Logistic Regression

```
##   x freq
## 1 0  276
## 2 1  122
```

Null Model

```
##
## Call:
## glm(formula = SR ~ 1, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -0.8556  -0.8556  -0.8556   1.5378   1.5378
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -0.8164     0.1087  -7.509 5.96e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 490.57  on 397  degrees of freedom
## Residual deviance: 490.57  on 397  degrees of freedom
## AIC: 492.57
##
## Number of Fisher Scoring iterations: 4
```

Logistic Regression: Full MOdel

```
##
## Call:
## glm(formula = SR ~ ., family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.0770  -0.7312  -0.4524   0.7762   2.5283
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.176466   1.851946   0.635  0.52526
## NASA        -0.030871   0.025838  -1.195  0.23217
## TA          -0.038834   0.023082  -1.682  0.09248 .
## EXT         -0.033804   0.063890  -0.529  0.59674
## AGR         -0.029114   0.082484  -0.353  0.72411
## CS          -0.022308   0.087335  -0.255  0.79839
## NT          -0.014129   0.091431  -0.155  0.87719
## OP          -0.031504   0.075220  -0.419  0.67535
## AV           0.027088   0.026723   1.014  0.31075
## EM           0.036846   0.034977   1.053  0.29214
## Task         0.006557   0.038558   0.170  0.86497
## H            0.014270   0.007793   1.831  0.06709 .
## RS2         -0.448986   0.270000  -1.663  0.09633 .
## WH2          0.408409   0.508135   0.804  0.42155
## TWR          0.011464   0.009638   1.190  0.23424
## BR2          0.195267   0.281227   0.694  0.48747
## NP2         -1.171758   0.293513  -3.992 6.55e-05 ***
## NP3         -2.272378   0.409298  -5.552 2.83e-08 ***
## FA2         -0.330446   0.354857  -0.931  0.35174
## FA3         -0.294078   0.637755  -0.461  0.64472
## FA4          1.275079   0.537579   2.372  0.01770 *
## FA5          0.267474   0.836021   0.320  0.74902
## FA6          1.403719   0.531320   2.642  0.00824 **
## AP           0.209052   0.369902   0.565  0.57197
## AR          -0.015940   0.108431  -0.147  0.88313
## DWH2        -0.558623   0.417592  -1.338  0.18099
## DWR          0.000737   0.008096   0.091  0.92746
## T2           0.379029   0.279322   1.357  0.17479
## DS2         -0.476648   0.312536  -1.525  0.12724
## Rank1       -0.692716   0.397554  -1.742  0.08143 .
## Rank2       -0.279265   0.393404  -0.710  0.47779
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 490.57  on 397  degrees of freedom
## Residual deviance: 384.13  on 367  degrees of freedom
## AIC: 446.13
##
## Number of Fisher Scoring iterations: 5
```

Backward Elimination Model selection

```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ NASA + TA + EXT + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BR + NP + FA + AP + AR + DWH + DWR +
##     T + DS + Rank
##
## Final Model:
## SR ~ TA + H + RS + TWR + NP + FA + DWH + T
##
##
##      Step Df    Deviance Resid. Df Resid. Dev      AIC
## 1                              367   384.1273 446.1273
## 2   - DWR  1 0.008301799       368   384.1356 444.1356
## 3    - AR  1 0.022190714       369   384.1578 442.1578
## 4    - NT  1 0.022646419       370   384.1805 440.1805
## 5  - Task  1 0.034886443       371   384.2154 438.2154
## 6    - CS  1 0.053251918       372   384.2686 436.2686
## 7   - AGR  1 0.109637530       373   384.3782 434.3782
## 8    - OP  1 0.213937998       374   384.5922 432.5922
## 9    - AP  1 0.292304587       375   384.8845 430.8845
## 10  - EXT  1 0.481575797       376   385.3661 429.3661
## 11   - BR  1 0.470033296       377   385.8361 427.8361
## 12   - AV  1 0.599589617       378   386.4357 426.4357
## 13 - Rank  2 3.004917390       380   389.4406 425.4406
## 14   - EM  1 0.862343998       381   390.3030 424.3030
## 15   - WH  1 0.963554946       382   391.2665 423.2665
## 16 - NASA  1 0.784666713       383   392.0512 422.0512
## 17   - DS  1 1.823444665       384   393.8746 421.8746
```

Backward Elimination Model

```
##
## Call:
## glm(formula = SR ~ TA + H + RS + TWR + NP + FA + DWH + T, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.8846  -0.7514  -0.4797   0.8515   2.4378
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.851491   0.809565   1.052 0.292897
## TA          -0.030691   0.012991  -2.363 0.018150 *
## H            0.012921   0.006349   2.035 0.041843 *
## RS2         -0.427454   0.256783  -1.665 0.095982 .
## TWR          0.012238   0.008272   1.479 0.139024
## NP2         -1.072419   0.278727  -3.848 0.000119 ***
## NP3         -2.183540   0.384622  -5.677 1.37e-08 ***
## FA2         -0.269827   0.338057  -0.798 0.424772
## FA3         -0.076568   0.595421  -0.129 0.897679
## FA4          1.440663   0.508141   2.835 0.004580 **
## FA5          0.248941   0.779546   0.319 0.749468
## FA6          1.363278   0.515559   2.644 0.008187 **
## DWH2        -0.732223   0.356300  -2.055 0.039872 *
## T2           0.450795   0.260773   1.729 0.083864 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 490.57  on 397  degrees of freedom
## Residual deviance: 393.87  on 384  degrees of freedom
## AIC: 421.87
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + TWR + NP + FA + DWH + T
## Model 3: SR ~ NASA + TA + EXT + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BR + NP + FA + AP + AR + DWH + DWR +
##     T + DS + Rank
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       397     490.57
## 2       384     393.87 13   96.699 7.216e-15 ***
## 3       367     384.13 17    9.747    0.9139
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Forward Selection

