Logistic Regression

Null Model

```
##
## Call:
## glm(formula = SR ~ 1, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -0.8518  -0.8518  -0.8518   1.5427   1.5427
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -0.8272     0.1118    -7.4 1.37e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 464.49  on 377  degrees of freedom
## Residual deviance: 464.49  on 377  degrees of freedom
## AIC: 466.49
##
## 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
## -2.0768  -0.7357  -0.4388   0.8014   2.5194
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.348653   2.038295  -0.171 0.864183
## NASA        -0.028494   0.026856  -1.061 0.288693
## TA          -0.036878   0.023686  -1.557 0.119491
## EXT         -0.011454   0.065231  -0.176 0.860610
## AGR         -0.001868   0.085698  -0.022 0.982608
## CS          -0.033143   0.089880  -0.369 0.712311
## NT           0.016931   0.095441   0.177 0.859196
## OP           0.000436   0.077230   0.006 0.995495
## AV           0.019453   0.027535   0.706 0.479877
## EM           0.028594   0.035808   0.799 0.424551
## Task         0.014452   0.040223   0.359 0.719370
## H            0.613495   0.279698   2.193 0.028277 *
## RS2         -0.546950   0.278284  -1.965 0.049364 *
## WH2          0.311280   0.533074   0.584 0.559265
## TWR          0.009699   0.009962   0.974 0.330272
## BR2          0.177957   0.289470   0.615 0.538708
## NP2         -1.165218   0.300350  -3.880 0.000105 ***
## NP3         -2.366442   0.428287  -5.525 3.29e-08 ***
## FA2         -0.296665   0.364432  -0.814 0.415617
## FA3         -0.257934   0.645191  -0.400 0.689319
## FA4          1.109944   0.568775   1.951 0.051002 .
## FA5          0.075427   0.858962   0.088 0.930026
## FA6          1.488131   0.541774   2.747 0.006018 **
## AP           0.132741   0.370227   0.359 0.719939
## AR          -0.059534   0.110867  -0.537 0.591280
## DWH2        -0.518275   0.428215  -1.210 0.226159
## DWR          0.002704   0.008530   0.317 0.751235
## T2           0.256861   0.287002   0.895 0.370797
## DS2         -0.550427   0.325108  -1.693 0.090444 .
## Rank1       -0.978354   0.422185  -2.317 0.020484 *
## Rank2       -0.612189   0.434049  -1.410 0.158418
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 464.49  on 377  degrees of freedom
## Residual deviance: 364.91  on 347  degrees of freedom
## AIC: 426.91
##
## 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 + DS + Rank
##
##
##      Step Df     Deviance Resid. Df Resid. Dev      AIC
## 1                               347   364.9140 426.9140
## 2    - OP  1 3.187468e-05       348   364.9140 424.9140
## 3   - AGR  1 4.627297e-04       349   364.9144 422.9144
## 4   - EXT  1 3.132979e-02       350   364.9458 420.9458
## 5    - NT  1 2.961918e-02       351   364.9754 418.9754
## 6   - DWR  1 9.831104e-02       352   365.0737 417.0737
## 7    - AP  1 1.227959e-01       353   365.1965 415.1965
## 8  - Task  1 1.354428e-01       354   365.3319 413.3319
## 9    - CS  1 8.531670e-02       355   365.4173 411.4173
## 10   - AR  1 2.854253e-01       356   365.7027 409.7027
## 11   - BR  1 3.199171e-01       357   366.0226 408.0226
## 12   - AV  1 4.201670e-01       358   366.4428 406.4428
## 13   - WH  1 6.630343e-01       359   367.1058 405.1058
## 14 - NASA  1 7.464724e-01       360   367.8523 403.8523
## 15   - EM  1 7.754731e-01       361   368.6278 402.6278
## 16    - T  1 8.747927e-01       362   369.5025 401.5025
## 17  - TWR  1 1.512991e+00       363   371.0155 401.0155
## 18  - DWH  1 1.837685e+00       364   372.8532 400.8532
```

