Classifier

```
set.seed(42)

library(caret)
```

```
## Loading required package: ggplot2
```

```
## Loading required package: lattice
```

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v lubridate 1.9.3     v tibble    3.2.1
## v purrr     1.0.2     v tidyr     1.3.1
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x purrr::lift()   masks caret::lift()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become error
```

```
library(tidymodels)
```

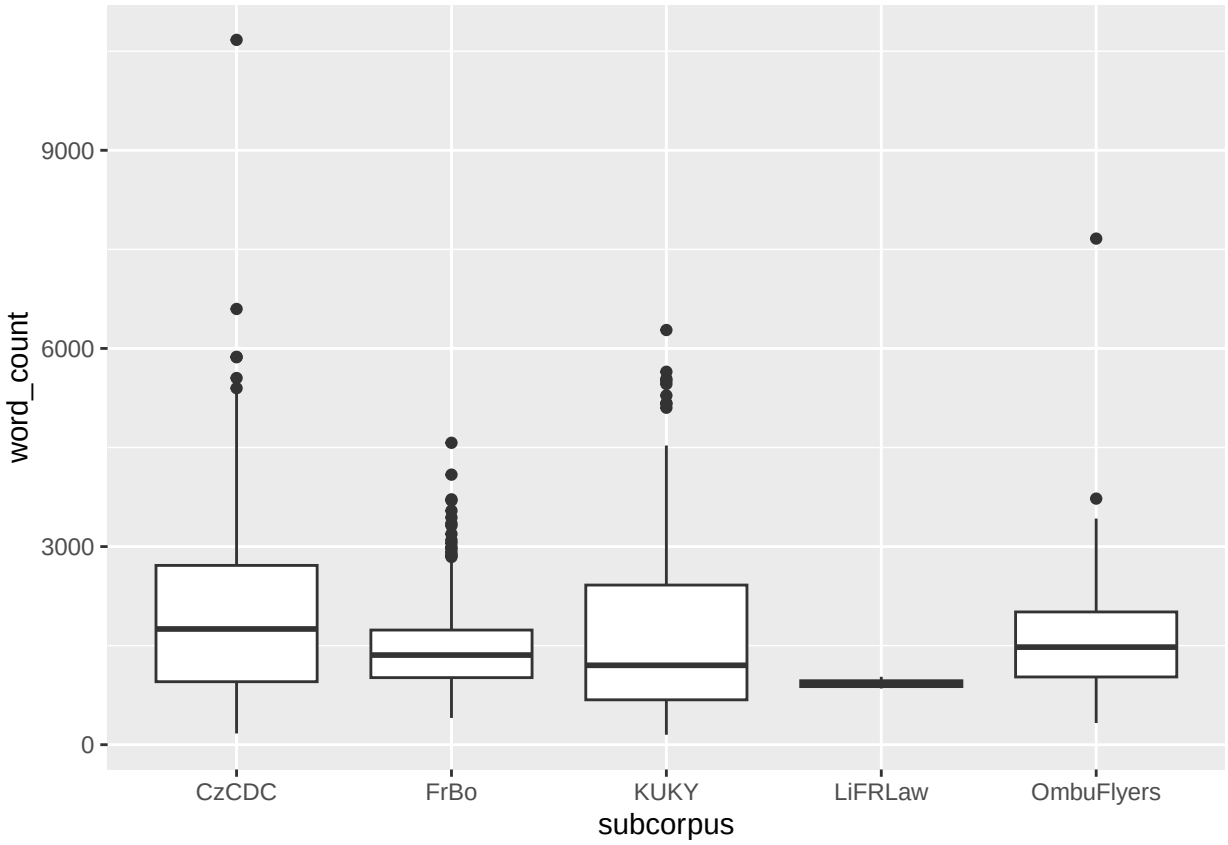
```
## -- Attaching packages --------------------------------------- tidymodels 1.2.0 --
## v broom        1.0.5     v rsample      1.2.1
## v dials        1.3.0     v tune         1.2.1
## v infer        1.0.7     v workflows    1.1.4
## v modeldata    1.4.0     v workflowsets 1.1.0
## v parsnip      1.2.1     v yardstick    1.3.2
## v recipes      1.1.0
## -- Conflicts ------------------------------------------ tidymodels_conflicts() --
## x scales::discard()        masks purrr::discard()
## x dplyr::filter()          masks stats::filter()
## x recipes::fixed()         masks stringr::fixed()
## x dplyr::lag()             masks stats::lag()
## x purrr::lift()            masks caret::lift()
## x yardstick::precision()   masks caret::precision()
## x yardstick::recall()      masks caret::recall()
## x yardstick::sensitivity() masks caret::sensitivity()
## x yardstick::spec()        masks readr::spec()
## x yardstick::specificity() masks caret::specificity()
## x recipes::step()          masks stats::step()
## * Learn how to get started at https://www.tidymodels.org/start/
```

Load and tidy data

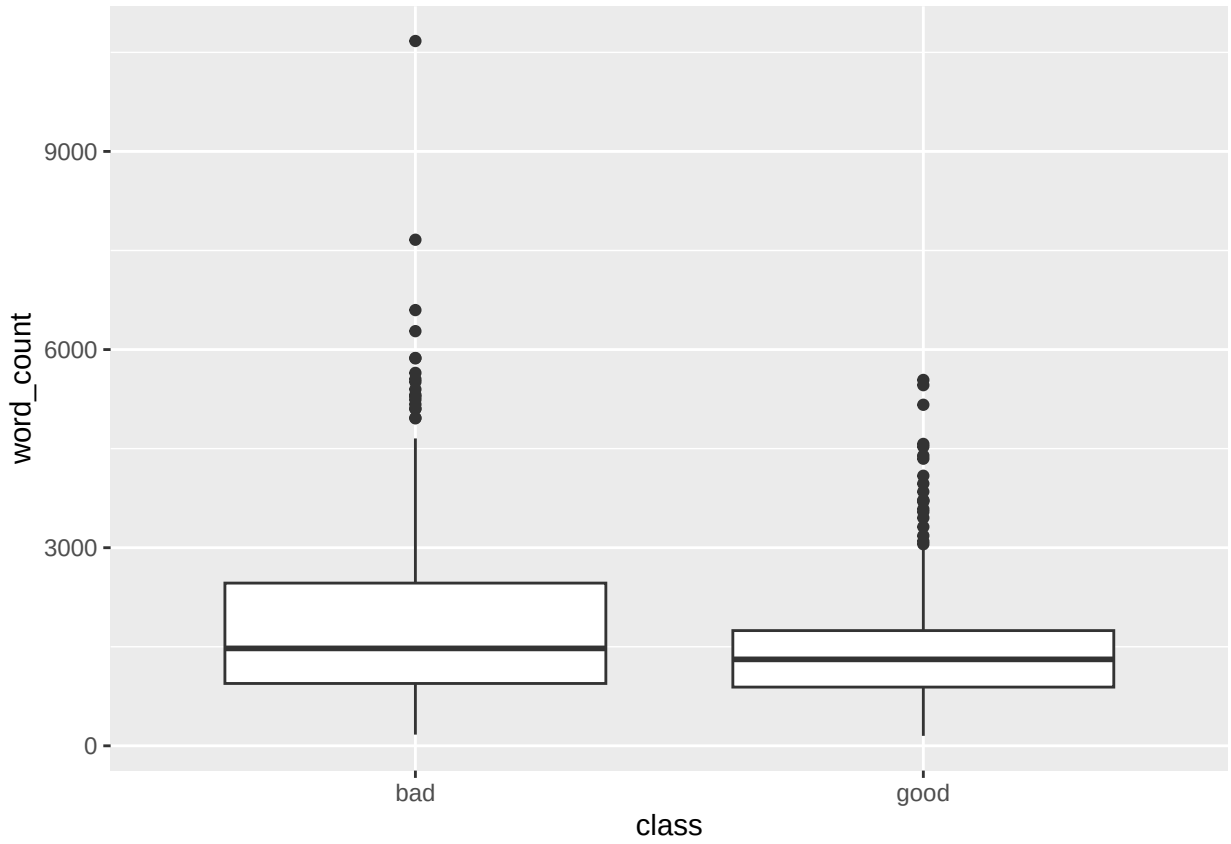
```
data <- read_csv("../measurements/measurements.csv")
```

```
## Rows: 754 Columns: 96
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (9): fpath, KUK_ID, class, FileName, FolderPath, subcorpus, DocumentTit...
## dbl (85): RuleAbstractNouns, RuleAmbiguousRegards, RuleAnaphoricReferences, ...
## lgl  (2): ClarityPursuit, SyllogismBased
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
data %>% ggplot(aes(x = subcorpus, word_count)) +
  geom_boxplot()
```




```
data %>% ggplot(aes(x = class, word_count)) +
  geom_boxplot()
```




```
data_clean <- data %>%
  select(!c(
    fpath,
    KUK_ID,
    FileName,
    FolderPath,
    # subcorpus,
    DocumentTitle,
    ClarityPursuit,
    Readability,
    SyllogismBased,
    SourceDB
  )) %>%
  # replace -1s in variation coefficients with NAs
  mutate(across(c(
    `RuleDoubleAdpos.max_allowable_distance.v`,
    `RuleTooManyNegations.max_negation_frac.v`,
    `RuleTooManyNegations.max_allowable_negations.v`,
    `RuleTooManyNominalConstructions.max_noun_frac.v`,
    `RuleTooManyNominalConstructions.max_allowable_nouns.v`,
    `RuleCaseRepetition.max_repetition_count.v`,
    `RuleCaseRepetition.max_repetition_frac.v`,
    `RulePredSubjDistance.max_distance.v`,
    `RulePredObjDistance.max_distance.v`,
    `RuleInfVerbDistance.max_distance.v`,
    `RuleMultiPartVerbs.max_distance.v`,
    `RuleLongSentences.max_length.v`,
```

```
  `RulePredAtClauseBeginning.max_order.v`,
  `mattr.v`,
  `maentropy.v`
), ~ na_if(.x, -1))) %>%
# replace NAs with 0s
replace_na(list(
  RuleGPcoordovs = 0,
  RuleGPdeverbaddr = 0,
  RuleGPpatinstr = 0,
  RuleGPdeverbsubj = 0,
  RuleGPadjective = 0,
  RuleGPpatbenperson = 0,
  RuleGPwordorder = 0,
  RuleDoubleAdpos = 0,
  RuleDoubleAdpos.max_allowable_distance = 0,
  RuleDoubleAdpos.max_allowable_distance.v = 0,
  RuleAmbiguousRegards = 0,
  RuleReflexivePassWithAnimSubj = 0,
  RuleTooManyNegations = 0,
  RuleTooManyNegations.max_negation_frac = 0,
  RuleTooManyNegations.max_negation_frac.v = 0,
  RuleTooManyNegations.max_allowable_negations = 0,
  RuleTooManyNegations.max_allowable_negations.v = 0,
  RuleTooManyNominalConstructions.max_noun_frac.v = 0,
  RuleTooManyNominalConstructions.max_allowable_nouns.v = 0,
  RuleFunctionWordRepetition = 0,
  RuleCaseRepetition.max_repetition_count.v = 0,
  RuleCaseRepetition.max_repetition_frac.v = 0,
  RuleWeakMeaningWords = 0,
  RuleAbstractNouns = 0,
  RuleRelativisticExpressions = 0,
  RuleConfirmationExpressions = 0,
  RuleRedundantExpressions = 0,
  RuleTooLongExpressions = 0,
  RuleAnaphoricReferences = 0,
  RuleLiteraryStyle = 0,
  RulePassive = 0,
  RulePredSubjDistance = 0,
  RulePredSubjDistance.max_distance = 0,
  RulePredSubjDistance.max_distance.v = 0,
  RulePredObjDistance = 0,
  RulePredObjDistance.max_distance = 0,
  RulePredObjDistance.max_distance.v = 0,
  RuleInfVerbDistance = 0,
  RuleInfVerbDistance.max_distance = 0,
  RuleInfVerbDistance.max_distance.v = 0,
  RuleMultiPartVerbs = 0,
  RuleMultiPartVerbs.max_distance = 0,
  RuleMultiPartVerbs.max_distance.v = 0,
  RuleLongSentences.max_length.v = 0,
  RulePredAtClauseBeginning.max_order.v = 0,
  RuleVerbalNouns = 0,
  RuleDoubleComparison = 0,
```

```
  RuleWrongValencyCase = 0,
  RuleWrongVerbonominalCase = 0,
  RuleIncompleteConjunction = 0
)) %>%
# norm data expected to correlate with text length
mutate(across(c(
  RuleGPcoordovs,
  RuleGPdeverbaddr,
  RuleGPpatinstr,
  RuleGPdeverbsubj,
  RuleGPadjective,
  RuleGPpatbenperson,
  RuleGPwordorder,
  RuleDoubleAdpos,
  RuleAmbiguousRegards,
  RuleFunctionWordRepetition,
  RuleWeakMeaningWords,
  RuleAbstractNouns,
  RuleRelativisticExpressions,
  RuleConfirmationExpressions,
  RuleRedundantExpressions,
  RuleTooLongExpressions,
  RuleAnaphoricReferences,
  RuleLiteraryStyle,
  RulePassive,
  RuleVerbalNouns,
  RuleDoubleComparison,
  RuleWrongValencyCase,
  RuleWrongVerbonominalCase,
  RuleIncompleteConjunction,
  num_hapax,
  RuleReflexivePassWithAnimSubj,
  RuleTooManyNominalConstructions,
  RulePredSubjDistance,
  RuleMultiPartVerbs,
  RulePredAtClauseBeginning
), ~ .x / word_count)) %>%
mutate(across(c(
  RuleTooFewVerbs,
  RuleTooManyNegations,
  RuleCaseRepetition,
  RuleLongSentences,
  RulePredObjDistance,
  RuleInfVerbDistance
), ~ .x / sent_count)) %>%
# remove variables identified as "u counts"
select(!c(
  RuleTooFewVerbs,
  RuleTooManyNegations,
  RuleTooManyNominalConstructions,
  RuleCaseRepetition,
  RuleLongSentences,
  RulePredAtClauseBeginning
```

```
  )) %>%
  unite("strata", c(subcorpus, class), sep = "_", remove = FALSE) %>%
  mutate(across(c(class), ~ as.factor(.x)))

# no NAs should be present now
data_clean[!complete.cases(data_clean), ]
```

```
## # A tibble: 0 x 82
## # i 82 variables: strata <chr>, class <fct>, subcorpus <chr>,
## #   RuleAbstractNouns <dbl>, RuleAmbiguousRegards <dbl>,
## #   RuleAnaphoricReferences <dbl>,
## #   RuleCaseRepetition.max_repetition_count <dbl>,
## #   RuleCaseRepetition.max_repetition_count.v <dbl>,
## #   RuleCaseRepetition.max_repetition_frac <dbl>,
## #   RuleCaseRepetition.max_repetition_frac.v <dbl>, ...
```

```
# use tidymodels::step_corr to remove high-correlating variables
```

Prepare splits and folds

```
# CHECK CONSISTENCY WITH analysis.Rmd

.split_prop <- 4 / 5 # proportion of testing data in the dataset
.no_folds <- 10 # no. of folds in v-fold cross-validation

split <- data_clean %>% initial_split(prop = .split_prop)
training_set <- training(split)
evaluation_set <- testing(split)

folds <- vfold_cv(training_set, v = .no_folds, strata = strata)

print(split)
```

```
## <Training/Testing/Total>
## <603/151/754>
```

```
print(folds)
```

```
## #  10-fold cross-validation using stratification
## # A tibble: 10 x 2
##    splits           id
##    <list>           <chr>
##  1 <split [540/63]> Fold01
##  2 <split [540/63]> Fold02
##  3 <split [541/62]> Fold03
##  4 <split [541/62]> Fold04
##  5 <split [543/60]> Fold05
##  6 <split [544/59]> Fold06
##  7 <split [544/59]> Fold07
##  8 <split [544/59]> Fold08
##  9 <split [545/58]> Fold09
## 10 <split [545/58]> Fold10
```

```r
# structure of the training set
table(training_set$subcorpus, training_set$class)
```

```
##
##              bad good
##   CzCDC      175    0
##   FrBo        62  178
##   KUKY        68   90
##   LiFRLaw      2    0
##   OmbuFlyers  28    0
```

```r
# structure of the evaluation set
table(evaluation_set$subcorpus, evaluation_set$class)
```

```
##
##              bad good
##   CzCDC       39    0
##   FrBo        16   51
##   KUKY        14   20
##   LiFRLaw      1    0
##   OmbuFlyers  10    0
```

Classifier helpers

Models

```r
library(vip)
```

```
##
## Attaching package: 'vip'
```

```
## The following object is masked from 'package:utils':
##
##     vi
```

```r
# decision tree libraries
library(rpart)
```

```
##
## Attaching package: 'rpart'
```

```
## The following object is masked from 'package:dials':
##
##     prune
```

```r
library(rpart.plot)
```

Null model

```r
train_null <- function(recipe, folds) {
  null_workflow <- workflow() %>% add_recipe(recipe)

  null_classification <- null_model() %>%
    set_engine("parsnip") %>%
    set_mode("classification")
```

```
  null_rs <- fit_resamples(null_workflow %>% add_model(null_classification), folds)

  cat("Null resamples:\n")
  print(null_rs)

  cat("Null metrics:\n")
  collect_metrics(null_rs) %>% print()

  return(null_rs)
}
```

Decision tree

```
train_decision_tree <- function(formula, training_set) {
  model <- rpart(formula, training_set)
  model %>% rpart.plot(type = 2, extra = 2)
  return(model)
}
```

Lasso

```
train_lasso <- function(recipe, training_set, folds) {
  lasso_tune_spec <- logistic_reg(penalty = tune(), mixture = 1) %>%
    set_mode("classification") %>%
    set_engine("glmnet")

  # cat("Lasso specification for tuning:\n")
  # print(lasso_tune_spec)

  lambda_grid <- grid_regular(penalty(), levels = 30)

  lasso_tune_wf <- workflow() %>%
    add_recipe(recipe) %>%
    add_model(lasso_tune_spec)

  cat("Lasso tune workflow:\n")
  print(lasso_tune_wf)

  lasso_tune_rs <- tune_grid(
    lasso_tune_wf,
    folds,
    grid = lambda_grid,
    control = control_resamples(save_pred = TRUE)
  )

  # cat("Lasso tune resamples:\n")
  # print(lasso_tune_rs)

  cat("Lasso tuning metrics:\n")
  # collect_metrics(lasso_tune_rs) %>% print()
  autoplot(lasso_tune_rs) %>% print()

  lasso_tune_rs %>%
```

```
    show_best(metric = "roc_auc") %>%
    print()
  lasso_tune_rs %>%
    show_best(metric = "accuracy") %>%
    print()

  best_roc_auc <- lasso_tune_rs %>%
    select_by_one_std_err(metric = "roc_auc", -penalty)

  cat("Best ROC AUC:\n")
  print(best_roc_auc)

  final_lasso <- lasso_tune_wf %>% finalize_workflow(best_roc_auc)
  cat("Final workflow:\n")
  print(final_lasso)

  fitted_lasso <- fit(final_lasso, training_set)

  cat("Final coefficients:\n")
  fitted_lasso %>%
    extract_fit_parsnip() %>%
    tidy() %>%
    arrange(estimate) %>%
    print(n = 100)

  cat("Variable importance:\n")
  fitted_lasso %>%
    extract_fit_parsnip() %>%
    vi(lambda = best_roc_auc %>% pull(penalty)) %>%
    print(n = 100)

  return(final_lasso)
}
```

SVM

```
train_svm <- function(recipe, training_set, folds) {
  svm_spec <- svm_linear() %>%
    set_mode("classification") %>%
    set_engine("kernlab")

  svm_wf <- workflow() %>%
    add_recipe(recipe) %>%
    add_model(svm_spec)
  cat("SVM workflow:\n")
  print(svm_wf)

  svm_rs <- fit_resamples(
    svm_wf,
    folds,
    control = control_resamples(save_pred = TRUE)
  )
  # cat("SVM resamples:\n")
```

```
  # print(svm_rs)

  cat("SVM metrics:\n")
  collect_metrics(svm_rs) %>% print()

  svm_rs %>%
    collect_predictions() %>%
    roc_curve(truth = class, .pred_bad) %>%
    autoplot() %>%
    print()

  print("\n")

  svm_rs %>%
    collect_predictions() %>%
    group_by(id) %>%
    roc_curve(truth = class, .pred_bad) %>%
    autoplot() %>%
    print()

  print("\n")

  svm_rs %>%
    conf_mat_resampled(tidy = FALSE) %>%
    autoplot(type = "heatmap") %>%
    print()

  print("\n")

  final_svm <- svm_wf

  return(final_svm)
}

train_svm_rbf <- function(recipe, training_set, folds) {
  svm_spec <- svm_rbf() %>%
    set_mode("classification") %>%
    set_engine("kernlab")

  svm_wf <- workflow() %>%
    add_recipe(recipe) %>%
    add_model(svm_spec)
  cat("SVM workflow:\n")
  print(svm_wf)

  svm_rs <- fit_resamples(
    svm_wf,
    folds,
    control = control_resamples(save_pred = TRUE)
  )
  # cat("SVM resamples:\n")
  # print(svm_rs)
```

```
  cat("SVM metrics:\n")
  collect_metrics(svm_rs) %>% print()

  svm_rs %>%
    collect_predictions() %>%
    roc_curve(truth = class, .pred_bad) %>%
    autoplot() %>%
    print()

  print("\n")

  svm_rs %>%
    collect_predictions() %>%
    group_by(id) %>%
    roc_curve(truth = class, .pred_bad) %>%
    autoplot() %>%
    print()

  print("\n")

  svm_rs %>%
    conf_mat_resampled(tidy = FALSE) %>%
    autoplot(type = "heatmap") %>%
    print()

  print("\n")

  final_svm <- svm_wf

  return(final_svm)
}

# not sure this works
train_svm_tune <- function(recipe, training_set, folds) {
  svm_tune_spec <- svm_linear(cost = tune()) %>%
    set_mode("classification") %>%
    set_engine("kernlab")

  cat("SVM specification for tuning:\n")
  print(svm_tune_spec)

  lambda_grid <- grid_regular(cost(), levels = 10)
  cat("SVM tuning grid:\n")
  print(lambda_grid)

  svm_tune_wf <- workflow() %>%
    add_recipe(recipe) %>%
    add_model(svm_tune_spec)

  cat("SVM tune workflow:\n")
  print(svm_tune_wf)

  svm_tune_rs <- tune_grid(
```

```
    svm_tune_wf,
    folds,
    grid = lambda_grid,
    control = control_resamples(save_pred = TRUE)
  )

  cat("SVM tune resamples:\n")
  print(svm_tune_rs)

  cat("SVM tuning metrics:\n")
  collect_metrics(svm_tune_rs) %>% print()
  autoplot(svm_tune_rs) %>% print()

  svm_tune_rs %>%
    show_best(metric = "roc_auc") %>%
    print()
  svm_tune_rs %>%
    show_best(metric = "accuracy") %>%
    print()

  best_accuracy <- svm_tune_rs %>%
    select_by_one_std_err(metric = "accuracy", -cost)

  cat("Best ROC AUC:\n")
  print(best_accuracy)

  final_svm <- svm_tune_wf %>% finalize_workflow(best_accuracy)

  cat("Final workflow:\n")
  print(final_svm)

  fitted_svm <- fit(final_svm, training_set)

  return(fitted_svm)
}
```

Random forest

```
train_random_forest <- function(recipe, training_set, folds) {
  rf_spec <- rand_forest(trees = 1000) %>%
    set_mode("classification") %>%
    set_engine("ranger", importance = "impurity")

  # cat("RF specification:\n")
  # print(rf_spec)

  rf_wf <- workflow() %>%
    add_recipe(recipe) %>%
    add_model(rf_spec)

  cat("RF workflow:\n")
  print(rf_wf)
```

```
  rf_rs <- fit_resamples(
    rf_wf,
    folds,
    control = control_resamples(save_pred = TRUE)
  )
  # cat("RF resamples:\n")
  # print(rf_rs)

  cat("RF metrics:\n")
  collect_metrics(rf_rs) %>% print()


  rf_rs %>%
    collect_predictions() %>%
    roc_curve(truth = class, .pred_bad) %>%
    autoplot() %>%
    print()

  print("\n")

  rf_rs %>%
    collect_predictions() %>%
    group_by(id) %>%
    roc_curve(truth = class, .pred_bad) %>%
    autoplot() %>%
    print()

  print("\n")

  rf_rs %>%
    conf_mat_resampled(tidy = FALSE) %>%
    autoplot(type = "heatmap") %>%
    print()

  print("\n")

  final_rf <- rf_wf

  fitted_rf <- final_rf %>% fit(training_set)
  fitted_rf %>%
    extract_fit_parsnip() %>%
    vi() %>%
    print(n = 100)

  return(final_rf)
}
```

Recipes

```
add_corr_remove_step <- function(recipe, training_set) {
  recipe <- recipe %>% step_corr(all_numeric_predictors(), threshold = .9)

  prep <- recipe %>% prep(training = training_set)
```

```
  no <- prep %>%
    tidy() %>%
    filter(type == "corr") %>%
    pull(number)
  prep %>%
    tidy(number = no[[1]]) %>%
    print(n = 200)

  return(recipe)
}
```

All variables

```
# features excluded, because:
# - they're ucounts
# - they were selected to be excluded (unreliability or irrelevance)

formula_all <- class ~
  RuleGPcoordovs +
  RuleGPdeverbaddr +
  RuleGPpatinstr +
  RuleGPdeverbsubj +
  RuleGPadjective +
  RuleGPpatbenperson +
  RuleGPwordorder +
  RuleDoubleAdpos +
  RuleDoubleAdpos.max_allowable_distance +
  RuleDoubleAdpos.max_allowable_distance.v +
  # RuleAmbiguousRegards +
  RuleReflexivePassWithAnimSubj +
  # RuleTooFewVerbs +
  RuleTooFewVerbs.min_verb_frac +
  # RuleTooManyNegations +
  RuleTooManyNegations.max_negation_frac +
  RuleTooManyNegations.max_negation_frac.v +
  RuleTooManyNegations.max_allowable_negations +
  RuleTooManyNegations.max_allowable_negations.v +
  # RuleTooManyNominalConstructions +
  RuleTooManyNominalConstructions.max_noun_frac +
  RuleTooManyNominalConstructions.max_noun_frac.v +
  RuleTooManyNominalConstructions.max_allowable_nouns +
  RuleTooManyNominalConstructions.max_allowable_nouns +
  # RuleFunctionWordRepetition +
  # RuleCaseRepetition +
  RuleCaseRepetition.max_repetition_count +
  RuleCaseRepetition.max_repetition_count.v +
  RuleCaseRepetition.max_repetition_frac +
  RuleCaseRepetition.max_repetition_frac.v +
  RuleWeakMeaningWords +
  RuleAbstractNouns +
  RuleRelativisticExpressions +
  RuleConfirmationExpressions +
  RuleRedundantExpressions +
```

```
  RuleTooLongExpressions +
  RuleAnaphoricReferences +
  RuleLiteraryStyle +
  RulePassive +
  RulePredSubjDistance +
  RulePredSubjDistance.max_distance +
  RulePredSubjDistance.max_distance.v +
  RulePredObjDistance +
  RulePredObjDistance.max_distance +
  RulePredObjDistance.max_distance.v +
  RuleInfVerbDistance +
  RuleInfVerbDistance.max_distance +
  RuleInfVerbDistance.max_distance.v +
  RuleMultiPartVerbs +
  RuleMultiPartVerbs.max_distance +
  RuleMultiPartVerbs.max_distance.v +
  # RuleLongSentences +
  RuleLongSentences.max_length +
  RuleLongSentences.max_length.v +
  # RulePredAtClauseBeginning +
  RulePredAtClauseBeginning.max_order +
  RulePredAtClauseBeginning.max_order.v +
  RuleVerbalNouns +
  # RuleDoubleComparison +
  # RuleWrongValencyCase +
  # RuleWrongVerbonominalCase +
  # RuleIncompleteConjunction +
  sent_count +
  word_count +
  syllab_count +
  char_count +
  cli +
  ari +
  num_hapax +
  entropy +
  ttr +
  mattr +
  mattr.v +
  maentropy +
  maentropy.v +
  mamr +
  verb_dist +
  activity +
  hpoint +
  atl +
  fre +
  fkgl +
  gf +
  smog

recipe_all_base <- recipe(
  formula_all,
  data = training_set
```

```
)

# without the removal of correlating variables
recipe_all_nocorr <- recipe_all_base %>%
  step_normalize(all_numeric_predictors())
recipe_all_nocorr
```

```
##
## -- Recipe ----------------------------------------------------------------
##
## -- Inputs
## Number of variables by role
## outcome:    1
## predictor: 71
##
## -- Operations
## * Centering and scaling for: all_numeric_predictors()
```

```
# with the removal of correlating variables
recipe_all <- recipe_all_nocorr %>%
  add_corr_remove_step(training_set = training_set)
```

```
## # A tibble: 11 x 2
##    terms                                  id
##    <chr>                                  <chr>
##  1 RuleCaseRepetition.max_repetition_frac.v corr_jzELQ
##  2 char_count                             corr_jzELQ
##  3 ari                                    corr_jzELQ
##  4 ttr                                    corr_jzELQ
##  5 maentropy                              corr_jzELQ
##  6 hpoint                                 corr_jzELQ
##  7 atl                                    corr_jzELQ
##  8 gf                                     corr_jzELQ
##  9 smog                                   corr_jzELQ
## 10 word_count                             corr_jzELQ
## 11 RuleLongSentences.max_length           corr_jzELQ
```

```
recipe_all
```

```
##
## -- Recipe ----------------------------------------------------------------
##
## -- Inputs
## Number of variables by role
## outcome:    1
## predictor: 71
##
## -- Operations
```

```
## * Centering and scaling for: all_numeric_predictors()
## * Correlation filter on: all_numeric_predictors()
```

No text length

```
# features excluded, because:
# - they're ucounts
# - they were selected to be excluded (unreliability or irrelevance)

formula_notl <- class ~
  RuleGPcoordovs +
  RuleGPdeverbaddr +
  RuleGPpatinstr +
  RuleGPdeverbsubj +
  RuleGPadjective +
  RuleGPpatbenperson +
  RuleGPwordorder +
  RuleDoubleAdpos +
  RuleDoubleAdpos.max_allowable_distance +
  RuleDoubleAdpos.max_allowable_distance.v +
  # RuleAmbiguousRegards +
  RuleReflexivePassWithAnimSubj +
  # RuleTooFewVerbs +
  RuleTooFewVerbs.min_verb_frac +
  # RuleTooManyNegations +
  RuleTooManyNegations.max_negation_frac +
  RuleTooManyNegations.max_negation_frac.v +
  RuleTooManyNegations.max_allowable_negations +
  RuleTooManyNegations.max_allowable_negations.v +
  # RuleTooManyNominalConstructions +
  RuleTooManyNominalConstructions.max_noun_frac +
  RuleTooManyNominalConstructions.max_noun_frac.v +
  RuleTooManyNominalConstructions.max_allowable_nouns +
  RuleTooManyNominalConstructions.max_allowable_nouns +
  # RuleFunctionWordRepetition +
  # RuleCaseRepetition +
  RuleCaseRepetition.max_repetition_count +
  RuleCaseRepetition.max_repetition_count.v +
  RuleCaseRepetition.max_repetition_frac +
  RuleCaseRepetition.max_repetition_frac.v +
  RuleWeakMeaningWords +
  RuleAbstractNouns +
  RuleRelativisticExpressions +
  RuleConfirmationExpressions +
  RuleRedundantExpressions +
  RuleTooLongExpressions +
  RuleAnaphoricReferences +
  RuleLiteraryStyle +
  RulePassive +
  RulePredSubjDistance +
  RulePredSubjDistance.max_distance +
  RulePredSubjDistance.max_distance.v +
  RulePredObjDistance +
```

```
  RulePredObjDistance.max_distance +
  RulePredObjDistance.max_distance.v +
  RuleInfVerbDistance +
  RuleInfVerbDistance.max_distance +
  RuleInfVerbDistance.max_distance.v +
  RuleMultiPartVerbs +
  RuleMultiPartVerbs.max_distance +
  RuleMultiPartVerbs.max_distance.v +
  # RuleLongSentences +
  RuleLongSentences.max_length +
  RuleLongSentences.max_length.v +
  # RulePredAtClauseBeginning +
  RulePredAtClauseBeginning.max_order +
  RulePredAtClauseBeginning.max_order.v +
  RuleVerbalNouns +
  # RuleDoubleComparison +
  # RuleWrongValencyCase +
  # RuleWrongVerbonominalCase +
  # RuleIncompleteConjunction +
  # sent_count +
  # word_count +
  # syllab_count +
  # char_count +
  cli +
  ari +
  num_hapax +
  entropy +
  ttr +
  mattr +
  mattr.v +
  maentropy +
  maentropy.v +
  mamr +
  verb_dist +
  activity +
  hpoint +
  atl +
  fre +
  fkgl +
  gf +
  smog

recipe_notl_base <- recipe(
  formula_notl,
  data = training_set
)

# without the removal of correlating variables
recipe_notl_nocorr <- recipe_notl_base %>%
  step_normalize(all_numeric_predictors())
recipe_notl_nocorr
```

```
##
```

```
## -- Recipe ----------------------------------------------------------------------

##

## -- Inputs

## Number of variables by role

## outcome:    1
## predictor: 67

##

## -- Operations

## * Centering and scaling for: all_numeric_predictors()
```

Counts

```
# features excluded, because:
# - they were selected to be excluded

formula_counts <- class ~
  RuleGPcoordovs +
  RuleGPdeverbaddr +
  RuleGPpatinstr +
  RuleGPdeverbsubj +
  RuleGPadjective +
  RuleGPpatbenperson +
  RuleGPwordorder +
  RuleDoubleAdpos +
  # RuleAmbiguousRegards +
  RuleReflexivePassWithAnimSubj +
  # RuleFunctionWordRepetition +
  RuleWeakMeaningWords +
  RuleAbstractNouns +
  RuleRelativisticExpressions +
  RuleConfirmationExpressions +
  RuleRedundantExpressions +
  RuleTooLongExpressions +
  RuleAnaphoricReferences +
  RuleLiteraryStyle +
  RulePassive +
  RulePredSubjDistance +
  RulePredObjDistance +
  RuleInfVerbDistance +
  RuleMultiPartVerbs +
  RuleVerbalNouns +
  # RuleDoubleComparison +
  # RuleWrongValencyCase +
  # RuleWrongVerbonominalCase +
  # RuleIncompleteConjunction +
  # sent_count +
  # word_count +
  # syllab_count +
  # char_count +
  num_hapax
```

```
recipe_counts_base <- recipe(formula_counts, data = training_set)

recipe_counts_nocorr <- recipe_counts_base %>%
  step_normalize()
recipe_counts_nocorr
```

```
##
## -- Recipe ----------------------------------------------------------------------
##
## -- Inputs
## Number of variables by role
## outcome:    1
## predictor: 24
##
## -- Operations
## * Centering and scaling for: <none>
```

```
recipe_counts <- recipe_counts_nocorr %>%
  add_corr_remove_step(training_set = training_set)
```

```
## # A tibble: 0 x 2
## # i 2 variables: terms <dbl>, id <chr>
```

```
recipe_counts
```

```
##
## -- Recipe ----------------------------------------------------------------------
##
## -- Inputs
## Number of variables by role
## outcome:    1
## predictor: 24
##
## -- Operations
## * Centering and scaling for: <none>
## * Correlation filter on: all_numeric_predictors()
```

Indicators, averages, and coefficients

```
formula_iac <- class ~
  RuleDoubleAdpos.max_allowable_distance +
  RuleDoubleAdpos.max_allowable_distance.v +
  RuleTooFewVerbs.min_verb_frac +
  RuleTooManyNegations.max_negation_frac +
  RuleTooManyNegations.max_negation_frac.v +
  RuleTooManyNegations.max_allowable_negations +
```

```
  RuleTooManyNegations.max_allowable_negations.v +
  RuleTooManyNominalConstructions.max_noun_frac +
  RuleTooManyNominalConstructions.max_noun_frac.v +
  RuleTooManyNominalConstructions.max_allowable_nouns +
  RuleTooManyNominalConstructions.max_allowable_nouns.v +
  RuleCaseRepetition.max_repetition_count +
  RuleCaseRepetition.max_repetition_count.v +
  RuleCaseRepetition.max_repetition_frac +
  RuleCaseRepetition.max_repetition_frac.v +
  RulePredSubjDistance.max_distance +
  RulePredSubjDistance.max_distance.v +
  RulePredObjDistance.max_distance +
  RulePredObjDistance.max_distance.v +
  RuleInfVerbDistance.max_distance +
  RuleInfVerbDistance.max_distance.v +
  RuleMultiPartVerbs.max_distance +
  RuleMultiPartVerbs.max_distance.v +
  RuleLongSentences.max_length +
  RuleLongSentences.max_length.v +
  RulePredAtClauseBeginning.max_order +
  RulePredAtClauseBeginning.max_order.v +
  cli +
  ari +
  entropy +
  ttr +
  mattr +
  mattr.v +
  maentropy +
  maentropy.v +
  mamr +
  verb_dist +
  activity +
  hpoint +
  atl +
  fre +
  fkgl +
  gf +
  smog

recipe_iac_base <- recipe(formula_iac, data = training_set)

recipe_iac_nocorr <- recipe_iac_base %>%
  step_normalize()
recipe_iac_nocorr
```

```
##
## -- Recipe ----------------------------------------------------------------
##
## -- Inputs
## Number of variables by role
## outcome:    1
```

```
## predictor: 44

##

## -- Operations

## * Centering and scaling for: <none>
```

```
recipe_iac <- recipe_iac_nocorr %>%
  add_corr_remove_step(training_set = training_set)
```

```
## # A tibble: 7 x 2
##   terms                                    id
##   <chr>                                    <chr>
## 1 RuleCaseRepetition.max_repetition_frac.v corr_tc2c2
## 2 ari                                      corr_tc2c2
## 3 maentropy                                corr_tc2c2
## 4 atl                                      corr_tc2c2
## 5 gf                                       corr_tc2c2
## 6 smog                                     corr_tc2c2
## 7 RuleLongSentences.max_length             corr_tc2c2
```

```
recipe_iac
```

```
##

## -- Recipe ----------------------------------------------------------------

##

## -- Inputs

## Number of variables by role

## outcome:    1
## predictor: 44

##

## -- Operations

## * Centering and scaling for: <none>

## * Correlation filter on: all_numeric_predictors()
```

Evaluation

Decision tree

```
evaluate_decision_tree <- function(model, evaluation_set) {
  test_predictions <- predict(model, evaluation_set, type = "class")
  # cm <- table(evaluation_set$conti_de, test_predictions)

  cm <- confusionMatrix(
    data = test_predictions,
    reference = evaluation_set$class,
    positive = "good"
  )
  print(cm)
}
```

Tidymodels

```
get_vi <- function(final_fit) {
  model_class <- final_fit %>%
    extract_fit_engine() %>%
    class()
  if ("glmnet" %in% model_class) {
    return(final_fit$.workflow[[1]] %>%
      extract_fit_parsnip() %>%
      vi(lambda = final_fit %>%
        extract_fit_parsnip() %>%
        tidy() %>%
        pull(penalty)))
  } else if ("ranger" %in% model_class) {
    return(
      final_fit$.workflow[[1]] %>%
        extract_fit_parsnip() %>%
        vi()
    )
  }
}

evaluate_tidymodel <- function(final_wf, split) {
  final_fitted <- last_fit(final_wf, split)

  metrics <- collect_metrics(final_fitted)
  print(metrics)

  predictions <- collect_predictions(final_fitted)
  predictions %>%
    conf_mat(truth = class, estimate = .pred_class) %>%
    autoplot(type = "heatmap") %>%
    print()
  predictions %>%
    roc_curve(truth = class, .pred_bad) %>%
    autoplot() %>%
    print()

  cat("Variable importance:\n")
  get_vi(final_fitted) %>% print(n = 100)

  return(final_fitted)
}

lasso_get_coefficients <- function(final_lasso_wf) {
  return(
    final_lasso_wf %>%
      extract_fit_parsnip() %>%
      tidy() %>%
      arrange(estimate)
  )
}

get_mismatch_details <- function(lfit, data_orig) {
```

```
  joined <- data_orig %>%
    select(KUK_ID, FileName, Readability, ClarityPursuit, subcorpus) %>%
    rowid_to_column(".row") %>%
    right_join(lfit$.predictions[[1]] %>% select(!.config), by = ".row")

  print(
    joined %>% ggplot(aes(x = .pred_good, y = class, color = subcorpus)) +
      geom_jitter(height = 0.2, width = 0)
  )

  cat("Confusion matrices by subcorpora:\n")
  joined %>%
    select(.pred_class, class, subcorpus) %>%
    table() %>%
    print()

  cat("\n")

  deviations <- joined %>%
    filter(.pred_class != class) %>%
    mutate(deviation = .pred_good - 0.5) %>%
    mutate(abs_deviation = abs(deviation)) %>%
    arrange(-abs_deviation)

  cat("Greatest deviations:\n")
  deviations %>%
    select(abs_deviation, .pred_class, class, subcorpus, FileName) %>%
    print(n = round(nrow(joined) / 5))

  cat("Highest-deviating documents names:\n")
  deviations %>%
    filter(abs_deviation >= 0.25) %>%
    arrange(-abs_deviation) %>%
    pull(FileName) %>%
    print()
}
```

Null model

All variables

Remove correlating

```
train_null(recipe_all, folds)
```

```
## Null resamples:
## # Resampling results
## # 10-fold cross-validation using stratification
## # A tibble: 10 x 4
##    splits           id     .metrics         .notes
##    <list>           <chr>  <list>           <list>
##  1 <split [540/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
##  2 <split [540/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
```

```
##  3 <split [541/62]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [541/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [543/60]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [544/59]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [544/59]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [544/59]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [545/58]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [545/58]> Fold10 <tibble [3 x 4]> <tibble [0 x 3]>
## Null metrics:
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n  std_err .config
##   <chr>       <chr>      <dbl> <int>    <dbl> <chr>
## 1 accuracy    binary     0.556    10 0.00414  Preprocessor1_Model1
## 2 brier_class binary     0.247    10 0.000453 Preprocessor1_Model1
## 3 roc_auc     binary     0.5      10 0        Preprocessor1_Model1
```

```
## # Resampling results
## # 10-fold cross-validation using stratification
## # A tibble: 10 x 4
##    splits           id     .metrics         .notes
##    <list>           <chr>  <list>           <list>
##  1 <split [540/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
##  2 <split [540/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
##  3 <split [541/62]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [541/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [543/60]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [544/59]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [544/59]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [544/59]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [545/58]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [545/58]> Fold10 <tibble [3 x 4]> <tibble [0 x 3]>
```

Keep correlating

```
train_null(recipe_all_nocorr, folds)
```

```
## Null resamples:
## # Resampling results
## # 10-fold cross-validation using stratification
## # A tibble: 10 x 4
##    splits           id     .metrics         .notes
##    <list>           <chr>  <list>           <list>
##  1 <split [540/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
##  2 <split [540/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
##  3 <split [541/62]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [541/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [543/60]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [544/59]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [544/59]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [544/59]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [545/58]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [545/58]> Fold10 <tibble [3 x 4]> <tibble [0 x 3]>
## Null metrics:
## # A tibble: 3 x 6
```

