Logistic Regression

```
##   x freq
## 1 0  335
## 2 1   64
```

Null Model

```
##
## Call:
## glm(formula = SR ~ 1, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -0.5913  -0.5913  -0.5913  -0.5913   1.9131
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -1.6552     0.1364  -12.13   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 351.39  on 398  degrees of freedom
## Residual deviance: 351.39  on 398  degrees of freedom
## AIC: 353.39
##
## Number of Fisher Scoring iterations: 3
```

Logistic Regression: Full MOdel

```
##
## Call:
## glm(formula = SR ~ ., family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.8675  -0.5533  -0.3134  -0.1685   3.1735
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.547476   2.412405  -1.056  0.29097
## NASA        -0.002060   0.034123  -0.060  0.95187
## TA          -0.028494   0.028664  -0.994  0.32020
## EXT         -0.286948   0.088362  -3.247  0.00116 **
## AGR          0.118009   0.106061   1.113  0.26586
## CS           0.054595   0.111488   0.490  0.62435
## NT           0.053338   0.115423   0.462  0.64401
## OP           0.096349   0.097988   0.983  0.32547
## AV           0.048553   0.034604   1.403  0.16058
## EM           0.027158   0.044300   0.613  0.53985
## Task         0.066694   0.052168   1.278  0.20109
## H            0.020842   0.008791   2.371  0.01775 *
## RS2         -0.450760   0.336742  -1.339  0.18070
## WH2         -0.153185   0.645793  -0.237  0.81250
## TWR          0.009760   0.012101   0.807  0.41995
## BR2          0.773751   0.365528   2.117  0.03428 *
## NP2         -1.181426   0.368120  -3.209  0.00133 **
## NP3         -2.613387   0.576405  -4.534 5.79e-06 ***
## FA2         -0.458449   0.478961  -0.957  0.33848
## FA3          1.231176   0.643927   1.912  0.05588 .
## FA4          1.452426   0.593161   2.449  0.01434 *
## FA5         -0.352484   1.229701  -0.287  0.77439
## FA6          1.476025   0.565645   2.609  0.00907 **
## AP          -0.360477   0.456131  -0.790  0.42936
## AR          -0.211525   0.135895  -1.557  0.11958
## DWH2         0.186226   0.497089   0.375  0.70793
## DWR         -0.005727   0.010250  -0.559  0.57633
## T2           0.024084   0.353755   0.068  0.94572
## DS2         -0.685464   0.405341  -1.691  0.09082 .
## Rank1       -0.378435   0.496485  -0.762  0.44592
## Rank2       -0.677905   0.536250  -1.264  0.20617
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 351.39  on 398  degrees of freedom
## Residual deviance: 264.75  on 368  degrees of freedom
## AIC: 326.75
##
## Number of Fisher Scoring iterations: 6
```

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 ~ EXT + AV + Task + H + BR + NP + FA + AR + DS
##
##
##      Step Df     Deviance Resid. Df Resid. Dev      AIC
## 1                               368   264.7523 326.7523
## 2  - Rank  2 1.5990573891       370   266.3514 324.3514
## 3  - NASA  1 0.0004439254       371   266.3518 322.3518
## 4     - T  1 0.0015125468       372   266.3533 320.3533
## 5    - WH  1 0.0564137405       373   266.4098 318.4098
## 6   - DWH  1 0.0939554395       374   266.5037 316.5037
## 7    - CS  1 0.2138193961       375   266.7175 314.7175
## 8    - NT  1 0.2566540137       376   266.9742 312.9742
## 9   - DWR  1 0.2764933249       377   267.2507 311.2507
## 10   - TA  1 0.4865607345       378   267.7372 309.7372
## 11   - EM  1 0.1688471230       379   267.9061 307.9061
## 12  - TWR  1 0.8398545503       380   268.7459 306.7459
## 13   - AP  1 0.9287122576       381   269.6747 305.6747
## 14   - RS  1 1.1545045760       382   270.8292 304.8292
## 15   - OP  1 1.1916071519       383   272.0208 304.0208
## 16  - AGR  1 1.3193172114       384   273.3401 303.3401
```

Backward Elimination Model

