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)
```

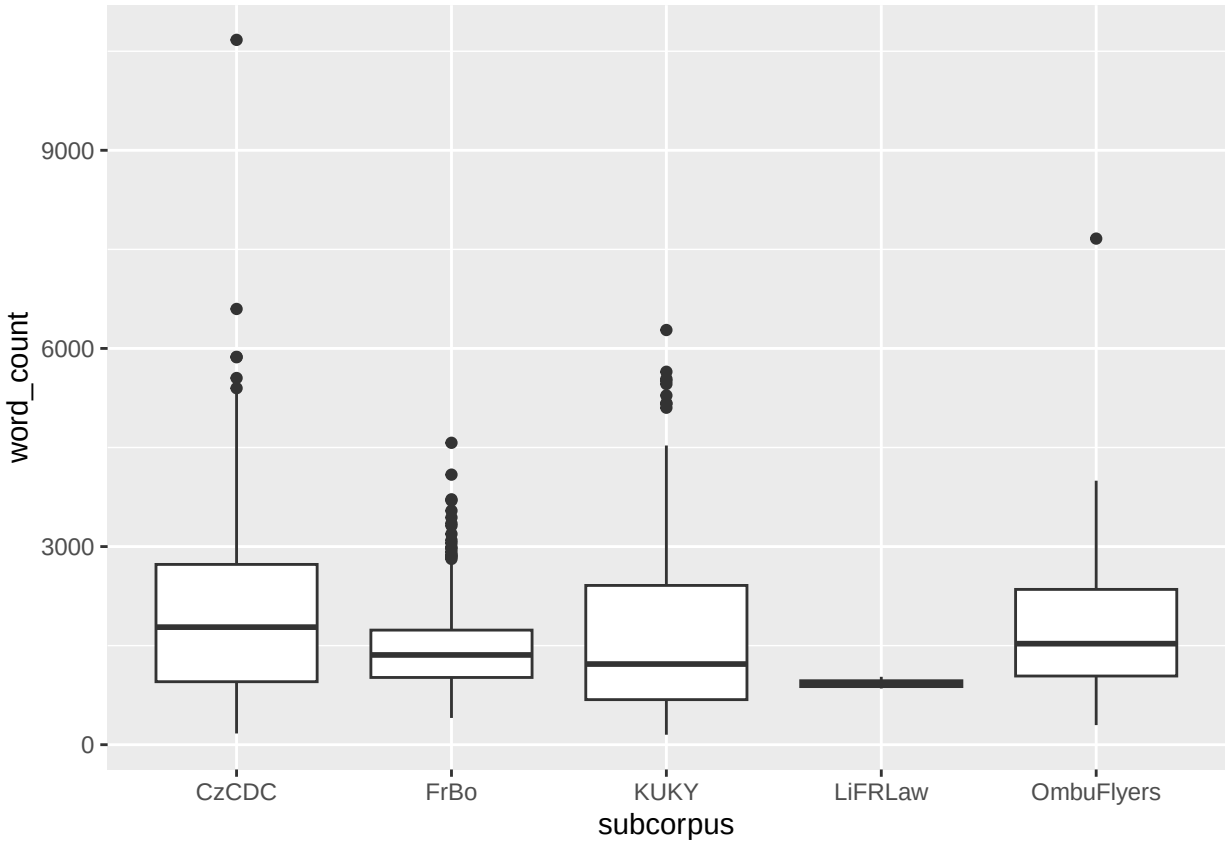
```
## -- Attaching packages --------------------------------------- tidymodels 1.2.0 --
## v broom        1.0.5     v rsample      1.2.1
## v dials        1.3.0     v tune         1.2.1
## v infer        1.0.7     v workflows    1.1.4
## v modeldata    1.4.0     v workflowsets 1.1.0
## v parsnip      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

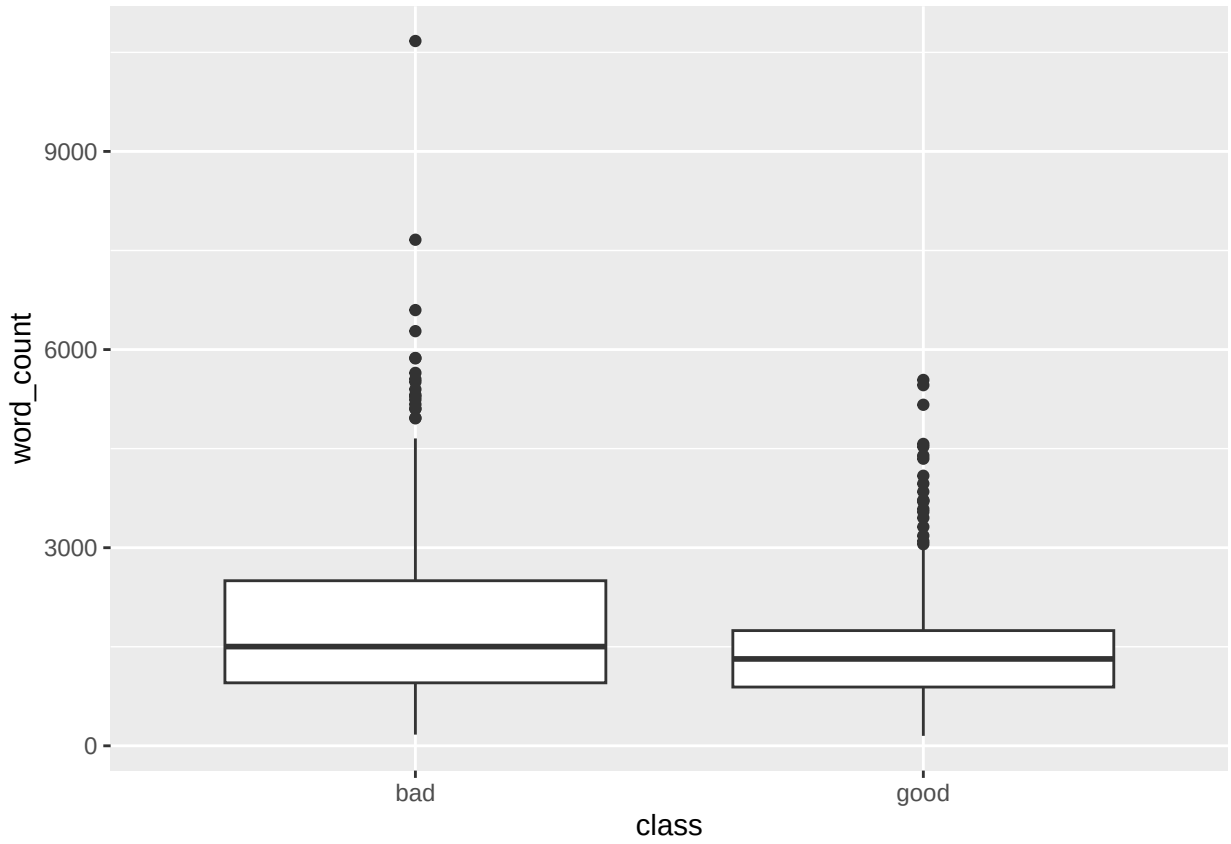
```
data <- read_csv("../measurements/measurements.csv")
```

```
## Rows: 766 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>
## <612/154/766>
```

```
print(folds)
```

```
## #  10-fold cross-validation using stratification
## # A tibble: 10 x 2
##    splits           id
##    <list>           <chr>
##  1 <split [549/63]> Fold01
##  2 <split [549/63]> Fold02
##  3 <split [549/63]> Fold03
##  4 <split [550/62]> Fold04
##  5 <split [551/61]> Fold05
##  6 <split [552/60]> Fold06
##  7 <split [552/60]> Fold07
##  8 <split [552/60]> Fold08
##  9 <split [552/60]> Fold09
## 10 <split [552/60]> Fold10
```

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

```
##
##              bad good
##   CzCDC      169    0
##   FrBo        57  187
##   KUKY        70   88
##   LiFRLaw      3    0
##   OmbuFlyers  38    0
```

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

```
##
##              bad good
##   CzCDC       41    0
##   FrBo        22   43
##   KUKY        14   22
##   OmbuFlyers  12    0
```

Classifier helpers

Models

```
library(vip)
```

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

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

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

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

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

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

Null model

```
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_accuracy <- lasso_tune_rs %>%
    select_by_one_std_err(metric = "accuracy", -penalty)

  cat("Best accuracy:\n")
  print(best_accuracy)

  final_lasso <- lasso_tune_wf %>% finalize_workflow(best_accuracy)
  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_accuracy %>% 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: 10 x 2
##    terms                                  id
##    <chr>                                  <chr>
##  1 RuleCaseRepetition.max_repetition_frac.v corr_VT4kj
##  2 char_count                             corr_VT4kj
##  3 ari                                    corr_VT4kj
##  4 ttr                                    corr_VT4kj
##  5 maentropy                              corr_VT4kj
##  6 hpoint                                 corr_VT4kj
##  7 atl                                    corr_VT4kj
##  8 gf                                     corr_VT4kj
##  9 smog                                   corr_VT4kj
## 10 word_count                             corr_VT4kj
```

```
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_fD0q0
## 2 ari                                      corr_fD0q0
## 3 maentropy                                corr_fD0q0
## 4 atl                                      corr_fD0q0
## 5 gf                                       corr_fD0q0
## 6 smog                                     corr_fD0q0
## 7 RuleLongSentences.max_length             corr_fD0q0
```

```
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

```r
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")
  cat("Greatest deviations:\n")
  joined %>%
    filter(.pred_class != class) %>%
    mutate(deviation = .pred_good - 0.5) %>%
    mutate(abs_deviation = abs(deviation)) %>%
    arrange(-abs_deviation) %>%
    select(abs_deviation, .pred_class, class, subcorpus, FileName) %>%
    print(n = round(nrow(joined) / 5))
}
```

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 [549/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
##  2 <split [549/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
##  3 <split [549/63]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [550/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [551/61]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [552/60]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [552/60]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [552/60]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [552/60]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [552/60]> 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     0.550    10 0.0134  Preprocessor1_Model1
## 2 brier_class binary     0.248    10 0.00137 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 [549/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
##  2 <split [549/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
##  3 <split [549/63]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [550/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [551/61]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [552/60]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [552/60]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [552/60]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [552/60]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [552/60]> 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 [549/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
##  2 <split [549/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
##  3 <split [549/63]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [550/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [551/61]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [552/60]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [552/60]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [552/60]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [552/60]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [552/60]> 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     0.550    10 0.0134  Preprocessor1_Model1
## 2 brier_class binary     0.248    10 0.00137 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 [549/63]> Fold01 <tibble [3 x 4]> <tibble [0 x 3]>
```

```
##  2 <split [549/63]> Fold02 <tibble [3 x 4]> <tibble [0 x 3]>
##  3 <split [549/63]> Fold03 <tibble [3 x 4]> <tibble [0 x 3]>
##  4 <split [550/62]> Fold04 <tibble [3 x 4]> <tibble [0 x 3]>
##  5 <split [551/61]> Fold05 <tibble [3 x 4]> <tibble [0 x 3]>
##  6 <split [552/60]> Fold06 <tibble [3 x 4]> <tibble [0 x 3]>
##  7 <split [552/60]> Fold07 <tibble [3 x 4]> <tibble [0 x 3]>
##  8 <split [552/60]> Fold08 <tibble [3 x 4]> <tibble [0 x 3]>
##  9 <split [552/60]> Fold09 <tibble [3 x 4]> <tibble [0 x 3]>
## 10 <split [552/60]> 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)                                    -5.815e-01  1.671e-01
## RuleGPcoordovs                                 -5.074e-02  1.260e-01
## RuleGPdeverbaddr                               -2.489e-01  1.320e-01
## RuleGPpatinstr                                 -1.270e-01  1.316e-01
## RuleGPdeverbsubj                               -1.933e-01  1.148e-01
## RuleGPadjective                                 3.952e-01  2.386e-01
## RuleGPpatbenperson                             -1.703e-01  1.295e-01
## RuleGPwordorder                                -1.446e-01  1.550e-01
## RuleDoubleAdpos                                 6.323e-02  1.617e-01
## RuleDoubleAdpos.max_allowable_distance         -2.776e-02  2.707e-01
## RuleDoubleAdpos.max_allowable_distance.v        1.041e-01  2.222e-01
## RuleReflexivePassWithAnimSubj                  -8.326e-02  1.423e-01
## RuleTooFewVerbs.min_verb_frac                  -1.797e+00  5.367e-01
## RuleTooManyNegations.max_negation_frac          1.358e-01  2.071e-01
## RuleTooManyNegations.max_negation_frac.v       -4.608e-02  1.559e-01
## RuleTooManyNegations.max_allowable_negations    2.424e-01  2.638e-01
## RuleTooManyNegations.max_allowable_negations.v -1.448e-01  2.330e-01
## RuleTooManyNominalConstructions.max_noun_frac  -3.317e-01  2.176e-01
## RuleTooManyNominalConstructions.max_noun_frac.v 7.527e-02  1.634e-01
## RuleTooManyNominalConstructions.max_allowable_nouns 3.154e-01  5.022e-01
## RuleCaseRepetition.max_repetition_count        -2.595e-01  3.832e-01
## RuleCaseRepetition.max_repetition_count.v      -2.389e-01  1.916e-01
```

```
## RuleCaseRepetition.max_repetition_frac              8.332e-01  1.099e+00
## RuleCaseRepetition.max_repetition_frac.v            1.219e+00  1.079e+00
## RuleWeakMeaningWords                               -1.196e-01  1.351e-01
## RuleAbstractNouns                                   1.056e-01  1.366e-01
## RuleRelativisticExpressions                        -2.598e-01  1.369e-01
## RuleConfirmationExpressions                         1.833e-01  1.570e-01
## RuleRedundantExpressions                           -1.947e-01  1.623e-01
## RuleTooLongExpressions                              2.882e-01  1.552e-01
## RuleAnaphoricReferences                             5.204e-01  1.548e-01
## RuleLiteraryStyle                                  -4.104e-01  1.616e-01
## RulePassive                                        -4.972e-01  2.051e-01
## RulePredSubjDistance                                4.758e-01  2.172e-01
## RulePredSubjDistance.max_distance                  -5.392e-01  2.923e-01
## RulePredSubjDistance.max_distance.v                -6.081e-02  2.127e-01
## RulePredObjDistance                                 2.251e-04  2.551e-01
## RulePredObjDistance.max_distance                   -3.251e-01  2.803e-01
## RulePredObjDistance.max_distance.v                  3.876e-02  1.916e-01
## RuleInfVerbDistance                                 1.657e-01  2.624e-01
## RuleInfVerbDistance.max_distance                    3.270e-01  1.385e-01
## RuleInfVerbDistance.max_distance.v                 -2.439e-01  1.855e-01
## RuleMultiPartVerbs                                  5.539e-01  2.528e-01
## RuleMultiPartVerbs.max_distance                     8.468e-02  2.252e-01
## RuleMultiPartVerbs.max_distance.v                   1.599e-01  2.190e-01
## RuleLongSentences.max_length                        3.448e+00  9.828e-01
## RuleLongSentences.max_length.v                      8.485e-01  2.205e-01
## RulePredAtClauseBeginning.max_order                -2.599e-01  3.283e-01
## RulePredAtClauseBeginning.max_order.v               2.779e-02  2.618e-01
## RuleVerbalNouns                                    -6.928e-02  1.587e-01
## sent_count                                          1.298e+00  7.708e-01
## word_count                                         -5.628e+00  3.832e+00
## syllab_count                                       -1.337e+01  6.339e+00
## char_count                                          1.854e+01  8.225e+00
## cli                                                -8.734e-01  2.335e+00
## ari                                                -5.628e+00  1.956e+00
## num_hapax                                           5.712e-01  9.716e-01
## entropy                                            -6.519e-01  3.855e-01
## ttr                                                -1.092e+00  1.293e+00
## mattr                                              -1.207e+00  1.121e+00
## mattr.v                                            -4.288e-01  4.514e-01
## maentropy                                           9.184e-01  1.166e+00
## maentropy.v                                         9.324e-01  6.971e-01
## mamr                                               -1.154e-01  2.997e-01
## verb_dist                                           3.170e-01  3.314e-01
## activity                                            1.668e+00  5.612e-01
## hpoint                                             -1.182e+00  8.745e-01
## atl                                                 8.325e-01  2.690e+00
## fre                                                -2.980e+00  1.045e+00
## fkgl                                                       NA         NA
## gf                                                 -2.400e+00  2.475e+00
## smog                                                1.635e+00  2.006e+00
##                                                   z value Pr(>|z|)
## (Intercept)                                        -3.479 0.000503 ***
## RuleGPcoordovs                                     -0.403 0.687185
## RuleGPdeverbaddr                                   -1.885 0.059432 .
```

```
## RuleGPpatinstr                                        -0.965 0.334677
## RuleGPdeverbsubj                                      -1.683 0.092298 .
## RuleGPadjective                                        1.656 0.097703 .
## RuleGPpatbenperson                                    -1.315 0.188646
## RuleGPwordorder                                       -0.933 0.350771
## RuleDoubleAdpos                                        0.391 0.695761
## RuleDoubleAdpos.max_allowable_distance                -0.103 0.918321
## RuleDoubleAdpos.max_allowable_distance.v               0.469 0.639328
## RuleReflexivePassWithAnimSubj                         -0.585 0.558582
## RuleTooFewVerbs.min_verb_frac                         -3.348 0.000814 ***
## RuleTooManyNegations.max_negation_frac                 0.656 0.512087
## RuleTooManyNegations.max_negation_frac.v              -0.296 0.767594
## RuleTooManyNegations.max_allowable_negations           0.919 0.358160
## RuleTooManyNegations.max_allowable_negations.v        -0.621 0.534471
## RuleTooManyNominalConstructions.max_noun_frac         -1.525 0.127325
## RuleTooManyNominalConstructions.max_noun_frac.v        0.461 0.644988
## RuleTooManyNominalConstructions.max_allowable_nouns    0.628 0.530051
## RuleCaseRepetition.max_repetition_count               -0.677 0.498276
## RuleCaseRepetition.max_repetition_count.v             -1.247 0.212388
## RuleCaseRepetition.max_repetition_frac                 0.758 0.448318
## RuleCaseRepetition.max_repetition_frac.v               1.129 0.258693
## RuleWeakMeaningWords                                  -0.885 0.376126
## RuleAbstractNouns                                      0.773 0.439470
## RuleRelativisticExpressions                           -1.898 0.057734 .
## RuleConfirmationExpressions                            1.167 0.243117
## RuleRedundantExpressions                              -1.199 0.230455
## RuleTooLongExpressions                                 1.857 0.063326 .
## RuleAnaphoricReferences                                3.362 0.000775 ***
## RuleLiteraryStyle                                     -2.540 0.011083 *
## RulePassive                                           -2.424 0.015345 *
## RulePredSubjDistance                                   2.191 0.028487 *
## RulePredSubjDistance.max_distance                     -1.845 0.065042 .
## RulePredSubjDistance.max_distance.v                   -0.286 0.774961
## RulePredObjDistance                                    0.001 0.999296
## RulePredObjDistance.max_distance                      -1.160 0.246052
## RulePredObjDistance.max_distance.v                     0.202 0.839646
## RuleInfVerbDistance                                    0.631 0.527832
## RuleInfVerbDistance.max_distance                       2.361 0.018208 *
## RuleInfVerbDistance.max_distance.v                    -1.315 0.188458
## RuleMultiPartVerbs                                     2.191 0.028448 *
## RuleMultiPartVerbs.max_distance                        0.376 0.706919
## RuleMultiPartVerbs.max_distance.v                      0.730 0.465362
## RuleLongSentences.max_length                           3.508 0.000451 ***
## RuleLongSentences.max_length.v                         3.848 0.000119 ***
## RulePredAtClauseBeginning.max_order                   -0.792 0.428556
## RulePredAtClauseBeginning.max_order.v                  0.106 0.915457
## RuleVerbalNouns                                       -0.437 0.662408
## sent_count                                             1.684 0.092098 .
## word_count                                            -1.469 0.141952
## syllab_count                                          -2.110 0.034877 *
## char_count                                             2.255 0.024155 *
## cli                                                   -0.374 0.708383
## ari                                                   -2.877 0.004012 **
## num_hapax                                              0.588 0.556610
```

```
## entropy                                                -1.691 0.090784 .
## ttr                                                    -0.845 0.398068
## mattr                                                  -1.077 0.281681
## mattr.v                                                -0.950 0.342143
## maentropy                                               0.788 0.430877
## maentropy.v                                             1.338 0.181024
## mamr                                                   -0.385 0.700324
## verb_dist                                               0.957 0.338746
## activity                                                2.972 0.002957 **
## hpoint                                                 -1.351 0.176635
## atl                                                     0.309 0.756963
## fre                                                    -2.853 0.004337 **
## fkgl                                                       NA       NA
## gf                                                     -0.970 0.332153
## smog                                                    0.815 0.415107
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 842.12  on 611  degrees of freedom
## Residual deviance: 424.47  on 541  degrees of freedom
## AIC: 566.47
##
## Number of Fisher Scoring iterations: 6
```

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)                                     -0.452532   0.134377
## RuleDoubleAdpos.max_allowable_distance           0.153689   0.192495
## RuleDoubleAdpos.max_allowable_distance.v        -0.114459   0.167523
## RuleTooFewVerbs.min_verb_frac                   -1.539441   0.426885
## RuleTooManyNegations.max_negation_frac           0.040402   0.178987
## RuleTooManyNegations.max_negation_frac.v         0.063467   0.130559
## RuleTooManyNegations.max_allowable_negations     0.096269   0.236561
## RuleTooManyNegations.max_allowable_negations.v  -0.198630   0.201009
## RuleTooManyNominalConstructions.max_noun_frac   -0.351172   0.178675
## RuleTooManyNominalConstructions.max_noun_frac.v  0.139525   0.137715
## RuleTooManyNominalConstructions.max_allowable_nouns  0.219309   0.413569
## RuleTooManyNominalConstructions.max_allowable_nouns.v -0.218766   0.189946
## RuleCaseRepetition.max_repetition_count          0.053659   0.302008
```

```
## RuleCaseRepetition.max_repetition_count.v             -0.325508   0.169448
## RuleCaseRepetition.max_repetition_frac                 0.458775   0.922474
## RuleCaseRepetition.max_repetition_frac.v               0.718221   0.906236
## RulePredSubjDistance.max_distance                     -0.562731   0.275941
## RulePredSubjDistance.max_distance.v                    0.037959   0.179267
## RulePredObjDistance.max_distance                      -0.259888   0.245379
## RulePredObjDistance.max_distance.v                     0.005293   0.164510
## RuleInfVerbDistance.max_distance                       0.214965   0.118217
## RuleInfVerbDistance.max_distance.v                    -0.374875   0.150446
## RuleMultiPartVerbs.max_distance                        0.151781   0.208376
## RuleMultiPartVerbs.max_distance.v                      0.173853   0.185069
## RuleLongSentences.max_length                           3.111818   0.890676
## RuleLongSentences.max_length.v                         0.624271   0.181781
## RulePredAtClauseBeginning.max_order                   -0.101123   0.359959
## RulePredAtClauseBeginning.max_order.v                 -0.125394   0.217829
## cli                                                   -0.797606   1.761512
## ari                                                   -4.234860   1.336233
## entropy                                               -0.167785   0.307403
## ttr                                                   -0.393476   0.326889
## mattr                                                 -0.891455   0.870774
## mattr.v                                               -0.575654   0.399181
## maentropy                                              0.599774   0.885082
## maentropy.v                                            1.133037   0.631452
## mamr                                                   0.029908   0.228002
## verb_dist                                              0.439288   0.270594
## activity                                               1.977103   0.398249
## hpoint                                                -0.404004   0.359116
## atl                                                    1.612271   1.915494
## fre                                                   -2.095035   0.545251
## fkgl                                                         NA         NA
## gf                                                    -1.876752   2.118482
## smog                                                   0.646687   1.695271
##                                                      z value Pr(>|z|)
## (Intercept)                                           -3.368 0.000758 ***
## RuleDoubleAdpos.max_allowable_distance                 0.798 0.424634
## RuleDoubleAdpos.max_allowable_distance.v              -0.683 0.494453
## RuleTooFewVerbs.min_verb_frac                         -3.606 0.000311 ***
## RuleTooManyNegations.max_negation_frac                 0.226 0.821417
## RuleTooManyNegations.max_negation_frac.v               0.486 0.626883
## RuleTooManyNegations.max_allowable_negations           0.407 0.684044
## RuleTooManyNegations.max_allowable_negations.v        -0.988 0.323073
## RuleTooManyNominalConstructions.max_noun_frac         -1.965 0.049365 *
## RuleTooManyNominalConstructions.max_noun_frac.v        1.013 0.310992
## RuleTooManyNominalConstructions.max_allowable_nouns    0.530 0.595914
## RuleTooManyNominalConstructions.max_allowable_nouns.v -1.152 0.249433
## RuleCaseRepetition.max_repetition_count                0.178 0.858980
## RuleCaseRepetition.max_repetition_count.v             -1.921 0.054733 .
## RuleCaseRepetition.max_repetition_frac                 0.497 0.618955
## RuleCaseRepetition.max_repetition_frac.v               0.793 0.428050
## RulePredSubjDistance.max_distance                     -2.039 0.041418 *
## RulePredSubjDistance.max_distance.v                    0.212 0.832306
## RulePredObjDistance.max_distance                      -1.059 0.289542
## RulePredObjDistance.max_distance.v                     0.032 0.974333
## RuleInfVerbDistance.max_distance                       1.818 0.069003 .
```

```
## RuleInfVerbDistance.max_distance.v                    -2.492 0.012711 *
## RuleMultiPartVerbs.max_distance                        0.728 0.466368
## RuleMultiPartVerbs.max_distance.v                      0.939 0.347526
## RuleLongSentences.max_length                           3.494 0.000476 ***
## RuleLongSentences.max_length.v                         3.434 0.000594 ***
## RulePredAtClauseBeginning.max_order                   -0.281 0.778766
## RulePredAtClauseBeginning.max_order.v                 -0.576 0.564849
## cli                                                   -0.453 0.650695
## ari                                                   -3.169 0.001528 **
## entropy                                               -0.546 0.585193
## ttr                                                   -1.204 0.228706
## mattr                                                 -1.024 0.305953
## mattr.v                                               -1.442 0.149278
## maentropy                                              0.678 0.497995
## maentropy.v                                            1.794 0.072759 .
## mamr                                                   0.131 0.895637
## verb_dist                                              1.623 0.104500
## activity                                               4.964 6.89e-07 ***
## hpoint                                                -1.125 0.260590
## atl                                                    0.842 0.399956
## fre                                                   -3.842 0.000122 ***
## fkgl                                                     NA       NA
## gf                                                    -0.886 0.375674
## smog                                                   0.381 0.702858
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 842.12  on 611  degrees of freedom
## Residual deviance: 502.46  on 568  degrees of freedom
## AIC: 590.46
##
## 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)                  -0.366984   0.108361  -3.387 0.000707 ***
## RuleGPcoordovs               -0.028494   0.103516  -0.275 0.783112
## RuleGPdeverbaddr             -0.169166   0.110902  -1.525 0.127169
## RuleGPpatinstr                0.023252   0.097093   0.239 0.810729
```

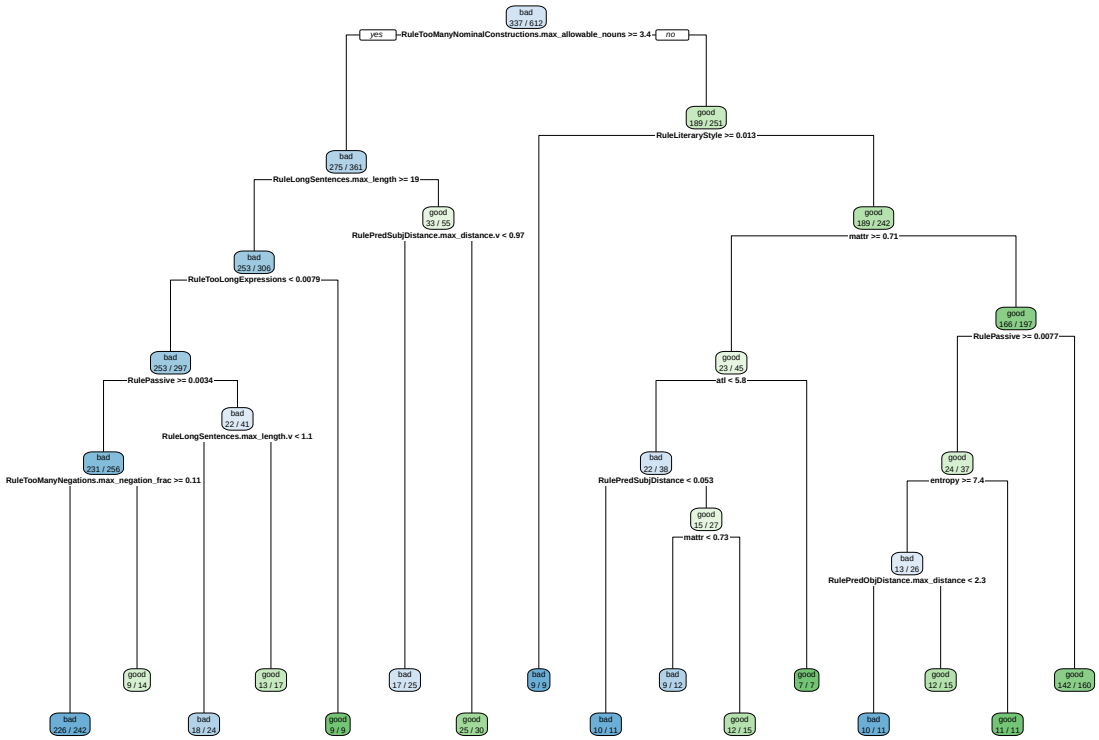
```
## RuleGPdeverbsubj              -0.247337   0.131464  -1.881 0.059917 .
## RuleGPadjective                0.241576   0.151276   1.597 0.110282
## RuleGPpatbenperson            -0.088009   0.099527  -0.884 0.376548
## RuleGPwordorder               -0.105531   0.120029  -0.879 0.379286
## RuleDoubleAdpos               -0.093099   0.108656  -0.857 0.391541
## RuleReflexivePassWithAnimSubj  0.061361   0.104220   0.589 0.556022
## RuleWeakMeaningWords          -0.017223   0.105003  -0.164 0.869713
## RuleAbstractNouns              0.009075   0.109190   0.083 0.933760
## RuleRelativisticExpressions   -0.319457   0.129536  -2.466 0.013657 *
## RuleConfirmationExpressions    0.015026   0.118577   0.127 0.899160
## RuleRedundantExpressions      -0.289076   0.164491  -1.757 0.078849 .
## RuleTooLongExpressions         0.299057   0.111553   2.681 0.007344 **
## RuleAnaphoricReferences        0.358157   0.120768   2.966 0.003020 **
## RuleLiteraryStyle             -0.626614   0.127157  -4.928 8.31e-07 ***
## RulePassive                   -0.882818   0.136113  -6.486 8.82e-11 ***
## RulePredSubjDistance           0.419705   0.132206   3.175 0.001500 **
## RulePredObjDistance           -0.143205   0.134534  -1.064 0.287122
## RuleInfVerbDistance            0.233889   0.141315   1.655 0.097907 .
## RuleMultiPartVerbs             0.600104   0.145545   4.123 3.74e-05 ***
## RuleVerbalNouns                0.272509   0.115050   2.369 0.017854 *
## num_hapax                      0.175356   0.110968   1.580 0.114053
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 842.12  on 611  degrees of freedom
## Residual deviance: 565.93  on 587  degrees of freedom
## AIC: 615.93
##
## 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
```

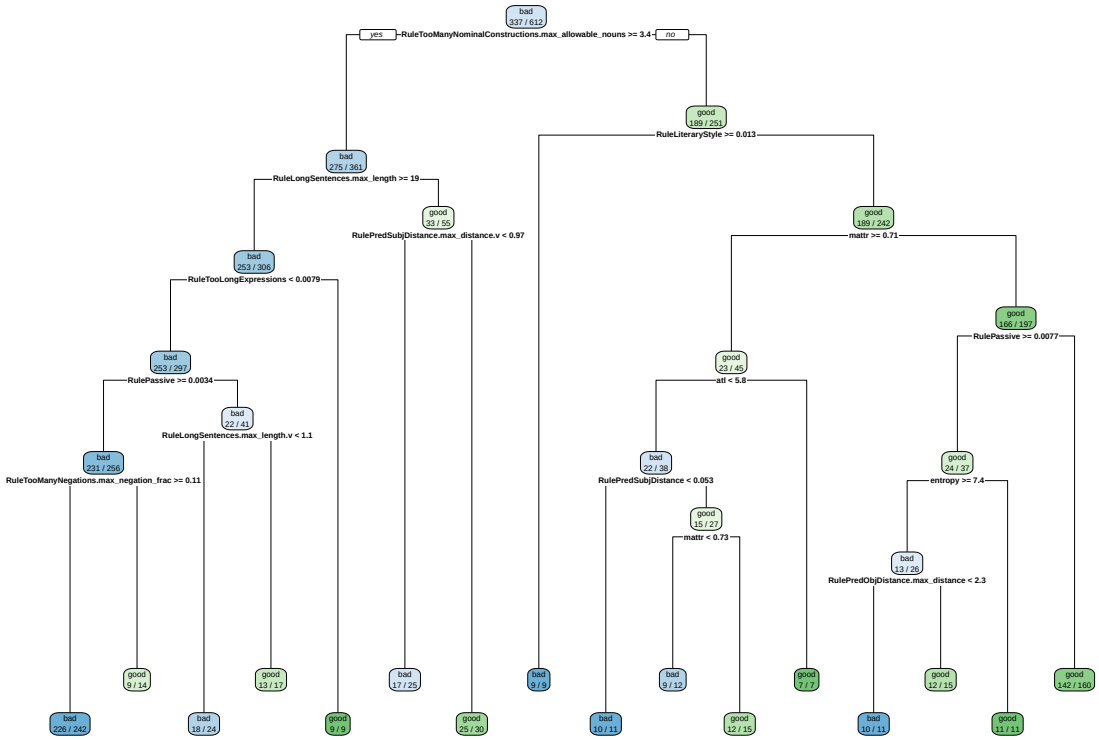
All variables

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



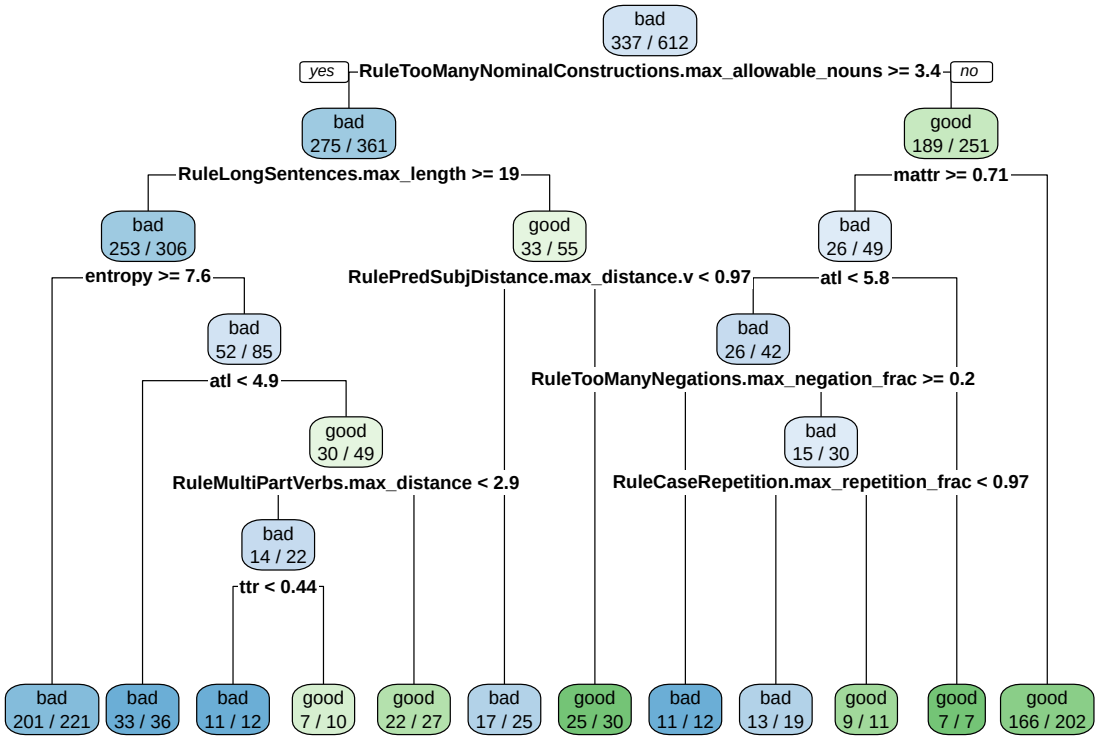
No TL

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



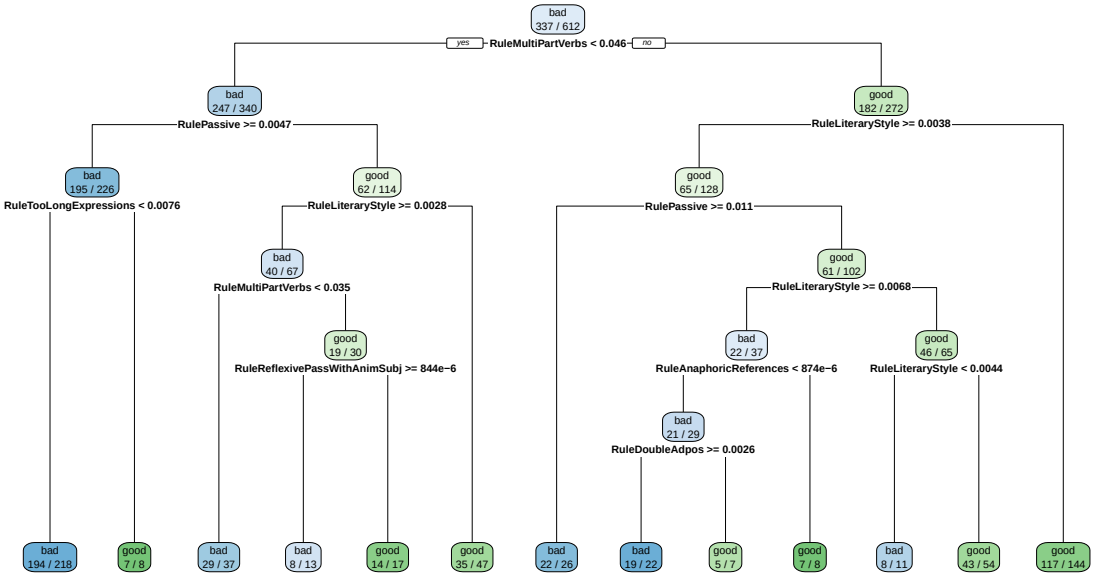
IAC

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



Counts

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



Lasso

All variables

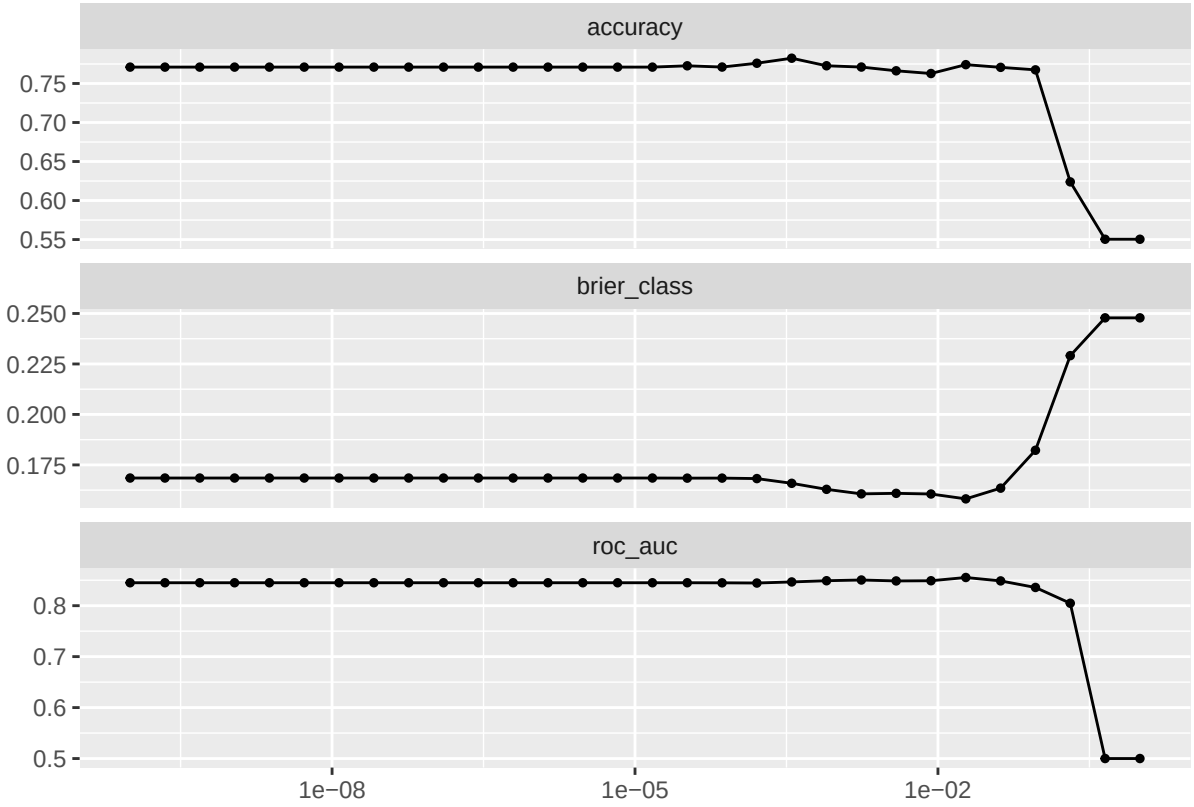
Remove correlating

