VotePulse Project

Bobga-Herman Gwanvoma

2025-05-31

```r
# Clean & Prepare Data
election_df <- election_data %>%
  select(total_receipts, total_disbursements, cash_on_hand_end_period, party_full) %>%
  mutate(across(c(total_receipts, total_disbursements, cash_on_hand_end_period), as.numeric)) %>%
  drop_na()

median_receipts <- median(election_df$total_receipts, na.rm = TRUE)
election_df <- election_df %>%
  mutate(high_funding = ifelse(total_receipts > median_receipts, 1, 0),
         party_full = as.factor(party_full),
         high_funding = as.factor(high_funding))
```

```r
# Logistic Regression
log_model <- glm(high_funding ~ total_disbursements + cash_on_hand_end_period + party_full,
                 data = election_df, family = binomial)
```

```
## Warning: glm.fit: algorithm did not converge
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```r
summary(log_model)
```

```
##
## Call:
## glm(formula = high_funding ~ total_disbursements + cash_on_hand_end_period +
##     party_full, family = binomial, data = election_df)
##
## Coefficients:
##                                            Estimate Std. Error z value
## (Intercept)                               -2.657e+01  1.781e+05   0.000
## total_disbursements                        5.469e-03  1.387e-03   3.943
## cash_on_hand_end_period                    2.537e-03  8.231e-04   3.083
## party_fullAMERICAN INDEPENDENT PARTY      -5.645e-05  2.140e+05   0.000
## party_fullAMERICAN PARTY                  -5.644e-05  2.518e+05   0.000
## party_fullAMERICAN PEOPLE'S FREEDOM PARTY -5.646e-05  3.084e+05   0.000
## party_fullCITIZENS' PARTY                 -5.644e-05  3.982e+05   0.000
## party_fullCOMMANDMENTS PARTY              -5.643e-05  3.982e+05   0.000
## party_fullCOMMUNIST PARTY                 -5.644e-05  3.982e+05   0.000
## party_fullCONSERVATIVE PARTY              -5.641e-05  3.982e+05   0.000
## party_fullCONSTITUTION PARTY               2.627e+01  1.781e+05   0.000
```

