Homework 3

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```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --
## v ggplot2 3.3.6     v purrr   0.3.4
## v tibble  3.1.7     v dplyr   1.0.9
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(ggplot2)
library(GGally)
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
fire <- read.csv("data/forestfires.csv")
```

```
head(fire)
```

```
##   X Y month day FFMC  DMC    DC  ISI temp RH wind rain area
## 1 7 5   mar fri 86.2 26.2  94.3  5.1  8.2 51  6.7  0.0    0
## 2 7 4   oct tue 90.6 35.4 669.1  6.7 18.0 33  0.9  0.0    0
## 3 7 4   oct sat 90.6 43.7 686.9  6.7 14.6 33  1.3  0.0    0
## 4 8 6   mar fri 91.7 33.3  77.5  9.0  8.3 97  4.0  0.2    0
## 5 8 6   mar sun 89.3 51.3 102.2  9.6 11.4 99  1.8  0.0    0
## 6 8 6   aug sun 92.3 85.3 488.0 14.7 22.2 29  5.4  0.0    0
```

```
str(fire)
```

```
## 'data.frame':    517 obs. of  13 variables:
##  $ X    : int  7 7 7 8 8 8 8 8 8 7 ...
##  $ Y    : int  5 4 4 6 6 6 6 6 6 5 ...
##  $ month: chr  "mar" "oct" "oct" "mar" ...
##  $ day  : chr  "fri" "tue" "sat" "fri" ...
##  $ FFMC : num  86.2 90.6 90.6 91.7 89.3 92.3 92.3 91.5 91 92.5 ...
##  $ DMC  : num  26.2 35.4 43.7 33.3 51.3 ...
##  $ DC   : num  94.3 669.1 686.9 77.5 102.2 ...
##  $ ISI  : num  5.1 6.7 6.7 9 9.6 14.7 8.5 10.7 7 7.1 ...
##  $ temp : num  8.2 18 14.6 8.3 11.4 22.2 24.1 8 13.1 22.8 ...
##  $ RH   : int  51 33 33 97 99 29 27 86 63 40 ...
##  $ wind : num  6.7 0.9 1.3 4 1.8 5.4 3.1 2.2 5.4 4 ...
##  $ rain : num  0 0 0 0.2 0 0 0 0 0 0 ...
```

```
##  $ area : num  0 0 0 0 0 0 0 0 0 0 0 ...
```

```
summary(fire)
```

```
##        X               Y          month               day
##  Min.   :1.000   Min.   :2.0   Length:517         Length:517
##  1st Qu.:3.000   1st Qu.:4.0   Class :character   Class :character
##  Median :4.000   Median :4.0   Mode  :character   Mode  :character
##  Mean   :4.669   Mean   :4.3
##  3rd Qu.:7.000   3rd Qu.:5.0
##  Max.   :9.000   Max.   :9.0
##       FFMC            DMC              DC             ISI
##  Min.   :18.70   Min.   :  1.1   Min.   :  7.9   Min.   : 0.000
##  1st Qu.:90.20   1st Qu.: 68.6   1st Qu.:437.7   1st Qu.: 6.500
##  Median :91.60   Median :108.3   Median :664.2   Median : 8.400
##  Mean   :90.64   Mean   :110.9   Mean   :547.9   Mean   : 9.022
##  3rd Qu.:92.90   3rd Qu.:142.4   3rd Qu.:713.9   3rd Qu.:10.800
##  Max.   :96.20   Max.   :291.3   Max.   :860.6   Max.   :56.100
##       temp             RH              wind            rain
##  Min.   : 2.20   Min.   : 15.00   Min.   :0.400   Min.   :0.00000
##  1st Qu.:15.50   1st Qu.: 33.00   1st Qu.:2.700   1st Qu.:0.00000
##  Median :19.30   Median : 42.00   Median :4.000   Median :0.00000
##  Mean   :18.89   Mean   : 44.29   Mean   :4.018   Mean   :0.02166
##  3rd Qu.:22.80   3rd Qu.: 53.00   3rd Qu.:4.900   3rd Qu.:0.00000
##  Max.   :33.30   Max.   :100.00   Max.   :9.400   Max.   :6.40000
##       area
##  Min.   :   0.00
##  1st Qu.:   0.00
##  Median :   0.52
##  Mean   :  12.85
##  3rd Qu.:   6.57
##  Max.   :1090.84
```