```
##   .metric     .estimator  mean     n  std_err .config
##   <chr>       <chr>      <dbl> <int>    <dbl> <chr>
## 1 accuracy    binary     0.556    10 0.00414  Preprocessor1_Model1
## 2 brier_class binary     0.247    10 0.000453 Preprocessor1_Model1
## 3 roc_auc     binary     0.5      10 0        Preprocessor1_Model1
```

```
## # Resampling results
## # 10-fold cross-validation using stratification
## # A tibble: 10 x 4
##    splits           id     .metrics          .notes
##    <list>           <chr>  <list>            <list>
##  1 <split [540/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
##  2 <split [540/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
##  3 <split [541/62]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [541/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [543/60]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [544/59]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [544/59]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [544/59]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [545/58]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [545/58]> Fold10 <tibble [3 x 4]> <tibble [0 x 3]>
```

Regular logistic regression

```
training_set_modif <- training_set %>%
  mutate(across(class, ~ .x == "good")) %>%
  mutate(across(RuleAbstractNouns:word_count, ~ scale(.x)))
```

All variables

```
glm(
  formula_all,
  data = training_set_modif,
  family = binomial(link = "logit")
) %>% summary()
```

```
##
## Call:
## glm(formula = formula_all, family = binomial(link = "logit"),
##     data = training_set_modif)
##
## Coefficients: (1 not defined because of singularities)
##                                                 Estimate Std. Error
## (Intercept)                                    -7.450e-01  1.810e-01
## RuleGPcoordovs                                 -2.400e-01  1.251e-01
## RuleGPdeverbaddr                               -2.226e-01  1.292e-01
## RuleGPpatinstr                                 -2.733e-01  1.389e-01
## RuleGPdeverbsubj                               -2.319e-01  1.162e-01
## RuleGPadjective                                 3.380e-01  1.503e-01
## RuleGPpatbenperson                             -1.578e-01  1.345e-01
## RuleGPwordorder                                -4.532e-02  1.462e-01
## RuleDoubleAdpos                                -5.831e-02  1.664e-01
## RuleDoubleAdpos.max_allowable_distance         -9.469e-02  2.614e-01
```

```
## RuleDoubleAdpos.max_allowable_distance.v             3.276e-01  2.324e-01
## RuleReflexivePassWithAnimSubj                        3.199e-02  1.368e-01
## RuleTooFewVerbs.min_verb_frac                       -1.380e+00  5.299e-01
## RuleTooManyNegations.max_negation_frac               7.524e-03  1.974e-01
## RuleTooManyNegations.max_negation_frac.v             3.376e-02  1.578e-01
## RuleTooManyNegations.max_allowable_negations         3.160e-01  2.769e-01
## RuleTooManyNegations.max_allowable_negations.v      -1.996e-01  2.431e-01
## RuleTooManyNominalConstructions.max_noun_frac       -2.825e-01  2.312e-01
## RuleTooManyNominalConstructions.max_noun_frac.v      2.332e-01  1.565e-01
## RuleTooManyNominalConstructions.max_allowable_nouns  2.821e-01  4.935e-01
## RuleCaseRepetition.max_repetition_count             -1.497e-01  3.702e-01
## RuleCaseRepetition.max_repetition_count.v           -2.547e-01  1.920e-01
## RuleCaseRepetition.max_repetition_frac              -2.120e-01  9.337e-01
## RuleCaseRepetition.max_repetition_frac.v             1.961e-01  9.273e-01
## RuleWeakMeaningWords                                 1.815e-02  1.388e-01
## RuleAbstractNouns                                    8.582e-02  1.390e-01
## RuleRelativisticExpressions                         -4.170e-01  1.769e-01
## RuleConfirmationExpressions                          5.597e-01  1.709e-01
## RuleRedundantExpressions                            -5.724e-02  1.752e-01
## RuleTooLongExpressions                               1.196e-01  1.418e-01
## RuleAnaphoricReferences                              6.321e-01  1.473e-01
## RuleLiteraryStyle                                   -2.263e-01  1.645e-01
## RulePassive                                         -6.438e-01  2.137e-01
## RulePredSubjDistance                                 3.943e-01  2.226e-01
## RulePredSubjDistance.max_distance                   -1.012e+00  2.931e-01
## RulePredSubjDistance.max_distance.v                 -1.976e-01  2.184e-01
## RulePredObjDistance                                 -8.086e-02  2.625e-01
## RulePredObjDistance.max_distance                     7.289e-05  2.677e-01
## RulePredObjDistance.max_distance.v                   1.401e-01  2.041e-01
## RuleInfVerbDistance                                  3.368e-02  2.753e-01
## RuleInfVerbDistance.max_distance                     2.202e-01  1.496e-01
## RuleInfVerbDistance.max_distance.v                  -2.026e-01  1.937e-01
## RuleMultiPartVerbs                                   1.494e-02  2.541e-01
## RuleMultiPartVerbs.max_distance                     -1.061e-01  2.964e-01
## RuleMultiPartVerbs.max_distance.v                    1.130e-01  2.000e-01
## RuleLongSentences.max_length                         3.248e+00  1.031e+00
## RuleLongSentences.max_length.v                       6.332e-01  2.078e-01
## RulePredAtClauseBeginning.max_order                 -3.824e-03  2.924e-01
## RulePredAtClauseBeginning.max_order.v                5.747e-02  2.805e-01
## RuleVerbalNouns                                      8.998e-02  1.607e-01
## sent_count                                           2.153e+00  7.629e-01
## word_count                                          -6.383e+00  4.245e+00
## syllab_count                                        -1.769e+01  7.498e+00
## char_count                                           2.415e+01  9.812e+00
## cli                                                  1.176e+00  2.277e+00
## ari                                                 -5.458e+00  2.195e+00
## num_hapax                                            2.081e-01  1.032e+00
## entropy                                             -6.733e-01  3.723e-01
## ttr                                                 -7.841e-01  1.398e+00
## mattr                                                1.997e-01  1.095e+00
## mattr.v                                             -6.532e-01  4.290e-01
## maentropy                                           -5.555e-01  1.127e+00
## maentropy.v                                          1.223e+00  6.357e-01
## mamr                                                -1.388e-02  3.085e-01
```

```
## verb_dist                                              5.231e-01  3.120e-01
## activity                                               2.222e+00  5.840e-01
## hpoint                                                -2.681e+00  9.692e-01
## atl                                                   -1.442e+00  2.690e+00
## fre                                                   -2.928e+00  1.125e+00
## fkgl                                                         NA         NA
## gf                                                    -1.604e+00  2.569e+00
## smog                                                   7.215e-01  2.070e+00
##                                                       z value Pr(>|z|)
## (Intercept)                                            -4.115 3.88e-05 ***
## RuleGPcoordovs                                         -1.919 0.055016 .
## RuleGPdeverbaddr                                       -1.724 0.084788 .
## RuleGPpatinstr                                         -1.967 0.049147 *
## RuleGPdeverbsubj                                       -1.996 0.045932 *
## RuleGPadjective                                         2.249 0.024515 *
## RuleGPpatbenperson                                     -1.173 0.240835
## RuleGPwordorder                                        -0.310 0.756534
## RuleDoubleAdpos                                        -0.350 0.725974
## RuleDoubleAdpos.max_allowable_distance                 -0.362 0.717230
## RuleDoubleAdpos.max_allowable_distance.v                1.410 0.158655
## RuleReflexivePassWithAnimSubj                           0.234 0.815085
## RuleTooFewVerbs.min_verb_frac                          -2.604 0.009227 **
## RuleTooManyNegations.max_negation_frac                  0.038 0.969602
## RuleTooManyNegations.max_negation_frac.v                0.214 0.830607
## RuleTooManyNegations.max_allowable_negations            1.141 0.253791
## RuleTooManyNegations.max_allowable_negations.v         -0.821 0.411585
## RuleTooManyNominalConstructions.max_noun_frac          -1.222 0.221761
## RuleTooManyNominalConstructions.max_noun_frac.v         1.490 0.136113
## RuleTooManyNominalConstructions.max_allowable_nouns     0.572 0.567497
## RuleCaseRepetition.max_repetition_count                -0.404 0.685877
## RuleCaseRepetition.max_repetition_count.v              -1.326 0.184741
## RuleCaseRepetition.max_repetition_frac                 -0.227 0.820359
## RuleCaseRepetition.max_repetition_frac.v                0.211 0.832535
## RuleWeakMeaningWords                                   0.131 0.895931
## RuleAbstractNouns                                      0.617 0.536968
## RuleRelativisticExpressions                           -2.357 0.018414 *
## RuleConfirmationExpressions                            3.274 0.001059 **
## RuleRedundantExpressions                              -0.327 0.743903
## RuleTooLongExpressions                                 0.844 0.398902
## RuleAnaphoricReferences                                4.291 1.78e-05 ***
## RuleLiteraryStyle                                     -1.376 0.168900
## RulePassive                                           -3.013 0.002589 **
## RulePredSubjDistance                                   1.772 0.076462 .
## RulePredSubjDistance.max_distance                     -3.454 0.000553 ***
## RulePredSubjDistance.max_distance.v                   -0.905 0.365651
## RulePredObjDistance                                   -0.308 0.758036
## RulePredObjDistance.max_distance                       0.000 0.999783
## RulePredObjDistance.max_distance.v                     0.686 0.492450
## RuleInfVerbDistance                                    0.122 0.902644
## RuleInfVerbDistance.max_distance                       1.472 0.140955
## RuleInfVerbDistance.max_distance.v                    -1.046 0.295643
## RuleMultiPartVerbs                                     0.059 0.953099
## RuleMultiPartVerbs.max_distance                       -0.358 0.720408
## RuleMultiPartVerbs.max_distance.v                      0.565 0.572133
```

```
## RuleLongSentences.max_length                              3.149 0.001637 **
## RuleLongSentences.max_length.v                            3.047 0.002315 **
## RulePredAtClauseBeginning.max_order                      -0.013 0.989567
## RulePredAtClauseBeginning.max_order.v                     0.205 0.837633
## RuleVerbalNouns                                           0.560 0.575633
## sent_count                                                2.822 0.004775 **
## word_count                                               -1.504 0.132636
## syllab_count                                             -2.359 0.018325 *
## char_count                                                2.461 0.013854 *
## cli                                                       0.517 0.605356
## ari                                                      -2.487 0.012896 *
## num_hapax                                                 0.202 0.840113
## entropy                                                  -1.808 0.070534 .
## ttr                                                      -0.561 0.574936
## mattr                                                     0.182 0.855343
## mattr.v                                                  -1.523 0.127801
## maentropy                                                -0.493 0.622089
## maentropy.v                                               1.924 0.054382 .
## mamr                                                     -0.045 0.964128
## verb_dist                                                 1.677 0.093636 .
## activity                                                  3.804 0.000142 ***
## hpoint                                                   -2.766 0.005680 **
## atl                                                      -0.536 0.591953
## fre                                                      -2.603 0.009236 **
## fkgl                                                        NA       NA
## gf                                                       -0.624 0.532353
## smog                                                      0.349 0.727388
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 828.48  on 602  degrees of freedom
## Residual deviance: 409.00  on 532  degrees of freedom
## AIC: 551
##
## Number of Fisher Scoring iterations: 7
```

Indicators, averages, and coefficients

```
glm(
  formula_iac,
  data = training_set_modif,
  family = binomial(link = "logit")
) %>% summary()
```

```
##
## Call:
## glm(formula = formula_iac, family = binomial(link = "logit"),
##     data = training_set_modif)
##
## Coefficients: (1 not defined because of singularities)
##                                                          Estimate Std. Error
## (Intercept)                                             -0.485315   0.135304
```

```
## RuleDoubleAdpos.max_allowable_distance                 0.124592   0.197691
## RuleDoubleAdpos.max_allowable_distance.v              -0.124484   0.172429
## RuleTooFewVerbs.min_verb_frac                         -1.074415   0.427968
## RuleTooManyNegations.max_negation_frac                 0.011705   0.171404
## RuleTooManyNegations.max_negation_frac.v               0.117015   0.129299
## RuleTooManyNegations.max_allowable_negations           0.230022   0.240110
## RuleTooManyNegations.max_allowable_negations.v        -0.328178   0.207044
## RuleTooManyNominalConstructions.max_noun_frac         -0.385240   0.187521
## RuleTooManyNominalConstructions.max_noun_frac.v        0.151785   0.131303
## RuleTooManyNominalConstructions.max_allowable_nouns    0.474443   0.404167
## RuleTooManyNominalConstructions.max_allowable_nouns.v -0.211813   0.186629
## RuleCaseRepetition.max_repetition_count                0.046290   0.290951
## RuleCaseRepetition.max_repetition_count.v             -0.376412   0.163926
## RuleCaseRepetition.max_repetition_frac                 0.068135   0.793295
## RuleCaseRepetition.max_repetition_frac.v               0.385322   0.781831
## RulePredSubjDistance.max_distance                     -0.597528   0.275426
## RulePredSubjDistance.max_distance.v                   -0.089574   0.180387
## RulePredObjDistance.max_distance                      -0.171092   0.275808
## RulePredObjDistance.max_distance.v                     0.074113   0.170041
## RuleInfVerbDistance.max_distance                       0.142428   0.116819
## RuleInfVerbDistance.max_distance.v                    -0.350950   0.150909
## RuleMultiPartVerbs.max_distance                       -0.002272   0.240486
## RuleMultiPartVerbs.max_distance.v                      0.144803   0.177500
## RuleLongSentences.max_length                           2.612078   0.881488
## RuleLongSentences.max_length.v                         0.518320   0.174887
## RulePredAtClauseBeginning.max_order                    0.014461   0.309973
## RulePredAtClauseBeginning.max_order.v                 -0.083262   0.226972
## cli                                                   -0.153504   1.729663
## ari                                                   -3.641986   1.421287
## entropy                                               -0.133483   0.299296
## ttr                                                   -0.305837   0.341453
## mattr                                                  0.101935   0.840677
## mattr.v                                               -0.503228   0.373581
## maentropy                                             -0.450348   0.846024
## maentropy.v                                            0.857332   0.574551
## mamr                                                  -0.134925   0.238009
## verb_dist                                              0.408672   0.270109
## activity                                               1.996512   0.391700
## hpoint                                                -0.249828   0.366353
## atl                                                    1.175201   1.893936
## fre                                                   -1.506646   0.574457
## fkgl                                                         NA         NA
## gf                                                    -1.050525   2.139429
## smog                                                   0.146754   1.710213
##                                                      z value Pr(>|z|)
## (Intercept)                                           -3.587 0.000335 ***
## RuleDoubleAdpos.max_allowable_distance                 0.630 0.528541
## RuleDoubleAdpos.max_allowable_distance.v              -0.722 0.470330
## RuleTooFewVerbs.min_verb_frac                         -2.511 0.012056 *
## RuleTooManyNegations.max_negation_frac                 0.068 0.945557
## RuleTooManyNegations.max_negation_frac.v               0.905 0.365468
## RuleTooManyNegations.max_allowable_negations           0.958 0.338070
## RuleTooManyNegations.max_allowable_negations.v        -1.585 0.112952
## RuleTooManyNominalConstructions.max_noun_frac         -2.054 0.039939 *
```

```
## RuleTooManyNominalConstructions.max_noun_frac.v         1.156 0.247688
## RuleTooManyNominalConstructions.max_allowable_nouns     1.174 0.240444
## RuleTooManyNominalConstructions.max_allowable_nouns.v  -1.135 0.256402
## RuleCaseRepetition.max_repetition_count                 0.159 0.873591
## RuleCaseRepetition.max_repetition_count.v              -2.296 0.021663 *
## RuleCaseRepetition.max_repetition_frac                  0.086 0.931555
## RuleCaseRepetition.max_repetition_frac.v                0.493 0.622122
## RulePredSubjDistance.max_distance                     -2.169 0.030047 *
## RulePredSubjDistance.max_distance.v                   -0.497 0.619496
## RulePredObjDistance.max_distance                      -0.620 0.535040
## RulePredObjDistance.max_distance.v                     0.436 0.662941
## RuleInfVerbDistance.max_distance                       1.219 0.222762
## RuleInfVerbDistance.max_distance.v                    -2.326 0.020041 *
## RuleMultiPartVerbs.max_distance                       -0.009 0.992462
## RuleMultiPartVerbs.max_distance.v                      0.816 0.414621
## RuleLongSentences.max_length                           2.963 0.003044 **
## RuleLongSentences.max_length.v                         2.964 0.003039 **
## RulePredAtClauseBeginning.max_order                    0.047 0.962789
## RulePredAtClauseBeginning.max_order.v                 -0.367 0.713739
## cli                                                   -0.089 0.929282
## ari                                                   -2.562 0.010393 *
## entropy                                               -0.446 0.655605
## ttr                                                   -0.896 0.370416
## mattr                                                  0.121 0.903491
## mattr.v                                               -1.347 0.177967
## maentropy                                             -0.532 0.594511
## maentropy.v                                            1.492 0.135652
## mamr                                                  -0.567 0.570788
## verb_dist                                              1.513 0.130283
## activity                                               5.097 3.45e-07 ***
## hpoint                                                -0.682 0.495281
## atl                                                    0.621 0.534924
## fre                                                   -2.623 0.008723 **
## fkgl                                                      NA       NA
## gf                                                    -0.491 0.623405
## smog                                                   0.086 0.931617
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 828.48  on 602  degrees of freedom
## Residual deviance: 502.98  on 559  degrees of freedom
## AIC: 590.98
##
## Number of Fisher Scoring iterations: 6
```

Counts

```
glm(
  formula_counts,
  data = training_set_modif,
  family = binomial(link = "logit")
```

```
) %>% summary()
```

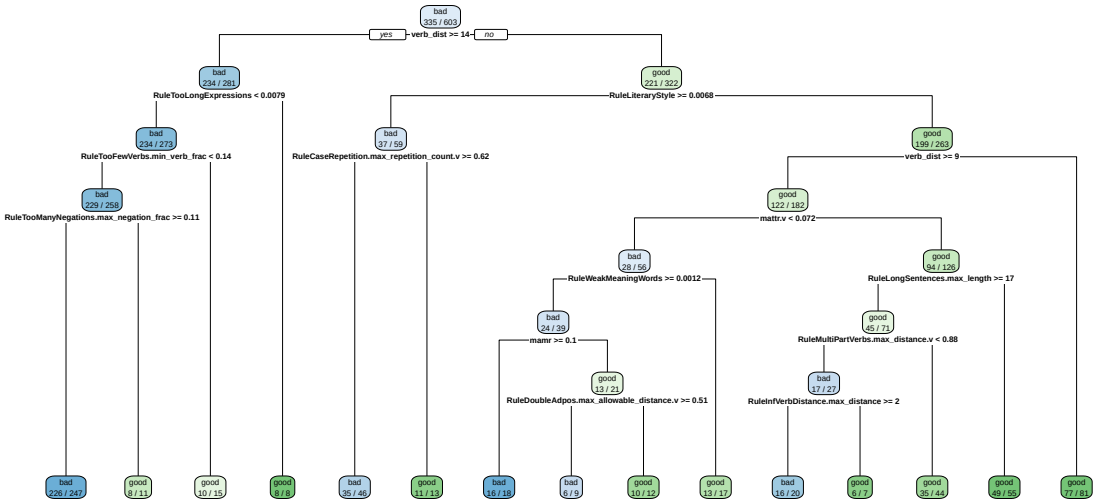
```
##
## Call:
## glm(formula = formula_counts, family = binomial(link = "logit"),
##     data = training_set_modif)
##
## Coefficients:
##                                Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   -0.409019   0.110283  -3.709 0.000208 ***
## RuleGPcoordovs                -0.185174   0.104529  -1.772 0.076477 .
## RuleGPdeverbaddr              -0.152961   0.112171  -1.364 0.172682
## RuleGPpatinstr                -0.003148   0.102088  -0.031 0.975399
## RuleGPdeverbsubj              -0.299533   0.132567  -2.259 0.023854 *
## RuleGPadjective                0.235592   0.129553   1.819 0.068987 .
## RuleGPpatbenperson            -0.076535   0.100870  -0.759 0.448002
## RuleGPwordorder               -0.073571   0.118355  -0.622 0.534194
## RuleDoubleAdpos               -0.113453   0.108640  -1.044 0.296345
## RuleReflexivePassWithAnimSubj  0.107873   0.108506   0.994 0.320141
## RuleWeakMeaningWords           0.029967   0.107677   0.278 0.780781
## RuleAbstractNouns              0.083220   0.109713   0.759 0.448140
## RuleRelativisticExpressions   -0.464180   0.156740  -2.961 0.003062 **
## RuleConfirmationExpressions    0.191687   0.117427   1.632 0.102597
## RuleRedundantExpressions      -0.232668   0.166078  -1.401 0.161228
## RuleTooLongExpressions         0.123506   0.105835   1.167 0.243223
## RuleAnaphoricReferences        0.464418   0.118392   3.923 8.76e-05 ***
## RuleLiteraryStyle             -0.481297   0.128396  -3.749 0.000178 ***
## RulePassive                   -0.994309   0.145213  -6.847 7.53e-12 ***
## RulePredSubjDistance           0.436763   0.136887   3.191 0.001419 **
## RulePredObjDistance           -0.168758   0.139622  -1.209 0.226787
## RuleInfVerbDistance            0.358416   0.143624   2.496 0.012577 *
## RuleMultiPartVerbs             0.411360   0.145989   2.818 0.004836 **
## RuleVerbalNouns                0.312812   0.115151   2.717 0.006597 **
## num_hapax                      0.127466   0.113074   1.127 0.259625
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 828.48  on 602  degrees of freedom
## Residual deviance: 555.75  on 578  degrees of freedom
## AIC: 605.75
##
## Number of Fisher Scoring iterations: 5
```

Decision tree

```
library(rpart) # decision trees for classification and regression
library(rpart.plot) # visualization of decision trees created with rpart
```

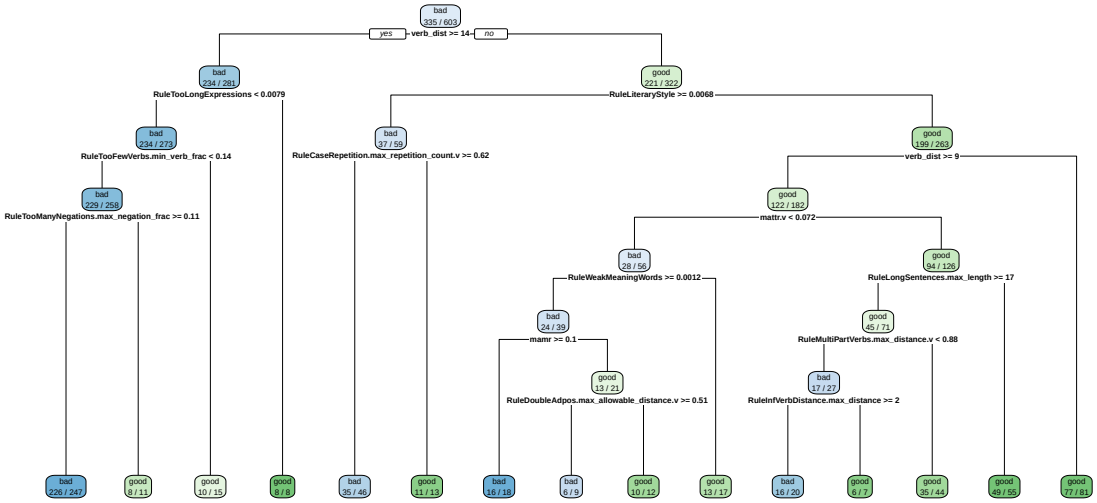
All variables

```
model_dt_all <- train_decision_tree(formula_all, training_set)
```



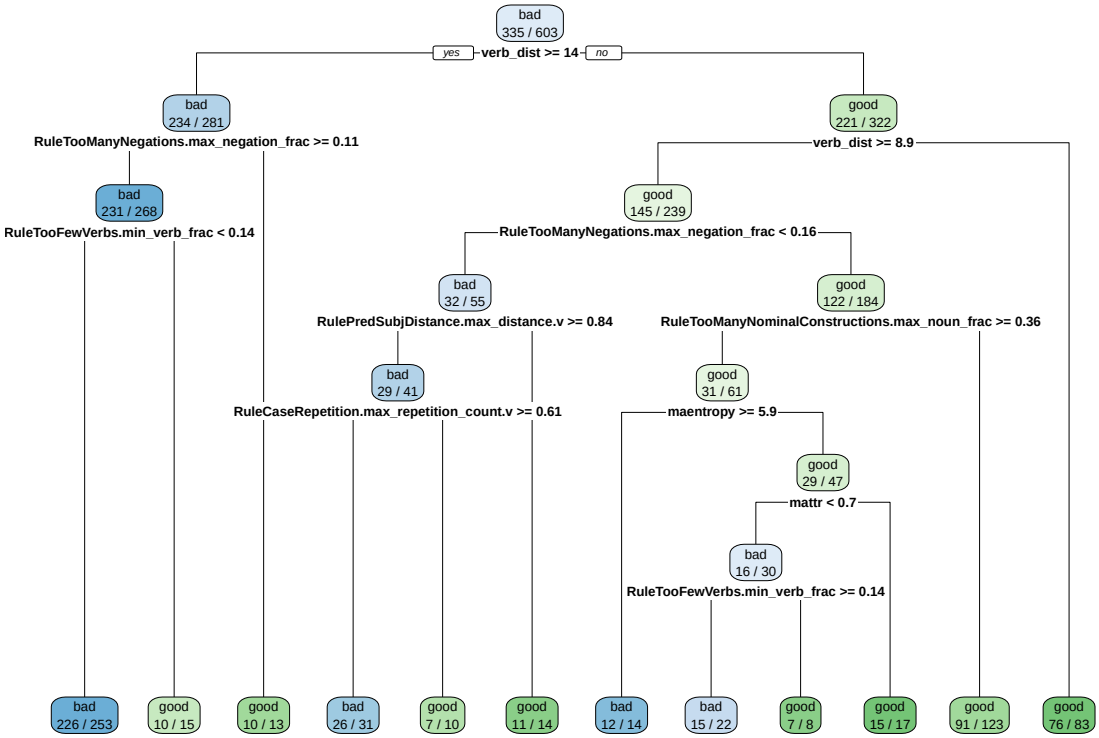
No TL

```
model_dt_notl <- train_decision_tree(formula_notl, training_set)
```



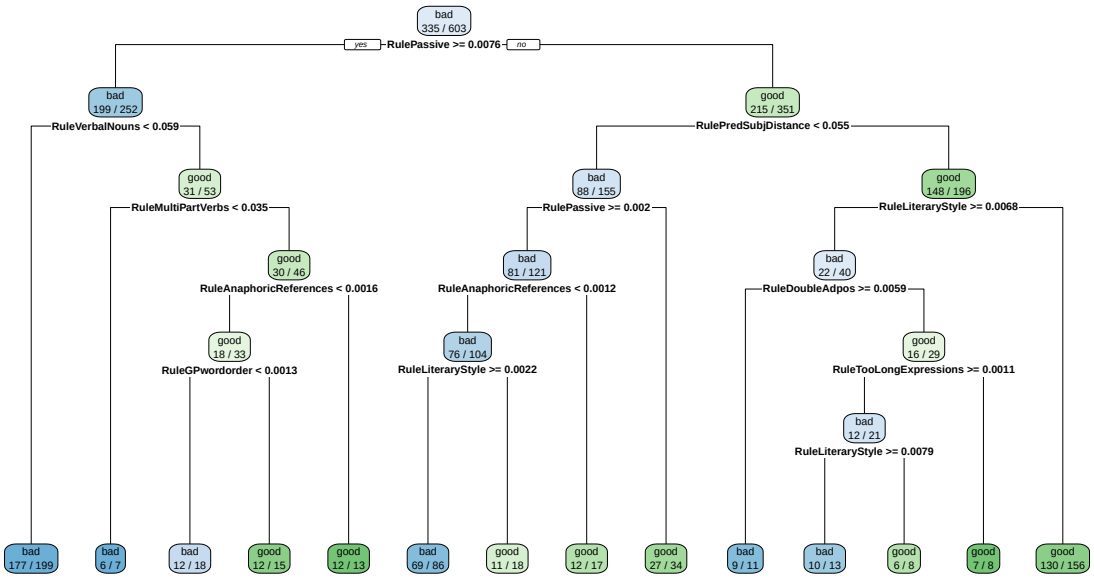
IAC

```
model_dt_iac <- train_decision_tree(formula_iac, training_set)
```



Counts

```
model_dt_counts <- train_decision_tree(formula_counts, training_set)
```



Lasso

All variables

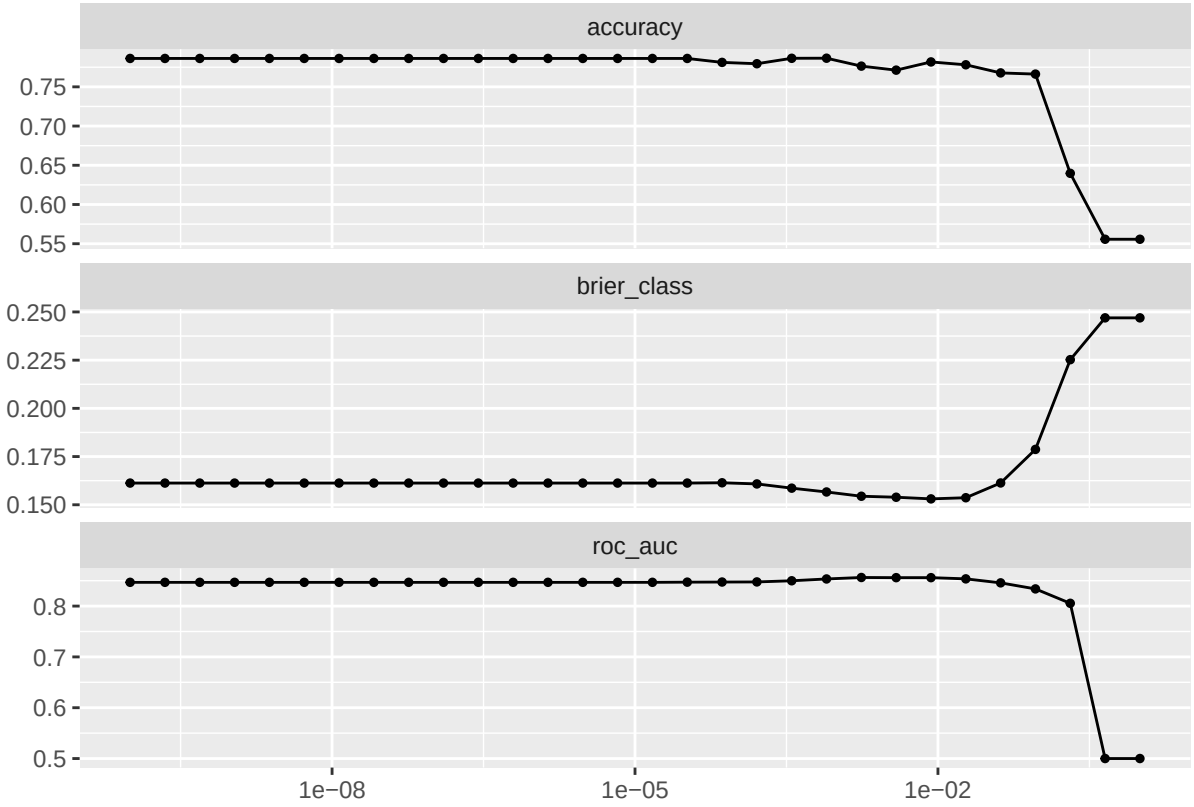
Remove correlating

```
# train_lasso(recipe_all, training_set, folds)
```

Keep correlating

```
model_lasso_all <- train_lasso(recipe_all_nocorr, training_set, folds)
```

```
## Lasso tune workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = tune()
##   mixture = 1
##
## Computational engine: glmnet
##
## Lasso tuning metrics:
```




```
## # A tibble: 5 x 7
##    penalty .metric .estimator  mean     n std_err .config
##      <dbl> <chr>   <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.00174  roc_auc binary     0.856    10 0.0120  Preprocessor1_Model22
## 2 0.00386  roc_auc binary     0.856    10 0.0111  Preprocessor1_Model23
## 3 0.00853  roc_auc binary     0.856    10 0.00828 Preprocessor1_Model24
## 4 0.0189   roc_auc binary     0.854    10 0.00798 Preprocessor1_Model25
## 5 0.000788 roc_auc binary     0.853    10 0.0129  Preprocessor1_Model21
## # A tibble: 5 x 7
##    penalty .metric  .estimator  mean     n std_err .config
##      <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 7.88e- 4 accuracy binary     0.786    10  0.0168 Preprocessor1_Model21
## 2 3.56e- 4 accuracy binary     0.786    10  0.0183 Preprocessor1_Model20
## 3 1   e-10 accuracy binary     0.786    10  0.0162 Preprocessor1_Model01
## 4 2.21e-10 accuracy binary     0.786    10  0.0162 Preprocessor1_Model02
## 5 4.89e-10 accuracy binary     0.786    10  0.0162 Preprocessor1_Model03
## Best ROC AUC:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1  0.0418 Preprocessor1_Model26
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
```

```
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ---------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.0417531893656041
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 72 x 3
##    term                                              estimate penalty
##    <chr>                                                <dbl>   <dbl>
##  1 (Intercept)                                         -0.294   0.0418
##  2 RuleLiteraryStyle                                   -0.267   0.0418
##  3 smog                                                -0.182   0.0418
##  4 RulePassive                                         -0.173   0.0418
##  5 maentropy                                           -0.162   0.0418
##  6 entropy                                             -0.0937  0.0418
##  7 RuleGPcoordovs                                       0       0.0418
##  8 RuleGPdeverbaddr                                     0       0.0418
##  9 RuleGPpatinstr                                       0       0.0418
## 10 RuleGPdeverbsubj                                     0       0.0418
## 11 RuleGPadjective                                      0       0.0418
## 12 RuleGPpatbenperson                                   0       0.0418
## 13 RuleGPwordorder                                      0       0.0418
## 14 RuleDoubleAdpos                                      0       0.0418
## 15 RuleDoubleAdpos.max_allowable_distance               0       0.0418
## 16 RuleDoubleAdpos.max_allowable_distance.v             0       0.0418
## 17 RuleReflexivePassWithAnimSubj                        0       0.0418
## 18 RuleTooFewVerbs.min_verb_frac                        0       0.0418
## 19 RuleTooManyNegations.max_negation_frac               0       0.0418
## 20 RuleTooManyNegations.max_negation_frac.v             0       0.0418
## 21 RuleTooManyNegations.max_allowable_negations         0       0.0418
## 22 RuleTooManyNegations.max_allowable_negations.v       0       0.0418
## 23 RuleTooManyNominalConstructions.max_noun_frac        0       0.0418
## 24 RuleTooManyNominalConstructions.max_noun_frac.v      0       0.0418
## 25 RuleTooManyNominalConstructions.max_allowable_nouns  0       0.0418
## 26 RuleCaseRepetition.max_repetition_count              0       0.0418
## 27 RuleCaseRepetition.max_repetition_count.v            0       0.0418
## 28 RuleCaseRepetition.max_repetition_frac               0       0.0418
## 29 RuleCaseRepetition.max_repetition_frac.v             0       0.0418
## 30 RuleWeakMeaningWords                                 0       0.0418
## 31 RuleAbstractNouns                                    0       0.0418
## 32 RuleRelativisticExpressions                          0       0.0418
## 33 RuleConfirmationExpressions                          0       0.0418
## 34 RuleRedundantExpressions                             0       0.0418
## 35 RuleTooLongExpressions                               0       0.0418
## 36 RulePredSubjDistance                                 0       0.0418
## 37 RulePredSubjDistance.max_distance                    0       0.0418
```

```
## 38 RulePredSubjDistance.max_distance.v                  0       0.0418
## 39 RulePredObjDistance                                  0       0.0418
## 40 RulePredObjDistance.max_distance                     0       0.0418
## 41 RulePredObjDistance.max_distance.v                   0       0.0418
## 42 RuleInfVerbDistance                                  0       0.0418
## 43 RuleInfVerbDistance.max_distance                     0       0.0418
## 44 RuleInfVerbDistance.max_distance.v                   0       0.0418
## 45 RuleMultiPartVerbs                                   0       0.0418
## 46 RuleMultiPartVerbs.max_distance                      0       0.0418
## 47 RuleMultiPartVerbs.max_distance.v                    0       0.0418
## 48 RuleLongSentences.max_length                         0       0.0418
## 49 RuleLongSentences.max_length.v                       0       0.0418
## 50 RulePredAtClauseBeginning.max_order                  0       0.0418
## 51 RulePredAtClauseBeginning.max_order.v                0       0.0418
## 52 RuleVerbalNouns                                      0       0.0418
## 53 sent_count                                           0       0.0418
## 54 word_count                                           0       0.0418
## 55 syllab_count                                         0       0.0418
## 56 char_count                                           0       0.0418
## 57 cli                                                  0       0.0418
## 58 ari                                                  0       0.0418
## 59 num_hapax                                            0       0.0418
## 60 ttr                                                  0       0.0418
## 61 mattr                                                0       0.0418
## 62 mattr.v                                              0       0.0418
## 63 maentropy.v                                          0       0.0418
## 64 mamr                                                 0       0.0418
## 65 verb_dist                                            0       0.0418
## 66 hpoint                                               0       0.0418
## 67 fre                                                  0       0.0418
## 68 fkgl                                                 0       0.0418
## 69 gf                                                   0       0.0418
## 70 RuleAnaphoricReferences                            0.0539    0.0418
## 71 atl                                                0.381     0.0418
## 72 activity                                           0.541     0.0418
## Variable importance:
## # A tibble: 71 x 3
##    Variable                                          Importance Sign
##    <chr>                                                  <dbl> <chr>
##  1 activity                                              0.541  POS
##  2 atl                                                   0.381  POS
##  3 RuleLiteraryStyle                                     0.267  NEG
##  4 smog                                                  0.182  NEG
##  5 RulePassive                                           0.173  NEG
##  6 maentropy                                             0.162  NEG
##  7 entropy                                               0.0937 NEG
##  8 RuleAnaphoricReferences                               0.0539 POS
##  9 RuleGPcoordovs                                        0      NEG
## 10 RuleGPdeverbaddr                                      0      NEG
## 11 RuleGPpatinstr                                        0      NEG
## 12 RuleGPdeverbsubj                                      0      NEG
## 13 RuleGPadjective                                       0      NEG
## 14 RuleGPpatbenperson                                    0      NEG
## 15 RuleGPwordorder                                       0      NEG
```

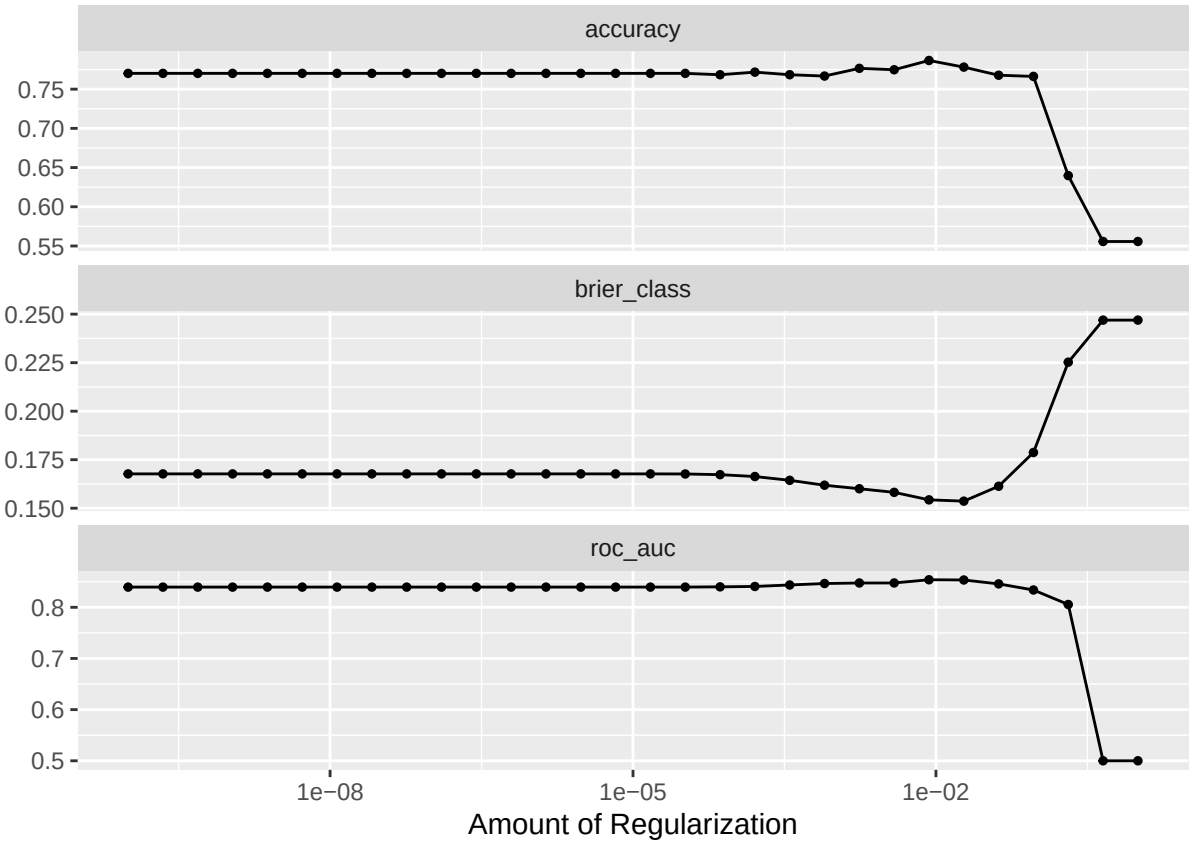
```
## 16 RuleDoubleAdpos                                          0      NEG
## 17 RuleDoubleAdpos.max_allowable_distance                   0      NEG
## 18 RuleDoubleAdpos.max_allowable_distance.v                 0      NEG
## 19 RuleReflexivePassWithAnimSubj                            0      NEG
## 20 RuleTooFewVerbs.min_verb_frac                            0      NEG
## 21 RuleTooManyNegations.max_negation_frac                   0      NEG
## 22 RuleTooManyNegations.max_negation_frac.v                 0      NEG
## 23 RuleTooManyNegations.max_allowable_negations             0      NEG
## 24 RuleTooManyNegations.max_allowable_negations.v           0      NEG
## 25 RuleTooManyNominalConstructions.max_noun_frac            0      NEG
## 26 RuleTooManyNominalConstructions.max_noun_frac.v          0      NEG
## 27 RuleTooManyNominalConstructions.max_allowable_nouns      0      NEG
## 28 RuleCaseRepetition.max_repetition_count                  0      NEG
## 29 RuleCaseRepetition.max_repetition_count.v                0      NEG
## 30 RuleCaseRepetition.max_repetition_frac                   0      NEG
## 31 RuleCaseRepetition.max_repetition_frac.v                 0      NEG
## 32 RuleWeakMeaningWords                                     0      NEG
## 33 RuleAbstractNouns                                        0      NEG
## 34 RuleRelativisticExpressions                              0      NEG
## 35 RuleConfirmationExpressions                              0      NEG
## 36 RuleRedundantExpressions                                 0      NEG
## 37 RuleTooLongExpressions                                   0      NEG
## 38 RulePredSubjDistance                                     0      NEG
## 39 RulePredSubjDistance.max_distance                        0      NEG
## 40 RulePredSubjDistance.max_distance.v                      0      NEG
## 41 RulePredObjDistance                                      0      NEG
## 42 RulePredObjDistance.max_distance                         0      NEG
## 43 RulePredObjDistance.max_distance.v                       0      NEG
## 44 RuleInfVerbDistance                                      0      NEG
## 45 RuleInfVerbDistance.max_distance                         0      NEG
## 46 RuleInfVerbDistance.max_distance.v                       0      NEG
## 47 RuleMultiPartVerbs                                       0      NEG
## 48 RuleMultiPartVerbs.max_distance                          0      NEG
## 49 RuleMultiPartVerbs.max_distance.v                        0      NEG
## 50 RuleLongSentences.max_length                             0      NEG
## 51 RuleLongSentences.max_length.v                           0      NEG
## 52 RulePredAtClauseBeginning.max_order                      0      NEG
## 53 RulePredAtClauseBeginning.max_order.v                    0      NEG
## 54 RuleVerbalNouns                                          0      NEG
## 55 sent_count                                               0      NEG
## 56 word_count                                               0      NEG
## 57 syllab_count                                             0      NEG
## 58 char_count                                               0      NEG
## 59 cli                                                      0      NEG
## 60 ari                                                      0      NEG
## 61 num_hapax                                                0      NEG
## 62 ttr                                                      0      NEG
## 63 mattr                                                    0      NEG
## 64 mattr.v                                                  0      NEG
## 65 maentropy.v                                              0      NEG
## 66 mamr                                                     0      NEG
## 67 verb_dist                                                0      NEG
## 68 hpoint                                                   0      NEG
## 69 fre                                                      0      NEG
```