```
# 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 0.0189   roc_auc binary     0.855    10  0.0192 Preprocessor1_Model25
## 2 0.00174  roc_auc binary     0.850    10  0.0180 Preprocessor1_Model22
## 3 0.000788 roc_auc binary     0.849    10  0.0170 Preprocessor1_Model21
## 4 0.00853  roc_auc binary     0.849    10  0.0201 Preprocessor1_Model24
## 5 0.0418   roc_auc binary     0.849    10  0.0162 Preprocessor1_Model26
## # A tibble: 5 x 7
##     penalty .metric  .estimator  mean     n std_err .config
##       <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.000356  accuracy binary     0.782    10  0.0163 Preprocessor1_Model20
## 2 0.000161  accuracy binary     0.776    10  0.0163 Preprocessor1_Model19
## 3 0.0189    accuracy binary     0.774    10  0.0172 Preprocessor1_Model25
## 4 0.000788  accuracy binary     0.773    10  0.0160 Preprocessor1_Model21
## 5 0.0000329 accuracy binary     0.773    10  0.0175 Preprocessor1_Model17
## Best accuracy:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1  0.0924 Preprocessor1_Model27
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
```

```
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ---------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.0923670857187388
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 72 x 3
##    term                                              estimate penalty
##    <chr>                                                <dbl>   <dbl>
##  1 (Intercept)                                       -0.230     0.0924
##  2 smog                                              -0.191     0.0924
##  3 RuleLiteraryStyle                                 -0.168     0.0924
##  4 gf                                                -0.0184    0.0924
##  5 entropy                                           -0.0165    0.0924
##  6 maentropy                                         -0.00435   0.0924
##  7 ari                                               -0.000272  0.0924
##  8 RuleGPcoordovs                                     0         0.0924
##  9 RuleGPdeverbaddr                                   0         0.0924
## 10 RuleGPpatinstr                                     0         0.0924
## 11 RuleGPdeverbsubj                                   0         0.0924
## 12 RuleGPadjective                                    0         0.0924
## 13 RuleGPpatbenperson                                 0         0.0924
## 14 RuleGPwordorder                                    0         0.0924
## 15 RuleDoubleAdpos                                    0         0.0924
## 16 RuleDoubleAdpos.max_allowable_distance             0         0.0924
## 17 RuleDoubleAdpos.max_allowable_distance.v           0         0.0924
## 18 RuleReflexivePassWithAnimSubj                      0         0.0924
## 19 RuleTooFewVerbs.min_verb_frac                      0         0.0924
## 20 RuleTooManyNegations.max_negation_frac             0         0.0924
## 21 RuleTooManyNegations.max_negation_frac.v           0         0.0924
## 22 RuleTooManyNegations.max_allowable_negations       0         0.0924
## 23 RuleTooManyNegations.max_allowable_negations.v     0         0.0924
## 24 RuleTooManyNominalConstructions.max_noun_frac      0         0.0924
## 25 RuleTooManyNominalConstructions.max_noun_frac.v    0         0.0924
## 26 RuleTooManyNominalConstructions.max_allowable_nouns 0        0.0924
## 27 RuleCaseRepetition.max_repetition_count            0         0.0924
## 28 RuleCaseRepetition.max_repetition_count.v          0         0.0924
## 29 RuleCaseRepetition.max_repetition_frac             0         0.0924
## 30 RuleCaseRepetition.max_repetition_frac.v           0         0.0924
## 31 RuleWeakMeaningWords                               0         0.0924
## 32 RuleAbstractNouns                                  0         0.0924
## 33 RuleRelativisticExpressions                        0         0.0924
## 34 RuleConfirmationExpressions                        0         0.0924
## 35 RuleRedundantExpressions                           0         0.0924
## 36 RuleTooLongExpressions                             0         0.0924
## 37 RuleAnaphoricReferences                            0         0.0924
```

```
## 38 RulePassive                                        0         0.0924
## 39 RulePredSubjDistance                               0         0.0924
## 40 RulePredSubjDistance.max_distance                  0         0.0924
## 41 RulePredSubjDistance.max_distance.v                0         0.0924
## 42 RulePredObjDistance                                0         0.0924
## 43 RulePredObjDistance.max_distance                   0         0.0924
## 44 RulePredObjDistance.max_distance.v                 0         0.0924
## 45 RuleInfVerbDistance                                0         0.0924
## 46 RuleInfVerbDistance.max_distance                   0         0.0924
## 47 RuleInfVerbDistance.max_distance.v                 0         0.0924
## 48 RuleMultiPartVerbs                                 0         0.0924
## 49 RuleMultiPartVerbs.max_distance                    0         0.0924
## 50 RuleMultiPartVerbs.max_distance.v                  0         0.0924
## 51 RuleLongSentences.max_length                       0         0.0924
## 52 RuleLongSentences.max_length.v                     0         0.0924
## 53 RulePredAtClauseBeginning.max_order                0         0.0924
## 54 RulePredAtClauseBeginning.max_order.v              0         0.0924
## 55 RuleVerbalNouns                                    0         0.0924
## 56 sent_count                                         0         0.0924
## 57 word_count                                         0         0.0924
## 58 syllab_count                                       0         0.0924
## 59 char_count                                         0         0.0924
## 60 cli                                                0         0.0924
## 61 num_hapax                                          0         0.0924
## 62 ttr                                                0         0.0924
## 63 mattr                                              0         0.0924
## 64 mattr.v                                            0         0.0924
## 65 maentropy.v                                        0         0.0924
## 66 verb_dist                                          0         0.0924
## 67 hpoint                                             0         0.0924
## 68 fre                                                0         0.0924
## 69 fkgl                                               0         0.0924
## 70 mamr                                          0.0576         0.0924
## 71 atl                                           0.100          0.0924
## 72 activity                                      0.408          0.0924
## Variable importance:
## # A tibble: 71 x 3
##    Variable                                    Importance Sign
##    <chr>                                            <dbl> <chr>
##  1 activity                                      0.408    POS
##  2 smog                                          0.191    NEG
##  3 RuleLiteraryStyle                             0.168    NEG
##  4 atl                                           0.100    POS
##  5 mamr                                          0.0576   POS
##  6 gf                                            0.0184   NEG
##  7 entropy                                       0.0165   NEG
##  8 maentropy                                     0.00435  NEG
##  9 ari                                           0.000272 NEG
## 10 RuleGPcoordovs                                0        NEG
## 11 RuleGPdeverbaddr                              0        NEG
## 12 RuleGPpatinstr                                0        NEG
## 13 RuleGPdeverbsubj                              0        NEG
## 14 RuleGPadjective                               0        NEG
## 15 RuleGPpatbenperson                            0        NEG
```

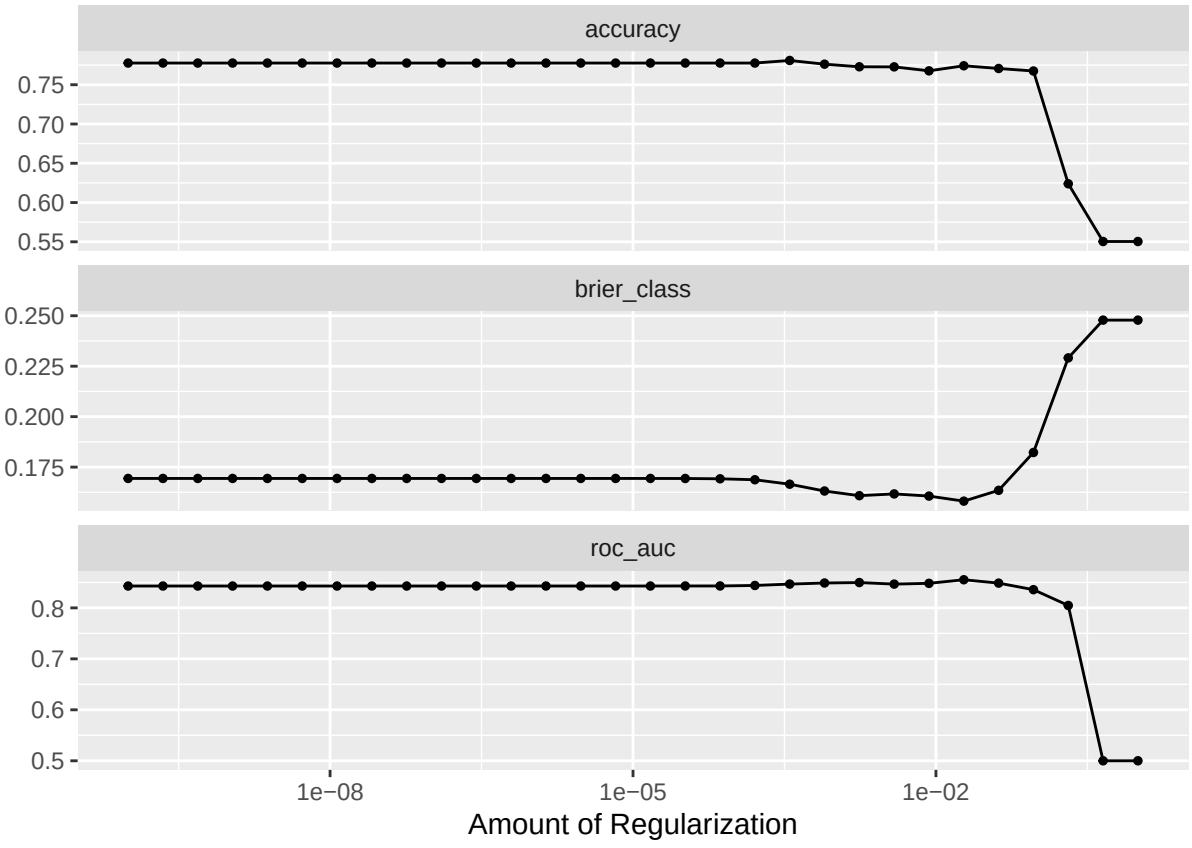
```
## 16 RuleGPwordorder                                          0        NEG
## 17 RuleDoubleAdpos                                          0        NEG
## 18 RuleDoubleAdpos.max_allowable_distance                   0        NEG
## 19 RuleDoubleAdpos.max_allowable_distance.v                 0    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

```
## 70 fre                                                    0        NEG
## 71 fkgl                                                   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 0.0189   roc_auc binary     0.855    10  0.0192 Preprocessor1_Model25
## 2 0.00174  roc_auc binary     0.850    10  0.0178 Preprocessor1_Model22
## 3 0.000788 roc_auc binary     0.849    10  0.0165 Preprocessor1_Model21
## 4 0.0418   roc_auc binary     0.849    10  0.0162 Preprocessor1_Model26
## 5 0.00853  roc_auc binary     0.848    10  0.0200 Preprocessor1_Model24
## # A tibble: 5 x 7
##    penalty .metric  .estimator  mean     n std_err .config
##      <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 3.56e- 4 accuracy binary     0.781    10  0.0146 Preprocessor1_Model20
## 2 1   e-10 accuracy binary     0.778    10  0.0160 Preprocessor1_Model01
## 3 2.21e-10 accuracy binary     0.778    10  0.0160 Preprocessor1_Model02
## 4 4.89e-10 accuracy binary     0.778    10  0.0160 Preprocessor1_Model03
## 5 1.08e- 9 accuracy binary     0.778    10  0.0160 Preprocessor1_Model04
## Best accuracy:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1  0.0924 Preprocessor1_Model27
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.0923670857187388
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 68 x 3
##    term                                              estimate penalty
##    <chr>                                                <dbl>   <dbl>
##  1 (Intercept)                                       -0.230     0.0924
##  2 smog                                              -0.191     0.0924
##  3 RuleLiteraryStyle                                 -0.168     0.0924
##  4 gf                                                -0.0184    0.0924
##  5 entropy                                           -0.0165    0.0924
##  6 maentropy                                         -0.00435   0.0924
##  7 ari                                               -0.000272  0.0924
##  8 RuleGPcoordovs                                     0         0.0924
##  9 RuleGPdeverbaddr                                   0         0.0924
## 10 RuleGPpatinstr                                     0         0.0924
```

```
## 11 RuleGPdeverbsubj                                    0         0.0924
## 12 RuleGPadjective                                     0         0.0924
## 13 RuleGPpatbenperson                                  0         0.0924
## 14 RuleGPwordorder                                     0         0.0924
## 15 RuleDoubleAdpos                                     0         0.0924
## 16 RuleDoubleAdpos.max_allowable_distance              0         0.0924
## 17 RuleDoubleAdpos.max_allowable_distance.v            0         0.0924
## 18 RuleReflexivePassWithAnimSubj                       0         0.0924
## 19 RuleTooFewVerbs.min_verb_frac                       0         0.0924
## 20 RuleTooManyNegations.max_negation_frac              0         0.0924
## 21 RuleTooManyNegations.max_negation_frac.v            0         0.0924
## 22 RuleTooManyNegations.max_allowable_negations        0         0.0924
## 23 RuleTooManyNegations.max_allowable_negations.v      0         0.0924
## 24 RuleTooManyNominalConstructions.max_noun_frac       0         0.0924
## 25 RuleTooManyNominalConstructions.max_noun_frac.v     0         0.0924
## 26 RuleTooManyNominalConstructions.max_allowable_nouns 0         0.0924
## 27 RuleCaseRepetition.max_repetition_count             0         0.0924
## 28 RuleCaseRepetition.max_repetition_count.v           0         0.0924
## 29 RuleCaseRepetition.max_repetition_frac              0         0.0924
## 30 RuleCaseRepetition.max_repetition_frac.v            0         0.0924
## 31 RuleWeakMeaningWords                                0         0.0924
## 32 RuleAbstractNouns                                   0         0.0924
## 33 RuleRelativisticExpressions                         0         0.0924
## 34 RuleConfirmationExpressions                         0         0.0924
## 35 RuleRedundantExpressions                            0         0.0924
## 36 RuleTooLongExpressions                              0         0.0924
## 37 RuleAnaphoricReferences                             0         0.0924
## 38 RulePassive                                         0         0.0924
## 39 RulePredSubjDistance                                0         0.0924
## 40 RulePredSubjDistance.max_distance                   0         0.0924
## 41 RulePredSubjDistance.max_distance.v                 0         0.0924
## 42 RulePredObjDistance                                 0         0.0924
## 43 RulePredObjDistance.max_distance                    0         0.0924
## 44 RulePredObjDistance.max_distance.v                  0         0.0924
## 45 RuleInfVerbDistance                                 0         0.0924
## 46 RuleInfVerbDistance.max_distance                    0         0.0924
## 47 RuleInfVerbDistance.max_distance.v                  0         0.0924
## 48 RuleMultiPartVerbs                                  0         0.0924
## 49 RuleMultiPartVerbs.max_distance                     0         0.0924
## 50 RuleMultiPartVerbs.max_distance.v                   0         0.0924
## 51 RuleLongSentences.max_length                        0         0.0924
## 52 RuleLongSentences.max_length.v                      0         0.0924
## 53 RulePredAtClauseBeginning.max_order                 0         0.0924
## 54 RulePredAtClauseBeginning.max_order.v               0         0.0924
## 55 RuleVerbalNouns                                     0         0.0924
## 56 cli                                                 0         0.0924
## 57 num_hapax                                           0         0.0924
## 58 ttr                                                 0         0.0924
## 59 mattr                                               0         0.0924
## 60 mattr.v                                             0         0.0924
## 61 maentropy.v                                         0         0.0924
## 62 verb_dist                                           0         0.0924
## 63 hpoint                                              0         0.0924
## 64 fre                                                 0         0.0924
```

```
## 65 fkgl                                                  0         0.0924
## 66 mamr                                                  0.0576    0.0924
## 67 atl                                                   0.100     0.0924
## 68 activity                                              0.408     0.0924
## Variable importance:
## # A tibble: 67 x 3
##    Variable                                            Importance Sign
##    <chr>                                                    <dbl> <chr>
##  1 activity                                              0.408    POS
##  2 smog                                                  0.191    NEG
##  3 RuleLiteraryStyle                                     0.168    NEG
##  4 atl                                                   0.100    POS
##  5 mamr                                                  0.0576   POS
##  6 gf                                                    0.0184   NEG
##  7 entropy                                               0.0165   NEG
##  8 maentropy                                             0.00435  NEG
##  9 ari                                                   0.000272 NEG
## 10 RuleGPcoordovs                                        0        NEG
## 11 RuleGPdeverbaddr                                      0        NEG
## 12 RuleGPpatinstr                                        0        NEG
## 13 RuleGPdeverbsubj                                      0        NEG
## 14 RuleGPadjective                                       0        NEG
## 15 RuleGPpatbenperson                                    0        NEG
## 16 RuleGPwordorder                                       0        NEG
## 17 RuleDoubleAdpos                                       0        NEG
## 18 RuleDoubleAdpos.max_allowable_distance                0        NEG
## 19 RuleDoubleAdpos.max_allowable_distance.v              0        NEG
## 20 RuleReflexivePassWithAnimSubj                         0        NEG
## 21 RuleTooFewVerbs.min_verb_frac                         0        NEG
## 22 RuleTooManyNegations.max_negation_frac                0        NEG
## 23 RuleTooManyNegations.max_negation_frac.v              0        NEG
## 24 RuleTooManyNegations.max_allowable_negations          0        NEG
## 25 RuleTooManyNegations.max_allowable_negations.v        0        NEG
## 26 RuleTooManyNominalConstructions.max_noun_frac         0        NEG
## 27 RuleTooManyNominalConstructions.max_noun_frac.v       0        NEG
## 28 RuleTooManyNominalConstructions.max_allowable_nouns   0        NEG
## 29 RuleCaseRepetition.max_repetition_count               0        NEG
## 30 RuleCaseRepetition.max_repetition_count.v             0        NEG
## 31 RuleCaseRepetition.max_repetition_frac                0        NEG
## 32 RuleCaseRepetition.max_repetition_frac.v              0        NEG
## 33 RuleWeakMeaningWords                                  0        NEG
## 34 RuleAbstractNouns                                     0        NEG
## 35 RuleRelativisticExpressions                           0        NEG
## 36 RuleConfirmationExpressions                           0        NEG
## 37 RuleRedundantExpressions                              0        NEG
## 38 RuleTooLongExpressions                                0        NEG
## 39 RuleAnaphoricReferences                               0        NEG
## 40 RulePassive                                           0        NEG
## 41 RulePredSubjDistance                                  0        NEG
## 42 RulePredSubjDistance.max_distance                     0        NEG
## 43 RulePredSubjDistance.max_distance.v                   0        NEG
## 44 RulePredObjDistance                                   0        NEG
## 45 RulePredObjDistance.max_distance                      0        NEG
## 46 RulePredObjDistance.max_distance.v                    0        NEG
```

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

Indicators, averages, and coefficients

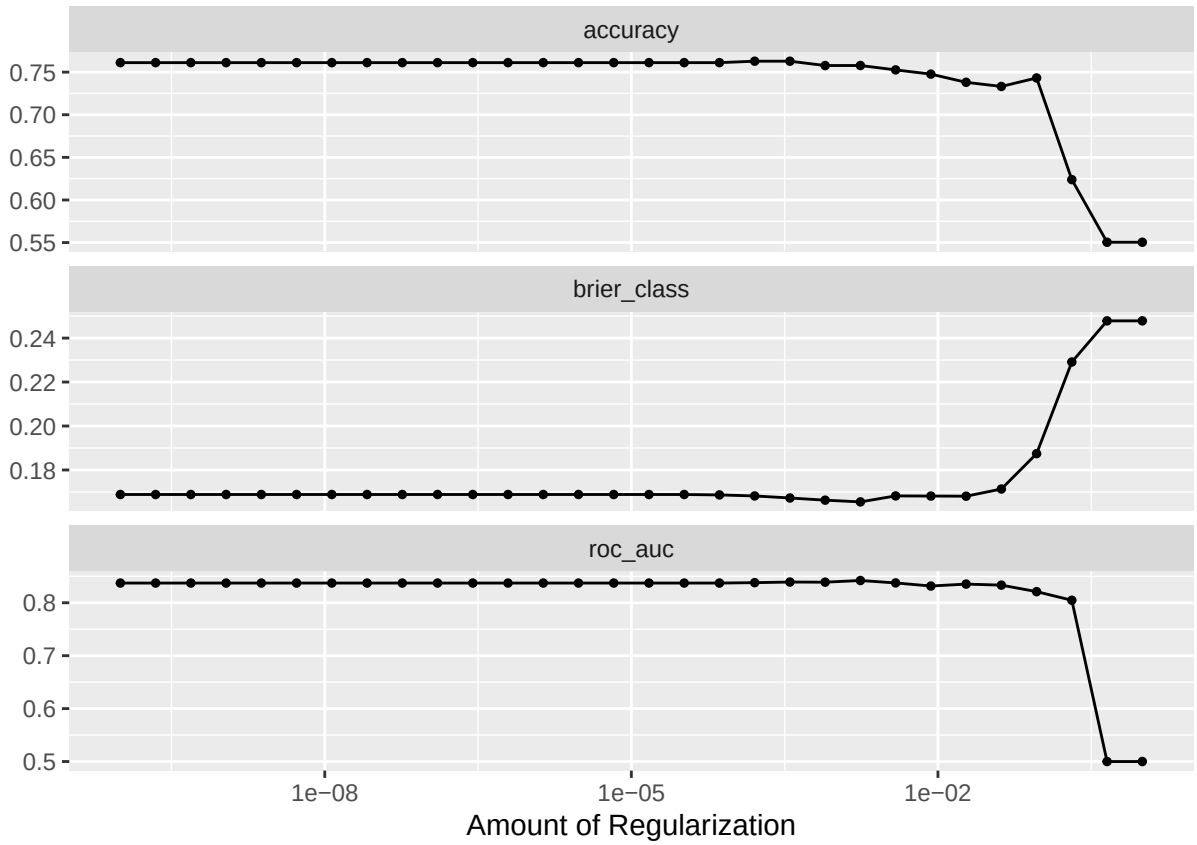
Remove correlating

```
# 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     0.842    10  0.0168 Preprocessor1_Model22
## 2 0.000356 roc_auc binary     0.839    10  0.0160 Preprocessor1_Model20
## 3 0.000788 roc_auc binary     0.839    10  0.0164 Preprocessor1_Model21
## 4 0.000161 roc_auc binary     0.838    10  0.0156 Preprocessor1_Model19
## 5 0.00386  roc_auc binary     0.837    10  0.0179 Preprocessor1_Model23
## # A tibble: 5 x 7
##    penalty .metric  .estimator  mean     n std_err .config
##      <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 1.61e- 4 accuracy binary     0.763    10  0.0132 Preprocessor1_Model19
## 2 3.56e- 4 accuracy binary     0.763    10  0.0138 Preprocessor1_Model20
## 3 1   e-10 accuracy binary     0.761    10  0.0137 Preprocessor1_Model01
## 4 2.21e-10 accuracy binary     0.761    10  0.0137 Preprocessor1_Model02
## 5 4.89e-10 accuracy binary     0.761    10  0.0137 Preprocessor1_Model03
## Best accuracy:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1 0.00386 Preprocessor1_Model23
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
```

```
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ---------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.00385662042116347
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 45 x 3
##    term                                                 estimate penalty
##    <chr>                                                   <dbl>   <dbl>
##  1 RuleTooFewVerbs.min_verb_frac                         -16.1     0.00386
##  2 RuleCaseRepetition.max_repetition_frac                -14.2     0.00386
##  3 RuleTooManyNominalConstructions.max_noun_frac          -6.66    0.00386
##  4 mattr                                                  -6.42    0.00386
##  5 RuleCaseRepetition.max_repetition_count.v              -1.90    0.00386
##  6 ttr                                                    -1.09    0.00386
##  7 RuleTooManyNominalConstructions.max_allowable_nouns.v -0.991   0.00386
##  8 RuleTooManyNegations.max_allowable_negations.v         -0.867   0.00386
##  9 RuleInfVerbDistance.max_distance.v                     -0.778   0.00386
## 10 entropy                                                -0.576   0.00386
## 11 ari                                                    -0.167   0.00386
## 12 gf                                                     -0.140   0.00386
## 13 RuleDoubleAdpos.max_allowable_distance.v               -0.138   0.00386
## 14 RulePredSubjDistance.max_distance.v                    -0.0890  0.00386
## 15 fre                                                    -0.0449  0.00386
## 16 smog                                                   -0.0307  0.00386
## 17 RulePredSubjDistance.max_distance                      -0.0230  0.00386
## 18 RulePredObjDistance.max_distance                       -0.0213  0.00386
## 19 hpoint                                                 -0.00122 0.00386
## 20 RuleTooManyNegations.max_negation_frac.v                0       0.00386
## 21 RuleTooManyNegations.max_allowable_negations            0       0.00386
## 22 RuleCaseRepetition.max_repetition_count                 0       0.00386
## 23 RulePredObjDistance.max_distance.v                      0       0.00386
## 24 RuleMultiPartVerbs.max_distance                         0       0.00386
## 25 RulePredAtClauseBeginning.max_order.v                   0       0.00386
## 26 cli                                                     0       0.00386
## 27 mattr.v                                                 0       0.00386
## 28 maentropy                                               0       0.00386
## 29 mamr                                                    0       0.00386
## 30 fkgl                                                    0       0.00386
## 31 RuleDoubleAdpos.max_allowable_distance                  0.00441 0.00386
## 32 RulePredAtClauseBeginning.max_order                     0.00681 0.00386
## 33 verb_dist                                               0.0325  0.00386
## 34 RuleTooManyNominalConstructions.max_allowable_nouns     0.0332  0.00386
## 35 RuleLongSentences.max_length                            0.0354  0.00386
## 36 RuleInfVerbDistance.max_distance                        0.100   0.00386
## 37 RuleMultiPartVerbs.max_distance.v                       0.155   0.00386
```

```
## 38 RuleTooManyNegations.max_negation_frac                  0.479   0.00386
## 39 RuleLongSentences.max_length.v                          1.10    0.00386
## 40 atl                                                     1.90    0.00386
## 41 RuleTooManyNominalConstructions.max_noun_frac.v         2.11    0.00386
## 42 RuleCaseRepetition.max_repetition_frac.v                4.98    0.00386
## 43 maentropy.v                                             9.14    0.00386
## 44 activity                                               11.4     0.00386
## 45 (Intercept)                                            18.4     0.00386
## Variable importance:
## # A tibble: 44 x 3
##    Variable                                            Importance Sign
##    <chr>                                                    <dbl> <chr>
##  1 RuleTooFewVerbs.min_verb_frac                           16.1    NEG
##  2 RuleCaseRepetition.max_repetition_frac                  14.2    NEG
##  3 activity                                                11.4    POS
##  4 maentropy.v                                              9.14   POS
##  5 RuleTooManyNominalConstructions.max_noun_frac            6.66   NEG
##  6 mattr                                                    6.42   NEG
##  7 RuleCaseRepetition.max_repetition_frac.v                 4.98   POS
##  8 RuleTooManyNominalConstructions.max_noun_frac.v          2.11   POS
##  9 atl                                                      1.90   POS
## 10 RuleCaseRepetition.max_repetition_count.v                1.90   NEG
## 11 RuleLongSentences.max_length.v                           1.10   POS
## 12 ttr                                                      1.09   NEG
## 13 RuleTooManyNominalConstructions.max_allowable_nouns.v    0.991  NEG
## 14 RuleTooManyNegations.max_allowable_negations.v           0.867  NEG
## 15 RuleInfVerbDistance.max_distance.v                       0.778  NEG
## 16 entropy                                                  0.576  NEG
## 17 RuleTooManyNegations.max_negation_frac                   0.479  POS
## 18 ari                                                      0.167  NEG
## 19 RuleMultiPartVerbs.max_distance.v                        0.155  POS
## 20 gf                                                       0.140  NEG
## 21 RuleDoubleAdpos.max_allowable_distance.v                 0.138  NEG
## 22 RuleInfVerbDistance.max_distance                         0.100  POS
## 23 RulePredSubjDistance.max_distance.v                      0.0890 NEG
## 24 fre                                                      0.0449 NEG
## 25 RuleLongSentences.max_length                             0.0354 POS
## 26 RuleTooManyNominalConstructions.max_allowable_nouns      0.0332 POS
## 27 verb_dist                                                0.0325 POS
## 28 smog                                                     0.0307 NEG
## 29 RulePredSubjDistance.max_distance                        0.0230 NEG
## 30 RulePredObjDistance.max_distance                         0.0213 NEG
## 31 RulePredAtClauseBeginning.max_order                      0.00681 POS
## 32 RuleDoubleAdpos.max_allowable_distance                   0.00441 POS
## 33 hpoint                                                   0.00122 NEG
## 34 RuleTooManyNegations.max_negation_frac.v                 0       NEG
## 35 RuleTooManyNegations.max_allowable_negations             0       NEG
## 36 RuleCaseRepetition.max_repetition_count                  0       NEG
## 37 RulePredObjDistance.max_distance.v                       0       NEG
## 38 RuleMultiPartVerbs.max_distance                          0       NEG
## 39 RulePredAtClauseBeginning.max_order.v                    0       NEG
## 40 cli                                                      0       NEG
## 41 mattr.v                                                  0       NEG
## 42 maentropy                                                0       NEG
```

```
## 43 mamr                                                    0       NEG
## 44 fkgl                                                    0       NEG
```