```
#ggpairs(fire)
```

```
fire <- fire %>% mutate(month = as.factor(month),
                day = as.factor(day))
```

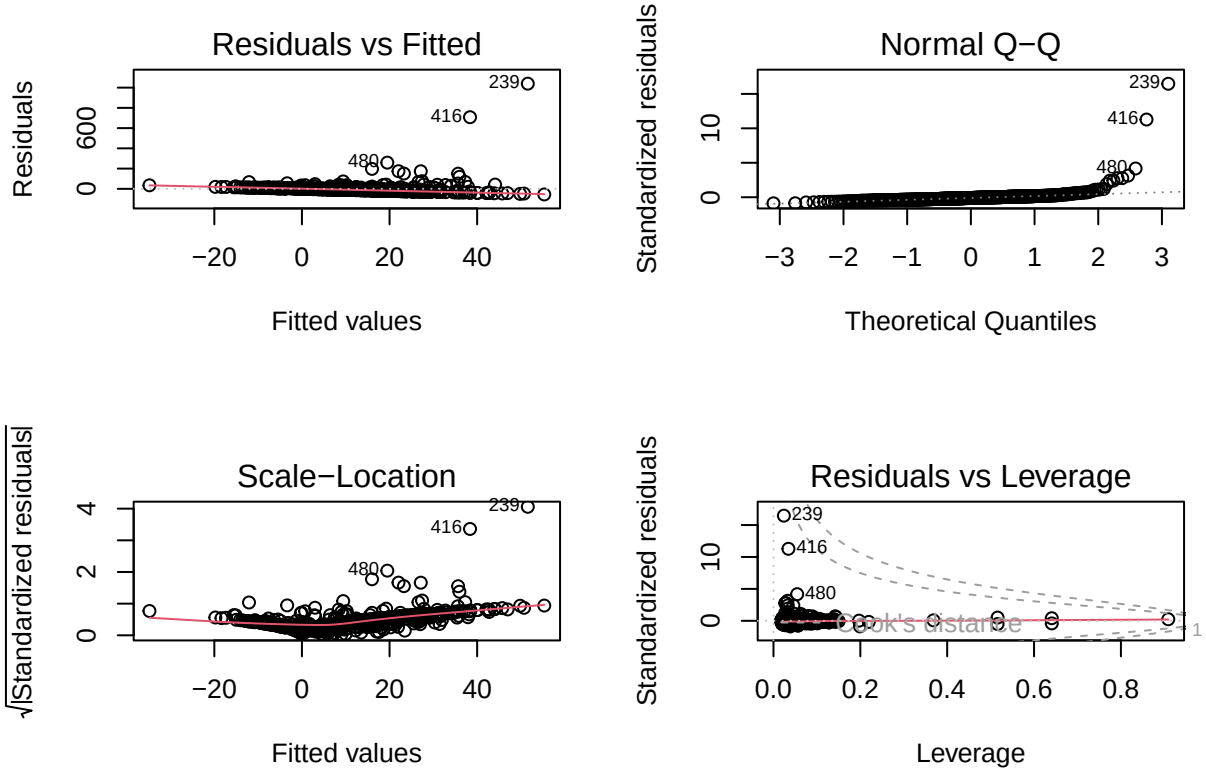
```
# Reponse area (multiple regression)
lm.fit <- lm(area ~ ., data = fire )
summary(lm.fit)
```

```
##
## Call:
## lm(formula = area ~ ., data = fire)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
##  -55.32  -17.84   -6.82    4.99 1039.28
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -15.16402   76.56086  -0.198   0.8431
## X             2.25583    1.49786   1.506   0.1327
## Y            -0.14765    2.81881  -0.052   0.9582
## monthaug     46.88205   38.08792   1.231   0.2190
```