```
## 70 fkgl                                                    0      NEG
## 71 gf                                                      0      NEG
```

No TL

```
model_lasso_notl <- train_lasso(recipe_notl_nocorr, training_set, folds)
```

```
## Lasso tune workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = tune()
##   mixture = 1
##
## Computational engine: glmnet
##
## Lasso tuning metrics:
```



```
## # A tibble: 5 x 7
##    penalty .metric .estimator  mean     n std_err .config
##      <dbl> <chr>   <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.00853  roc_auc binary     0.854    10 0.00856 Preprocessor1_Model24
## 2 0.0189   roc_auc binary     0.853    10 0.00804 Preprocessor1_Model25
## 3 0.00386  roc_auc binary     0.848    10 0.0110  Preprocessor1_Model23
## 4 0.00174  roc_auc binary     0.848    10 0.0125  Preprocessor1_Model22
## 5 0.000788 roc_auc binary     0.846    10 0.0139  Preprocessor1_Model21
## # A tibble: 5 x 7
##    penalty .metric  .estimator  mean     n std_err .config
##      <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.00853  accuracy binary     0.787    10  0.0163 Preprocessor1_Model24
## 2 0.0189   accuracy binary     0.778    10  0.0145 Preprocessor1_Model25
## 3 0.00174  accuracy binary     0.777    10  0.0153 Preprocessor1_Model22
## 4 0.00386  accuracy binary     0.775    10  0.0171 Preprocessor1_Model23
## 5 0.000161 accuracy binary     0.772    10  0.0182 Preprocessor1_Model19
## Best ROC AUC:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1  0.0418 Preprocessor1_Model26
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.0417531893656041
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 68 x 3
##    term                                              estimate penalty
##    <chr>                                                <dbl>   <dbl>
##  1 (Intercept)                                         -0.294   0.0418
##  2 RuleLiteraryStyle                                   -0.267   0.0418
##  3 smog                                                -0.182   0.0418
##  4 RulePassive                                         -0.173   0.0418
##  5 maentropy                                           -0.162   0.0418
##  6 entropy                                             -0.0937  0.0418
##  7 RuleGPcoordovs                                       0       0.0418
##  8 RuleGPdeverbaddr                                     0       0.0418
##  9 RuleGPpatinstr                                       0       0.0418
## 10 RuleGPdeverbsubj                                     0       0.0418
```

```
## 11 RuleGPadjective                                        0       0.0418
## 12 RuleGPpatbenperson                                     0       0.0418
## 13 RuleGPwordorder                                        0       0.0418
## 14 RuleDoubleAdpos                                        0       0.0418
## 15 RuleDoubleAdpos.max_allowable_distance                 0       0.0418
## 16 RuleDoubleAdpos.max_allowable_distance.v               0       0.0418
## 17 RuleReflexivePassWithAnimSubj                          0       0.0418
## 18 RuleTooFewVerbs.min_verb_frac                          0       0.0418
## 19 RuleTooManyNegations.max_negation_frac                 0       0.0418
## 20 RuleTooManyNegations.max_negation_frac.v               0       0.0418
## 21 RuleTooManyNegations.max_allowable_negations           0       0.0418
## 22 RuleTooManyNegations.max_allowable_negations.v         0       0.0418
## 23 RuleTooManyNominalConstructions.max_noun_frac          0       0.0418
## 24 RuleTooManyNominalConstructions.max_noun_frac.v        0       0.0418
## 25 RuleTooManyNominalConstructions.max_allowable_nouns    0       0.0418
## 26 RuleCaseRepetition.max_repetition_count                0       0.0418
## 27 RuleCaseRepetition.max_repetition_count.v              0       0.0418
## 28 RuleCaseRepetition.max_repetition_frac                 0       0.0418
## 29 RuleCaseRepetition.max_repetition_frac.v               0       0.0418
## 30 RuleWeakMeaningWords                                   0       0.0418
## 31 RuleAbstractNouns                                      0       0.0418
## 32 RuleRelativisticExpressions                            0       0.0418
## 33 RuleConfirmationExpressions                            0       0.0418
## 34 RuleRedundantExpressions                               0       0.0418
## 35 RuleTooLongExpressions                                 0       0.0418
## 36 RulePredSubjDistance                                   0       0.0418
## 37 RulePredSubjDistance.max_distance                      0       0.0418
## 38 RulePredSubjDistance.max_distance.v                    0       0.0418
## 39 RulePredObjDistance                                    0       0.0418
## 40 RulePredObjDistance.max_distance                       0       0.0418
## 41 RulePredObjDistance.max_distance.v                     0       0.0418
## 42 RuleInfVerbDistance                                    0       0.0418
## 43 RuleInfVerbDistance.max_distance                       0       0.0418
## 44 RuleInfVerbDistance.max_distance.v                     0       0.0418
## 45 RuleMultiPartVerbs                                     0       0.0418
## 46 RuleMultiPartVerbs.max_distance                        0       0.0418
## 47 RuleMultiPartVerbs.max_distance.v                      0       0.0418
## 48 RuleLongSentences.max_length                           0       0.0418
## 49 RuleLongSentences.max_length.v                         0       0.0418
## 50 RulePredAtClauseBeginning.max_order                    0       0.0418
## 51 RulePredAtClauseBeginning.max_order.v                  0       0.0418
## 52 RuleVerbalNouns                                        0       0.0418
## 53 cli                                                    0       0.0418
## 54 ari                                                    0       0.0418
## 55 num_hapax                                              0       0.0418
## 56 ttr                                                    0       0.0418
## 57 mattr                                                  0       0.0418
## 58 mattr.v                                                0       0.0418
## 59 maentropy.v                                            0       0.0418
## 60 mamr                                                   0       0.0418
## 61 verb_dist                                              0       0.0418
## 62 hpoint                                                 0       0.0418
## 63 fre                                                    0       0.0418
## 64 fkgl                                                   0       0.0418
```

```
## 65 gf                                                  0       0.0418
## 66 RuleAnaphoricReferences                             0.0539  0.0418
## 67 atl                                                 0.381   0.0418
## 68 activity                                            0.541   0.0418
## Variable importance:
## # A tibble: 67 x 3
##    Variable                                          Importance Sign
##    <chr>                                                  <dbl> <chr>
##  1 activity                                              0.541  POS
##  2 atl                                                   0.381  POS
##  3 RuleLiteraryStyle                                     0.267  NEG
##  4 smog                                                  0.182  NEG
##  5 RulePassive                                           0.173  NEG
##  6 maentropy                                             0.162  NEG
##  7 entropy                                               0.0937 NEG
##  8 RuleAnaphoricReferences                               0.0539 POS
##  9 RuleGPcoordovs                                        0      NEG
## 10 RuleGPdeverbaddr                                      0      NEG
## 11 RuleGPpatinstr                                        0      NEG
## 12 RuleGPdeverbsubj                                      0      NEG
## 13 RuleGPadjective                                       0      NEG
## 14 RuleGPpatbenperson                                    0      NEG
## 15 RuleGPwordorder                                       0      NEG
## 16 RuleDoubleAdpos                                       0      NEG
## 17 RuleDoubleAdpos.max_allowable_distance                0      NEG
## 18 RuleDoubleAdpos.max_allowable_distance.v              0      NEG
## 19 RuleReflexivePassWithAnimSubj                         0      NEG
## 20 RuleTooFewVerbs.min_verb_frac                         0      NEG
## 21 RuleTooManyNegations.max_negation_frac                0      NEG
## 22 RuleTooManyNegations.max_negation_frac.v              0      NEG
## 23 RuleTooManyNegations.max_allowable_negations          0      NEG
## 24 RuleTooManyNegations.max_allowable_negations.v        0      NEG
## 25 RuleTooManyNominalConstructions.max_noun_frac         0      NEG
## 26 RuleTooManyNominalConstructions.max_noun_frac.v       0      NEG
## 27 RuleTooManyNominalConstructions.max_allowable_nouns   0      NEG
## 28 RuleCaseRepetition.max_repetition_count               0      NEG
## 29 RuleCaseRepetition.max_repetition_count.v             0      NEG
## 30 RuleCaseRepetition.max_repetition_frac                0      NEG
## 31 RuleCaseRepetition.max_repetition_frac.v              0      NEG
## 32 RuleWeakMeaningWords                                  0      NEG
## 33 RuleAbstractNouns                                     0      NEG
## 34 RuleRelativisticExpressions                           0      NEG
## 35 RuleConfirmationExpressions                           0      NEG
## 36 RuleRedundantExpressions                              0      NEG
## 37 RuleTooLongExpressions                                0      NEG
## 38 RulePredSubjDistance                                  0      NEG
## 39 RulePredSubjDistance.max_distance                     0      NEG
## 40 RulePredSubjDistance.max_distance.v                   0      NEG
## 41 RulePredObjDistance                                   0      NEG
## 42 RulePredObjDistance.max_distance                      0      NEG
## 43 RulePredObjDistance.max_distance.v                    0      NEG
## 44 RuleInfVerbDistance                                   0      NEG
## 45 RuleInfVerbDistance.max_distance                      0      NEG
## 46 RuleInfVerbDistance.max_distance.v                    0      NEG
```

```
## 47 RuleMultiPartVerbs                                  0      NEG
## 48 RuleMultiPartVerbs.max_distance                     0      NEG
## 49 RuleMultiPartVerbs.max_distance.v                   0      NEG
## 50 RuleLongSentences.max_length                        0      NEG
## 51 RuleLongSentences.max_length.v                      0      NEG
## 52 RulePredAtClauseBeginning.max_order                 0      NEG
## 53 RulePredAtClauseBeginning.max_order.v               0      NEG
## 54 RuleVerbalNouns                                     0      NEG
## 55 cli                                                 0      NEG
## 56 ari                                                 0      NEG
## 57 num_hapax                                           0      NEG
## 58 ttr                                                 0      NEG
## 59 mattr                                               0      NEG
## 60 mattr.v                                             0      NEG
## 61 maentropy.v                                         0      NEG
## 62 mamr                                                0      NEG
## 63 verb_dist                                           0      NEG
## 64 hpoint                                              0      NEG
## 65 fre                                                 0      NEG
## 66 fkgl                                                0      NEG
## 67 gf                                                  0      NEG
```

Indicators, averages, and coefficients

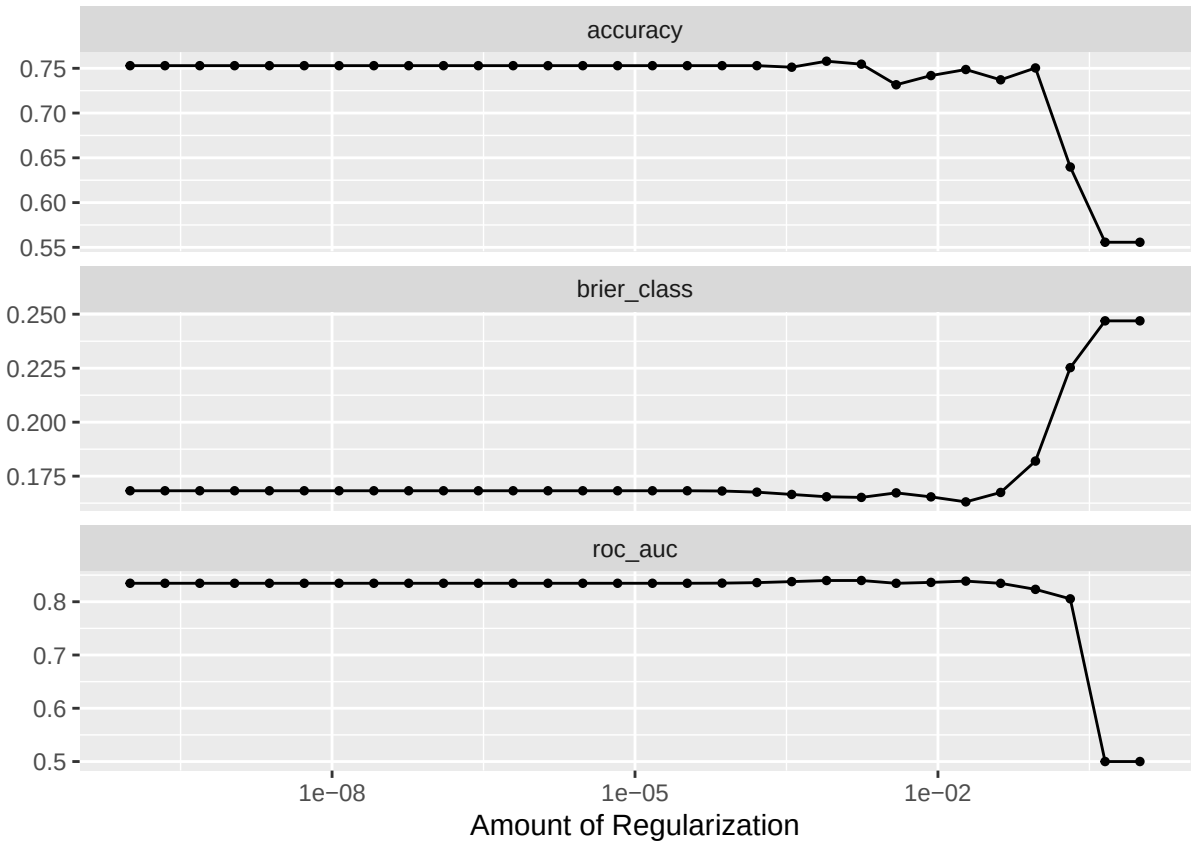
Remove correlating

```
# train_lasso(recipe_iac, training_set, folds)
```

Keep correlating

```
model_lasso_iac <- train_lasso(recipe_iac_nocorr, training_set, folds)
```

```
## Lasso tune workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = tune()
##   mixture = 1
##
## Computational engine: glmnet
##
## Lasso tuning metrics:
```




```
## # A tibble: 5 x 7
##    penalty .metric .estimator  mean     n std_err .config
##      <dbl> <chr>   <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.00174  roc_auc binary     0.840    10 0.0121  Preprocessor1_Model22
## 2 0.000788 roc_auc binary     0.840    10 0.0141  Preprocessor1_Model21
## 3 0.0189   roc_auc binary     0.839    10 0.00890 Preprocessor1_Model25
## 4 0.000356 roc_auc binary     0.838    10 0.0153  Preprocessor1_Model20
## 5 0.00853  roc_auc binary     0.836    10 0.00864 Preprocessor1_Model24
## # A tibble: 5 x 7
##    penalty .metric  .estimator  mean     n std_err .config
##      <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 7.88e- 4 accuracy binary     0.758    10  0.0125 Preprocessor1_Model21
## 2 1.74e- 3 accuracy binary     0.755    10  0.0138 Preprocessor1_Model22
## 3 1   e-10 accuracy binary     0.753    10  0.0117 Preprocessor1_Model01
## 4 2.21e-10 accuracy binary     0.753    10  0.0117 Preprocessor1_Model02
## 5 4.89e-10 accuracy binary     0.753    10  0.0117 Preprocessor1_Model03
## Best ROC AUC:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1  0.0418 Preprocessor1_Model26
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
```

```
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ---------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.0417531893656041
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 45 x 3
##    term                                                 estimate penalty
##    <chr>                                                   <dbl>   <dbl>
##  1 maentropy                                             -1.41      0.0418
##  2 RuleTooManyNegations.max_allowable_negations.v        -0.345     0.0418
##  3 entropy                                               -0.258     0.0418
##  4 smog                                                  -0.111     0.0418
##  5 RuleTooManyNominalConstructions.max_allowable_nouns.v -0.0104    0.0418
##  6 gf                                                    -0.000136  0.0418
##  7 RuleDoubleAdpos.max_allowable_distance                 0         0.0418
##  8 RuleDoubleAdpos.max_allowable_distance.v               0         0.0418
##  9 RuleTooFewVerbs.min_verb_frac                          0         0.0418
## 10 RuleTooManyNegations.max_negation_frac                 0         0.0418
## 11 RuleTooManyNegations.max_negation_frac.v               0         0.0418
## 12 RuleTooManyNegations.max_allowable_negations           0         0.0418
## 13 RuleTooManyNominalConstructions.max_noun_frac          0         0.0418
## 14 RuleTooManyNominalConstructions.max_noun_frac.v        0         0.0418
## 15 RuleTooManyNominalConstructions.max_allowable_nouns    0         0.0418
## 16 RuleCaseRepetition.max_repetition_count                0         0.0418
## 17 RuleCaseRepetition.max_repetition_count.v              0         0.0418
## 18 RuleCaseRepetition.max_repetition_frac                 0         0.0418
## 19 RuleCaseRepetition.max_repetition_frac.v               0         0.0418
## 20 RulePredSubjDistance.max_distance                      0         0.0418
## 21 RulePredSubjDistance.max_distance.v                    0         0.0418
## 22 RulePredObjDistance.max_distance                       0         0.0418
## 23 RulePredObjDistance.max_distance.v                     0         0.0418
## 24 RuleInfVerbDistance.max_distance                       0         0.0418
## 25 RuleInfVerbDistance.max_distance.v                     0         0.0418
## 26 RuleMultiPartVerbs.max_distance                        0         0.0418
## 27 RuleMultiPartVerbs.max_distance.v                      0         0.0418
## 28 RuleLongSentences.max_length                           0         0.0418
## 29 RuleLongSentences.max_length.v                         0         0.0418
## 30 RulePredAtClauseBeginning.max_order                    0         0.0418
## 31 RulePredAtClauseBeginning.max_order.v                  0         0.0418
## 32 cli                                                    0         0.0418
## 33 ari                                                    0         0.0418
## 34 ttr                                                    0         0.0418
## 35 mattr                                                  0         0.0418
## 36 mattr.v                                                0         0.0418
## 37 maentropy.v                                            0         0.0418
```

```
## 38 mamr                                                  0          0.0418
## 39 verb_dist                                             0          0.0418
## 40 hpoint                                                0          0.0418
## 41 fre                                                   0          0.0418
## 42 fkgl                                                  0          0.0418
## 43 atl                                                   1.03       0.0418
## 44 (Intercept)                                           4.33       0.0418
## 45 activity                                              5.25       0.0418
## Variable importance:
## # A tibble: 44 x 3
##    Variable                                            Importance Sign
##    <chr>                                                    <dbl> <chr>
##  1 activity                                              5.25     POS
##  2 maentropy                                             1.41     NEG
##  3 atl                                                   1.03     POS
##  4 RuleTooManyNegations.max_allowable_negations.v        0.345    NEG
##  5 entropy                                               0.258    NEG
##  6 smog                                                  0.111    NEG
##  7 RuleTooManyNominalConstructions.max_allowable_nouns.v 0.0104   NEG
##  8 gf                                                    0.000136 NEG
##  9 RuleDoubleAdpos.max_allowable_distance                0        NEG
## 10 RuleDoubleAdpos.max_allowable_distance.v              0        NEG
## 11 RuleTooFewVerbs.min_verb_frac                         0        NEG
## 12 RuleTooManyNegations.max_negation_frac                0        NEG
## 13 RuleTooManyNegations.max_negation_frac.v              0        NEG
## 14 RuleTooManyNegations.max_allowable_negations          0        NEG
## 15 RuleTooManyNominalConstructions.max_noun_frac         0        NEG
## 16 RuleTooManyNominalConstructions.max_noun_frac.v       0        NEG
## 17 RuleTooManyNominalConstructions.max_allowable_nouns   0        NEG
## 18 RuleCaseRepetition.max_repetition_count               0        NEG
## 19 RuleCaseRepetition.max_repetition_count.v             0        NEG
## 20 RuleCaseRepetition.max_repetition_frac                0        NEG
## 21 RuleCaseRepetition.max_repetition_frac.v              0        NEG
## 22 RulePredSubjDistance.max_distance                     0        NEG
## 23 RulePredSubjDistance.max_distance.v                   0        NEG
## 24 RulePredObjDistance.max_distance                      0        NEG
## 25 RulePredObjDistance.max_distance.v                    0        NEG
## 26 RuleInfVerbDistance.max_distance                      0        NEG
## 27 RuleInfVerbDistance.max_distance.v                    0        NEG
## 28 RuleMultiPartVerbs.max_distance                       0        NEG
## 29 RuleMultiPartVerbs.max_distance.v                     0        NEG
## 30 RuleLongSentences.max_length                          0        NEG
## 31 RuleLongSentences.max_length.v                        0        NEG
## 32 RulePredAtClauseBeginning.max_order                   0        NEG
## 33 RulePredAtClauseBeginning.max_order.v                 0        NEG
## 34 cli                                                   0        NEG
## 35 ari                                                   0        NEG
## 36 ttr                                                   0        NEG
## 37 mattr                                                 0        NEG
## 38 mattr.v                                               0        NEG
## 39 maentropy.v                                           0        NEG
## 40 mamr                                                  0        NEG
## 41 verb_dist                                             0        NEG
## 42 hpoint                                                0        NEG
```

```
## 43 fre                                                    0        NEG
## 44 fkgl                                                   0        NEG
```

Counts

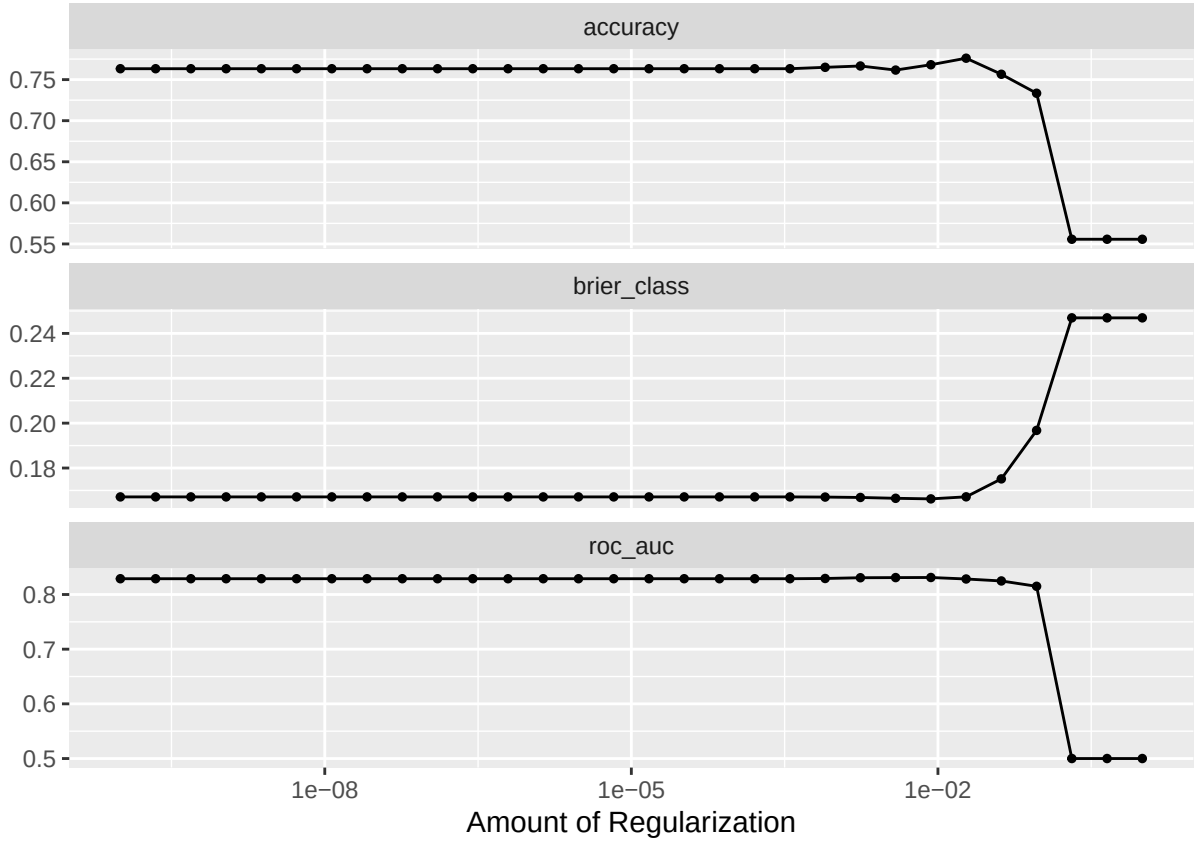
Remove correlating

```
# train_lasso(recipe_counts, training_set, folds)
```

Keep correlating

```
model_lasso_counts <- train_lasso(recipe_counts_nocorr, training_set, folds)
```

```
## Lasso tune workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = tune()
##   mixture = 1
##
## Computational engine: glmnet
##
## Lasso tuning metrics:
```




```
## # A tibble: 5 x 7
##        penalty .metric .estimator  mean     n std_err .config
##          <dbl> <chr>   <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.00853      roc_auc binary     0.831    10  0.0137 Preprocessor1_Model24
## 2 0.00386      roc_auc binary     0.831    10  0.0145 Preprocessor1_Model23
## 3 0.00174      roc_auc binary     0.831    10  0.0154 Preprocessor1_Model22
## 4 0.000788     roc_auc binary     0.829    10  0.0156 Preprocessor1_Model21
## 5 0.0000000001 roc_auc binary     0.829    10  0.0157 Preprocessor1_Model01
## # A tibble: 5 x 7
##        penalty .metric  .estimator  mean     n std_err .config
##          <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.0189       accuracy binary     0.776    10  0.0128 Preprocessor1_Model25
## 2 0.00853      accuracy binary     0.768    10  0.0121 Preprocessor1_Model24
## 3 0.00174      accuracy binary     0.767    10  0.0125 Preprocessor1_Model22
## 4 0.000788     accuracy binary     0.765    10  0.0119 Preprocessor1_Model21
## 5 0.0000000001 accuracy binary     0.763    10  0.0121 Preprocessor1_Model01
## Best ROC AUC:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1  0.0418 Preprocessor1_Model26
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
```

```
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ---------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.0417531893656041
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 25 x 3
##    term                           estimate penalty
##    <chr>                             <dbl>   <dbl>
##  1 RuleRelativisticExpressions    -140.     0.0418
##  2 RulePassive                    -122.     0.0418
##  3 RuleLiteraryStyle              -102.     0.0418
##  4 (Intercept)                      -1.30   0.0418
##  5 RuleGPcoordovs                    0      0.0418
##  6 RuleGPdeverbaddr                  0      0.0418
##  7 RuleGPpatinstr                    0      0.0418
##  8 RuleGPdeverbsubj                  0      0.0418
##  9 RuleGPadjective                   0      0.0418
## 10 RuleGPpatbenperson                0      0.0418
## 11 RuleGPwordorder                   0      0.0418
## 12 RuleDoubleAdpos                   0      0.0418
## 13 RuleReflexivePassWithAnimSubj     0      0.0418
## 14 RuleWeakMeaningWords              0      0.0418
## 15 RuleAbstractNouns                 0      0.0418
## 16 RuleConfirmationExpressions       0      0.0418
## 17 RuleRedundantExpressions          0      0.0418
## 18 RuleTooLongExpressions            0      0.0418
## 19 RulePredObjDistance               0      0.0418
## 20 num_hapax                         0      0.0418
## 21 RuleInfVerbDistance               1.02   0.0418
## 22 RuleVerbalNouns                   5.24   0.0418
## 23 RulePredSubjDistance             14.6    0.0418
## 24 RuleMultiPartVerbs               24.0    0.0418
## 25 RuleAnaphoricReferences          39.8    0.0418
## Variable importance:
## # A tibble: 24 x 3
##    Variable                       Importance Sign
##    <chr>                               <dbl> <chr>
##  1 RuleRelativisticExpressions       140.    NEG
##  2 RulePassive                       122.    NEG
##  3 RuleLiteraryStyle                 102.    NEG
##  4 RuleAnaphoricReferences            39.8   POS
##  5 RuleMultiPartVerbs                 24.0   POS
##  6 RulePredSubjDistance               14.6   POS
##  7 RuleVerbalNouns                     5.24  POS
##  8 RuleInfVerbDistance                 1.02  POS
```

```
##  9 RuleGPcoordovs                     0    NEG
## 10 RuleGPdeverbaddr                   0    NEG
## 11 RuleGPpatinstr                     0    NEG
## 12 RuleGPdeverbsubj                   0    NEG
## 13 RuleGPadjective                    0    NEG
## 14 RuleGPpatbenperson                 0    NEG
## 15 RuleGPwordorder                    0    NEG
## 16 RuleDoubleAdpos                    0    NEG
## 17 RuleReflexivePassWithAnimSubj      0    NEG
## 18 RuleWeakMeaningWords               0    NEG
## 19 RuleAbstractNouns                  0    NEG
## 20 RuleConfirmationExpressions        0    NEG
## 21 RuleRedundantExpressions           0    NEG
## 22 RuleTooLongExpressions             0    NEG
## 23 RulePredObjDistance                0    NEG
## 24 num_hapax                          0    NEG
```

SVM

All variables

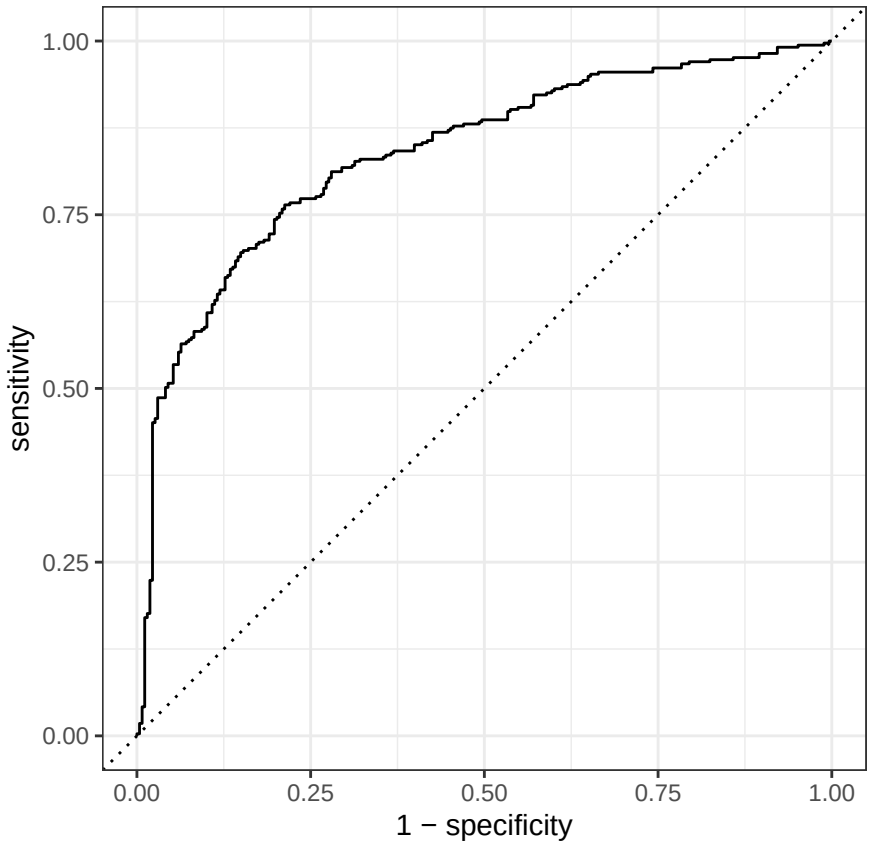
Remove correlating

```
# train_svm(recipe_all, training_set, folds)
```

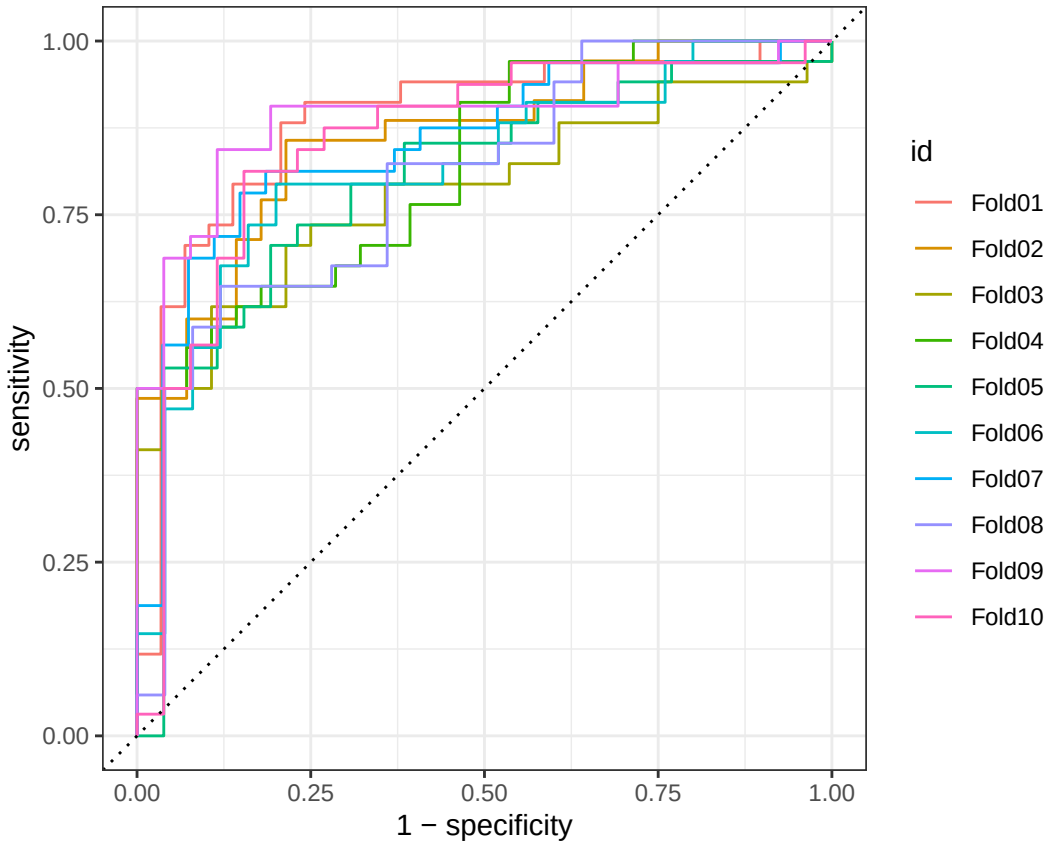
Keep correlating

```
model_svm_all <- train_svm(recipe_all_nocorr, training_set, folds)
```

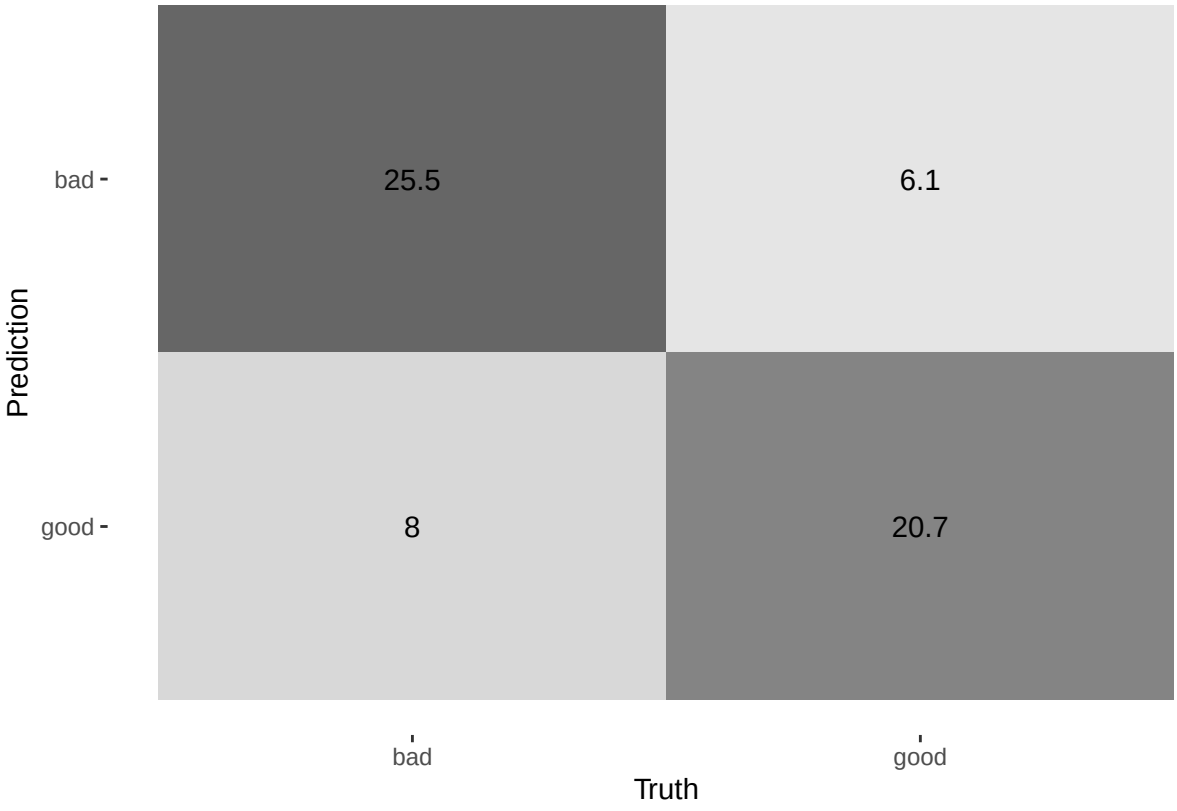
```
## SVM workflow:
## == Workflow ============================================================================
## Preprocessor: Recipe
## Model: svm_linear()
##
## -- Preprocessor ----------------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ------------------------------------------------------------------------------
## Linear Support Vector Machine Model Specification (classification)
##
## Computational engine: kernlab
##
## SVM metrics:
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n std_err .config
##   <chr>       <chr>      <dbl> <int>   <dbl> <chr>
## 1 accuracy    binary     0.766    10 0.0159  Preprocessor1_Model1
## 2 brier_class binary     0.167    10 0.00536 Preprocessor1_Model1
## 3 roc_auc     binary     0.837    10 0.0120  Preprocessor1_Model1
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity

```
## [1] "\n"
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity
id
Fold01
Fold02
Fold03
Fold04
Fold05
Fold06
Fold07
Fold08
Fold09
Fold10

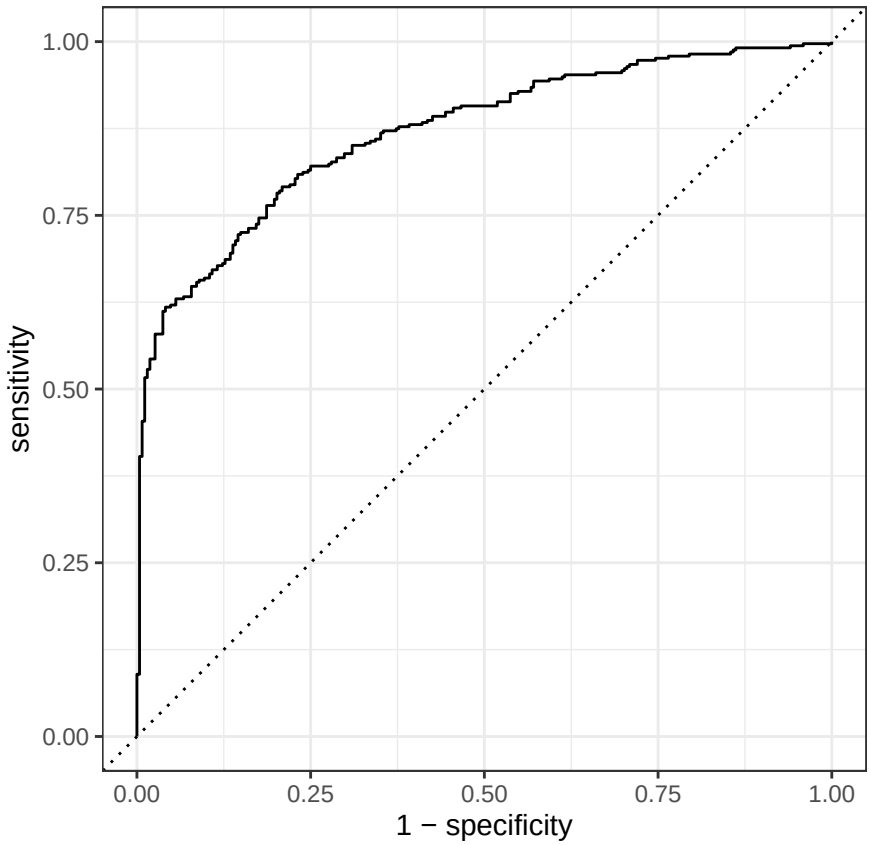
```
## [1] "\n"
```


bad
good
Prediction
25.5
6.1
8
20.7
bad
good
Truth

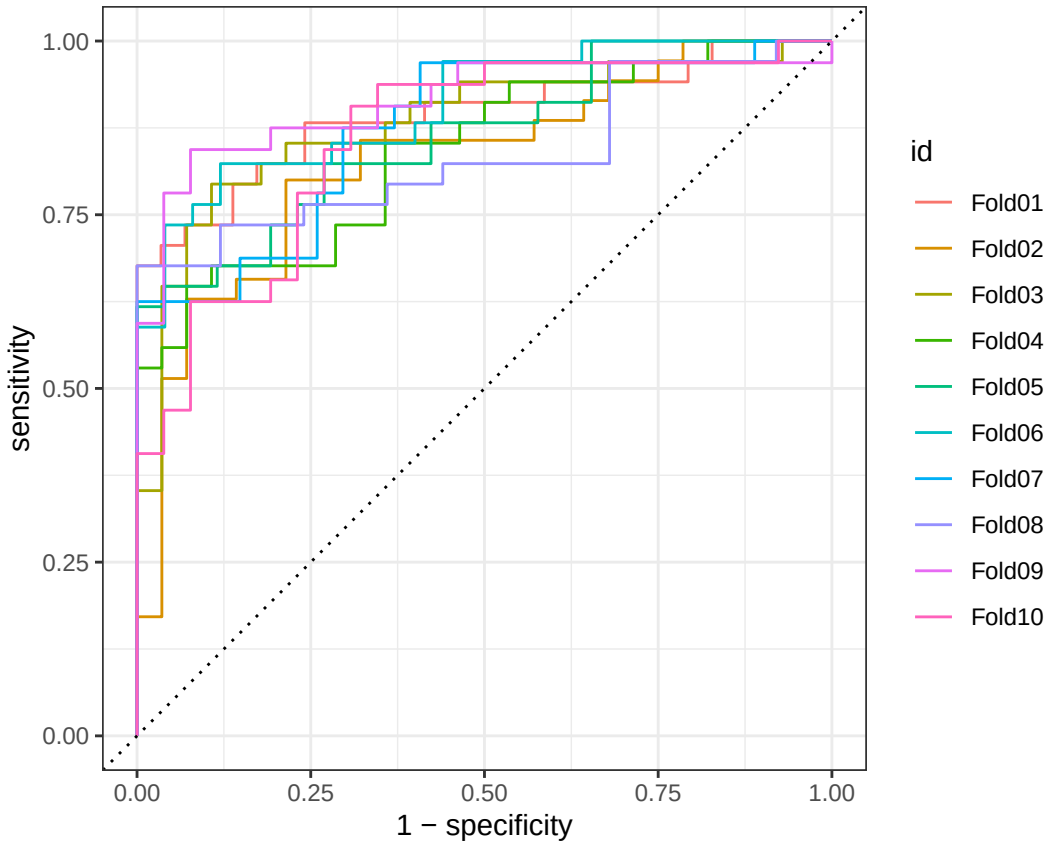
```
## [1] "\n"
```

