> library(ggcorrplot)

> library(car)

> price<-read.csv("C:/Users/DELL/Desktop/price.csv")

> # Look at the first 6 observations

> head(price)

Price Sale weight resoloution ppi cpu.core cpu.freq internal.mem ram

1 2357 10 135.0 5.2 424 8 1.35 16 3.000

2 1749 10 125.0 4.0 233 2 1.30 4 1.000

3 1916 10 110.0 4.7 312 4 1.20 8 1.500

4 1315 11 118.5 4.0 233 2 1.30 4 0.512

5 1749 11 125.0 4.0 233 2 1.30 4 1.000

6 2137 12 150.0 5.5 401 4 2.30 16 2.000

RearCam Front\_Cam battery thickness

1 13.00 8 2610 7.4

2 3.15 0 1700 9.9

3 13.00 5 2000 7.6

4 3.15 0 1400 11.0

5 3.15 0 1700 9.9

6 16.00 8 2500 9.5

> # Check the dimension

> dim(price)

[1] 168 13

> model1 <- lm(price$Price ~price$Sale+price$weight+price$resoloution+price$ppi+price$cpu.core

+ +price$cpu.freq+price$internal.mem+price$ram+price$battery, data = price)

> # Get the model residuals

> model\_residuals = model1$residuals

> # Plot the result

> hist(model\_residuals)

> # Plot the residuals

> qqnorm(model\_residuals)

> # Plot the Q-Q line

> qqline(model\_residuals)

> # Remove the sale column

> reduced\_data <- subset(price, select = -Sale)

> # Compute correlation

> corr\_matrix = cor(reduced\_data)

> # Compute and show the result

> ggcorrplot(corr\_matrix, hc.order = TRUE, type = "lower",lab = TRUE)

> model2 <- lm(price$Price ~ price$Sale+price$resoloution+price$ppi+price$cpu.core

+ +price$cpu.freq+price$internal.mem+price$battery, data = price[-c(33,48,75,77),])

> price.col <- subset(price, select = -c(price$resoloution,price$weight))

> pric <- price[, -which(names(price) %in% c("weight", "resoloution"))]

> head(pric)

Price Sale ppi cpu.core cpu.freq internal.mem ram RearCam Front\_Cam

1 2357 10 424 8 1.35 16 3.000 13.00 8

2 1749 10 233 2 1.30 4 1.000 3.15 0

3 1916 10 312 4 1.20 8 1.500 13.00 5

4 1315 11 233 2 1.30 4 0.512 3.15 0

5 1749 11 233 2 1.30 4 1.000 3.15 0

6 2137 12 401 4 2.30 16 2.000 16.00 8

battery thickness

1 2610 7.4

2 1700 9.9

3 2000 7.6

4 1400 11.0

5 1700 9.9

6 2500 9.5

> pric.rem<-pric[-c(33,48),]

> model3<-lm(pric.rem$Price~.,data = pric.rem)

> summary(model3)

Call:

lm(formula = pric.rem$Price ~ ., data = pric.rem)

Residuals:

Min 1Q Median 3Q Max

-343.21 -106.23 -9.44 122.48 478.88

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1363.21346 133.13545 10.239 < 2e-16 \*\*\*

Sale -0.02824 0.01152 -2.451 0.0154 \*

ppi 1.17824 0.21605 5.454 1.91e-07 \*\*\*

cpu.core 54.09237 9.87183 5.479 1.69e-07 \*\*\*

cpu.freq 91.00261 40.14540 2.267 0.0248 \*

internal.mem 7.12038 1.20818 5.893 2.28e-08 \*\*\*

ram 108.07416 25.65730 4.212 4.28e-05 \*\*\*

RearCam 4.16192 4.25660 0.978 0.3297

Front\_Cam 10.39603 5.24779 1.981 0.0494 \*

battery 0.02888 0.01405 2.055 0.0416 \*

thickness -57.60783 9.87456 -5.834 3.06e-08 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 176 on 155 degrees of freedom

Multiple R-squared: 0.9497, Adjusted R-squared: 0.9464

F-statistic: 292.4 on 10 and 155 DF, p-value: < 2.2e-16

> avPlots(model3)

Hit <Return> to see next plot:

Hit <Return> to see next plot:

> vif(model3)

Sale ppi cpu.core cpu.freq internal.mem

1.648396 4.548382 3.070938 3.078384 6.307796

ram RearCam Front\_Cam battery thickness

8.991669 3.598920 2.711502 1.935813 2.466872

> influenceIndexPlot(model3,grid = T,id=list(n=10,cex=1.5,col="blue"))

