Classifier

```r
set.seed(42)

library(caret)
```

```
## Loading required package: ggplot2

## Loading required package: lattice
```

```r
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 errors
```

```r
library(tidymodels)
```

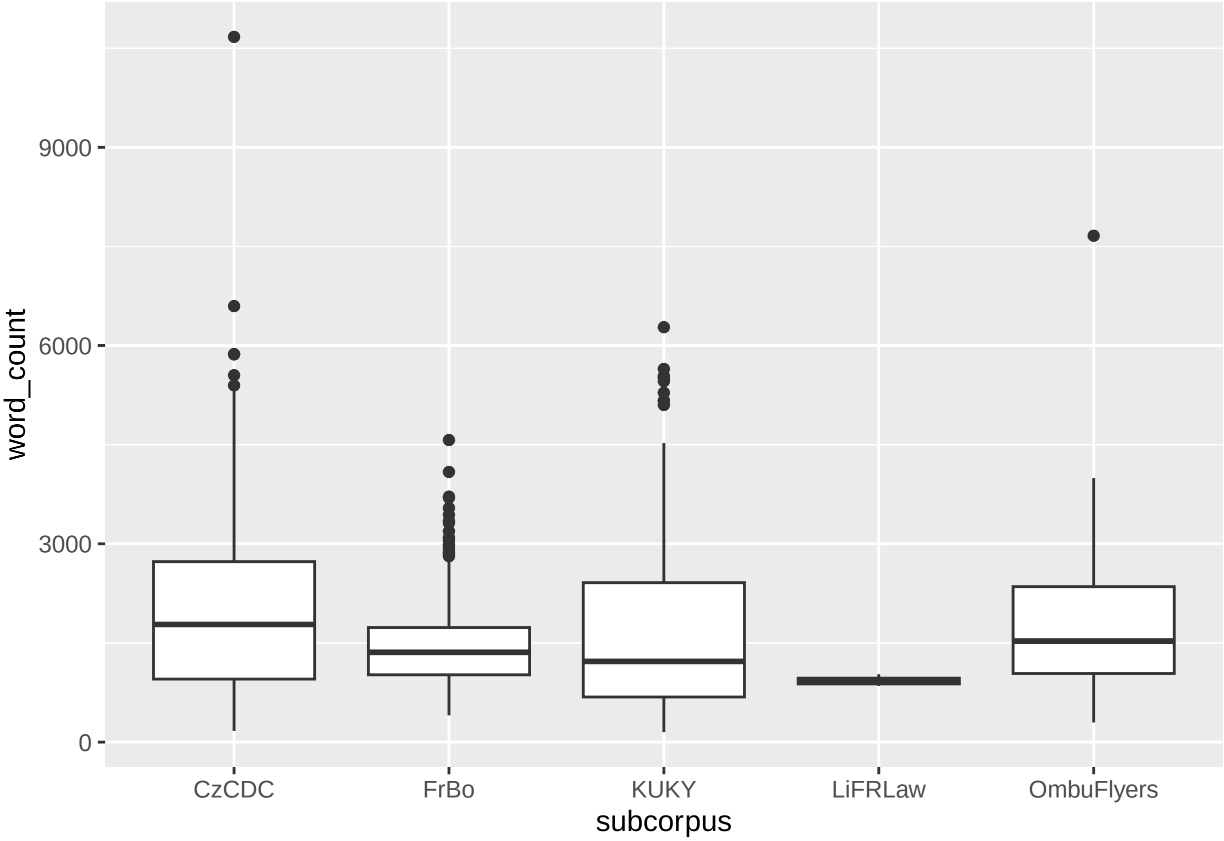
```
## -- Attaching packages -------------------------------------- tidymodels 1.2.0 --
## v broom        1.0.5     v rsample      1.2.1
## v dials        1.3.0     v tune         1.2.1
## v infer        1.0.7     v workflows    1.1.4
## v modeldata    1.4.0     v workflowsets 1.1.0
## v parsnip      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()
## * Use tidymodels_prefer() to resolve common conflicts.
```