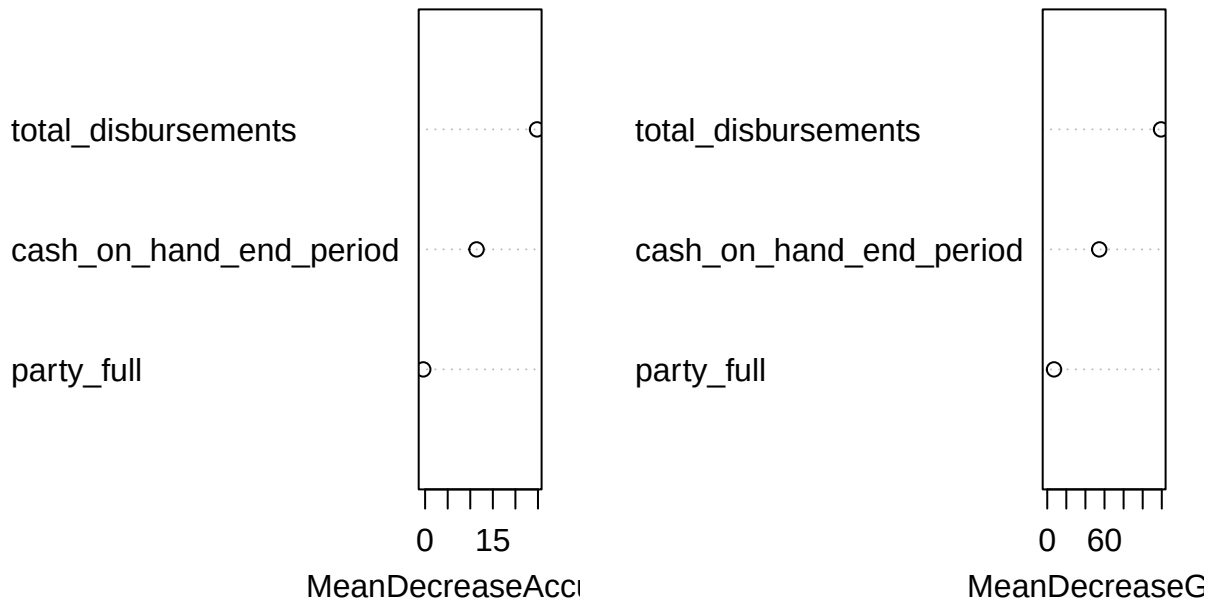
```
## party_fullDEMOCRATIC-FARMER-LABOR             -5.644e-05  3.982e+05   0.000
## party_fullDEMOCRATIC PARTY                     2.275e+01  1.781e+05   0.000
## party_fullFEDERALIST                          -5.644e-05  2.720e+05   0.000
## party_fullFREEDOM PARTY                       -5.644e-05  3.982e+05   0.000
## party_fullGREEN PARTY                          1.963e+01  1.781e+05   0.000
## party_fullINDEPENDENCE PARTY                  -5.644e-05  2.079e+05   0.000
## party_fullINDEPENDENT                          1.536e+01  1.781e+05   0.000
## party_fullINDEPENDENT AMERICAN PARTY          -5.644e-05  3.084e+05   0.000
## party_fullINDEPENDENT CONSERVATIVE DEMOCRATIC -5.642e-05  3.982e+05   0.000
## party_fullJEWISH/CHRISTIAN NATIONAL           -5.644e-05  3.982e+05   0.000
## party_fullLA RAZA UNIDA                       -5.644e-05  3.982e+05   0.000
## party_fullLIBERAL PARTY                       -5.644e-05  3.982e+05   0.000
## party_fullLIBERTARIAN PARTY                    2.385e+01  1.781e+05   0.000
## party_fullNEW PROGRESSIVE PARTY               -5.644e-05  3.982e+05   0.000
## party_fullNO PARTY AFFILIATION                 1.565e+01  1.781e+05   0.000
## party_fullNO PARTY PREFERENCE                 -5.644e-05  3.982e+05   0.000
## party_fullNON-PARTY                            7.879e+00  1.781e+05   0.000
## party_fullNONE                                 8.644e+00  1.781e+05   0.000
## party_fullOTHER                                1.528e+01  1.781e+05   0.000
## party_fullPEACE AND FREEDOM PARTY             -5.644e-05  3.982e+05   0.000
## party_fullPEOPLE'S PARTY                      -5.644e-05  3.982e+05   0.000
## party_fullPROGRESSIVE PARTY                   -5.645e-05  3.982e+05   0.000
## party_fullPROHIBITION PARTY                   -5.644e-05  3.982e+05   0.000
## party_fullREPUBLICAN PARTY                     2.251e+01  1.781e+05   0.000
## party_fullRESOURCE PARTY                      -5.644e-05  3.982e+05   0.000
## party_fullSOCIALIST EQUALITY PARTY            -2.680e+02  3.982e+05  -0.001
## party_fullSOCIALIST PARTY U.S.A.               2.501e+01  3.982e+05   0.000
## party_fullUNAFFILIATED                         2.320e+01  1.781e+05   0.000
## party_fullUNITED CITIZEN                      -5.644e-05  3.982e+05   0.000
## party_fullUNKNOWN                              3.438e+00  1.792e+05   0.000
## party_fullVETERANS PARTY                      -5.644e-05  3.982e+05   0.000
## party_fullWRITE-IN                             1.103e+01  1.781e+05   0.000
##                                               Pr(>|z|)
## (Intercept)                                    0.99988
## total_disbursements                           8.04e-05 ***
## cash_on_hand_end_period                        0.00205 **
## party_fullAMERICAN INDEPENDENT PARTY           1.00000
## party_fullAMERICAN PARTY                       1.00000
## party_fullAMERICAN PEOPLE'S FREEDOM PARTY      1.00000
## party_fullCITIZENS' PARTY                      1.00000
## party_fullCOMMANDMENTS PARTY                   1.00000
## party_fullCOMMUNIST PARTY                      1.00000
## party_fullCONSERVATIVE PARTY                   1.00000
## party_fullCONSTITUTION PARTY                   0.99988
## party_fullDEMOCRATIC-FARMER-LABOR              1.00000
## party_fullDEMOCRATIC PARTY                     0.99990
## party_fullFEDERALIST                           1.00000
## party_fullFREEDOM PARTY                        1.00000
## party_fullGREEN PARTY                          0.99991
## party_fullINDEPENDENCE PARTY                   1.00000
## party_fullINDEPENDENT                          0.99993
## party_fullINDEPENDENT AMERICAN PARTY           1.00000
## party_fullINDEPENDENT CONSERVATIVE DEMOCRATIC  1.00000
## party_fullJEWISH/CHRISTIAN NATIONAL            1.00000
```

```
## party_fullLA RAZA UNIDA                          1.00000
## party_fullLIBERAL PARTY                          1.00000
## party_fullLIBERTARIAN PARTY                      0.99989
## party_fullNEW PROGRESSIVE PARTY                  1.00000
## party_fullNO PARTY AFFILIATION                   0.99993
## party_fullNO PARTY PREFERENCE                    1.00000
## party_fullNON-PARTY                              0.99996
## party_fullNONE                                   0.99996
## party_fullOTHER                                  0.99993
## party_fullPEACE AND FREEDOM PARTY                1.00000
## party_fullPEOPLE'S PARTY                         1.00000
## party_fullPROGRESSIVE PARTY                      1.00000
## party_fullPROHIBITION PARTY                      1.00000
## party_fullREPUBLICAN PARTY                       0.99990
## party_fullRESOURCE PARTY                         1.00000
## party_fullSOCIALIST EQUALITY PARTY               0.99946
## party_fullSOCIALIST PARTY U.S.A.                 0.99995
## party_fullUNAFFILIATED                           0.99990
## party_fullUNITED CITIZEN                         1.00000
## party_fullUNKNOWN                                0.99998
## party_fullVETERANS PARTY                         1.00000
## party_fullWRITE-IN                               0.99995
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 666.298  on 849  degrees of freedom
## Residual deviance:  93.956  on 807  degrees of freedom
## AIC: 179.96
##
## Number of Fisher Scoring iterations: 25
```

```
# Random Forest
rf_model <- randomForest(high_funding ~ total_disbursements + cash_on_hand_end_period + party_full,
                         data = election_df, ntree = 100, importance = TRUE)
print(rf_model)
```

```
##
## Call:
##  randomForest(formula = high_funding ~ total_disbursements + cash_on_hand_end_period +      party_ful
##                Type of random forest: classification
##                      Number of trees: 100
## No. of variables tried at each split: 1
##
##         OOB estimate of  error rate: 1.29%
## Confusion matrix:
##     0   1 class.error
## 0 733   4 0.005427408
## 1   7 106 0.061946903
```

