DAS Project2 Group18

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```
library(tidyverse)
library(dplyr)
library(readr)
library(ggplot2)
library(vcd)
library(MASS)
```

```
#load the data
shelter_01 <- read.csv("dataset18.csv")
```

```
#Checking for missing value
any_na <- apply(shelter_01, 2, function(x) any(is.na(x)))
any_na
```

```
  animal_type           month            year     intake_type    outcome_type
        FALSE           FALSE           FALSE           FALSE           FALSE
  chip_status time_at_shelter
        FALSE           FALSE
```

```
total_na <- sum(is.na(shelter_01))
total_na
```

```
[1] 0
```

```
#Converting a string variable to a factor type and make a summary statistics
shelter_01$animal_type <- as.factor(shelter_01$animal_type)
shelter_01$intake_type <- as.factor(shelter_01$intake_type)
shelter_01$outcome_type <- as.factor(shelter_01$outcome_type)
```

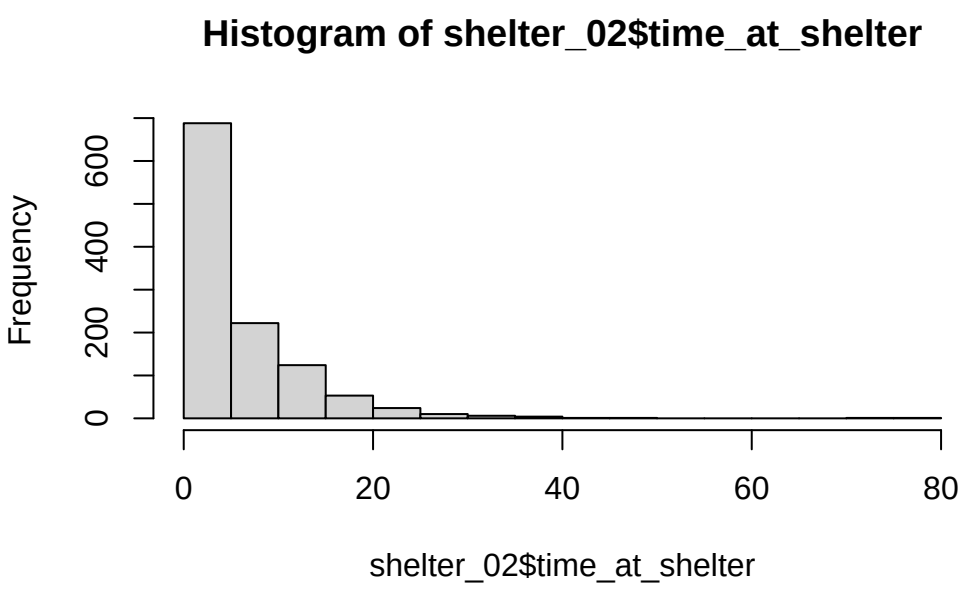
```r
shelter_01$chip_status <- as.factor(shelter_01$chip_status)
summary(shelter_01)
```

```
   animal_type      month             year               intake_type
BIRD     :  2   Min.   : 1.000   Min.   :2016   CONFISCATED    : 59
CAT      :238   1st Qu.: 4.000   1st Qu.:2017   OWNER SURRENDER:363
DOG      :880   Median : 7.000   Median :2017   STRAY          :713
LIVESTOCK:  1   Mean   : 6.574   Mean   :2017
WILDLIFE : 14   3rd Qu.: 9.000   3rd Qu.:2017
                Max.   :12.000   Max.   :2017
           outcome_type         chip_status  time_at_shelter
ADOPTION         :474   SCAN CHIP     :214   Min.   : 0.00
DIED             : 14   SCAN NO CHIP  :860   1st Qu.: 1.00
EUTHANIZED       :417   UNABLE TO SCAN: 61   Median : 4.00
FOSTER           : 30                        Mean   : 6.12
RETURNED TO OWNER:200                        3rd Qu.: 9.00
                                             Max.   :78.00
```

```r
#Converting shelter_01 to dataframe
shelter_02 <- as.data.frame(shelter_01)
summary(shelter_02)
```

```
   animal_type      month             year               intake_type
BIRD     :  2   Min.   : 1.000   Min.   :2016   CONFISCATED    : 59
CAT      :238   1st Qu.: 4.000   1st Qu.:2017   OWNER SURRENDER:363
DOG      :880   Median : 7.000   Median :2017   STRAY          :713
LIVESTOCK:  1   Mean   : 6.574   Mean   :2017
WILDLIFE : 14   3rd Qu.: 9.000   3rd Qu.:2017
                Max.   :12.000   Max.   :2017
           outcome_type         chip_status  time_at_shelter
ADOPTION         :474   SCAN CHIP     :214   Min.   : 0.00
DIED             : 14   SCAN NO CHIP  :860   1st Qu.: 1.00
EUTHANIZED       :417   UNABLE TO SCAN: 61   Median : 4.00
FOSTER           : 30                        Mean   : 6.12
RETURNED TO OWNER:200                        3rd Qu.: 9.00
                                             Max.   :78.00
```

```r
hist(shelter_02$time_at_shelter)
```




```
glm_model_poi <- glm(time_at_shelter ~ year + month + animal_type + intake_type
                     + outcome_type + chip_status, data = shelter_02,
                   family = poisson())
summary(glm_model_poi)
```

```
Call:
glm(formula = time_at_shelter ~ year + month + animal_type +
    intake_type + outcome_type + chip_status, family = poisson(),
    data = shelter_02)