Counts

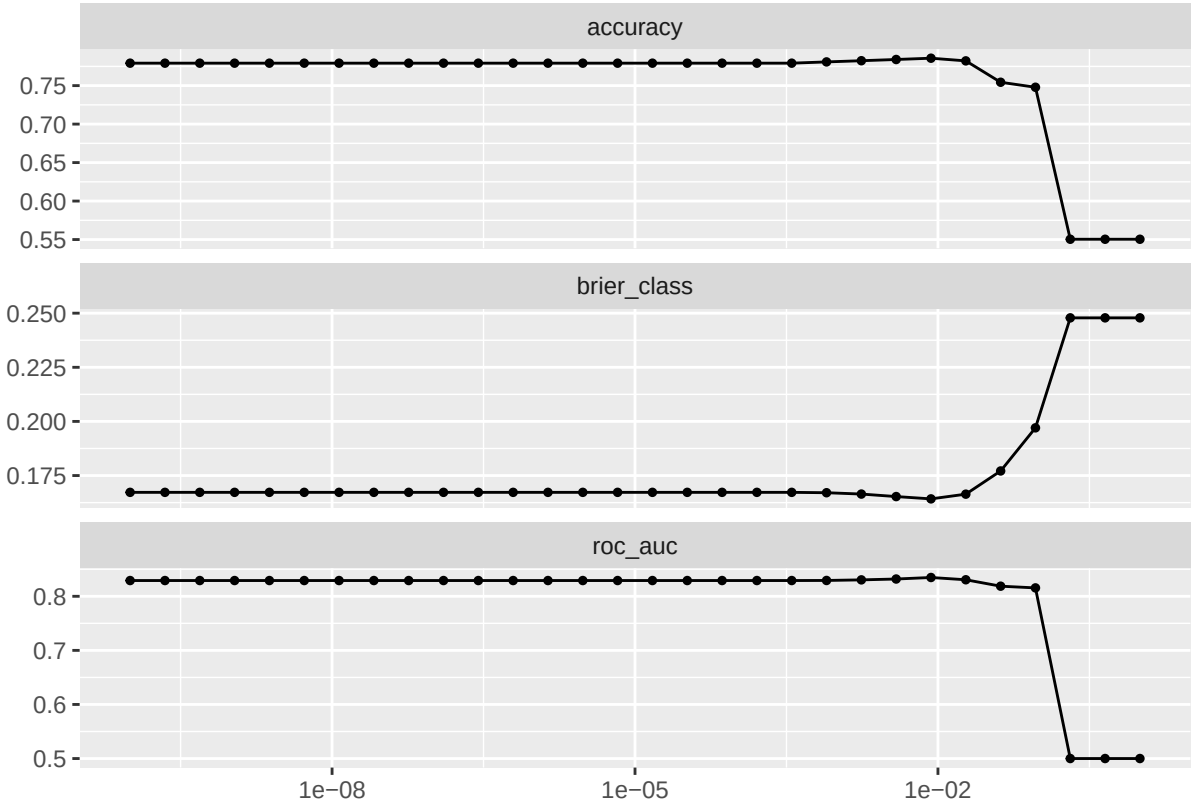
Remove correlating

```
# 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     0.835    10  0.0194 Preprocessor1_Model24
## 2 0.00386  roc_auc binary     0.832    10  0.0191 Preprocessor1_Model23
## 3 0.0189   roc_auc binary     0.831    10  0.0188 Preprocessor1_Model25
## 4 0.00174  roc_auc binary     0.830    10  0.0193 Preprocessor1_Model22
## 5 0.000788 roc_auc binary     0.829    10  0.0192 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     0.786    10  0.0193 Preprocessor1_Model24
## 2 0.00386  accuracy binary     0.784    10  0.0176 Preprocessor1_Model23
## 3 0.00174  accuracy binary     0.782    10  0.0171 Preprocessor1_Model22
## 4 0.0189   accuracy binary     0.782    10  0.0208 Preprocessor1_Model25
## 5 0.000788 accuracy binary     0.781    10  0.0179 Preprocessor1_Model21
## Best accuracy:
## # A tibble: 1 x 2
##   penalty .config
##     <dbl> <chr>
## 1  0.0189 Preprocessor1_Model25
## Final workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
```

```
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model ---------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Main Arguments:
##   penalty = 0.018873918221351
##   mixture = 1
##
## Computational engine: glmnet
##
## Final coefficients:
## # A tibble: 25 x 3
##    term                           estimate penalty
##    <chr>                             <dbl>   <dbl>
##  1 RuleRedundantExpressions      -758.      0.0189
##  2 RuleRelativisticExpressions   -399.      0.0189
##  3 RuleGPdeverbsubj              -163.      0.0189
##  4 RulePassive                   -138.      0.0189
##  5 RuleLiteraryStyle             -136.      0.0189
##  6 RuleGPdeverbaddr               -81.7     0.0189
##  7 (Intercept)                     -2.41    0.0189
##  8 RulePredObjDistance             -0.0831  0.0189
##  9 RuleGPcoordovs                   0       0.0189
## 10 RuleGPpatinstr                   0       0.0189
## 11 RuleGPpatbenperson               0       0.0189
## 12 RuleGPwordorder                  0       0.0189
## 13 RuleDoubleAdpos                  0       0.0189
## 14 RuleReflexivePassWithAnimSubj    0       0.0189
## 15 RuleWeakMeaningWords             0       0.0189
## 16 RuleAbstractNouns                0       0.0189
## 17 RuleConfirmationExpressions      0       0.0189
## 18 RuleInfVerbDistance              0.878   0.0189
## 19 num_hapax                        1.18    0.0189
## 20 RuleVerbalNouns                  7.98    0.0189
## 21 RulePredSubjDistance            20.9     0.0189
## 22 RuleMultiPartVerbs              39.2     0.0189
## 23 RuleTooLongExpressions          56.7     0.0189
## 24 RuleGPadjective                139.      0.0189
## 25 RuleAnaphoricReferences        178.      0.0189
## Variable importance:
## # A tibble: 24 x 3
##    Variable                      Importance Sign
##    <chr>                              <dbl> <chr>
##  1 RuleRedundantExpressions        758.     NEG
##  2 RuleRelativisticExpressions     399.     NEG
##  3 RuleAnaphoricReferences         178.     POS
##  4 RuleGPdeverbsubj                163.     NEG
##  5 RuleGPadjective                 139.     POS
##  6 RulePassive                     138.     NEG
##  7 RuleLiteraryStyle               136.     NEG
##  8 RuleGPdeverbaddr                 81.7    NEG
```

```
##  9 RuleTooLongExpressions           56.7    POS
## 10 RuleMultiPartVerbs               39.2    POS
## 11 RulePredSubjDistance             20.9    POS
## 12 RuleVerbalNouns                   7.98   POS
## 13 num_hapax                         1.18   POS
## 14 RuleInfVerbDistance               0.878  POS
## 15 RulePredObjDistance               0.0831 NEG
## 16 RuleGPcoordovs                    0      NEG
## 17 RuleGPpatinstr                    0      NEG
## 18 RuleGPpatbenperson                0      NEG
## 19 RuleGPwordorder                   0      NEG
## 20 RuleDoubleAdpos                   0      NEG
## 21 RuleReflexivePassWithAnimSubj     0      NEG
## 22 RuleWeakMeaningWords              0      NEG
## 23 RuleAbstractNouns                 0      NEG
## 24 RuleConfirmationExpressions       0      NEG
```

SVM

All variables

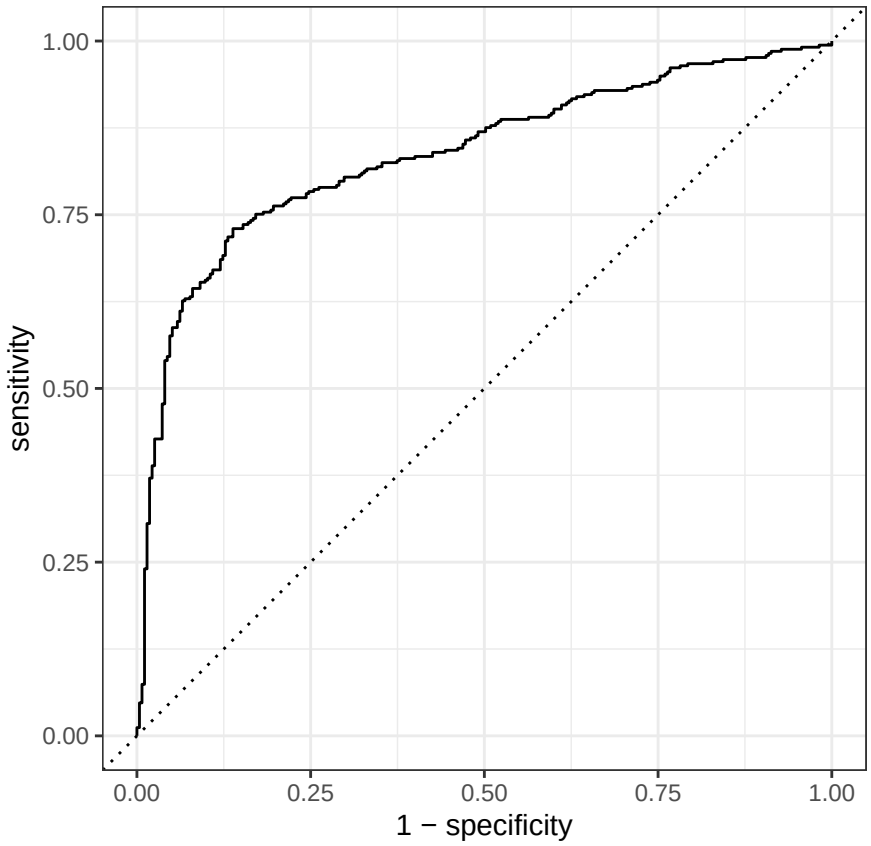
Remove correlating

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

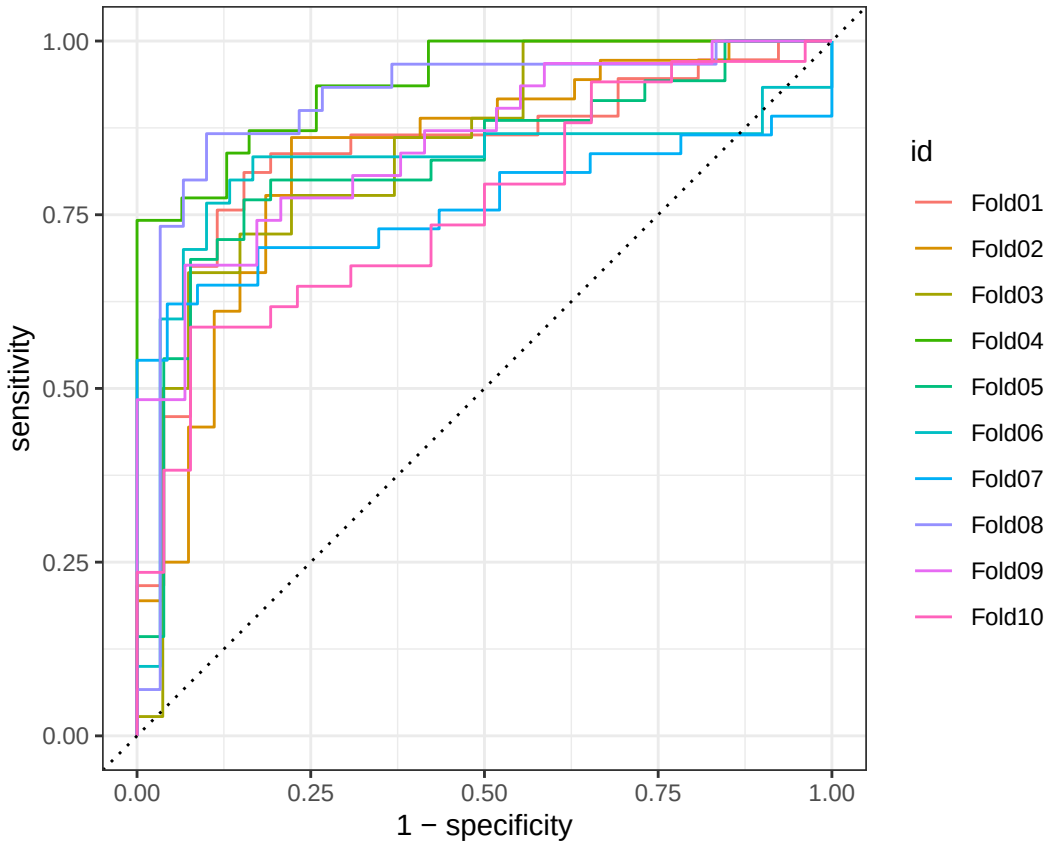
Keep correlating

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

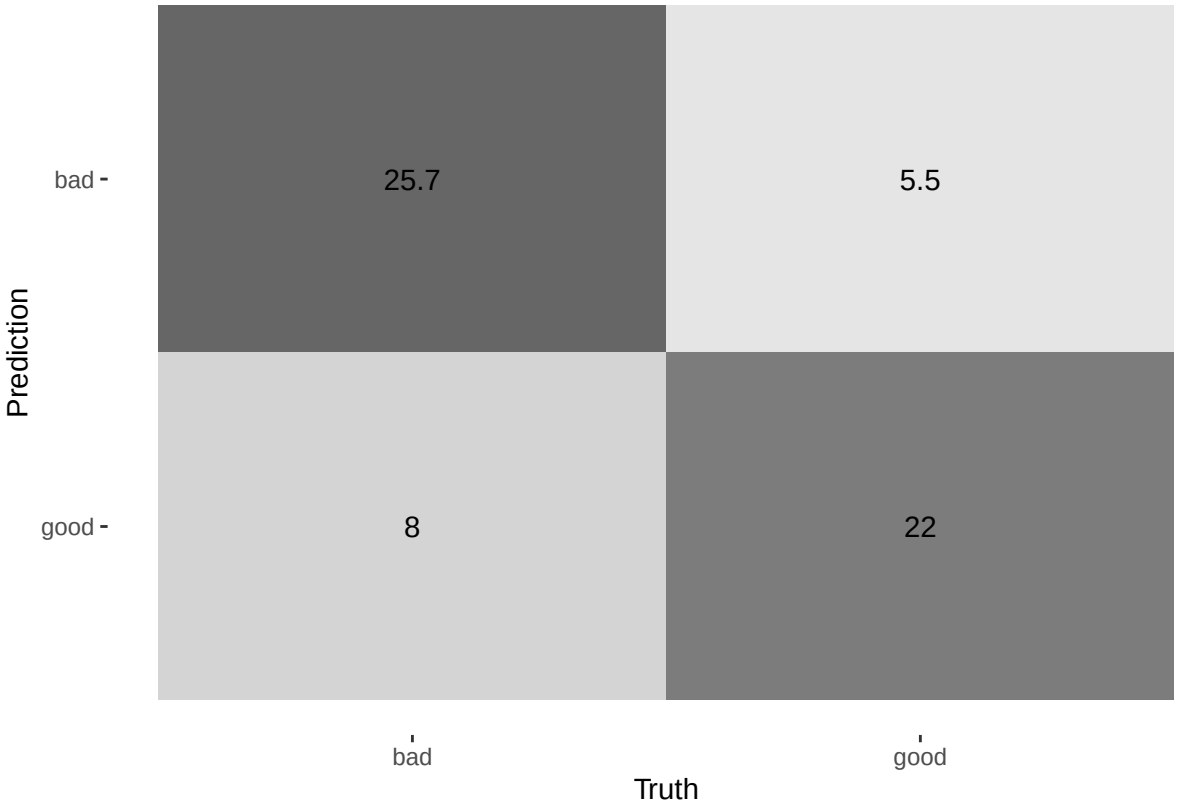
```
## SVM workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: svm_linear()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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     0.779    10 0.0174  Preprocessor1_Model1
## 2 brier_class binary     0.167    10 0.00766 Preprocessor1_Model1
## 3 roc_auc     binary     0.839    10 0.0177  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

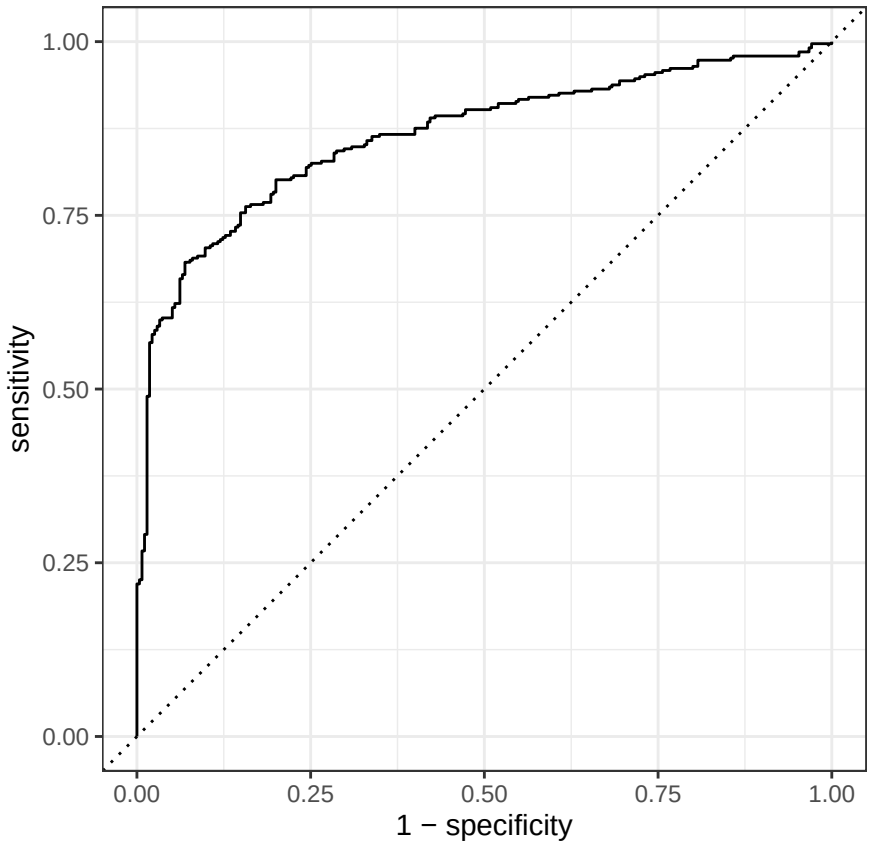
```
## [1] "\n"
```


bad
good
Prediction
25.7
5.5
8
22
bad
good
Truth

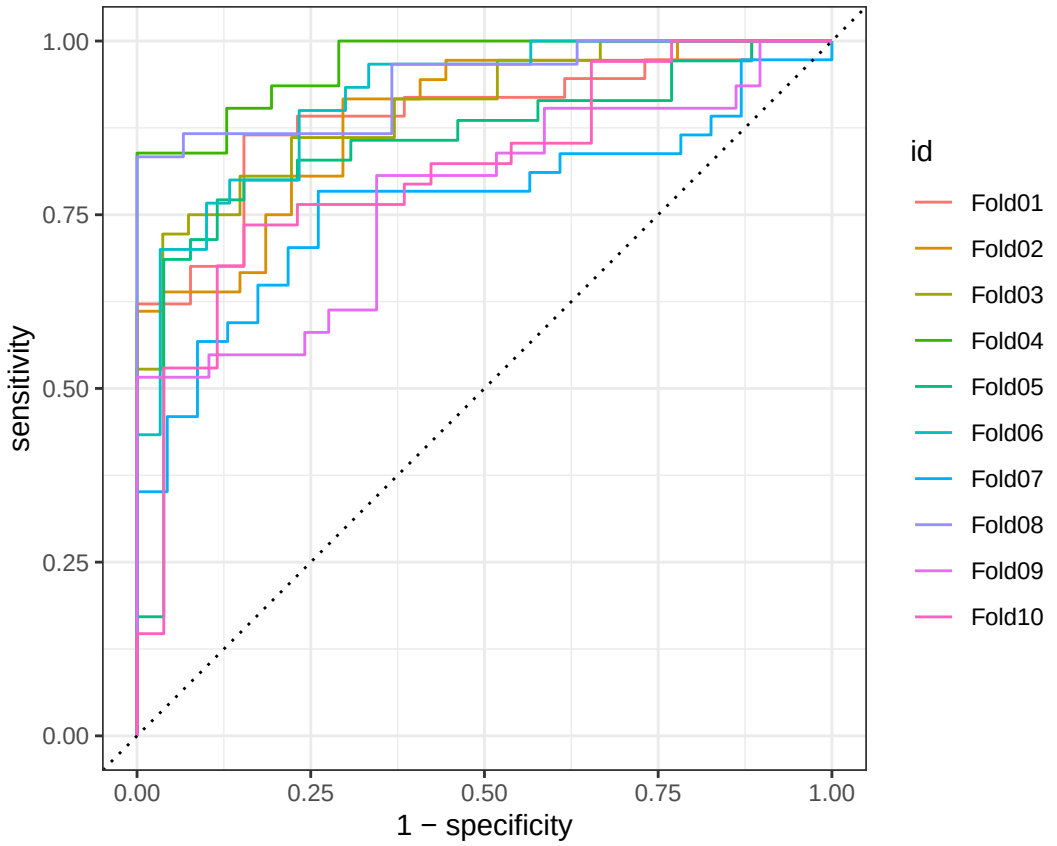
```
## [1] "\n"
```

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

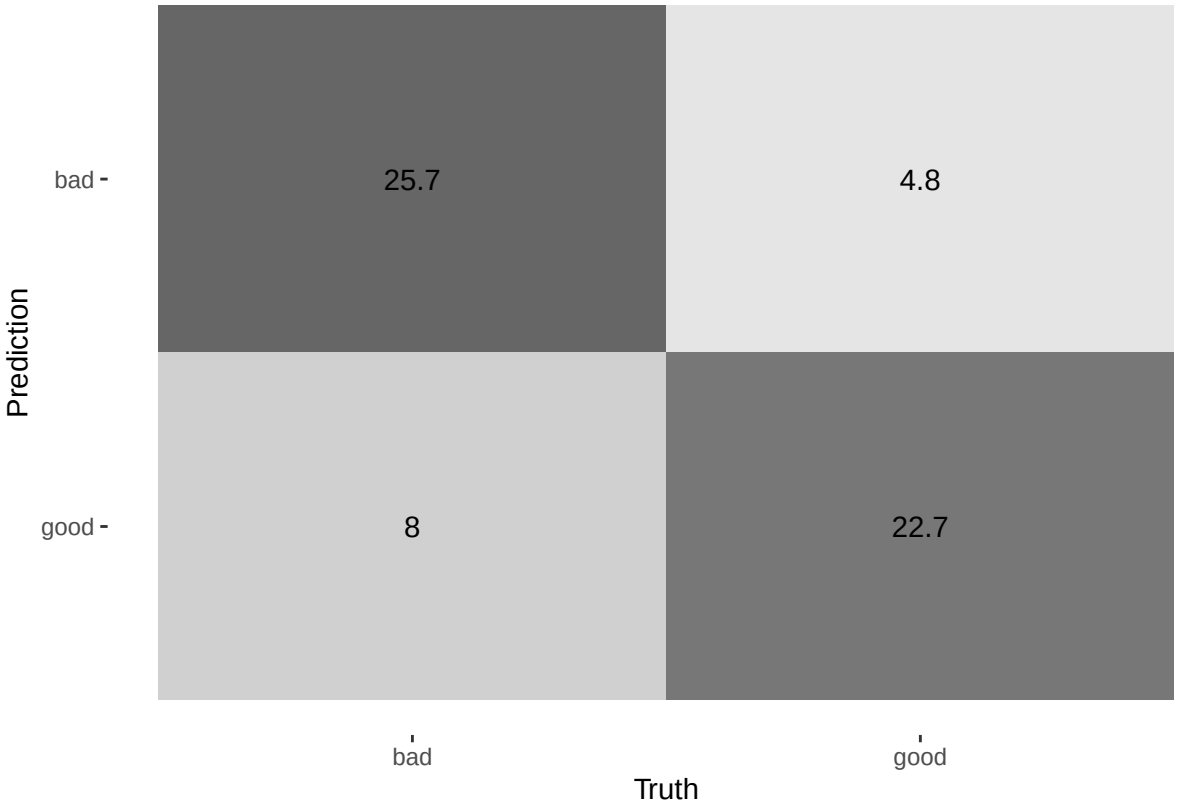
```
## SVM workflow:
## == Workflow ============================================================================
## Preprocessor: Recipe
## Model: svm_rbf()
##
## -- Preprocessor ----------------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- 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     0.791    10  0.0204 Preprocessor1_Model1
## 2 brier_class binary     0.146    10  0.0123 Preprocessor1_Model1
## 3 roc_auc     binary     0.871    10  0.0215 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
25.7
4.8
8
22.7
bad
good
Truth

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

Random forest

All variables

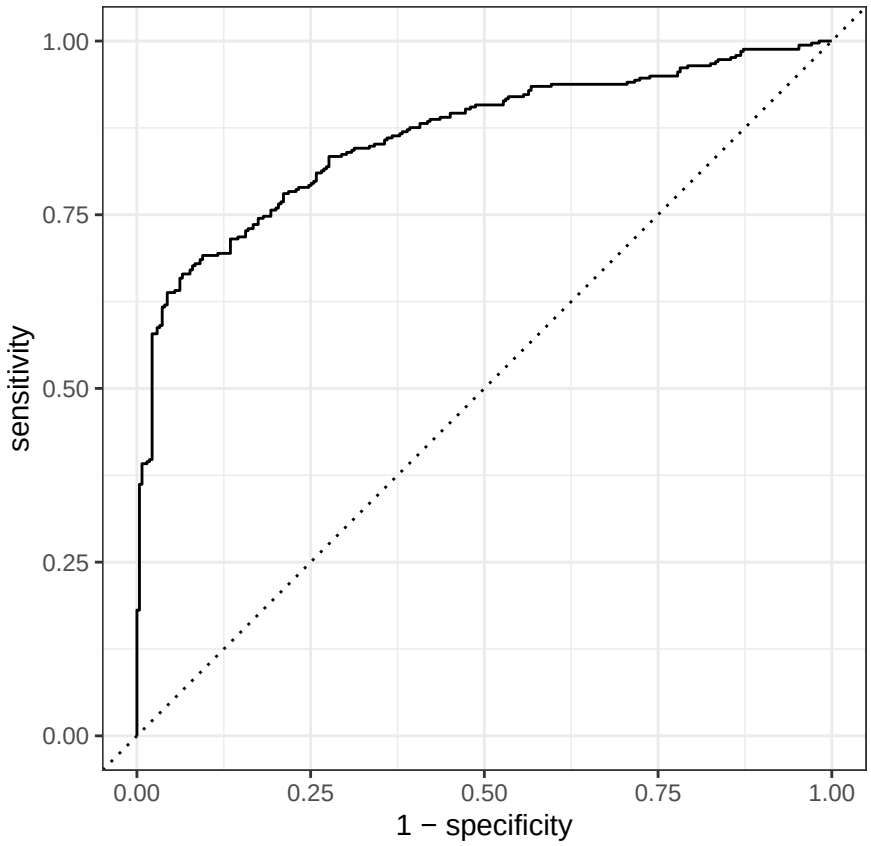
Remove correlating

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

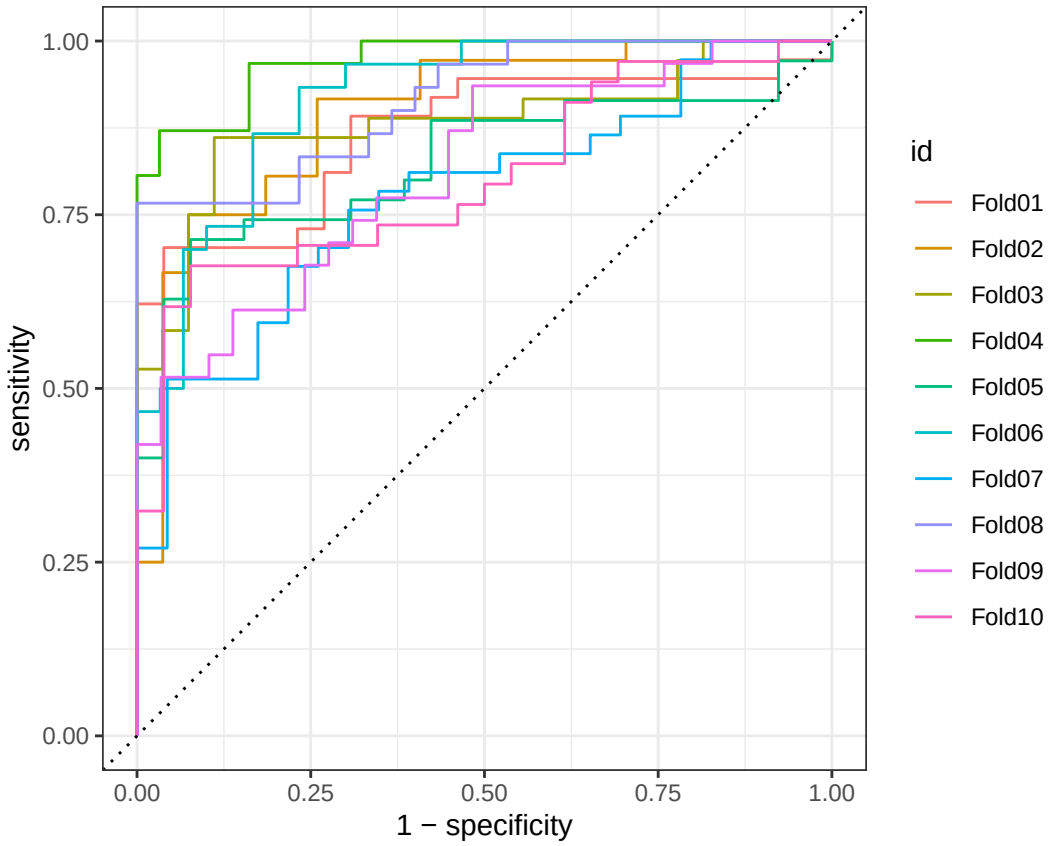
Keep correlating

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

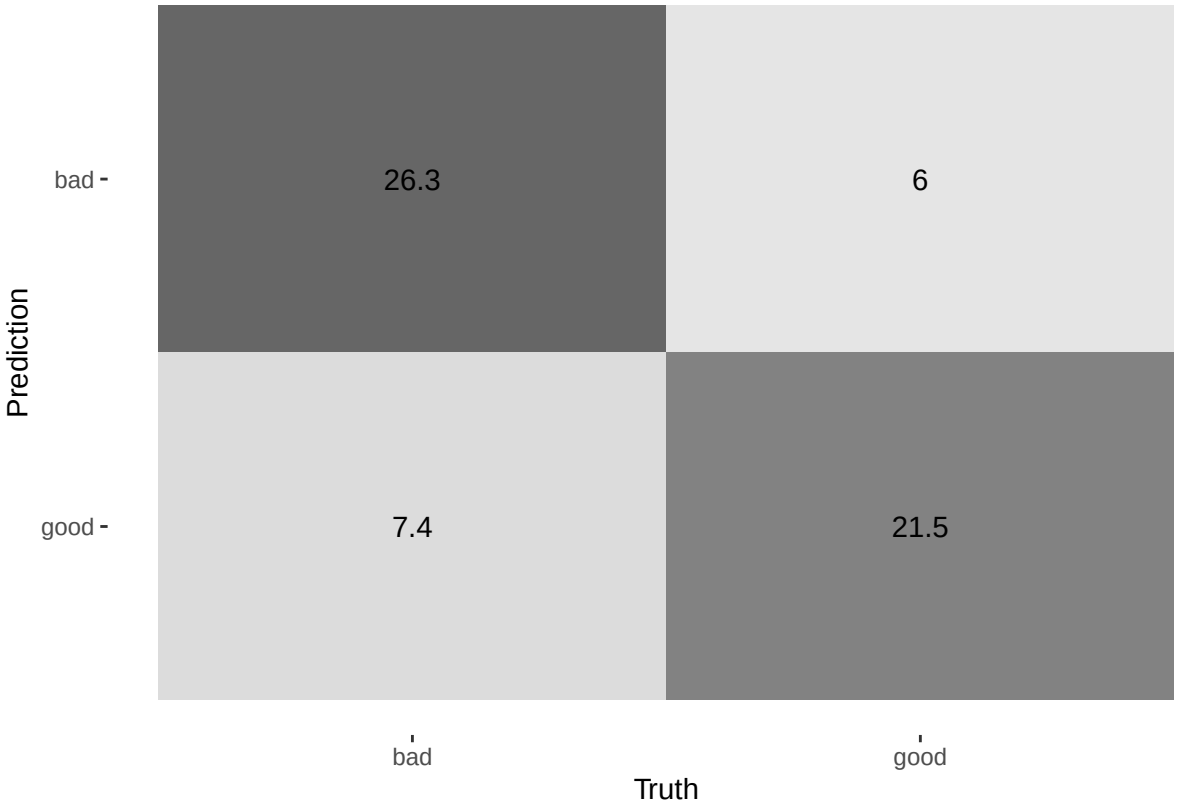
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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     0.781    10 0.0180  Preprocessor1_Model1
## 2 brier_class binary     0.149    10 0.00944 Preprocessor1_Model1
## 3 roc_auc     binary     0.867    10 0.0194  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
26.3
6
7.4
21.5
bad
good
Truth