```
model_svm_rbf_all <- train_svm_rbf(recipe_all_nocorr, training_set, folds)
```

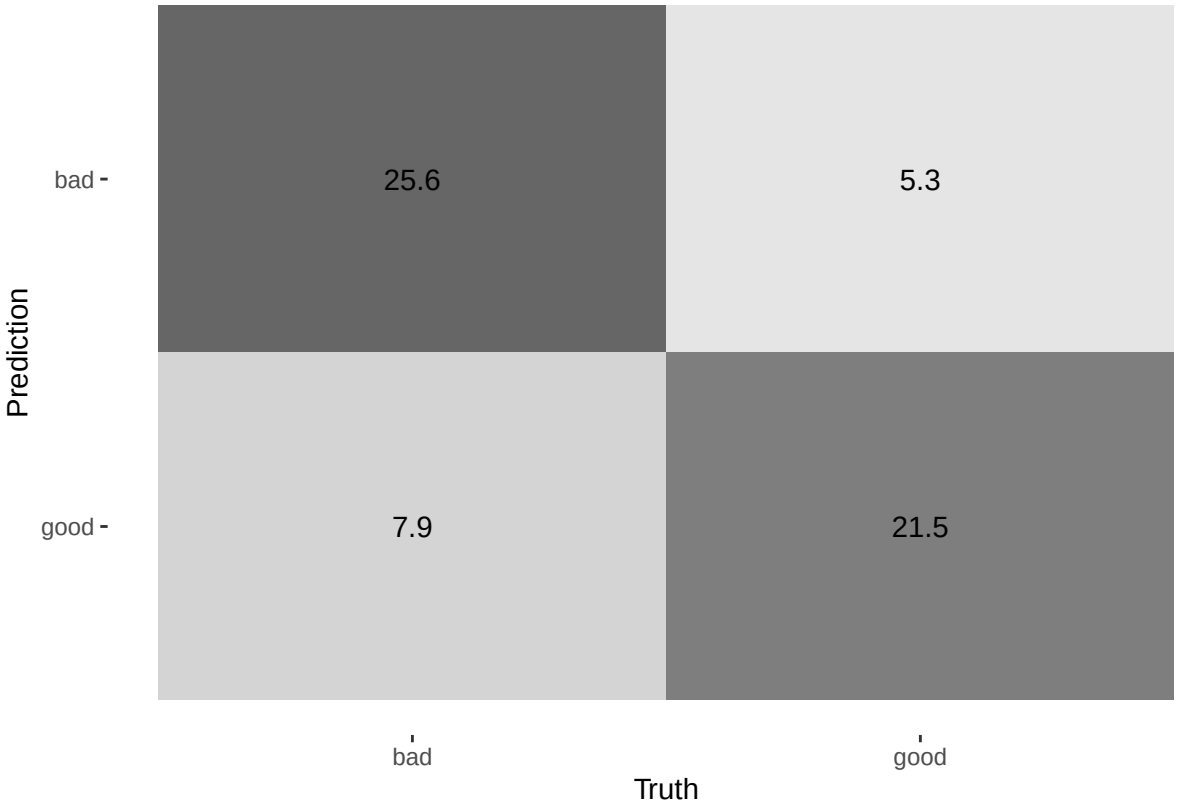
```
## SVM workflow:
## == Workflow ============================================================================
## Preprocessor: Recipe
## Model: svm_rbf()
##
## -- Preprocessor ----------------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ------------------------------------------------------------------------------
## Radial Basis Function Support Vector Machine Model Specification (classification)
##
## Computational engine: kernlab
##
## SVM metrics:
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n std_err .config
##   <chr>       <chr>      <dbl> <int>   <dbl> <chr>
## 1 accuracy    binary     0.781    10 0.0139  Preprocessor1_Model1
## 2 brier_class binary     0.145    10 0.00561 Preprocessor1_Model1
## 3 roc_auc     binary     0.869    10 0.00928 Preprocessor1_Model1
```




```
## [1] "\n"
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity
id
Fold01
Fold02
Fold03
Fold04
Fold05
Fold06
Fold07
Fold08
Fold09
Fold10

```
## [1] "\n"
```


bad
good
Prediction
25.6
5.3
7.9
21.5
bad
good
Truth

```
## [1] "\n"
```

Random forest

All variables

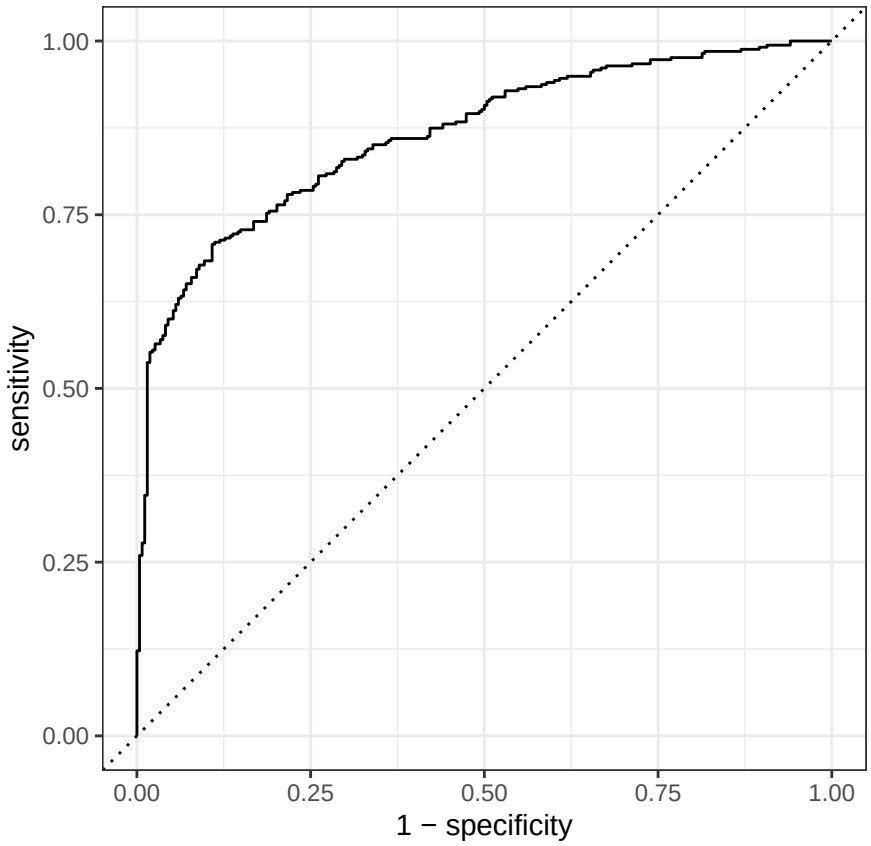
Remove correlating

```
# train_random_forest(recipe_all, training_set, folds)
```

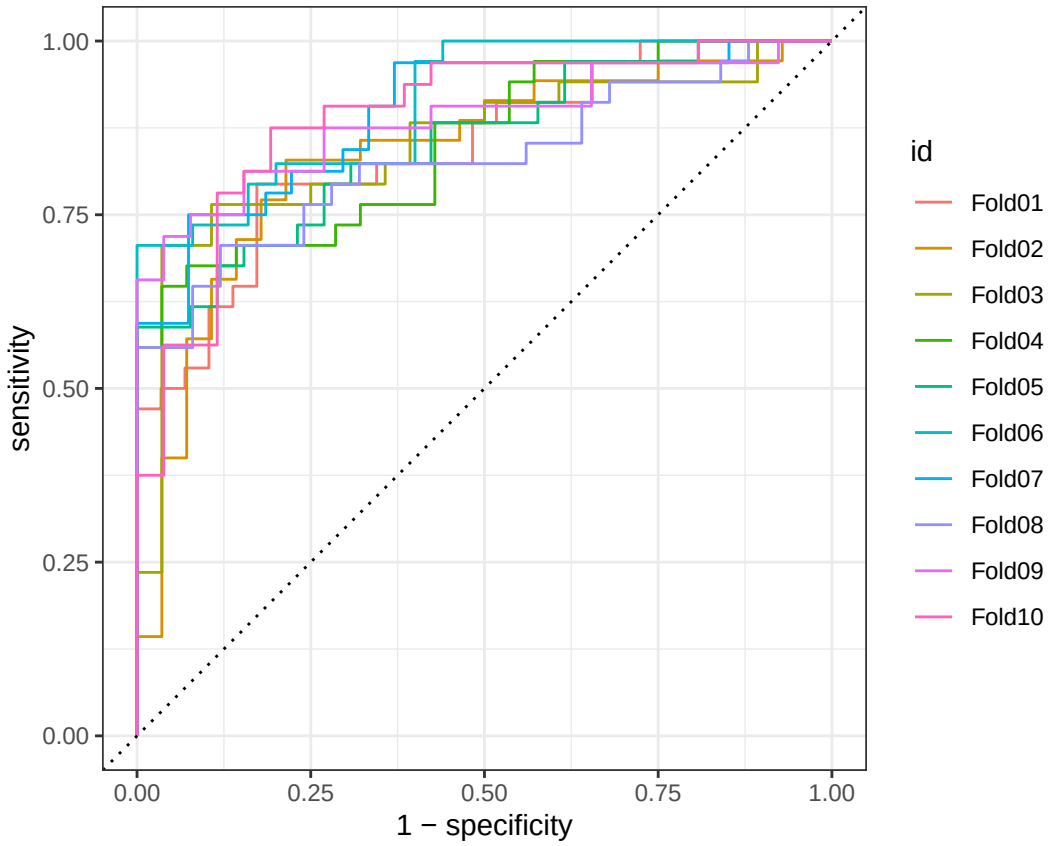
Keep correlating

```
model_rf_all <- train_random_forest(recipe_all_nocorr, training_set, folds)
```

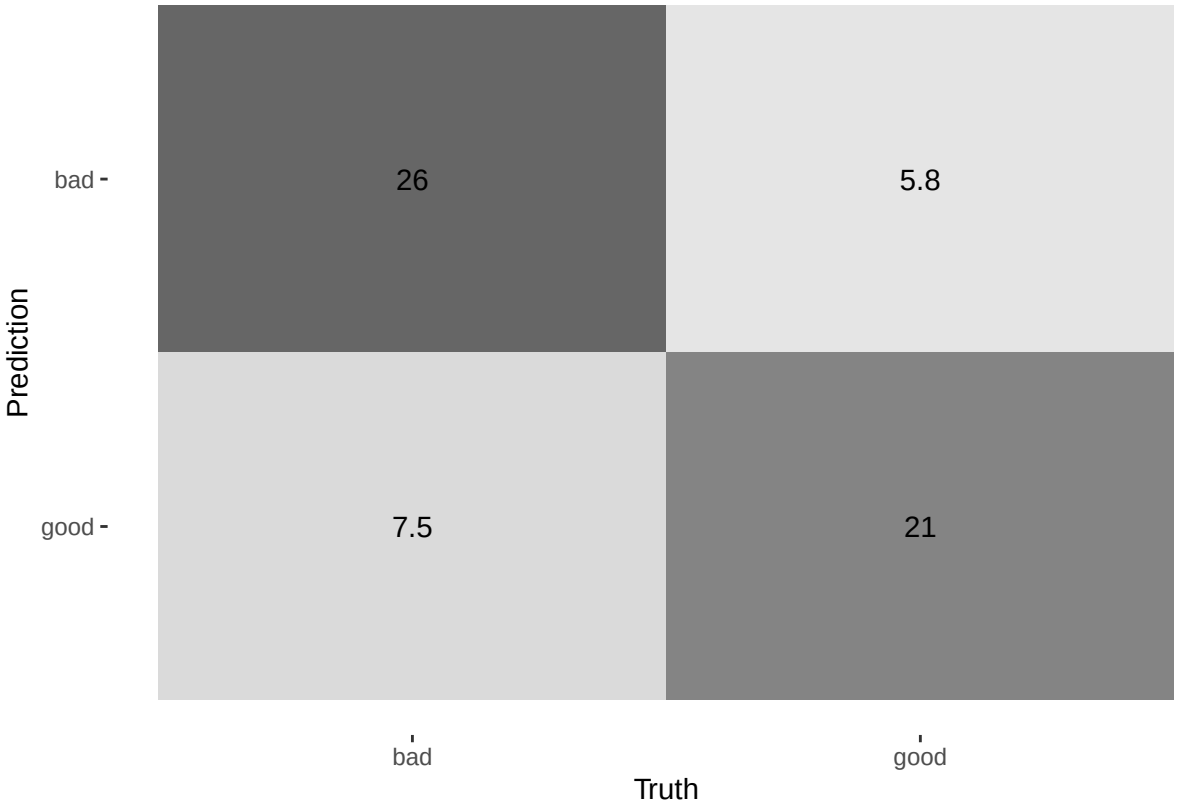
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Random Forest Model Specification (classification)
##
## Main Arguments:
##   trees = 1000
##
## Engine-Specific Arguments:
##   importance = impurity
##
## Computational engine: ranger
##
## RF metrics:
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n std_err .config
##   <chr>       <chr>      <dbl> <int>   <dbl> <chr>
## 1 accuracy    binary     0.780    10 0.00932 Preprocessor1_Model1
## 2 brier_class binary     0.148    10 0.00422 Preprocessor1_Model1
## 3 roc_auc     binary     0.865    10 0.00889 Preprocessor1_Model1
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity

```
## [1] "\n"
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity
id
Fold01
Fold02
Fold03
Fold04
Fold05
Fold06
Fold07
Fold08
Fold09
Fold10

```
## [1] "\n"
```


bad
good
Prediction
26
5.8
7.5
21
bad
good
Truth

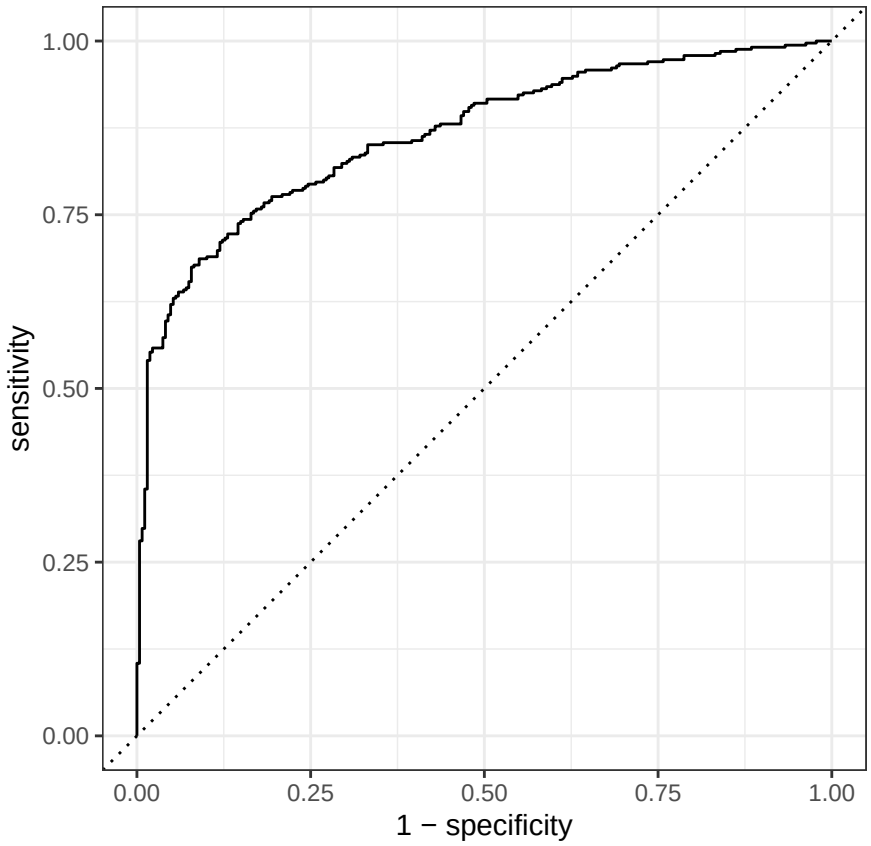
```
## [1] "\n"
## # A tibble: 71 x 2
##    Variable                                              Importance
##    <chr>                                                      <dbl>
##  1 activity                                                  15.6
##  2 RuleTooFewVerbs.min_verb_frac                             13.9
##  3 verb_dist                                                 13.1
##  4 RuleLongSentences.max_length                              10.5
##  5 RuleTooManyNominalConstructions.max_allowable_nouns       10.3
##  6 ari                                                        9.55
##  7 RulePassive                                                9.29
##  8 RulePredAtClauseBeginning.max_order                        8.92
##  9 gf                                                         7.24
## 10 smog                                                       7.01
## 11 atl                                                        6.85
## 12 RuleLiteraryStyle                                          6.42
## 13 fkgl                                                       5.59
## 14 RuleTooManyNegations.max_negation_frac                     4.76
## 15 maentropy                                                  4.58
## 16 RuleTooLongExpressions                                     4.10
## 17 mamr                                                       4.00
## 18 RulePredAtClauseBeginning.max_order.v                      3.90
## 19 RuleTooManyNominalConstructions.max_noun_frac              3.75
## 20 mattr                                                      3.71
## 21 RuleVerbalNouns                                            3.67
## 22 RulePredSubjDistance                                       3.59
## 23 RuleCaseRepetition.max_repetition_count.v                  3.58
## 24 RuleMultiPartVerbs                                         3.41
## 25 maentropy.v                                                3.39
## 26 RuleCaseRepetition.max_repetition_frac.v                   3.38
## 27 cli                                                        3.30
## 28 RuleLongSentences.max_length.v                             3.27
## 29 RuleCaseRepetition.max_repetition_frac                     3.04
## 30 RulePredSubjDistance.max_distance                          2.98
## 31 RuleAnaphoricReferences                                    2.96
## 32 mattr.v                                                    2.92
## 33 RulePredSubjDistance.max_distance.v                        2.86
## 34 entropy                                                    2.70
## 35 RulePredObjDistance.max_distance                           2.64
## 36 RuleDoubleAdpos                                            2.61
## 37 RuleInfVerbDistance                                        2.56
## 38 RuleTooManyNegations.max_allowable_negations.v             2.49
## 39 RuleMultiPartVerbs.max_distance                            2.47
## 40 RuleCaseRepetition.max_repetition_count                    2.46
## 41 RulePredObjDistance                                        2.43
## 42 RuleTooManyNominalConstructions.max_noun_frac.v            2.39
## 43 RuleTooManyNegations.max_allowable_negations               2.37
## 44 fre                                                        2.36
## 45 RuleInfVerbDistance.max_distance                           2.35
## 46 RuleTooManyNegations.max_negation_frac.v                   2.28
## 47 RuleMultiPartVerbs.max_distance.v                          2.23
## 48 RuleInfVerbDistance.max_distance.v                         2.18
## 49 ttr                                                        2.11
## 50 RuleAbstractNouns                                          2.05
```

```
## 51 word_count                                          2.00
## 52 RuleWeakMeaningWords                                2.00
## 53 RuleDoubleAdpos.max_allowable_distance.v            1.98
## 54 num_hapax                                           1.94
## 55 syllab_count                                        1.92
## 56 sent_count                                          1.91
## 57 char_count                                          1.89
## 58 RuleDoubleAdpos.max_allowable_distance              1.86
## 59 RulePredObjDistance.max_distance.v                  1.82
## 60 RuleGPwordorder                                     1.58
## 61 hpoint                                              1.45
## 62 RuleGPcoordovs                                      1.38
## 63 RuleReflexivePassWithAnimSubj                       1.36
## 64 RuleGPpatinstr                                      1.09
## 65 RuleGPdeverbaddr                                    1.01
## 66 RuleRelativisticExpressions                         0.943
## 67 RuleGPdeverbsubj                                    0.806
## 68 RuleGPpatbenperson                                  0.724
## 69 RuleConfirmationExpressions                         0.526
## 70 RuleGPadjective                                     0.252
## 71 RuleRedundantExpressions                            0.0978
```

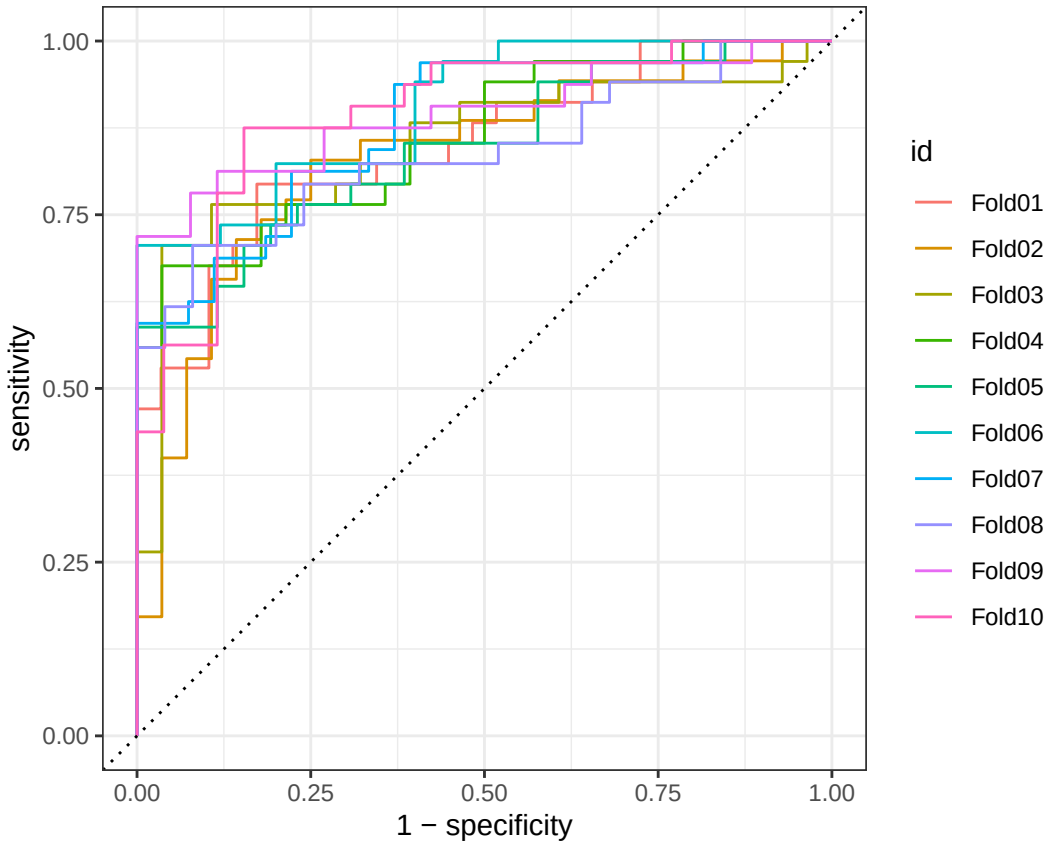
No TL

```
model_rf_notl <- train_random_forest(recipe_notl_nocorr, training_set, folds)
```

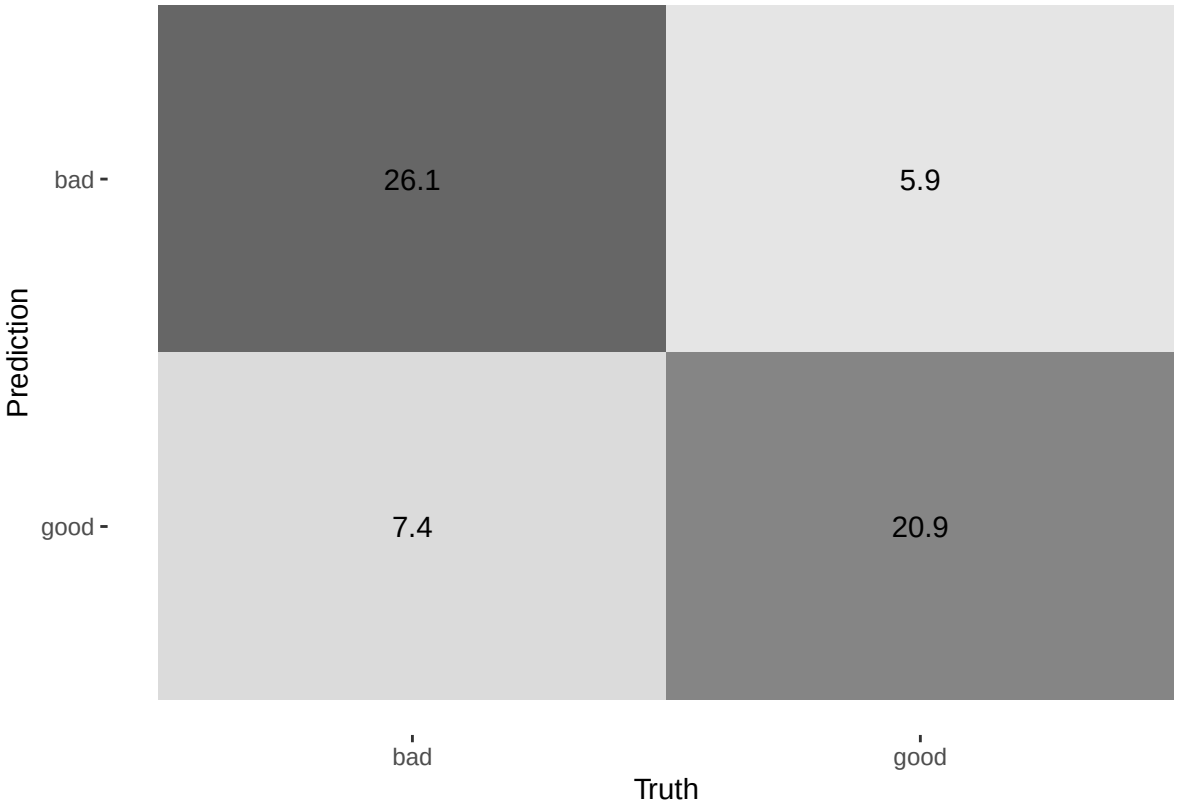
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Random Forest Model Specification (classification)
##
## Main Arguments:
##   trees = 1000
##
## Engine-Specific Arguments:
##   importance = impurity
##
## Computational engine: ranger
##
## RF metrics:
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n std_err .config
##   <chr>       <chr>      <dbl> <int>   <dbl> <chr>
## 1 accuracy    binary     0.780    10 0.0108  Preprocessor1_Model1
## 2 brier_class binary     0.147    10 0.00427 Preprocessor1_Model1
## 3 roc_auc     binary     0.865    10 0.00841 Preprocessor1_Model1
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity

```
## [1] "\n"
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity
id
Fold01
Fold02
Fold03
Fold04
Fold05
Fold06
Fold07
Fold08
Fold09
Fold10

```
## [1] "\n"
```


bad
good
Prediction
26.1
5.9
7.4
20.9
bad
good
Truth

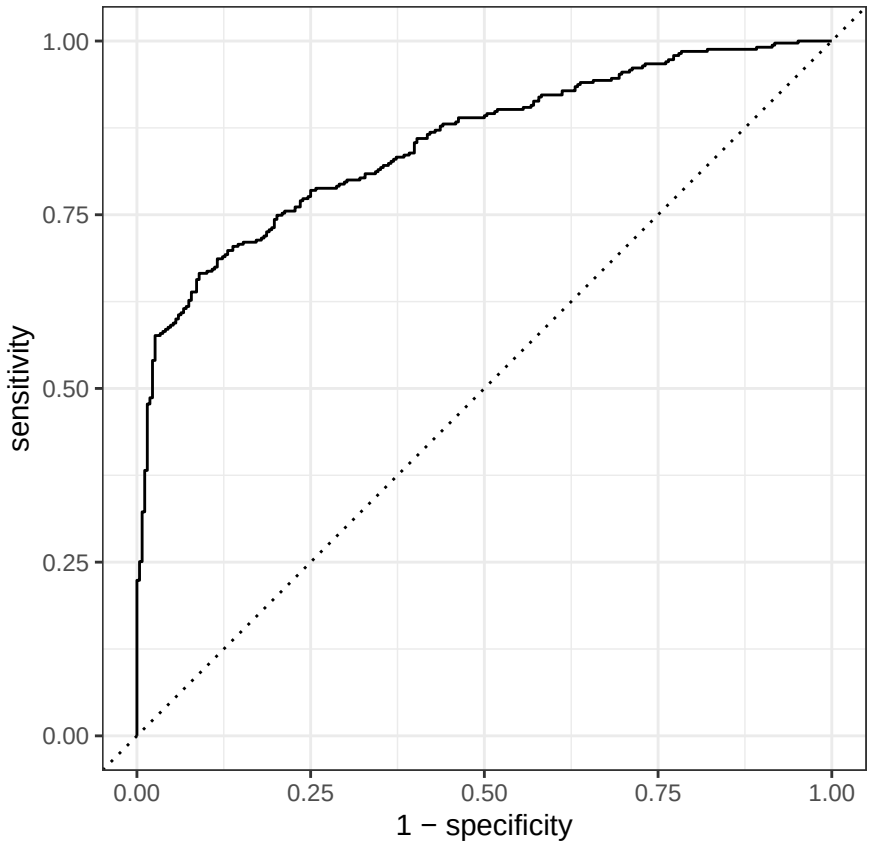
```
## [1] "\n"
## # A tibble: 67 x 2
##    Variable                                              Importance
##    <chr>                                                      <dbl>
##  1 activity                                                  16.8
##  2 verb_dist                                                 15.5
##  3 RuleTooFewVerbs.min_verb_frac                             13.2
##  4 RuleLongSentences.max_length                              11.1
##  5 RuleTooManyNominalConstructions.max_allowable_nouns       11.1
##  6 RulePredAtClauseBeginning.max_order                        9.69
##  7 ari                                                        9.28
##  8 RulePassive                                                9.03
##  9 RuleLiteraryStyle                                          7.09
## 10 gf                                                         7.04
## 11 smog                                                       6.35
## 12 atl                                                        5.72
## 13 fkgl                                                       5.03
## 14 RuleTooManyNegations.max_negation_frac                     4.96
## 15 mamr                                                       4.30
## 16 mattr                                                      4.26
## 17 RuleTooLongExpressions                                     4.25
## 18 RulePredAtClauseBeginning.max_order.v                      4.23
## 19 RuleMultiPartVerbs                                         4.15
## 20 RuleVerbalNouns                                            4.11
## 21 maentropy                                                  3.95
## 22 RuleTooManyNominalConstructions.max_noun_frac              3.86
## 23 RuleCaseRepetition.max_repetition_count.v                  3.57
## 24 maentropy.v                                                3.53
## 25 entropy                                                    3.49
## 26 RulePredSubjDistance                                       3.42
## 27 RulePredSubjDistance.max_distance                          3.35
## 28 RuleLongSentences.max_length.v                             3.27
## 29 RuleCaseRepetition.max_repetition_frac.v                   3.26
## 30 cli                                                        3.26
## 31 RuleAnaphoricReferences                                    3.11
## 32 mattr.v                                                    3.04
## 33 RulePredObjDistance.max_distance                           2.83
## 34 RuleCaseRepetition.max_repetition_frac                     2.77
## 35 RuleTooManyNegations.max_allowable_negations.v             2.64
## 36 RuleCaseRepetition.max_repetition_count                    2.60
## 37 RuleInfVerbDistance                                        2.56
## 38 RuleInfVerbDistance.max_distance                           2.54
## 39 RuleMultiPartVerbs.max_distance                            2.48
## 40 RulePredObjDistance                                        2.47
## 41 ttr                                                        2.45
## 42 RuleTooManyNegations.max_allowable_negations               2.42
## 43 num_hapax                                                  2.42
## 44 RuleTooManyNegations.max_negation_frac.v                   2.41
## 45 RuleTooManyNominalConstructions.max_noun_frac.v            2.37
## 46 RuleInfVerbDistance.max_distance.v                         2.37
## 47 RuleDoubleAdpos                                            2.33
## 48 fre                                                        2.28
## 49 RuleDoubleAdpos.max_allowable_distance.v                   2.22
## 50 RulePredSubjDistance.max_distance.v                        2.22
```

```
## 51 RulePredObjDistance.max_distance.v                    2.16
## 52 RuleMultiPartVerbs.max_distance.v                     2.12
## 53 RuleWeakMeaningWords                                  2.10
## 54 RuleAbstractNouns                                     2.05
## 55 RuleDoubleAdpos.max_allowable_distance                1.84
## 56 hpoint                                                1.73
## 57 RuleGPcoordovs                                        1.61
## 58 RuleGPwordorder                                       1.44
## 59 RuleReflexivePassWithAnimSubj                         1.41
## 60 RuleGPpatinstr                                        1.09
## 61 RuleGPdeverbaddr                                      1.04
## 62 RuleRelativisticExpressions                           0.996
## 63 RuleGPpatbenperson                                    0.845
## 64 RuleGPdeverbsubj                                      0.738
## 65 RuleConfirmationExpressions                           0.612
## 66 RuleGPadjective                                       0.365
## 67 RuleRedundantExpressions                              0.0837
```

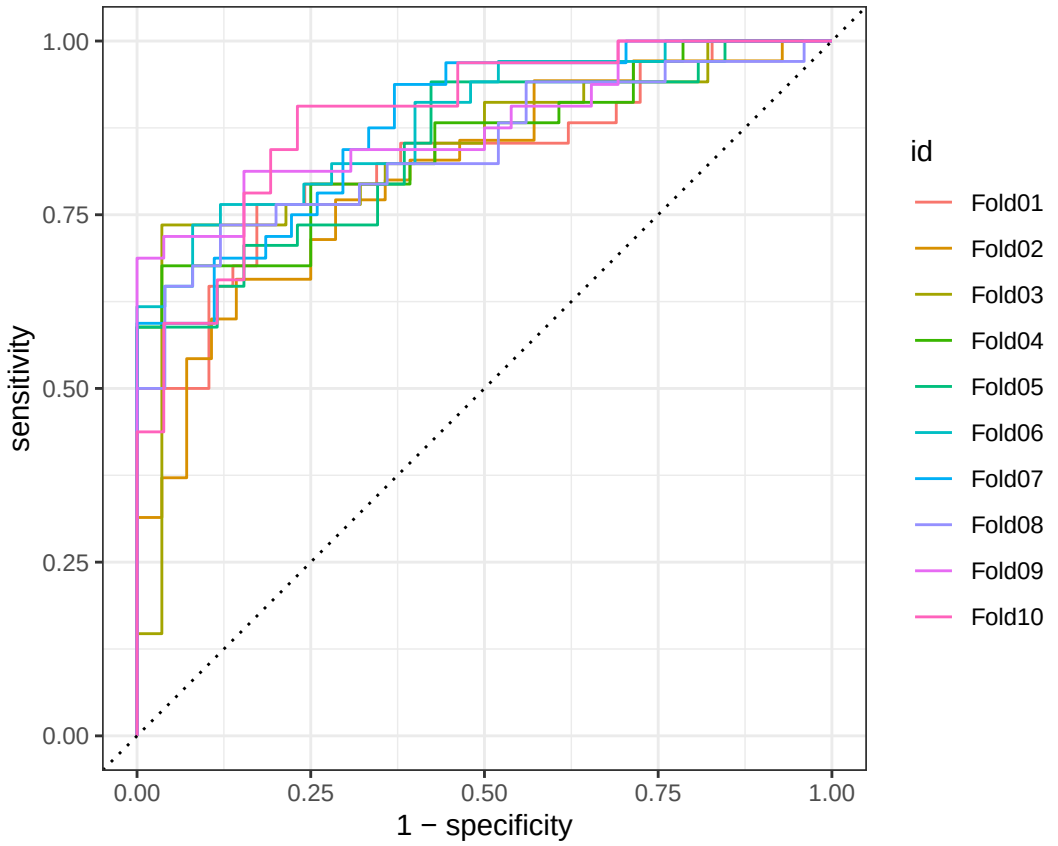
IAC

```
model_rf_iac <- train_random_forest(recipe_iac_nocorr, training_set, folds)
```

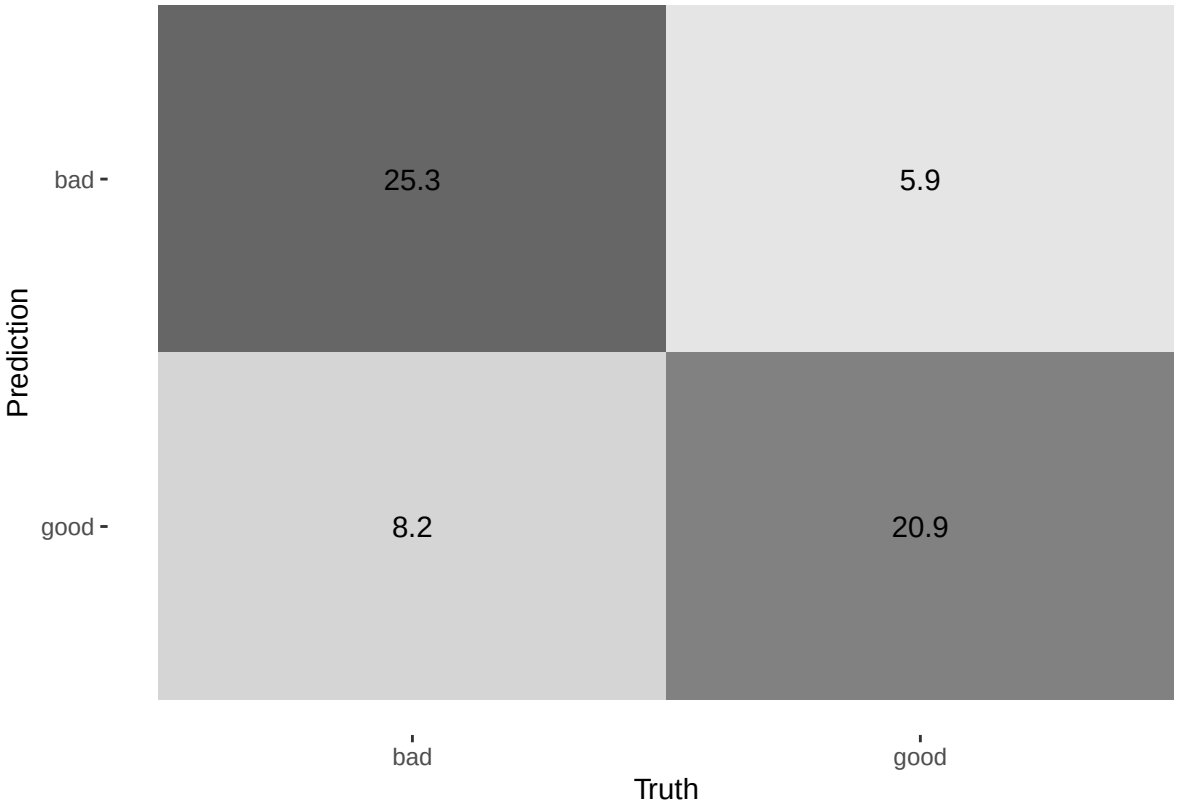
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Random Forest Model Specification (classification)
##
## Main Arguments:
##   trees = 1000
##
## Engine-Specific Arguments:
##   importance = impurity
##
## Computational engine: ranger
##
## RF metrics:
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n std_err .config
##   <chr>       <chr>      <dbl> <int>   <dbl> <chr>
## 1 accuracy    binary     0.767    10 0.0120  Preprocessor1_Model1
## 2 brier_class binary     0.153    10 0.00403 Preprocessor1_Model1
## 3 roc_auc     binary     0.856    10 0.00838 Preprocessor1_Model1
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity

```
## [1] "\n"
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity
id
Fold01
Fold02
Fold03
Fold04
Fold05
Fold06
Fold07
Fold08
Fold09
Fold10