Load and tidy data

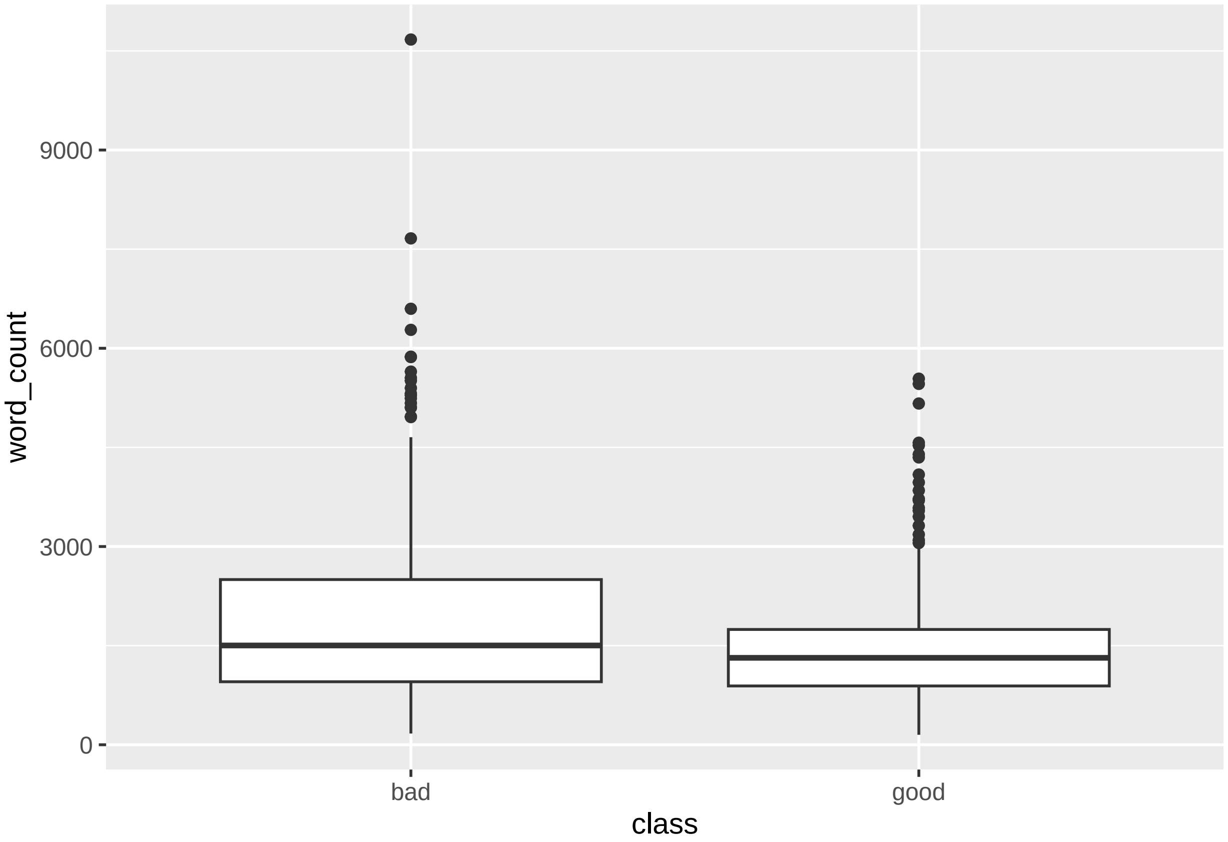
```
data <- read_csv("../measurements/measurements.csv")
```

```
## 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
```

```r
# 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
```

```r
# 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

```r
library(vip)
```

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

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

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

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

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

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

Null model

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

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

  null_rs <- fit_resamples(null_workflow %>% add_model(null_classification), folds)
  cat("Null resamples:\n")
  print(null_rs)

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

  return(null_rs)
}
```

Decision tree

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

Lasso

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

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

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

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

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

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

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

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

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

  best_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() %>%
    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,
```

```r
    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

```r
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
```

```r
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()
```

```r
# 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
```

```r
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 +
```

```r
  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_all,
  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: 71

##

## -- 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: 28
##
## -- Operations
## * Centering and scaling for: <none>
```

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

```
## # A tibble: 2 x 2
##   terms        id
##   <chr>        <chr>
## 1 syllab_count corr_Fw2K3
## 2 word_count   corr_Fw2K3
```

```
recipe_counts
```

```
##
## -- Recipe ----------------------------------------------------------------------
##
## -- Inputs
## Number of variables by role
## outcome:    1
## predictor: 28
##
## -- 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
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()

  var_imp <- final_fitted$.workflow[[1]] %>%
    extract_fit_parsnip() %>%
    vi()
  var_imp %>%
    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()
```