```
## monthdec     47.37821   36.94830   1.282   0.2004
## monthfeb      5.58985   25.94816   0.215   0.8295
## monthjan     14.76909   56.40617   0.262   0.7936
## monthjul     28.87889   33.05232   0.874   0.3827
## monthjun      6.71548   30.33765   0.221   0.8249
## monthmar     -4.22256   23.41447  -0.180   0.8570
## monthmay     12.79646   50.91572   0.251   0.8017
## monthnov     -4.41010   68.37767  -0.064   0.9486
## monthoct     68.97536   45.42009   1.519   0.1295
## monthsep     73.73192   42.67672   1.728   0.0847 .
## daymon        5.96928   10.48154   0.570   0.5693
## daysat       19.40993   10.06218   1.929   0.0543 .
## daysun        5.14460    9.78870   0.526   0.5994
## daythu        9.67192   11.10696   0.871   0.3843
## daytue        7.79282   10.88291   0.716   0.4743
## daywed        5.47914   11.40526   0.480   0.6312
## FFMC         -0.09527    0.76985  -0.124   0.9016
## DMC           0.20106    0.08681   2.316   0.0210 *
## DC           -0.12880    0.05872  -2.194   0.0287 *
## ISI          -0.54416    0.83105  -0.655   0.5129
## temp          1.29620    1.03082   1.257   0.2092
## RH           -0.13476    0.28845  -0.467   0.6406
## wind          1.97427    1.77824   1.110   0.2674
## rain         -2.81545    9.92647  -0.284   0.7768
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 63.88 on 489 degrees of freedom
## Multiple R-squared:  0.04578,    Adjusted R-squared:  -0.006905
## F-statistic: 0.8689 on 27 and 489 DF,  p-value: 0.6581
```

```
par(mfrow=c(2,2))
plot(lm.fit)
```

```
## Warning: not plotting observations with leverage one:
##   517
```




```
# Binary area
fire <- fire %>%
  mutate(binary_area = if_else(area != 0, "Not zero", "Zero")) %>%
  mutate(binary_area = as.factor(binary_area))

glm.fit <- glm(binary_area ~ ., family = "binomial", data = fire %>% select(-area))
summary(glm.fit)
```

```
##
## Call:
## glm(formula = binary_area ~ ., family = "binomial", data = fire %>%
##     select(-area))
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.5873  -1.0993  -0.8112   1.1860   1.6016
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)  4.644e+00  2.888e+00   1.608    0.108
## X           -5.838e-02  4.806e-02  -1.215    0.225
## Y           -4.134e-02  9.078e-02  -0.455    0.649
## monthaug     2.074e-01  1.214e+00   0.171    0.864
## monthdec    -1.682e+01  7.894e+02  -0.021    0.983
## monthfeb    -4.220e-01  8.237e-01  -0.512    0.608
## monthjan     1.505e+01  1.556e+03   0.010    0.992
```

```
## monthjul     1.292e-01  1.054e+00   0.123    0.902
## monthjun     3.762e-01  9.718e-01   0.387    0.699
## monthmar     4.897e-01  7.494e-01   0.653    0.513
## monthmay    -8.583e-03  1.603e+00  -0.005    0.996
## monthnov     1.631e+01  2.400e+03   0.007    0.995
## monthoct     1.005e+00  1.456e+00   0.691    0.490
## monthsep    -5.052e-03  1.360e+00  -0.004    0.997
## daymon      -1.331e-01  3.400e-01  -0.391    0.695
## daysat      -6.636e-02  3.229e-01  -0.206    0.837
## daysun       1.264e-02  3.146e-01   0.040    0.968
## daythu       3.645e-03  3.569e-01   0.010    0.992
## daytue      -2.725e-01  3.504e-01  -0.778    0.437
## daywed      -3.474e-01  3.696e-01  -0.940    0.347
## FFMC        -3.146e-02  3.039e-02  -1.035    0.301
## DMC          1.138e-03  2.769e-03   0.411    0.681
## DC          -4.078e-04  1.871e-03  -0.218    0.827
## ISI          1.591e-02  2.803e-02   0.568    0.570
## temp        -4.861e-02  3.352e-02  -1.450    0.147
## RH          -5.851e-03  9.514e-03  -0.615    0.539
## wind        -8.036e-02  5.786e-02  -1.389    0.165
## rain        -6.886e-03  3.492e-01  -0.020    0.984
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 715.69  on 516  degrees of freedom
## Residual deviance: 678.24  on 489  degrees of freedom
## AIC: 734.24
##
## Number of Fisher Scoring iterations: 15
```

```r
training_ind <- sample(1:517, floor(.8*517), replace = FALSE)

train <- fire[training_ind,c("temp","RH","wind","rain")]
val <- fire[-training_ind,c("temp","RH","wind","rain")]



#lm(y ~ x1 + x2)
#lm(y ~ x1 + x4 + x3)
#lm(y ~ x1 + x2 + x3 + x4)
```