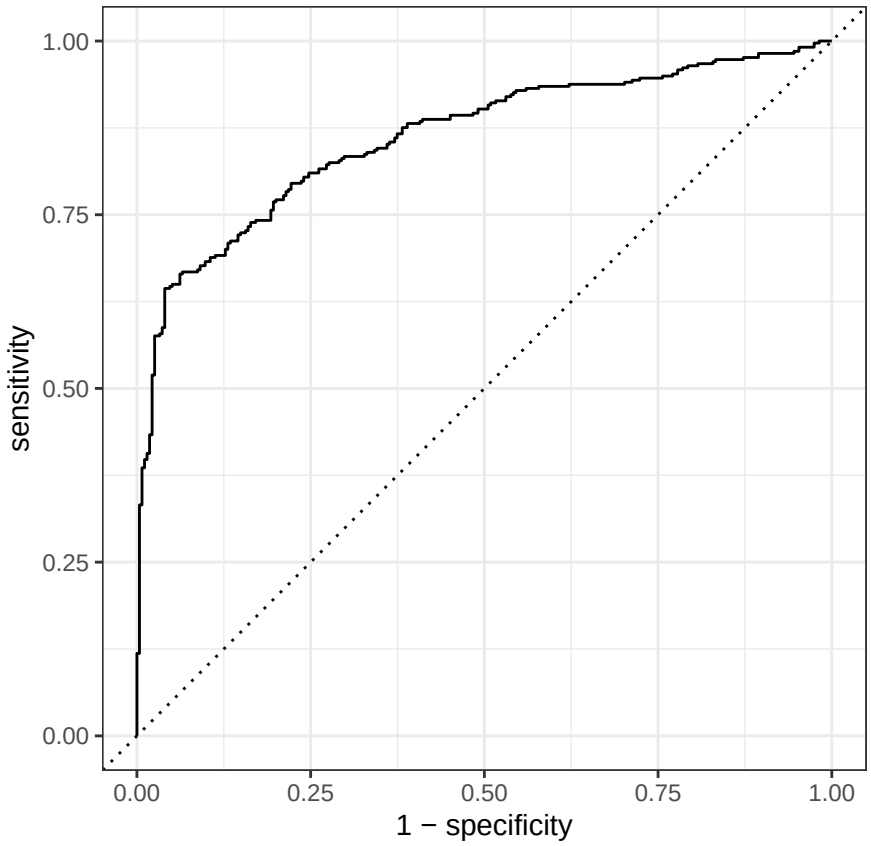
```
## [1] "\n"
## # A tibble: 71 x 2
##    Variable                                              Importance
##    <chr>                                                      <dbl>
##  1 activity                                                  12.9
##  2 verb_dist                                                 12.2
##  3 RuleTooManyNominalConstructions.max_allowable_nouns       11.8
##  4 RuleLongSentences.max_length                              11.1
##  5 ari                                                       10.3
##  6 RuleTooFewVerbs.min_verb_frac                             10.1
##  7 smog                                                       9.21
##  8 RuleLiteraryStyle                                          8.96
##  9 RulePredAtClauseBeginning.max_order                        8.78
## 10 gf                                                         8.46
## 11 RulePassive                                                6.82
## 12 fkgl                                                       5.75
## 13 mamr                                                       5.49
## 14 RuleMultiPartVerbs                                         5.28
## 15 atl                                                        5.02
## 16 RulePredAtClauseBeginning.max_order.v                      4.77
## 17 maentropy                                                  4.36
## 18 mattr                                                      4.09
## 19 RuleTooManyNegations.max_negation_frac                     4.06
## 20 RuleTooManyNominalConstructions.max_noun_frac              3.86
## 21 RuleVerbalNouns                                            3.79
## 22 entropy                                                    3.73
## 23 RuleTooLongExpressions                                     3.69
## 24 RulePredSubjDistance                                       3.53
## 25 RuleAnaphoricReferences                                    3.49
## 26 cli                                                        3.33
## 27 maentropy.v                                                3.27
## 28 RuleCaseRepetition.max_repetition_count.v                  3.25
## 29 RuleLongSentences.max_length.v                             3.21
## 30 RulePredSubjDistance.max_distance                          3.17
## 31 mattr.v                                                    3.07
## 32 RuleDoubleAdpos.max_allowable_distance.v                   2.92
## 33 RulePredObjDistance                                        2.77
## 34 RuleTooManyNegations.max_negation_frac.v                   2.76
## 35 word_count                                                 2.76
## 36 RuleInfVerbDistance.max_distance                           2.73
## 37 RuleCaseRepetition.max_repetition_frac                     2.71
## 38 RulePredSubjDistance.max_distance.v                        2.69
## 39 RuleMultiPartVerbs.max_distance                            2.57
## 40 RuleCaseRepetition.max_repetition_frac.v                   2.56
## 41 RuleInfVerbDistance.max_distance.v                         2.54
## 42 RuleTooManyNegations.max_allowable_negations.v             2.48
## 43 RuleCaseRepetition.max_repetition_count                    2.40
## 44 RulePredObjDistance.max_distance                           2.37
## 45 RulePredObjDistance.max_distance.v                         2.37
## 46 char_count                                                 2.35
## 47 num_hapax                                                  2.33
## 48 fre                                                        2.32
## 49 ttr                                                        2.31
## 50 RuleTooManyNegations.max_allowable_negations               2.31
```

```
## 51 syllab_count                                          2.24
## 52 RuleInfVerbDistance                                   2.22
## 53 sent_count                                            2.21
## 54 RuleDoubleAdpos                                       2.18
## 55 RuleMultiPartVerbs.max_distance.v                     2.15
## 56 RuleTooManyNominalConstructions.max_noun_frac.v       2.06
## 57 RuleAbstractNouns                                     1.98
## 58 RuleDoubleAdpos.max_allowable_distance                1.95
## 59 RuleWeakMeaningWords                                  1.77
## 60 RuleReflexivePassWithAnimSubj                         1.58
## 61 hpoint                                                1.52
## 62 RuleGPwordorder                                       1.48
## 63 RuleGPpatinstr                                        1.24
## 64 RuleGPdeverbaddr                                      1.17
## 65 RuleRelativisticExpressions                           1.03
## 66 RuleGPdeverbsubj                                      0.933
## 67 RuleGPpatbenperson                                    0.843
## 68 RuleGPcoordovs                                        0.830
## 69 RuleConfirmationExpressions                           0.268
## 70 RuleRedundantExpressions                              0.249
## 71 RuleGPadjective                                       0.216
```

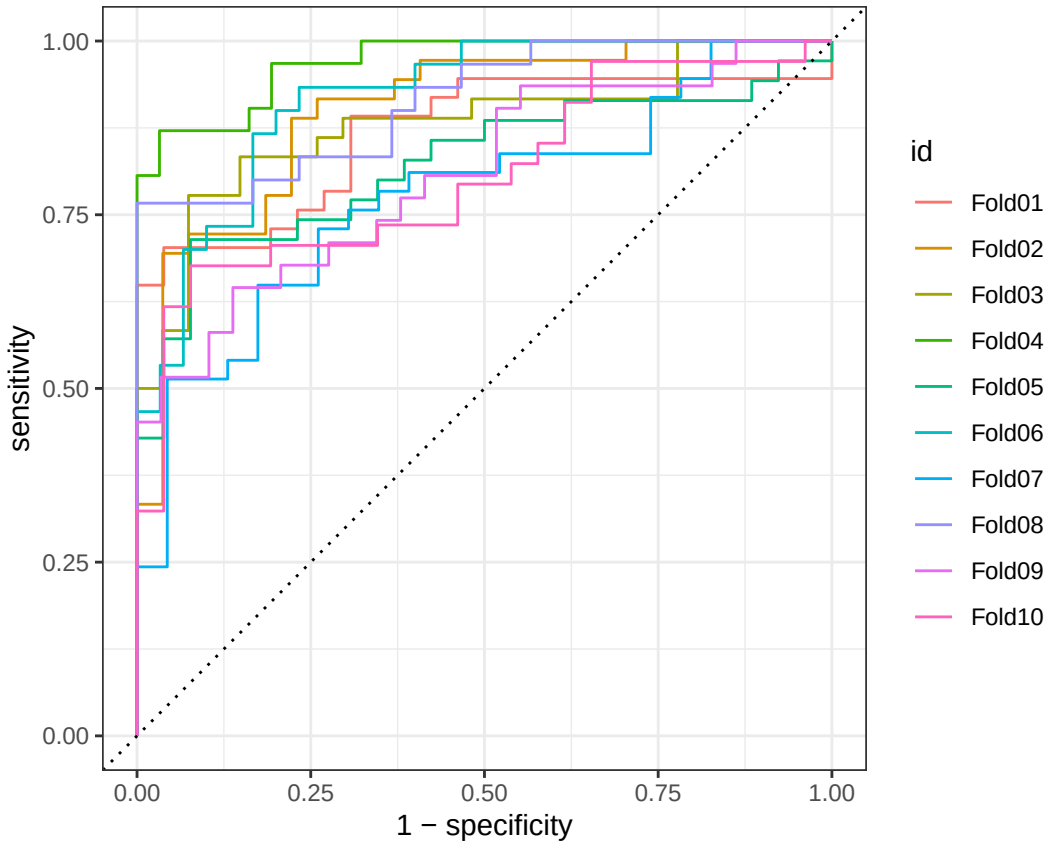
No TL

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

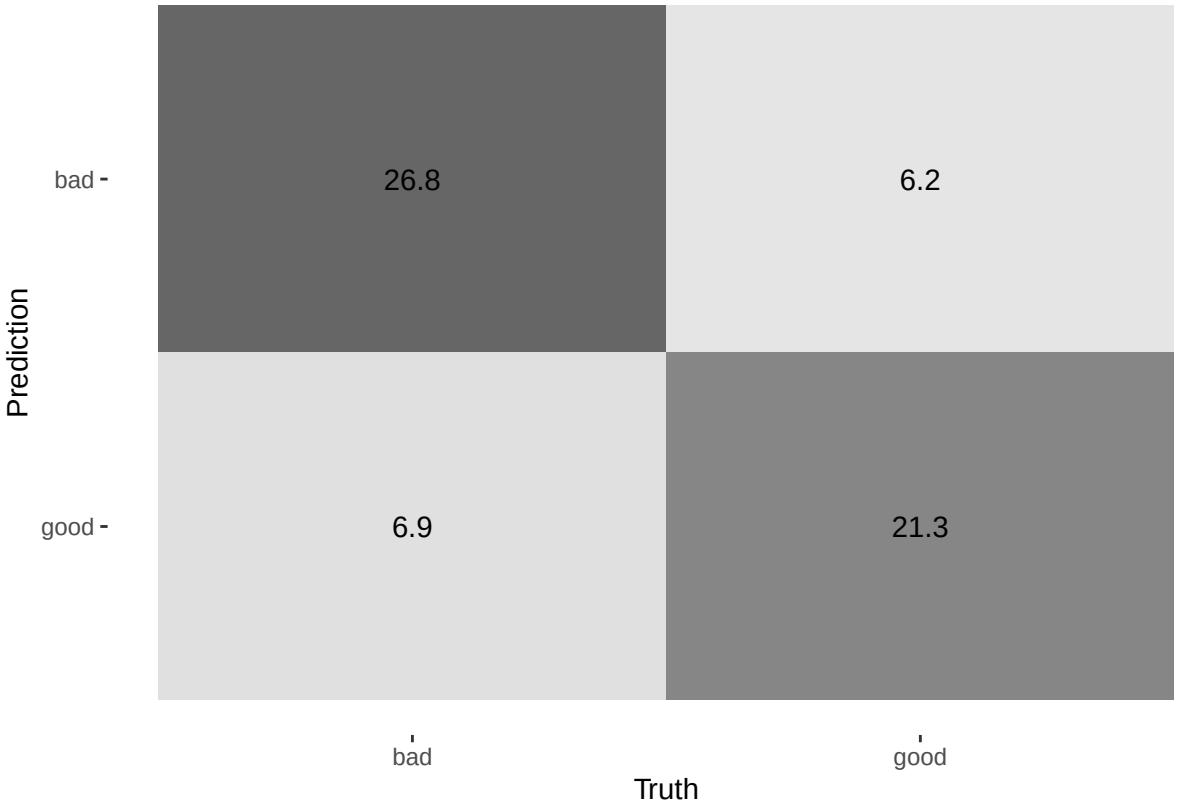
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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     0.785    10 0.0202  Preprocessor1_Model1
## 2 brier_class binary     0.150    10 0.00938 Preprocessor1_Model1
## 3 roc_auc     binary     0.866    10 0.0195  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
26.8
6.2
6.9
21.3
bad
good
Truth

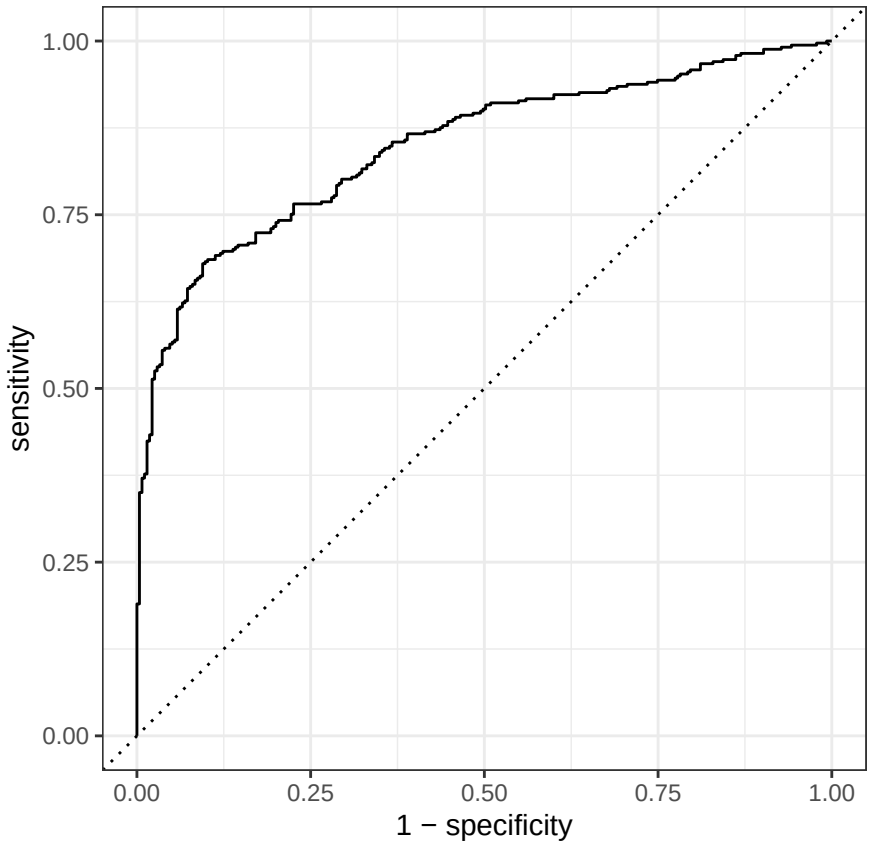
```
## [1] "\n"
## # A tibble: 67 x 2
##    Variable                                              Importance
##    <chr>                                                      <dbl>
##  1 activity                                                  14.6
##  2 RuleTooManyNominalConstructions.max_allowable_nouns       13.0
##  3 verb_dist                                                 11.9
##  4 RuleTooFewVerbs.min_verb_frac                             11.5
##  5 gf                                                        10.1
##  6 ari                                                       10.0
##  7 RuleLongSentences.max_length                               9.48
##  8 smog                                                       9.37
##  9 RuleLiteraryStyle                                          8.57
## 10 RulePredAtClauseBeginning.max_order                        7.91
## 11 RulePassive                                                7.63
## 12 fkgl                                                       5.49
## 13 atl                                                        5.42
## 14 mamr                                                       5.38
## 15 RuleMultiPartVerbs                                         4.62
## 16 maentropy                                                  4.55
## 17 RuleTooManyNegations.max_negation_frac                     4.52
## 18 RulePredAtClauseBeginning.max_order.v                      4.44
## 19 RuleVerbalNouns                                            4.34
## 20 mattr                                                      4.28
## 21 entropy                                                    4.12
## 22 RuleAnaphoricReferences                                    4.05
## 23 RuleTooLongExpressions                                     4.03
## 24 RuleTooManyNominalConstructions.max_noun_frac              3.80
## 25 RulePredSubjDistance                                       3.73
## 26 maentropy.v                                                3.40
## 27 cli                                                        3.38
## 28 RuleLongSentences.max_length.v                             3.35
## 29 RuleDoubleAdpos.max_allowable_distance.v                   3.30
## 30 RulePredSubjDistance.max_distance                          3.27
## 31 mattr.v                                                    2.98
## 32 RuleTooManyNegations.max_negation_frac.v                   2.96
## 33 num_hapax                                                  2.95
## 34 RuleCaseRepetition.max_repetition_frac.v                   2.89
## 35 RulePredSubjDistance.max_distance.v                        2.87
## 36 RuleCaseRepetition.max_repetition_count.v                  2.86
## 37 RuleInfVerbDistance.max_distance                           2.79
## 38 RulePredObjDistance                                        2.76
## 39 RuleCaseRepetition.max_repetition_frac                     2.75
## 40 RuleInfVerbDistance.max_distance.v                         2.73
## 41 RuleCaseRepetition.max_repetition_count                    2.72
## 42 RuleTooManyNegations.max_allowable_negations               2.71
## 43 ttr                                                        2.67
## 44 RuleMultiPartVerbs.max_distance                            2.61
## 45 RulePredObjDistance.max_distance                           2.53
## 46 RuleTooManyNegations.max_allowable_negations.v             2.50
## 47 RuleMultiPartVerbs.max_distance.v                          2.49
## 48 RulePredObjDistance.max_distance.v                         2.33
## 49 RuleInfVerbDistance                                        2.23
## 50 RuleDoubleAdpos                                            2.21
```

```
## 51 RuleDoubleAdpos.max_allowable_distance                  2.16
## 52 hpoint                                                  2.09
## 53 fre                                                     2.09
## 54 RuleAbstractNouns                                       2.05
## 55 RuleTooManyNominalConstructions.max_noun_frac.v         2.00
## 56 RuleWeakMeaningWords                                    1.88
## 57 RuleReflexivePassWithAnimSubj                           1.60
## 58 RuleGPwordorder                                         1.58
## 59 RuleGPdeverbaddr                                        1.32
## 60 RuleGPpatinstr                                          1.28
## 61 RuleRelativisticExpressions                             0.966
## 62 RuleGPdeverbsubj                                        0.905
## 63 RuleGPpatbenperson                                      0.820
## 64 RuleGPcoordovs                                          0.811
## 65 RuleRedundantExpressions                                0.339
## 66 RuleGPadjective                                         0.305
## 67 RuleConfirmationExpressions                             0.305
```

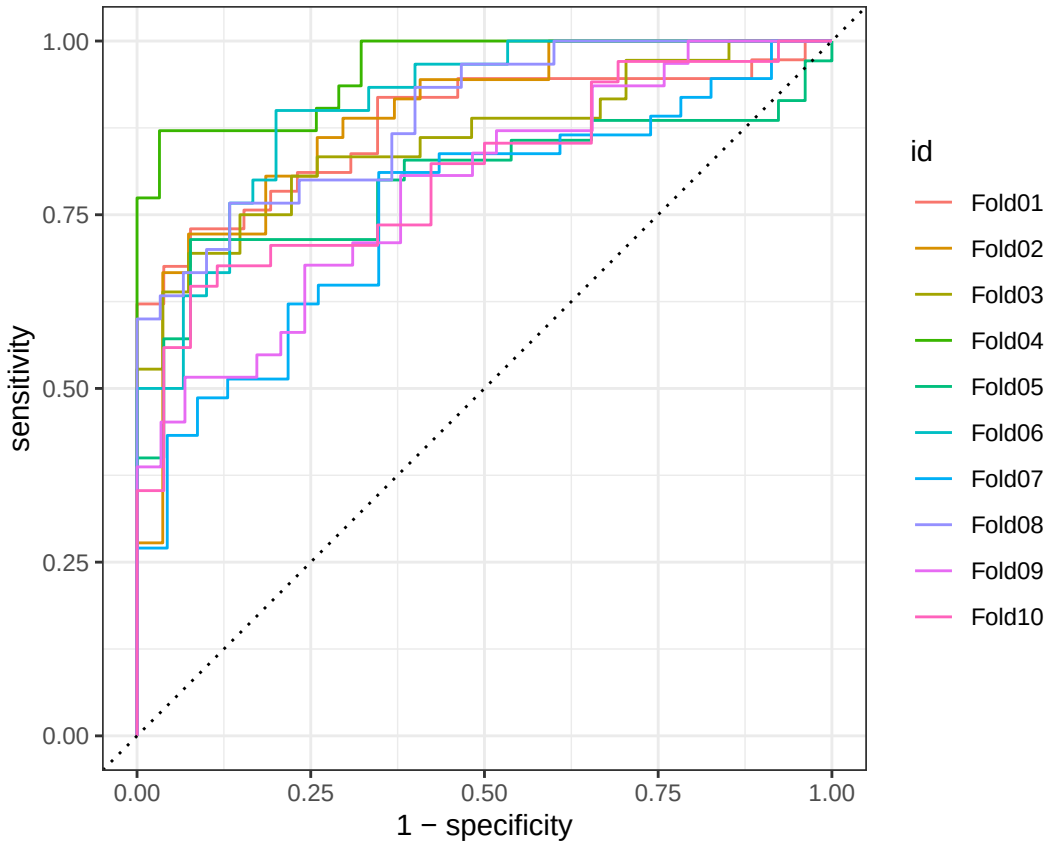
IAC

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

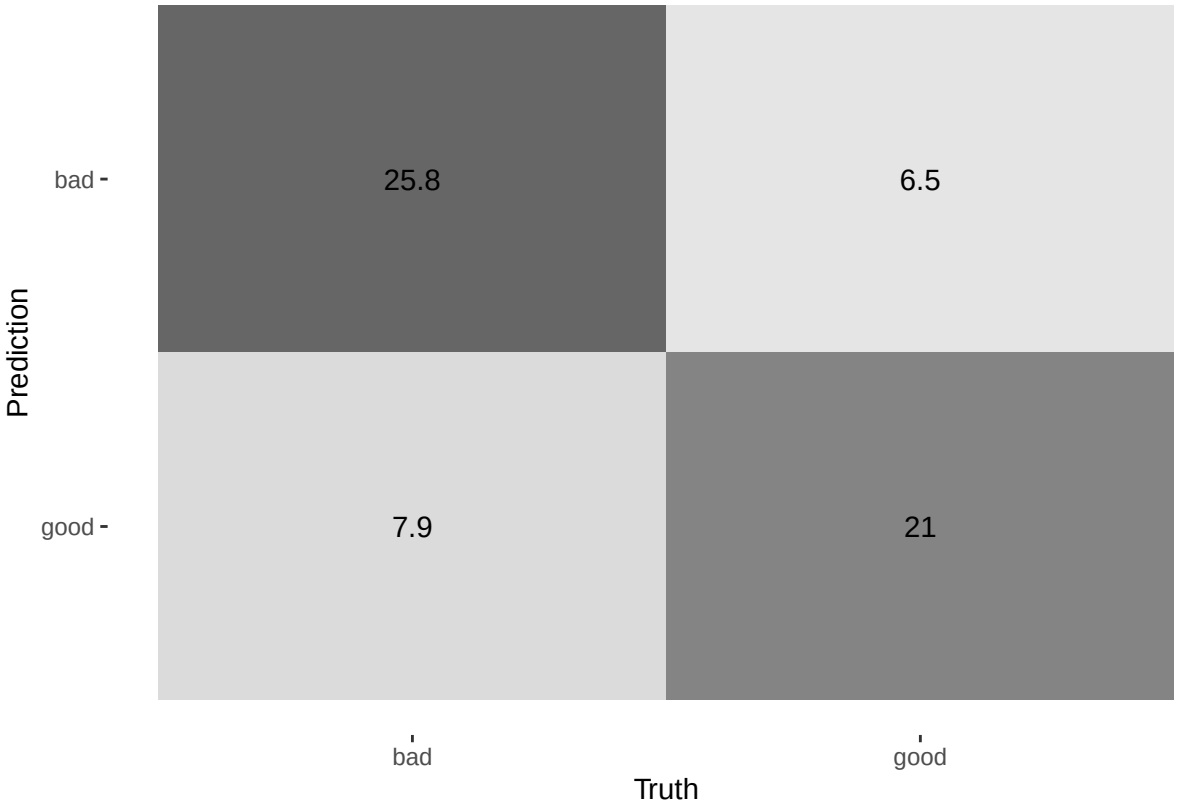
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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     0.764    10 0.0159  Preprocessor1_Model1
## 2 brier_class binary     0.156    10 0.00897 Preprocessor1_Model1
## 3 roc_auc     binary     0.853    10 0.0200  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
25.8
6.5
7.9
21
bad
good
Truth

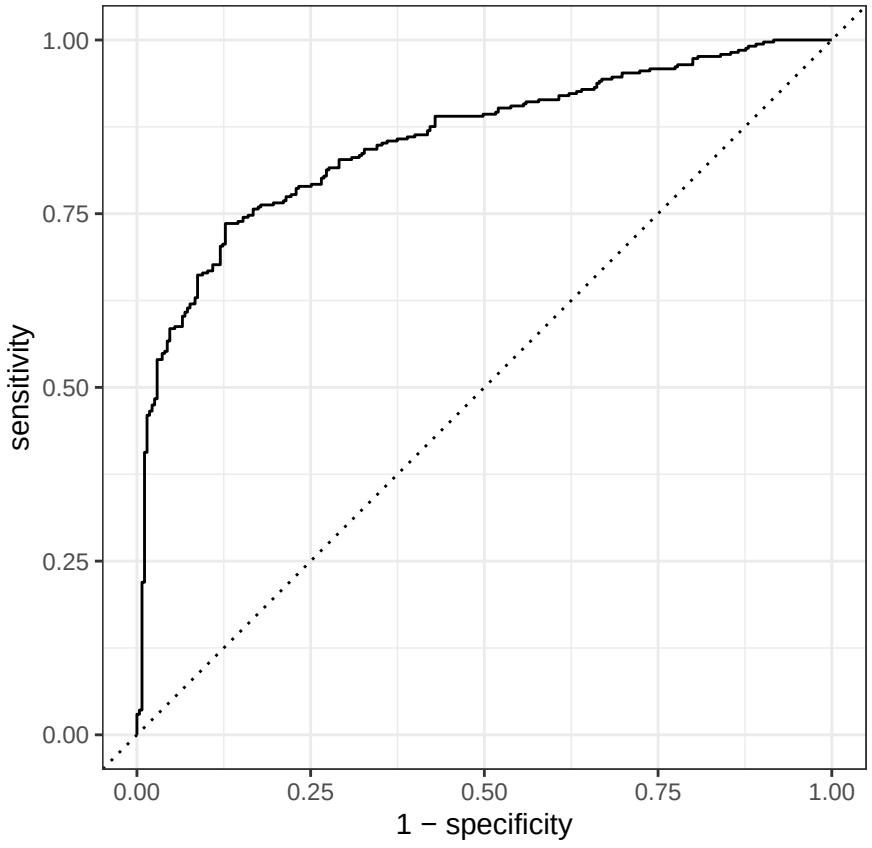
```
## [1] "\n"
## # A tibble: 44 x 2
##    Variable                                                Importance
##    <chr>                                                        <dbl>
##  1 RuleTooManyNominalConstructions.max_allowable_nouns          15.5
##  2 activity                                                     15.5
##  3 verb_dist                                                    15.1
##  4 RuleTooFewVerbs.min_verb_frac                                13.2
##  5 RuleLongSentences.max_length                                 12.1
##  6 smog                                                         11.3
##  7 gf                                                           11.0
##  8 ari                                                          10.4
##  9 RulePredAtClauseBeginning.max_order                           9.69
## 10 mamr                                                          6.56
## 11 atl                                                           6.47
## 12 fkgl                                                          6.17
## 13 RuleTooManyNegations.max_negation_frac                        6.02
## 14 entropy                                                       5.96
## 15 RuleTooManyNominalConstructions.max_noun_frac                 5.76
## 16 maentropy                                                     5.58
## 17 mattr                                                         5.47
## 18 RulePredAtClauseBeginning.max_order.v                         5.26
## 19 cli                                                           5.06
## 20 RuleTooManyNominalConstructions.max_allowable_nouns.v         4.69
## 21 maentropy.v                                                   4.68
## 22 RuleLongSentences.max_length.v                                4.63
## 23 RuleDoubleAdpos.max_allowable_distance.v                      4.53
## 24 mattr.v                                                       4.37
## 25 RulePredSubjDistance.max_distance                             4.07
## 26 RuleTooManyNegations.max_negation_frac.v                      4.07
## 27 RuleInfVerbDistance.max_distance.v                            4.03
## 28 RuleInfVerbDistance.max_distance                              4.01
## 29 ttr                                                           4.00
## 30 RuleCaseRepetition.max_repetition_count.v                     3.96
## 31 RulePredSubjDistance.max_distance.v                           3.67
## 32 RuleMultiPartVerbs.max_distance                               3.66
## 33 RuleTooManyNegations.max_allowable_negations                  3.65
## 34 RuleCaseRepetition.max_repetition_frac                        3.62
## 35 RulePredObjDistance.max_distance                              3.57
## 36 RuleCaseRepetition.max_repetition_frac.v                      3.56
## 37 RuleCaseRepetition.max_repetition_count                       3.46
## 38 RuleMultiPartVerbs.max_distance.v                             3.46
## 39 RuleTooManyNegations.max_allowable_negations.v                3.46
## 40 fre                                                           3.42
## 41 RulePredObjDistance.max_distance.v                            3.32
## 42 hpoint                                                        3.09
## 43 RuleTooManyNominalConstructions.max_noun_frac.v               2.85
## 44 RuleDoubleAdpos.max_allowable_distance                        2.73
```

Counts

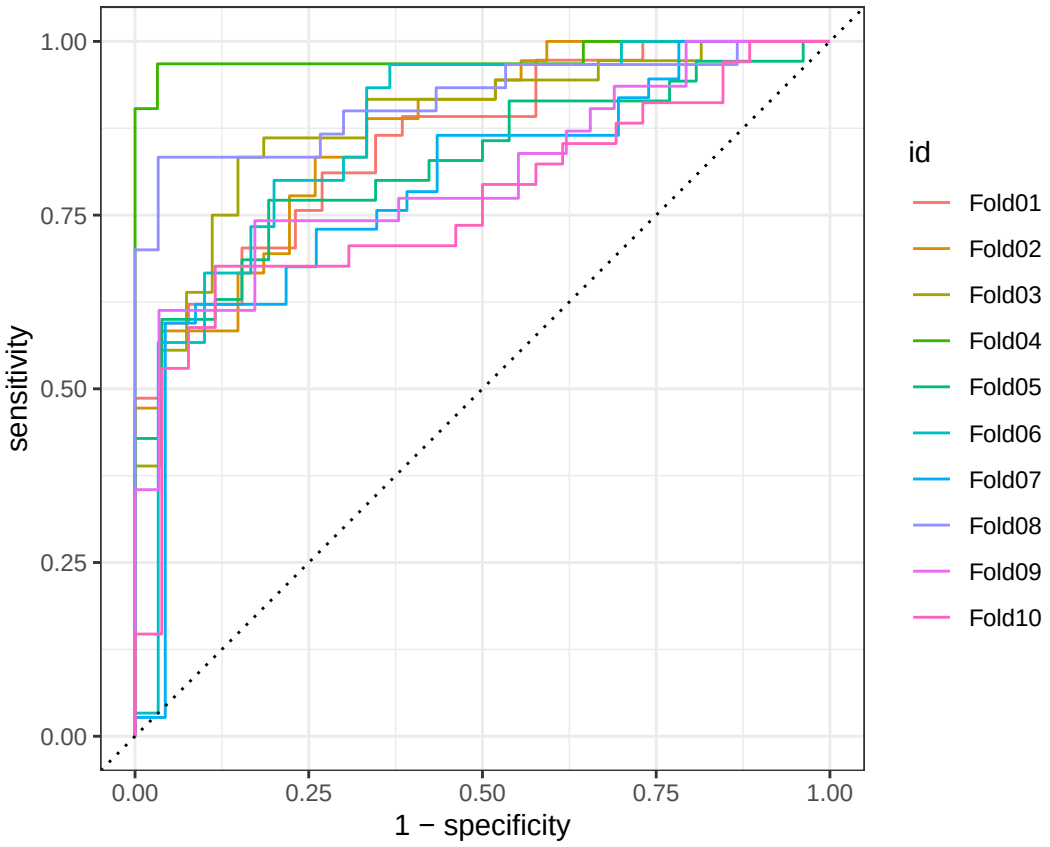
```
model_rf_counts <- train_random_forest(recipe_counts_nocorr, training_set, folds)
```

```
## RF workflow:
```

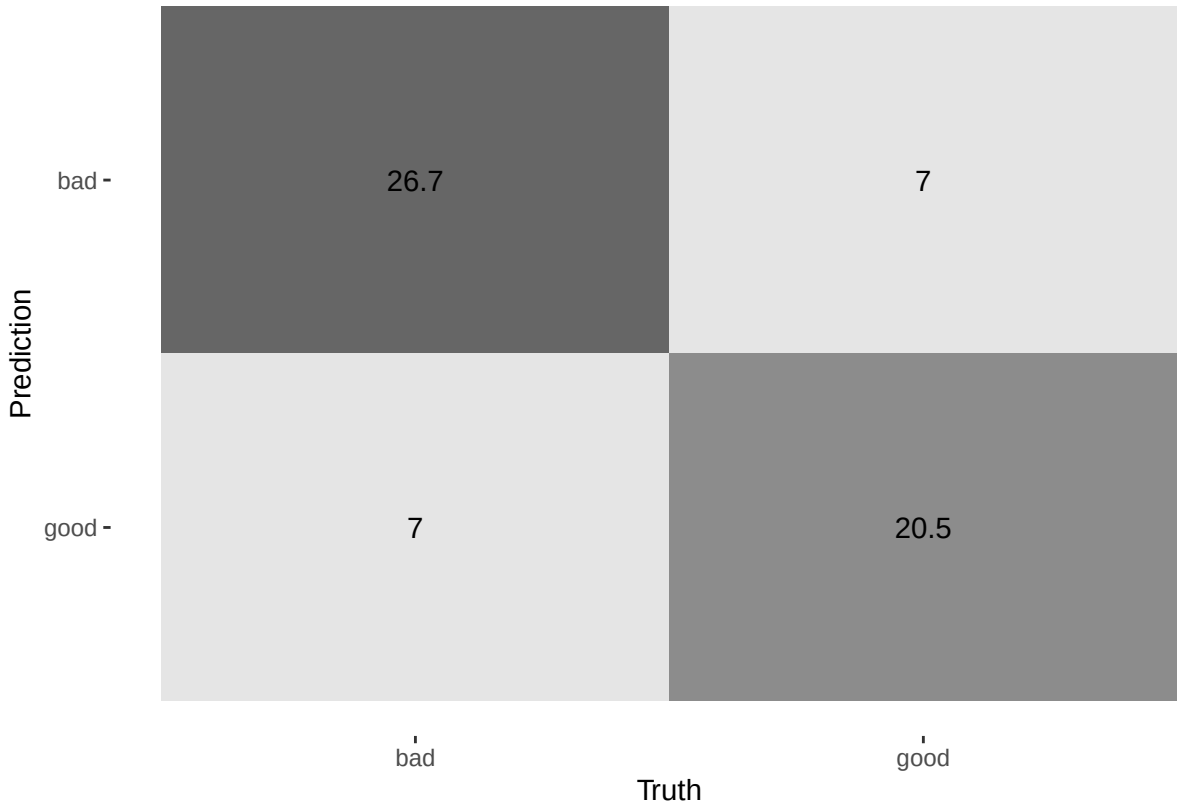
```
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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     0.771    10 0.0228  Preprocessor1_Model1
## 2 brier_class binary     0.158    10 0.00840 Preprocessor1_Model1
## 3 roc_auc     binary     0.856    10 0.0197  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 RuleMultiPartVerbs                33.3
##  2 RulePassive                       31.8
##  3 RuleLiteraryStyle                 30.4
##  4 RulePredSubjDistance              21.1
##  5 RuleInfVerbDistance               16.8
##  6 RuleVerbalNouns                   13.8
##  7 num_hapax                         12.3
##  8 RulePredObjDistance               11.0
##  9 RuleTooLongExpressions             9.91
## 10 RuleAbstractNouns                  9.07
## 11 RuleDoubleAdpos                    9.02
## 12 RuleAnaphoricReferences            8.36
## 13 RuleGPwordorder                    8.27
## 14 RuleWeakMeaningWords               7.24
## 15 RuleReflexivePassWithAnimSubj      6.77
## 16 RuleGPdeverbsubj                   5.11
## 17 RuleGPpatinstr                     4.66
## 18 RuleGPdeverbaddr                   3.73
## 19 RuleGPpatbenperson                 2.78
## 20 RuleGPcoordovs                     2.50
## 21 RuleRelativisticExpressions        2.43
## 22 RuleConfirmationExpressions        1.73
## 23 RuleGPadjective                    0.879
## 24 RuleRedundantExpressions           0.733
```