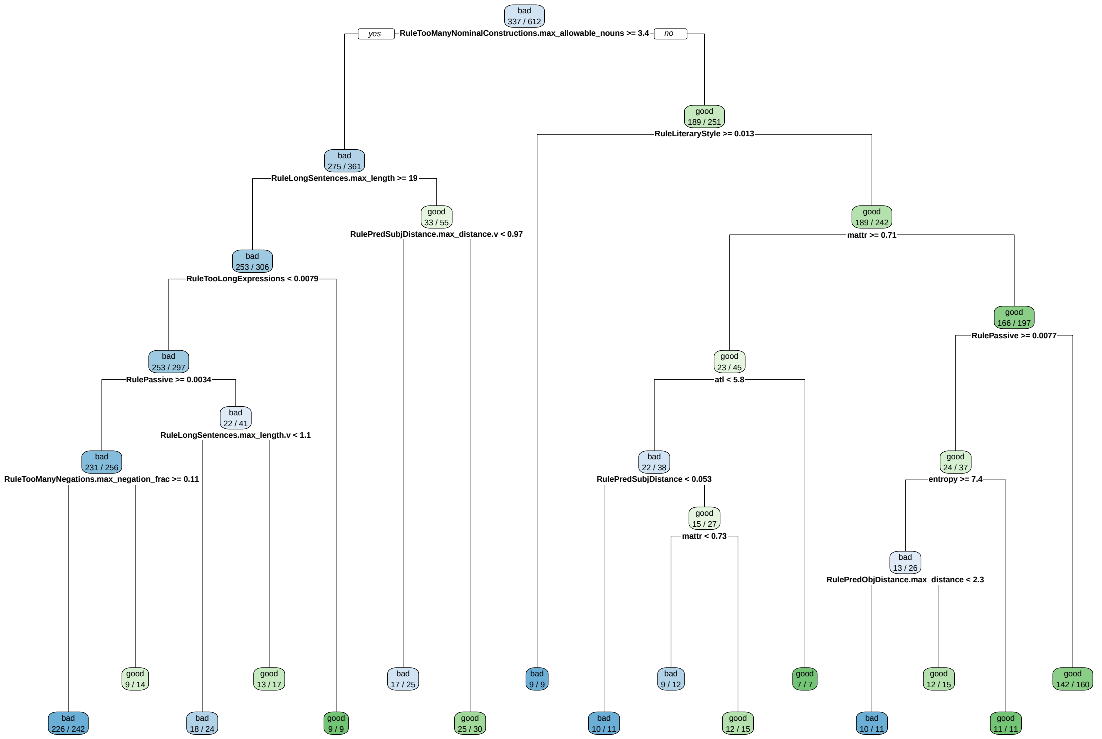
```
## 
## Call:
## glm(formula = formula_counts, family = binomial(link = "logit"), 
##     data = training_set_modif)
## 
## Coefficients:
##                               Estimate Std. Error z value Pr(>|z|)    
## (Intercept)                   -0.48980    0.12417  -3.945 7.99e-05 ***
## RuleGPcoordovs                -0.02693    0.10339  -0.260 0.794499    
## RuleGPdeverbaddr              -0.24009    0.11055  -2.172 0.029870 *  
## RuleGPpatinstr                -0.04447    0.09841  -0.452 0.651321    
## RuleGPdeverbsubj              -0.19249    0.12937  -1.488 0.136774    
## RuleGPadjective                0.21364    0.17015   1.256 0.209258    
## RuleGPpatbenperson            -0.07276    0.09844  -0.739 0.459841    
## RuleGPwordorder               -0.19871    0.11969  -1.660 0.096863 .  
## RuleDoubleAdpos               -0.12260    0.11105  -1.104 0.269616    
## RuleReflexivePassWithAnimSubj  0.02322    0.10779   0.215 0.829408    
## RuleWeakMeaningWords          -0.06538    0.10696  -0.611 0.541037    
## RuleAbstractNouns             -0.01576    0.11206  -0.141 0.888158    
## RuleRelativisticExpressions   -0.22035    0.12580  -1.752 0.079842 .  
## RuleConfirmationExpressions    0.14181    0.12686   1.118 0.263644    
## RuleRedundantExpressions      -0.22443    0.14833  -1.513 0.130264    
## RuleTooLongExpressions         0.36750    0.11623   3.162 0.001568 ** 
## RuleAnaphoricReferences        0.33398    0.11934   2.799 0.005134 ** 
## RuleLiteraryStyle             -0.48480    0.12558  -3.861 0.000113 ***
## RulePassive                   -0.56990    0.14435  -3.948 7.88e-05 ***
## RulePredSubjDistance           0.19828    0.13807   1.436 0.150991    
## RulePredObjDistance            0.20756    0.14615   1.420 0.155553    
## RuleInfVerbDistance              0.05512    0.14772   0.373 0.709032
## RuleMultiPartVerbs               0.37500    0.15199   2.467 0.013616 *
## RuleVerbalNouns                  0.13503    0.12274   1.100 0.271277
## sent_count                       1.70513    0.44154   3.862 0.000113 ***
## word_count                      -3.65338    1.82665  -2.000 0.045496 *
## syllab_count                     0.27311    3.29165   0.083 0.933876
## char_count                       1.03853    3.85562   0.269 0.787656
## num_hapax                       -0.19284    0.16742  -1.152 0.249389
## ---
## 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: 529.92  on 583  degrees of freedom
## AIC: 587.92
##
## Number of Fisher Scoring iterations: 6
```

