Logistic Regression

```
##   x freq
## 1 0  278
## 2 1  122
```

Null Model

```
## 
## Call:
## glm(formula = SR ~ 1, family = "binomial", data = lm_DF)
## 
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -0.853  -0.853  -0.853   1.541   1.541
## 
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -0.8236     0.1086  -7.584 3.35e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## (Dispersion parameter for binomial family taken to be 1)
## 
##     Null deviance: 492.03  on 399  degrees of freedom
## Residual deviance: 492.03  on 399  degrees of freedom
## AIC: 494.03
## 
## 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
## -2.0773  -0.7334  -0.4525   0.7706   2.5349
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.2345966  1.8503854   0.667  0.50464
## NASA        -0.0309258  0.0258753  -1.195  0.23201
## TA          -0.0386155  0.0231069  -1.671  0.09469 .
## EXT         -0.0293509  0.0635357  -0.462  0.64411
## AGR         -0.0341314  0.0822562  -0.415  0.67819
## CS          -0.0272209  0.0872076  -0.312  0.75493
## NT          -0.0158319  0.0915540  -0.173  0.86271
## OP          -0.0302067  0.0752227  -0.402  0.68801
## AV           0.0262304  0.0267181   0.982  0.32622
## EM           0.0364870  0.0350152   1.042  0.29740
## Task         0.0063495  0.0385988   0.164  0.86934
## H            0.0144911  0.0078024   1.857  0.06327 .
## RS2         -0.4493013  0.2701483  -1.663  0.09628 .
## WH2          0.4020736  0.5087648   0.790  0.42936
## TWR          0.0110865  0.0096255   1.152  0.24941
## BR2          0.2066692  0.2807670   0.736  0.46168
## NP2         -1.1589104  0.2930644  -3.954 7.67e-05 ***
## NP3         -2.2672503  0.4093441  -5.539 3.05e-08 ***
## FA2         -0.3226519  0.3548888  -0.909  0.36326
## FA3         -0.2815544  0.6379622  -0.441  0.65897
## FA4          1.2856565  0.5376323   2.391  0.01679 *
## FA5          0.2576916  0.8376256   0.308  0.75835
## FA6          1.4141084  0.5315940   2.660  0.00781 **
## AP           0.2153691  0.3699047   0.582  0.56041
## AR          -0.0190359  0.1083455  -0.176  0.86053
## DWH2        -0.5570828  0.4180116  -1.333  0.18263
## DWR          0.0008552  0.0081130   0.105  0.91605
## T2           0.3916591  0.2791027   1.403  0.16053
## DS2         -0.4826258  0.3126487  -1.544  0.12267
## Rank1       -0.7049225  0.3973347  -1.774  0.07604 .
## Rank2       -0.2793890  0.3935568  -0.710  0.47776
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 492.03  on 399  degrees of freedom
## Residual deviance: 384.90  on 369  degrees of freedom
## AIC: 446.9
##
## 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 + T + DS
##
##
##        Step Df   Deviance Resid. Df Resid. Dev      AIC
## 1                              369    384.9001 446.9001
## 2   - DWR  1 0.01113496        370    384.9113 444.9113
## 3    - NT  1 0.03068473        371    384.9420 442.9420
## 4    - AR  1 0.02935926        372    384.9713 440.9713
## 5  - Task  1 0.03339660        373    385.0047 439.0047
## 6    - CS  1 0.08639948        374    385.0911 437.0911
## 7   - AGR  1 0.15448551        375    385.2456 435.2456
## 8    - OP  1 0.20742363        376    385.4530 433.4530
## 9    - AP  1 0.29970268        377    385.7527 431.7527
## 10  - EXT  1 0.39076034        378    386.1435 430.1435
## 11   - BR  1 0.50410472        379    386.6476 428.6476
## 12   - AV  1 0.55915698        380    387.2068 427.2068
## 13   - WH  1 1.00934654        381    388.2161 426.2161
## 14 - NASA  1 0.84098757        382    389.0571 425.0571
## 15   - EM  1 0.97955054        383    390.0366 424.0366
## 16 - Rank  2 2.87101255        385    392.9076 422.9076
## 17  - TWR  1 1.74280170        386    394.6504 422.6504
```