Coefficients:
                              Estimate Std. Error z value Pr(>|z|)
(Intercept)                 209.563215 219.298918   0.956  0.33927
year                         -0.108790   0.043770  -2.486  0.01294 *
month                        -0.016839   0.005842  -2.882  0.00395 **
animal_typeCAT               13.253664 200.734972   0.066  0.94736
animal_typeDOG               13.354757 200.734971   0.067  0.94696
animal_typeLIVESTOCK         -0.191216 348.317912  -0.001  0.99956
animal_typeWILDLIFE          12.834001 200.735017   0.064  0.94902
intake_typeOWNER SURRENDER   -1.367180   0.049511 -27.614  < 2e-16 ***
intake_typeSTRAY             -0.856870   0.044964 -19.057  < 2e-16 ***
```

```
outcome_typeDIED               -0.469573   0.113310  -4.144 3.41e-05 ***
outcome_typeEUTHANIZED         -0.542380   0.027585 -19.662  < 2e-16 ***
outcome_typeFOSTER             -0.576073   0.088272  -6.526 6.75e-11 ***
outcome_typeRETURNED TO OWNER  -1.621092   0.050170 -32.312  < 2e-16 ***
chip_statusSCAN NO CHIP        -0.258643   0.031581  -8.190 2.62e-16 ***
chip_statusUNABLE TO SCAN      -0.645688   0.074825  -8.629  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 8495.8  on 1134  degrees of freedom
Residual deviance: 6544.7  on 1120  degrees of freedom
AIC: 9670.3

Number of Fisher Scoring iterations: 10
```

```r
model_poi <- step(glm_model_poi)
```

```
Start:  AIC=9670.31
time_at_shelter ~ year + month + animal_type + intake_type +
    outcome_type + chip_status

               Df Deviance     AIC
<none>              6544.7  9670.3
- year          1   6550.9  9674.5
- month         1   6553.0  9676.6
- animal_type   4   6587.0  9704.6
- chip_status   2   6651.2  9772.8
- intake_type   2   7270.5 10392.1
- outcome_type  4   8056.1 11173.7
```

```r
glm_model_nb <- glm.nb(time_at_shelter ~ year + month + animal_type + intake_type
                   + outcome_type + chip_status, data = shelter_02)
summary(glm_model_nb)
```

```
Call:
glm.nb(formula = time_at_shelter ~ year + month + animal_type +
    intake_type + outcome_type + chip_status, data = shelter_02,
```

```
    init.theta = 0.9633756977, link = log)

Coefficients:
                                Estimate Std. Error z value Pr(>|z|)
(Intercept)                    3.078e+02  1.333e+05   0.002   0.9982
year                          -1.638e-01  1.217e-01  -1.345   0.1785
month                         -2.029e-02  1.613e-02  -1.258   0.2084
animal_typeCAT                 2.619e+01  1.333e+05   0.000   0.9998
animal_typeDOG                 2.631e+01  1.333e+05   0.000   0.9998
animal_typeLIVESTOCK          -3.126e-01  2.315e+05   0.000   1.0000
animal_typeWILDLIFE            2.574e+01  1.333e+05   0.000   0.9998
intake_typeOWNER SURRENDER    -1.703e+00  1.600e-01 -10.640  < 2e-16 ***
intake_typeSTRAY              -1.295e+00  1.506e-01  -8.602  < 2e-16 ***
outcome_typeDIED              -4.871e-01  3.005e-01  -1.621   0.1050
outcome_typeEUTHANIZED        -6.033e-01  7.598e-02  -7.940 2.02e-15 ***
outcome_typeFOSTER            -4.783e-01  2.175e-01  -2.199   0.0279 *
outcome_typeRETURNED TO OWNER -1.843e+00  1.108e-01 -16.638  < 2e-16 ***
chip_statusSCAN NO CHIP       -1.717e-01  9.032e-02  -1.901   0.0573 .
chip_statusUNABLE TO SCAN     -7.708e-01  1.816e-01  -4.244 2.20e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for Negative Binomial(0.9634) family taken to be 1)

    Null deviance: 1640.1  on 1134  degrees of freedom
Residual deviance: 1312.5  on 1120  degrees of freedom
AIC: 6252.2

Number of Fisher Scoring iterations: 1

              Theta:  0.9634
          Std. Err.:  0.0542

 2 x log-likelihood:  -6220.2480
```

```r
model_nb <- step(glm_model_nb)
```

```
Start:  AIC=6250.25
time_at_shelter ~ year + month + animal_type + intake_type +
    outcome_type + chip_status
```

```
               Df Deviance    AIC
- month         1   1314.0 6249.7
- year          1   1314.3 6250.1
<none>              1312.5 6250.2
- animal_type   4   1325.0 6254.8
- chip_status   2   1330.3 6264.1
- intake_type   2   1439.1 6372.9
- outcome_type  4   1573.6 6503.4

Step:  AIC=6249.74
time_at_shelter ~ year + animal_type + intake_type + outcome_type +
    chip_status

               Df Deviance    AIC
- year          1   1313.0 6248.2
<none>              1312.6 6249.7
- animal_type   4   1325.5 6254.6
- chip_status   2   1329.9 6263.0
- intake_type   2   1439.1 6372.2
- outcome_type  4   1574.3 6503.4

Step:  AIC=6248.17
time_at_shelter ~ animal_type + intake_type + outcome_type +
    chip_status

               Df Deviance    AIC
<none>              1312.6 6248.2
- animal_type   4   1325.4 6253.0
- chip_status   2   1330.1 6261.7
- intake_type   2   1439.7 6371.3
- outcome_type  4   1577.9 6505.5
```