Decision tree

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

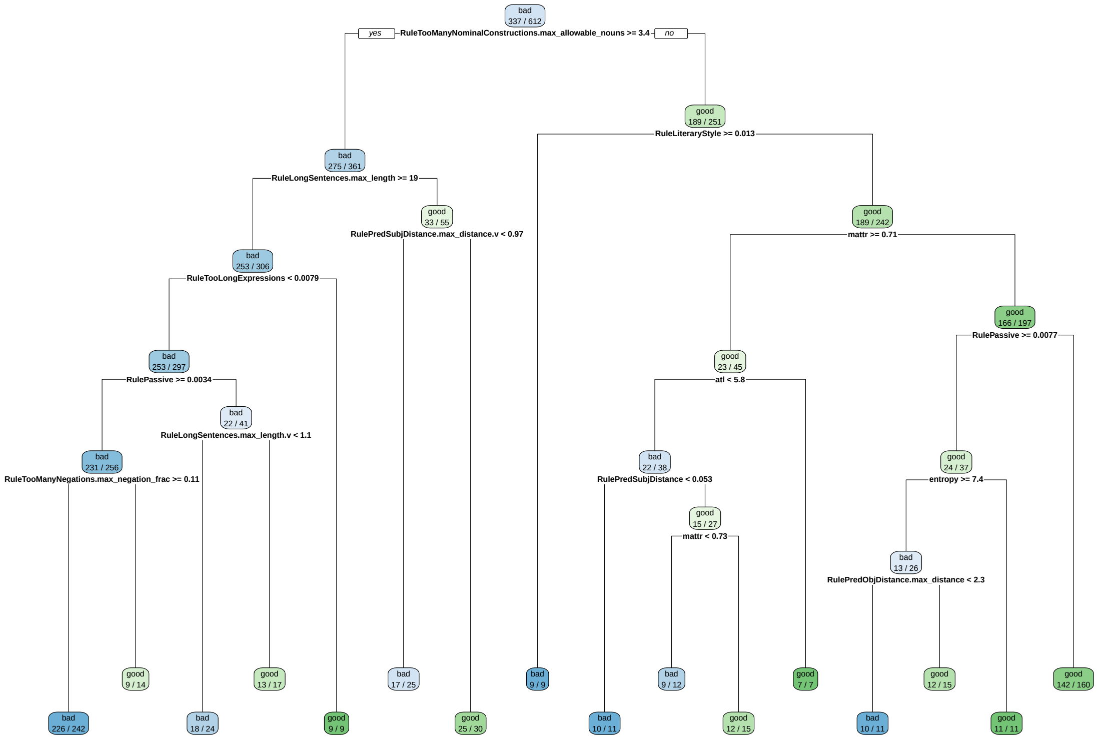
All variables

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