Backward Elimination Model

```
##
## Call:
## glm(formula = SR ~ TA + H + RS + NP + FA + DWH + T + DS, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9426  -0.7556  -0.4683   0.8207   2.4914
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.395218   0.735055   1.898 0.057681 .
## TA          -0.027766   0.013200  -2.103 0.035431 *
## H            0.012912   0.006358   2.031 0.042276 *
## RS2         -0.417505   0.256440  -1.628 0.103507
## NP2         -1.023264   0.276660  -3.699 0.000217 ***
## NP3         -2.098468   0.376261  -5.577 2.44e-08 ***
## FA2         -0.215003   0.335423  -0.641 0.521530
## FA3         -0.055207   0.599710  -0.092 0.926653
## FA4          1.391123   0.507573   2.741 0.006130 **
## FA5          0.118117   0.791306   0.149 0.881342
## FA6          1.342954   0.509006   2.638 0.008330 **
## DWH2        -0.587905   0.380496  -1.545 0.122322
## T2           0.389914   0.266645   1.462 0.143660
## DS2         -0.444235   0.299453  -1.483 0.137945
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 492.03  on 399  degrees of freedom
## Residual deviance: 394.65  on 386  degrees of freedom
## AIC: 422.65
##
## 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 + T + DS
## 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       399     492.03
## 2       386     394.65 13   97.383 5.324e-15 ***
## 3       369     384.90 17    9.750    0.9138
## ---
## 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                          399    492.0332 494.0332
## 2   + NP  2 49.806071       397    442.2271 448.2271
## 3   + DS  1 13.197279       396    429.0298 437.0298
## 4   + FA  5 14.449244       391    414.5806 432.5806
## 5   + TA  1  7.537660       390    407.0429 427.0429
## 6    + H  1  4.935499       389    402.1074 424.1074
## 7   + RS  1  2.748596       388    399.3588 423.3588
## 8 + DWH  1  2.563744       387    396.7951 422.7951
## 9    + T  1  2.144622       386    394.6504 422.6504
```

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
## -1.9823  -0.7590  -0.4685   0.8371   2.5488
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.696111   0.734828   2.308  0.02099 *
## NP2         -1.104867   0.279403  -3.954 7.67e-05 ***
## NP3         -2.293829   0.381146  -6.018 1.76e-09 ***
## DS2         -0.739077   0.268233  -2.755  0.00586 **
## H            0.013637   0.007151   1.907  0.05653 .
## RS2         -0.406204   0.259042  -1.568  0.11686
## FA2         -0.176310   0.334603  -0.527  0.59825
## FA3         -0.144708   0.601020  -0.241  0.80973
## FA4          1.261773   0.504286   2.502  0.01235 *
## FA5          0.060003   0.819760   0.073  0.94165
## FA6          1.527917   0.498286   3.066  0.00217 **
## TA          -0.028959   0.013611  -2.128  0.03336 *
## Rank1       -0.645591   0.382726  -1.687  0.09164 .
## Rank2       -0.278510   0.378408  -0.736  0.46173
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 492.03  on 399  degrees of freedom
## Residual deviance: 396.31  on 386  degrees of freedom
## AIC: 424.31
##
## Number of Fisher Scoring iterations: 5
```

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Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + RS + NP + FA + DWH + T + DS
## 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       399     492.03
## 2       386     394.65 13   97.383 5.324e-15 ***
## 3       386     396.31  0   -1.658
## 4       369     384.90 17   11.408    0.8346
## ---
## 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                           399    492.0332 494.0332
## 2   + NP  2 49.806071       397    442.2271 448.2271
## 3   + DS  1 13.197279       396    429.0298 437.0298
## 4   + FA  5 14.449244       391    414.5806 432.5806
## 5   + TA  1  7.537660       390    407.0429 427.0429
## 6    + H  1  4.935499       389    402.1074 424.1074
## 7   + RS  1  2.748596       388    399.3588 423.3588
## 8 + DWH  1  2.563744       387    396.7951 422.7951
## 9    + T  1  2.144622       386    394.6504 422.6504


##
## Call:
## glm(formula = SR ~ NP + DS + FA + TA + H + RS + DWH + T, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min      1Q   Median      3Q      Max
## -1.9426  -0.7556  -0.4683   0.8207   2.4914
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.395218   0.735055   1.898 0.057681 .
## NP2         -1.023264   0.276660  -3.699 0.000217 ***
## NP3         -2.098468   0.376261  -5.577 2.44e-08 ***
## DS2         -0.444235   0.299453  -1.483 0.137945
## FA2         -0.215003   0.335423  -0.641 0.521530
## FA3         -0.055207   0.599710  -0.092 0.926653
## FA4          1.391123   0.507573   2.741 0.006130 **
## FA5          0.118117   0.791306   0.149 0.881342
## FA6          1.342954   0.509006   2.638 0.008330 **
## TA          -0.027766   0.013200  -2.103 0.035431 *
## H            0.012912   0.006358   2.031 0.042276 *
## RS2         -0.417505   0.256440  -1.628 0.103507
## DWH2        -0.587905   0.380496  -1.545 0.122322
## T2           0.389914   0.266645   1.462 0.143660
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 492.03  on 399  degrees of freedom
```

```
## Residual deviance: 394.65  on 386  degrees of freedom
## AIC: 422.65
##
## 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 + T + DS
## 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       399     492.03
## 2       386     394.65 13   97.383 5.324e-15 ***
## 3       386     396.31  0   -1.658
## 4       386     394.65  0    1.658
## 5       369     384.90 17    9.750    0.9138
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

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