```
## [1] "\n"
```


bad
good
Prediction
25.3
5.9
8.2
20.9
bad
good
Truth

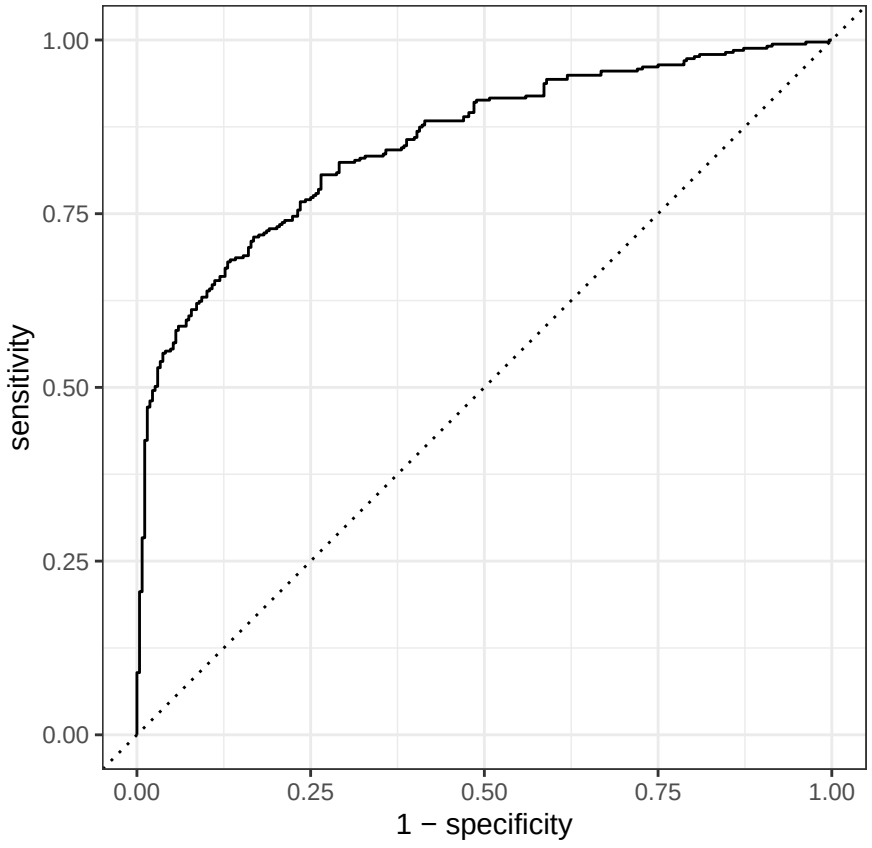
```
## [1] "\n"
## # A tibble: 44 x 2
##    Variable                                                Importance
##    <chr>                                                        <dbl>
##  1 activity                                                     19.0
##  2 verb_dist                                                    16.8
##  3 RuleTooFewVerbs.min_verb_frac                                16.8
##  4 RuleTooManyNominalConstructions.max_allowable_nouns          12.6
##  5 RuleLongSentences.max_length                                 11.7
##  6 ari                                                          10.9
##  7 RulePredAtClauseBeginning.max_order                          10.0
##  8 gf                                                            9.03
##  9 atl                                                           7.72
## 10 smog                                                          7.72
## 11 RuleTooManyNegations.max_negation_frac                        6.27
## 12 RuleTooManyNominalConstructions.max_noun_frac                 5.77
## 13 maentropy                                                     5.70
## 14 fkgl                                                          5.64
## 15 mattr                                                         5.35
## 16 RuleTooManyNominalConstructions.max_allowable_nouns.v         5.30
## 17 mamr                                                          5.20
## 18 RuleLongSentences.max_length.v                                4.82
## 19 RulePredAtClauseBeginning.max_order.v                         4.72
## 20 cli                                                           4.65
## 21 maentropy.v                                                   4.57
## 22 entropy                                                       4.57
## 23 RuleCaseRepetition.max_repetition_count.v                     4.50
## 24 RulePredSubjDistance.max_distance                             4.31
## 25 RuleCaseRepetition.max_repetition_frac.v                      4.10
## 26 mattr.v                                                       3.96
## 27 RuleCaseRepetition.max_repetition_frac                        3.92
## 28 RuleTooManyNegations.max_negation_frac.v                      3.89
## 29 RuleTooManyNegations.max_allowable_negations                  3.65
## 30 RulePredObjDistance.max_distance                              3.64
## 31 RuleTooManyNegations.max_allowable_negations.v                3.59
## 32 ttr                                                           3.57
## 33 RuleCaseRepetition.max_repetition_count                       3.49
## 34 RulePredSubjDistance.max_distance.v                           3.47
## 35 RuleInfVerbDistance.max_distance.v                            3.38
## 36 RuleTooManyNominalConstructions.max_noun_frac.v               3.29
## 37 RuleInfVerbDistance.max_distance                              3.29
## 38 RuleMultiPartVerbs.max_distance                               3.26
## 39 fre                                                           3.23
## 40 RuleMultiPartVerbs.max_distance.v                             3.18
## 41 RuleDoubleAdpos.max_allowable_distance.v                      3.13
## 42 RulePredObjDistance.max_distance.v                            3.07
## 43 RuleDoubleAdpos.max_allowable_distance                        2.85
## 44 hpoint                                                        2.57
```

Counts

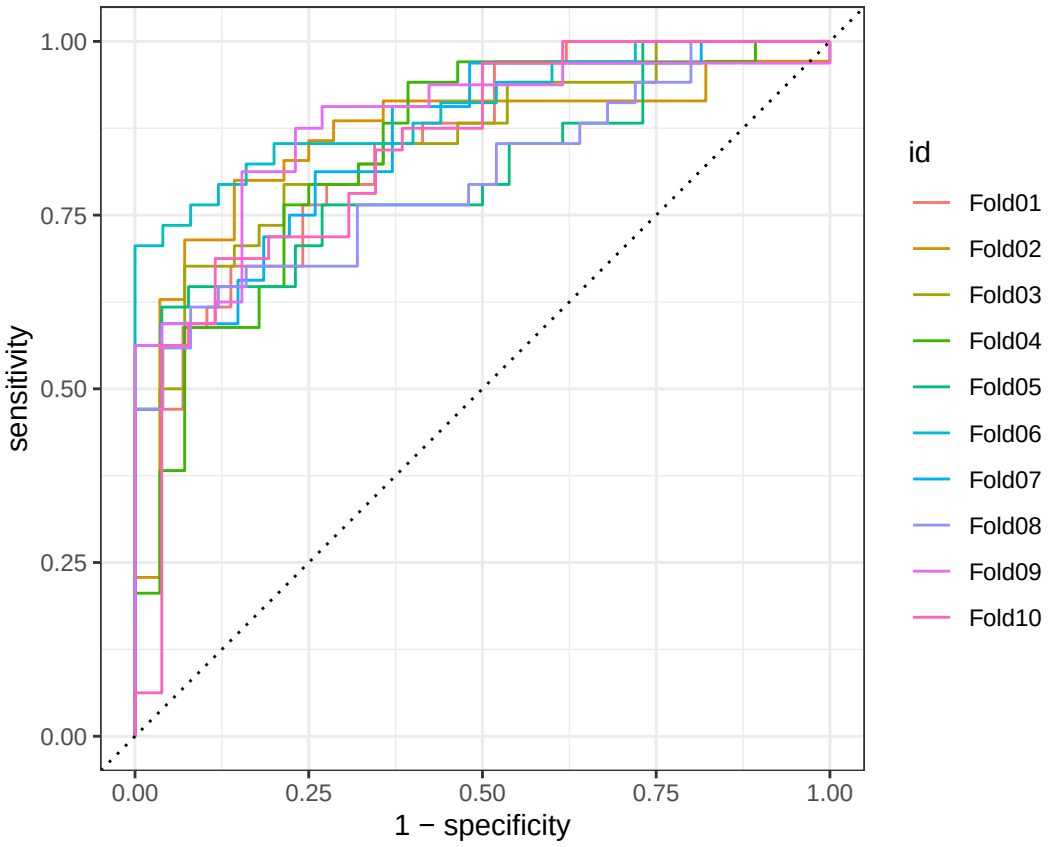
```
model_rf_counts <- train_random_forest(recipe_counts_nocorr, training_set, folds)
```

```
## RF workflow:
```

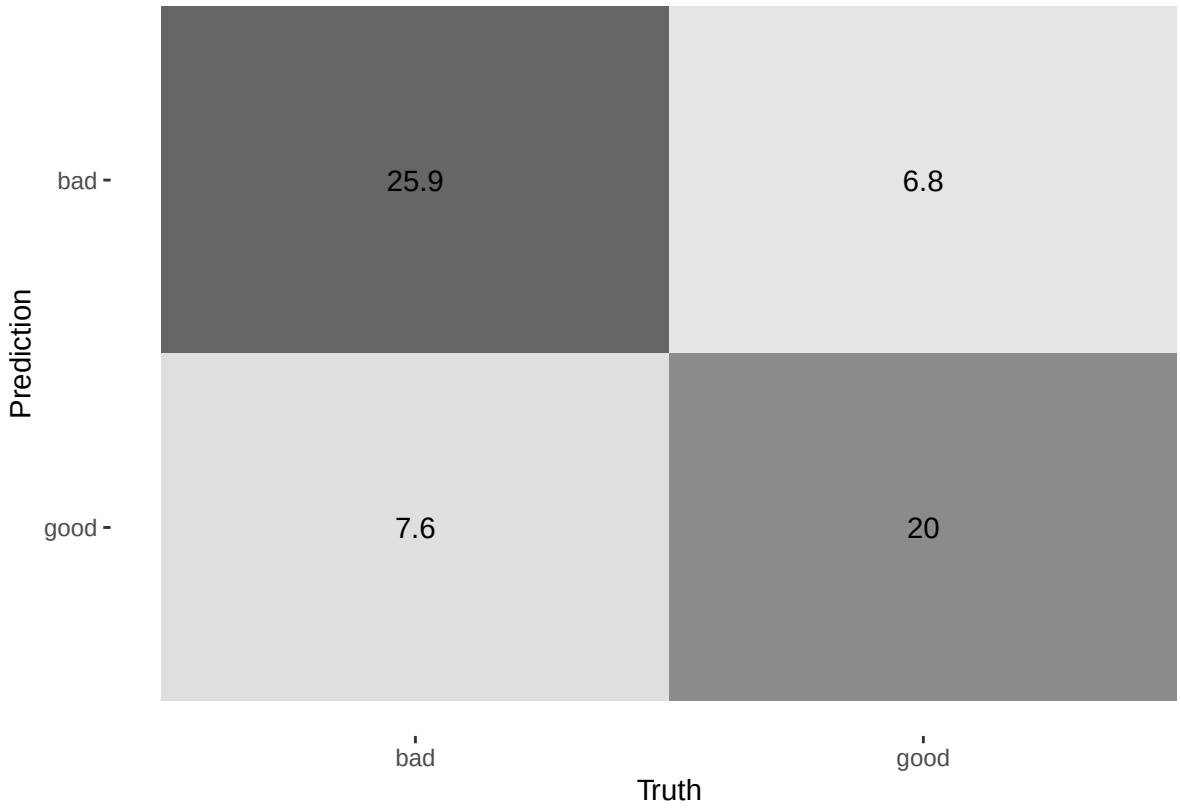
```
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Random Forest Model Specification (classification)
##
## Main Arguments:
##   trees = 1000
##
## Engine-Specific Arguments:
##   importance = impurity
##
## Computational engine: ranger
##
## RF metrics:
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n std_err .config
##   <chr>       <chr>      <dbl> <int>   <dbl> <chr>
## 1 accuracy    binary     0.761    10 0.0127  Preprocessor1_Model1
## 2 brier_class binary     0.159    10 0.00404 Preprocessor1_Model1
## 3 roc_auc     binary     0.852    10 0.00930 Preprocessor1_Model1
```



```
## [1] "\n"
```


1.00
0.75
0.50
0.25
0.00
sensitivity
0.00
0.25
0.50
0.75
1.00
1 − specificity
id
Fold01
Fold02
Fold03
Fold04
Fold05
Fold06
Fold07
Fold08
Fold09
Fold10

```
## [1] "\n"
```




```
## [1] "\n"
## # A tibble: 24 x 2
##    Variable                      Importance
##    <chr>                              <dbl>
##  1 RulePassive                         36.8
##  2 RuleMultiPartVerbs                  26.1
##  3 RuleLiteraryStyle                   24.3
##  4 RulePredSubjDistance                23.5
##  5 RuleInfVerbDistance                 18.6
##  6 RuleVerbalNouns                     13.7
##  7 num_hapax                           11.1
##  8 RuleAbstractNouns                   10.4
##  9 RuleTooLongExpressions               9.85
## 10 RulePredObjDistance                  9.66
## 11 RuleDoubleAdpos                      9.37
## 12 RuleGPwordorder                      8.94
## 13 RuleAnaphoricReferences              7.89
## 14 RuleWeakMeaningWords                 7.56
## 15 RuleReflexivePassWithAnimSubj        6.66
## 16 RuleGPdeverbsubj                     4.56
## 17 RuleGPpatinstr                       4.15
## 18 RuleGPdeverbaddr                     3.55
## 19 RuleGPcoordovs                       3.47
## 20 RuleRelativisticExpressions          2.82
## 21 RuleGPpatbenperson                   2.77
## 22 RuleConfirmationExpressions          2.16
## 23 RuleGPadjective                      0.887
## 24 RuleRedundantExpressions             0.506
```

Evaluations

Decision tree

All variables

```
evaluate_decision_tree(model_dt_all, evaluation_set)
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   61   18
##       good  19   53
##
##                Accuracy : 0.755
##                  95% CI : (0.6784, 0.8212)
##     No Information Rate : 0.5298
##     P-Value [Acc > NIR] : 1.014e-08
##
##                   Kappa : 0.5086
##
##  Mcnemar's Test P-Value : 1
##
##             Sensitivity : 0.7465
##             Specificity : 0.7625
##          Pos Pred Value : 0.7361
##          Neg Pred Value : 0.7722
##              Prevalence : 0.4702
##          Detection Rate : 0.3510
##    Detection Prevalence : 0.4768
##       Balanced Accuracy : 0.7545
##
##        'Positive' Class : good
##
```

No TL

```
evaluate_decision_tree(model_dt_notl, evaluation_set)
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   61   18
##       good  19   53
##
##                Accuracy : 0.755
##                  95% CI : (0.6784, 0.8212)
##     No Information Rate : 0.5298
##     P-Value [Acc > NIR] : 1.014e-08
##
##                   Kappa : 0.5086
##
##  Mcnemar's Test P-Value : 1
```

```
##
##             Sensitivity : 0.7465
##             Specificity : 0.7625
##          Pos Pred Value : 0.7361
##          Neg Pred Value : 0.7722
##              Prevalence : 0.4702
##          Detection Rate : 0.3510
##    Detection Prevalence : 0.4768
##       Balanced Accuracy : 0.7545
##
##        'Positive' Class : good
##
```

IAC

```
evaluate_decision_tree(model_dt_iac, evaluation_set)
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   56   19
##       good  24   52
##
##                Accuracy : 0.7152
##                  95% CI : (0.6362, 0.7856)
##     No Information Rate : 0.5298
##     P-Value [Acc > NIR] : 2.467e-06
##
##                   Kappa : 0.4307
##
##  Mcnemar's Test P-Value : 0.5419
##
##             Sensitivity : 0.7324
##             Specificity : 0.7000
##          Pos Pred Value : 0.6842
##          Neg Pred Value : 0.7467
##              Prevalence : 0.4702
##          Detection Rate : 0.3444
##    Detection Prevalence : 0.5033
##       Balanced Accuracy : 0.7162
##
##        'Positive' Class : good
##
```

Counts

```
evaluate_decision_tree(model_dt_counts, evaluation_set)
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   56   22
```

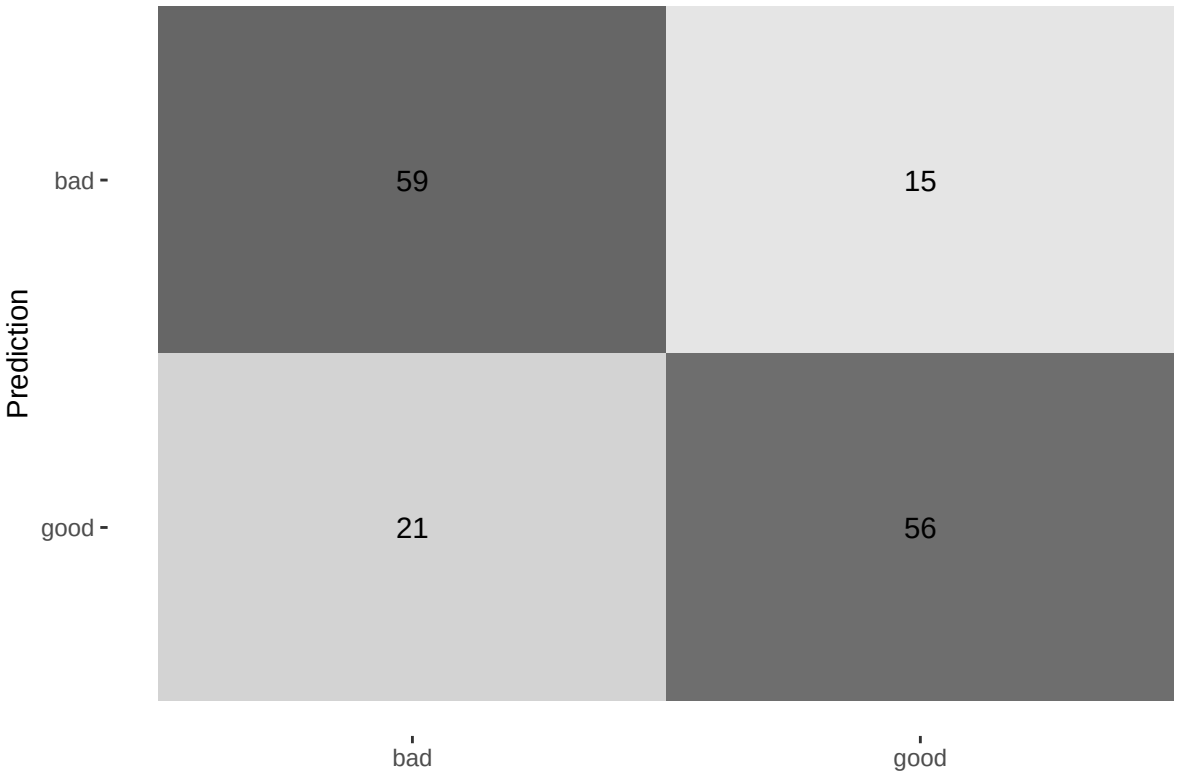
```
##       good  24   49
##
##                Accuracy : 0.6954
##                  95% CI : (0.6153, 0.7676)
##     No Information Rate : 0.5298
##     P-Value [Acc > NIR] : 2.505e-05
##
##                   Kappa : 0.3895
##
##  Mcnemar's Test P-Value : 0.8828
##
##             Sensitivity : 0.6901
##             Specificity : 0.7000
##          Pos Pred Value : 0.6712
##          Neg Pred Value : 0.7179
##              Prevalence : 0.4702
##          Detection Rate : 0.3245
##    Detection Prevalence : 0.4834
##       Balanced Accuracy : 0.6951
##
##        'Positive' Class : good
##
```

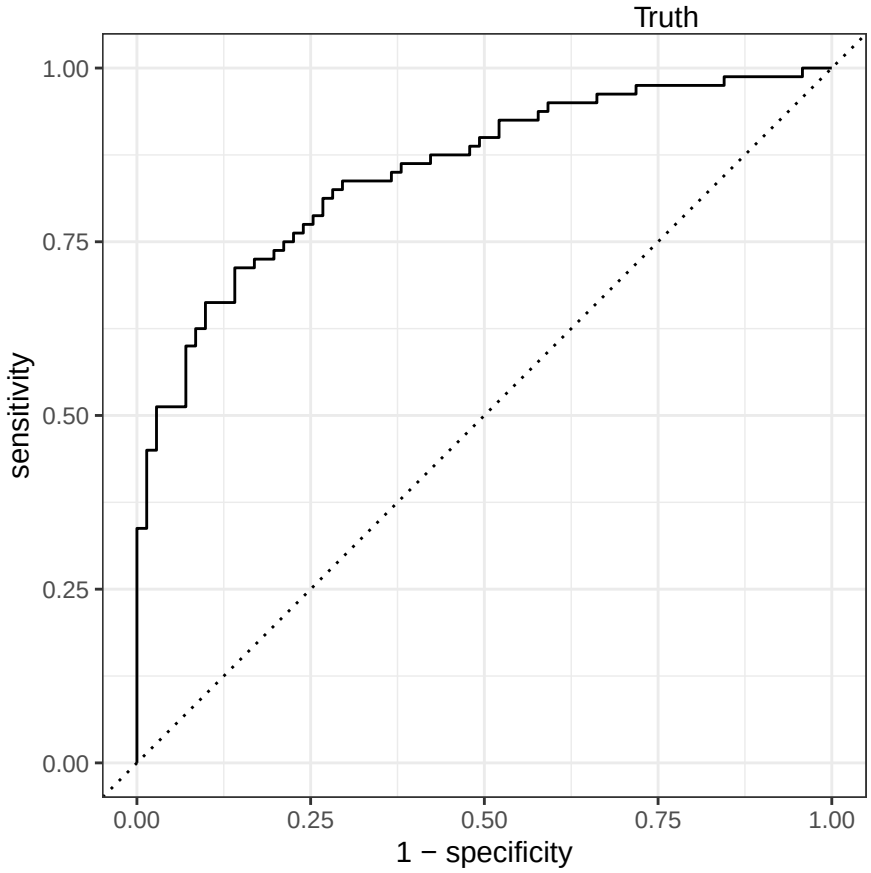
Lasso

All

```
lfit_lasso_all <- model_lasso_all %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.762 Preprocessor1_Model1
## 2 roc_auc     binary         0.853 Preprocessor1_Model1
## 3 brier_class binary         0.159 Preprocessor1_Model1
```



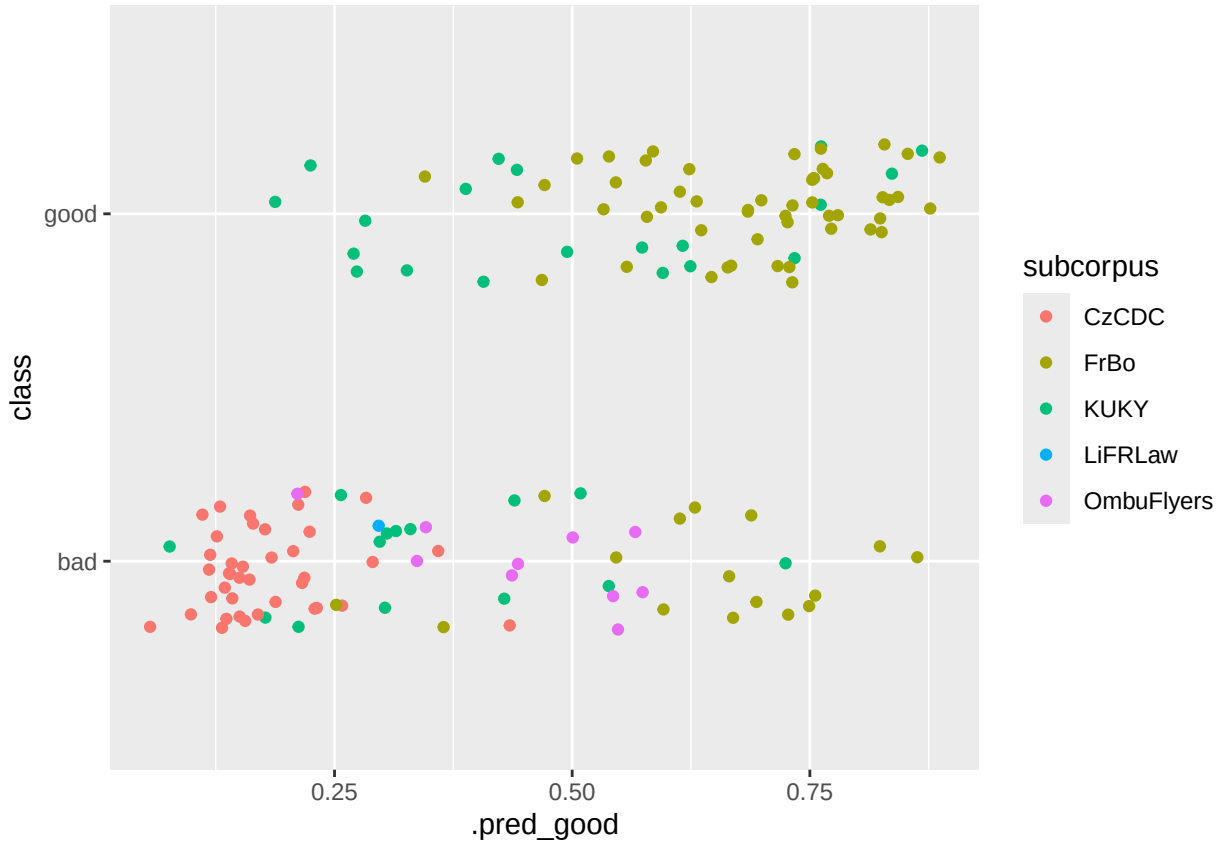



```
## Variable importance:
## # A tibble: 71 x 3
```

```
##    Variable                                              Importance Sign
##    <chr>                                                      <dbl> <chr>
##  1 activity                                                  0.541  POS
##  2 atl                                                       0.381  POS
##  3 RuleLiteraryStyle                                         0.267  NEG
##  4 smog                                                      0.182  NEG
##  5 RulePassive                                               0.173  NEG
##  6 maentropy                                                 0.162  NEG
##  7 entropy                                                   0.0937 NEG
##  8 RuleAnaphoricReferences                                   0.0539 POS
##  9 RuleGPcoordovs                                            0      NEG
## 10 RuleGPdeverbaddr                                          0      NEG
## 11 RuleGPpatinstr                                            0      NEG
## 12 RuleGPdeverbsubj                                          0      NEG
## 13 RuleGPadjective                                           0      NEG
## 14 RuleGPpatbenperson                                        0      NEG
## 15 RuleGPwordorder                                           0      NEG
## 16 RuleDoubleAdpos                                           0      NEG
## 17 RuleDoubleAdpos.max_allowable_distance                    0      NEG
## 18 RuleDoubleAdpos.max_allowable_distance.v                  0      NEG
## 19 RuleReflexivePassWithAnimSubj                             0      NEG
## 20 RuleTooFewVerbs.min_verb_frac                             0      NEG
## 21 RuleTooManyNegations.max_negation_frac                    0      NEG
## 22 RuleTooManyNegations.max_negation_frac.v                  0      NEG
## 23 RuleTooManyNegations.max_allowable_negations              0      NEG
## 24 RuleTooManyNegations.max_allowable_negations.v            0      NEG
## 25 RuleTooManyNominalConstructions.max_noun_frac             0      NEG
## 26 RuleTooManyNominalConstructions.max_noun_frac.v           0      NEG
## 27 RuleTooManyNominalConstructions.max_allowable_nouns       0      NEG
## 28 RuleCaseRepetition.max_repetition_count                   0      NEG
## 29 RuleCaseRepetition.max_repetition_count.v                 0      NEG
## 30 RuleCaseRepetition.max_repetition_frac                    0      NEG
## 31 RuleCaseRepetition.max_repetition_frac.v                  0      NEG
## 32 RuleWeakMeaningWords                                      0      NEG
## 33 RuleAbstractNouns                                         0      NEG
## 34 RuleRelativisticExpressions                               0      NEG
## 35 RuleConfirmationExpressions                               0      NEG
## 36 RuleRedundantExpressions                                  0      NEG
## 37 RuleTooLongExpressions                                    0      NEG
## 38 RulePredSubjDistance                                      0      NEG
## 39 RulePredSubjDistance.max_distance                         0      NEG
## 40 RulePredSubjDistance.max_distance.v                       0      NEG
## 41 RulePredObjDistance                                       0      NEG
## 42 RulePredObjDistance.max_distance                          0      NEG
## 43 RulePredObjDistance.max_distance.v                        0      NEG
## 44 RuleInfVerbDistance                                       0      NEG
## 45 RuleInfVerbDistance.max_distance                          0      NEG
## 46 RuleInfVerbDistance.max_distance.v                        0      NEG
## 47 RuleMultiPartVerbs                                        0      NEG
## 48 RuleMultiPartVerbs.max_distance                           0      NEG
## 49 RuleMultiPartVerbs.max_distance.v                         0      NEG
## 50 RuleLongSentences.max_length                              0      NEG
## 51 RuleLongSentences.max_length.v                            0      NEG
## 52 RulePredAtClauseBeginning.max_order                       0      NEG
```

```
## 53 RulePredAtClauseBeginning.max_order.v                    0       NEG
## 54 RuleVerbalNouns                                          0       NEG
## 55 sent_count                                               0       NEG
## 56 word_count                                               0       NEG
## 57 syllab_count                                             0       NEG
## 58 char_count                                               0       NEG
## 59 cli                                                      0       NEG
## 60 ari                                                      0       NEG
## 61 num_hapax                                                0       NEG
## 62 ttr                                                      0       NEG
## 63 mattr                                                    0       NEG
## 64 mattr.v                                                  0       NEG
## 65 maentropy.v                                              0       NEG
## 66 mamr                                                     0       NEG
## 67 verb_dist                                                0       NEG
## 68 hpoint                                                   0       NEG
## 69 fre                                                      0       NEG
## 70 fkgl                                                     0       NEG
## 71 gf                                                       0       NEG
```

```
lfit_lasso_all %>% get_mismatch_details(data)
```




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##             class
## .pred_class bad good
##        bad   39    0
```

```
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    3    4
##        good  13   47
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   11   11
##        good   3    9
##
## , , subcorpus = LiFRLaw
##
##            class
## .pred_class bad good
##        bad    1    0
##        good   0    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    5    0
##        good   5    0
##
##
## Greatest deviations:
## # A tibble: 36 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.363  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  2        0.324  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  3        0.312  bad         good  KUKY       Mestsky_urad_usneseni_-_slouceni_~
##  4        0.275  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
##  5        0.256  good        bad   FrBo       orig_Jak namítat podjatost_final
##  6        0.249  good        bad   FrBo       orig_Kterých řízení se může váš s~
##  7        0.230  bad         good  KUKY       Reakce_na_dopis_pracovni
##  8        0.227  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
##  9        0.227  bad         good  KUKY       1A_dokument_puvodni_ustanoven_zas~
## 10        0.225  good        bad   KUKY       016_Obcane-EU
## 11        0.218  bad         good  KUKY       33 Cdo 30_2024
## 12        0.194  good        bad   FrBo       64
## 13        0.188  good        bad   FrBo       orig_Jak probíhá správní řízení
## 14        0.174  bad         good  KUKY       11_vizum_pred
## 15        0.169  good        bad   FrBo       149
## 16        0.165  good        bad   FrBo       orig_Jak zajistit měření hluku
## 17        0.155  bad         good  FrBo       red_Certifikáty autorizovaných in~
## 18        0.129  good        bad   FrBo       153
## 19        0.113  good        bad   FrBo       orig_financovani_politickych_stran
```

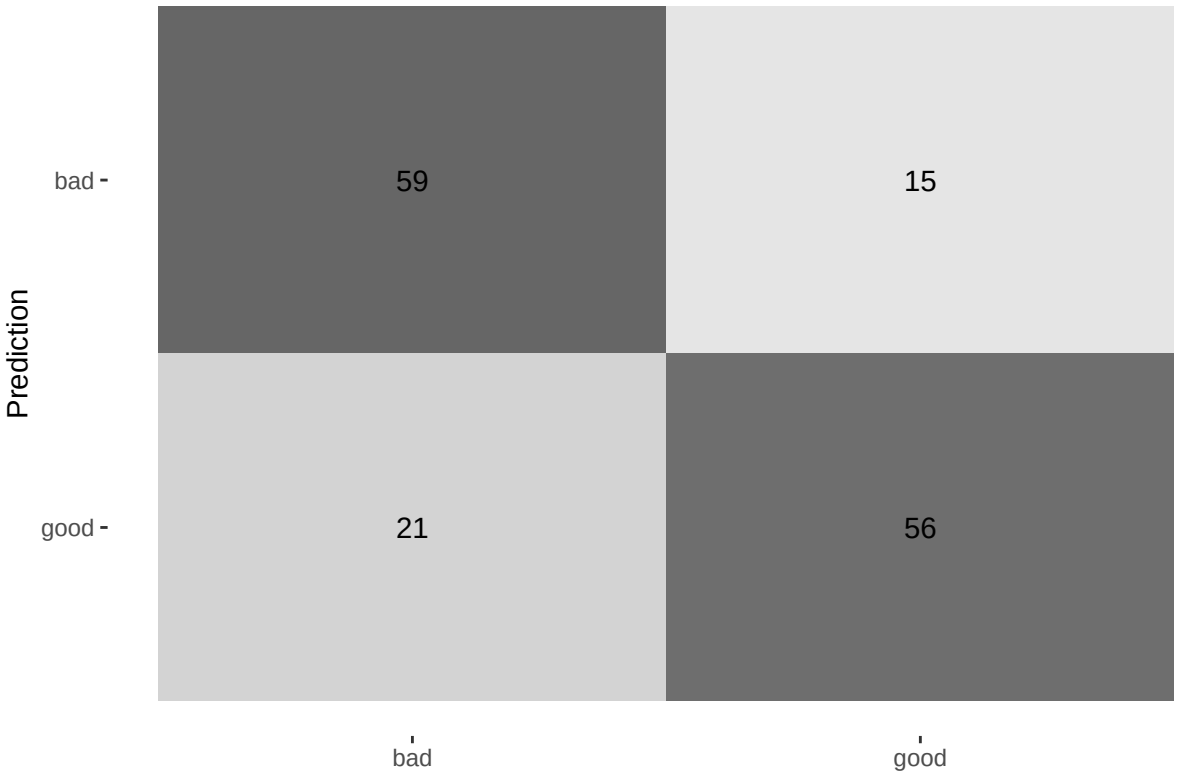
```
## 20        0.112  bad         good  KUKY       857_2024_VOP
## 21        0.0960 good        bad   FrBo       142
## 22        0.0933 bad         good  KUKY       Reakce_na_dopis_rev
## 23        0.0774 bad         good  KUKY       Mestsky_urad_Vyzva_k_zaplaceni_na~
## 24        0.0741 good        bad   OmbuFlyers Soudni-poplatky
## 25        0.0664 good        bad   OmbuFlyers Studny
## 26        0.0581 bad         good  KUKY       6421_2023_VOP
## 27        0.0573 bad         good  FrBo       red_závazná stanoviska_aktualizov~
## 28        0.0482 good        bad   OmbuFlyers Spolecenstvi-vlastniku
## 29        0.0463 good        bad   FrBo       orig_Pozemkové úpravy_pracovní ve~
## 30        0.0430 good        bad   OmbuFlyers Sikana-na-pracovisti
## # i 6 more rows
## Highest-deviating documents names:
## [1] "orig_Jak uspořádat shromáždění"
## [2] "orig_Zastupitelstvo_o čem a jak rozhoduje"
## [3] "Mestsky_urad_usneseni_-_slouceni_pred"
## [4] "2A_dokument_puvodni_vyzva_k_zaplaceni_SOP_a_k_doplneni_kast_pouceni"
## [5] "orig_Jak namítat podjatost_final"
```

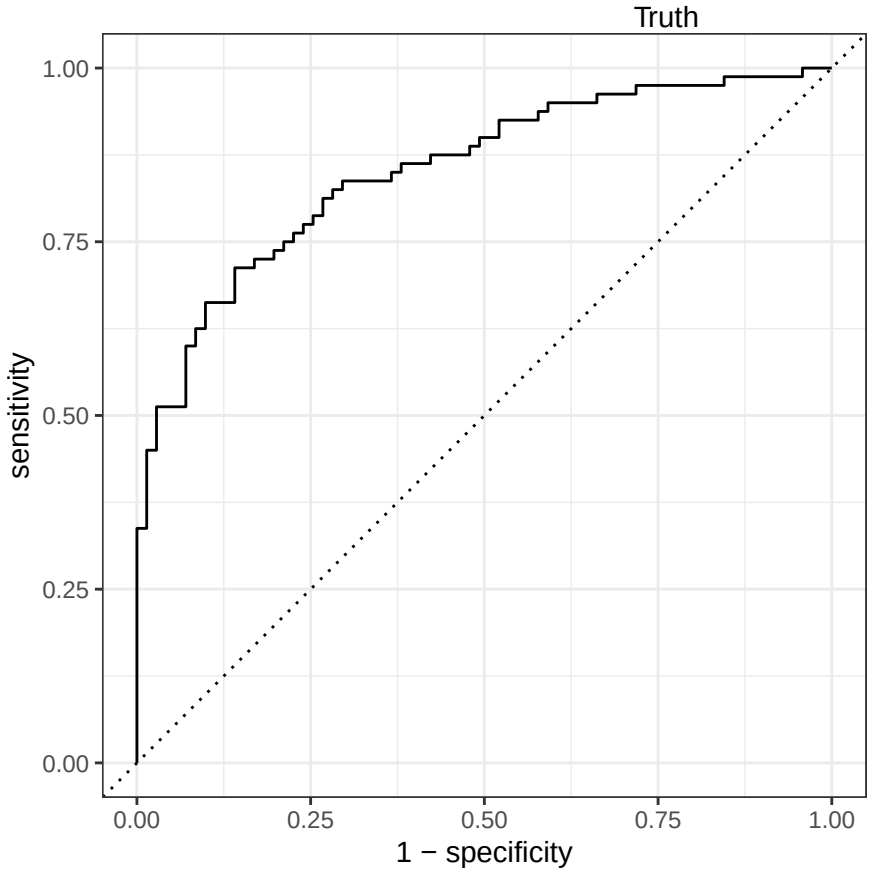
```
# lfit_lasso_all %>%
#   lasso_get_coefficients() %>%
#   print(n = 100)
```

No TL

```
lfit_lasso_notl <- model_lasso_notl %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.762 Preprocessor1_Model1
## 2 roc_auc     binary         0.853 Preprocessor1_Model1
## 3 brier_class binary         0.159 Preprocessor1_Model1
```



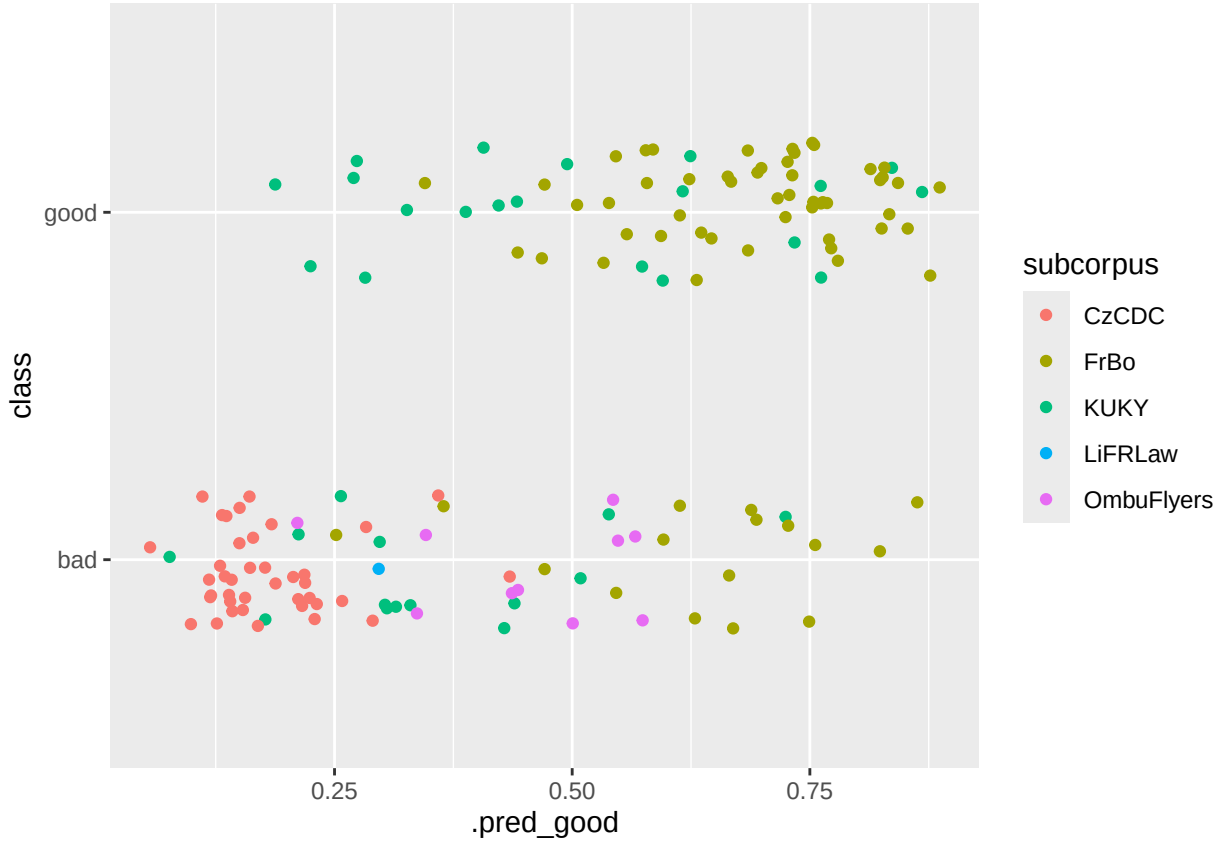



```
## Variable importance:
## # A tibble: 67 x 3
```

```
##    Variable                                              Importance Sign
##    <chr>                                                      <dbl> <chr>
##  1 activity                                                 0.541  POS
##  2 atl                                                      0.381  POS
##  3 RuleLiteraryStyle                                        0.267  NEG
##  4 smog                                                     0.182  NEG
##  5 RulePassive                                              0.173  NEG
##  6 maentropy                                                0.162  NEG
##  7 entropy                                                  0.0937 NEG
##  8 RuleAnaphoricReferences                                  0.0539 POS
##  9 RuleGPcoordovs                                           0      NEG
## 10 RuleGPdeverbaddr                                         0      NEG
## 11 RuleGPpatinstr                                           0      NEG
## 12 RuleGPdeverbsubj                                         0      NEG
## 13 RuleGPadjective                                          0      NEG
## 14 RuleGPpatbenperson                                       0      NEG
## 15 RuleGPwordorder                                          0      NEG
## 16 RuleDoubleAdpos                                          0      NEG
## 17 RuleDoubleAdpos.max_allowable_distance                   0      NEG
## 18 RuleDoubleAdpos.max_allowable_distance.v                 0      NEG
## 19 RuleReflexivePassWithAnimSubj                            0      NEG
## 20 RuleTooFewVerbs.min_verb_frac                            0      NEG
## 21 RuleTooManyNegations.max_negation_frac                   0      NEG
## 22 RuleTooManyNegations.max_negation_frac.v                 0      NEG
## 23 RuleTooManyNegations.max_allowable_negations             0      NEG
## 24 RuleTooManyNegations.max_allowable_negations.v           0      NEG
## 25 RuleTooManyNominalConstructions.max_noun_frac            0      NEG
## 26 RuleTooManyNominalConstructions.max_noun_frac.v          0      NEG
## 27 RuleTooManyNominalConstructions.max_allowable_nouns      0      NEG
## 28 RuleCaseRepetition.max_repetition_count                  0      NEG
## 29 RuleCaseRepetition.max_repetition_count.v                0      NEG
## 30 RuleCaseRepetition.max_repetition_frac                   0      NEG
## 31 RuleCaseRepetition.max_repetition_frac.v                 0      NEG
## 32 RuleWeakMeaningWords                                     0      NEG
## 33 RuleAbstractNouns                                        0      NEG
## 34 RuleRelativisticExpressions                              0      NEG
## 35 RuleConfirmationExpressions                              0      NEG
## 36 RuleRedundantExpressions                                 0      NEG
## 37 RuleTooLongExpressions                                   0      NEG
## 38 RulePredSubjDistance                                     0      NEG
## 39 RulePredSubjDistance.max_distance                        0      NEG
## 40 RulePredSubjDistance.max_distance.v                      0      NEG
## 41 RulePredObjDistance                                      0      NEG
## 42 RulePredObjDistance.max_distance                         0      NEG
## 43 RulePredObjDistance.max_distance.v                       0      NEG
## 44 RuleInfVerbDistance                                      0      NEG
## 45 RuleInfVerbDistance.max_distance                         0      NEG
## 46 RuleInfVerbDistance.max_distance.v                       0      NEG
## 47 RuleMultiPartVerbs                                       0      NEG
## 48 RuleMultiPartVerbs.max_distance                          0      NEG
## 49 RuleMultiPartVerbs.max_distance.v                        0      NEG
## 50 RuleLongSentences.max_length                             0      NEG
## 51 RuleLongSentences.max_length.v                           0      NEG
## 52 RulePredAtClauseBeginning.max_order                      0      NEG
```

```
## 53 RulePredAtClauseBeginning.max_order.v                0       NEG
## 54 RuleVerbalNouns                                      0       NEG
## 55 cli                                                  0       NEG
## 56 ari                                                  0       NEG
## 57 num_hapax                                            0       NEG
## 58 ttr                                                  0       NEG
## 59 mattr                                                0       NEG
## 60 mattr.v                                              0       NEG
## 61 maentropy.v                                          0       NEG
## 62 mamr                                                 0       NEG
## 63 verb_dist                                            0       NEG
## 64 hpoint                                               0       NEG
## 65 fre                                                  0       NEG
## 66 fkgl                                                 0       NEG
## 67 gf                                                   0       NEG
```

```
lfit_lasso_notl %>% get_mismatch_details(data)
```