Evaluations

Decision tree

All variables

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

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   68   21
##       good  21   44
##
##                Accuracy : 0.7273
##                  95% CI : (0.6497, 0.7958)
##     No Information Rate : 0.5779
##     P-Value [Acc > NIR] : 8.678e-05
##
##                   Kappa : 0.441
##
##  Mcnemar's Test P-Value : 1
##
##             Sensitivity : 0.6769
##             Specificity : 0.7640
##          Pos Pred Value : 0.6769
##          Neg Pred Value : 0.7640
##              Prevalence : 0.4221
##          Detection Rate : 0.2857
##    Detection Prevalence : 0.4221
##       Balanced Accuracy : 0.7205
##
##        'Positive' Class : good
##
```

No TL

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

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   68   21
##       good  21   44
##
##                Accuracy : 0.7273
##                  95% CI : (0.6497, 0.7958)
##     No Information Rate : 0.5779
##     P-Value [Acc > NIR] : 8.678e-05
##
##                   Kappa : 0.441
##
##  Mcnemar's Test P-Value : 1
```

```
##
##             Sensitivity : 0.6769
##             Specificity : 0.7640
##          Pos Pred Value : 0.6769
##          Neg Pred Value : 0.7640
##              Prevalence : 0.4221
##          Detection Rate : 0.2857
##    Detection Prevalence : 0.4221
##       Balanced Accuracy : 0.7205
##
##        'Positive' Class : good
##
```

IAC

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

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   62   21
##       good  27   44
##
##                Accuracy : 0.6883
##                  95% CI : (0.6088, 0.7604)
##     No Information Rate : 0.5779
##     P-Value [Acc > NIR] : 0.003172
##
##                   Kappa : 0.369
##
##  Mcnemar's Test P-Value : 0.470486
##
##             Sensitivity : 0.6769
##             Specificity : 0.6966
##          Pos Pred Value : 0.6197
##          Neg Pred Value : 0.7470
##              Prevalence : 0.4221
##          Detection Rate : 0.2857
##    Detection Prevalence : 0.4610
##       Balanced Accuracy : 0.6868
##
##        'Positive' Class : good
##
```

Counts

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

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction bad good
##       bad   65   18
```

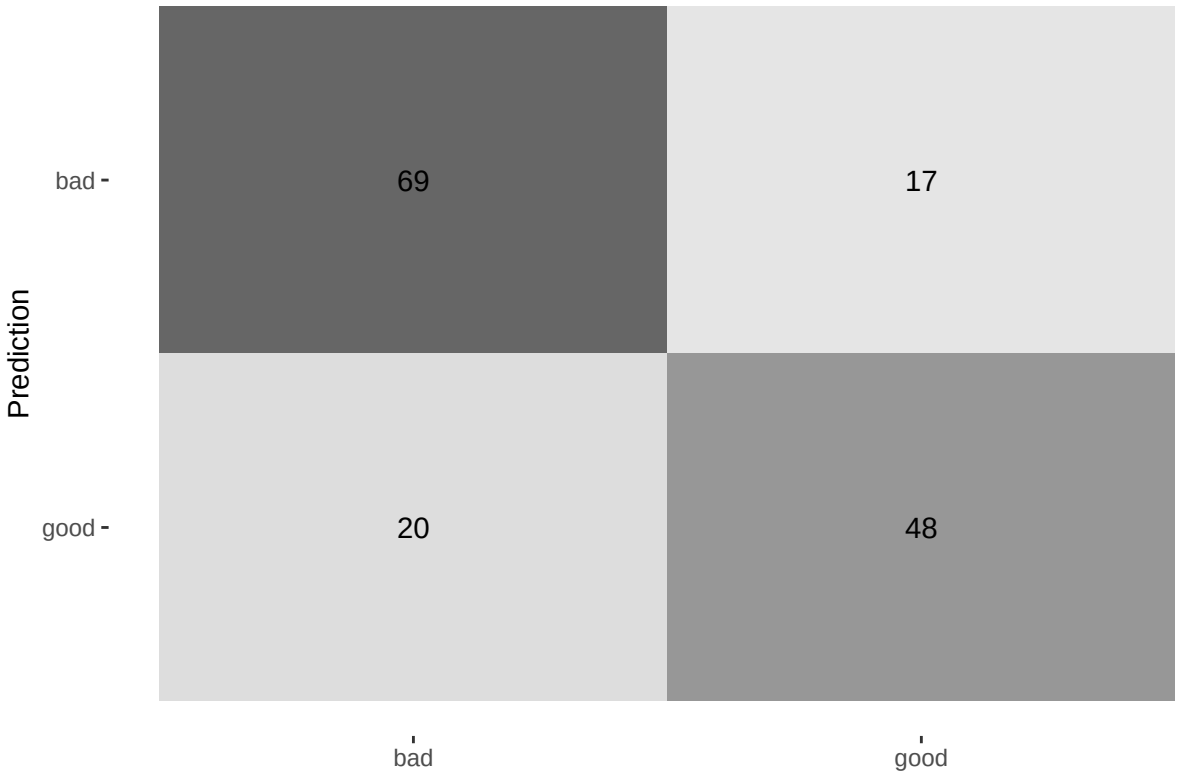
```
##       good  24   47
##
##                Accuracy : 0.7273
##                  95% CI : (0.6497, 0.7958)
##     No Information Rate : 0.5779
##     P-Value [Acc > NIR] : 8.678e-05
##
##                   Kappa : 0.4478
##
##  Mcnemar's Test P-Value : 0.4404
##
##             Sensitivity : 0.7231
##             Specificity : 0.7303
##          Pos Pred Value : 0.6620
##          Neg Pred Value : 0.7831
##              Prevalence : 0.4221
##          Detection Rate : 0.3052
##    Detection Prevalence : 0.4610
##       Balanced Accuracy : 0.7267
##
##        'Positive' Class : good
##
```

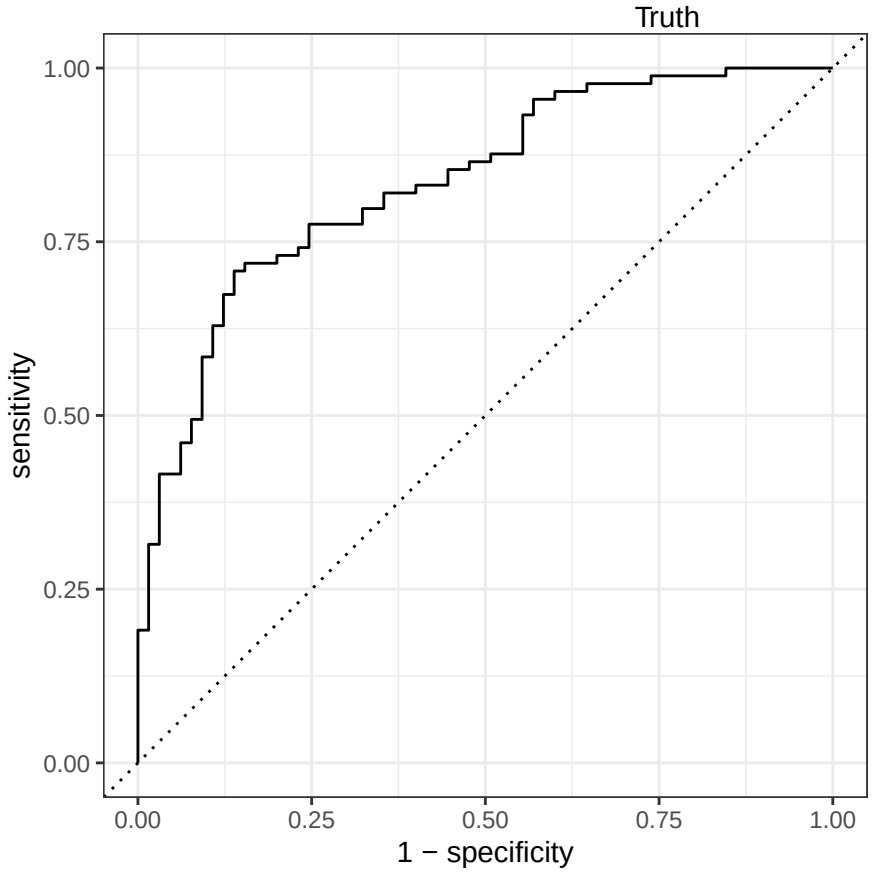
Lasso

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         0.760 Preprocessor1_Model1
## 2 roc_auc     binary         0.835 Preprocessor1_Model1
## 3 brier_class binary         0.178 Preprocessor1_Model1
```



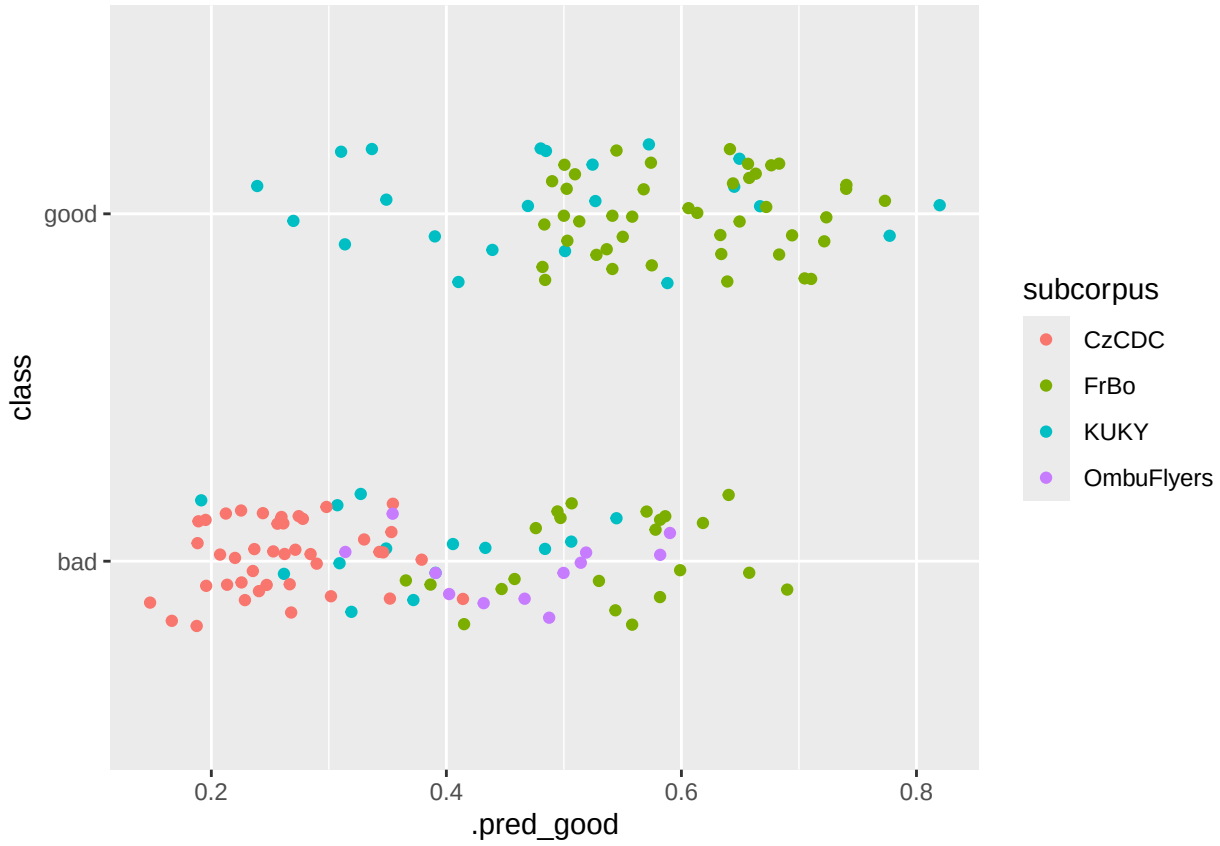



```
## Variable importance:
## # A tibble: 71 x 3
```

```
##    Variable                                              Importance Sign
##    <chr>                                                      <dbl> <chr>
##  1 activity                                                 0.408    POS
##  2 smog                                                     0.191    NEG
##  3 RuleLiteraryStyle                                        0.168    NEG
##  4 atl                                                      0.100    POS
##  5 mamr                                                     0.0576   POS
##  6 gf                                                       0.0184   NEG
##  7 entropy                                                  0.0165   NEG
##  8 maentropy                                                0.00435  NEG
##  9 ari                                                      0.000272 NEG
## 10 RuleGPcoordovs                                           0        NEG
## 11 RuleGPdeverbaddr                                         0        NEG
## 12 RuleGPpatinstr                                           0        NEG
## 13 RuleGPdeverbsubj                                         0        NEG
## 14 RuleGPadjective                                          0        NEG
## 15 RuleGPpatbenperson                                       0        NEG
## 16 RuleGPwordorder                                          0        NEG
## 17 RuleDoubleAdpos                                          0        NEG
## 18 RuleDoubleAdpos.max_allowable_distance                   0        NEG
## 19 RuleDoubleAdpos.max_allowable_distance.v                 0        NEG
## 20 RuleReflexivePassWithAnimSubj                            0        NEG
## 21 RuleTooFewVerbs.min_verb_frac                            0        NEG
## 22 RuleTooManyNegations.max_negation_frac                   0        NEG
## 23 RuleTooManyNegations.max_negation_frac.v                 0        NEG
## 24 RuleTooManyNegations.max_allowable_negations             0        NEG
## 25 RuleTooManyNegations.max_allowable_negations.v           0        NEG
## 26 RuleTooManyNominalConstructions.max_noun_frac            0        NEG
## 27 RuleTooManyNominalConstructions.max_noun_frac.v          0        NEG
## 28 RuleTooManyNominalConstructions.max_allowable_nouns      0        NEG
## 29 RuleCaseRepetition.max_repetition_count                  0        NEG
## 30 RuleCaseRepetition.max_repetition_count.v                0        NEG
## 31 RuleCaseRepetition.max_repetition_frac                   0        NEG
## 32 RuleCaseRepetition.max_repetition_frac.v                 0        NEG
## 33 RuleWeakMeaningWords                                     0        NEG
## 34 RuleAbstractNouns                                        0        NEG
## 35 RuleRelativisticExpressions                              0        NEG
## 36 RuleConfirmationExpressions                              0        NEG
## 37 RuleRedundantExpressions                                 0        NEG
## 38 RuleTooLongExpressions                                   0        NEG
## 39 RuleAnaphoricReferences                                  0        NEG
## 40 RulePassive                                              0        NEG
## 41 RulePredSubjDistance                                     0        NEG
## 42 RulePredSubjDistance.max_distance                        0        NEG
## 43 RulePredSubjDistance.max_distance.v                      0        NEG
## 44 RulePredObjDistance                                      0        NEG
## 45 RulePredObjDistance.max_distance                         0        NEG
## 46 RulePredObjDistance.max_distance.v                       0        NEG
## 47 RuleInfVerbDistance                                      0        NEG
## 48 RuleInfVerbDistance.max_distance                         0        NEG
## 49 RuleInfVerbDistance.max_distance.v                       0        NEG
## 50 RuleMultiPartVerbs                                       0        NEG
## 51 RuleMultiPartVerbs.max_distance                          0        NEG
## 52 RuleMultiPartVerbs.max_distance.v                        0        NEG
```

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

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




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
```

```
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    8    5
##        good  14   38
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   12   12
##        good   2   10
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    8    0
##        good   4    0
##
##
## Greatest deviations:
## # A tibble: 37 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.261  bad         good  KUKY       Odvolani_proti_rozhodnuti_o_nepov~
##  2        0.230  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  3        0.190  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  4        0.190  bad         good  KUKY       MV_Odneti_trvaleho_pobytu_Kru_po
##  5        0.186  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
##  6        0.163  bad         good  KUKY       Odvolani
##  7        0.158  good        bad   FrBo       orig_Co je to EIA_final
##  8        0.151  bad         good  KUKY       AK_JH_Podani_US_podpis
##  9        0.140  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
## 10        0.118  good        bad   FrBo       orig_znalci, znalecké posudky
## 11        0.110  bad         good  KUKY       invalidní důchod_1399-23_původní
## 12        0.0989 good        bad   FrBo       64
## 13        0.0902 good        bad   OmbuFlyers Soudni-poplatky
## 14        0.0897 bad         good  KUKY       Ockovani_JSm
## 15        0.0862 good        bad   FrBo       orig_Sousedské vztahy
## 16        0.0819 good        bad   OmbuFlyers Detsky-domov
## 17        0.0819 good        bad   FrBo       orig_Jak probíhá správní řízení
## 18        0.0818 good        bad   FrBo       orig_Jak zajistit, aby skládka do~
## 19        0.0780 good        bad   FrBo       orig_územní řízení
## 20        0.0704 good        bad   FrBo       orig_Co je to a jak probíhá integ~
## 21        0.0608 bad         good  KUKY       důchod-dorovnávací přídavek_1298-~
## 22        0.0581 good        bad   FrBo       orig_Jak využít svého práva být i~
## 23        0.0447 good        bad   KUKY       Pravni rada_uver SVJ
## 24        0.0438 good        bad   FrBo       149
## 25        0.0306 bad         good  KUKY       4842_2023_VOP
## 26        0.0298 good        bad   FrBo       142
```

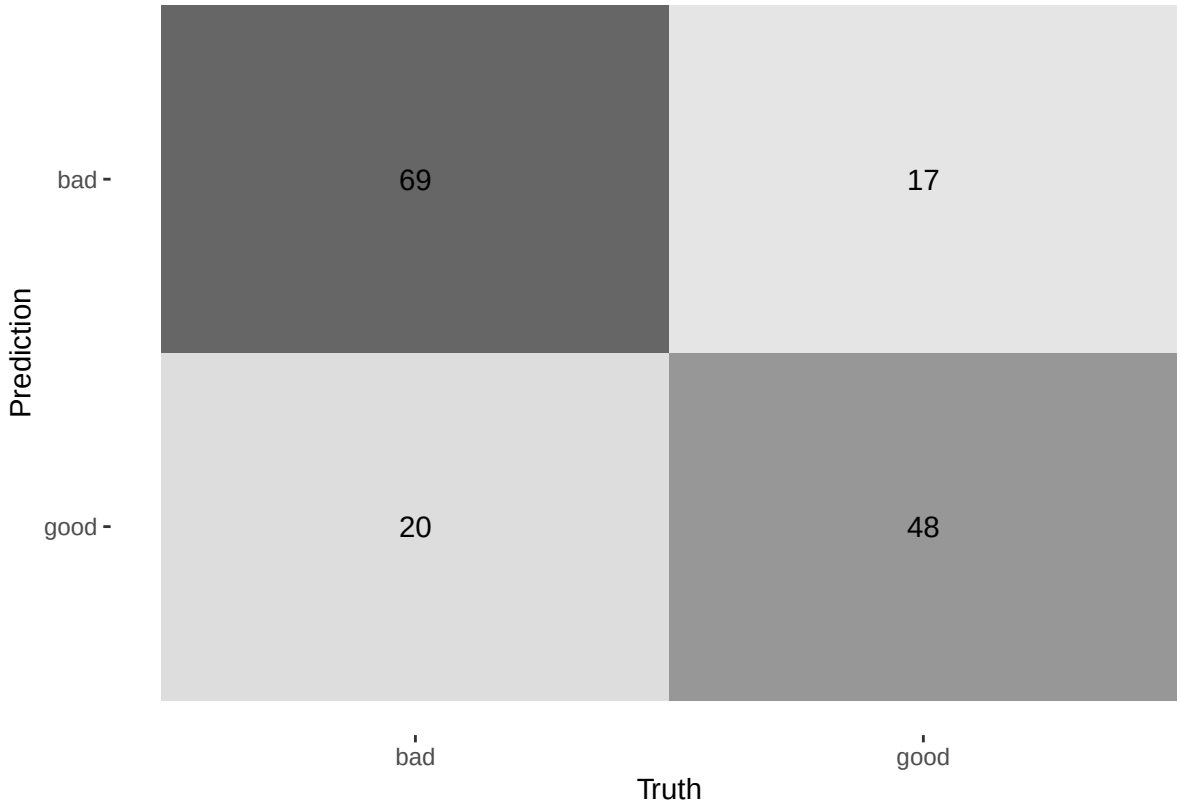
```
## 27        0.0197 bad         good  KUKY       6525_2022_VOP
## 28        0.0189 good        bad   OmbuFlyers Studny
## 29        0.0182 bad         good  FrBo       red_Pozemkové úpravy_final
## 30        0.0166 bad         good  FrBo       156
## 31        0.0160 bad         good  FrBo       red_Jaké jsou povinnosti veřejnýc~
## # i 6 more rows
```

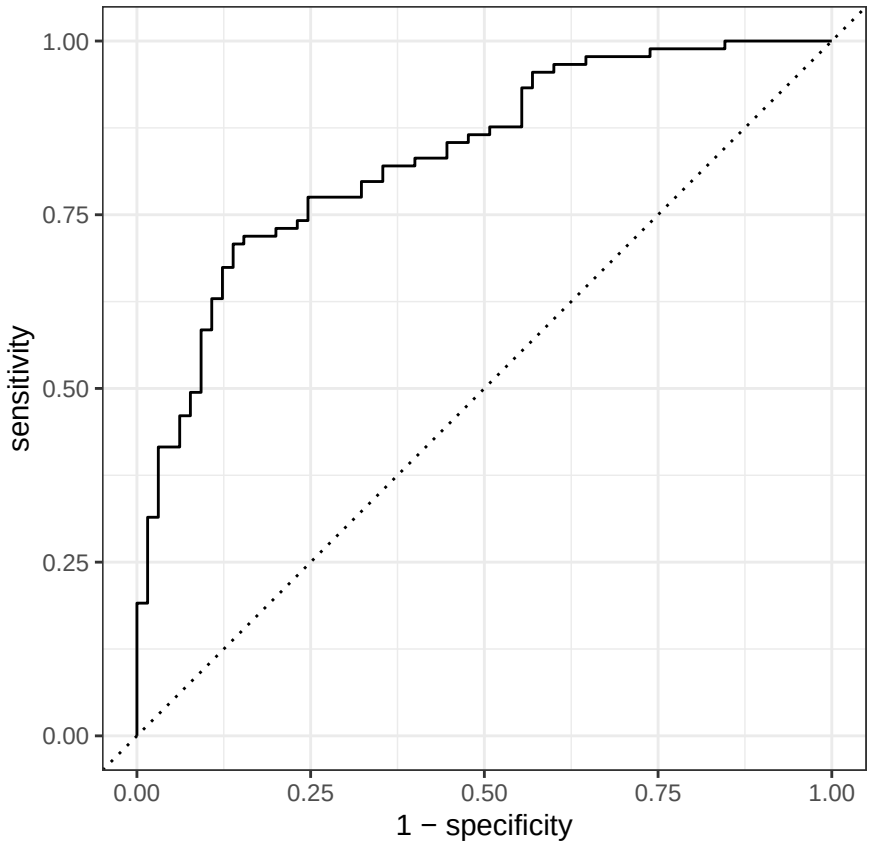
```
# lfit_lasso_all %>%
#   lasso_get_coefficients() %>%
#   print(n = 100)
```

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         0.760 Preprocessor1_Model1
## 2 roc_auc     binary         0.835 Preprocessor1_Model1
## 3 brier_class binary         0.178 Preprocessor1_Model1
```

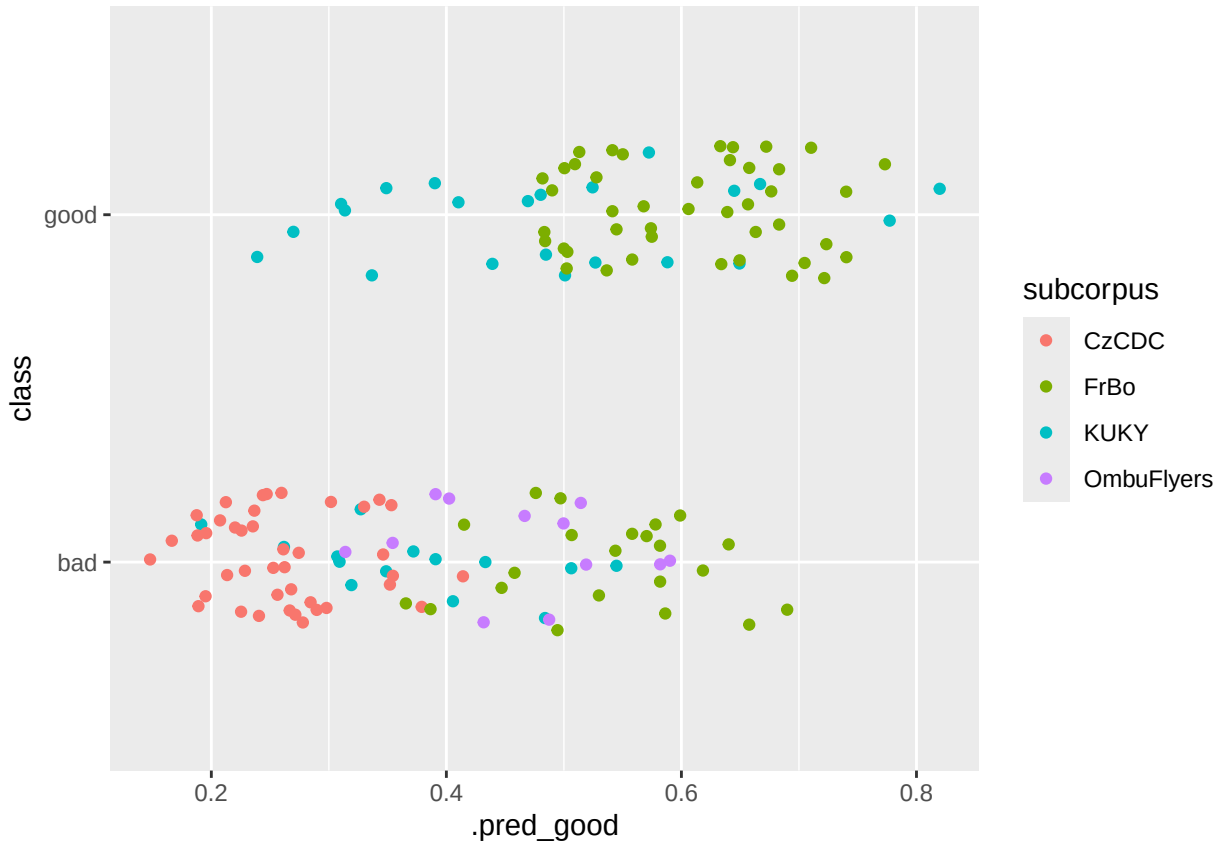





```
## Variable importance:
## # A tibble: 67 x 3
##    Variable                                          Importance Sign
##    <chr>                                                  <dbl> <chr>
##  1 activity                                           0.408    POS
##  2 smog                                               0.191    NEG
##  3 RuleLiteraryStyle                                  0.168    NEG
##  4 atl                                                0.100    POS
##  5 mamr                                               0.0576   POS
##  6 gf                                                 0.0184   NEG
##  7 entropy                                            0.0165   NEG
##  8 maentropy                                          0.00435  NEG
##  9 ari                                                0.000272 NEG
## 10 RuleGPcoordovs                                     0        NEG
## 11 RuleGPdeverbaddr                                   0        NEG
## 12 RuleGPpatinstr                                     0        NEG
## 13 RuleGPdeverbsubj                                   0        NEG
## 14 RuleGPadjective                                    0        NEG
## 15 RuleGPpatbenperson                                 0        NEG
## 16 RuleGPwordorder                                    0        NEG
## 17 RuleDoubleAdpos                                    0        NEG
## 18 RuleDoubleAdpos.max_allowable_distance             0        NEG
## 19 RuleDoubleAdpos.max_allowable_distance.v           0        NEG
## 20 RuleReflexivePassWithAnimSubj                      0        NEG
## 21 RuleTooFewVerbs.min_verb_frac                      0        NEG
## 22 RuleTooManyNegations.max_negation_frac             0        NEG
## 23 RuleTooManyNegations.max_negation_frac.v           0        NEG
```

```
## 24 RuleTooManyNegations.max_allowable_negations          0        NEG
## 25 RuleTooManyNegations.max_allowable_negations.v        0        NEG
## 26 RuleTooManyNominalConstructions.max_noun_frac         0        NEG
## 27 RuleTooManyNominalConstructions.max_noun_frac.v       0        NEG
## 28 RuleTooManyNominalConstructions.max_allowable_nouns   0        NEG
## 29 RuleCaseRepetition.max_repetition_count               0        NEG
## 30 RuleCaseRepetition.max_repetition_count.v             0        NEG
## 31 RuleCaseRepetition.max_repetition_frac                0        NEG
## 32 RuleCaseRepetition.max_repetition_frac.v              0        NEG
## 33 RuleWeakMeaningWords                                  0        NEG
## 34 RuleAbstractNouns                                     0        NEG
## 35 RuleRelativisticExpressions                           0        NEG
## 36 RuleConfirmationExpressions                           0        NEG
## 37 RuleRedundantExpressions                              0        NEG
## 38 RuleTooLongExpressions                                0        NEG
## 39 RuleAnaphoricReferences                               0        NEG
## 40 RulePassive                                           0        NEG
## 41 RulePredSubjDistance                                  0        NEG
## 42 RulePredSubjDistance.max_distance                     0        NEG
## 43 RulePredSubjDistance.max_distance.v                   0        NEG
## 44 RulePredObjDistance                                   0        NEG
## 45 RulePredObjDistance.max_distance                      0        NEG
## 46 RulePredObjDistance.max_distance.v                    0        NEG
## 47 RuleInfVerbDistance                                   0        NEG
## 48 RuleInfVerbDistance.max_distance                      0        NEG
## 49 RuleInfVerbDistance.max_distance.v                    0        NEG
## 50 RuleMultiPartVerbs                                    0        NEG
## 51 RuleMultiPartVerbs.max_distance                       0        NEG
## 52 RuleMultiPartVerbs.max_distance.v                     0        NEG
## 53 RuleLongSentences.max_length                          0        NEG
## 54 RuleLongSentences.max_length.v                        0        NEG
## 55 RulePredAtClauseBeginning.max_order                   0        NEG
## 56 RulePredAtClauseBeginning.max_order.v                 0        NEG
## 57 RuleVerbalNouns                                       0        NEG
## 58 cli                                                   0        NEG
## 59 num_hapax                                             0        NEG
## 60 ttr                                                   0        NEG
## 61 mattr                                                 0        NEG
## 62 mattr.v                                               0        NEG
## 63 maentropy.v                                           0        NEG
## 64 verb_dist                                             0        NEG
## 65 hpoint                                                0        NEG
## 66 fre                                                   0        NEG
## 67 fkgl                                                  0        NEG
```

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




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    8    5
##        good  14   38
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   12   12
##        good   2   10
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    8    0
```

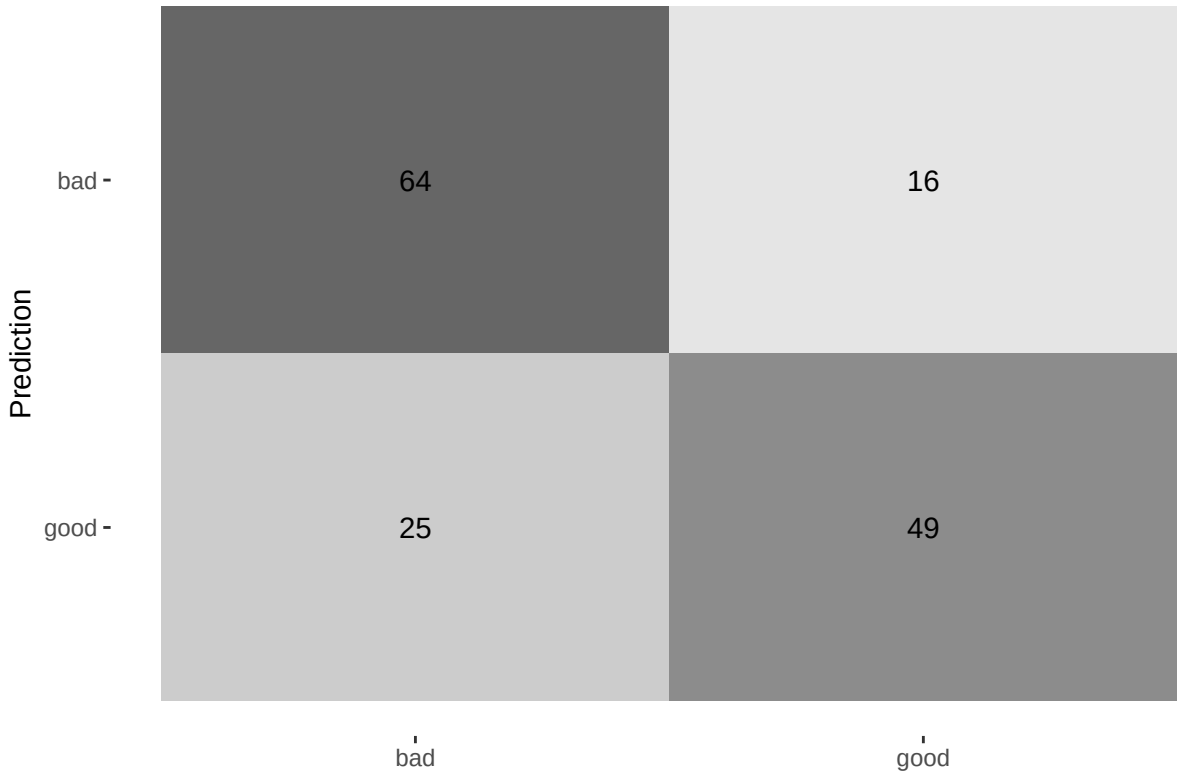
```
##        good   4    0
##
##
## Greatest deviations:
## # A tibble: 37 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.261  bad         good  KUKY       Odvolani_proti_rozhodnuti_o_nepov~
##  2        0.230  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  3        0.190  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  4        0.190  bad         good  KUKY       MV_Odneti_trvaleho_pobytu_Kru_po
##  5        0.186  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
##  6        0.163  bad         good  KUKY       Odvolani
##  7        0.158  good        bad   FrBo       orig_Co je to EIA_final
##  8        0.151  bad         good  KUKY       AK_JH_Podani_US_podpis
##  9        0.140  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
## 10        0.118  good        bad   FrBo       orig_znalci, znalecké posudky
## 11        0.110  bad         good  KUKY       invalidní důchod_1399-23_původní
## 12        0.0989 good        bad   FrBo       64
## 13        0.0902 good        bad   OmbuFlyers Soudni-poplatky
## 14        0.0897 bad         good  KUKY       Ockovani_JSm
## 15        0.0862 good        bad   FrBo       orig_Sousedské vztahy
## 16        0.0819 good        bad   OmbuFlyers Detsky-domov
## 17        0.0819 good        bad   FrBo       orig_Jak probíhá správní řízení
## 18        0.0818 good        bad   FrBo       orig_Jak zajistit, aby skládka do~
## 19        0.0780 good        bad   FrBo       orig_územní řízení
## 20        0.0704 good        bad   FrBo       orig_Co je to a jak probíhá integ~
## 21        0.0608 bad         good  KUKY       důchod-dorovnávací přídavek_1298-~
## 22        0.0581 good        bad   FrBo       orig_Jak využít svého práva být i~
## 23        0.0447 good        bad   KUKY       Pravni rada_uver SVJ
## 24        0.0438 good        bad   FrBo       149
## 25        0.0306 bad         good  KUKY       4842_2023_VOP
## 26        0.0298 good        bad   FrBo       142
## 27        0.0197 bad         good  KUKY       6525_2022_VOP
## 28        0.0189 good        bad   OmbuFlyers Studny
## 29        0.0182 bad         good  FrBo       red_Pozemkové úpravy_final
## 30        0.0166 bad         good  FrBo       156
## 31        0.0160 bad         good  FrBo       red_Jaké jsou povinnosti veřejnýc~
## # i 6 more rows
```