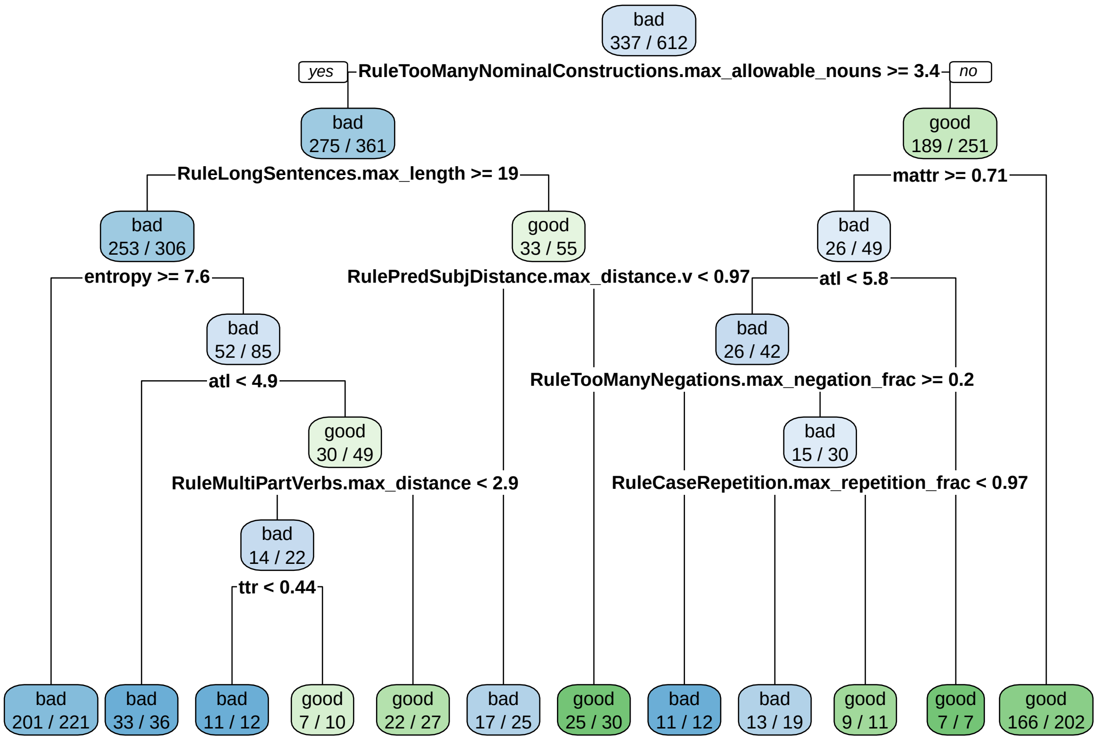
No TL

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



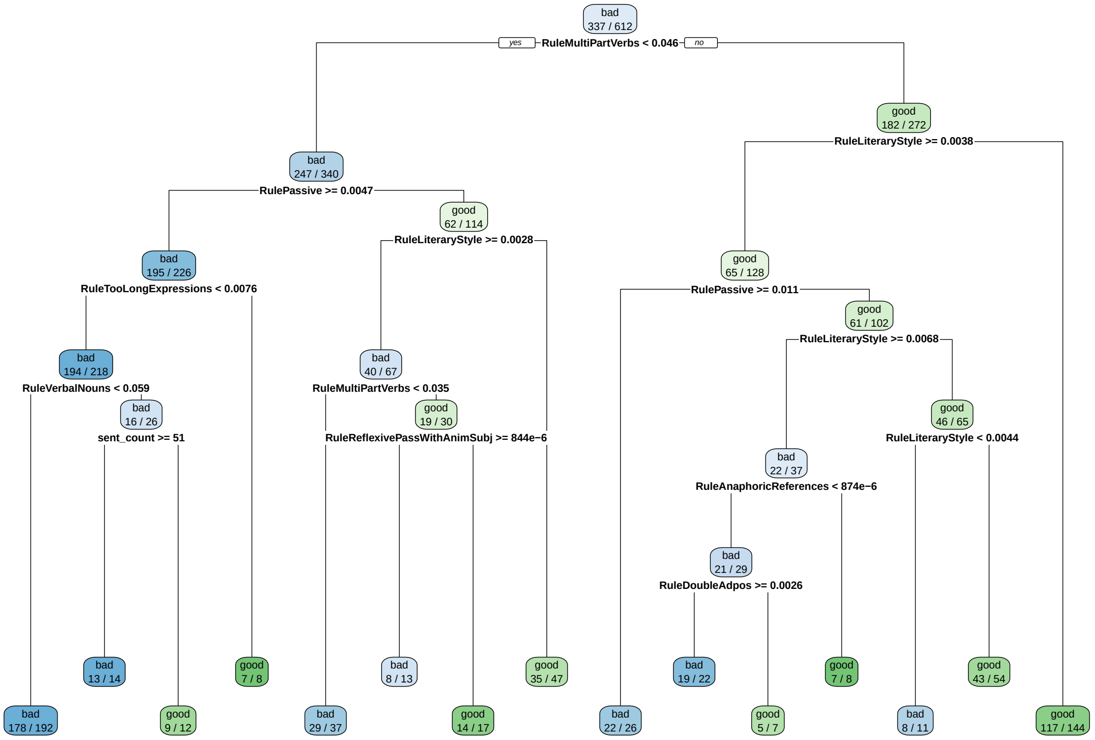
IAC

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



Counts