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##             class
## .pred_class bad good
##        bad   39    0
##        good   0    0
##
## , , subcorpus = FrBo
##
```

```
##            class
## .pred_class bad good
##        bad    3    4
##        good  13   47
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   11   11
##        good   3    9
##
## , , subcorpus = LiFRLaw
##
##            class
## .pred_class bad good
##        bad    1    0
##        good   0    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    5    0
##        good   5    0
##
##
## Greatest deviations:
## # A tibble: 36 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.363  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  2        0.324  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  3        0.312  bad         good  KUKY       Mestsky_urad_usneseni_-_slouceni_~
##  4        0.275  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
##  5        0.256  good        bad   FrBo       orig_Jak namítat podjatost_final
##  6        0.249  good        bad   FrBo       orig_Kterých řízení se může váš s~
##  7        0.230  bad         good  KUKY       Reakce_na_dopis_pracovni
##  8        0.227  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
##  9        0.227  bad         good  KUKY       1A_dokument_puvodni_ustanoven_zas~
## 10        0.225  good        bad   KUKY       016_Obcane-EU
## 11        0.218  bad         good  KUKY       33 Cdo 30_2024
## 12        0.194  good        bad   FrBo       64
## 13        0.188  good        bad   FrBo       orig_Jak probíhá správní řízení
## 14        0.174  bad         good  KUKY       11_vizum_pred
## 15        0.169  good        bad   FrBo       149
## 16        0.165  good        bad   FrBo       orig_Jak zajistit měření hluku
## 17        0.155  bad         good  FrBo       red_Certifikáty autorizovaných in~
## 18        0.129  good        bad   FrBo       153
## 19        0.113  good        bad   FrBo       orig_financovani_politickych_stran
## 20        0.112  bad         good  KUKY       857_2024_VOP
## 21        0.0960 good        bad   FrBo       142
## 22        0.0933 bad         good  KUKY       Reakce_na_dopis_rev
## 23        0.0774 bad         good  KUKY       Mestsky_urad_Vyzva_k_zaplaceni_na~
```

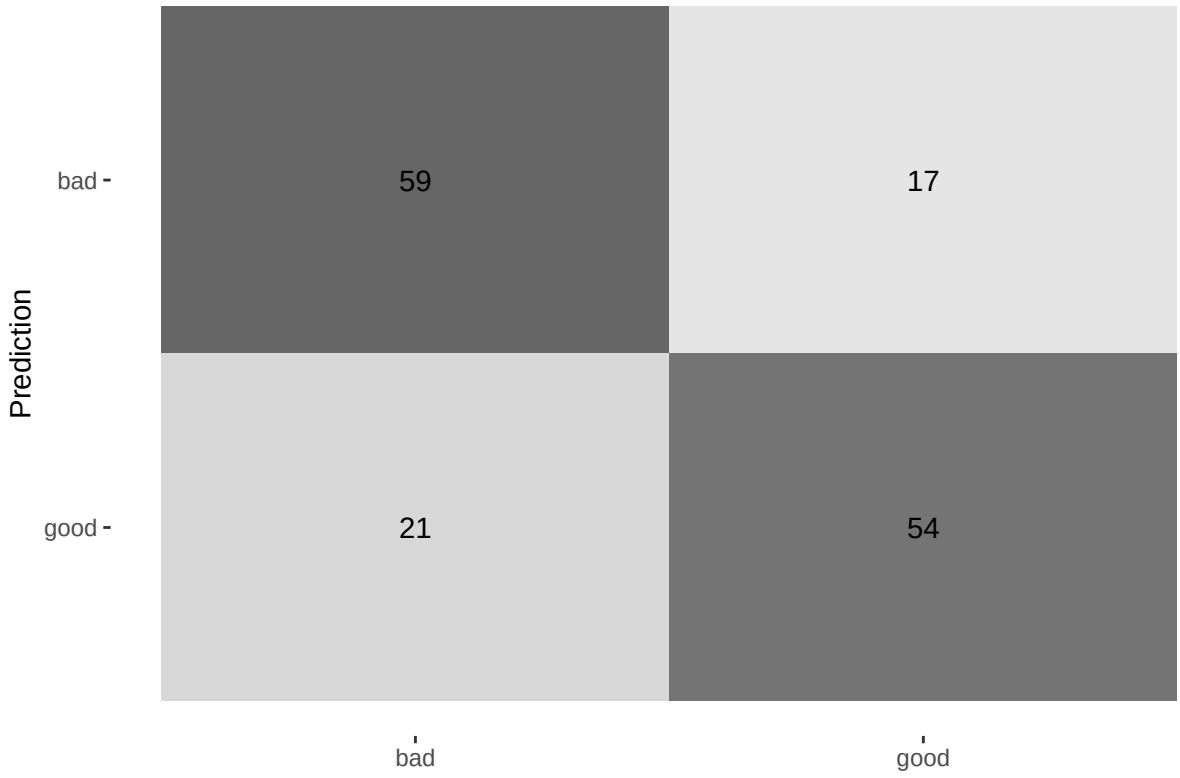
```
## 24        0.0741 good        bad   OmbuFlyers Soudni-poplatky
## 25        0.0664 good        bad   OmbuFlyers Studny
## 26        0.0581 bad         good  KUKY       6421_2023_VOP
## 27        0.0573 bad         good  FrBo       red_závazná stanoviska_aktualizov~
## 28        0.0482 good        bad   OmbuFlyers Spolecenstvi-vlastniku
## 29        0.0463 good        bad   FrBo       orig_Pozemkové úpravy_pracovní ve~
## 30        0.0430 good        bad   OmbuFlyers Sikana-na-pracovisti
## # i 6 more rows
## Highest-deviating documents names:
## [1] "orig_Jak uspořádat shromáždění"
## [2] "orig_Zastupitelstvo_o čem a jak rozhoduje"
## [3] "Mestsky_urad_usneseni_-_slouceni_pred"
## [4] "2A_dokument_puvodni_vyzva_k_zaplaceni_SOP_a_k_doplneni_kast_pouceni"
## [5] "orig_Jak namítat podjatost_final"
```

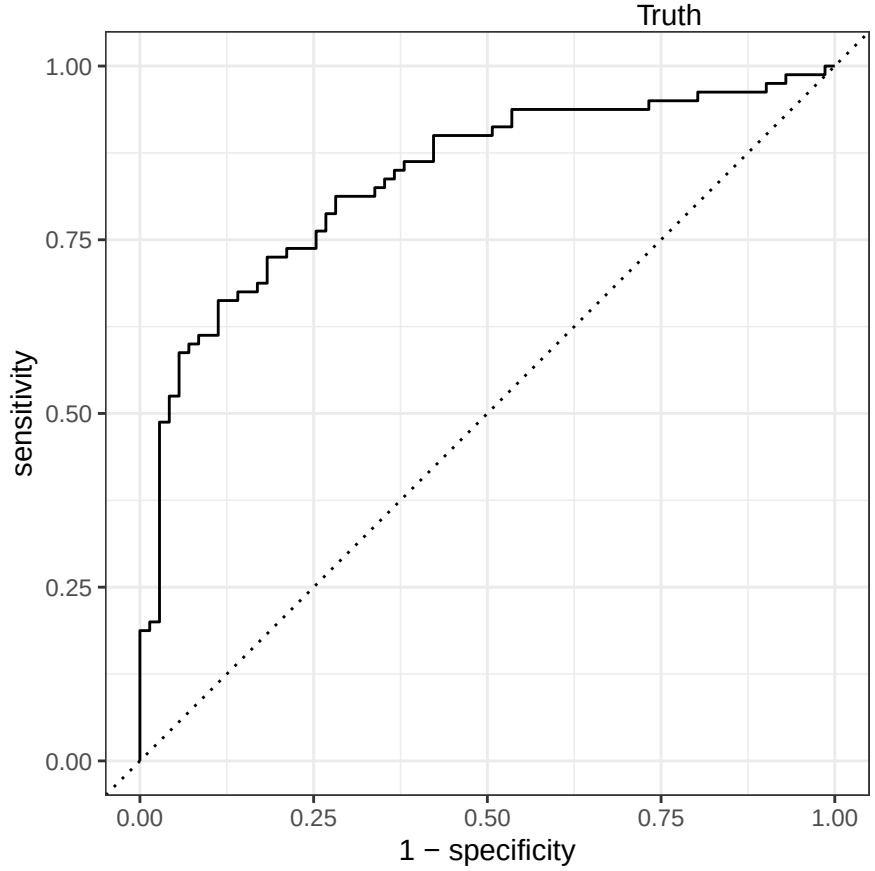
```
# lfit_lasso_notl %>%
#   lasso_get_coefficients() %>%
#   print(n = 100)
```

IAC

```
lfit_lasso_iac <- model_lasso_iac %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.748 Preprocessor1_Model1
## 2 roc_auc     binary         0.838 Preprocessor1_Model1
## 3 brier_class binary         0.167 Preprocessor1_Model1
```

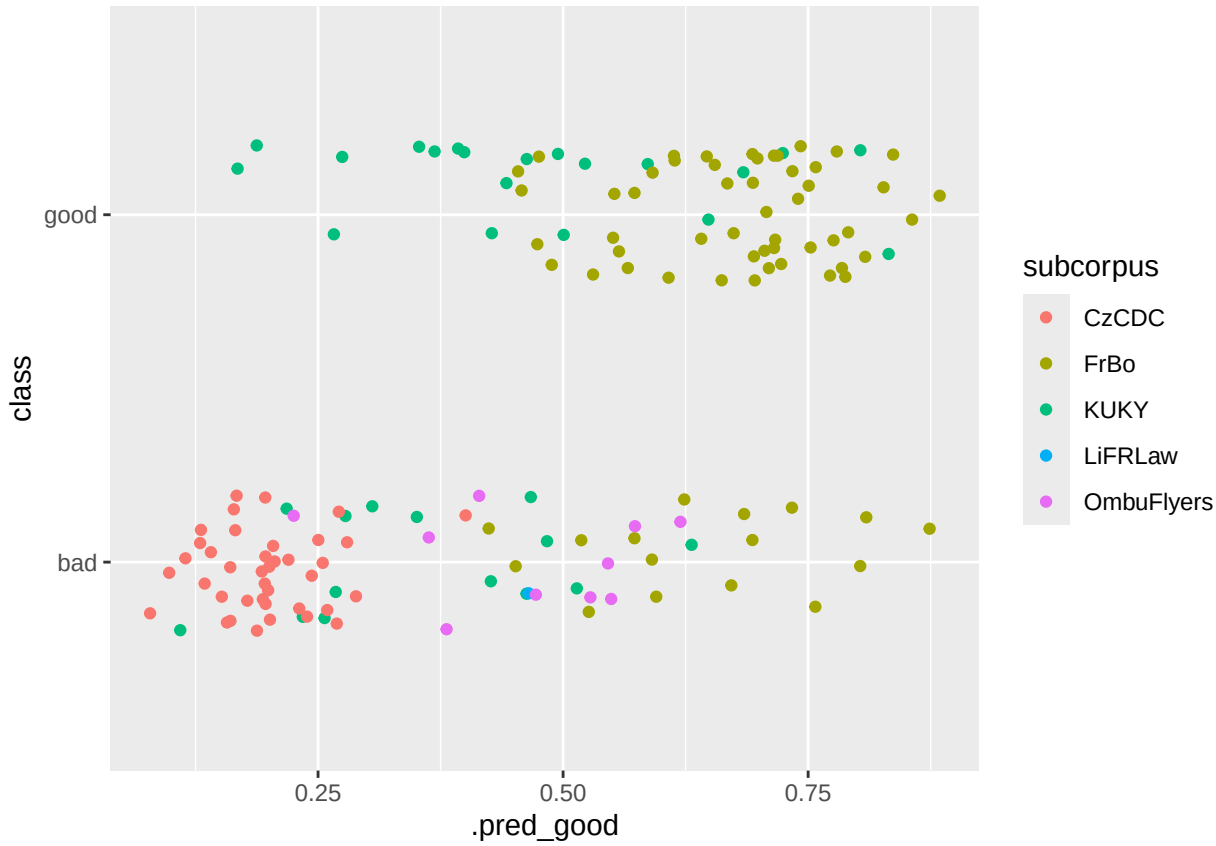





```
## Variable importance:
## # A tibble: 44 x 3
```

```
##    Variable                                                Importance Sign
##    <chr>                                                        <dbl> <chr>
##  1 activity                                                  5.25     POS
##  2 maentropy                                                 1.41     NEG
##  3 atl                                                       1.03     POS
##  4 RuleTooManyNegations.max_allowable_negations.v            0.345    NEG
##  5 entropy                                                   0.258    NEG
##  6 smog                                                      0.111    NEG
##  7 RuleTooManyNominalConstructions.max_allowable_nouns.v     0.0104   NEG
##  8 gf                                                        0.000136 NEG
##  9 RuleDoubleAdpos.max_allowable_distance                    0        NEG
## 10 RuleDoubleAdpos.max_allowable_distance.v                  0        NEG
## 11 RuleTooFewVerbs.min_verb_frac                             0        NEG
## 12 RuleTooManyNegations.max_negation_frac                    0        NEG
## 13 RuleTooManyNegations.max_negation_frac.v                  0        NEG
## 14 RuleTooManyNegations.max_allowable_negations              0        NEG
## 15 RuleTooManyNominalConstructions.max_noun_frac             0        NEG
## 16 RuleTooManyNominalConstructions.max_noun_frac.v           0        NEG
## 17 RuleTooManyNominalConstructions.max_allowable_nouns       0        NEG
## 18 RuleCaseRepetition.max_repetition_count                   0        NEG
## 19 RuleCaseRepetition.max_repetition_count.v                 0        NEG
## 20 RuleCaseRepetition.max_repetition_frac                    0        NEG
## 21 RuleCaseRepetition.max_repetition_frac.v                  0        NEG
## 22 RulePredSubjDistance.max_distance                        0        NEG
## 23 RulePredSubjDistance.max_distance.v                      0        NEG
## 24 RulePredObjDistance.max_distance                         0        NEG
## 25 RulePredObjDistance.max_distance.v                       0        NEG
## 26 RuleInfVerbDistance.max_distance                         0        NEG
## 27 RuleInfVerbDistance.max_distance.v                       0        NEG
## 28 RuleMultiPartVerbs.max_distance                          0        NEG
## 29 RuleMultiPartVerbs.max_distance.v                        0        NEG
## 30 RuleLongSentences.max_length                             0        NEG
## 31 RuleLongSentences.max_length.v                           0        NEG
## 32 RulePredAtClauseBeginning.max_order                      0        NEG
## 33 RulePredAtClauseBeginning.max_order.v                    0        NEG
## 34 cli                                                      0        NEG
## 35 ari                                                      0        NEG
## 36 ttr                                                      0        NEG
## 37 mattr                                                    0        NEG
## 38 mattr.v                                                  0        NEG
## 39 maentropy.v                                              0        NEG
## 40 mamr                                                     0        NEG
## 41 verb_dist                                                0        NEG
## 42 hpoint                                                   0        NEG
## 43 fre                                                      0        NEG
## 44 fkgl                                                     0        NEG
```

```
lfit_lasso_iac %>% get_mismatch_details(data)
```




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   39    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    2    5
##        good  14   46
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   12   12
##        good   2    8
##
## , , subcorpus = LiFRLaw
##
##            class
## .pred_class bad good
##        bad    1    0
```

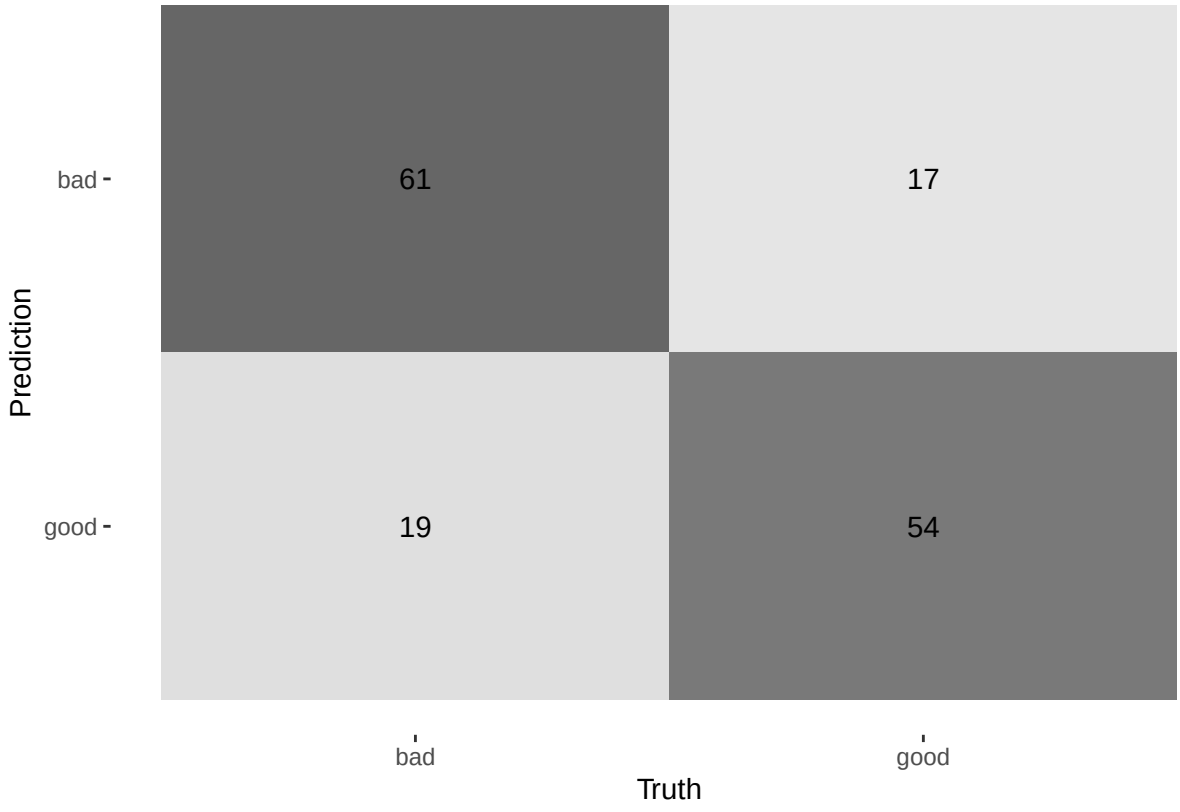
```
##        good   0    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    5    0
##        good   5    0
##
##
## Greatest deviations:
## # A tibble: 38 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.374  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  2        0.332  bad         good  KUKY       Mestsky_urad_usneseni_-_slouceni_~
##  3        0.313  bad         good  KUKY       Mestsky_urad_Vyzva_k_zaplaceni_na~
##  4        0.309  good        bad   FrBo       orig_Jak namítat podjatost_final
##  5        0.303  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  6        0.257  good        bad   FrBo       orig_Jak probíhá správní řízení
##  7        0.234  bad         good  KUKY       33 Cdo 30_2024
##  8        0.234  good        bad   FrBo       orig_Kterých řízení se může váš s~
##  9        0.225  bad         good  KUKY       11_vizum_pred
## 10        0.193  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
## 11        0.185  good        bad   FrBo       64
## 12        0.172  good        bad   FrBo       orig_Jak zajistit měření hluku
## 13        0.147  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
## 14        0.131  good        bad   KUKY       016_Obcane-EU
## 15        0.131  bad         good  KUKY       1A_dokument_puvodni_ustanoven_zas~
## 16        0.124  good        bad   FrBo       153
## 17        0.120  good        bad   OmbuFlyers Soudni-poplatky
## 18        0.107  bad         good  KUKY       Reakce_na_dopis_pracovni
## 19        0.101  bad         good  KUKY       857_2024_VOP
## 20        0.0951 good        bad   FrBo       149
## 21        0.0907 good        bad   FrBo       142
## 22        0.0733 good        bad   OmbuFlyers Spolecenstvi-vlastniku
## 23        0.0728 good        bad   FrBo       orig_Pozemkové úpravy_pracovní ve~
## 24        0.0727 bad         good  KUKY       6421_2023_VOP
## 25        0.0578 bad         good  KUKY       6525_2022_VOP
## 26        0.0491 good        bad   OmbuFlyers Studny
## 27        0.0459 bad         good  FrBo       1
## 28        0.0458 good        bad   OmbuFlyers Sikana-na-pracovisti
## 29        0.0423 bad         good  FrBo       orig_Soustavné obtěžování hlukem ~
## 30        0.0370 bad         good  KUKY       KVOP_19_Stavarska_zprava_JSm
## # i 8 more rows
## Highest-deviating documents names:
## [1] "orig_Jak uspořádat shromáždění"
## [2] "Mestsky_urad_usneseni_-_slouceni_pred"
## [3] "Mestsky_urad_Vyzva_k_zaplaceni_nakladu_rizeni_pred"
## [4] "orig_Jak namítat podjatost_final"
## [5] "orig_Zastupitelstvo_o čem a jak rozhoduje"
## [6] "orig_Jak probíhá správní řízení"
```

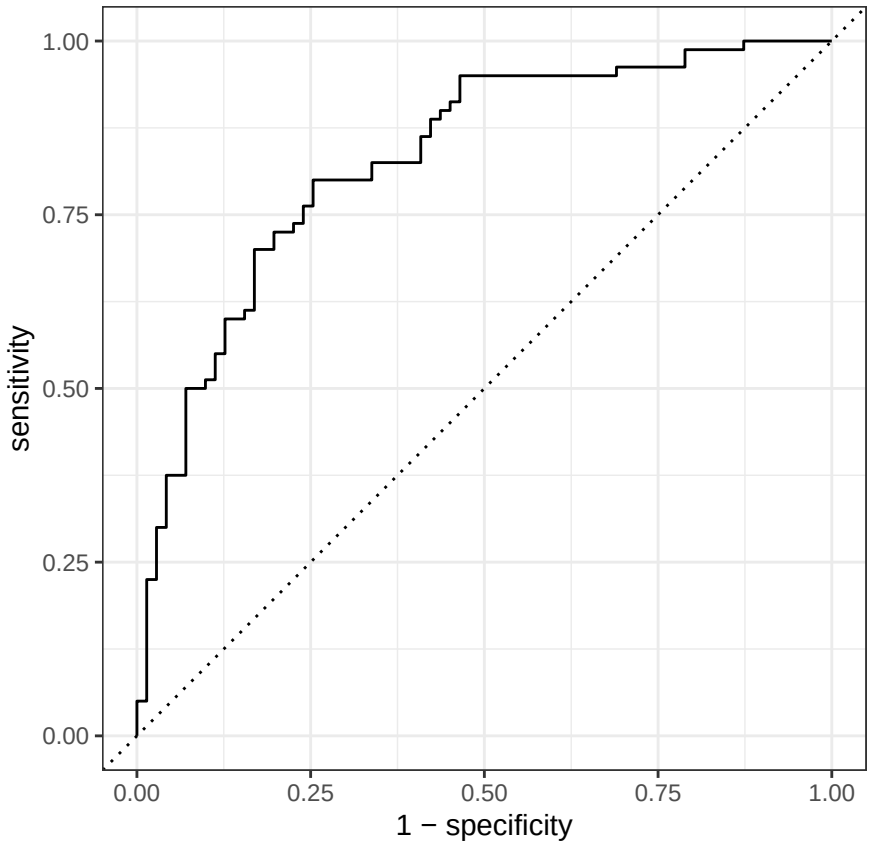
```
# lfit_lasso_iac %>%
#   lasso_get_coefficients() %>%
#   print(n = 100)
```

Counts

```
lfit_lasso_counts <- model_lasso_counts %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.762 Preprocessor1_Model1
## 2 roc_auc     binary         0.830 Preprocessor1_Model1
## 3 brier_class binary         0.173 Preprocessor1_Model1
```

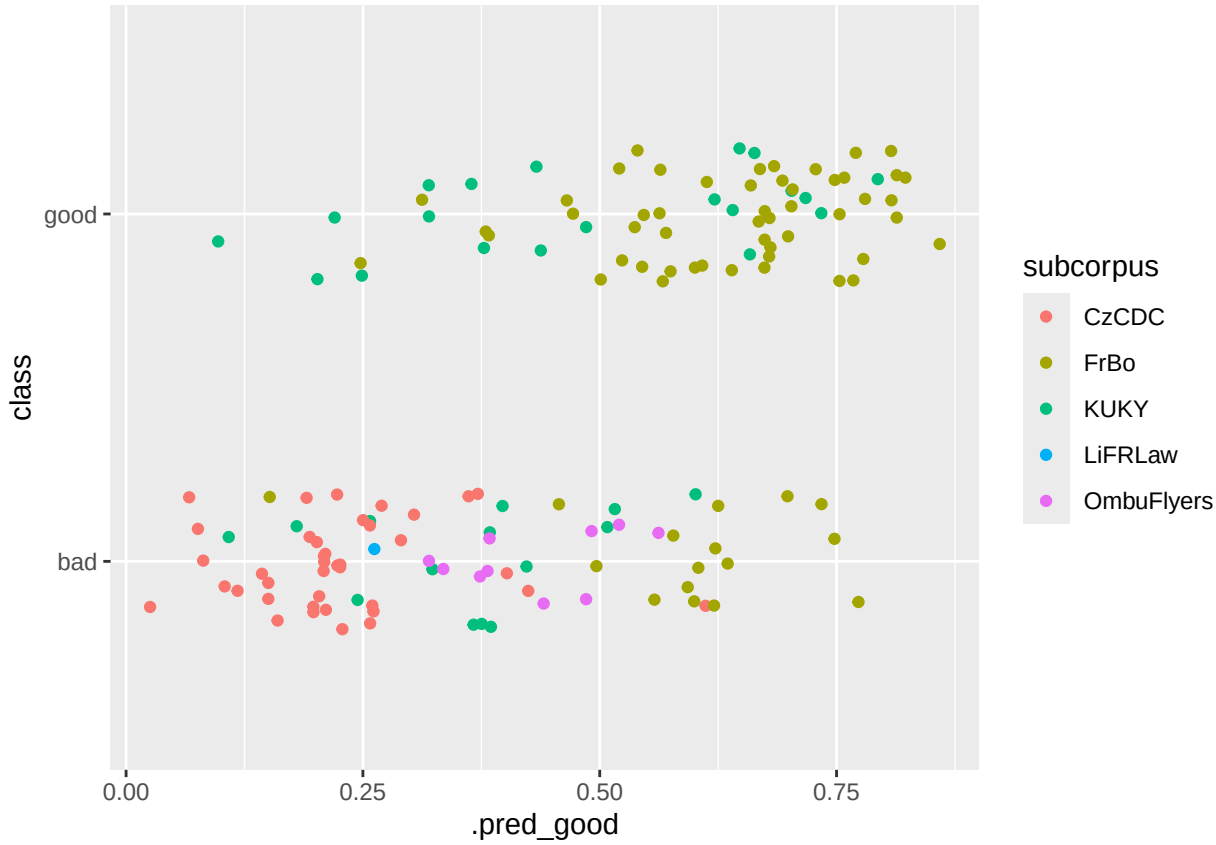





```
## Variable importance:
## # A tibble: 24 x 3
##    Variable                       Importance Sign
##    <chr>                               <dbl> <chr>
##  1 RuleRelativisticExpressions       140.    NEG
##  2 RulePassive                       122.    NEG
##  3 RuleLiteraryStyle                 102.    NEG
##  4 RuleAnaphoricReferences            39.8   POS
##  5 RuleMultiPartVerbs                 24.0   POS
##  6 RulePredSubjDistance               14.6   POS
##  7 RuleVerbalNouns                     5.24  POS
##  8 RuleInfVerbDistance                 1.02  POS
##  9 RuleGPcoordovs                      0     NEG
## 10 RuleGPdeverbaddr                    0     NEG
## 11 RuleGPpatinstr                      0     NEG
## 12 RuleGPdeverbsubj                    0     NEG
## 13 RuleGPadjective                     0     NEG
## 14 RuleGPpatbenperson                  0     NEG
## 15 RuleGPwordorder                     0     NEG
## 16 RuleDoubleAdpos                     0     NEG
## 17 RuleReflexivePassWithAnimSubj       0     NEG
## 18 RuleWeakMeaningWords                0     NEG
## 19 RuleAbstractNouns                   0     NEG
## 20 RuleConfirmationExpressions         0     NEG
## 21 RuleRedundantExpressions            0     NEG
## 22 RuleTooLongExpressions              0     NEG
## 23 RulePredObjDistance                 0     NEG
```

```
## 24 num_hapax                              0     NEG
```

```
lfit_lasso_counts %>% get_mismatch_details(data)
```




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##             class
## .pred_class bad good
##        bad   38    0
##        good   1    0
##
## , , subcorpus = FrBo
##
##             class
## .pred_class bad good
##        bad    3    6
##        good  13   45
##
## , , subcorpus = KUKY
##
##             class
## .pred_class bad good
##        bad   11   11
##        good   3    9
##
## , , subcorpus = LiFRLaw
##
```

```
##            class
## .pred_class bad good
##        bad    1    0
##        good   0    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    8    0
##        good   2    0
##
##
## Greatest deviations:
## # A tibble: 36 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.403  bad         good  KUKY       Reakce_na_dopis_pracovni
##  2        0.298  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
##  3        0.280  bad         good  KUKY       Reakce_na_dopis_rev
##  4        0.273  good        bad   FrBo       orig_Kterých řízení se může váš s~
##  5        0.252  bad         good  FrBo       red_Certifikáty autorizovaných in~
##  6        0.251  bad         good  KUKY       1A_dokument_puvodni_ustanoven_zas~
##  7        0.248  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  8        0.234  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  9        0.198  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
## 10        0.188  bad         good  FrBo       red_10 významných práv účastníka ~
## 11        0.180  bad         good  KUKY       857_2024_VOP
## 12        0.180  bad         good  KUKY       Mestsky_urad_usneseni_-_slouceni_~
## 13        0.135  bad         good  KUKY       33 Cdo 30_2024
## 14        0.135  good        bad   FrBo       orig_Jak probíhá správní řízení
## 15        0.125  good        bad   FrBo       orig_Změny v zákoně o EIA
## 16        0.122  bad         good  KUKY       11_vizum_pred
## 17        0.122  good        bad   FrBo       149
## 18        0.121  good        bad   FrBo       orig_Jak namítat podjatost_final
## 19        0.120  bad         good  FrBo       red_závazná stanoviska_aktualizov~
## 20        0.117  bad         good  FrBo       red_Jak podat trestní oznámení
## 21        0.112  good        bad   CzCDC      4-34-13_1
## 22        0.104  good        bad   FrBo       orig_financovani_politickych_stran
## 23        0.101  good        bad   KUKY       016_Obcane-EU
## 24        0.0997 good        bad   FrBo       orig_Jak zajistit měření hluku
## 25        0.0929 good        bad   FrBo       64
## 26        0.0777 good        bad   FrBo       153
## 27        0.0668 bad         good  KUKY       6421_2023_VOP
## 28        0.0622 bad         good  KUKY       důchod-dorovnávací přídavek_1298-~
## 29        0.0620 good        bad   OmbuFlyers Studny
## 30        0.0578 good        bad   FrBo       orig_provokace_korupcniho_jednani
## # i 6 more rows
## Highest-deviating documents names:
## [1] "Reakce_na_dopis_pracovni"
## [2] "2A_dokument_puvodni_vyzva_k_zaplaceni_SOP_a_k_doplneni_kast_pouceni"
## [3] "Reakce_na_dopis_rev"
## [4] "orig_Kterých řízení se může váš spolek účastnit_FINAL"
## [5] "red_Certifikáty autorizovaných inspektorů"
```

```
## [6] "1A_dokument_puvodni_ustanoven_zastupce_vyzva_k_doplneni_kast_pouceni"
```

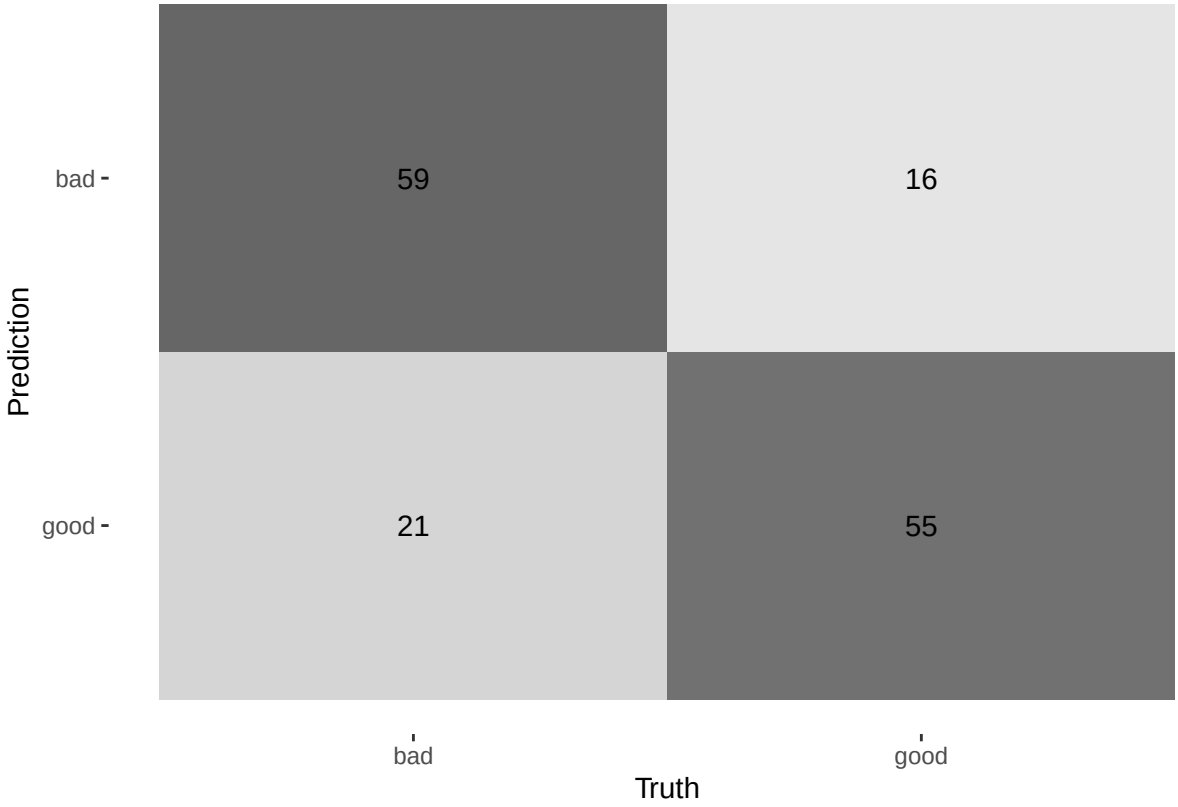
```
# lfit_lasso_counts %>%
#   lasso_get_coefficients() %>%
#   print(n = 100)
```

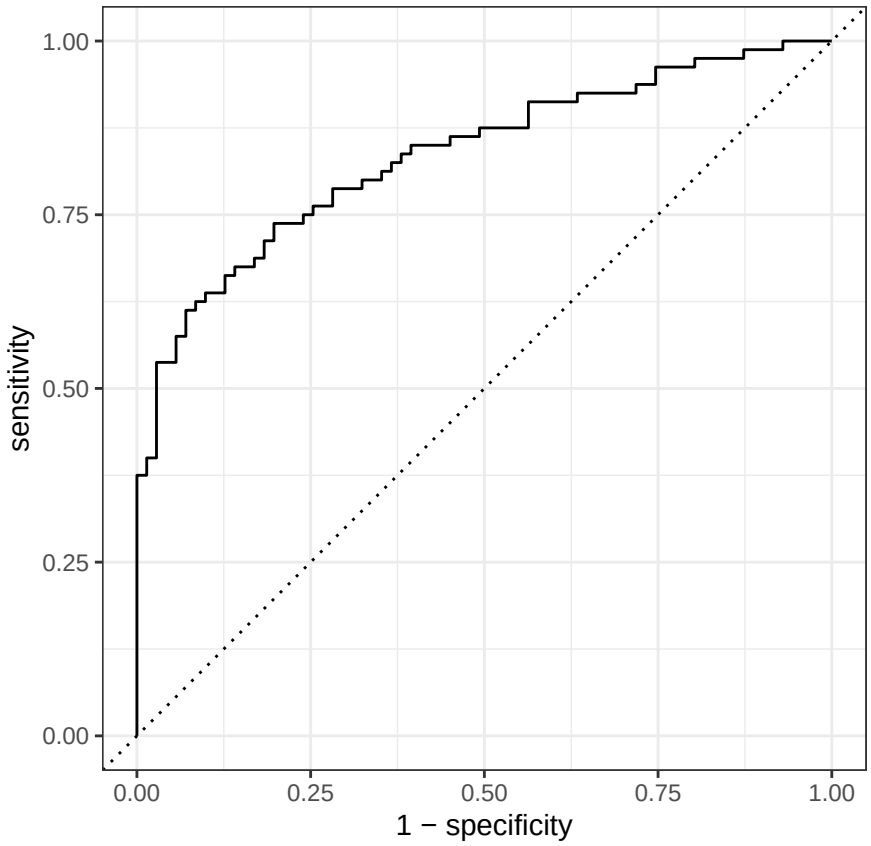
Random forest

All

```
lfit_rf_all <- model_rf_all %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.755 Preprocessor1_Model1
## 2 roc_auc     binary         0.835 Preprocessor1_Model1
## 3 brier_class binary         0.163 Preprocessor1_Model1
```

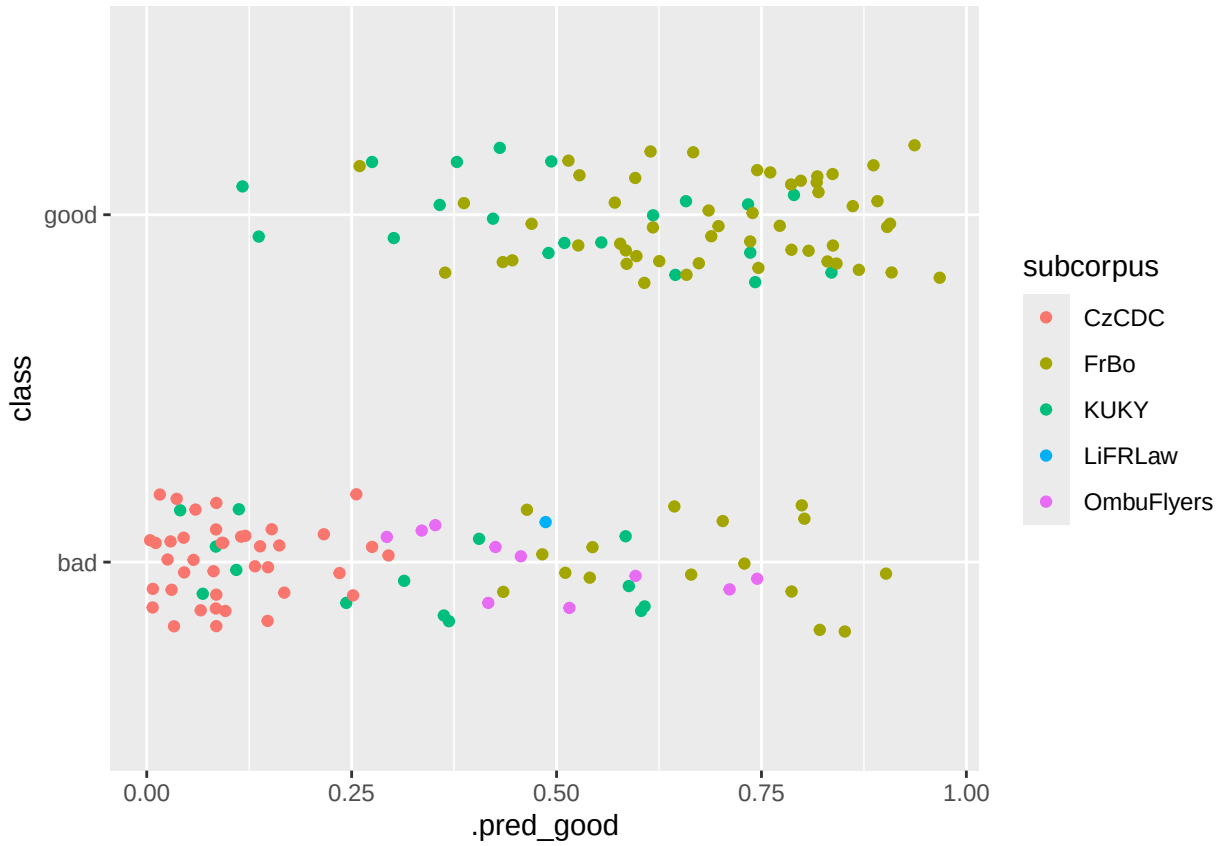





```
## Variable importance:
## # A tibble: 71 x 2
##    Variable                                              Importance
##    <chr>                                                      <dbl>
##  1 activity                                                  16.7
##  2 RuleTooFewVerbs.min_verb_frac                             14.4
##  3 verb_dist                                                 12.5
##  4 RuleTooManyNominalConstructions.max_allowable_nouns       10.3
##  5 RuleLongSentences.max_length                              10.1
##  6 ari                                                        8.91
##  7 RulePredAtClauseBeginning.max_order                        8.87
##  8 RulePassive                                                8.68
##  9 gf                                                         8.52
## 10 RuleLiteraryStyle                                          6.38
## 11 smog                                                       6.23
## 12 atl                                                        5.84
## 13 maentropy                                                  4.71
## 14 fkgl                                                       4.60
## 15 RuleTooManyNegations.max_negation_frac                     4.43
## 16 mamr                                                       4.35
## 17 RulePredAtClauseBeginning.max_order.v                      4.32
## 18 mattr                                                      4.31
## 19 RuleTooLongExpressions                                     4.22
## 20 RuleTooManyNominalConstructions.max_noun_frac              3.92
## 21 RuleMultiPartVerbs                                         3.88
## 22 RuleVerbalNouns                                            3.67
## 23 cli                                                        3.60
```