> influence.measures(model3)

Influence measures of

lm(formula = pric.rem$Price ~ ., data = pric.rem) :

dfb.1\_ dfb.Sale dfb.ppi dfb.cp.c dfb.cp.f dfb.int. dfb.ram

1 -0.041314 -0.000301 -1.32e-01 -0.092495 0.18977 0.200552 -0.179699

2 0.094886 0.029854 -5.51e-05 -0.065444 0.03963 -0.056972 0.057227

3 -0.062926 0.015555 -3.59e-03 0.052375 0.03905 0.016535 0.000351

4 0.000329 0.000576 1.35e-03 0.001461 -0.02161 -0.008156 0.009468

5 0.094906 0.029956 -4.30e-05 -0.065442 0.03963 -0.057014 0.057249

6 0.068478 0.069310 2.80e-02 0.070507 -0.12605 -0.023799 0.071482

7 0.021999 -0.000795 2.40e-03 -0.012892 -0.04801 0.005138 -0.023644

8 0.068458 0.069242 2.80e-02 0.070486 -0.12602 -0.023775 0.071457

9 0.000323 0.000515 1.34e-03 0.001453 -0.02158 -0.008122 0.009443

10 -0.022776 -0.029757 -3.10e-02 -0.096861 0.18105 0.033208 -0.087320

11 -0.001729 0.069306 2.41e-01 -0.129774 0.06061 0.137956 -0.301601

12 -0.038478 0.037097 -7.45e-02 0.198776 0.05487 0.041112 0.006820

13 0.091318 -0.090910 -3.71e-02 -0.086470 -0.00654 0.115786 -0.149271

14 -0.010814 -0.008449 7.11e-03 -0.016908 0.02816 0.002413 -0.009284

15 -0.022771 -0.029669 -3.10e-02 -0.096864 0.18107 0.033179 -0.087315

16 -0.013661 -0.004712 -6.25e-03 -0.017858 0.02990 0.032783 -0.043674

17 -0.030439 -0.006343 4.24e-03 -0.000881 0.04314 0.004764 -0.012746

18 0.013166 -0.025327 1.58e-01 -0.141430 -0.07270 -0.165356 0.110668

19 -0.013669 -0.004839 -6.26e-03 -0.017865 0.02989 0.032818 -0.043681

20 0.021931 -0.001224 2.34e-03 -0.012917 -0.04794 0.005285 -0.023686

21 -0.001782 0.068690 2.40e-01 -0.129761 0.06059 0.138090 -0.301538

22 0.048710 0.224261 1.53e-01 -0.038648 -0.05595 -0.041710 0.024928

23 0.051029 -0.019590 -8.17e-02 -0.069620 -0.00831 0.065910 -0.068215

24 -0.010863 -0.008395 7.16e-03 -0.016991 0.02831 0.002391 -0.009318

25 0.182380 0.089205 -5.42e-02 0.062322 -0.17115 -0.032518 0.112637

26 -0.119141 0.043945 2.97e-02 0.038591 -0.04693 -0.015369 0.049015

27 -0.038507 0.037587 -7.46e-02 0.199172 0.05496 0.041034 0.006902

28 0.013215 -0.024979 1.59e-01 -0.141547 -0.07279 -0.165669 0.110849

29 -0.119143 0.043809 2.97e-02 0.038576 -0.04692 -0.015320 0.048989

30 0.138812 0.001994 -6.57e-02 -0.039731 -0.00411 0.015926 -0.004387

31 -0.030562 -0.006181 4.28e-03 -0.000867 0.04334 0.004718 -0.012774

32 0.050958 -0.019731 -8.16e-02 -0.069559 -0.00829 0.065896 -0.068166

34 -0.017784 0.013195 3.03e-03 -0.019545 0.01296 -0.034935 0.032555

35 0.011891 0.002357 5.55e-03 -0.004334 -0.00202 -0.000719 -0.000559

36 -0.017766 0.013142 3.03e-03 -0.019525 0.01294 -0.034880 0.032510

37 0.182082 0.087960 -5.43e-02 0.062148 -0.17095 -0.032074 0.112329

38 0.001791 -0.006999 6.54e-03 0.052610 -0.03579 0.021883 0.016092

39 0.053464 0.011459 -9.89e-02 0.054773 0.07386 0.072645 -0.054279

40 0.048478 0.222282 1.53e-01 -0.038732 -0.05583 -0.041071 0.024623

41 0.001785 -0.007045 6.53e-03 0.052556 -0.03576 0.021881 0.016068