```
##
## Call:
## glm(formula = SR ~ EXT + AV + Task + H + BR + NP + FA + AR +
##     DS, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7681  -0.5511  -0.3475  -0.1981   3.1035
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.67832    1.49975  -1.786  0.07413 .
## EXT         -0.24640    0.08049  -3.061  0.00220 **
## AV           0.05514    0.03326   1.658  0.09732 .
## Task         0.06848    0.04617   1.483  0.13800
## H            0.01872    0.00743   2.519  0.01175 *
## BR2          0.68713    0.32775   2.097  0.03604 *
## NP2         -1.06348    0.34937  -3.044  0.00233 **
## NP3         -2.36536    0.52534  -4.503 6.71e-06 ***
## FA2         -0.43681    0.46055  -0.948  0.34291
## FA3          1.26416    0.61056   2.070  0.03841 *
## FA4          1.22477    0.56716   2.159  0.03081 *
## FA5         -0.10475    1.16374  -0.090  0.92828
## FA6          1.41099    0.52551   2.685  0.00725 **
## AR          -0.18288    0.12682  -1.442  0.14929
## DS2         -0.58223    0.32954  -1.767  0.07727 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 351.39  on 398  degrees of freedom
## Residual deviance: 273.34  on 384  degrees of freedom
## AIC: 303.34
##
## Number of Fisher Scoring iterations: 6
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ EXT + AV + Task + H + BR + NP + FA + AR + 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       398     351.39
## 2       384     273.34 14   78.047 6.505e-11 ***
## 3       368     264.75 16    8.588    0.9294
## ---
## 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 + FA + H + EXT + Task + BR + DS + AV + AR
##
##
##      Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                            398   351.3867 353.3867
## 2    + NP  2 31.748427       396   319.6383 325.6383
## 3    + FA  5 17.347055       391   302.2912 318.2912
## 4     + H  1  8.979013       390   293.3122 311.3122
## 5   + EXT  1  6.833297       389   286.4789 306.4789
## 6  + Task  1  3.237528       388   283.2414 305.2414
## 7    + BR  1  2.577346       387   280.6641 304.6641
## 8    + DS  1  2.614660       386   278.0494 304.0494
## 9    + AV  1  2.622743       385   275.4267 303.4267
## 10   + AR  1  2.086568       384   273.3401 303.3401
```

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
## -1.4786  -0.5931  -0.3907  -0.2289   2.5247
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.451726   0.895564  -0.504  0.61398
## NP2         -1.078727   0.345872  -3.119  0.00182 **
## NP3         -2.296750   0.519739  -4.419 9.91e-06 ***
## DS2         -0.529570   0.330464  -1.603  0.10904
## H            0.023405   0.008142   2.875  0.00405 **
## RS2         -0.362719   0.313549  -1.157  0.24735
## FA2         -0.478329   0.442304  -1.081  0.27950
## FA3          0.996866   0.606839   1.643  0.10044
## FA4          1.485793   0.549043   2.706  0.00681 **
## FA5         -0.451864   1.139180  -0.397  0.69162
## FA6          1.430877   0.512846   2.790  0.00527 **
## TA          -0.010056   0.016537  -0.608  0.54313
## Rank1       -0.243834   0.468926  -0.520  0.60307
## Rank2       -0.704347   0.495473  -1.422  0.15515
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 351.39  on 398  degrees of freedom
## Residual deviance: 287.65  on 385  degrees of freedom
## AIC: 315.65
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ EXT + AV + Task + H + BR + NP + FA + AR + 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       398     351.39
## 2       384     273.34 14   78.047 6.505e-11 ***
## 3       385     287.65 -1  -14.315 0.0001547 ***
## 4       368     264.75 17   22.902 0.1524591
## ---
## 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 + FA + H + EXT + Task + BR + DS + AV + AR
##
##
##      Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                            398   351.3867 353.3867
## 2    + NP  2 31.748427       396   319.6383 325.6383
## 3    + FA  5 17.347055       391   302.2912 318.2912
## 4     + H  1  8.979013       390   293.3122 311.3122
## 5   + EXT  1  6.833297       389   286.4789 306.4789
## 6  + Task  1  3.237528       388   283.2414 305.2414
## 7    + BR  1  2.577346       387   280.6641 304.6641
## 8    + DS  1  2.614660       386   278.0494 304.0494
## 9    + AV  1  2.622743       385   275.4267 303.4267
## 10   + AR  1  2.086568       384   273.3401 303.3401

##
## Call:
## glm(formula = SR ~ NP + FA + H + EXT + Task + BR + DS + AV +
##     AR, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7681  -0.5511  -0.3475  -0.1981   3.1035
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.67832    1.49975  -1.786  0.07413 .
## NP2         -1.06348    0.34937  -3.044  0.00233 **
## NP3         -2.36536    0.52534  -4.503 6.71e-06 ***
## FA2         -0.43681    0.46055  -0.948  0.34291
## FA3          1.26416    0.61056   2.070  0.03841 *
## FA4          1.22477    0.56716   2.159  0.03081 *
## FA5         -0.10475    1.16374  -0.090  0.92828
## FA6          1.41099    0.52551   2.685  0.00725 **
## H            0.01872    0.00743   2.519  0.01175 *
## EXT         -0.24640    0.08049  -3.061  0.00220 **
## Task         0.06848    0.04617   1.483  0.13800
## BR2          0.68713    0.32775   2.097  0.03604 *
## DS2         -0.58223    0.32954  -1.767  0.07727 .
## AV           0.05514    0.03326   1.658  0.09732 .
## AR          -0.18288    0.12682  -1.442  0.14929
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
```

```
##
##     Null deviance: 351.39  on 398  degrees of freedom
## Residual deviance: 273.34  on 384  degrees of freedom
## AIC: 303.34
##
## Number of Fisher Scoring iterations: 6
```

Comparing models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ EXT + AV + Task + H + BR + NP + FA + AR + DS
## Model 3: SR ~ NP + DS + H + RS + FA + TA + Rank
## Model 4: SR ~ NP + FA + H + EXT + Task + BR + DS + AV + AR
## 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       398     351.39
## 2       384     273.34 14   78.047 6.505e-11 ***
## 3       385     287.65 -1  -14.315 0.0001547 ***
## 4       384     273.34  1   14.315 0.0001547 ***
## 5       368     264.75 16    8.588 0.9294155
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

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