

MSD 2019 Final Project

An extension (regularized model) of Greed and Grievance in Civil War by Paul Collier and Anke Hoeffler, 2000

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Reading Data

```
setwd(".")
options(scipen = 100, digits = 4)

data <- read.dta("data/G&G.dta")
data <- data[!is.na(data$warsa), ]
```

Helper Functions

```
summarize_into_table <- function(summary_obj) {
  # takes summary object as input, and returns a DF
  # res. to print res, use print(summ(obj), quote =
  # FALSE) is you don't want quotes

  options(digits = 4)
  res <- t(round(summary_obj$coefficients, digits = 4))
  z.values <- res[4, ]
  Signif <- symnum(z.values, corr = FALSE, na = FALSE,
    cutpoints = c(0, 0.01, 0.05, 0.1, 1), symbols = c("***",
      "**", "*", ""))
  res <- rbind(res, Signif)
  res <- t(res)
  res <- res[-1, ]
  res
}

comma_sep = function(x) {
```

```

    x = strsplit(x, "")
  }

convert2dArrayToDf = function(all_tests) {
  model_names <- all_tests[, 1]

  invisible(apply(all_tests, 2, as.numeric))
  invisible(sapply(all_tests, as.numeric))
  class(all_tests) <- "numeric"
  storage.mode(all_tests) <- "numeric"

  all_tests <- as.data.frame(all_tests)

  all_tests[, 1] <- model_names

  return(all_tests)
}

```

Free variables

```

k <- 5

all_tests <- matrix(data = 0, nrow = k, ncol = 6)
colnames(all_tests) <- c("model", "test_index", "sens",
  "spec", "auc", "accuracy")

set.seed(42)
shuffled_data <- data[sample(nrow(data)), ]
folds <- cut(seq(1, nrow(shuffled_data)), breaks = k,
  labels = FALSE)

thresholding_flag = TRUE

threshold_value = as.numeric(params$threshold)

sens_index <- 3
spec_index <- 4
auc_index <- 5
accuracy_index <- 6

```

Regularized Model

```

for (testIndex in 1:k) {

  regularized.data <- shuffled_data %>% select(warsa,
    coldwar, prevwara, peace, elfo, rf, frac, geogia,
    mount, lnpop, sxp, sxp2, dem, ygini, lgini,
    lngdp_, gyl, secm, diaspeaa, difdpeaa, diahpeaa,
    pol16, oilxsp, oilxsp2, etdo4590)

```

```

# Segment your data by fold using the which()
# function
testIndexes <- which(folds == testIndex, arr.ind = TRUE)
testData <- regularized.data[testIndexes, ]
trainData <- regularized.data[-testIndexes, ]

trainData <- na.omit(trainData)
testData <- na.omit(testData)

train_x <- as.matrix(trainData[, 2:ncol(trainData)])
train_y <- as.matrix(trainData$warsa)

test_x <- as.matrix(testData[, 2:ncol(testData)])
test_y <- as.matrix(testData$warsa)

regularized_fit <- cv.glmnet(x = train_x, y = train_y,
  family = "binomial", type.measure = "auc")
regularized_predict <- predict(regularized_fit,
  test_x, type = "response", s = "lambda.min")

regularized_y.hat <- as.matrix(regularized_predict)

all_tests[testIndex, 1] <- paste(c("regularized"),
  collapse = ".")
all_tests[testIndex, 2] <- as.numeric(testIndex)

regularized_y.hat_normalized <- regularized_y.hat

regularized_y.hat_normalized[regularized_y.hat_normalized >=
  threshold_value] <- 1
regularized_y.hat_normalized[regularized_y.hat_normalized <
  threshold_value] <- 0

regularized_predict_normalized <- prediction(regularized_y.hat_normalized,
  test_y)

len <- length(regularized_predict_normalized@fp[[1]])
fp <- as.numeric(regularized_predict_normalized@fp[[1]][len -
  1])
tp <- as.numeric(regularized_predict_normalized@tp[[1]][len -
  1])
fn <- as.numeric(regularized_predict_normalized@fn[[1]][len -
  1])
tn <- as.numeric(regularized_predict_normalized@tn[[1]][len -
  1])

all_tests[testIndex, sens_index] <- tp/(tp + fn)
all_tests[testIndex, spec_index] <- tn/(tn + fp)

all_tests[testIndex, accuracy_index] <- (tp + tn)/(tp +
  tn + fp + fn)

regularized_predict <- prediction(regularized_y.hat,