42 -0.167684 0.035576 4.10e-02 0.079501 0.07643 0.070216 -0.146469

43 0.002969 0.011196 -9.23e-02 0.109415 0.08090 0.047883 0.015474

44 -0.167643 0.035300 4.10e-02 0.079445 0.07641 0.070283 -0.146455

45 -0.025470 0.058289 -7.13e-02 0.058681 0.03145 -0.037076 0.010990

46 -0.021613 0.017570 1.64e-02 0.026668 0.01370 0.006127 -0.007043

47 0.012032 0.002463 5.63e-03 -0.004375 -0.00205 -0.000755 -0.000552

49 0.002996 0.011475 -9.23e-02 0.109481 0.08092 0.047802 0.015525

50 0.010532 0.029899 5.93e-02 -0.040826 -0.00122 -0.034366 0.002399

51 -0.143640 -0.008403 -2.98e-02 0.132171 0.06187 0.040948 -0.011943

52 -0.048279 -0.008206 9.55e-03 0.040807 -0.01866 -0.001658 0.016851

53 -0.025467 0.058095 -7.13e-02 0.058627 0.03143 -0.036996 0.010957

54 -0.095823 -0.063595 -2.15e-01 0.203763 0.16372 -0.092332 0.365574

55 0.055262 -0.010131 5.36e-02 -0.057524 -0.05853 -0.014473 -0.033600

56 0.053599 0.012267 -9.89e-02 0.054910 0.07393 0.072443 -0.054209

57 -0.095835 -0.062944 -2.15e-01 0.203995 0.16384 -0.092658 0.365986

58 0.055501 -0.009729 5.39e-02 -0.057689 -0.05875 -0.014681 -0.033648

59 -0.021478 0.017038 1.62e-02 0.026419 0.01360 0.006219 -0.007052

60 -0.143790 -0.007235 -2.97e-02 0.132523 0.06196 0.040601 -0.011770

61 -0.082568 -0.162524 -8.82e-02 -0.048379 -0.06019 0.052039 -0.037415

62 -0.004647 0.053505 2.63e-02 0.031397 -0.00307 -0.043262 0.000791

63 -0.048000 -0.008978 9.38e-03 0.040427 -0.01851 -0.001349 0.016589

64 -0.034980 -0.003898 -6.95e-04 -0.039715 -0.01961 -0.037835 0.044588

dfb.RrCm dfb.Fr\_C dfb.bttr dfb.thck dffit cov.r cook.d hat inf

1 0.11157 -2.25e-02 4.57e-02 0.048107 -0.3710 0.924 1.24e-02 0.0469

2 -0.08673 -2.95e-02 -5.86e-02 -0.059684 0.2299 0.941 4.77e-03 0.0235

3 -0.03813 -1.48e-02 -5.24e-03 0.055185 -0.0923 1.093 7.78e-04 0.0341

4 0.01310 3.80e-05 1.58e-02 -0.008229 -0.0477 1.094 2.08e-04 0.0244

5 -0.08677 -2.95e-02 -5.87e-02 -0.059706 0.2299 0.941 4.77e-03 0.0235

6 -0.06036 -1.21e-01 -4.28e-03 -0.066939 -0.2083 1.109 3.95e-03 0.0702

7 0.06573 1.13e-02 5.24e-02 -0.052523 -0.1540 1.038 2.16e-03 0.0268

8 -0.06034 -1.21e-01 -4.28e-03 -0.066916 -0.2082 1.109 3.95e-03 0.0702

9 0.01310 5.47e-05 1.57e-02 -0.008207 -0.0476 1.094 2.07e-04 0.0244

10 0.11658 -2.18e-02 1.02e-03 -0.000610 0.3120 0.991 8.80e-03 0.0500

11 -0.05219 4.95e-02 4.89e-02 -0.056020 -0.4528 0.933 1.84e-02 0.0653

12 -0.04371 -1.16e-01 -8.74e-02 0.054388 0.2306 1.120 4.85e-03 0.0817

13 0.14543 6.33e-02 4.09e-03 -0.067883 0.2528 0.998 5.79e-03 0.0388

14 0.00518 4.25e-03 1.24e-05 0.005047 0.0492 1.129 2.22e-04 0.0520

15 0.11658 -2.19e-02 1.02e-03 -0.000625 0.3120 0.991 8.80e-03 0.0500

16 0.00279 5.14e-02 2.86e-02 -0.007461 -0.1143 1.017 1.19e-03 0.0136

17 0.00482 -1.71e-03 -1.11e-02 0.027412 0.0655 1.112 3.92e-04 0.0411

18 -0.09764 1.03e-01 7.39e-02 -0.037636 0.2716 1.100 6.72e-03 0.0808

19 0.00282 5.14e-02 2.86e-02 -0.007438 -0.1143 1.017 1.19e-03 0.0136