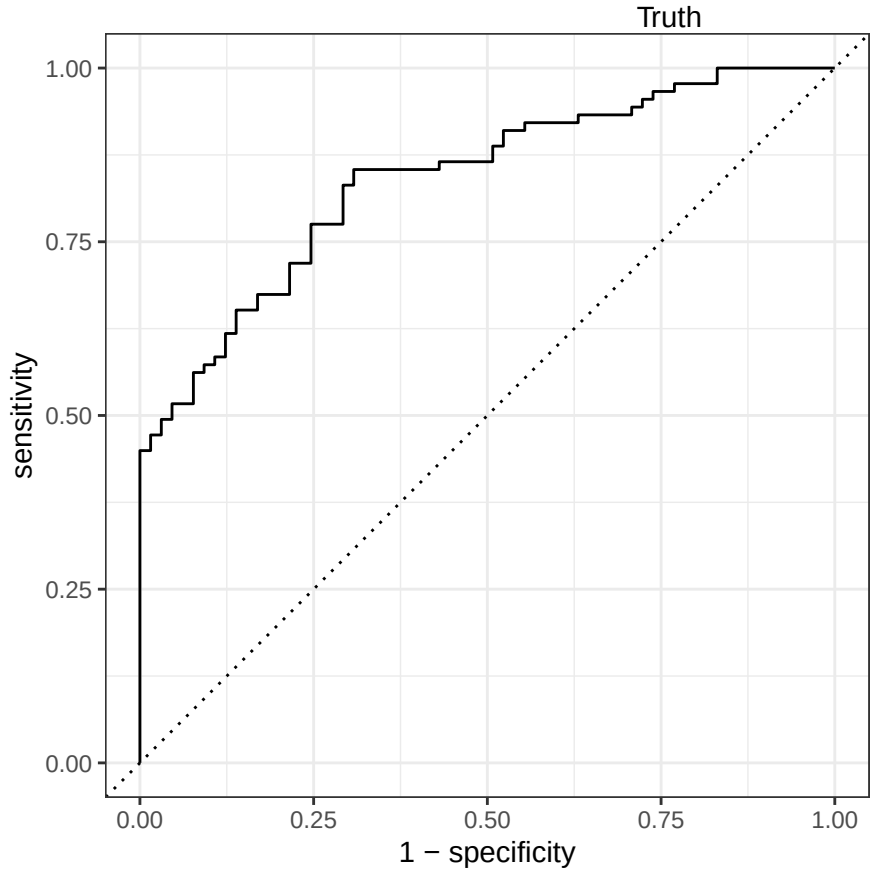
```
# lfit_lasso_notl %>%
#   lasso_get_coefficients() %>%
#   print(n = 100)
```

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         0.734 Preprocessor1_Model1
## 2 roc_auc     binary         0.840 Preprocessor1_Model1
## 3 brier_class binary         0.164 Preprocessor1_Model1
```

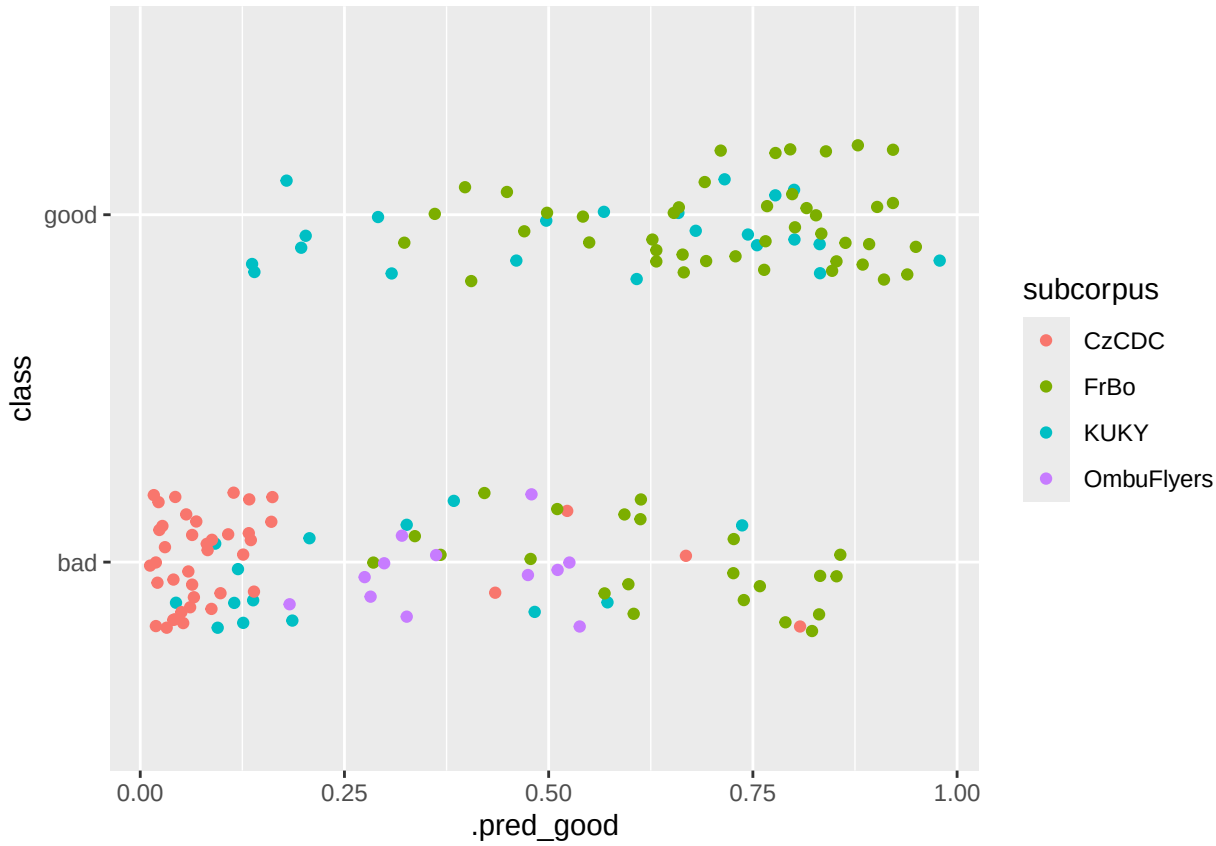





```
## Variable importance:
## # A tibble: 44 x 3
```

```
##    Variable                                              Importance Sign
##    <chr>                                                      <dbl> <chr>
##  1 RuleTooFewVerbs.min_verb_frac                              16.1  NEG
##  2 RuleCaseRepetition.max_repetition_frac                     14.2  NEG
##  3 activity                                                   11.4  POS
##  4 maentropy.v                                                 9.14 POS
##  5 RuleTooManyNominalConstructions.max_noun_frac               6.66 NEG
##  6 mattr                                                       6.42 NEG
##  7 RuleCaseRepetition.max_repetition_frac.v                    4.98 POS
##  8 RuleTooManyNominalConstructions.max_noun_frac.v             2.11 POS
##  9 atl                                                         1.90 POS
## 10 RuleCaseRepetition.max_repetition_count.v                   1.90 NEG
## 11 RuleLongSentences.max_length.v                              1.10 POS
## 12 ttr                                                         1.09 NEG
## 13 RuleTooManyNominalConstructions.max_allowable_nouns.v       0.991 NEG
## 14 RuleTooManyNegations.max_allowable_negations.v              0.867 NEG
## 15 RuleInfVerbDistance.max_distance.v                          0.778 NEG
## 16 entropy                                                     0.576 NEG
## 17 RuleTooManyNegations.max_negation_frac                      0.479 POS
## 18 ari                                                         0.167 NEG
## 19 RuleMultiPartVerbs.max_distance.v                           0.155 POS
## 20 gf                                                          0.140 NEG
## 21 RuleDoubleAdpos.max_allowable_distance.v                    0.138 NEG
## 22 RuleInfVerbDistance.max_distance                            0.100 POS
## 23 RulePredSubjDistance.max_distance.v                         0.0890 NEG
## 24 fre                                                         0.0449 NEG
## 25 RuleLongSentences.max_length                                0.0354 POS
## 26 RuleTooManyNominalConstructions.max_allowable_nouns         0.0332 POS
## 27 verb_dist                                                   0.0325 POS
## 28 smog                                                        0.0307 NEG
## 29 RulePredSubjDistance.max_distance                           0.0230 NEG
## 30 RulePredObjDistance.max_distance                            0.0213 NEG
## 31 RulePredAtClauseBeginning.max_order                         0.00681 POS
## 32 RuleDoubleAdpos.max_allowable_distance                      0.00441 POS
## 33 hpoint                                                      0.00122 NEG
## 34 RuleTooManyNegations.max_negation_frac.v                    0       NEG
## 35 RuleTooManyNegations.max_allowable_negations                0       NEG
## 36 RuleCaseRepetition.max_repetition_count                     0       NEG
## 37 RulePredObjDistance.max_distance.v                          0       NEG
## 38 RuleMultiPartVerbs.max_distance                             0       NEG
## 39 RulePredAtClauseBeginning.max_order.v                       0       NEG
## 40 cli                                                         0       NEG
## 41 mattr.v                                                     0       NEG
## 42 maentropy                                                   0       NEG
## 43 mamr                                                        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   38    0
##        good   3    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    5    7
##        good  17   36
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   12    9
##        good   2   13
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    9    0
```

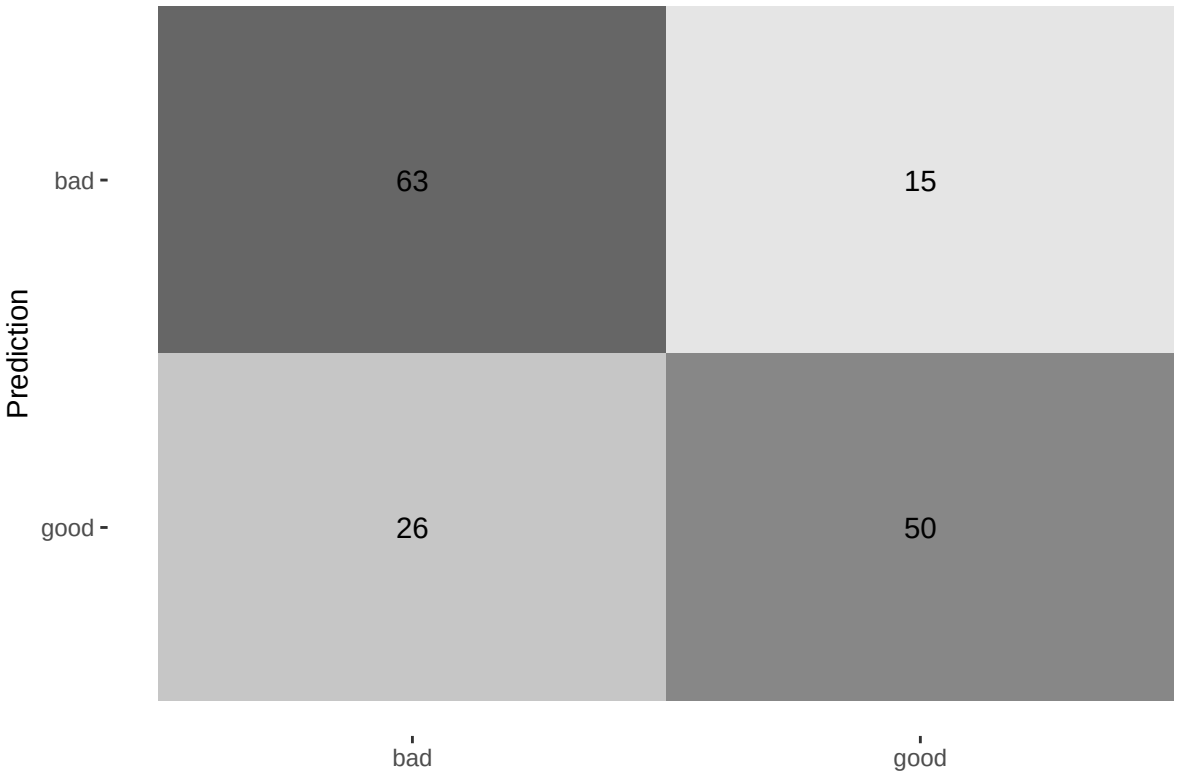
```
##        good   3    0
##
##
## Greatest deviations:
## # A tibble: 41 x 5
##    abs_deviation .pred_class class subcorpus FileName
##            <dbl> <fct>       <fct> <chr>     <chr>
##  1        0.363  bad         good  KUKY      0217_6Afs_2000035_20210219141328__~
##  2        0.360  bad         good  KUKY      Mestsky_urad_Vyzva_k_zaplaceni_nak~
##  3        0.357  good        bad   FrBo      orig_Jaké otázky (ne)můžete položi~
##  4        0.352  good        bad   FrBo      orig_Co je to EIA_final
##  5        0.332  good        bad   FrBo      orig_Zastupitelstvo_o čem a jak ro~
##  6        0.331  good        bad   FrBo      orig_Jak probíhá správní řízení
##  7        0.322  good        bad   FrBo      64
##  8        0.321  bad         good  KUKY      Odvolani_proti_rozhodnuti_o_nepovo~
##  9        0.308  good        bad   CzCDC     2-2825-08_1
## 10        0.303  bad         good  KUKY      Odvolani
## 11        0.297  bad         good  KUKY      MV_Odneti_trvaleho_pobytu_Kru_po
## 12        0.290  good        bad   FrBo      142
## 13        0.259  good        bad   FrBo      149
## 14        0.239  good        bad   FrBo      orig_územní řízení
## 15        0.237  good        bad   KUKY      Dopis_studentské brigády
## 16        0.227  good        bad   FrBo      orig_znalci, znalecké posudky
## 17        0.226  good        bad   FrBo      orig_Jak zajistit, aby skládka dod~
## 18        0.209  bad         good  KUKY      29 A 80-2021_20231122101241
## 19        0.192  bad         good  KUKY      AK_JH_Podani_US_podpis
## 20        0.177  bad         good  FrBo      14
## 21        0.168  good        bad   CzCDC     3-376-98
## 22        0.139  bad         good  FrBo      red_pravni_nastroje_ochrany_ovzdusi
## 23        0.113  good        bad   FrBo      orig_Certifikáty autorizovaných in~
## 24        0.112  good        bad   FrBo      orig_Správní exekuce
## 25        0.104  good        bad   FrBo      orig_Kdy a jak požadovat náhradu š~
## 26        0.102  bad         good  FrBo      red_Jaké právní nástroje můžete vy~
## 27        0.0976 good        bad   FrBo      orig_Jak využít svého práva být in~
## 28        0.0948 bad         good  FrBo      red_Les - co smíme a co je zakázáno
## 29        0.0928 good        bad   FrBo      orig_Co je to a jak probíhá integr~
## 30        0.0720 good        bad   KUKY      Pravni rada_uver SVJ
## 31        0.0684 good        bad   FrBo      68
## # i 10 more rows
```

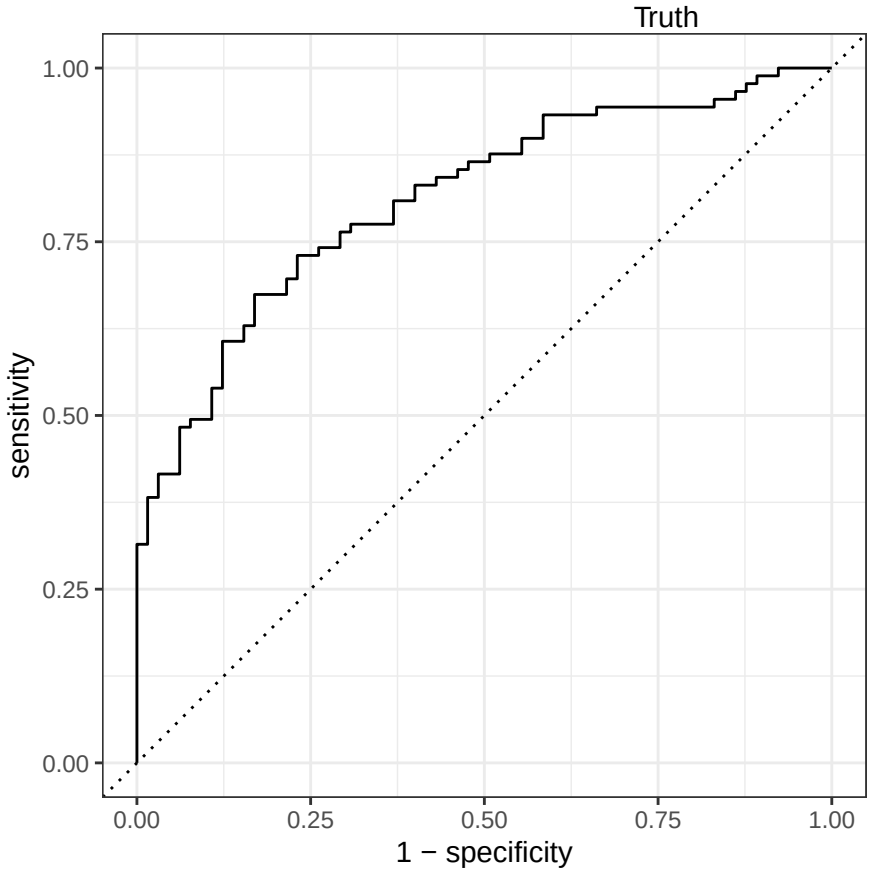
```
# lfit_lasso_iac %>%
#   lasso_get_coefficients() %>%
#   print(n = 100)
```

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         0.734 Preprocessor1_Model1
## 2 roc_auc     binary         0.812 Preprocessor1_Model1
## 3 brier_class binary         0.176 Preprocessor1_Model1
```

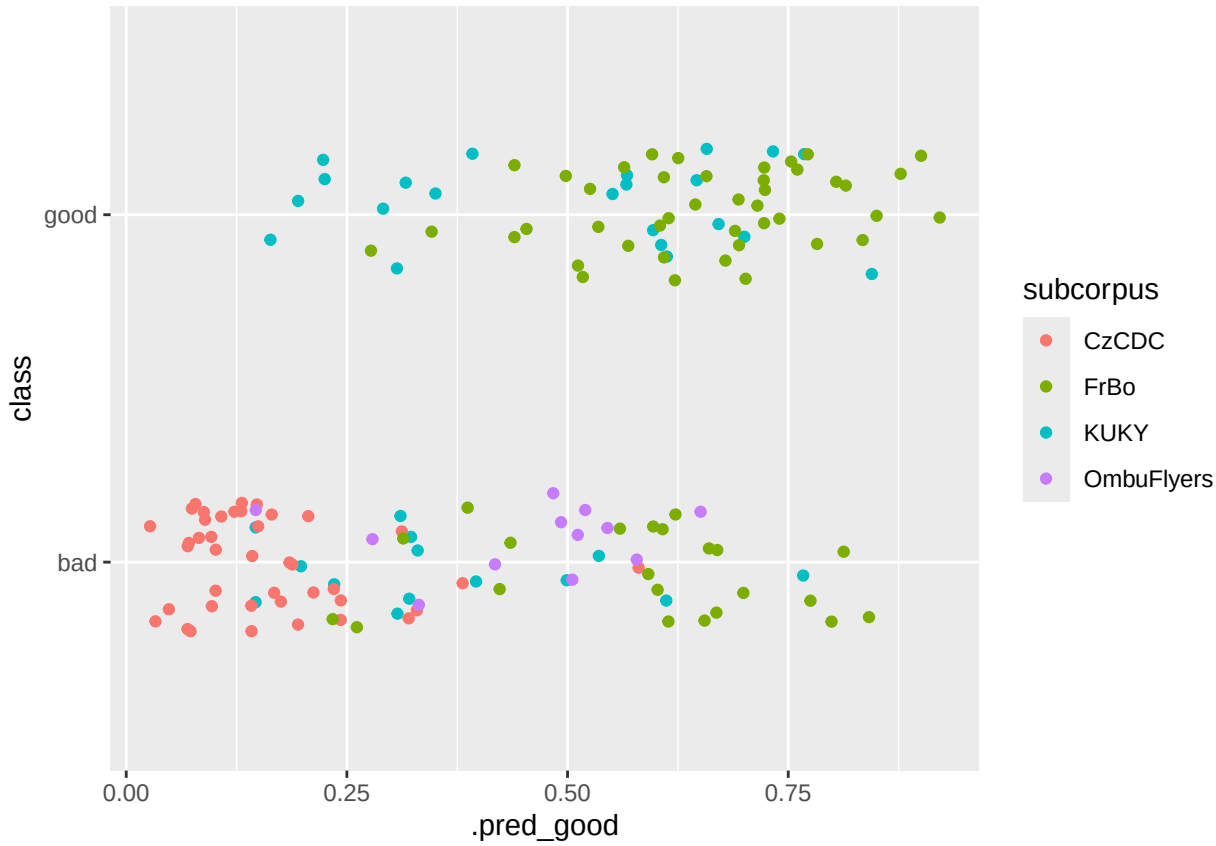





```
## Variable importance:
## # A tibble: 24 x 3
```

```
##    Variable                       Importance Sign
##    <chr>                               <dbl> <chr>
##  1 RuleRedundantExpressions          758.     NEG
##  2 RuleRelativisticExpressions       399.     NEG
##  3 RuleAnaphoricReferences           178.     POS
##  4 RuleGPdeverbsubj                  163.     NEG
##  5 RuleGPadjective                   139.     POS
##  6 RulePassive                       138.     NEG
##  7 RuleLiteraryStyle                 136.     NEG
##  8 RuleGPdeverbaddr                   81.7    NEG
##  9 RuleTooLongExpressions             56.7    POS
## 10 RuleMultiPartVerbs                 39.2    POS
## 11 RulePredSubjDistance               20.9    POS
## 12 RuleVerbalNouns                     7.98   POS
## 13 num_hapax                           1.18   POS
## 14 RuleInfVerbDistance                 0.878  POS
## 15 RulePredObjDistance                 0.0831 NEG
## 16 RuleGPcoordovs                      0      NEG
## 17 RuleGPpatinstr                      0      NEG
## 18 RuleGPpatbenperson                  0      NEG
## 19 RuleGPwordorder                     0      NEG
## 20 RuleDoubleAdpos                     0      NEG
## 21 RuleReflexivePassWithAnimSubj       0      NEG
## 22 RuleWeakMeaningWords                0      NEG
## 23 RuleAbstractNouns                   0      NEG
## 24 RuleConfirmationExpressions         0      NEG
```

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




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   40    0
##        good   1    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    6    6
##        good  16   37
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   11    9
##        good   3   13
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    6    0
```

```
##        good   6    0
##
##
## Greatest deviations:
## # A tibble: 41 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.341  good        bad   FrBo       orig_Co je to EIA_final
##  2        0.337  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  3        0.313  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  4        0.305  bad         good  KUKY       invalidní důchod_1399-23_původní
##  5        0.299  good        bad   FrBo       orig_Co je to a jak probíhá integ~
##  6        0.277  bad         good  KUKY       AK_JH_Podani_US_podpis
##  7        0.275  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  8        0.275  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
##  9        0.267  good        bad   KUKY       Dopis vysvětlující dopis klientovi
## 10        0.223  bad         good  FrBo       190
## 11        0.209  bad         good  KUKY       Odvolani_proti_rozhodnuti_o_nepov~
## 12        0.199  good        bad   FrBo       orig_Sousedské vztahy
## 13        0.193  bad         good  KUKY       důchod-dorovnávací přídavek_1298-~
## 14        0.183  bad         good  KUKY       Odvolani
## 15        0.170  good        bad   FrBo       orig_Jak probíhá správní řízení
## 16        0.169  good        bad   FrBo       149
## 17        0.160  good        bad   FrBo       orig_Změny v zákoně o EIA
## 18        0.155  good        bad   FrBo       orig_znalci, znalecké posudky
## 19        0.154  bad         good  FrBo       red_Co je to úřední deska a jak j~
## 20        0.151  good        bad   OmbuFlyers Ochrana-osob-omezenych-na-svobode
## 21        0.150  bad         good  KUKY       1732_2023_VOP
## 22        0.122  good        bad   FrBo       orig_územní řízení
## 23        0.114  good        bad   FrBo       64
## 24        0.112  good        bad   KUKY       Pravni rada_uver SVJ
## 25        0.108  bad         good  KUKY       29 A 80-2021_20231122101241
## 26        0.108  good        bad   FrBo       orig_Vyvlastnění podle zákona o u~
## 27        0.102  good        bad   FrBo       orig_Jak zajistit, aby skládka do~
## 28        0.0971 good        bad   FrBo       orig_pravni_nastroje_ochrany_ovzd~
## 29        0.0915 good        bad   FrBo       orig_Jaké právní nástroje můžete ~
## 30        0.0806 good        bad   CzCDC      4-34-13_1
## 31        0.0784 good        bad   OmbuFlyers Studny
## # i 10 more rows
```

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

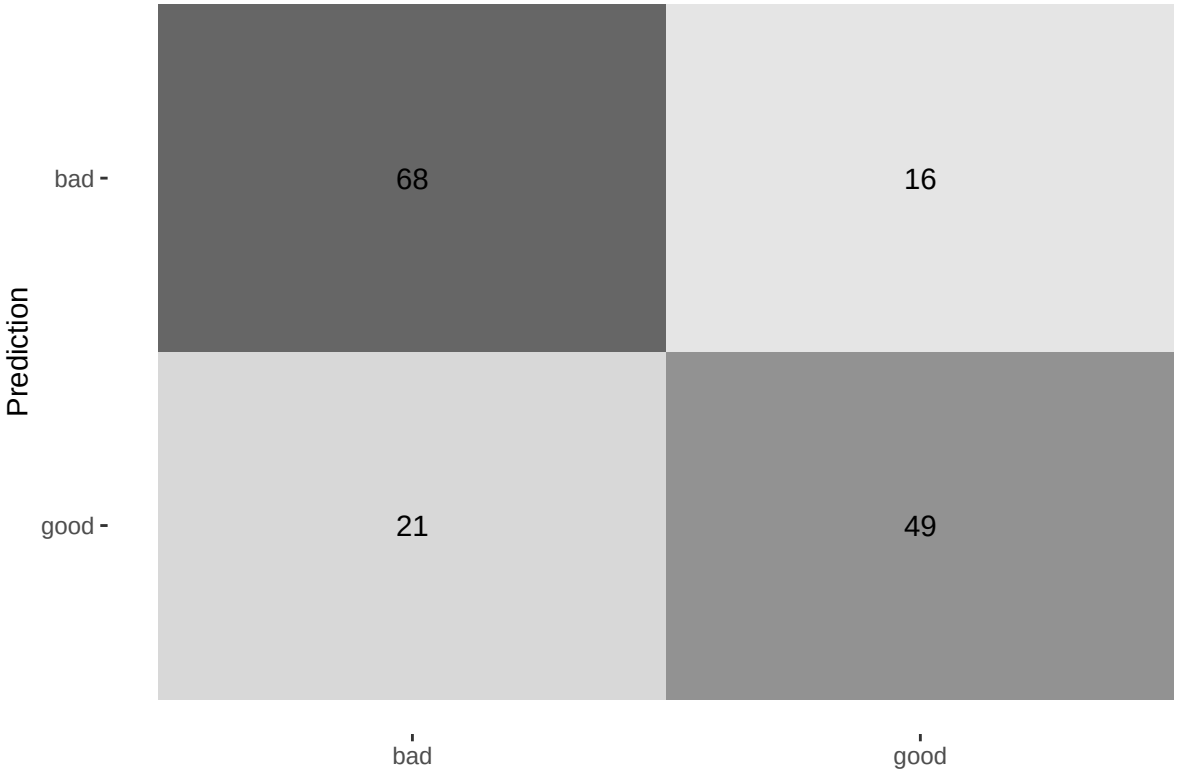
Random forest

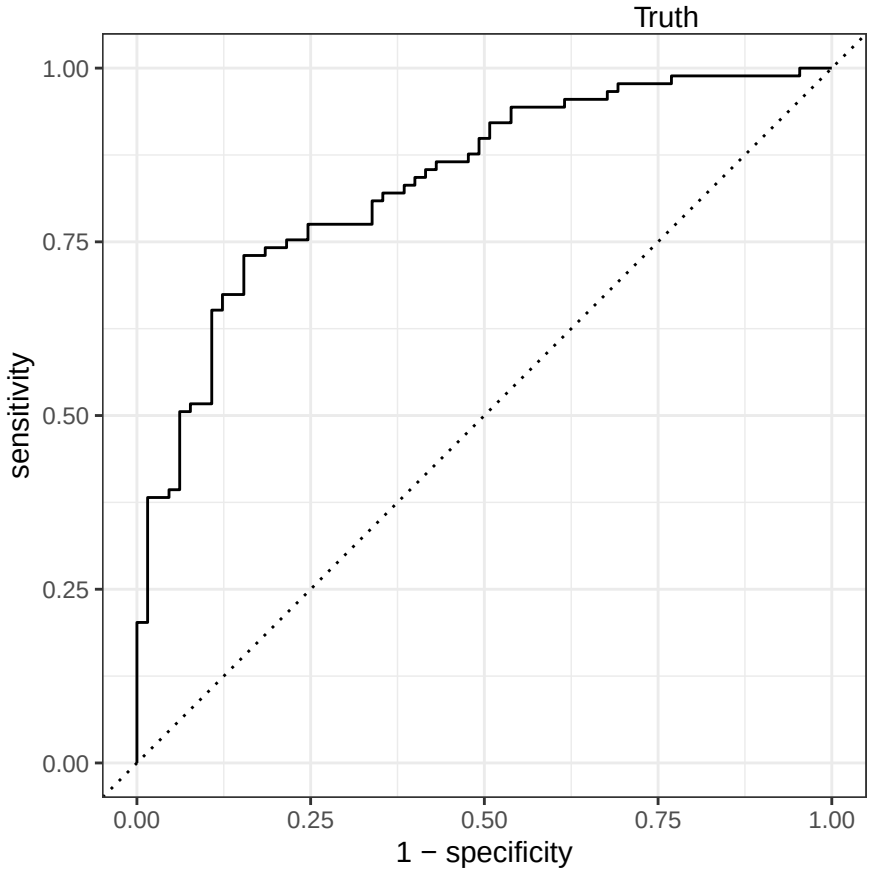
All

```
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         0.760 Preprocessor1_Model1
## 2 roc_auc     binary         0.838 Preprocessor1_Model1
```

```
## 3 brier_class binary         0.165 Preprocessor1_Model1
```

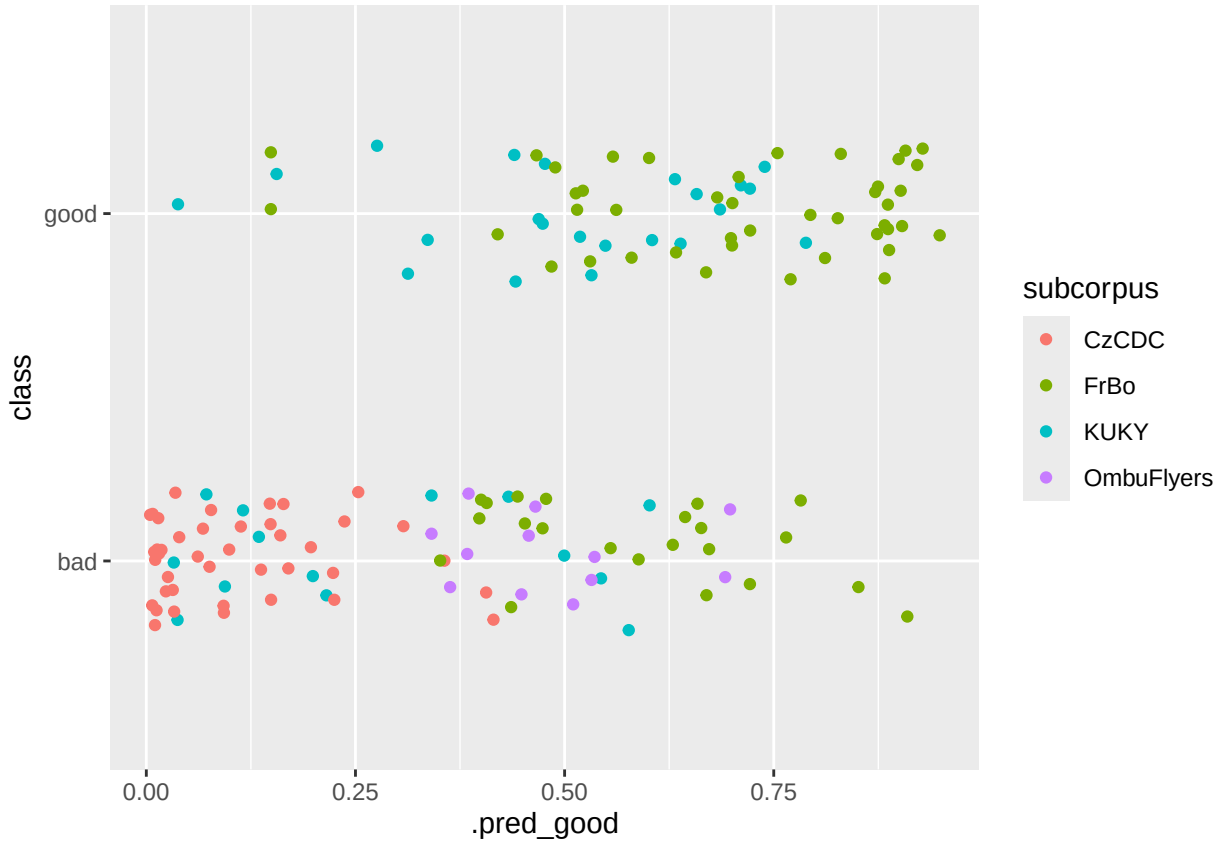