Backward Elimination Model

```
##
## Call:
## glm(formula = SR ~ TA + H + RS + NP + FA + DS + Rank, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9302  -0.7702  -0.4551   0.8102   2.5096
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.42307    1.00488   0.421  0.67374
## TA          -0.02831    0.01407  -2.012  0.04426 *
## H            0.65124    0.26210   2.485  0.01296 *
## RS2         -0.51950    0.26649  -1.949  0.05124 .
## NP2         -1.13919    0.28788  -3.957 7.58e-05 ***
## NP3         -2.40200    0.40029  -6.001 1.96e-09 ***
## FA2         -0.25744    0.34910  -0.737  0.46085
## FA3         -0.15395    0.61322  -0.251  0.80177
## FA4          1.05074    0.54176   1.939  0.05244 .
## FA5         -0.04054    0.83285  -0.049  0.96118
## FA6          1.56153    0.51014   3.061  0.00221 **
## DS2         -0.76153    0.27765  -2.743  0.00609 **
## Rank1       -0.97233    0.41116  -2.365  0.01804 *
## Rank2       -0.69176    0.42327  -1.634  0.10219
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 464.49  on 377  degrees of freedom
## Residual deviance: 372.85  on 364  degrees of freedom
## AIC: 400.85
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + 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       377     464.49
## 2       364     372.85 13   91.639 6.784e-14 ***
## 3       347     364.91 17    7.939    0.9678
## ---
## 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 + RS + FA + TA + Rank
##
##
##     Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                           377   464.4926 466.4926
## 2   + NP  2 47.588825       375   416.9038 422.9038
## 3   + DS  1 11.803077       374   405.1007 413.1007
## 4    + H  1  6.578118       373   398.5226 408.5226
## 5   + RS  1  4.206595       372   394.3160 406.3160
## 6   + FA  5 11.971585       367   382.3444 404.3444
## 7   + TA  1  3.808978       366   378.5354 402.5354
## 8 + Rank  2  5.682201       364   372.8532 400.8532
```

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
## -1.9302  -0.7702  -0.4551   0.8102   2.5096
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.42307    1.00488   0.421  0.67374
## NP2         -1.13919    0.28788  -3.957 7.58e-05 ***
## NP3         -2.40200    0.40029  -6.001 1.96e-09 ***
## DS2         -0.76153    0.27765  -2.743  0.00609 **
## H            0.65124    0.26210   2.485  0.01296 *
## RS2         -0.51950    0.26649  -1.949  0.05124 .
## FA2         -0.25744    0.34910  -0.737  0.46085
## FA3         -0.15395    0.61322  -0.251  0.80177
## FA4          1.05074    0.54176   1.939  0.05244 .
## FA5         -0.04054    0.83285  -0.049  0.96118
## FA6          1.56153    0.51014   3.061  0.00221 **
## TA          -0.02831    0.01407  -2.012  0.04426 *
## Rank1       -0.97233    0.41116  -2.365  0.01804 *
## Rank2       -0.69176    0.42327  -1.634  0.10219
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 464.49  on 377  degrees of freedom
## Residual deviance: 372.85  on 364  degrees of freedom
## AIC: 400.85
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + 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       377     464.49
## 2       364     372.85 13   91.639 6.784e-14 ***
## 3       364     372.85  0    0.000
## 4       347     364.91 17    7.939    0.9678
## ---
## 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 + RS + FA + TA + Rank
##
##
##     Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                           377   464.4926 466.4926
## 2   + NP  2 47.588825       375   416.9038 422.9038
## 3   + DS  1 11.803077       374   405.1007 413.1007
## 4    + H  1  6.578118       373   398.5226 408.5226
## 5   + RS  1  4.206595       372   394.3160 406.3160
## 6   + FA  5 11.971585       367   382.3444 404.3444
## 7   + TA  1  3.808978       366   378.5354 402.5354
## 8 + Rank  2  5.682201       364   372.8532 400.8532

##
## Call:
## glm(formula = SR ~ NP + DS + H + RS + FA + TA + Rank, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9302  -0.7702  -0.4551   0.8102   2.5096
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.42307    1.00488   0.421  0.67374
## NP2         -1.13919    0.28788  -3.957 7.58e-05 ***
## NP3         -2.40200    0.40029  -6.001 1.96e-09 ***
## DS2         -0.76153    0.27765  -2.743  0.00609 **
## H            0.65124    0.26210   2.485  0.01296 *
## RS2         -0.51950    0.26649  -1.949  0.05124 .
## FA2         -0.25744    0.34910  -0.737  0.46085
## FA3         -0.15395    0.61322  -0.251  0.80177
## FA4          1.05074    0.54176   1.939  0.05244 .
## FA5         -0.04054    0.83285  -0.049  0.96118
## FA6          1.56153    0.51014   3.061  0.00221 **
## TA          -0.02831    0.01407  -2.012  0.04426 *
## Rank1       -0.97233    0.41116  -2.365  0.01804 *
## Rank2       -0.69176    0.42327  -1.634  0.10219
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 464.49  on 377  degrees of freedom
## Residual deviance: 372.85  on 364  degrees of freedom
```

```
## AIC: 400.85
##
## Number of Fisher Scoring iterations: 5
```

Comparing models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DS + Rank
## Model 3: SR ~ NP + DS + H + RS + FA + TA + Rank
## Model 4: SR ~ NP + DS + H + RS + FA + TA + 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       377     464.49
## 2       364     372.85 13   91.639 6.784e-14 ***
## 3       364     372.85  0    0.000
## 4       364     372.85  0    0.000
## 5       347     364.91 17    7.939    0.9678
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

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