, Adjusted R-squared:  0.4612
## F-statistic: 83.16 on 2 and 190 DF,  p-value: < 2.2e-16
```

```r
par(mar=c(4,4,2,2)); par(mfrow=c(2,2)); plot(lm2)
```



```
lm3 <- lm(Var1~Var6+Var4+Var3,data=NBAPlayers2019); summary(lm3)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6 + Var4 + Var3, data = NBAPlayers2019)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -861.84 -216.89   -4.43  188.43 1163.48
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1394.5194   233.4251  -5.974 1.13e-08 ***
## Var6           67.2865     8.9236   7.540 1.91e-12 ***
## Var4            0.7033     0.1250   5.627 6.52e-08 ***
## Var3            2.6741     1.2395   2.157   0.0322 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 322.6 on 189 degrees of freedom
## Multiple R-squared:  0.5523, Adjusted R-squared:  0.5452
## F-statistic: 77.72 on 3 and 189 DF,  p-value: < 2.2e-16
```

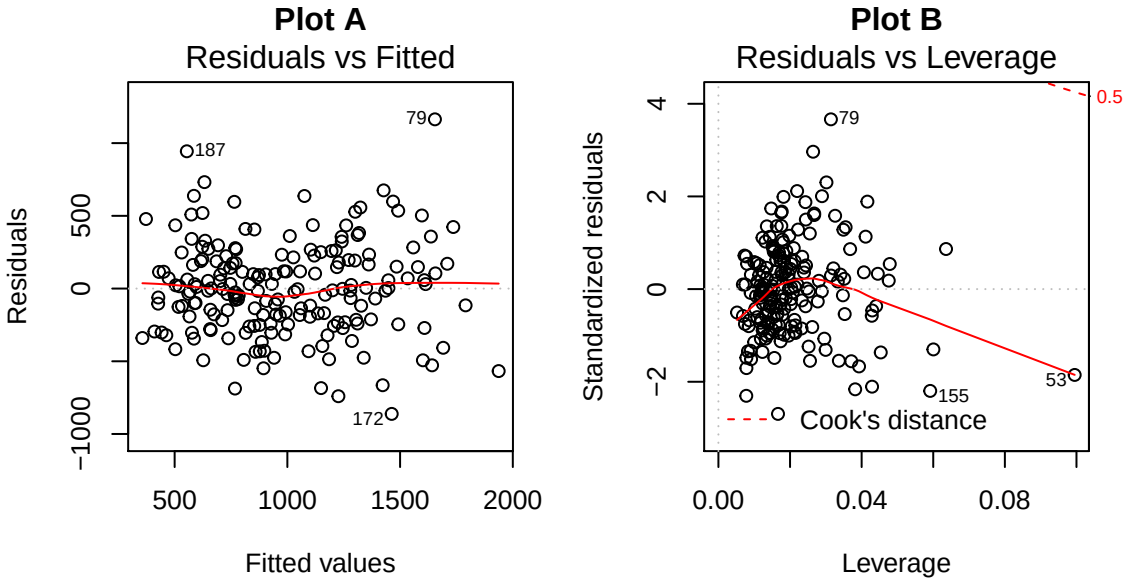
```
vif(lm3)
```

```
##     Var6     Var4     Var3
## 1.596282 1.305132 1.856332
```

```
confint(lm3)
```

```
##                       2.5 %      97.5 %
## (Intercept) -1854.9727364 -934.066137
## Var6           49.6838490   84.889136
## Var4            0.4567759    0.949844
## Var3            0.2290567    5.119222
```

```
par(mar=c(4,4,4,2)); par(mfrow=c(2,2)); plot(lm3, which=1, main="Plot A"); plot(lm3, which=5, main="Plo
```



```
lm4 <- lm(Var1~Var6+Var4+Var3*Var2,data=NBAPlayers2019); summary(lm4)
```

```
##
## Call:
## lm(formula = Var1 ~ Var6 + Var4 + Var3 * Var2, data = NBAPlayers2019)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -768.54 -213.94   -5.32  181.89 1131.48
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -1382.0574   233.1761  -5.927 1.46e-08 ***
## Var6                66.1580     8.9005   7.433 3.69e-12 ***
## Var4                 0.6892     0.1249   5.518 1.13e-07 ***
## Var3                 3.5507     1.3489   2.632  0.00919 **
## Var2under30         71.7264   126.0266   0.569  0.56995
## Var3:Var2under30    -2.9022     2.1541  -1.347  0.17952
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 321 on 187 degrees of freedom
## Multiple R-squared:  0.5615, Adjusted R-squared:  0.5498
## F-statistic:  47.9 on 5 and 187 DF,  p-value: < 2.2e-16
```

```
par(mar=c(4,4,2,2)); par(mfrow=c(2,2)); plot(lm4)
```