Logistic Regression

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
## -2.1106  -0.7192  -0.4430   0.7663   2.4900
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.155826   1.968847  -0.079  0.93692
## NASA        -0.031199   0.026079  -1.196  0.23157
## TA          -0.038092   0.023208  -1.641  0.10074
## EXT         -0.032406   0.063969  -0.507  0.61244
## AGR         -0.026417   0.082742  -0.319  0.74952
## CS          -0.016924   0.087337  -0.194  0.84635
## NT          -0.015055   0.091748  -0.164  0.86966
## OP          -0.027197   0.075460  -0.360  0.71853
## AV           0.029630   0.026768   1.107  0.26833
## EM           0.037243   0.035062   1.062  0.28815
## Task         0.005634   0.039246   0.144  0.88586
## H            0.639629   0.272105   2.351  0.01874 *
## RS2         -0.447897   0.270392  -1.656  0.09763 .
## WH2          0.309255   0.517662   0.597  0.55024
## TWR          0.011247   0.009655   1.165  0.24405
## BR2          0.211696   0.281710   0.751  0.45237
## NP2         -1.162323   0.294661  -3.945 7.99e-05 ***
## NP3         -2.304120   0.410911  -5.607 2.05e-08 ***
## FA2         -0.336890   0.354607  -0.950  0.34209
## FA3         -0.339653   0.636947  -0.533  0.59386
## FA4          1.251217   0.541346   2.311  0.02082 *
## FA5          0.173129   0.844192   0.205  0.83751
## FA6          1.475237   0.533309   2.766  0.00567 **
## AP           0.173555   0.367269   0.473  0.63653
## AR          -0.021165   0.108452  -0.195  0.84527
## DWH2        -0.564961   0.418810  -1.349  0.17735
## DWR          0.000470   0.008151   0.058  0.95402
## T2           0.327381   0.281228   1.164  0.24438
## DS2         -0.532088   0.315238  -1.688  0.09143 .
## Rank1       -0.881664   0.415841  -2.120  0.03399 *
## Rank2       -0.533941   0.429172  -1.244  0.21346
## ---
## 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: 381.91  on 367  degrees of freedom
## AIC: 443.91
##
## 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 + NP + FA + DWH + DS + Rank
##
##
##      Step Df    Deviance Resid. Df Resid. Dev      AIC
## 1                              367   381.9083 443.9083
## 2   - DWR  1 0.003327966       368   381.9116 441.9116
## 3  - Task  1 0.022626902       369   381.9343 439.9343
## 4    - CS  1 0.027250949       370   381.9615 437.9615
## 5    - NT  1 0.030203850       371   381.9917 435.9917
## 6    - AR  1 0.039829201       372   382.0316 434.0316
## 7   - AGR  1 0.088862461       373   382.1204 432.1204
## 8    - OP  1 0.161677053       374   382.2821 430.2821
## 9    - AP  1 0.204890996       375   382.4870 428.4870
## 10   - WH  1 0.414609067       376   382.9016 426.9016
## 11  - EXT  1 0.420579914       377   383.3222 425.3222
## 12   - AV  1 0.853679550       378   384.1759 424.1759
## 13   - BR  1 0.669222800       379   384.8451 422.8451
## 14 - NASA  1 0.854796673       380   385.6999 421.6999
## 15   - EM  1 1.081150418       381   386.7810 420.7810
## 16    - T  1 1.407294358       382   388.1883 420.1883
## 17  - TWR  1 1.812208143       383   390.0005 420.0005
```

Backward Elimination Model