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



Lasso

All variables

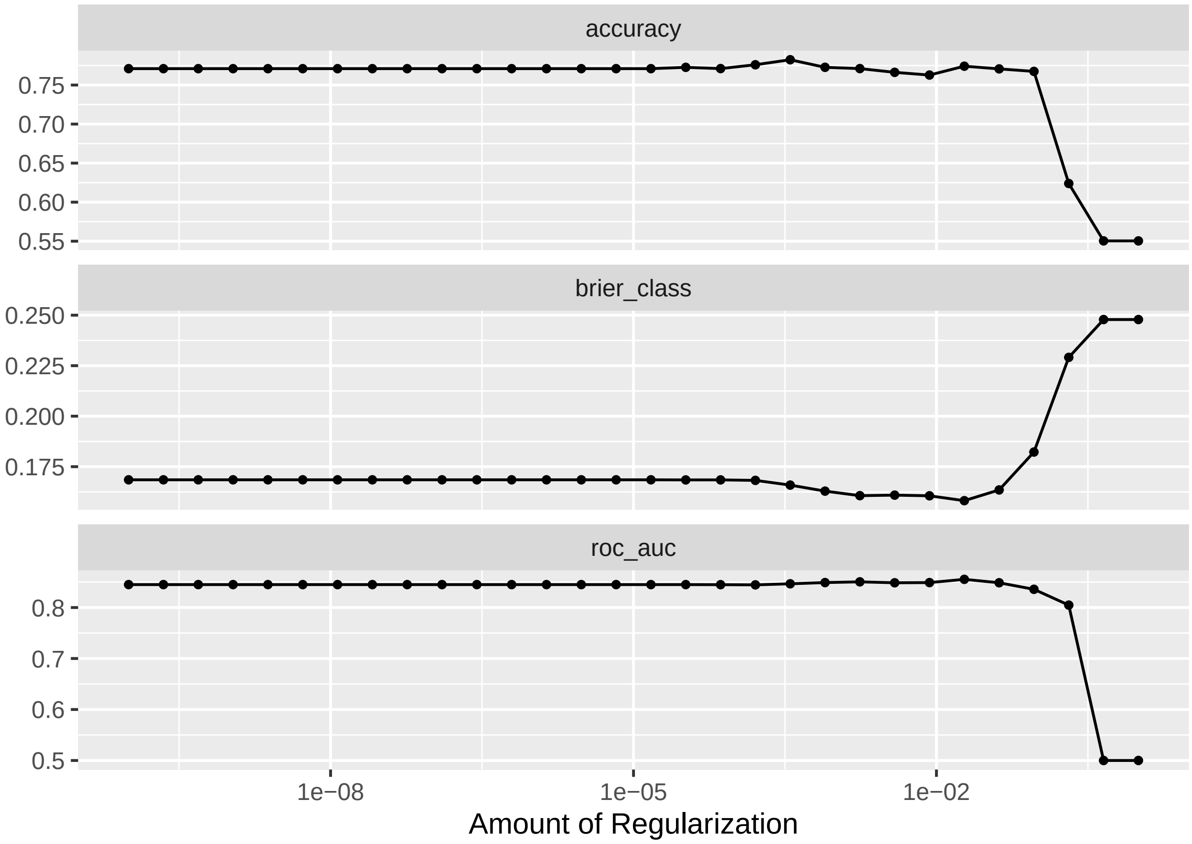
Remove correlating

```
# 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:
```