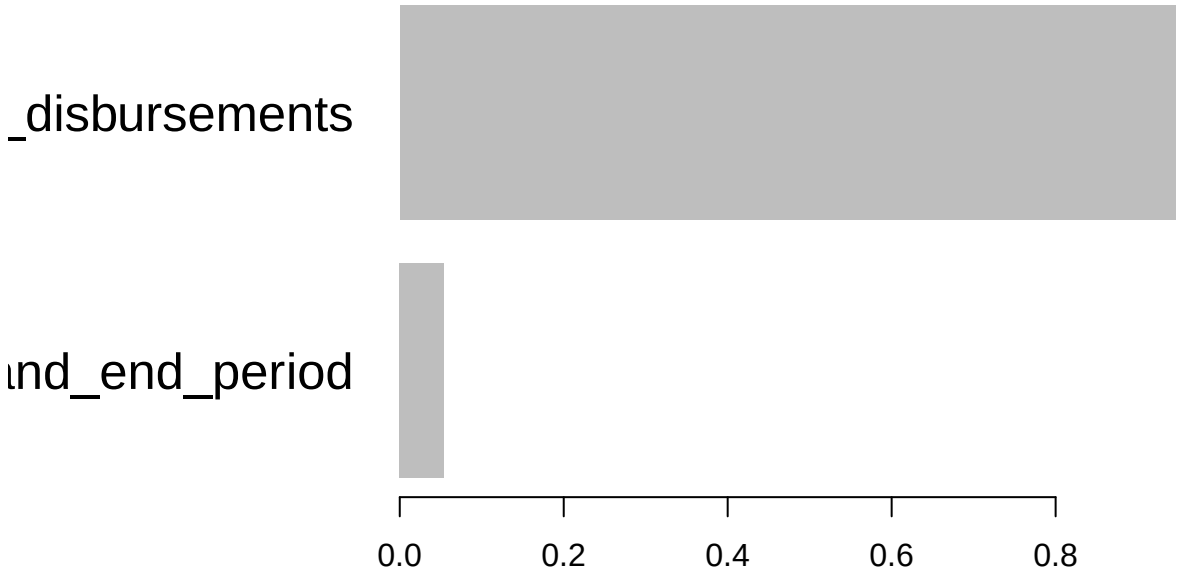
```
varImpPlot(rf_model)
```




```
# XGBoost
xgb_df <- election_df %>% select(total_disbursements, cash_on_hand_end_period) %>% as.matrix()
xgb_target <- as.numeric(election_df$high_funding) - 1
dtrain <- xgb.DMatrix(data = xgb_df, label = xgb_target)

xgb_model <- xgboost(data = dtrain, max.depth = 3, eta = 0.1,
                     nrounds = 50, objective = "binary:logistic", verbose = 0)

importance <- xgb.importance(model = xgb_model)
xgb.plot.importance(importance_matrix = importance)
```


_disbursements
ınd_end_period
0.0
0.2
0.4
0.6
0.8