

LogisticRegression_Surgery

SP

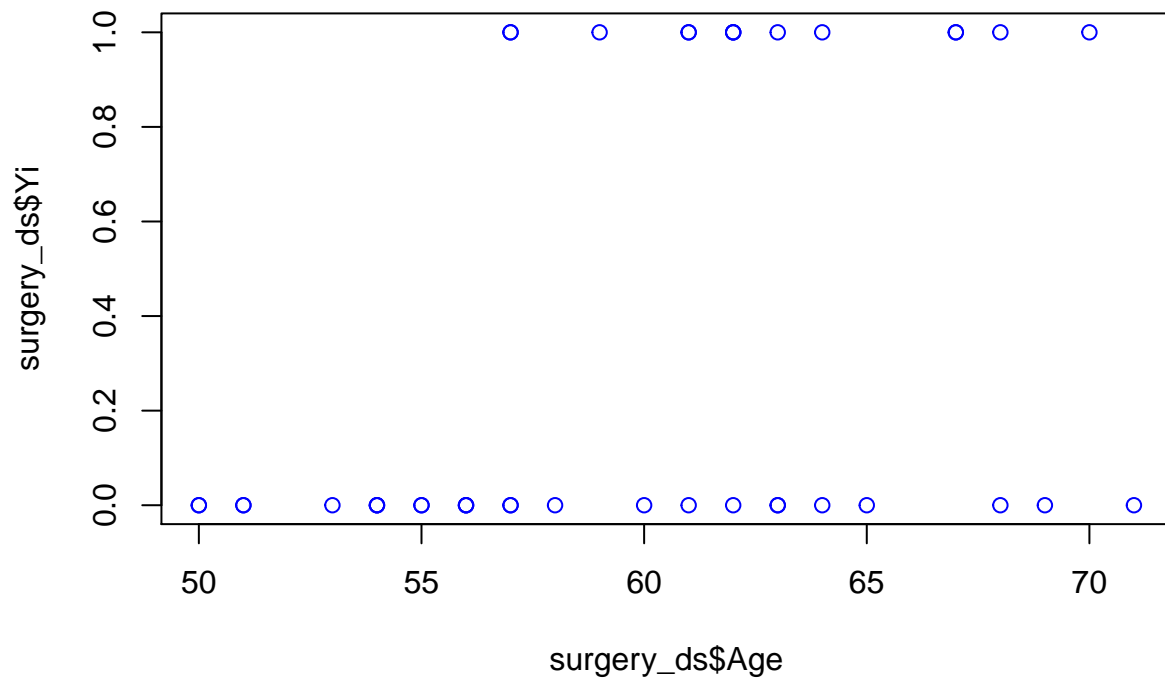
06/10/2019

```
surgery_ds = read.csv("surgery.csv")
```

```
head(surgery_ds)
```

```
## Patient Age Yi
## 1      1  50  0
## 2      2  50  0
## 3      3  51  0
## 4      4  51  0
## 5      5  53  0
## 6      6  54  0
```

```
plot(surgery_ds$Age, surgery_ds$Yi, col="blue")
```



```
surg_glm_model = glm(Yi~Age, data=surgery_ds, family=binomial)
```

```
summary(surg_glm_model)
```

```
##
## Call:
## glm(formula = Yi ~ Age, family = binomial, data = surgery_ds)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.6601  -0.8099  -0.5839   1.0491   1.7079
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -10.48174    4.30409  -2.435  0.0149 *
## Age          0.16295    0.07018   2.322  0.0202 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 51.796  on 39  degrees of freedom
## Residual deviance: 45.301  on 38  degrees of freedom
## AIC: 49.301
##
## Number of Fisher Scoring iterations: 3
```

```
head(surg_glm_model)
```

```
## $coefficients
## (Intercept)      Age
## -10.4817354    0.1629473
##
## $residuals
##      1      2      3      4      5      6      7
## -1.096871 -1.096871 -1.114015 -1.114015 -1.157942 -1.185893 -1.185893
##      8      9     10     11     12     13     14
## -1.185893 -1.218792 -1.218792 -1.257512 -1.257512 -1.257512  4.299399
##     15     16     17     18     19     20     21
##  4.299399 -1.303085 -1.303085 -1.356724  3.381775 -1.494159 -1.581612
##     22     23     24     25     26     27     28
##  2.719359  2.719359  2.460829  2.460829 -1.684543  2.460829 -1.805690
##     29     30     31     32     33     34     35
## -1.805690  2.241173 -1.948276  2.054545 -2.116097  1.646791  1.646791
##     36     37     38     39     40
## -2.819715  1.549537 -3.141758  1.396700 -3.966912
##
## $fitted.values
##      1      2      3      4      5      6
## 0.08831606 0.08831606 0.10234613 0.10234613 0.13639864 0.15675384
##      7      8      9     10     11     12
## 0.15675384 0.15675384 0.17951528 0.17951528 0.20477917 0.20477917
##     13     14     15     16     17     18
## 0.20477917 0.23259063 0.23259063 0.23259063 0.23259063 0.26293037
```

```
##          19          20          21          22          23          24
## 0.29570273 0.33072705 0.36773378 0.36773378 0.36773378 0.40636714
##          25          26          27          28          29          30
## 0.40636714 0.40636714 0.40636714 0.44619496 0.44619496 0.44619496
##          31          32          33          34          35          36
## 0.48672576 0.48672576 0.52743189 0.60724168 0.60724168 0.64535418
##          37          38          39          40
## 0.64535418 0.68170686 0.71597322 0.74791472
##
## $effects
## (Intercept)          Age
##  1.4516454    2.3217393  -0.2613452  -0.2613452  -0.3223381  -0.3576224
##
## -0.3576224  -0.3576224  -0.3964688  -0.3964688  -0.4391666  -0.4391666
##
## -0.4391666    1.8808949    1.8808949  -0.4860112  -0.4860112  -0.5373010
##
##  1.5979034  -0.6544140  -0.7208351    1.3530369    1.3530369    1.2431169
##
##  1.2431169  -0.7929001    1.2431169  -0.8709177  -0.8709177    1.1407644
##
## -0.9552114    1.0454943  -1.0461298    0.7982097    0.7982097   -1.3627422
##
##  0.7275096  -1.4845633    0.6019463  -1.7564321
##
## $R
##          (Intercept)          Age
## (Intercept)  -2.770581 -169.31151
## Age           0.000000   14.24841
##
## $rank
## [1] 2
```

```
anova(surg_glm_model)
```