```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ 1
##
## Final Model:
## SR ~ NP + DS + FA + TA + H + RS + DWH + T
##
##
##    Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                          397   490.5734 492.5734
## 2  + NP  2 49.990198       395   440.5832 446.5832
## 3  + DS  1 12.833208       394   427.7500 435.7500
## 4  + FA  5 14.253774       389   413.4962 431.4962
## 5  + TA  1  7.457319       388   406.0389 426.0389
## 6   + H  1  4.842892       387   401.1960 423.1960
## 7  + RS  1  2.683722       386   398.5123 422.5123
## 8 + DWH  1  2.548926       385   395.9633 421.9633
## 9   + T  1  2.026777       384   393.9366 421.9366
```

Forward Selection model

```
##
## Call:
## glm(formula = SR ~ NP + DS + H + RS + FA + TA + Rank, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9807  -0.7632  -0.4708   0.8416   2.5393
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.698575   0.734013   2.314  0.02066 *
## NP2         -1.112723   0.279429  -3.982 6.83e-05 ***
## NP3         -2.291463   0.380909  -6.016 1.79e-09 ***
## DS2         -0.732177   0.268183  -2.730  0.00633 **
## H            0.013591   0.007142   1.903  0.05706 .
## RS2         -0.404431   0.259029  -1.561  0.11844
## FA2         -0.183153   0.334526  -0.548  0.58404
## FA3         -0.151058   0.600596  -0.252  0.80142
## FA4          1.256110   0.504188   2.491  0.01273 *
## FA5          0.056841   0.818430   0.069  0.94463
## FA6          1.516995   0.498087   3.046  0.00232 **
## TA          -0.028885   0.013590  -2.126  0.03354 *
## Rank1       -0.634910   0.382973  -1.658  0.09735 .
## Rank2       -0.281398   0.378363  -0.744  0.45704
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 490.57  on 397  degrees of freedom
## Residual deviance: 395.59  on 384  degrees of freedom
## AIC: 423.59
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + TWR + NP + FA + DWH + T
## Model 3: SR ~ NP + DS + H + RS + FA + TA + Rank
## Model 4: SR ~ NASA + TA + EXT + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BR + NP + FA + AP + AR + DWH + DWR +
##     T + DS + Rank
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       397     490.57
## 2       384     393.87 13   96.699 7.216e-15 ***
## 3       384     395.59  0   -1.715
## 4       367     384.13 17   11.462    0.8316
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Step_wise method

```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ 1
##
## Final Model:
## SR ~ NP + DS + FA + TA + H + RS + DWH + T
##
##
##    Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                          397   490.5734 492.5734
## 2  + NP  2 49.990198       395   440.5832 446.5832
## 3  + DS  1 12.833208       394   427.7500 435.7500
## 4  + FA  5 14.253774       389   413.4962 431.4962
## 5  + TA  1  7.457319       388   406.0389 426.0389
## 6   + H  1  4.842892       387   401.1960 423.1960
## 7  + RS  1  2.683722       386   398.5123 422.5123
## 8 + DWH  1  2.548926       385   395.9633 421.9633
## 9   + T  1  2.026777       384   393.9366 421.9366

##
## Call:
## glm(formula = SR ~ NP + DS + FA + TA + H + RS + DWH + T, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9405  -0.7571  -0.4707   0.8274   2.4872
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.406661   0.734561   1.915 0.055497 .
## NP2         -1.032382   0.276816  -3.729 0.000192 ***
## NP3         -2.100544   0.376343  -5.581 2.39e-08 ***
## DS2         -0.440884   0.299288  -1.473 0.140722
## FA2         -0.220437   0.335356  -0.657 0.510975
## FA3         -0.062719   0.599533  -0.105 0.916683
## FA4          1.381668   0.507392   2.723 0.006468 **
## FA5          0.114858   0.790538   0.145 0.884481
## FA6          1.334843   0.508608   2.625 0.008678 **
## TA          -0.027664   0.013182  -2.099 0.035852 *
## H            0.012797   0.006353   2.014 0.043975 *
## RS2         -0.413386   0.256450  -1.612 0.106972
## DWH2        -0.586575   0.380379  -1.542 0.123054
## T2           0.379204   0.266747   1.422 0.155146
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 490.57  on 397  degrees of freedom
```

```
## Residual deviance: 393.94  on 384  degrees of freedom
## AIC: 421.94
##
## Number of Fisher Scoring iterations: 5
```

Comparing models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + TWR + NP + FA + DWH + T
## Model 3: SR ~ NP + DS + H + RS + FA + TA + Rank
## Model 4: SR ~ NP + DS + FA + TA + H + RS + DWH + T
## Model 5: SR ~ NASA + TA + EXT + AGR + CS + NT + OP + AV + EM + Task +
##     H + RS + WH + TWR + BR + NP + FA + AP + AR + DWH + DWR +
##     T + DS + Rank
##   Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
## 1       397     490.57
## 2       384     393.87 13   96.699 7.216e-15 ***
## 3       384     395.59  0   -1.715
## 4       384     393.94  0    1.653
## 5       367     384.13 17    9.809    0.9114
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

-> -> -> ->

-> -> -> -> ->

-> -> -> -> -> -> -> ->

-> -> -> -> ->