```

```

    test_y)
  regular_auc <- performance(regularized_predict,
    measure = "auc")
  all_tests[testIndex, auc_index] <- as.numeric(unlist(slot(regular_auc,
    "y.values"))))
}

lower_lim = 1
upper_lim = k
print(convert2dArrayToDf(all_tests[lower_lim:upper_lim,
  1:6]))

```

```

##           model test_index   sens   spec   auc accuracy
## 1 regularized           1 0.3333 0.9661 0.7966   0.9355
## 2 regularized           2 0.0000 1.0000 0.9153   0.9394
## 3 regularized           3 0.0000 1.0000 0.8776   0.9608
## 4 regularized           4 0.1667 0.9808 0.7788   0.8966
## 5 regularized           5 0.0000 1.0000 0.8480   0.9273

```

Converting Results into DataFrame

```

all_tests <- convert2dArrayToDf(all_tests)

result <- aggregate(all_tests[, 3:6], list(all_tests$model),
  mean)

names(result)[1] <- "model"

print(result)

##           model sens   spec   auc accuracy
## 1 regularized  0.1 0.9894 0.8433   0.9319

write.csv(result, file = paste0("Project_Extension_3_Threshold_",
  params$threshold, ".csv"))

```

The following is a list of all packages used to generate these results. (Leave at very end of file.)

```

sessionInfo()

## R version 3.5.2 (2018-12-20)
## Platform: x86_64-apple-darwin17.7.0 (64-bit)
## Running under: macOS High Sierra 10.13.6
##
## Matrix products: default
## BLAS/LAPACK: /usr/local/Cellar/openblas/0.3.5/lib/libopenblas-r0.3.5.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:

```

```

## [1] glmnet_2.0-16      foreach_1.4.4      ROCR_1.0-7
## [4] gplots_3.0.1.1     lme4_1.1-21       Matrix_1.2-15
## [7] DescTools_0.99.28  foreign_0.8-71    forcats_0.3.0
## [10] stringr_1.4.0      dplyr_0.8.0       purrr_0.3.0
## [13] readr_1.3.1        tidyr_0.8.2       tibble_2.0.1
## [16] ggplot2_3.1.0      tidyverse_1.2.1   scales_1.0.0
## [19] here_0.1
##
## loaded via a namespace (and not attached):
## [1] Rcpp_1.0.0          lubridate_1.7.4    mvtnorm_1.0-10
## [4] lattice_0.20-38     gtools_3.8.1       assertthat_0.2.0
## [7] rprojroot_1.3-2     digest_0.6.18      R6_2.4.0
## [10] cellranger_1.1.0    plyr_1.8.4         backports_1.1.3
## [13] evaluate_0.13       httr_1.4.0         pillar_1.3.1
## [16] rlang_0.3.1         lazyeval_0.2.1     readxl_1.3.0
## [19] rstudioapi_0.9.0    minqa_1.2.4        gdata_2.18.0
## [22] nloptr_1.2.1        rmarkdown_1.11     splines_3.5.2
## [25] munsell_0.5.0       broom_0.5.1        compiler_3.5.2
## [28] modelr_0.1.3        xfun_0.4           pkgconfig_2.0.2
## [31] manipulate_1.0.1    htmltools_0.3.6    tidyselect_0.2.5
## [34] expm_0.999-4        codetools_0.2-15   crayon_1.3.4
## [37] withr_2.1.2         MASS_7.3-51.1      bitops_1.0-6
## [40] grid_3.5.2          nlme_3.1-137       jsonlite_1.6
## [43] gtable_0.2.0        formatR_1.6         magrittr_1.5
## [46] KernSmooth_2.23-15  cli_1.0.1          stringi_1.3.1
## [49] xml2_1.2.0          generics_0.0.2     boot_1.3-20
## [52] iterators_1.0.10    tools_3.5.2        glue_1.3.0
## [55] hms_0.4.2           yaml_2.2.0         colorspace_1.4-0
## [58] caTools_1.17.1.2    rvest_0.3.2        knitr_1.21
## [61] haven_2.0.0

```