```
## 24 RulePredSubjDistance                                    3.53
## 25 RuleCaseRepetition.max_repetition_count.v               3.28
## 26 RulePredSubjDistance.max_distance                       3.27
## 27 RuleAnaphoricReferences                                 3.23
## 28 maentropy.v                                             3.19
## 29 RuleCaseRepetition.max_repetition_frac                  3.18
## 30 RuleCaseRepetition.max_repetition_frac.v                3.11
## 31 RuleLongSentences.max_length.v                          3.02
## 32 RuleTooManyNegations.max_allowable_negations.v          2.93
## 33 entropy                                                 2.80
## 34 RulePredSubjDistance.max_distance.v                     2.78
## 35 mattr.v                                                 2.76
## 36 fre                                                     2.75
## 37 RulePredObjDistance.max_distance                        2.72
## 38 RuleCaseRepetition.max_repetition_count                 2.64
## 39 RuleDoubleAdpos                                         2.56
## 40 RuleInfVerbDistance                                     2.55
## 41 RuleTooManyNegations.max_negation_frac.v                2.46
## 42 RulePredObjDistance                                     2.42
## 43 RuleInfVerbDistance.max_distance                        2.30
## 44 RuleTooManyNegations.max_allowable_negations            2.30
## 45 RuleTooManyNominalConstructions.max_noun_frac.v         2.29
## 46 RuleMultiPartVerbs.max_distance                         2.26
## 47 RuleAbstractNouns                                       2.18
## 48 num_hapax                                               2.15
## 49 RuleInfVerbDistance.max_distance.v                      2.11
## 50 RuleMultiPartVerbs.max_distance.v                       2.10
## 51 char_count                                              2.04
## 52 RulePredObjDistance.max_distance.v                      2.04
## 53 ttr                                                     2.03
## 54 sent_count                                              2.03
## 55 word_count                                              2.00
## 56 RuleDoubleAdpos.max_allowable_distance.v                1.97
## 57 RuleWeakMeaningWords                                    1.96
## 58 syllab_count                                            1.88
## 59 RuleDoubleAdpos.max_allowable_distance                  1.63
## 60 RuleGPwordorder                                         1.54
## 61 RuleGPcoordovs                                          1.41
## 62 RuleReflexivePassWithAnimSubj                           1.33
## 63 hpoint                                                  1.30
## 64 RuleGPpatinstr                                          1.27
## 65 RuleGPdeverbaddr                                        0.943
## 66 RuleRelativisticExpressions                             0.780
## 67 RuleGPpatbenperson                                      0.728
## 68 RuleGPdeverbsubj                                        0.633
## 69 RuleConfirmationExpressions                             0.514
## 70 RuleGPadjective                                         0.328
## 71 RuleRedundantExpressions                                0.0917
```

```
lfit_rf_all %>% get_mismatch_details(data)
```



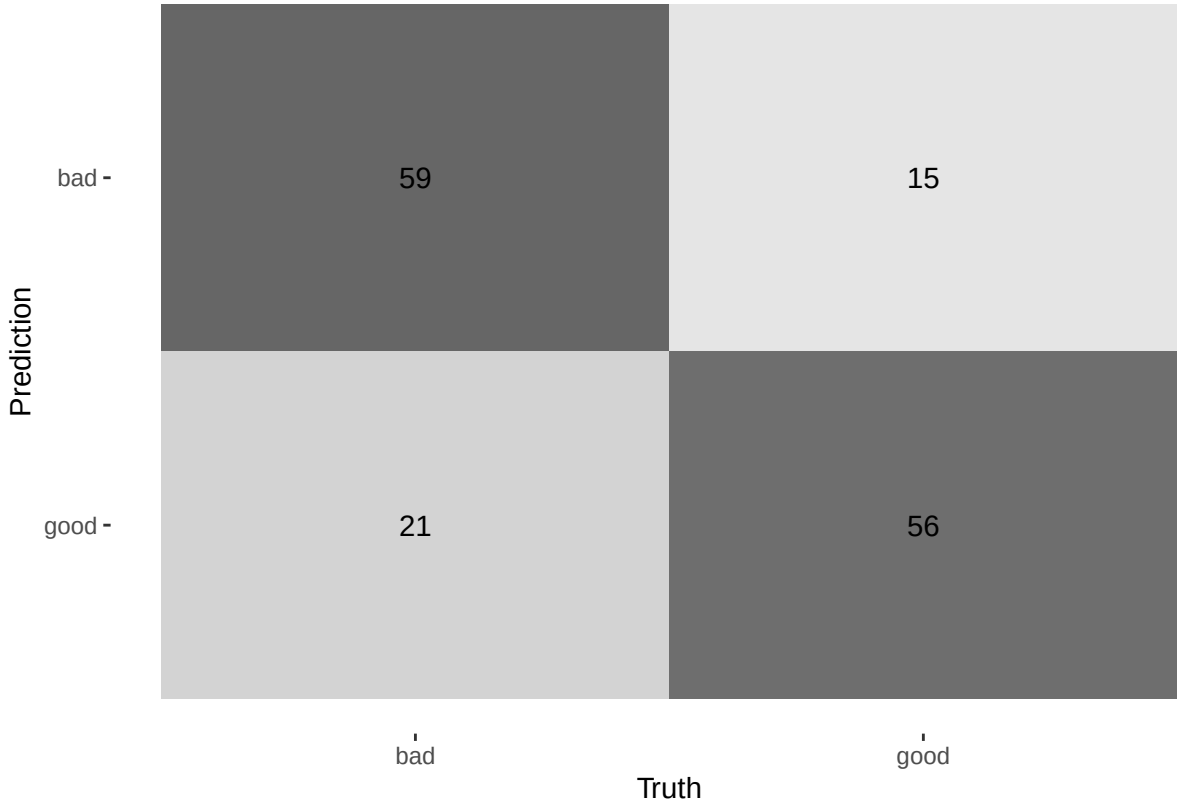

```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   39    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    3    6
##        good  13   45
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   10   10
##        good   4   10
##
## , , subcorpus = LiFRLaw
##
##            class
## .pred_class bad good
##        bad    1    0
```

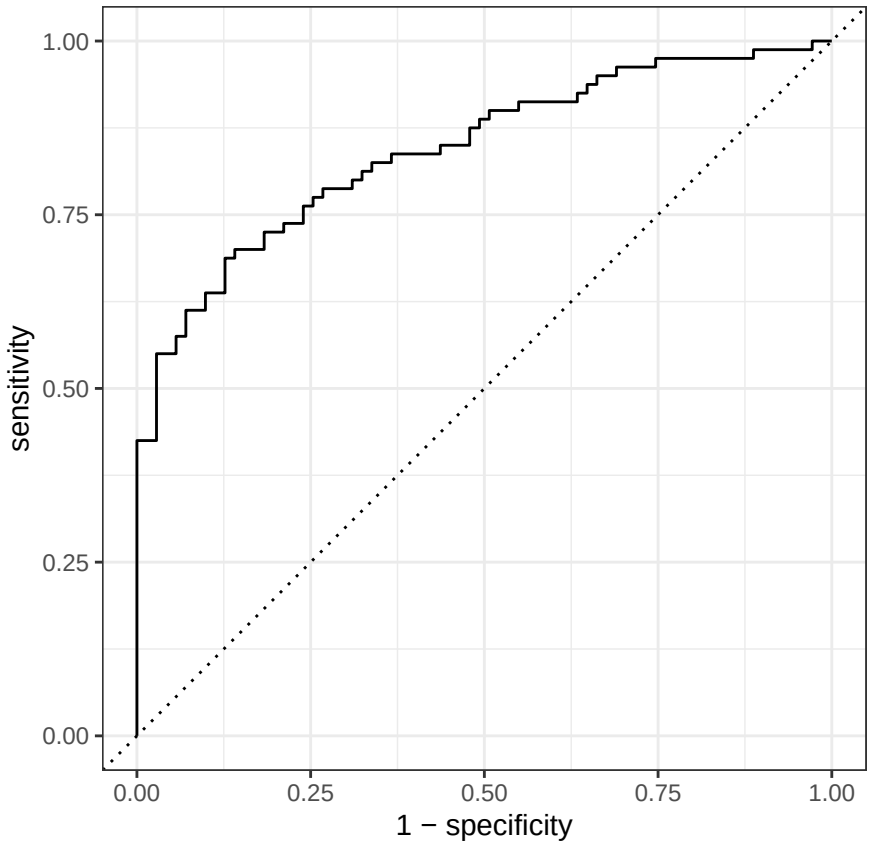
```
##        good   0    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    6    0
##        good   4    0
##
##
## Greatest deviations:
## # A tibble: 37 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.402  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  2        0.383  bad         good  KUKY       33 Cdo 30_2024
##  3        0.363  bad         good  KUKY       11_vizum_pred
##  4        0.352  good        bad   FrBo       orig_Kterých řízení se může váš s~
##  5        0.321  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
##  6        0.302  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  7        0.299  good        bad   FrBo       orig_Jak probíhá správní řízení
##  8        0.287  good        bad   FrBo       orig_Jak namítat podjatost_final
##  9        0.245  good        bad   OmbuFlyers Soudni-poplatky
## 10        0.240  bad         good  FrBo       red_Certifikáty autorizovaných in~
## 11        0.229  good        bad   FrBo       142
## 12        0.225  bad         good  KUKY       Mestsky_urad_usneseni_-_slouceni_~
## 13        0.211  good        bad   OmbuFlyers Studny
## 14        0.203  good        bad   FrBo       64
## 15        0.199  bad         good  KUKY       1A_dokument_puvodni_ustanoven_zas~
## 16        0.164  good        bad   FrBo       orig_Jak zajistit měření hluku
## 17        0.144  good        bad   FrBo       orig_provokace_korupcniho_jednani
## 18        0.143  bad         good  KUKY       Reakce_na_dopis_rev
## 19        0.136  bad         good  FrBo       1
## 20        0.122  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
## 21        0.113  bad         good  FrBo       red_Jak podat trestní oznámení
## 22        0.107  good        bad   KUKY       016_Obcane-EU
## 23        0.103  good        bad   KUKY       sluzebni_hodnoceni_puvodni
## 24        0.0964 good        bad   OmbuFlyers Socialni-sluzby
## 25        0.0882 good        bad   KUKY       7-Co-1752-2016-Vyber-judikatury
## 26        0.0843 good        bad   KUKY       UOOUOsobniUdajePuvodne
## 27        0.0775 bad         good  KUKY       Mestsky_urad_Vyzva_k_zaplaceni_na~
## 28        0.0693 bad         good  KUKY       důchod-dorovnávací přídavek_1298-~
## 29        0.0656 bad         good  FrBo       red_Les - co smíme a co je zakáza~
## 30        0.0539 bad         good  FrBo       red_závazná stanoviska_aktualizov~
## # i 7 more rows
## Highest-deviating documents names:
## [1] "orig_Jak uspořádat shromáždění"
## [2] "33 Cdo 30_2024"
## [3] "11_vizum_pred"
## [4] "orig_Kterých řízení se může váš spolek účastnit_FINAL"
## [5] "orig_lhuty_v_jednani_s_urady_a_soudy"
## [6] "orig_Zastupitelstvo_o čem a jak rozhoduje"
## [7] "orig_Jak probíhá správní řízení"
## [8] "orig_Jak namítat podjatost_final"
```

No TL

```
lfit_rf_notl <- model_rf_notl %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.762 Preprocessor1_Model1
## 2 roc_auc     binary         0.843 Preprocessor1_Model1
## 3 brier_class binary         0.160 Preprocessor1_Model1
```

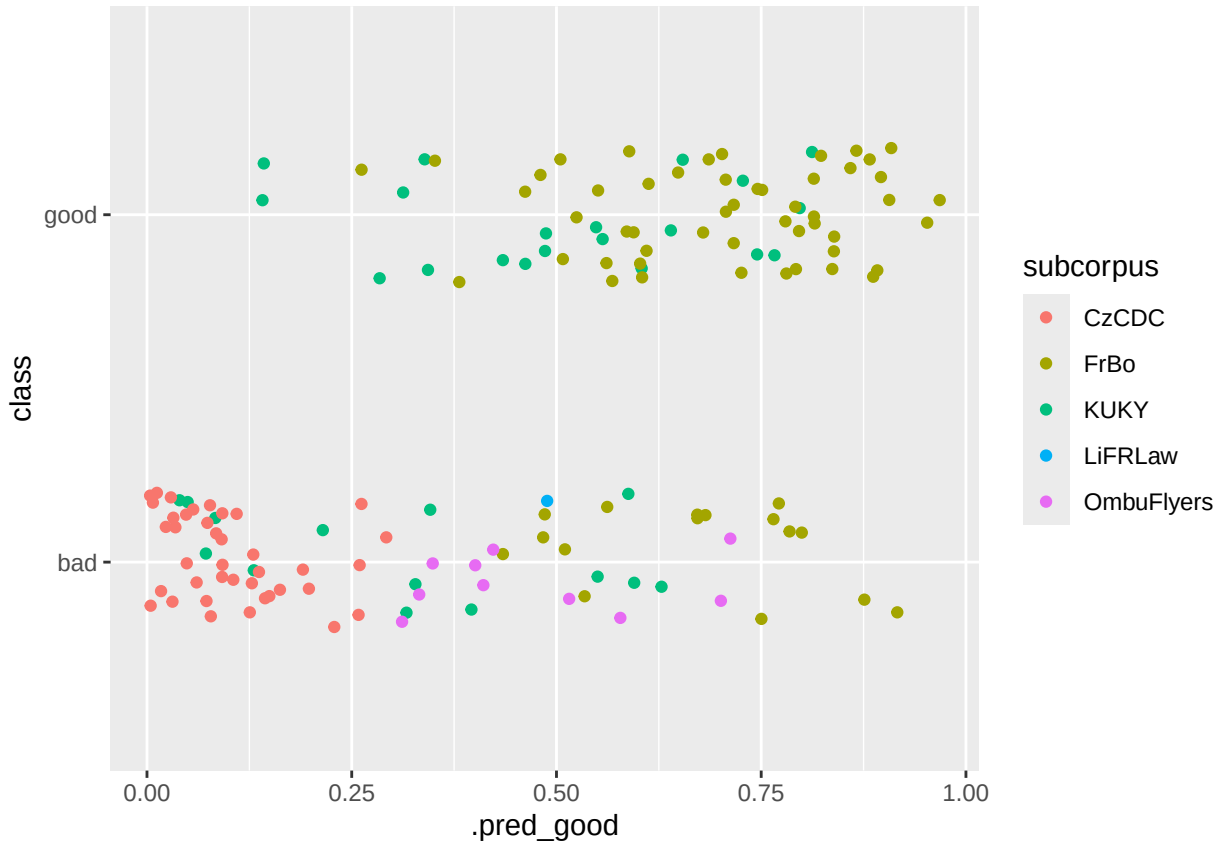





```
## Variable importance:
## # A tibble: 67 x 2
##    Variable                                              Importance
##    <chr>                                                      <dbl>
##  1 activity                                                    15.1
##  2 verb_dist                                                   14.0
##  3 RuleTooFewVerbs.min_verb_frac                               13.3
##  4 RuleLongSentences.max_length                                11.6
##  5 RuleTooManyNominalConstructions.max_allowable_nouns         10.3
##  6 RulePredAtClauseBeginning.max_order                          9.69
##  7 ari                                                          9.56
##  8 RulePassive                                                  9.06
##  9 gf                                                           8.31
## 10 RuleLiteraryStyle                                            6.88
## 11 atl                                                          6.28
## 12 smog                                                         6.13
## 13 fkgl                                                         5.56
## 14 RuleTooManyNegations.max_negation_frac                       4.96
## 15 mamr                                                         4.50
## 16 RuleTooLongExpressions                                       4.47
## 17 maentropy                                                    4.36
## 18 RuleVerbalNouns                                              4.22
## 19 RulePredAtClauseBeginning.max_order.v                        4.17
## 20 RuleMultiPartVerbs                                           4.12
## 21 RuleTooManyNominalConstructions.max_noun_frac                4.04
## 22 mattr                                                        3.76
## 23 RulePredSubjDistance                                         3.69
```

```
## 24 RuleLongSentences.max_length.v                          3.60
## 25 RuleAnaphoricReferences                                 3.37
## 26 RulePredSubjDistance.max_distance                       3.34
## 27 cli                                                     3.32
## 28 RuleCaseRepetition.max_repetition_count.v               3.30
## 29 RuleCaseRepetition.max_repetition_frac.v                3.20
## 30 entropy                                                 3.17
## 31 maentropy.v                                             3.14
## 32 RuleCaseRepetition.max_repetition_frac                  3.08
## 33 mattr.v                                                 3.06
## 34 RulePredSubjDistance.max_distance.v                     2.87
## 35 RuleCaseRepetition.max_repetition_count                 2.80
## 36 RulePredObjDistance.max_distance                        2.69
## 37 RuleTooManyNegations.max_allowable_negations.v          2.66
## 38 num_hapax                                               2.58
## 39 RuleInfVerbDistance                                     2.57
## 40 RuleTooManyNegations.max_allowable_negations            2.51
## 41 RuleInfVerbDistance.max_distance                        2.49
## 42 RuleInfVerbDistance.max_distance.v                      2.34
## 43 RuleTooManyNegations.max_negation_frac.v                2.34
## 44 RuleWeakMeaningWords                                    2.34
## 45 RulePredObjDistance.max_distance.v                      2.33
## 46 RuleDoubleAdpos                                         2.31
## 47 ttr                                                     2.31
## 48 fre                                                     2.27
## 49 RuleTooManyNominalConstructions.max_noun_frac.v         2.25
## 50 RuleMultiPartVerbs.max_distance                         2.25
## 51 RuleDoubleAdpos.max_allowable_distance.v                2.22
## 52 RulePredObjDistance                                     2.21
## 53 RuleAbstractNouns                                       2.09
## 54 RuleMultiPartVerbs.max_distance.v                       2.05
## 55 RuleDoubleAdpos.max_allowable_distance                  1.88
## 56 hpoint                                                  1.78
## 57 RuleGPcoordovs                                          1.56
## 58 RuleGPwordorder                                         1.42
## 59 RuleReflexivePassWithAnimSubj                           1.25
## 60 RuleGPdeverbaddr                                        1.15
## 61 RuleGPpatinstr                                          1.15
## 62 RuleRelativisticExpressions                             0.945
## 63 RuleGPpatbenperson                                      0.792
## 64 RuleGPdeverbsubj                                        0.768
## 65 RuleConfirmationExpressions                             0.654
## 66 RuleGPadjective                                         0.383
## 67 RuleRedundantExpressions                                0.126
```

```
lfit_rf_notl %>% get_mismatch_details(data)
```




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##             class
## .pred_class bad good
##        bad   39    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##             class
## .pred_class bad good
##        bad    3    5
##        good  13   46
##
## , , subcorpus = KUKY
##
##             class
## .pred_class bad good
##        bad   10   10
##        good   4   10
##
## , , subcorpus = LiFRLaw
##
##             class
## .pred_class bad good
##        bad    1    0
```

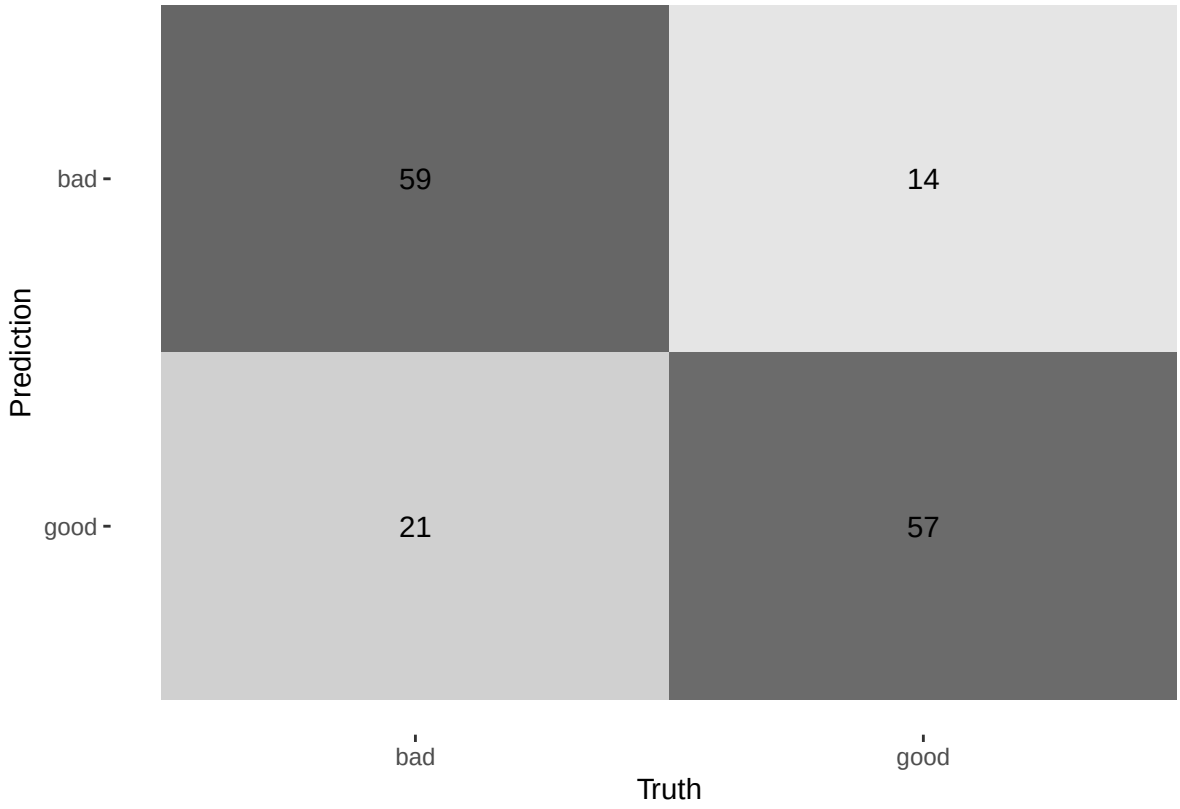
```
##        good   0    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    6    0
##        good   4    0
##
##
## Greatest deviations:
## # A tibble: 36 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.416  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  2        0.376  good        bad   FrBo       orig_Kterých řízení se může váš s~
##  3        0.359  bad         good  KUKY       11_vizum_pred
##  4        0.357  bad         good  KUKY       33 Cdo 30_2024
##  5        0.300  good        bad   FrBo       orig_Jak namítat podjatost_final
##  6        0.285  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
##  7        0.272  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  8        0.265  good        bad   FrBo       orig_Jak probíhá správní řízení
##  9        0.250  good        bad   FrBo       142
## 10        0.238  bad         good  FrBo       red_Certifikáty autorizovaných in~
## 11        0.216  bad         good  KUKY       Mestsky_urad_usneseni_-_slouceni_~
## 12        0.212  good        bad   OmbuFlyers Studny
## 13        0.201  good        bad   OmbuFlyers Soudni-poplatky
## 14        0.187  bad         good  KUKY       1A_dokument_puvodni_ustanoven_zas~
## 15        0.182  good        bad   FrBo       64
## 16        0.172  good        bad   FrBo       orig_provokace_korupcniho_jednani
## 17        0.172  good        bad   FrBo       orig_Jak zajistit měření hluku
## 18        0.161  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
## 19        0.157  bad         good  KUKY       Reakce_na_dopis_rev
## 20        0.148  bad         good  FrBo       1
## 21        0.128  good        bad   KUKY       016_Obcane-EU
## 22        0.119  bad         good  FrBo       red_Jak podat trestní oznámení
## 23        0.0949 good        bad   KUKY       sluzebni_hodnoceni_puvodni
## 24        0.0878 good        bad   KUKY       7-Co-1752-2016-Vyber-judikatury
## 25        0.0780 good        bad   OmbuFlyers Socialni-sluzby
## 26        0.0654 bad         good  KUKY       Mestsky_urad_Vyzva_k_zaplaceni_na~
## 27        0.0620 good        bad   FrBo       153
## 28        0.0503 good        bad   KUKY       UOOUOsobniUdajePuvodne
## 29        0.0382 bad         good  FrBo       red_Les - co smíme a co je zakáz~
## 30        0.0380 bad         good  KUKY       důchod-dorovnávací přídavek_1298-~
## # i 6 more rows
## Highest-deviating documents names:
## [1] "orig_Jak uspořádat shromáždění"
## [2] "orig_Kterých řízení se může váš spolek účastnit_FINAL"
## [3] "11_vizum_pred"
## [4] "33 Cdo 30_2024"
## [5] "orig_Jak namítat podjatost_final"
## [6] "orig_lhuty_v_jednani_s_urady_a_soudy"
## [7] "orig_Zastupitelstvo_o čem a jak rozhoduje"
## [8] "orig_Jak probíhá správní řízení"
```

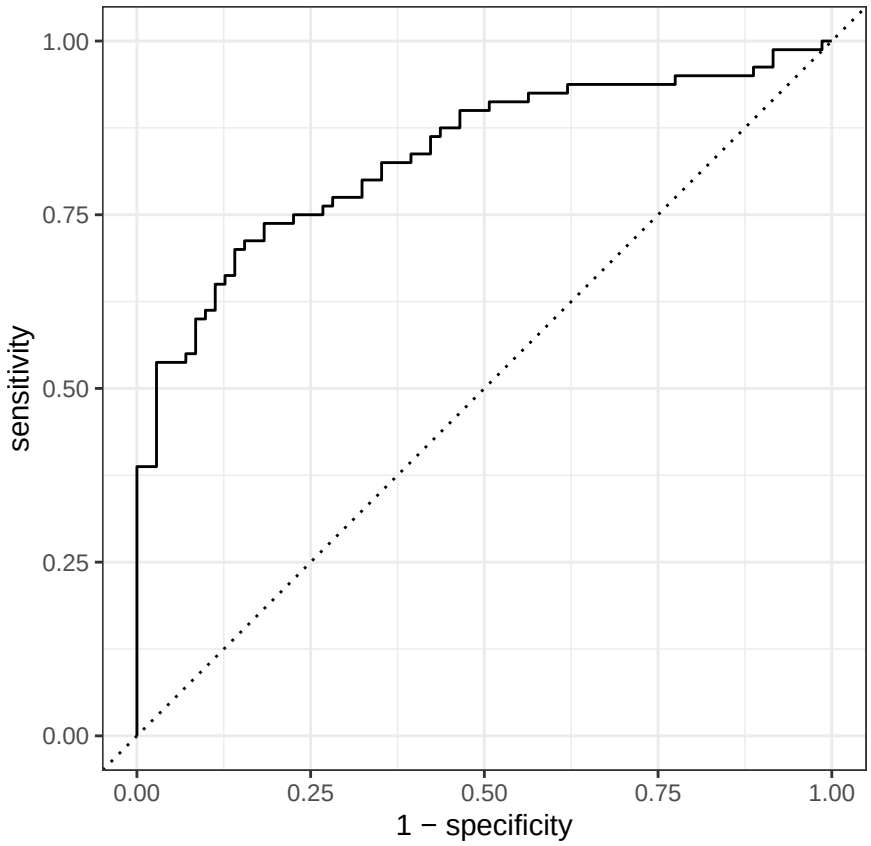
```
## [9] "142"
```

IAC

```
lfit_rf_iac <- model_rf_iac %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.768 Preprocessor1_Model1
## 2 roc_auc     binary         0.836 Preprocessor1_Model1
## 3 brier_class binary         0.164 Preprocessor1_Model1
```

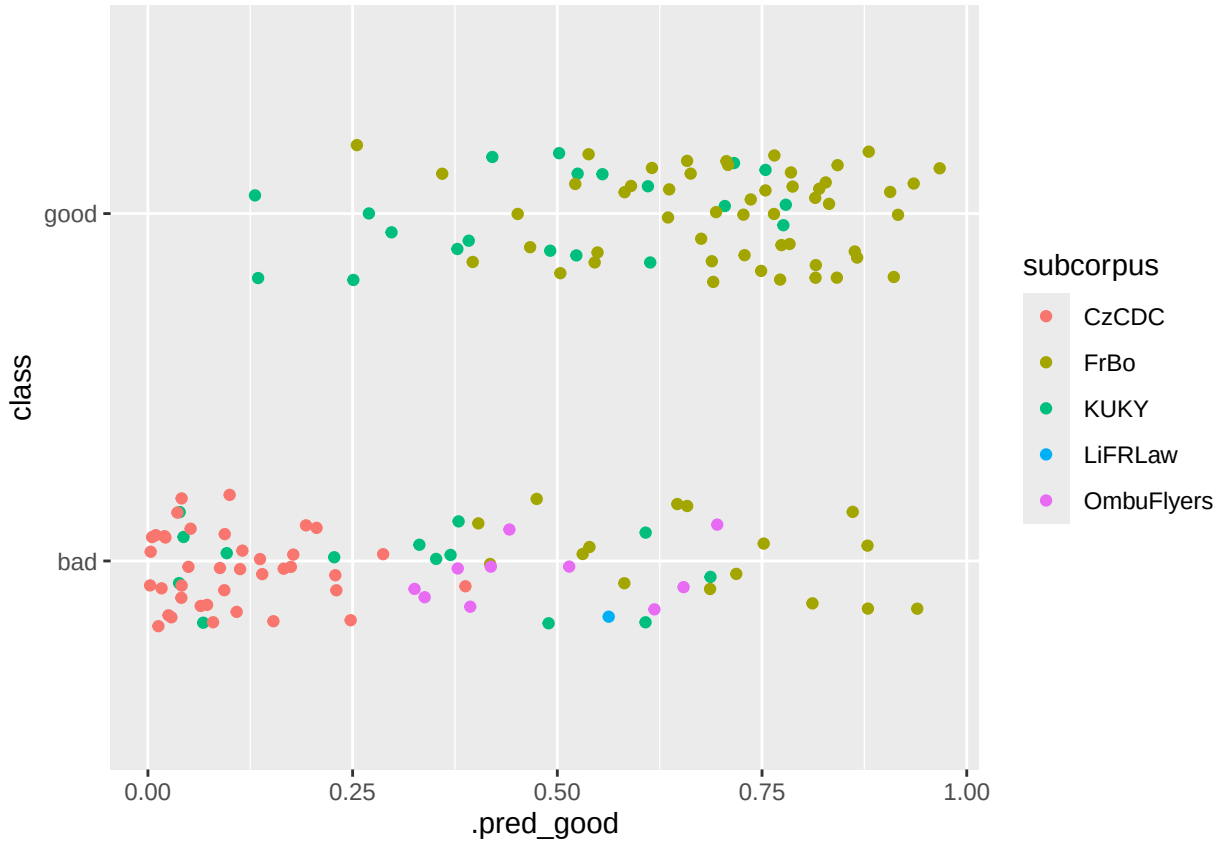





```
## Variable importance:
## # A tibble: 44 x 2
##    Variable                                                Importance
##    <chr>                                                        <dbl>
##  1 activity                                                      18.2
##  2 verb_dist                                                     16.9
##  3 RuleTooFewVerbs.min_verb_frac                                 15.2
##  4 RuleTooManyNominalConstructions.max_allowable_nouns           13.6
##  5 RuleLongSentences.max_length                                  12.3
##  6 RulePredAtClauseBeginning.max_order                           10.7
##  7 ari                                                            9.64
##  8 gf                                                             9.28
##  9 smog                                                           7.74
## 10 atl                                                            7.20
## 11 RuleTooManyNegations.max_negation_frac                         6.42
## 12 fkgl                                                           6.10
## 13 mamr                                                           5.67
## 14 mattr                                                          5.54
## 15 RuleTooManyNominalConstructions.max_noun_frac                  5.53
## 16 maentropy                                                      5.39
## 17 cli                                                            4.90
## 18 RuleTooManyNominalConstructions.max_allowable_nouns.v          4.84
## 19 maentropy.v                                                    4.80
## 20 RulePredAtClauseBeginning.max_order.v                          4.77
## 21 RuleCaseRepetition.max_repetition_count.v                      4.69
## 22 RuleLongSentences.max_length.v                                 4.61
## 23 RuleCaseRepetition.max_repetition_frac.v                       4.53
```

```
## 24 entropy                                                    4.49
## 25 RulePredObjDistance.max_distance                           4.29
## 26 RuleCaseRepetition.max_repetition_frac                     4.09
## 27 RulePredSubjDistance.max_distance                          3.99
## 28 mattr.v                                                    3.87
## 29 RuleTooManyNegations.max_allowable_negations               3.74
## 30 RuleTooManyNegations.max_allowable_negations.v             3.72
## 31 ttr                                                        3.58
## 32 RuleTooManyNegations.max_negation_frac.v                   3.57
## 33 RuleInfVerbDistance.max_distance                           3.50
## 34 RuleTooManyNominalConstructions.max_noun_frac.v            3.38
## 35 RuleCaseRepetition.max_repetition_count                    3.38
## 36 RuleInfVerbDistance.max_distance.v                         3.30
## 37 RulePredObjDistance.max_distance.v                         3.28
## 38 fre                                                        3.25
## 39 RulePredSubjDistance.max_distance.v                        3.23
## 40 RuleMultiPartVerbs.max_distance                            3.22
## 41 RuleDoubleAdpos.max_allowable_distance.v                   3.06
## 42 RuleMultiPartVerbs.max_distance.v                          3.05
## 43 RuleDoubleAdpos.max_allowable_distance                     2.75
## 44 hpoint                                                     2.40
```

```
lfit_rf_iac %>% get_mismatch_details(data)
```




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
```

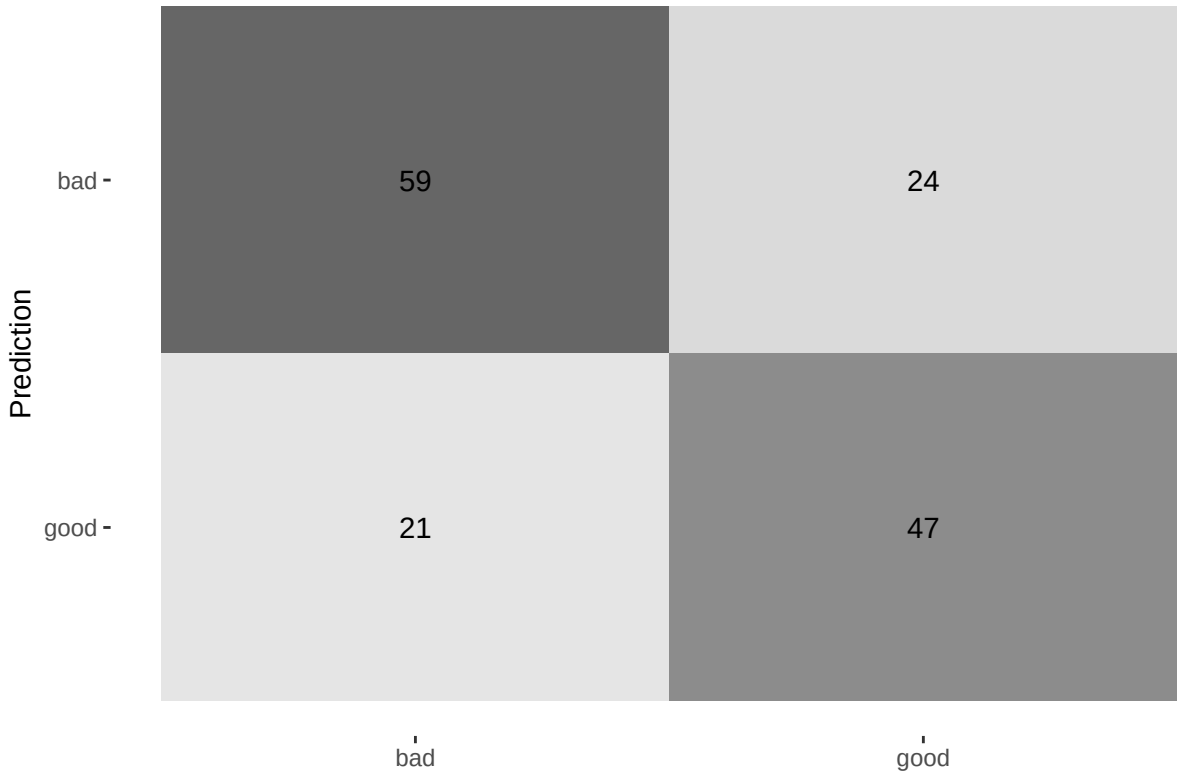
```
## .pred_class bad good
##        bad   39    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    3    5
##        good  13   46
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   11    9
##        good   3   11
##
## , , subcorpus = LiFRLaw
##
##            class
## .pred_class bad good
##        bad    0    0
##        good   1    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    6    0
##        good   4    0
##
##
## Greatest deviations:
## # A tibble: 35 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.440  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  2        0.379  good        bad   FrBo       orig_Kterých řízení se může váš s~
##  3        0.379  good        bad   FrBo       orig_Jak probíhá správní řízení
##  4        0.369  bad         good  KUKY       33 Cdo 30_2024
##  5        0.365  bad         good  KUKY       11_vizum_pred
##  6        0.361  good        bad   FrBo       orig_Jak namítat podjatost_final
##  7        0.312  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
##  8        0.252  good        bad   FrBo       142
##  9        0.249  bad         good  KUKY       Mestsky_urad_usneseni_-_slouceni_~
## 10        0.245  bad         good  FrBo       red_Certifikáty autorizovaných in~
## 11        0.230  bad         good  KUKY       Mestsky_urad_Vyzva_k_zaplaceni_na~
## 12        0.219  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
## 13        0.202  bad         good  KUKY       1A_dokument_puvodni_ustanoven_zas~
## 14        0.195  good        bad   OmbuFlyers Studny
## 15        0.187  good        bad   KUKY       sluzebni_hodnoceni_puvodni
## 16        0.187  good        bad   FrBo       orig_provokace_korupcniho_jednani
## 17        0.159  good        bad   FrBo       orig_Jak zajistit měření hluku
```

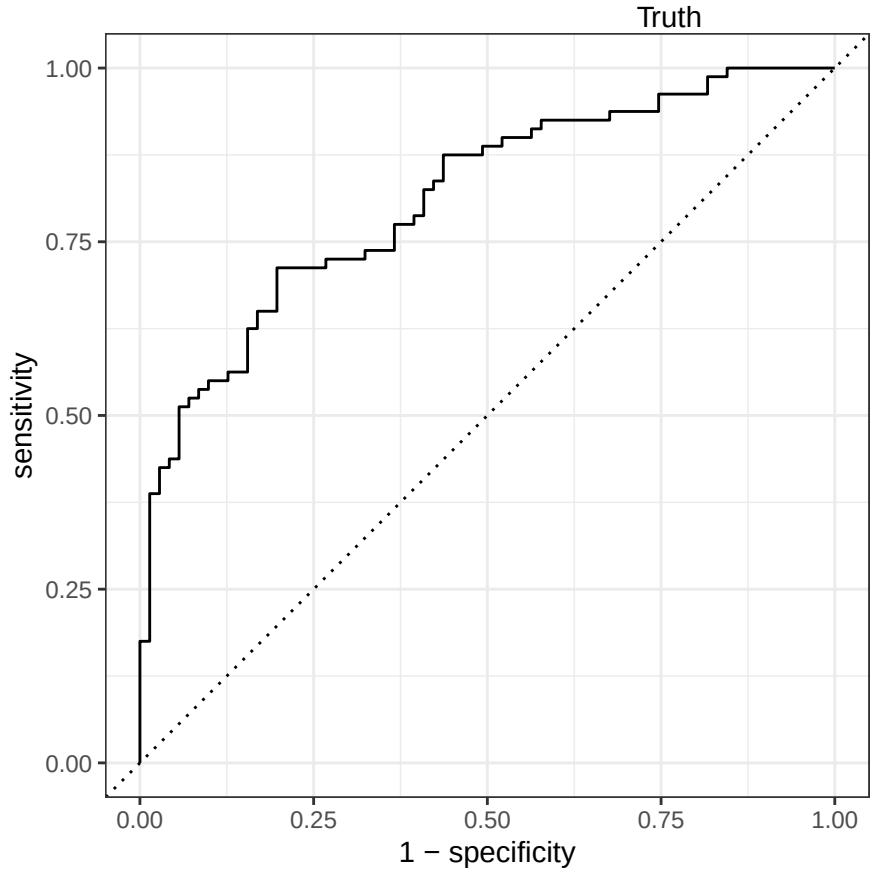
```
## 18        0.154  good        bad   OmbuFlyers Soudni-poplatky
## 19        0.147  good        bad   FrBo       64
## 20        0.141  bad         good  FrBo       1
## 21        0.122  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
## 22        0.119  good        bad   OmbuFlyers Bydlení - zajištění bydlení - obe~
## 23        0.108  bad         good  KUKY       Reakce_na_dopis_rev
## 24        0.108  good        bad   KUKY       016_Obcane-EU
## 25        0.108  good        bad   KUKY       7-Co-1752-2016-Vyber-judikatury
## 26        0.103  bad         good  FrBo       red_Les - co smíme a co je zakázá~
## 27        0.0819 good        bad   FrBo       orig_Pozemkové úpravy_pracovní ve~
## 28        0.0793 bad         good  KUKY       Reakce_na_dopis_pracovni
## 29        0.0627 good        bad   LiFRLaw    zastoupeni-3_orig
## 30        0.0484 bad         good  FrBo       red_Jak podat trestní oznámení
## # i 5 more rows
## Highest-deviating documents names:
## [1] "orig_Jak uspořádat shromáždění"
## [2] "orig_Kterých řízení se může váš spolek účastnit_FINAL"
## [3] "orig_Jak probíhá správní řízení"
## [4] "33 Cdo 30_2024"
## [5] "11_vizum_pred"
## [6] "orig_Jak namítat podjatost_final"
## [7] "orig_lhuty_v_jednani_s_urady_a_soudy"
## [8] "142"
```

Counts

```
lfit_rf_counts <- model_rf_counts %>% evaluate_tidymodel(split)
```

```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.702 Preprocessor1_Model1
## 2 roc_auc     binary         0.812 Preprocessor1_Model1
## 3 brier_class binary         0.176 Preprocessor1_Model1
```

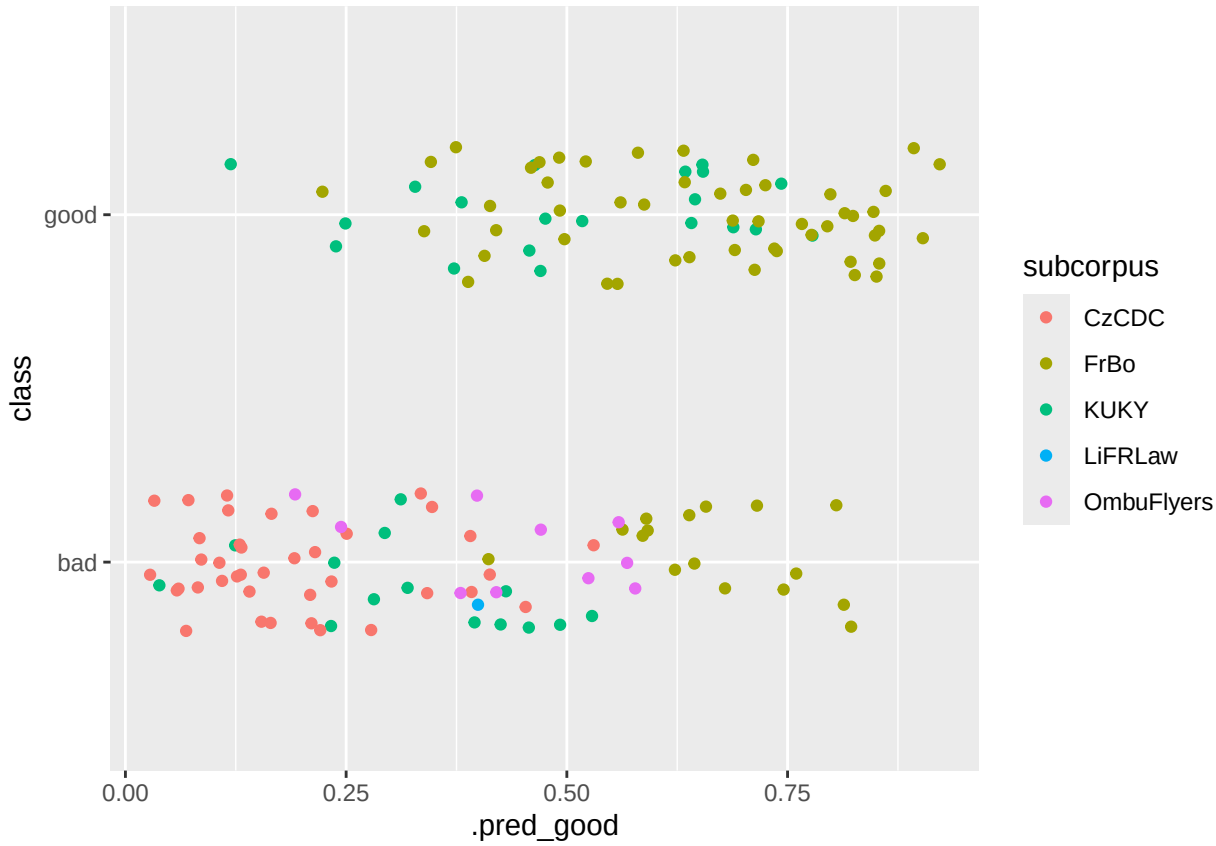