```
##
## Call:
## glm(formula = SR ~ TA + H + RS + NP + FA + DWH + DS + Rank, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9510  -0.7481  -0.4547   0.8268   2.4945
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.61588    1.00425   0.613 0.539698
## TA          -0.02848    0.01375  -2.072 0.038294 *
## H            0.65591    0.25534   2.569 0.010205 *
## RS2         -0.40185    0.26118  -1.539 0.123904
## NP2         -1.09493    0.28223  -3.880 0.000105 ***
## NP3         -2.26445    0.38805  -5.836 5.36e-09 ***
## FA2         -0.22867    0.33948  -0.674 0.500570
## FA3         -0.23076    0.61226  -0.377 0.706242
## FA4          1.25658    0.50820   2.473 0.013414 *
## FA5         -0.01104    0.81512  -0.014 0.989198
## FA6          1.51876    0.50800   2.990 0.002793 **
## DWH2        -0.59620    0.38491  -1.549 0.121400
## DS2         -0.60288    0.29472  -2.046 0.040798 *
## Rank1       -0.83171    0.40437  -2.057 0.039704 *
## Rank2       -0.57567    0.41917  -1.373 0.169640
## ---
## 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: 390.00  on 383  degrees of freedom
## AIC: 420
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DWH + DS + Rank
## 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       383     390.00 14  100.573 3.683e-15 ***
## 3       367     381.91 16    8.092    0.9461
## ---
## 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 + H + FA + TA + DWH + RS + Rank
##
##
##      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     + H  1  8.399876       393    419.3501 429.3501
## 5    + FA  5 15.151327       388    404.1988 424.1988
## 6    + TA  1  4.764489       387    399.4343 421.4343
## 7   + DWH  1  2.772511       386    396.6618 420.6618
## 8    + RS  1  2.396227       385    394.2655 420.2655
## 9 + Rank  2  4.265021       383    390.0005 420.0005
```

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
## -2.0415  -0.7643  -0.4556   0.8155   2.5166
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.25033    0.96521   0.259  0.79536
## NP2         -1.11989    0.28137  -3.980 6.89e-05 ***
## NP3         -2.34861    0.38519  -6.097 1.08e-09 ***
## DS2         -0.77901    0.27042  -2.881  0.00397 **
## H            0.66077    0.25424   2.599  0.00935 **
## RS2         -0.40498    0.25990  -1.558  0.11918
## FA2         -0.21614    0.33607  -0.643  0.52014
## FA3         -0.20675    0.59985  -0.345  0.73035
## FA4          1.25322    0.50885   2.463  0.01378 *
## FA5         -0.04747    0.82584  -0.057  0.95416
## FA6          1.59606    0.50191   3.180  0.00147 **
## TA          -0.02871    0.01367  -2.100  0.03569 *
## Rank1       -0.86333    0.40287  -2.143  0.03212 *
## Rank2       -0.60065    0.41797  -1.437  0.15070
## ---
## 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: 392.41  on 384  degrees of freedom
## AIC: 420.41
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DWH + DS + Rank
## 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       383     390.00 14  100.573 3.683e-15 ***
## 3       384     392.41 -1   -2.405    0.1210
## 4       367     381.91 17   10.497    0.8815
## ---
## 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 + H + FA + TA + DWH + RS + Rank
##
##
##        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     + H  1  8.399876       393     419.3501 429.3501
## 5    + FA  5 15.151327       388     404.1988 424.1988
## 6    + TA  1  4.764489       387     399.4343 421.4343
## 7   + DWH  1  2.772511       386     396.6618 420.6618
## 8    + RS  1  2.396227       385     394.2655 420.2655
## 9 + Rank  2  4.265021       383     390.0005 420.0005


##
## Call:
## glm(formula = SR ~ NP + DS + H + FA + TA + DWH + RS + Rank, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9510  -0.7481  -0.4547   0.8268   2.4945
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.61588    1.00425   0.613 0.539698
## NP2         -1.09493    0.28223  -3.880 0.000105 ***
## NP3         -2.26445    0.38805  -5.836 5.36e-09 ***
## DS2         -0.60288    0.29472  -2.046 0.040798 *
## H            0.65591    0.25534   2.569 0.010205 *
## FA2         -0.22867    0.33948  -0.674 0.500570
## FA3         -0.23076    0.61226  -0.377 0.706242
## FA4          1.25658    0.50820   2.473 0.013414 *
## FA5         -0.01104    0.81512  -0.014 0.989198
## FA6          1.51876    0.50800   2.990 0.002793 **
## TA          -0.02848    0.01375  -2.072 0.038294 *
## DWH2        -0.59620    0.38491  -1.549 0.121400
## RS2         -0.40185    0.26118  -1.539 0.123904
## Rank1       -0.83171    0.40437  -2.057 0.039704 *
## Rank2       -0.57567    0.41917  -1.373 0.169640
## ---
## 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: 390.00  on 383  degrees of freedom
## AIC: 420
##
## Number of Fisher Scoring iterations: 5
```

Comparing models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DWH + DS + Rank
## Model 3: SR ~ NP + DS + H + RS + FA + TA + Rank
## Model 4: SR ~ NP + DS + H + FA + TA + DWH + RS + Rank
## 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       383     390.00 14  100.573 3.683e-15 ***
## 3       384     392.41 -1   -2.405    0.1210
## 4       383     390.00  1    2.405    0.1210
## 5       367     381.91 16    8.092    0.9461
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

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