20 0.06575 1.14e-02 5.23e-02 -0.052389 -0.1538 1.038 2.15e-03 0.0268

21 -0.05203 4.96e-02 4.88e-02 -0.055898 -0.4525 0.933 1.84e-02 0.0653

22 -0.00479 -4.00e-01 5.76e-02 -0.098354 -0.5353 0.977 2.58e-02 0.0946

23 0.10464 2.95e-02 4.01e-02 -0.028881 -0.1738 1.136 2.76e-03 0.0782

24 0.00518 4.25e-03 1.33e-05 0.005059 0.0495 1.129 2.24e-04 0.0519

25 -0.11184 -7.20e-02 1.41e-02 -0.168607 -0.3767 0.913 1.27e-02 0.0458

26 0.09596 -1.45e-01 6.44e-02 0.075010 -0.2943 0.830 7.73e-03 0.0214

27 -0.04388 -1.16e-01 -8.76e-02 0.054417 0.2311 1.120 4.87e-03 0.0817

28 -0.09783 1.03e-01 7.39e-02 -0.037737 0.2719 1.100 6.73e-03 0.0808

29 0.09598 -1.45e-01 6.44e-02 0.075025 -0.2943 0.830 7.72e-03 0.0214

30 0.03585 -3.25e-02 -3.46e-02 -0.119034 0.1652 1.088 2.49e-03 0.0495

31 0.00479 -1.77e-03 -1.11e-02 0.027508 0.0657 1.112 3.95e-04 0.0410

32 0.10456 2.95e-02 4.00e-02 -0.028823 -0.1737 1.136 2.75e-03 0.0782

34 -0.02536 1.65e-02 2.69e-03 0.019566 -0.0645 1.126 3.80e-04 0.0512

35 -0.00962 -1.91e-03 -6.15e-03 -0.008758 0.0222 1.103 4.49e-05 0.0280

36 -0.02532 1.65e-02 2.68e-03 0.019549 -0.0644 1.126 3.79e-04 0.0512

37 -0.11146 -7.16e-02 1.40e-02 -0.168244 -0.3760 0.913 1.27e-02 0.0458

38 0.01481 -2.11e-02 -1.15e-01 0.016392 -0.1505 1.241 2.07e-03 0.1430 \*

39 0.01360 -7.40e-02 -4.79e-02 -0.019876 0.2134 0.971 4.12e-03 0.0251

40 -0.00441 -3.99e-01 5.75e-02 -0.097928 -0.5337 0.977 2.56e-02 0.0944

41 0.01481 -2.11e-02 -1.15e-01 0.016385 -0.1504 1.241 2.07e-03 0.1430 \*

42 0.03754 6.85e-03 5.93e-02 0.128279 -0.2466 0.984 5.50e-03 0.0341

43 -0.02367 -1.01e-01 -1.32e-01 0.044894 0.2265 0.963 4.64e-03 0.0262

44 0.03759 6.92e-03 5.93e-02 0.128271 -0.2464 0.984 5.49e-03 0.0341

45 0.02329 -4.18e-03 -2.21e-02 0.034400 -0.1592 1.073 2.31e-03 0.0411

46 -0.03342 -7.46e-03 -3.69e-03 0.012404 -0.0535 1.089 2.61e-04 0.0226

47 -0.00974 -1.95e-03 -6.22e-03 -0.008869 0.0224 1.103 4.60e-05 0.0281

49 -0.02374 -1.01e-01 -1.33e-01 0.044866 0.2266 0.963 4.64e-03 0.0262

50 -0.08679 4.64e-02 2.47e-02 -0.019927 -0.1148 1.130 1.20e-03 0.0626

51 -0.02208 -6.26e-02 -2.91e-02 0.178540 0.2393 0.992 5.18e-03 0.0345

52 0.01934 -2.31e-03 -2.30e-02 0.041235 -0.0966 1.088 8.53e-04 0.0327

53 0.02331 -4.13e-03 -2.21e-02 0.034402 -0.1590 1.074 2.31e-03 0.0410

54 -0.14340 -9.22e-02 -2.72e-01 0.137935 0.5515 1.067 2.75e-02 0.1294

55 -0.00658 4.38e-02 6.31e-02 -0.059388 0.1138 1.097 1.18e-03 0.0419

56 0.01343 -7.43e-02 -4.80e-02 -0.020026 0.2137 0.971 4.13e-03 0.0251

57 -0.14368 -9.25e-02 -2.72e-01 0.137934 0.5519 1.066 2.75e-02 0.1293

58 -0.00671 4.38e-02 6.34e-02 -0.059671 0.1141 1.097 1.19e-03 0.0419

59 -0.03306 -7.29e-03 -3.67e-03 0.012369 -0.0529 1.089 2.56e-04 0.0225

60 -0.02239 -6.30e-02 -2.91e-02 0.178674 0.2397 0.992 5.20e-03 0.0345

61 0.28643 5.34e-02 7.96e-02 0.109517 0.3586 0.995 1.16e-02 0.0614

62 -0.03512 5.70e-03 -1.50e-02 -0.003620 -0.1029 1.094 9.67e-04 0.0372

63 0.01940 -2.06e-03 -2.28e-02 0.041064 -0.0960 1.089 8.41e-04 0.0328