```
## Variable importance:
## # A tibble: 71 x 2
##    Variable                                              Importance
##    <chr>                                                      <dbl>
##  1 verb_dist                                                  13.1
##  2 RuleLongSentences.max_length                               12.6
##  3 RuleTooManyNominalConstructions.max_allowable_nouns        12.4
##  4 activity                                                   12.1
##  5 RuleTooFewVerbs.min_verb_frac                              10.9
##  6 ari                                                        10.6
##  7 gf                                                          9.07
##  8 RuleLiteraryStyle                                           8.58
##  9 smog                                                        8.00
## 10 RulePredAtClauseBeginning.max_order                         7.89
## 11 RulePassive                                                 7.32
## 12 mamr                                                        5.61
## 13 atl                                                         5.32
## 14 fkgl                                                        5.24
## 15 RuleMultiPartVerbs                                          4.49
## 16 RulePredAtClauseBeginning.max_order.v                       4.30
## 17 mattr                                                       4.08
## 18 RuleTooManyNegations.max_negation_frac                      4.04
## 19 maentropy                                                   3.92
## 20 RuleVerbalNouns                                             3.92
## 21 RuleTooLongExpressions                                      3.79
## 22 RuleTooManyNominalConstructions.max_noun_frac               3.75
## 23 entropy                                                     3.72
## 24 maentropy.v                                                 3.59
## 25 RuleAnaphoricReferences                                     3.45
## 26 RulePredSubjDistance                                        3.43
## 27 cli                                                         3.29
## 28 RuleLongSentences.max_length.v                              3.18
## 29 RuleDoubleAdpos.max_allowable_distance.v                    3.17
## 30 mattr.v                                                     3.02
## 31 RulePredSubjDistance.max_distance                           2.97
## 32 RuleCaseRepetition.max_repetition_count.v                   2.93
## 33 word_count                                                  2.83
## 34 RuleCaseRepetition.max_repetition_frac.v                    2.80
## 35 RulePredObjDistance                                         2.74
## 36 RuleInfVerbDistance.max_distance                            2.74
## 37 RuleCaseRepetition.max_repetition_frac                      2.72
## 38 RuleCaseRepetition.max_repetition_count                     2.69
## 39 RuleTooManyNegations.max_negation_frac.v                    2.66
## 40 num_hapax                                                   2.58
## 41 RulePredSubjDistance.max_distance.v                         2.58
## 42 RuleTooManyNegations.max_allowable_negations                2.49
## 43 RuleInfVerbDistance.max_distance.v                          2.48
## 44 ttr                                                         2.45
## 45 RuleMultiPartVerbs.max_distance.v                           2.40
## 46 RulePredObjDistance.max_distance                            2.38
## 47 RulePredObjDistance.max_distance.v                          2.38
## 48 RuleMultiPartVerbs.max_distance                             2.35
## 49 char_count                                                  2.30
## 50 syllab_count                                                2.29
```

```
## 51 RuleDoubleAdpos                                          2.21
## 52 RuleInfVerbDistance                                      2.14
## 53 fre                                                      2.13
## 54 RuleTooManyNegations.max_allowable_negations.v           2.10
## 55 RuleAbstractNouns                                        2.10
## 56 RuleTooManyNominalConstructions.max_noun_frac.v          1.98
## 57 sent_count                                               1.94
## 58 RuleDoubleAdpos.max_allowable_distance                   1.91
## 59 hpoint                                                   1.78
## 60 RuleWeakMeaningWords                                     1.72
## 61 RuleReflexivePassWithAnimSubj                            1.57
## 62 RuleGPwordorder                                          1.47
## 63 RuleGPpatinstr                                           1.17
## 64 RuleGPdeverbaddr                                         1.16
## 65 RuleRelativisticExpressions                              1.04
## 66 RuleGPdeverbsubj                                         0.920
## 67 RuleGPpatbenperson                                       0.877
## 68 RuleGPcoordovs                                           0.790
## 69 RuleRedundantExpressions                                 0.269
## 70 RuleGPadjective                                          0.246
## 71 RuleConfirmationExpressions                              0.229
```

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




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

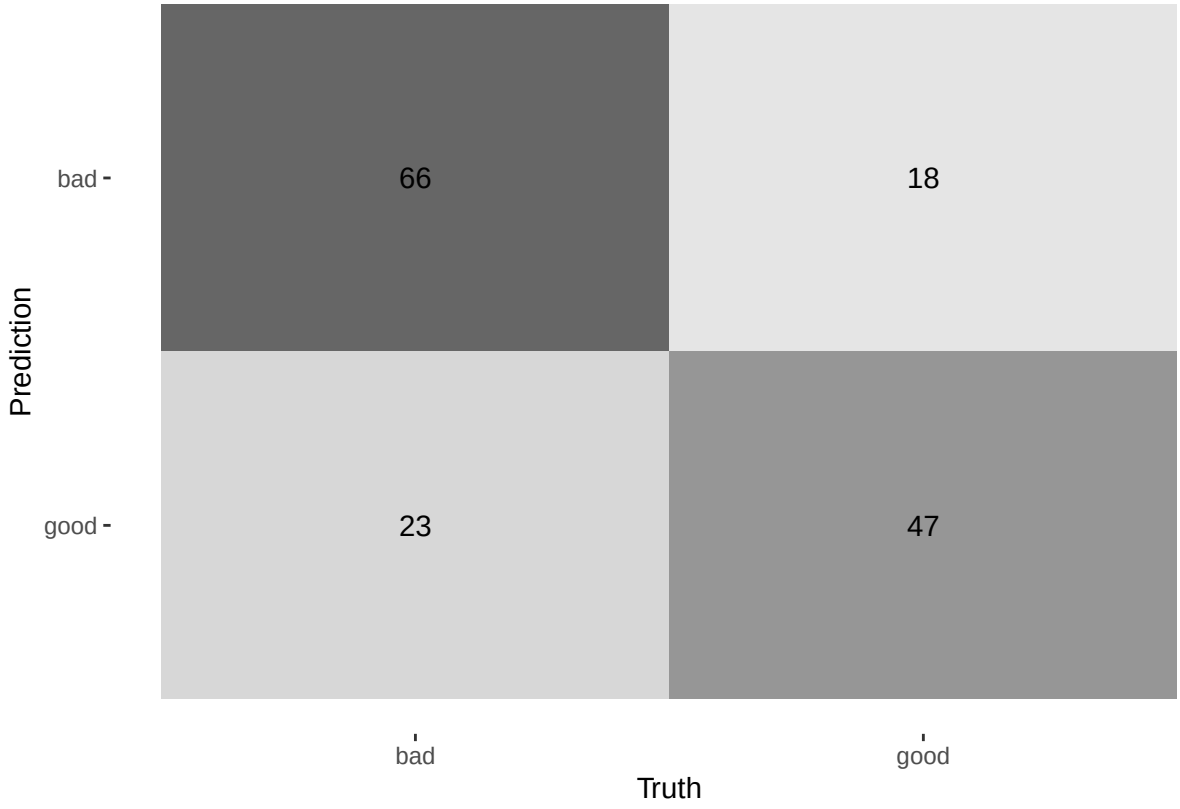
```
## .pred_class bad good
##        bad   41    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    9    6
##        good  13   37
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   11   10
##        good   3   12
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    7    0
##        good   5    0
##
##
## Greatest deviations:
## # A tibble: 37 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.462  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  2        0.410  good        bad   FrBo       orig_Jak zajistit, aby skládka do~
##  3        0.351  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  4        0.351  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  5        0.351  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  6        0.344  bad         good  KUKY       Odvolani
##  7        0.282  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  8        0.265  good        bad   FrBo       orig_Jak probíhá správní řízení
##  9        0.224  bad         good  KUKY       invalidní důchod_1399-23_původní
## 10        0.222  good        bad   FrBo       142
## 11        0.198  good        bad   OmbuFlyers Soudni-poplatky
## 12        0.192  good        bad   OmbuFlyers Studny
## 13        0.187  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
## 14        0.173  good        bad   FrBo       orig_územní řízení
## 15        0.170  good        bad   FrBo       orig_Jak využít svého práva být i~
## 16        0.164  bad         good  KUKY       AK_JH_Podani_US_podpis
## 17        0.163  good        bad   FrBo       64
## 18        0.159  good        bad   FrBo       orig_Kdy a jak požadovat náhradu ~
## 19        0.144  good        bad   FrBo       orig_Co je to a jak probíhá integ~
## 20        0.129  good        bad   FrBo       orig_znalci, znalecké posudky
## 21        0.102  good        bad   KUKY       Duchody
## 22        0.0885 good        bad   FrBo       orig_Sousedské vztahy
## 23        0.0800 bad         good  FrBo       red_pravni_nastroje_ochrany_ovzdu~
## 24        0.0767 good        bad   KUKY       Dopis vysvětlující dopis klientovi
```

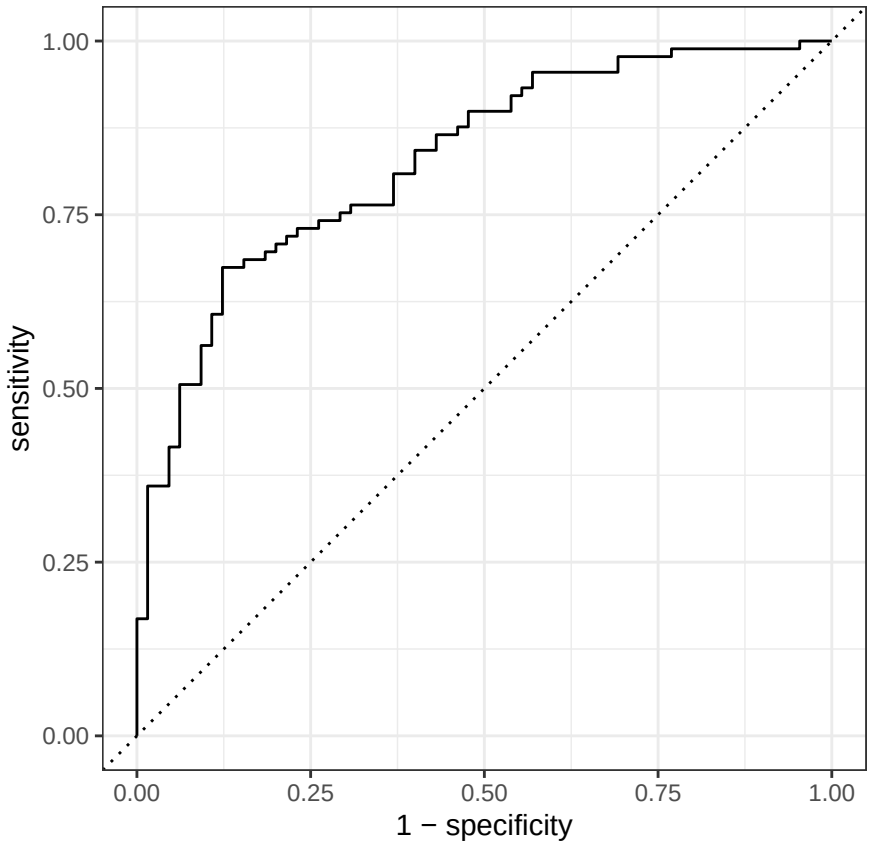
```
## 25        0.0601 bad         good  KUKY       29 A 80-2021_20231122101241
## 26        0.0585 bad         good  KUKY       4842_2023_VOP
## 27        0.0550 good        bad   FrBo       orig_Certifikáty autorizovaných i~
## 28        0.0436 good        bad   KUKY       Pravni rada_uver SVJ
## 29        0.0358 good        bad   OmbuFlyers Detsky-domov
## 30        0.0336 bad         good  FrBo       red_Pozemkové úpravy_final
## 31        0.0322 good        bad   OmbuFlyers Katastr-nemovitosti
## # i 6 more rows
```

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         0.734 Preprocessor1_Model1
## 2 roc_auc     binary         0.828 Preprocessor1_Model1
## 3 brier_class binary         0.167 Preprocessor1_Model1
```

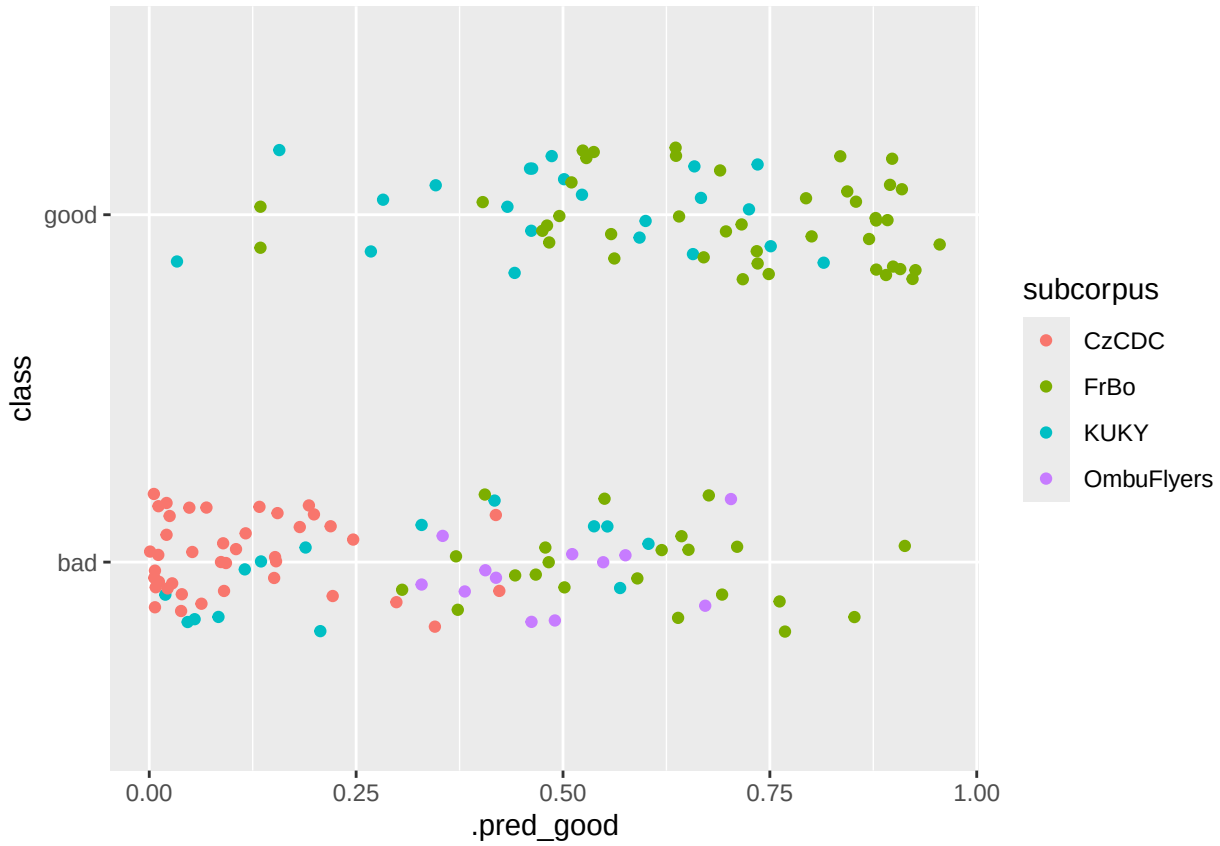





```
## Variable importance:
## # A tibble: 67 x 2
##    Variable                                                Importance
##    <chr>                                                        <dbl>
##  1 verb_dist                                                    13.5
##  2 activity                                                     13.5
##  3 RuleTooManyNominalConstructions.max_allowable_nouns          13.0
##  4 RuleTooFewVerbs.min_verb_frac                                11.1
##  5 RuleLongSentences.max_length                                 11.1
##  6 gf                                                           10.4
##  7 smog                                                         10.4
##  8 ari                                                           8.97
##  9 RuleLiteraryStyle                                             8.86
## 10 RulePredAtClauseBeginning.max_order                           8.25
## 11 RulePassive                                                   6.67
## 12 fkgl                                                          5.51
## 13 mamr                                                          5.36
## 14 RulePredAtClauseBeginning.max_order.v                         5.27
## 15 atl                                                           5.06
## 16 maentropy                                                     4.48
## 17 entropy                                                       4.28
## 18 RuleTooManyNegations.max_negation_frac                        4.26
## 19 RuleMultiPartVerbs                                            4.26
## 20 RuleTooManyNominalConstructions.max_noun_frac                 4.12
## 21 mattr                                                         4.11
## 22 RuleTooLongExpressions                                        4.07
## 23 RuleAnaphoricReferences                                       3.95
```

```
## 24 RuleVerbalNouns                                          3.76
## 25 RulePredSubjDistance                                     3.70
## 26 RulePredSubjDistance.max_distance                        3.32
## 27 maentropy.v                                              3.22
## 28 mattr.v                                                  3.18
## 29 cli                                                      3.13
## 30 RuleLongSentences.max_length.v                           3.12
## 31 ttr                                                      2.99
## 32 RuleCaseRepetition.max_repetition_count.v                2.98
## 33 RuleDoubleAdpos.max_allowable_distance.v                 2.94
## 34 RuleCaseRepetition.max_repetition_frac.v                 2.89
## 35 RulePredObjDistance                                      2.83
## 36 RuleCaseRepetition.max_repetition_frac                   2.82
## 37 RulePredSubjDistance.max_distance.v                      2.80
## 38 RuleTooManyNegations.max_allowable_negations             2.76
## 39 RuleInfVerbDistance.max_distance.v                       2.74
## 40 RuleInfVerbDistance.max_distance                         2.73
## 41 RuleTooManyNegations.max_negation_frac.v                 2.71
## 42 num_hapax                                                2.57
## 43 RuleMultiPartVerbs.max_distance                          2.56
## 44 RuleTooManyNegations.max_allowable_negations.v           2.55
## 45 RuleCaseRepetition.max_repetition_count                  2.54
## 46 fre                                                      2.50
## 47 RulePredObjDistance.max_distance.v                       2.48
## 48 RuleMultiPartVerbs.max_distance.v                        2.46
## 49 RulePredObjDistance.max_distance                         2.36
## 50 RuleDoubleAdpos                                          2.25
## 51 RuleInfVerbDistance                                      2.15
## 52 RuleDoubleAdpos.max_allowable_distance                   2.07
## 53 RuleTooManyNominalConstructions.max_noun_frac.v          2.06
## 54 RuleWeakMeaningWords                                     2.05
## 55 hpoint                                                   1.95
## 56 RuleAbstractNouns                                        1.93
## 57 RuleReflexivePassWithAnimSubj                            1.60
## 58 RuleGPwordorder                                          1.59
## 59 RuleGPpatinstr                                           1.40
## 60 RuleGPdeverbaddr                                         1.17
## 61 RuleRelativisticExpressions                              0.943
## 62 RuleGPdeverbsubj                                         0.862
## 63 RuleGPpatbenperson                                       0.841
## 64 RuleGPcoordovs                                           0.836
## 65 RuleGPadjective                                          0.346
## 66 RuleRedundantExpressions                                 0.318
## 67 RuleConfirmationExpressions                              0.277
```

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



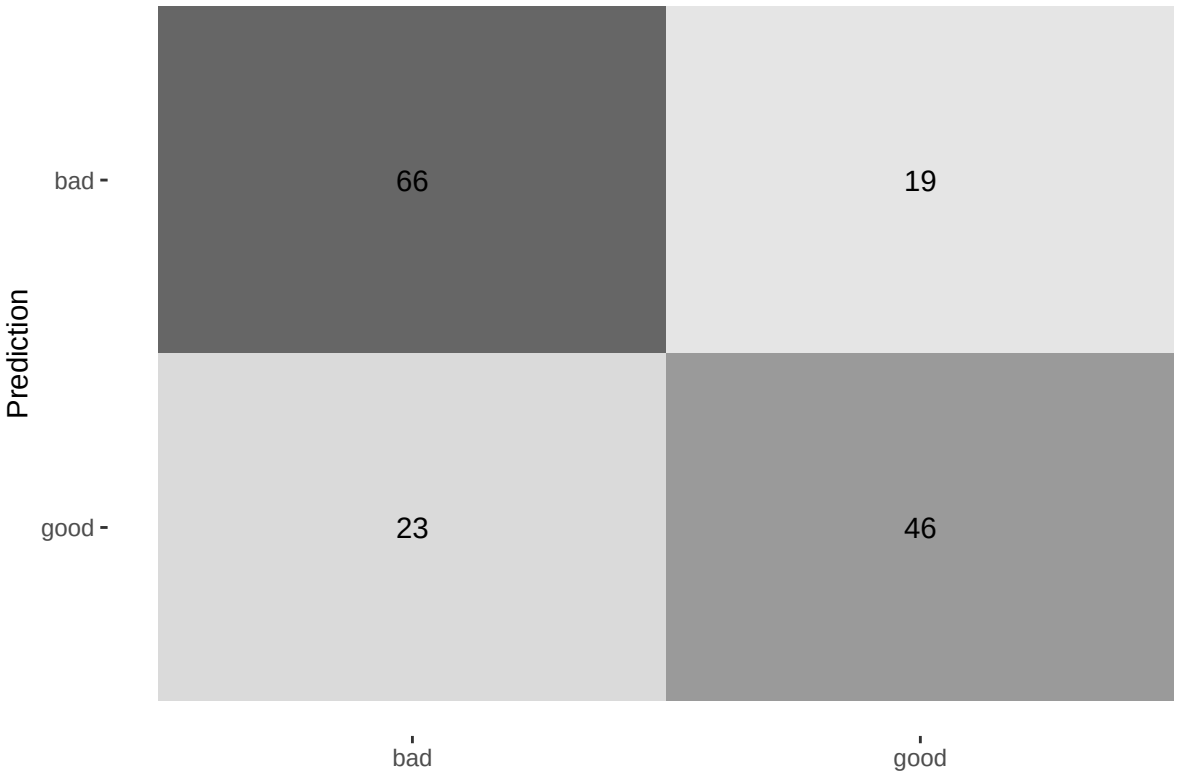

```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    8    7
##        good  14   36
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   10   11
##        good   4   11
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    7    0
```

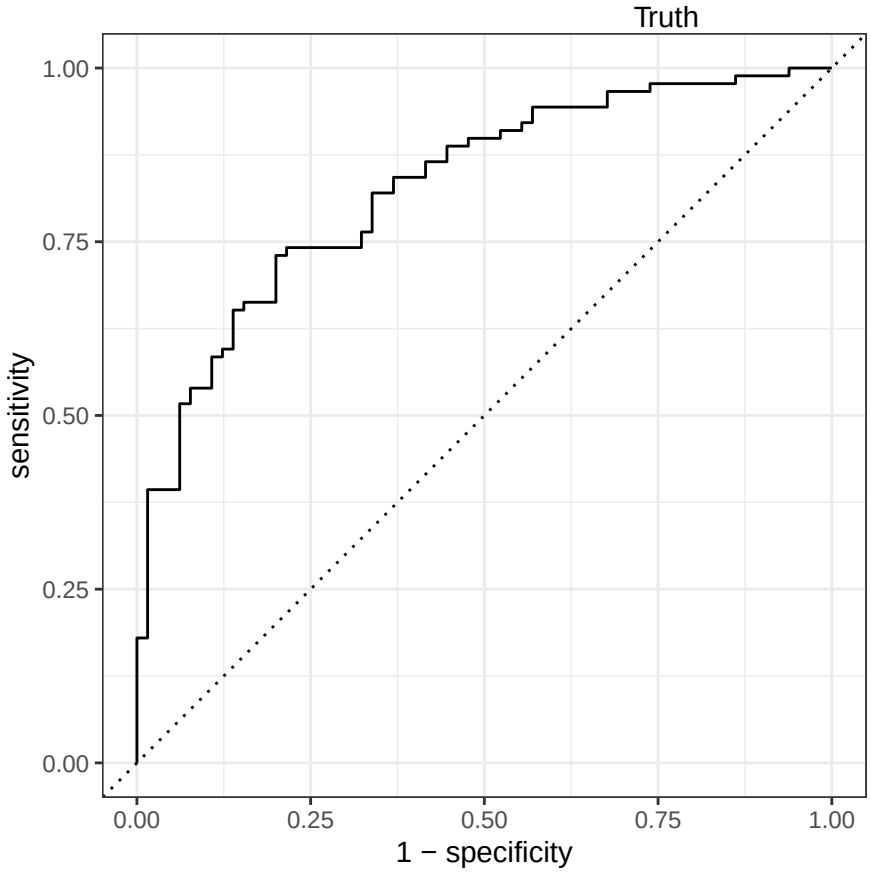
```
##        good   5    0
##
##
## Greatest deviations:
## # A tibble: 41 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.466  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  2        0.413  good        bad   FrBo       orig_Jak zajistit, aby skládka do~
##  3        0.366  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  4        0.366  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  5        0.352  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  6        0.343  bad         good  KUKY       Odvolani
##  7        0.268  good        bad   FrBo       orig_Jak probíhá správní řízení
##  8        0.262  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  9        0.232  bad         good  KUKY       invalidní důchod_1399-23_původní
## 10        0.217  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
## 11        0.210  good        bad   FrBo       orig_územní řízení
## 12        0.203  good        bad   OmbuFlyers Studny
## 13        0.192  good        bad   FrBo       142
## 14        0.176  good        bad   FrBo       orig_Jak využít svého práva být i~
## 15        0.172  good        bad   OmbuFlyers Soudni-poplatky
## 16        0.154  bad         good  KUKY       AK_JH_Podani_US_podpis
## 17        0.152  good        bad   FrBo       64
## 18        0.143  good        bad   FrBo       orig_znalci, znalecké posudky
## 19        0.139  good        bad   FrBo       orig_Kdy a jak požadovat náhradu ~
## 20        0.119  good        bad   FrBo       orig_Co je to a jak probíhá integ~
## 21        0.103  good        bad   KUKY       Duchody
## 22        0.0970 bad         good  FrBo       red_pravni_nastroje_ochrany_ovzdu~
## 23        0.0899 good        bad   FrBo       orig_Sousedské vztahy
## 24        0.0755 good        bad   OmbuFlyers Detsky-domov
## 25        0.0690 good        bad   KUKY       Dopis vysvětlující dopis klientovi
## 26        0.0671 bad         good  KUKY       29 A 80-2021_20231122101241
## 27        0.0584 bad         good  KUKY       4842_2023_VOP
## 28        0.0536 good        bad   KUKY       Pravni rada_uver SVJ
## 29        0.0502 good        bad   FrBo       orig_Certifikáty autorizovaných i~
## 30        0.0486 good        bad   OmbuFlyers Katastr-nemovitosti
## 31        0.0398 bad         good  KUKY       Odvolani_proti_rozhodnuti_o_nepov~
## # i 10 more rows
```

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         0.727 Preprocessor1_Model1
## 2 roc_auc     binary         0.828 Preprocessor1_Model1
## 3 brier_class binary         0.168 Preprocessor1_Model1
```

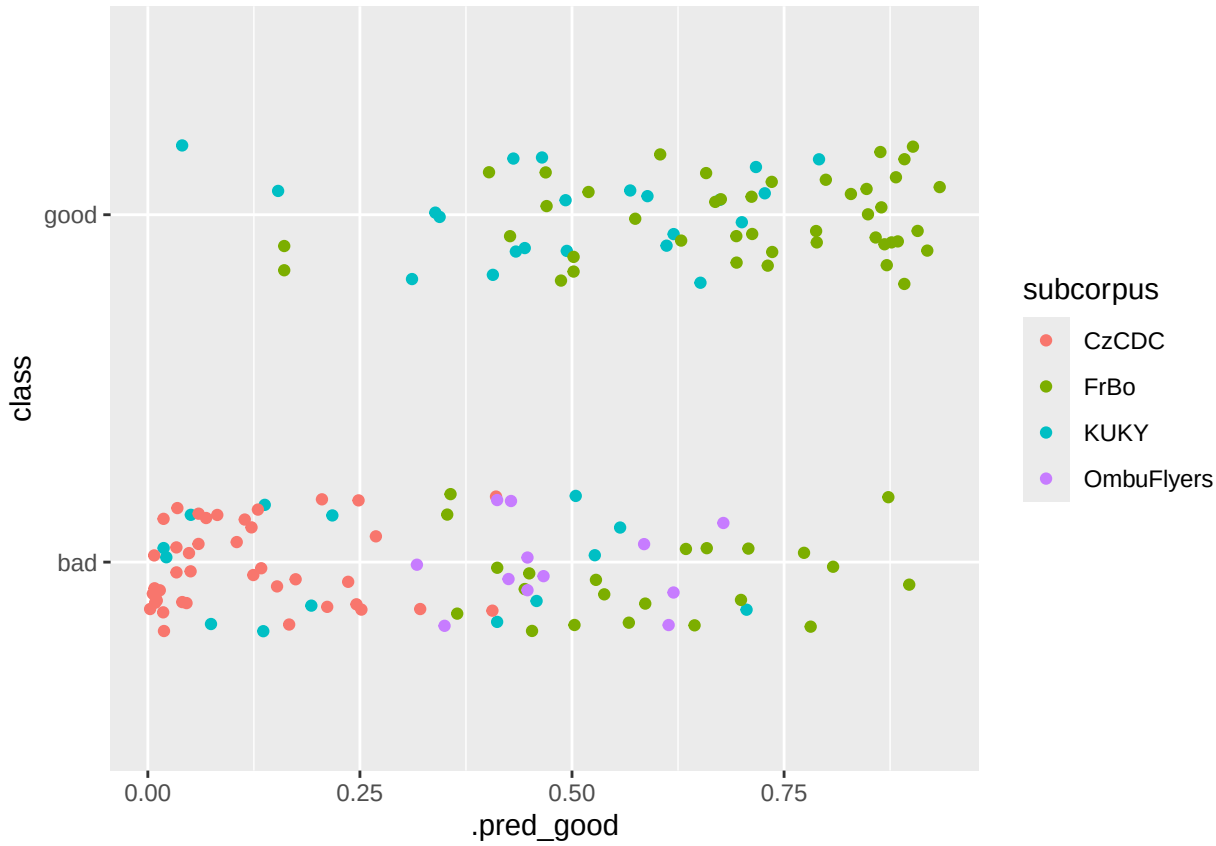





```
## Variable importance:
## # A tibble: 44 x 2
```

```
##    Variable                                                Importance
##    <chr>                                                        <dbl>
##  1 RuleTooManyNominalConstructions.max_allowable_nouns       15.8
##  2 activity                                                  15.3
##  3 verb_dist                                                 13.7
##  4 RuleTooFewVerbs.min_verb_frac                             13.5
##  5 RuleLongSentences.max_length                              12.4
##  6 ari                                                       11.4
##  7 gf                                                        11.4
##  8 smog                                                      10.7
##  9 RulePredAtClauseBeginning.max_order                        9.53
## 10 mamr                                                       6.63
## 11 fkgl                                                       6.48
## 12 atl                                                        6.39
## 13 RuleTooManyNegations.max_negation_frac                     6.02
## 14 maentropy                                                  5.98
## 15 RuleTooManyNominalConstructions.max_noun_frac              5.69
## 16 entropy                                                    5.62
## 17 mattr                                                      5.42
## 18 RulePredAtClauseBeginning.max_order.v                      5.05
## 19 maentropy.v                                                4.95
## 20 cli                                                        4.70
## 21 RuleTooManyNominalConstructions.max_allowable_nouns.v      4.67
## 22 RuleLongSentences.max_length.v                             4.56
## 23 RuleInfVerbDistance.max_distance.v                         4.23
## 24 RulePredSubjDistance.max_distance                          4.22
## 25 mattr.v                                                    4.21
## 26 RuleDoubleAdpos.max_allowable_distance.v                   4.20
## 27 ttr                                                        4.04
## 28 RuleInfVerbDistance.max_distance                           3.94
## 29 RuleTooManyNegations.max_negation_frac.v                   3.93
## 30 RuleCaseRepetition.max_repetition_count.v                  3.90
## 31 RuleCaseRepetition.max_repetition_frac                     3.90
## 32 RulePredSubjDistance.max_distance.v                        3.82
## 33 RuleTooManyNegations.max_allowable_negations               3.70
## 34 RuleCaseRepetition.max_repetition_frac.v                   3.66
## 35 RulePredObjDistance.max_distance.v                         3.63
## 36 RulePredObjDistance.max_distance                           3.46
## 37 RuleTooManyNegations.max_allowable_negations.v             3.44
## 38 RuleMultiPartVerbs.max_distance                            3.41
## 39 RuleCaseRepetition.max_repetition_count                    3.31
## 40 hpoint                                                     3.22
## 41 RuleMultiPartVerbs.max_distance.v                          3.17
## 42 fre                                                        3.11
## 43 RuleTooManyNominalConstructions.max_noun_frac.v            3.08
## 44 RuleDoubleAdpos.max_allowable_distance                     3.08
```

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



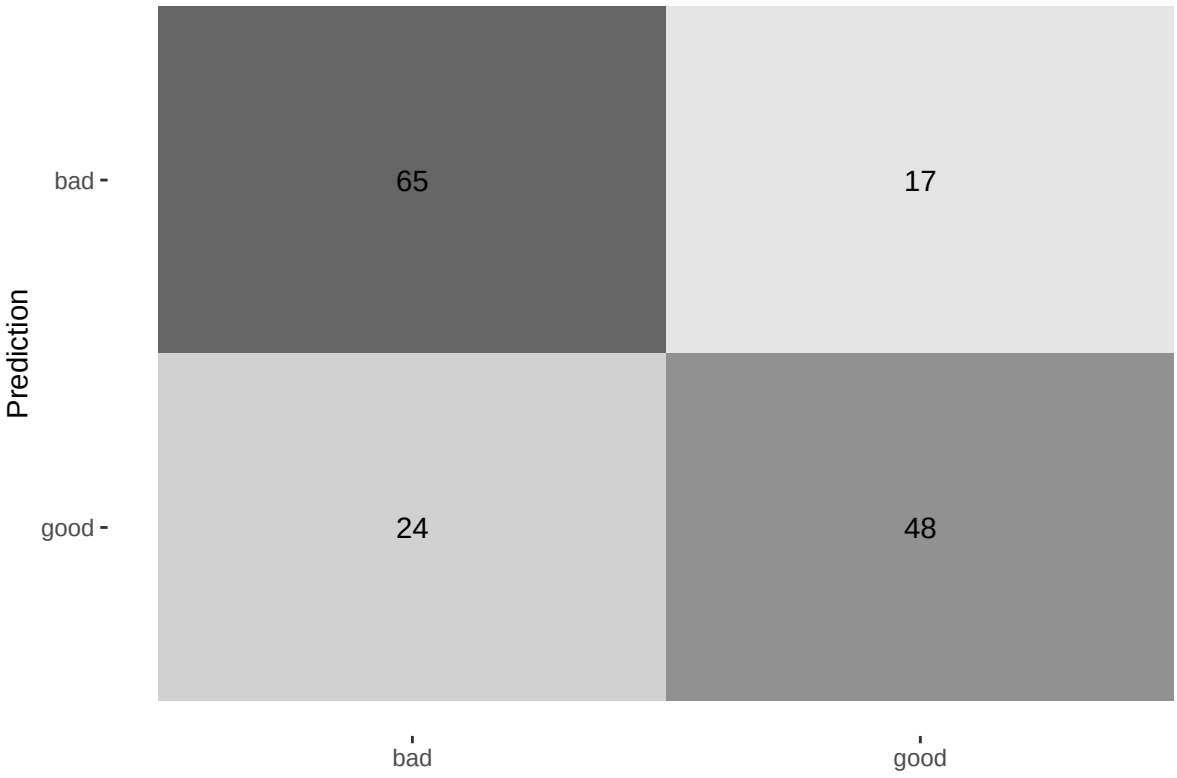