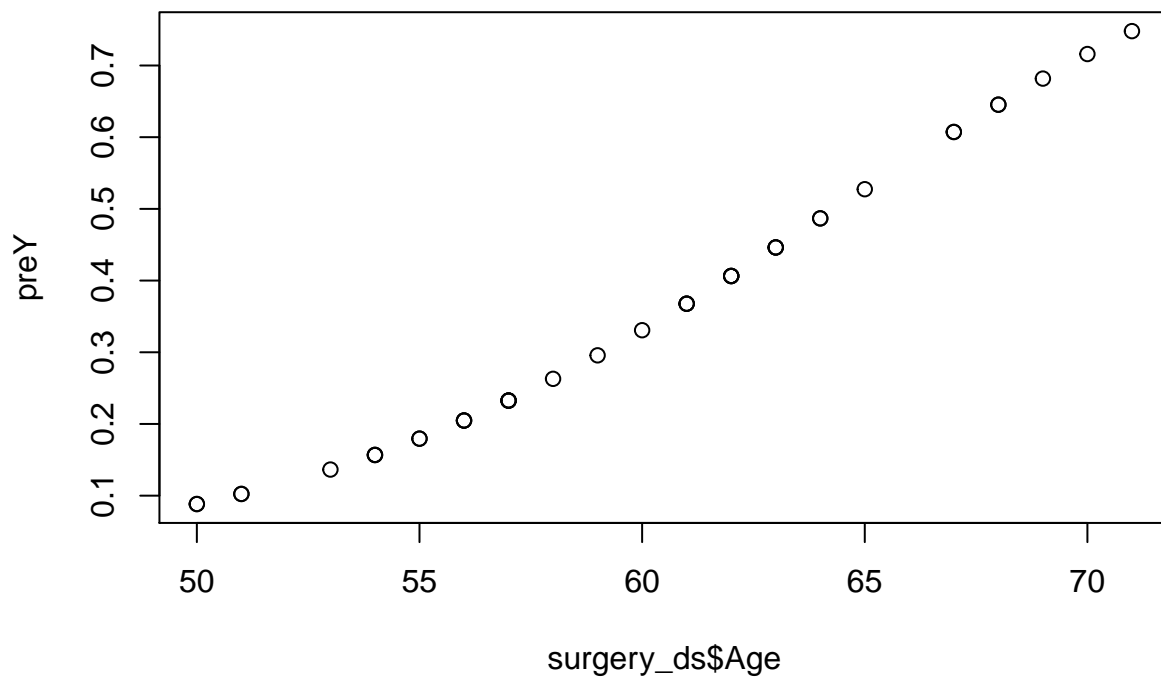
```
## Analysis of Deviance Table
##
## Model: binomial, link: logit
##
## Response: Yi
##
## Terms added sequentially (first to last)
##
##
##      Df Deviance Resid. Df Resid. Dev
## NULL                39      51.796
## Age      1    6.4949      38      45.301
```

```
#Predict Y using fitted model
preY = predict(surg_glm_model, type="response")
preY
```

```
##          1          2          3          4          5          6
```

```
## 0.08831606 0.08831606 0.10234613 0.10234613 0.13639864 0.15675384
##      7      8      9      10      11      12
## 0.15675384 0.15675384 0.17951528 0.17951528 0.20477917 0.20477917
##      13      14      15      16      17      18
## 0.20477917 0.23259063 0.23259063 0.23259063 0.23259063 0.26293037
##      19      20      21      22      23      24
## 0.29570273 0.33072705 0.36773378 0.36773378 0.36773378 0.40636714
##      25      26      27      28      29      30
## 0.40636714 0.40636714 0.40636714 0.44619496 0.44619496 0.44619496
##      31      32      33      34      35      36
## 0.48672576 0.48672576 0.52743189 0.60724168 0.60724168 0.64535418
##      37      38      39      40
## 0.64535418 0.68170686 0.71597322 0.74791472
```

```
plot(surgery_ds$Age, preY)
```



```
with(surg_glm_model, cbind(res.deviance=deviance, df=df.residual, p=pchisq(deviance, df.residual, lower.tail=FALSE)))
```

```
##      res.deviance df      p
## [1,]      45.30079 38 0.1936426
```