64 0.02721 2.94e-03 3.22e-02 0.039784 -0.1004 1.149 9.22e-04 0.0741

[ reached 'max' / getOption("max.print") -- omitted 104 rows ]

> qqPlot(model3)

154 166

152 164

> # Get the model residuals

> model\_residuals = model2$residuals

> # Plot the result

> hist(model\_residuals)

> # Plot the residuals

> qqnorm(model\_residuals)

> # Plot the Q-Q line

> qqline(model\_residuals)

> # Anova test

> anova(model1, model2)

Analysis of Variance Table

Model 1: price$Price ~ price$Sale + price$weight + price$resoloution +

price$ppi + price$cpu.core + price$cpu.freq + price$internal.mem +

price$ram + price$battery

Model 2: price$Price ~ price$Sale + price$resoloution + price$ppi + price$cpu.core +

price$cpu.freq + price$internal.mem + price$battery

Res.Df RSS Df Sum of Sq F Pr(>F)

1 158 5864419

2 160 7377262 -2 -1512843 20.38 1.337e-08 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> # Print the result of the model

> summary(model1)

Call:

lm(formula = price$Price ~ price$Sale + price$weight + price$resoloution +

price$ppi + price$cpu.core + price$cpu.freq + price$internal.mem +

price$ram + price$battery, data = price)

Residuals:

Min 1Q Median 3Q Max

-526.82 -132.17 -7.51 125.74 499.34

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 529.76591 80.66326 6.568 7.01e-10 \*\*\*

price$Sale -0.01787 0.01166 -1.533 0.127347

price$weight -2.77889 0.63076 -4.406 1.94e-05 \*\*\*

price$resoloution 92.91155 35.23095 2.637 0.009194 \*\*

price$ppi 1.04960 0.21197 4.952 1.87e-06 \*\*\*

price$cpu.core 79.97201 9.49071 8.426 2.07e-14 \*\*\*

price$cpu.freq 106.53689 48.57998 2.193 0.029768 \*

price$internal.mem 6.68644 1.30009 5.143 7.91e-07 \*\*\*

price$ram 115.99452 26.76665 4.334 2.60e-05 \*\*\*

price$battery 0.12969 0.03383 3.833 0.000182 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 192.7 on 158 degrees of freedom

Multiple R-squared: 0.94, Adjusted R-squared: 0.9366

F-statistic: 275.2 on 9 and 158 DF, p-value: < 2.2e-16

> summary(model2)

Call:

lm(formula = price$Price ~ price$Sale + price$resoloution + price$ppi +

price$cpu.core + price$cpu.freq + price$internal.mem + price$battery,

data = price[-c(33, 48, 75, 77), ])

Residuals:

Min 1Q Median 3Q Max

-501.17 -142.61 -16.17 147.60 680.20

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 645.22809 80.82782 7.983 2.62e-13 \*\*\*

price$Sale -0.02788 0.01280 -2.178 0.0308 \*

price$resoloution -38.36517 25.61486 -1.498 0.1362

price$ppi 1.28479 0.22922 5.605 8.92e-08 \*\*\*

price$cpu.core 111.28701 8.82247 12.614 < 2e-16 \*\*\*

price$cpu.freq 238.69824 48.65666 4.906 2.27e-06 \*\*\*

price$internal.mem 12.08441 0.97653 12.375 < 2e-16 \*\*\*

price$battery 0.05722 0.02815 2.033 0.0437 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 214.7 on 160 degrees of freedom

Multiple R-squared: 0.9246, Adjusted R-squared: 0.9213

F-statistic: 280.1 on 7 and 160 DF, p-value: < 2.2e-16