```
## Variable importance:
## # A tibble: 24 x 2
```

```
##    Variable                       Importance
##    <chr>                               <dbl>
##  1 RulePassive                          36.7
##  2 RuleMultiPartVerbs                   25.1
##  3 RulePredSubjDistance                 24.2
##  4 RuleLiteraryStyle                    23.9
##  5 RuleInfVerbDistance                  18.6
##  6 RuleVerbalNouns                      14.0
##  7 num_hapax                            11.4
##  8 RuleAbstractNouns                    10.4
##  9 RulePredObjDistance                  10.2
## 10 RuleTooLongExpressions               9.44
## 11 RuleDoubleAdpos                      9.35
## 12 RuleGPwordorder                      8.59
## 13 RuleWeakMeaningWords                 7.79
## 14 RuleAnaphoricReferences              7.49
## 15 RuleReflexivePassWithAnimSubj        6.86
## 16 RuleGPdeverbsubj                     4.32
## 17 RuleGPpatinstr                       4.18
## 18 RuleGPdeverbaddr                     3.68
## 19 RuleGPcoordovs                       3.48
## 20 RuleGPpatbenperson                   2.83
## 21 RuleRelativisticExpressions          2.78
## 22 RuleConfirmationExpressions          2.16
## 23 RuleGPadjective                      0.791
## 24 RuleRedundantExpressions             0.394
```

```
lfit_rf_counts %>% get_mismatch_details(data)
```




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##             class
## .pred_class bad good
##        bad   38    0
##        good   1    0
##
## , , subcorpus = FrBo
##
##             class
## .pred_class bad good
##        bad    1   14
##        good  15   37
##
## , , subcorpus = KUKY
##
##             class
## .pred_class bad good
##        bad   13   10
##        good   1   10
##
## , , subcorpus = LiFRLaw
##
##             class
## .pred_class bad good
##        bad    1    0
```

```
##        good   0    0
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    6    0
##        good   4    0
##
##
## Greatest deviations:
## # A tibble: 45 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.381  bad         good  KUKY       11_vizum_pred
##  2        0.322  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  3        0.314  good        bad   FrBo       64
##  4        0.305  good        bad   FrBo       orig_Jak uspořádat shromáždění
##  5        0.277  bad         good  FrBo       red_Certifikáty autorizovaných in~
##  6        0.262  bad         good  KUKY       2A_dokument_puvodni_vyzva_k_zapla~
##  7        0.260  good        bad   FrBo       orig_provokace_korupcniho_jednani
##  8        0.251  bad         good  KUKY       33 Cdo 30_2024
##  9        0.246  good        bad   FrBo       orig_lhuty_v_jednani_s_urady_a_so~
## 10        0.215  good        bad   FrBo       orig_Kterých řízení se může váš s~
## 11        0.179  good        bad   FrBo       orig_Jak probíhá správní řízení
## 12        0.172  bad         good  KUKY       857_2024_VOP
## 13        0.162  bad         good  FrBo       red_závazná stanoviska_aktualizov~
## 14        0.158  good        bad   FrBo       149
## 15        0.154  bad         good  FrBo       red_Jak podat trestní oznámení
## 16        0.144  good        bad   FrBo       orig_Jak namítat podjatost_final
## 17        0.139  good        bad   FrBo       orig_financovani_politickych_stran
## 18        0.128  bad         good  KUKY       6421_2023_VOP
## 19        0.126  bad         good  FrBo       24
## 20        0.122  good        bad   FrBo       orig_Změny v zákoně o EIA
## 21        0.119  bad         good  KUKY       Reakce_na_dopis_rev
## 22        0.112  bad         good  FrBo       red_10 významných práv účastníka ~
## 23        0.0932 bad         good  FrBo       148
## 24        0.0916 good        bad   FrBo       153
## 25        0.0900 good        bad   FrBo       orig_Jak zajistit měření hluku
## 26        0.0870 bad         good  FrBo       orig_Soustavné obtěžování hlukem ~
## 27        0.0859 good        bad   FrBo       orig_Pozemkové úpravy_pracovní ve~
## 28        0.0801 bad         good  FrBo       199
## 29        0.0774 good        bad   OmbuFlyers Spolecenstvi-vlastniku
## 30        0.0683 good        bad   OmbuFlyers Soudni-poplatky
## # i 15 more rows
## Highest-deviating documents names:
## [1] "11_vizum_pred"
## [2] "orig_Zastupitelstvo_o čem a jak rozhoduje"
## [3] "64"
## [4] "orig_Jak uspořádat shromáždění"
## [5] "red_Certifikáty autorizovaných inspektorů"
## [6] "2A_dokument_puvodni_vyzva_k_zaplaceni_SOP_a_k_doplneni_kast_pouceni"
## [7] "orig_provokace_korupcniho_jednani"
## [8] "33 Cdo 30_2024"
```

Variable importances

```
prepare_vi_for_comparison <- function(final_fit) {
  model_vi <- get_vi(final_fit) %>%
    arrange(-Importance) %>%
    rowid_to_column("rank") %>%
    mutate(across(rank, ~ if_else(Importance == 0, NA, .x))) %>%
    mutate(quantile = rank / n()) %>%
    select(rank, quantile, Variable, Importance)
}

importances <- full_join(
  prepare_vi_for_comparison(lfit_lasso_all),
  prepare_vi_for_comparison(lfit_lasso_notl),
  by = "Variable",
  suffix = c(
    ".lasso.all",
    ".lasso.notl"
  )
) %>%
  full_join(
    prepare_vi_for_comparison(lfit_lasso_iac),
    by = "Variable",
  ) %>%
  full_join(
    prepare_vi_for_comparison(lfit_lasso_counts),
    by = "Variable",
    suffix = c(
      ".lasso.iac",
      ".lasso.counts"
    )
  ) %>%
  full_join(
    prepare_vi_for_comparison(lfit_rf_all),
    by = "Variable"
  ) %>%
  full_join(
    prepare_vi_for_comparison(lfit_rf_notl),
    by = "Variable",
    suffix = c(
      ".rf.all",
      ".rf.notl"
    )
  ) %>%
  full_join(
    prepare_vi_for_comparison(lfit_rf_iac),
    by = "Variable"
  ) %>%
  full_join(
    prepare_vi_for_comparison(lfit_rf_counts),
    by = "Variable",
    suffix = c(
      ".rf.iac",
```

```
      ".rf.counts"
    )
  ) %>%
  select(Variable, everything())
importances_df <- importances %>%
  select(-Variable) %>%
  select(starts_with("rank")) %>%
  as.data.frame()
rownames(importances_df) <- importances %>% pull(Variable)
print(importances_df)
```

```
##                                                    rank.lasso.all
## activity                                                        1
## atl                                                             2
## RuleLiteraryStyle                                               3
## smog                                                            4
## RulePassive                                                     5
## maentropy                                                       6
## entropy                                                         7
## RuleAnaphoricReferences                                         8
## RuleGPcoordovs                                                 NA
## RuleGPdeverbaddr                                               NA
## RuleGPpatinstr                                                 NA
## RuleGPdeverbsubj                                               NA
## RuleGPadjective                                                NA
## RuleGPpatbenperson                                             NA
## RuleGPwordorder                                                NA
## RuleDoubleAdpos                                                NA
## RuleDoubleAdpos.max_allowable_distance                         NA
## RuleDoubleAdpos.max_allowable_distance.v                       NA
## RuleReflexivePassWithAnimSubj                                  NA
## RuleTooFewVerbs.min_verb_frac                                  NA
## RuleTooManyNegations.max_negation_frac                         NA
## RuleTooManyNegations.max_negation_frac.v                       NA
## RuleTooManyNegations.max_allowable_negations                   NA
## RuleTooManyNegations.max_allowable_negations.v                 NA
## RuleTooManyNominalConstructions.max_noun_frac                  NA
## RuleTooManyNominalConstructions.max_noun_frac.v                NA
## RuleTooManyNominalConstructions.max_allowable_nouns            NA
## RuleCaseRepetition.max_repetition_count                        NA
## RuleCaseRepetition.max_repetition_count.v                      NA
## RuleCaseRepetition.max_repetition_frac                         NA
## RuleCaseRepetition.max_repetition_frac.v                       NA
## RuleWeakMeaningWords                                           NA
## RuleAbstractNouns                                              NA
## RuleRelativisticExpressions                                    NA
## RuleConfirmationExpressions                                    NA
## RuleRedundantExpressions                                       NA
## RuleTooLongExpressions                                         NA
## RulePredSubjDistance                                           NA
## RulePredSubjDistance.max_distance                              NA
## RulePredSubjDistance.max_distance.v                            NA
## RulePredObjDistance                                            NA
## RulePredObjDistance.max_distance                               NA
```

```
## RulePredObjDistance.max_distance.v                                  NA
## RuleInfVerbDistance                                                 NA
## RuleInfVerbDistance.max_distance                                    NA
## RuleInfVerbDistance.max_distance.v                                  NA
## RuleMultiPartVerbs                                                  NA
## RuleMultiPartVerbs.max_distance                                     NA
## RuleMultiPartVerbs.max_distance.v                                   NA
## RuleLongSentences.max_length                                        NA
## RuleLongSentences.max_length.v                                      NA
## RulePredAtClauseBeginning.max_order                                 NA
## RulePredAtClauseBeginning.max_order.v                               NA
## RuleVerbalNouns                                                     NA
## sent_count                                                          NA
## word_count                                                          NA
## syllab_count                                                        NA
## char_count                                                          NA
## cli                                                                 NA
## ari                                                                 NA
## num_hapax                                                           NA
## ttr                                                                 NA
## mattr                                                               NA
## mattr.v                                                             NA
## maentropy.v                                                         NA
## mamr                                                                NA
## verb_dist                                                           NA
## hpoint                                                              NA
## fre                                                                 NA
## fkgl                                                                NA
## gf                                                                  NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v               NA
##                                                    rank.lasso.notl
## activity                                                         1
## atl                                                              2
## RuleLiteraryStyle                                                3
## smog                                                             4
## RulePassive                                                      5
## maentropy                                                        6
## entropy                                                          7
## RuleAnaphoricReferences                                          8
## RuleGPcoordovs                                                  NA
## RuleGPdeverbaddr                                                NA
## RuleGPpatinstr                                                  NA
## RuleGPdeverbsubj                                                NA
## RuleGPadjective                                                 NA
## RuleGPpatbenperson                                              NA
## RuleGPwordorder                                                 NA
## RuleDoubleAdpos                                                 NA
## RuleDoubleAdpos.max_allowable_distance                          NA
## RuleDoubleAdpos.max_allowable_distance.v                        NA
## RuleReflexivePassWithAnimSubj                                   NA
## RuleTooFewVerbs.min_verb_frac                                   NA
## RuleTooManyNegations.max_negation_frac                          NA
## RuleTooManyNegations.max_negation_frac.v                        NA
## RuleTooManyNegations.max_allowable_negations                    NA
```

```
## RuleTooManyNegations.max_allowable_negations.v                    NA
## RuleTooManyNominalConstructions.max_noun_frac                     NA
## RuleTooManyNominalConstructions.max_noun_frac.v                   NA
## RuleTooManyNominalConstructions.max_allowable_nouns               NA
## RuleCaseRepetition.max_repetition_count                           NA
## RuleCaseRepetition.max_repetition_count.v                         NA
## RuleCaseRepetition.max_repetition_frac                            NA
## RuleCaseRepetition.max_repetition_frac.v                          NA
## RuleWeakMeaningWords                                              NA
## RuleAbstractNouns                                                 NA
## RuleRelativisticExpressions                                       NA
## RuleConfirmationExpressions                                       NA
## RuleRedundantExpressions                                          NA
## RuleTooLongExpressions                                            NA
## RulePredSubjDistance                                              NA
## RulePredSubjDistance.max_distance                                 NA
## RulePredSubjDistance.max_distance.v                               NA
## RulePredObjDistance                                               NA
## RulePredObjDistance.max_distance                                  NA
## RulePredObjDistance.max_distance.v                                NA
## RuleInfVerbDistance                                               NA
## RuleInfVerbDistance.max_distance                                  NA
## RuleInfVerbDistance.max_distance.v                                NA
## RuleMultiPartVerbs                                                NA
## RuleMultiPartVerbs.max_distance                                   NA
## RuleMultiPartVerbs.max_distance.v                                 NA
## RuleLongSentences.max_length                                      NA
## RuleLongSentences.max_length.v                                    NA
## RulePredAtClauseBeginning.max_order                               NA
## RulePredAtClauseBeginning.max_order.v                             NA
## RuleVerbalNouns                                                   NA
## sent_count                                                        NA
## word_count                                                        NA
## syllab_count                                                      NA
## char_count                                                        NA
## cli                                                               NA
## ari                                                               NA
## num_hapax                                                         NA
## ttr                                                               NA
## mattr                                                             NA
## mattr.v                                                           NA
## maentropy.v                                                       NA
## mamr                                                              NA
## verb_dist                                                         NA
## hpoint                                                            NA
## fre                                                               NA
## fkgl                                                              NA
## gf                                                                NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v             NA
##                                                   rank.lasso.iac
## activity                                                       1
## atl                                                            3
## RuleLiteraryStyle                                             NA
## smog                                                           6
```

```
## RulePassive                                                    NA
## maentropy                                                       2
## entropy                                                         5
## RuleAnaphoricReferences                                        NA
## RuleGPcoordovs                                                 NA
## RuleGPdeverbaddr                                               NA
## RuleGPpatinstr                                                 NA
## RuleGPdeverbsubj                                               NA
## RuleGPadjective                                                NA
## RuleGPpatbenperson                                             NA
## RuleGPwordorder                                                NA
## RuleDoubleAdpos                                                NA
## RuleDoubleAdpos.max_allowable_distance                         NA
## RuleDoubleAdpos.max_allowable_distance.v                       NA
## RuleReflexivePassWithAnimSubj                                  NA
## RuleTooFewVerbs.min_verb_frac                                  NA
## RuleTooManyNegations.max_negation_frac                         NA
## RuleTooManyNegations.max_negation_frac.v                       NA
## RuleTooManyNegations.max_allowable_negations                   NA
## RuleTooManyNegations.max_allowable_negations.v                  4
## RuleTooManyNominalConstructions.max_noun_frac                  NA
## RuleTooManyNominalConstructions.max_noun_frac.v                NA
## RuleTooManyNominalConstructions.max_allowable_nouns            NA
## RuleCaseRepetition.max_repetition_count                        NA
## RuleCaseRepetition.max_repetition_count.v                      NA
## RuleCaseRepetition.max_repetition_frac                         NA
## RuleCaseRepetition.max_repetition_frac.v                       NA
## RuleWeakMeaningWords                                           NA
## RuleAbstractNouns                                              NA
## RuleRelativisticExpressions                                    NA
## RuleConfirmationExpressions                                    NA
## RuleRedundantExpressions                                       NA
## RuleTooLongExpressions                                         NA
## RulePredSubjDistance                                           NA
## RulePredSubjDistance.max_distance                              NA
## RulePredSubjDistance.max_distance.v                            NA
## RulePredObjDistance                                            NA
## RulePredObjDistance.max_distance                               NA
## RulePredObjDistance.max_distance.v                             NA
## RuleInfVerbDistance                                            NA
## RuleInfVerbDistance.max_distance                               NA
## RuleInfVerbDistance.max_distance.v                             NA
## RuleMultiPartVerbs                                             NA
## RuleMultiPartVerbs.max_distance                                NA
## RuleMultiPartVerbs.max_distance.v                              NA
## RuleLongSentences.max_length                                   NA
## RuleLongSentences.max_length.v                                 NA
## RulePredAtClauseBeginning.max_order                            NA
## RulePredAtClauseBeginning.max_order.v                          NA
## RuleVerbalNouns                                                NA
## sent_count                                                     NA
## word_count                                                     NA
## syllab_count                                                   NA
## char_count                                                     NA
```

```
## cli                                                                NA
## ari                                                                NA
## num_hapax                                                          NA
## ttr                                                                NA
## mattr                                                              NA
## mattr.v                                                            NA
## maentropy.v                                                        NA
## mamr                                                               NA
## verb_dist                                                          NA
## hpoint                                                             NA
## fre                                                                NA
## fkgl                                                               NA
## gf                                                                  8
## RuleTooManyNominalConstructions.max_allowable_nouns.v              7
##                                                    rank.lasso.counts
## activity                                                           NA
## atl                                                                NA
## RuleLiteraryStyle                                                   3
## smog                                                               NA
## RulePassive                                                         2
## maentropy                                                          NA
## entropy                                                            NA
## RuleAnaphoricReferences                                             4
## RuleGPcoordovs                                                     NA
## RuleGPdeverbaddr                                                   NA
## RuleGPpatinstr                                                     NA
## RuleGPdeverbsubj                                                   NA
## RuleGPadjective                                                    NA
## RuleGPpatbenperson                                                 NA
## RuleGPwordorder                                                    NA
## RuleDoubleAdpos                                                    NA
## RuleDoubleAdpos.max_allowable_distance                             NA
## RuleDoubleAdpos.max_allowable_distance.v                           NA
## RuleReflexivePassWithAnimSubj                                      NA
## RuleTooFewVerbs.min_verb_frac                                      NA
## RuleTooManyNegations.max_negation_frac                             NA
## RuleTooManyNegations.max_negation_frac.v                           NA
## RuleTooManyNegations.max_allowable_negations                       NA
## RuleTooManyNegations.max_allowable_negations.v                     NA
## RuleTooManyNominalConstructions.max_noun_frac                      NA
## RuleTooManyNominalConstructions.max_noun_frac.v                    NA
## RuleTooManyNominalConstructions.max_allowable_nouns                NA
## RuleCaseRepetition.max_repetition_count                            NA
## RuleCaseRepetition.max_repetition_count.v                          NA
## RuleCaseRepetition.max_repetition_frac                             NA
## RuleCaseRepetition.max_repetition_frac.v                           NA
## RuleWeakMeaningWords                                               NA
## RuleAbstractNouns                                                  NA
## RuleRelativisticExpressions                                         1
## RuleConfirmationExpressions                                        NA
## RuleRedundantExpressions                                           NA
## RuleTooLongExpressions                                             NA
## RulePredSubjDistance                                                6
## RulePredSubjDistance.max_distance                                  NA
```

```
## RulePredSubjDistance.max_distance.v                                NA
## RulePredObjDistance                                                NA
## RulePredObjDistance.max_distance                                   NA
## RulePredObjDistance.max_distance.v                                 NA
## RuleInfVerbDistance                                                 8
## RuleInfVerbDistance.max_distance                                   NA
## RuleInfVerbDistance.max_distance.v                                 NA
## RuleMultiPartVerbs                                                  5
## RuleMultiPartVerbs.max_distance                                    NA
## RuleMultiPartVerbs.max_distance.v                                  NA
## RuleLongSentences.max_length                                       NA
## RuleLongSentences.max_length.v                                     NA
## RulePredAtClauseBeginning.max_order                                NA
## RulePredAtClauseBeginning.max_order.v                              NA
## RuleVerbalNouns                                                     7
## sent_count                                                         NA
## word_count                                                         NA
## syllab_count                                                       NA
## char_count                                                         NA
## cli                                                                NA
## ari                                                                NA
## num_hapax                                                          NA
## ttr                                                                NA
## mattr                                                              NA
## mattr.v                                                            NA
## maentropy.v                                                        NA
## mamr                                                               NA
## verb_dist                                                          NA
## hpoint                                                             NA
## fre                                                                NA
## fkgl                                                               NA
## gf                                                                 NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v              NA
##                                                    rank.rf.all rank.rf.notl
## activity                                                     1            1
## atl                                                         12           11
## RuleLiteraryStyle                                           10           10
## smog                                                        11           12
## RulePassive                                                  8            8
## maentropy                                                   13           17
## entropy                                                     33           30
## RuleAnaphoricReferences                                     27           25
## RuleGPcoordovs                                              61           57
## RuleGPdeverbaddr                                            65           60
## RuleGPpatinstr                                              64           61
## RuleGPdeverbsubj                                            68           64
## RuleGPadjective                                             70           66
## RuleGPpatbenperson                                          67           63
## RuleGPwordorder                                             60           58
## RuleDoubleAdpos                                             39           46
## RuleDoubleAdpos.max_allowable_distance                      59           55
## RuleDoubleAdpos.max_allowable_distance.v                    56           51
## RuleReflexivePassWithAnimSubj                               62           59
## RuleTooFewVerbs.min_verb_frac                                2            3
```

```
## RuleTooManyNegations.max_negation_frac                          15          14
## RuleTooManyNegations.max_negation_frac.v                        41          43
## RuleTooManyNegations.max_allowable_negations                    44          40
## RuleTooManyNegations.max_allowable_negations.v                  32          37
## RuleTooManyNominalConstructions.max_noun_frac                   20          21
## RuleTooManyNominalConstructions.max_noun_frac.v                 45          49
## RuleTooManyNominalConstructions.max_allowable_nouns              4           5
## RuleCaseRepetition.max_repetition_count                         38          35
## RuleCaseRepetition.max_repetition_count.v                       25          28
## RuleCaseRepetition.max_repetition_frac                          29          32
## RuleCaseRepetition.max_repetition_frac.v                        30          29
## RuleWeakMeaningWords                                           57          44
## RuleAbstractNouns                                              47          53
## RuleRelativisticExpressions                                    66          62
## RuleConfirmationExpressions                                    69          65
## RuleRedundantExpressions                                       71          67
## RuleTooLongExpressions                                         19          16
## RulePredSubjDistance                                           24          23
## RulePredSubjDistance.max_distance                              26          26
## RulePredSubjDistance.max_distance.v                            34          34
## RulePredObjDistance                                            42          52
## RulePredObjDistance.max_distance                               37          36
## RulePredObjDistance.max_distance.v                             52          45
## RuleInfVerbDistance                                            40          39
## RuleInfVerbDistance.max_distance                               43          41
## RuleInfVerbDistance.max_distance.v                             49          42
## RuleMultiPartVerbs                                             21          20
## RuleMultiPartVerbs.max_distance                                46          50
## RuleMultiPartVerbs.max_distance.v                              50          54
## RuleLongSentences.max_length                                    5           4
## RuleLongSentences.max_length.v                                 31          24
## RulePredAtClauseBeginning.max_order                             7           6
## RulePredAtClauseBeginning.max_order.v                          17          19
## RuleVerbalNouns                                                22          18
## sent_count                                                     54          NA
## word_count                                                     55          NA
## syllab_count                                                   58          NA
## char_count                                                     51          NA
## cli                                                            23          27
## ari                                                             6           7
## num_hapax                                                      48          38
## ttr                                                            53          47
## mattr                                                          18          22
## mattr.v                                                        35          33
## maentropy.v                                                    28          31
## mamr                                                           16          15
## verb_dist                                                       3           2
## hpoint                                                         63          56
## fre                                                            36          48
## fkgl                                                           14          13
## gf                                                              9           9
## RuleTooManyNominalConstructions.max_allowable_nouns.v          NA          NA
##                                                        rank.rf.iac
## activity                                                        1
```

```
## atl                                                    10
## RuleLiteraryStyle                                      NA
## smog                                                    9
## RulePassive                                            NA
## maentropy                                              16
## entropy                                                24
## RuleAnaphoricReferences                                NA
## RuleGPcoordovs                                         NA
## RuleGPdeverbaddr                                       NA
## RuleGPpatinstr                                         NA
## RuleGPdeverbsubj                                       NA
## RuleGPadjective                                        NA
## RuleGPpatbenperson                                     NA
## RuleGPwordorder                                        NA
## RuleDoubleAdpos                                        NA
## RuleDoubleAdpos.max_allowable_distance                 43
## RuleDoubleAdpos.max_allowable_distance.v               41
## RuleReflexivePassWithAnimSubj                          NA
## RuleTooFewVerbs.min_verb_frac                           3
## RuleTooManyNegations.max_negation_frac                 11
## RuleTooManyNegations.max_negation_frac.v               32
## RuleTooManyNegations.max_allowable_negations           29
## RuleTooManyNegations.max_allowable_negations.v         30
## RuleTooManyNominalConstructions.max_noun_frac          15
## RuleTooManyNominalConstructions.max_noun_frac.v        34
## RuleTooManyNominalConstructions.max_allowable_nouns     4
## RuleCaseRepetition.max_repetition_count                35
## RuleCaseRepetition.max_repetition_count.v              21
## RuleCaseRepetition.max_repetition_frac                 26
## RuleCaseRepetition.max_repetition_frac.v               23
## RuleWeakMeaningWords                                   NA
## RuleAbstractNouns                                      NA
## RuleRelativisticExpressions                            NA
## RuleConfirmationExpressions                            NA
## RuleRedundantExpressions                               NA
## RuleTooLongExpressions                                 NA
## RulePredSubjDistance                                   NA
## RulePredSubjDistance.max_distance                      27
## RulePredSubjDistance.max_distance.v                    39
## RulePredObjDistance                                    NA
## RulePredObjDistance.max_distance                       25
## RulePredObjDistance.max_distance.v                     37
## RuleInfVerbDistance                                    NA
## RuleInfVerbDistance.max_distance                       33
## RuleInfVerbDistance.max_distance.v                     36
## RuleMultiPartVerbs                                     NA
## RuleMultiPartVerbs.max_distance                        40
## RuleMultiPartVerbs.max_distance.v                      42
## RuleLongSentences.max_length                            5
## RuleLongSentences.max_length.v                         22
## RulePredAtClauseBeginning.max_order                     6
## RulePredAtClauseBeginning.max_order.v                  20
## RuleVerbalNouns                                        NA
## sent_count                                             NA
```

```
## word_count                                                    NA
## syllab_count                                                  NA
## char_count                                                    NA
## cli                                                           17
## ari                                                            7
## num_hapax                                                     NA
## ttr                                                           31
## mattr                                                         14
## mattr.v                                                       28
## maentropy.v                                                   19
## mamr                                                          13
## verb_dist                                                      2
## hpoint                                                        44
## fre                                                           38
## fkgl                                                          12
## gf                                                             8
## RuleTooManyNominalConstructions.max_allowable_nouns.v         18
##                                                    rank.rf.counts
## activity                                                       NA
## atl                                                            NA
## RuleLiteraryStyle                                               4
## smog                                                           NA
## RulePassive                                                     1
## maentropy                                                      NA
## entropy                                                        NA
## RuleAnaphoricReferences                                        14
## RuleGPcoordovs                                                 19
## RuleGPdeverbaddr                                               18
## RuleGPpatinstr                                                 17
## RuleGPdeverbsubj                                               16
## RuleGPadjective                                                23
## RuleGPpatbenperson                                             20
## RuleGPwordorder                                                12
## RuleDoubleAdpos                                                11
## RuleDoubleAdpos.max_allowable_distance                         NA
## RuleDoubleAdpos.max_allowable_distance.v                       NA
## RuleReflexivePassWithAnimSubj                                  15
## RuleTooFewVerbs.min_verb_frac                                  NA
## RuleTooManyNegations.max_negation_frac                         NA
## RuleTooManyNegations.max_negation_frac.v                       NA
## RuleTooManyNegations.max_allowable_negations                   NA
## RuleTooManyNegations.max_allowable_negations.v                 NA
## RuleTooManyNominalConstructions.max_noun_frac                  NA
## RuleTooManyNominalConstructions.max_noun_frac.v                NA
## RuleTooManyNominalConstructions.max_allowable_nouns            NA
## RuleCaseRepetition.max_repetition_count                        NA
## RuleCaseRepetition.max_repetition_count.v                      NA
## RuleCaseRepetition.max_repetition_frac                         NA
## RuleCaseRepetition.max_repetition_frac.v                       NA
## RuleWeakMeaningWords                                           13
## RuleAbstractNouns                                               8
## RuleRelativisticExpressions                                    21
## RuleConfirmationExpressions                                    22
## RuleRedundantExpressions                                       24
```

```
## RuleTooLongExpressions                                          10
## RulePredSubjDistance                                             3
## RulePredSubjDistance.max_distance                               NA
## RulePredSubjDistance.max_distance.v                             NA
## RulePredObjDistance                                              9
## RulePredObjDistance.max_distance                                NA
## RulePredObjDistance.max_distance.v                              NA
## RuleInfVerbDistance                                              5
## RuleInfVerbDistance.max_distance                                NA
## RuleInfVerbDistance.max_distance.v                              NA
## RuleMultiPartVerbs                                               2
## RuleMultiPartVerbs.max_distance                                 NA
## RuleMultiPartVerbs.max_distance.v                               NA
## RuleLongSentences.max_length                                    NA
## RuleLongSentences.max_length.v                                  NA
## RulePredAtClauseBeginning.max_order                             NA
## RulePredAtClauseBeginning.max_order.v                           NA
## RuleVerbalNouns                                                  6
## sent_count                                                      NA
## word_count                                                      NA
## syllab_count                                                    NA
## char_count                                                      NA
## cli                                                             NA
## ari                                                             NA
## num_hapax                                                        7
## ttr                                                             NA
## mattr                                                           NA
## mattr.v                                                         NA
## maentropy.v                                                     NA
## mamr                                                            NA
## verb_dist                                                       NA
## hpoint                                                          NA
## fre                                                             NA
## fkgl                                                            NA
## gf                                                              NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v           NA
```

```r
importances_ranked <- importances %>%
  mutate(
    mean_rank = rowMeans(
      select(importances, starts_with("rank")),
      na.rm = TRUE
    ),
    mean_quantile = rowMeans(
      select(importances, starts_with("quantile")),
      na.rm = TRUE
    ),
    general_omissions = rowSums(
      select(importances, starts_with("Importance") & (ends_with("all") | ends_with("notl"))) == 0,
      na.rm = TRUE
    ),
    specialized_omissions = rowSums(
      select(importances, starts_with("Importance") & (ends_with("iac") | ends_with("counts"))) == 0,
      na.rm = TRUE
```

```
    ),
    no_of_irrelevance = rowSums(
      select(importances, starts_with("rank")) %>% is.na()
    )
  ) %>%
  mutate(omissions = general_omissions + specialized_omissions)

# working with the means really isn't informative, because:
# - the means don't take predictors omitted by lassos into account
# - the "all" and "no TL" models tend to be the same, thus they essentially get double the weight
importances_ranked %>%
  select(Variable, general_omissions, specialized_omissions) %>%
  arrange(specialized_omissions, general_omissions) %>%
  print(n = 100)
```

```
## # A tibble: 72 x 3
##    Variable                                general_omissions specialized_omissions
##    <chr>                                               <dbl>                 <dbl>
##  1 activity                                                0                     0
##  2 atl                                                     0                     0
##  3 RuleLiteraryStyle                                       0                     0
##  4 smog                                                    0                     0
##  5 RulePassive                                             0                     0
##  6 maentropy                                               0                     0
##  7 entropy                                                 0                     0
##  8 RuleAnaphoricReferences                                 0                     0
##  9 RuleTooManyNominalConstructions.max_~                   0                     0
## 10 sent_count                                              1                     0
## 11 word_count                                              1                     0
## 12 syllab_count                                            1                     0
## 13 char_count                                              1                     0
## 14 RuleTooManyNegations.max_allowable_n~                   2                     0
## 15 RuleRelativisticExpressions                             2                     0
## 16 RulePredSubjDistance                                    2                     0
## 17 RuleInfVerbDistance                                     2                     0
## 18 RuleMultiPartVerbs                                      2                     0
## 19 RuleVerbalNouns                                         2                     0
## 20 gf                                                      2                     0
## 21 RuleGPcoordovs                                          2                     1
## 22 RuleGPdeverbaddr                                        2                     1
## 23 RuleGPpatinstr                                          2                     1
## 24 RuleGPdeverbsubj                                        2                     1
## 25 RuleGPadjective                                         2                     1
## 26 RuleGPpatbenperson                                      2                     1
## 27 RuleGPwordorder                                         2                     1
## 28 RuleDoubleAdpos                                         2                     1
## 29 RuleDoubleAdpos.max_allowable_distan~                   2                     1
## 30 RuleDoubleAdpos.max_allowable_distan~                   2                     1
## 31 RuleReflexivePassWithAnimSubj                           2                     1
## 32 RuleTooFewVerbs.min_verb_frac                           2                     1
## 33 RuleTooManyNegations.max_negation_fr~                   2                     1
## 34 RuleTooManyNegations.max_negation_fr~                   2                     1
## 35 RuleTooManyNegations.max_allowable_n~                   2                     1
## 36 RuleTooManyNominalConstructions.max_~                   2                     1
```

```
## 37 RuleTooManyNominalConstructions.max_~                2                   1
## 38 RuleTooManyNominalConstructions.max_~                2                   1
## 39 RuleCaseRepetition.max_repetition_co~                2                   1
## 40 RuleCaseRepetition.max_repetition_co~                2                   1
## 41 RuleCaseRepetition.max_repetition_fr~                2                   1
## 42 RuleCaseRepetition.max_repetition_fr~                2                   1
## 43 RuleWeakMeaningWords                                 2                   1
## 44 RuleAbstractNouns                                    2                   1
## 45 RuleConfirmationExpressions                          2                   1
## 46 RuleRedundantExpressions                             2                   1
## 47 RuleTooLongExpressions                               2                   1
## 48 RulePredSubjDistance.max_distance                    2                   1
## 49 RulePredSubjDistance.max_distance.v                  2                   1
## 50 RulePredObjDistance                                  2                   1
## 51 RulePredObjDistance.max_distance                     2                   1
## 52 RulePredObjDistance.max_distance.v                   2                   1
## 53 RuleInfVerbDistance.max_distance                     2                   1
## 54 RuleInfVerbDistance.max_distance.v                   2                   1
## 55 RuleMultiPartVerbs.max_distance                      2                   1
## 56 RuleMultiPartVerbs.max_distance.v                    2                   1
## 57 RuleLongSentences.max_length                         2                   1
## 58 RuleLongSentences.max_length.v                       2                   1
## 59 RulePredAtClauseBeginning.max_order                  2                   1
## 60 RulePredAtClauseBeginning.max_order.v                2                   1
## 61 cli                                                  2                   1
## 62 ari                                                  2                   1
## 63 num_hapax                                            2                   1
## 64 ttr                                                  2                   1
## 65 mattr                                                2                   1
## 66 mattr.v                                              2                   1
## 67 maentropy.v                                          2                   1
## 68 mamr                                                 2                   1
## 69 verb_dist                                            2                   1
## 70 hpoint                                               2                   1
## 71 fre                                                  2                   1
## 72 fkgl                                                 2                   1
```

```
importances_ranked %>%
  select(Variable, mean_rank, mean_quantile, omissions) %>%
  arrange(omissions, mean_quantile) %>%
  print(n = 100)
```

```
## # A tibble: 72 x 4
##    Variable                                  mean_rank mean_quantile omissions
##    <chr>                                         <dbl>         <dbl>     <dbl>
##  1 activity                                       1           0.0172         0
##  2 RulePassive                                    4.83        0.0837         0
##  3 RuleLiteraryStyle                              5.5         0.111          0
##  4 atl                                            6.67        0.114          0
##  5 smog                                           7.67        0.132          0
##  6 maentropy                                     10           0.170          0
##  7 RuleTooManyNominalConstructions.max_allowa~   12.5         0.284          0
##  8 RuleAnaphoricReferences                       14.3         0.289          0
##  9 entropy                                       17.7         0.296          0
## 10 char_count                                    51           0.718          1
```

```
## 11 sent_count                                    54          0.761          1
## 12 word_count                                    55          0.775          1
## 13 syllab_count                                  58          0.817          1
## 14 gf                                             8.5        0.156          2
## 15 RuleMultiPartVerbs                            12          0.221          2
## 16 RulePredSubjDistance                          14          0.264          2
## 17 RuleVerbalNouns                               13.2        0.280          2
## 18 RuleInfVerbDistance                           23          0.422          2
## 19 RuleTooManyNegations.max_allowable_negatio~   25.8        0.444          2
## 20 RuleRelativisticExpressions                   37.5        0.693          2
## 21 verb_dist                                      2.33       0.0392         3
## 22 RuleTooFewVerbs.min_verb_frac                  2.67       0.0470         3
## 23 RuleTooManyNominalConstructions.max_allowa~    4.33       0.0740         3
## 24 RuleLongSentences.max_length                   4.67       0.0813         3
## 25 RulePredAtClauseBeginning.max_order            6.33       0.108          3
## 26 ari                                            6.67       0.116          3
## 27 fkgl                                          13          0.221          3
## 28 RuleTooManyNegations.max_negation_frac        13.3        0.223          3
## 29 mamr                                          14.7        0.248          3
## 30 mattr                                         18          0.300          3
## 31 RuleTooLongExpressions                        15          0.308          3
## 32 RuleTooManyNominalConstructions.max_noun_f~   18.7        0.312          3
## 33 RulePredAtClauseBeginning.max_order.v         18.7        0.326          3
## 34 cli                                           22.3        0.371          3
## 35 RuleCaseRepetition.max_repetition_count.v     24.7        0.416          3
## 36 maentropy.v                                   26          0.430          3
## 37 RuleLongSentences.max_length.v                25.7        0.432          3
## 38 RulePredSubjDistance.max_distance             26.3        0.456          3
## 39 RuleCaseRepetition.max_repetition_frac.v      27.3        0.459          3
## 40 RuleCaseRepetition.max_repetition_frac        29          0.492          3
## 41 num_hapax                                     31          0.512          3
## 42 mattr.v                                       32          0.541          3
## 43 RulePredObjDistance.max_distance              32.7        0.542          3
## 44 RuleDoubleAdpos                               32          0.565          3
## 45 RulePredObjDistance                           34.3        0.581          3
## 46 RuleAbstractNouns                             36          0.595          3
## 47 RuleCaseRepetition.max_repetition_count       36          0.618          3
## 48 RulePredSubjDistance.max_distance.v           35.7        0.624          3
## 49 RuleTooManyNegations.max_allowable_negatio~   37.7        0.625          3
## 50 RuleTooManyNegations.max_negation_frac.v      38.7        0.649          3
## 51 RuleInfVerbDistance.max_distance              39          0.656          3
## 52 RuleWeakMeaningWords                          38          0.667          3
## 53 fre                                           40.7        0.696          3
## 54 RuleInfVerbDistance.max_distance.v            42.3        0.712          3
## 55 RuleTooManyNominalConstructions.max_noun_f~   42.7        0.713          3
## 56 ttr                                           43.7        0.718          3
## 57 RuleGPwordorder                               43.3        0.737          3
## 58 RulePredObjDistance.max_distance.v            44.7        0.748          3
## 59 RuleMultiPartVerbs.max_distance               45.3        0.768          3
## 60 RuleReflexivePassWithAnimSubj                 45.3        0.793          3
## 61 RuleMultiPartVerbs.max_distance.v             48.7        0.822          3
## 62 RuleDoubleAdpos.max_allowable_distance.v      49.3        0.827          3
## 63 RuleGPcoordovs                                45.7        0.834          3
## 64 RuleGPpatinstr                                47.3        0.840          3
```

```
## 65 RuleGPdeverbaddr                              47.7        0.854        3
## 66 RuleGPdeverbsubj                              49.3        0.860        3
## 67 RuleDoubleAdpos.max_allowable_distance        52.3        0.876        3
## 68 RuleGPpatbenperson                            50          0.906        3
## 69 hpoint                                        54.3        0.908        3
## 70 RuleConfirmationExpressions                   52          0.953        3
## 71 RuleGPadjective                               53          0.976        3
## 72 RuleRedundantExpressions                      54          1            3
```

Discussing the variables

We might keep predictors not thrown away by any of the more niche models for the analysis.

Of course, the selection of predictor combinations for the analysis is somewhat arbitrary. We might stick by the characteristics that one group is more focused on more universal properties of the text while the other on more rare of spontaneously-occurring phenomena.

The features not excluded by the model with the richer feature set are the most important ones. The absence of *_counts from the features proves that they are not needed for the recognition of (un)readable texts. This might however be compensated by using entropy for the prediction, as the "most important" features include both regular entropy and the moving average entropy.

Top RF-selected predictors seem not to be omitted completely by the lasso models; the top 20 to 25 ranks seem to overlap somewhat (even if the ordering of the predictors is different). Notable exceptions are:

- `fkgl` (14th for RF.all, but omitted 3 times)
- `cli` (27th for RF.all, but omitted 3 times)
- `mattr.v` (30th for RF.all, but omitted 3 times; maentropy.v omitted only 2 times though)

The RF-selected features start to get omitted more often from rank 38 (`RuleCaseRepetition.max_repetition_count`).

Highly deviating documents

will probably need to redo this all over again

Lasso

FrBo / orig_Jak uspořádat shromáždění

truth: bad

FrBo / orig_Zastupitelstvo_o čem a jak rozhoduje

truth: bad

KUKY / Mestsky_urad_usneseni_-_slouceni_pred

truth: good

KUKY / 2A_dokument_puvodni_vyzva_k_zaplaceni_SOP_a_k_doplneni_kast_pouceni

truth: good

FrBo / orig_Jak namítat podjatost_final

truth: bad

KUKY / Mestsky__urad__Vyzva__k__zaplaceni__nakladu__rizeni__pred

truth: good

IAC-outlier

FrBo / orig__Jak probíhá správní řízení

truth: bad

IAC-outlier

KUKY / Reakce__na__dopis__pracovni

truth: good

counts-outlier

KUKY / Reakce__na__dopis__rev

truth: good

counts-outlier

FrBo / orig__Kterých řízení se může váš spolek účastnit__FINAL

truth: bad

counts-outlier

FrBo / red__Certifikáty autorizovaných inspektorů

truth: good

counts-outlier

KUKY / 1A__dokument__puvodni__ustanoven__zastupce__vyzva__k__doplneni__kast__pouceni

truth: good

counts-outlier

RF

FrBo / orig__Jak uspořádat shromáždění

truth: bad

KUKY / 33 Cdo 30__2024

truth: good

KUKY / 11__vizum__pred

truth: good

FrBo / orig__Kterých řízení se může váš spolek účastnit__FINAL

truth: bad

FrBo / orig_lhuty_v_jednani_s_urady_a_soudy

truth: bad

FrBo / orig_Zastupitelstvo_o čem a jak rozhoduje

truth: bad

FrBo / orig_Jak probíhá správní řízení

truth: bad

FrBo / orig_Jak namítat podjatost_final

truth: bad

FrBo / 142

truth: bad

IAC-outlier

FrBo / 64

truth: bad

counts-outlier

FrBo / red_Certifikáty autorizovaných inspektorů

truth: good

counts-outlier

KUKY / 2A_dokument_puvodni_vyzva_k_zaplaceni_SOP_a_k_doplneni_kast_pouceni

truth: good

counts-outlier

FrBo / orig_provokace_korupcniho_jednani

truth: bad

counts-outlier