```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    7    7
##        good  15   36
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   10   12
##        good   4   10
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    8    0
```

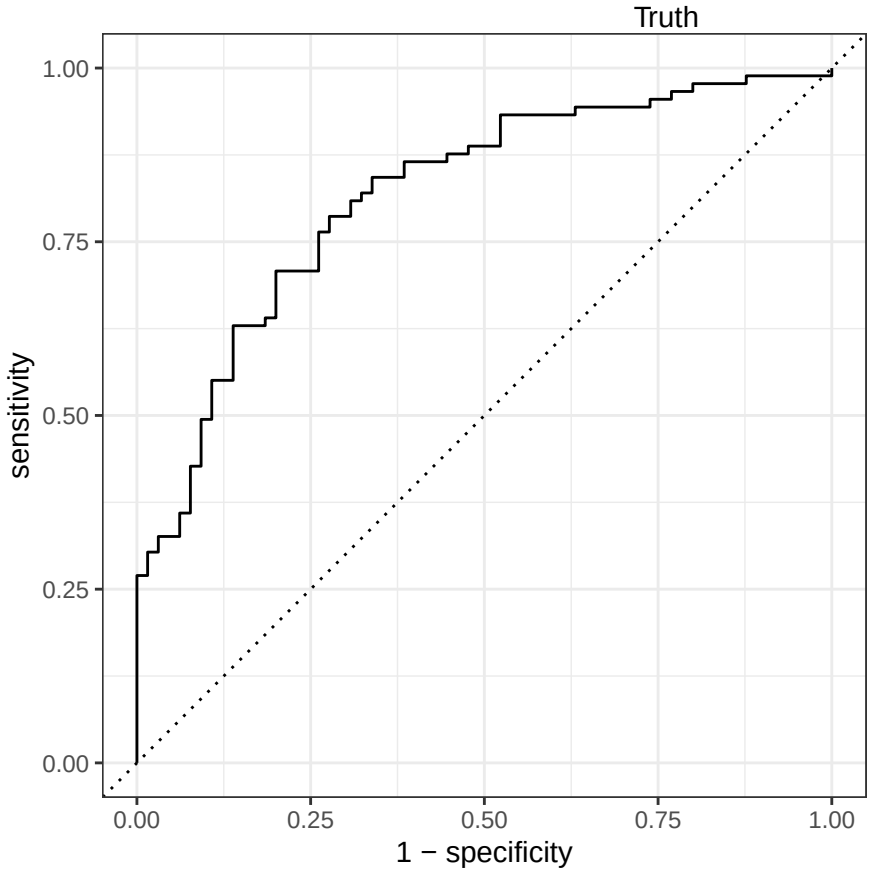
```
##        good   4    0
##
##
## Greatest deviations:
## # A tibble: 42 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.460  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  2        0.398  good        bad   FrBo       orig_Jak zajistit, aby skládka do~
##  3        0.373  good        bad   FrBo       orig_Jak probíhá správní řízení
##  4        0.346  bad         good  KUKY       Odvolani
##  5        0.339  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  6        0.339  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  7        0.308  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  8        0.281  good        bad   FrBo       orig_územní řízení
##  9        0.274  good        bad   FrBo       orig_Kdy a jak požadovat náhradu ~
## 10        0.208  good        bad   FrBo       142
## 11        0.206  good        bad   KUKY       Duchody
## 12        0.199  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
## 13        0.189  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
## 14        0.178  good        bad   OmbuFlyers Studny
## 15        0.161  bad         good  KUKY       invalidní důchod_1399-23_původní
## 16        0.159  good        bad   FrBo       orig_znalci, znalecké posudky
## 17        0.156  bad         good  KUKY       AK_JH_Podani_US_podpis
## 18        0.145  good        bad   FrBo       orig_Jak využít svého práva být i~
## 19        0.134  good        bad   FrBo       64
## 20        0.120  good        bad   OmbuFlyers Soudni-poplatky
## 21        0.114  good        bad   OmbuFlyers Detsky-domov
## 22        0.0978 bad         good  FrBo       red_pravni_nastroje_ochrany_ovzdu~
## 23        0.0933 bad         good  KUKY       Odvolani_proti_rozhodnuti_o_nepov~
## 24        0.0864 good        bad   FrBo       orig_Certifikáty autorizovaných i~
## 25        0.0850 good        bad   OmbuFlyers Katastr-nemovitosti
## 26        0.0730 bad         good  FrBo       red_Les - co smíme a co je zakázá~
## 27        0.0691 bad         good  KUKY       Mestsky_urad_Vyzva_k_zaplaceni_na~
## 28        0.0670 good        bad   FrBo       68
## 29        0.0661 bad         good  KUKY       4842_2023_VOP
## 30        0.0567 good        bad   KUKY       Pravni rada_uver SVJ
## 31        0.0557 bad         good  KUKY       29 A 80-2021_20231122101241
## # i 11 more rows
```

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         0.734 Preprocessor1_Model1
## 2 roc_auc     binary         0.817 Preprocessor1_Model1
## 3 brier_class binary         0.176 Preprocessor1_Model1
```

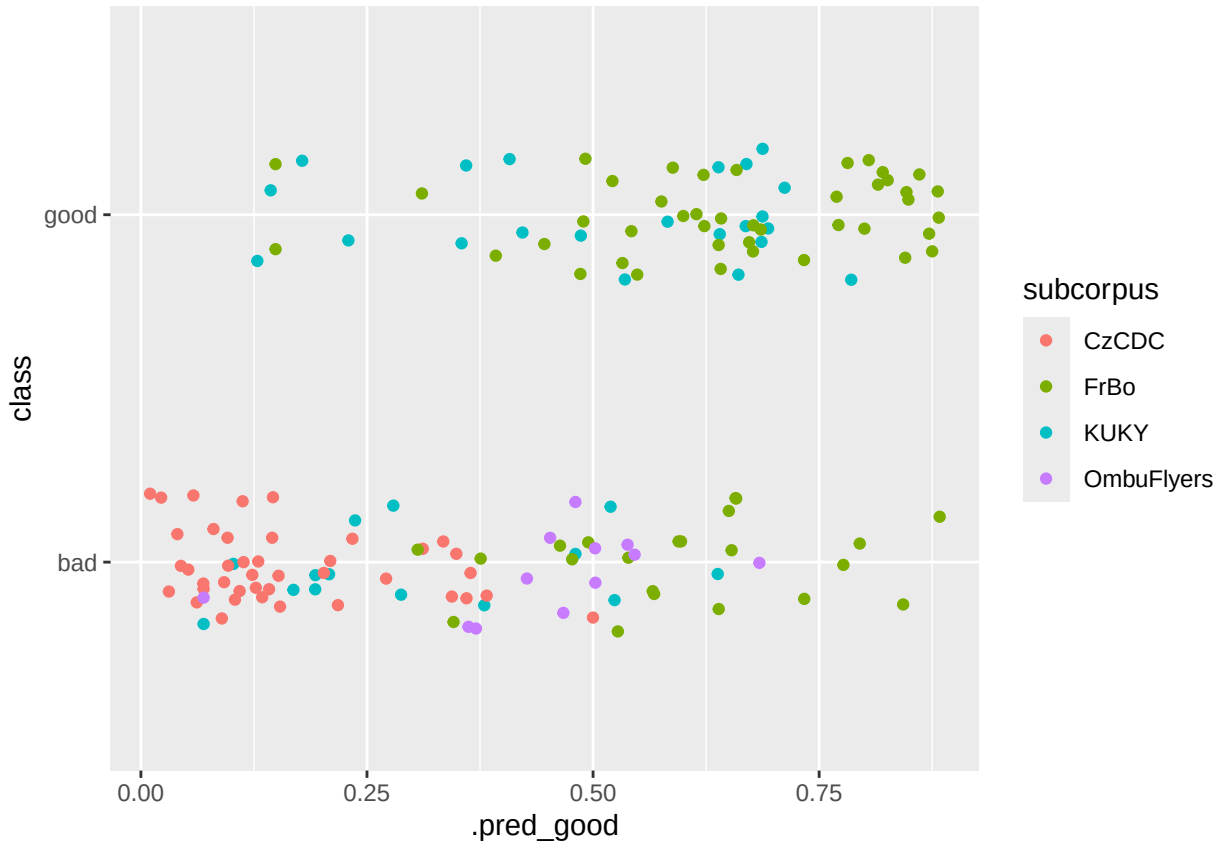





```
## Variable importance:
## # A tibble: 24 x 2
```

```
##    Variable                       Importance
##    <chr>                               <dbl>
##  1 RuleMultiPartVerbs                  32.8
##  2 RuleLiteraryStyle                   30.9
##  3 RulePassive                         30.9
##  4 RulePredSubjDistance                22.0
##  5 RuleInfVerbDistance                 17.0
##  6 RuleVerbalNouns                     13.4
##  7 num_hapax                           12.3
##  8 RulePredObjDistance                 10.5
##  9 RuleTooLongExpressions              10.0
## 10 RuleDoubleAdpos                      9.32
## 11 RuleAbstractNouns                    8.96
## 12 RuleAnaphoricReferences              8.78
## 13 RuleGPwordorder                      8.44
## 14 RuleWeakMeaningWords                 7.41
## 15 RuleReflexivePassWithAnimSubj        6.32
## 16 RuleGPdeverbsubj                     4.64
## 17 RuleGPpatinstr                       4.38
## 18 RuleGPdeverbaddr                     3.87
## 19 RuleGPpatbenperson                   2.99
## 20 RuleGPcoordovs                       2.58
## 21 RuleRelativisticExpressions          2.50
## 22 RuleConfirmationExpressions          1.90
## 23 RuleGPadjective                      0.928
## 24 RuleRedundantExpressions             0.756
```

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




```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    6    8
##        good  16   35
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   11    9
##        good   3   13
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    7    0
```

```
##        good   5    0
##
##
## Greatest deviations:
## # A tibble: 41 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.383  good        bad   FrBo       orig_Co je to a jak probíhá integ~
##  2        0.371  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  3        0.356  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
##  4        0.351  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  5        0.351  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  6        0.343  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  7        0.322  bad         good  KUKY       invalidní důchod_1399-23_původní
##  8        0.295  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  9        0.277  good        bad   FrBo       orig_Jak zajistit, aby skládka do~
## 10        0.271  bad         good  KUKY       AK_JH_Podani_US_podpis
## 11        0.234  good        bad   FrBo       64
## 12        0.189  bad         good  FrBo       red_Co je to úřední deska a jak j~
## 13        0.184  good        bad   OmbuFlyers Socialni-sluzby
## 14        0.158  good        bad   FrBo       orig_Sousedské vztahy
## 15        0.158  good        bad   FrBo       149
## 16        0.153  good        bad   FrBo       orig_Jak probíhá správní řízení
## 17        0.150  good        bad   FrBo       orig_Jaké právní nástroje můžete ~
## 18        0.145  bad         good  KUKY       1732_2023_VOP
## 19        0.140  bad         good  KUKY       29 A 80-2021_20231122101241
## 20        0.139  good        bad   FrBo       orig_Co je to EIA_final
## 21        0.138  good        bad   KUKY       Dopis vysvětlující dopis klientovi
## 22        0.108  bad         good  FrBo       orig_Nástroje občana při kontrole~
## 23        0.0973 good        bad   FrBo       orig_znalci, znalecké posudky
## 24        0.0946 good        bad   FrBo       orig_Změny v zákoně o EIA
## 25        0.0923 bad         good  KUKY       Odvolani
## 26        0.0780 bad         good  KUKY       4842_2023_VOP
## 27        0.0675 good        bad   FrBo       142
## 28        0.0660 good        bad   FrBo       orig_územní řízení
## 29        0.0538 bad         good  FrBo       190
## 30        0.0460 good        bad   OmbuFlyers Zvlastni-opravneni
## 31        0.0391 good        bad   FrBo       orig_Jak využít svého práva být i~
## # i 10 more rows
```

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
## smog                                                        2
```

```
## RuleLiteraryStyle                                                3
## atl                                                              4
## mamr                                                             5
## gf                                                               6
## entropy                                                          7
## maentropy                                                        8
## ari                                                              9
## 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
## RuleAnaphoricReferences                                         NA
## RulePassive                                                     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
## num_hapax                                                          NA
## ttr                                                                NA
## mattr                                                              NA
## mattr.v                                                            NA
## maentropy.v                                                        NA
## verb_dist                                                          NA
## hpoint                                                             NA
## fre                                                                NA
## fkgl                                                               NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v              NA
##                                                        rank.lasso.notl
## activity                                                             1
## smog                                                                 2
## RuleLiteraryStyle                                                    3
## atl                                                                  4
## mamr                                                                 5
## gf                                                                   6
## entropy                                                              7
## maentropy                                                            8
## ari                                                                  9
## 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
## RuleAnaphoricReferences                                         NA
## RulePassive                                                     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
## num_hapax                                                       NA
## ttr                                                             NA
## mattr                                                           NA
## mattr.v                                                         NA
## maentropy.v                                                     NA
## verb_dist                                                       NA
## hpoint                                                          NA
## fre                                                             NA
## fkgl                                                            NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v           NA
##                                                    rank.lasso.iac
## activity                                                        3
## smog                                                           28
## RuleLiteraryStyle                                              NA
## atl                                                             9
## mamr                                                           NA
## gf                                                             20
## entropy                                                        16
## maentropy                                                      NA
## ari                                                            18
## RuleGPcoordovs                                                 NA
## RuleGPdeverbaddr                                               NA
## RuleGPpatinstr                                                 NA
## RuleGPdeverbsubj                                               NA
## RuleGPadjective                                                NA
## RuleGPpatbenperson                                             NA
## RuleGPwordorder                                                NA
## RuleDoubleAdpos                                                NA
## RuleDoubleAdpos.max_allowable_distance                         32
```

```
## RuleDoubleAdpos.max_allowable_distance.v                    21
## RuleReflexivePassWithAnimSubj                               NA
## RuleTooFewVerbs.min_verb_frac                                1
## RuleTooManyNegations.max_negation_frac                      17
## RuleTooManyNegations.max_negation_frac.v                    NA
## RuleTooManyNegations.max_allowable_negations                NA
## RuleTooManyNegations.max_allowable_negations.v              14
## RuleTooManyNominalConstructions.max_noun_frac                5
## RuleTooManyNominalConstructions.max_noun_frac.v              8
## RuleTooManyNominalConstructions.max_allowable_nouns         26
## RuleCaseRepetition.max_repetition_count                     NA
## RuleCaseRepetition.max_repetition_count.v                   10
## RuleCaseRepetition.max_repetition_frac                       2
## RuleCaseRepetition.max_repetition_frac.v                     7
## RuleWeakMeaningWords                                        NA
## RuleAbstractNouns                                           NA
## RuleRelativisticExpressions                                 NA
## RuleConfirmationExpressions                                 NA
## RuleRedundantExpressions                                    NA
## RuleTooLongExpressions                                      NA
## RuleAnaphoricReferences                                     NA
## RulePassive                                                 NA
## RulePredSubjDistance                                        NA
## RulePredSubjDistance.max_distance                           29
## RulePredSubjDistance.max_distance.v                         23
## RulePredObjDistance                                         NA
## RulePredObjDistance.max_distance                            30
## RulePredObjDistance.max_distance.v                          NA
## RuleInfVerbDistance                                         NA
## RuleInfVerbDistance.max_distance                            22
## RuleInfVerbDistance.max_distance.v                          15
## RuleMultiPartVerbs                                          NA
## RuleMultiPartVerbs.max_distance                             NA
## RuleMultiPartVerbs.max_distance.v                           19
## RuleLongSentences.max_length                                25
## RuleLongSentences.max_length.v                              11
## RulePredAtClauseBeginning.max_order                         31
## RulePredAtClauseBeginning.max_order.v                       NA
## RuleVerbalNouns                                             NA
## sent_count                                                  NA
## word_count                                                  NA
## syllab_count                                                NA
## char_count                                                  NA
## cli                                                         NA
## num_hapax                                                   NA
## ttr                                                         12
## mattr                                                        6
## mattr.v                                                     NA
## maentropy.v                                                  4
## verb_dist                                                   27
## hpoint                                                      33
## fre                                                         24
## fkgl                                                        NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v       13
```

```
##                                                       rank.lasso.counts
## activity                                                             NA
## smog                                                                 NA
## RuleLiteraryStyle                                                     7
## atl                                                                  NA
## mamr                                                                 NA
## gf                                                                   NA
## entropy                                                              NA
## maentropy                                                            NA
## ari                                                                  NA
## RuleGPcoordovs                                                       NA
## RuleGPdeverbaddr                                                      8
## RuleGPpatinstr                                                       NA
## RuleGPdeverbsubj                                                      4
## RuleGPadjective                                                       5
## 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                                           2
## RuleConfirmationExpressions                                          NA
## RuleRedundantExpressions                                              1
## RuleTooLongExpressions                                                9
## RuleAnaphoricReferences                                               3
## RulePassive                                                           6
## RulePredSubjDistance                                                 11
## RulePredSubjDistance.max_distance                                    NA
## RulePredSubjDistance.max_distance.v                                  NA
## RulePredObjDistance                                                  15
## RulePredObjDistance.max_distance                                     NA
## RulePredObjDistance.max_distance.v                                   NA
## RuleInfVerbDistance                                                  14
## RuleInfVerbDistance.max_distance                                     NA
## RuleInfVerbDistance.max_distance.v                                   NA
## RuleMultiPartVerbs                                                   10
## 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                                                 12
## sent_count                                                      NA
## word_count                                                      NA
## syllab_count                                                    NA
## char_count                                                      NA
## cli                                                             NA
## num_hapax                                                       13
## ttr                                                             NA
## mattr                                                           NA
## mattr.v                                                         NA
## maentropy.v                                                     NA
## verb_dist                                                       NA
## hpoint                                                          NA
## fre                                                             NA
## fkgl                                                            NA
## RuleTooManyNominalConstructions.max_allowable_nouns.v           NA
##                                                   rank.rf.all rank.rf.notl
## activity                                                    4           2
## smog                                                        9           7
## RuleLiteraryStyle                                           8           9
## atl                                                        13          15
## mamr                                                       12          13
## gf                                                          7           6
## entropy                                                    23          17
## maentropy                                                  19          16
## ari                                                         6           8
## RuleGPcoordovs                                             68          64
## RuleGPdeverbaddr                                           64          60
## RuleGPpatinstr                                             63          59
## RuleGPdeverbsubj                                           66          62
## RuleGPadjective                                            70          65
## RuleGPpatbenperson                                         67          63
## RuleGPwordorder                                            62          58
## RuleDoubleAdpos                                            51          50
## RuleDoubleAdpos.max_allowable_distance                     58          52
## RuleDoubleAdpos.max_allowable_distance.v                   29          33
## RuleReflexivePassWithAnimSubj                              61          57
## RuleTooFewVerbs.min_verb_frac                               5           4
## RuleTooManyNegations.max_negation_frac                     18          18
## RuleTooManyNegations.max_negation_frac.v                   39          41
## RuleTooManyNegations.max_allowable_negations               42          38
## RuleTooManyNegations.max_allowable_negations.v             54          44
## RuleTooManyNominalConstructions.max_noun_frac              22          20
## RuleTooManyNominalConstructions.max_noun_frac.v            56          53
## RuleTooManyNominalConstructions.max_allowable_nouns         3           3
## RuleCaseRepetition.max_repetition_count                    38          45
## RuleCaseRepetition.max_repetition_count.v                  32          32
## RuleCaseRepetition.max_repetition_frac                     37          36
## RuleCaseRepetition.max_repetition_frac.v                   34          34
## RuleWeakMeaningWords                                       60          54
## RuleAbstractNouns                                          55          56
```

```
## RuleRelativisticExpressions                                  65          61
## RuleConfirmationExpressions                                  71          67
## RuleRedundantExpressions                                     69          66
## RuleTooLongExpressions                                       21          22
## RuleAnaphoricReferences                                      25          23
## RulePassive                                                  11          11
## RulePredSubjDistance                                         26          25
## RulePredSubjDistance.max_distance                            31          26
## RulePredSubjDistance.max_distance.v                          41          37
## RulePredObjDistance                                          35          35
## RulePredObjDistance.max_distance                             46          49
## RulePredObjDistance.max_distance.v                           47          47
## RuleInfVerbDistance                                          52          51
## RuleInfVerbDistance.max_distance                             36          40
## RuleInfVerbDistance.max_distance.v                           43          39
## RuleMultiPartVerbs                                           15          19
## RuleMultiPartVerbs.max_distance                              48          43
## RuleMultiPartVerbs.max_distance.v                            45          48
## RuleLongSentences.max_length                                  2           5
## RuleLongSentences.max_length.v                               28          30
## RulePredAtClauseBeginning.max_order                          10          10
## RulePredAtClauseBeginning.max_order.v                        16          14
## RuleVerbalNouns                                              20          24
## sent_count                                                   57          NA
## word_count                                                   33          NA
## syllab_count                                                 50          NA
## char_count                                                   49          NA
## cli                                                          27          29
## num_hapax                                                    40          42
## ttr                                                          44          31
## mattr                                                        17          21
## mattr.v                                                      30          28
## maentropy.v                                                  24          27
## verb_dist                                                     1           1
## hpoint                                                       59          55
## fre                                                          53          46
## fkgl                                                         14          12
## RuleTooManyNominalConstructions.max_allowable_nouns.v        NA          NA
##                                                      rank.rf.iac
## activity                                                      2
## smog                                                          8
## RuleLiteraryStyle                                            NA
## atl                                                          12
## mamr                                                         10
## gf                                                            7
## entropy                                                      16
## maentropy                                                    14
## ari                                                           6
## RuleGPcoordovs                                               NA
## RuleGPdeverbaddr                                             NA
## RuleGPpatinstr                                               NA
## RuleGPdeverbsubj                                             NA
## RuleGPadjective                                              NA
## RuleGPpatbenperson                                           NA
```

```
## RuleGPwordorder                                              NA
## RuleDoubleAdpos                                              NA
## RuleDoubleAdpos.max_allowable_distance                       44
## RuleDoubleAdpos.max_allowable_distance.v                     26
## RuleReflexivePassWithAnimSubj                                NA
## RuleTooFewVerbs.min_verb_frac                                 4
## RuleTooManyNegations.max_negation_frac                       13
## RuleTooManyNegations.max_negation_frac.v                     29
## RuleTooManyNegations.max_allowable_negations                 33
## RuleTooManyNegations.max_allowable_negations.v               37
## RuleTooManyNominalConstructions.max_noun_frac                15
## RuleTooManyNominalConstructions.max_noun_frac.v              43
## RuleTooManyNominalConstructions.max_allowable_nouns           1
## RuleCaseRepetition.max_repetition_count                      39
## RuleCaseRepetition.max_repetition_count.v                    30
## RuleCaseRepetition.max_repetition_frac                       31
## RuleCaseRepetition.max_repetition_frac.v                     34
## RuleWeakMeaningWords                                         NA
## RuleAbstractNouns                                            NA
## RuleRelativisticExpressions                                  NA
## RuleConfirmationExpressions                                  NA
## RuleRedundantExpressions                                     NA
## RuleTooLongExpressions                                       NA
## RuleAnaphoricReferences                                      NA
## RulePassive                                                  NA
## RulePredSubjDistance                                         NA
## RulePredSubjDistance.max_distance                            24
## RulePredSubjDistance.max_distance.v                          32
## RulePredObjDistance                                          NA
## RulePredObjDistance.max_distance                             36
## RulePredObjDistance.max_distance.v                           35
## RuleInfVerbDistance                                          NA
## RuleInfVerbDistance.max_distance                             28
## RuleInfVerbDistance.max_distance.v                           23
## RuleMultiPartVerbs                                           NA
## RuleMultiPartVerbs.max_distance                              38
## RuleMultiPartVerbs.max_distance.v                            41
## RuleLongSentences.max_length                                  5
## RuleLongSentences.max_length.v                               22
## RulePredAtClauseBeginning.max_order                           9
## RulePredAtClauseBeginning.max_order.v                        18
## RuleVerbalNouns                                              NA
## sent_count                                                   NA
## word_count                                                   NA
## syllab_count                                                 NA
## char_count                                                   NA
## cli                                                          20
## num_hapax                                                    NA
## ttr                                                          27
## mattr                                                        17
## mattr.v                                                      25
## maentropy.v                                                  19
## verb_dist                                                     3
## hpoint                                                       40
```

```
## fre                                                          42
## fkgl                                                         11
## RuleTooManyNominalConstructions.max_allowable_nouns.v        21
##                                                    rank.rf.counts
## activity                                                       NA
## smog                                                           NA
## RuleLiteraryStyle                                               2
## atl                                                            NA
## mamr                                                           NA
## gf                                                             NA
## entropy                                                        NA
## maentropy                                                      NA
## ari                                                            NA
## RuleGPcoordovs                                                 20
## RuleGPdeverbaddr                                               18
## RuleGPpatinstr                                                 17
## RuleGPdeverbsubj                                               16
## RuleGPadjective                                                23
## RuleGPpatbenperson                                             19
## RuleGPwordorder                                                13
## RuleDoubleAdpos                                                10
## 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                                           14
## RuleAbstractNouns                                              11
## RuleRelativisticExpressions                                    21
## RuleConfirmationExpressions                                    22
## RuleRedundantExpressions                                       24
## RuleTooLongExpressions                                          9
## RuleAnaphoricReferences                                        12
## RulePassive                                                     3
## RulePredSubjDistance                                            4
## RulePredSubjDistance.max_distance                              NA
## RulePredSubjDistance.max_distance.v                            NA
## RulePredObjDistance                                             8
## RulePredObjDistance.max_distance                               NA
## RulePredObjDistance.max_distance.v                             NA
## RuleInfVerbDistance                                             5
## RuleInfVerbDistance.max_distance                               NA
## RuleInfVerbDistance.max_distance.v                             NA
## RuleMultiPartVerbs                                              1
```

```
## 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
## num_hapax                                                           7
## ttr                                                                NA
## mattr                                                              NA
## mattr.v                                                            NA
## maentropy.v                                                        NA
## verb_dist                                                          NA
## hpoint                                                             NA
## fre                                                                NA
## fkgl                                                               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 smog                                                    0                      0
##  3 RuleLiteraryStyle                                       0                      0
##  4 atl                                                     0                      0
##  5 gf                                                      0                      0
##  6 entropy                                                 0                      0
##  7 ari                                                     0                      0
##  8 RuleTooManyNominalConstructions.max_~                   0                      0
##  9 sent_count                                              1                      0
## 10 word_count                                              1                      0
## 11 syllab_count                                            1                      0
## 12 char_count                                              1                      0
## 13 RuleGPdeverbaddr                                        2                      0
## 14 RuleGPdeverbsubj                                        2                      0
## 15 RuleGPadjective                                         2                      0
## 16 RuleDoubleAdpos.max_allowable_distan~                   2                      0
## 17 RuleDoubleAdpos.max_allowable_distan~                   2                      0
## 18 RuleTooFewVerbs.min_verb_frac                           2                      0
## 19 RuleTooManyNegations.max_negation_fr~                   2                      0
## 20 RuleTooManyNegations.max_allowable_n~                   2                      0
## 21 RuleTooManyNominalConstructions.max_~                   2                      0
## 22 RuleTooManyNominalConstructions.max_~                   2                      0
## 23 RuleTooManyNominalConstructions.max_~                   2                      0
## 24 RuleCaseRepetition.max_repetition_co~                   2                      0
## 25 RuleCaseRepetition.max_repetition_fr~                   2                      0
## 26 RuleCaseRepetition.max_repetition_fr~                   2                      0
## 27 RuleRelativisticExpressions                             2                      0
## 28 RuleRedundantExpressions                                2                      0
## 29 RuleTooLongExpressions                                  2                      0
## 30 RuleAnaphoricReferences                                 2                      0
## 31 RulePassive                                             2                      0
## 32 RulePredSubjDistance                                    2                      0
## 33 RulePredSubjDistance.max_distance                       2                      0
## 34 RulePredSubjDistance.max_distance.v                     2                      0
## 35 RulePredObjDistance                                     2                      0
## 36 RulePredObjDistance.max_distance                        2                      0
## 37 RuleInfVerbDistance                                     2                      0
## 38 RuleInfVerbDistance.max_distance                        2                      0
## 39 RuleInfVerbDistance.max_distance.v                      2                      0
## 40 RuleMultiPartVerbs                                      2                      0
## 41 RuleMultiPartVerbs.max_distance.v                       2                      0
## 42 RuleLongSentences.max_length                            2                      0
## 43 RuleLongSentences.max_length.v                          2                      0
## 44 RulePredAtClauseBeginning.max_order                     2                      0
## 45 RuleVerbalNouns                                         2                      0
## 46 num_hapax                                               2                      0
## 47 ttr                                                     2                      0
## 48 mattr                                                   2                      0
## 49 maentropy.v                                             2                      0
## 50 verb_dist                                               2                      0
## 51 hpoint                                                  2                      0
```

```
## 52 fre                                                2                    0
## 53 mamr                                               0                    1
## 54 maentropy                                          0                    1
## 55 RuleGPcoordovs                                     2                    1
## 56 RuleGPpatinstr                                     2                    1
## 57 RuleGPpatbenperson                                 2                    1
## 58 RuleGPwordorder                                    2                    1
## 59 RuleDoubleAdpos                                    2                    1
## 60 RuleReflexivePassWithAnimSubj                      2                    1
## 61 RuleTooManyNegations.max_negation_fr~              2                    1
## 62 RuleTooManyNegations.max_allowable_n~              2                    1
## 63 RuleCaseRepetition.max_repetition_co~              2                    1
## 64 RuleWeakMeaningWords                               2                    1
## 65 RuleAbstractNouns                                  2                    1
## 66 RuleConfirmationExpressions                        2                    1
## 67 RulePredObjDistance.max_distance.v                 2                    1
## 68 RuleMultiPartVerbs.max_distance                    2                    1
## 69 RulePredAtClauseBeginning.max_order.v              2                    1
## 70 cli                                                2                    1
## 71 mattr.v                                            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                                         2.17        0.0381         0
##  2 RuleLiteraryStyle                                5.33        0.118          0
##  3 gf                                               8.67        0.163          0
##  4 atl                                              9.5         0.167          0
##  5 ari                                              9.33        0.168          0
##  6 smog                                             9.33        0.185          0
##  7 entropy                                         14.3         0.251          0
##  8 RuleTooManyNominalConstructions.max_allowa~     17           0.386          0
##  9 mamr                                             9           0.147          1
## 10 maentropy                                       13           0.211          1
## 11 word_count                                      33           0.465          1
## 12 char_count                                      49           0.690          1
## 13 syllab_count                                    50           0.704          1
## 14 sent_count                                      57           0.803          1
## 15 RuleTooFewVerbs.min_verb_frac                    3.5         0.0609         2
## 16 RulePassive                                      7.75        0.174          2
## 17 RuleTooManyNominalConstructions.max_allowa~      8.25        0.175          2
## 18 verb_dist                                        8           0.178          2
## 19 RuleLongSentences.max_length                     9.25        0.196          2
## 20 RuleMultiPartVerbs                              11.2         0.238          2
## 21 RuleTooManyNominalConstructions.max_noun_f~     15.5         0.266          2
## 22 mattr                                           15.2         0.269          2
## 23 RulePredAtClauseBeginning.max_order             15           0.300          2
## 24 RuleTooManyNegations.max_negation_frac          16.5         0.301          2
## 25 maentropy.v                                     18.5         0.316          2
```

```
## 26 RuleAnaphoricReferences                          15.8        0.330        2
## 27 RulePredSubjDistance                             16.5        0.341        2
## 28 RuleTooLongExpressions                           15.2        0.344        2
## 29 RuleVerbalNouns                                  15.5        0.347        2
## 30 RuleLongSentences.max_length.v                   22.8        0.398        2
## 31 RuleCaseRepetition.max_repetition_frac           26.5        0.452        2
## 32 RuleCaseRepetition.max_repetition_count.v        26          0.459        2
## 33 RuleCaseRepetition.max_repetition_frac.v         27.2        0.480        2
## 34 ttr                                              28.5        0.492        2
## 35 RuleDoubleAdpos.max_allowable_distance.v         27.2        0.492        2
## 36 RulePredObjDistance                              23.2        0.493        2
## 37 num_hapax                                        25.5        0.506        2
## 38 RulePredSubjDistance.max_distance                27.5        0.507        2
## 39 RuleInfVerbDistance.max_distance.v               30          0.513        2
## 40 RuleInfVerbDistance.max_distance                 31.5        0.560        2
## 41 RuleInfVerbDistance                              30.5        0.571        2
## 42 RulePredSubjDistance.max_distance.v              33.2        0.595        2
## 43 RuleTooManyNegations.max_allowable_negatio~      37.2        0.644        2
## 44 RuleGPdeverbsubj                                 37          0.672        2
## 45 RuleMultiPartVerbs.max_distance.v                38.2        0.678        2
## 46 RuleTooManyNominalConstructions.max_noun_f~      40          0.685        2
## 47 RuleRelativisticExpressions                      37.2        0.696        2
## 48 RulePredObjDistance.max_distance                 40.2        0.720        2
## 49 RuleGPdeverbaddr                                 37.5        0.720        2
## 50 fre                                              41.2        0.733        2
## 51 RuleRedundantExpressions                         40          0.750        2
## 52 RuleGPadjective                                  40.8        0.781        2
## 53 hpoint                                           46.8        0.828        2
## 54 RuleDoubleAdpos.max_allowable_distance           46.5        0.830        2
## 55 fkgl                                             12.3        0.209        3
## 56 RulePredAtClauseBeginning.max_order.v            16          0.281        3
## 57 cli                                              25.3        0.423        3
## 58 mattr.v                                          27.7        0.470        3
## 59 RuleTooManyNegations.max_negation_frac.v         36.3        0.607        3
## 60 RuleDoubleAdpos                                  37          0.627        3
## 61 RuleTooManyNegations.max_allowable_negatio~      37.7        0.636        3
## 62 RuleAbstractNouns                                40.7        0.690        3
## 63 RuleCaseRepetition.max_repetition_count          40.7        0.698        3
## 64 RulePredObjDistance.max_distance.v               43          0.720        3
## 65 RuleMultiPartVerbs.max_distance                  43          0.727        3
## 66 RuleWeakMeaningWords                             42.7        0.745        3
## 67 RuleGPwordorder                                  44.3        0.760        3
## 68 RuleReflexivePassWithAnimSubj                    44.3        0.778        3
## 69 RuleGPpatinstr                                   46.3        0.825        3
## 70 RuleGPpatbenperson                               49.7        0.892        3
## 71 RuleGPcoordovs                                   50.7        0.915        3
## 72 RuleConfirmationExpressions                      53.3        0.972        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`).