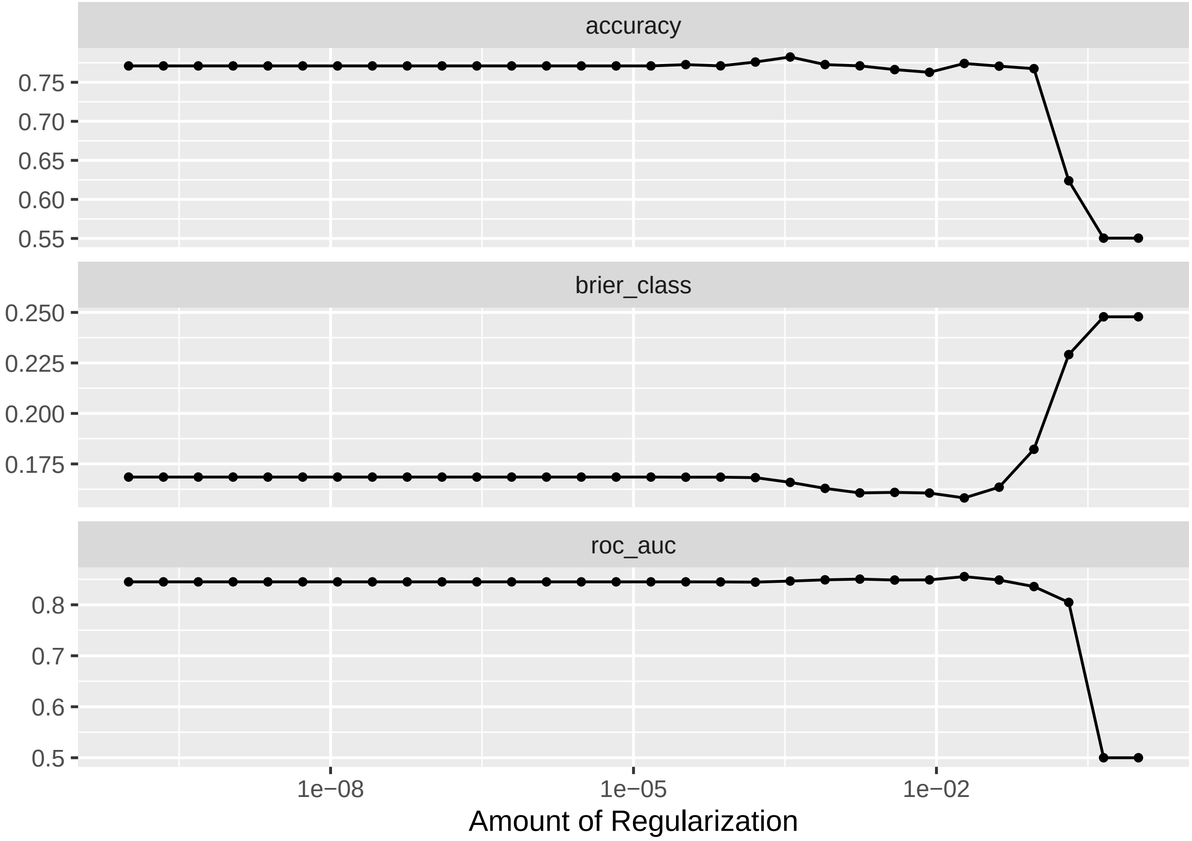


```
## # A tibble: 5 x 7
##    penalty .metric .estimator  mean     n std_err .config
##      <dbl> <chr>   <chr>      <dbl> <int>   <dbl> <chr>
## 1 0.0189   roc_auc binary     0.855    10  0.0192 Preprocessor1_Model25
## 2 0.00174  roc_auc binary     0.850    10  0.0180 Preprocessor1_Model22
## 3 0.000788 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 char_count                                            13.8     POS
##  2 syllab_count                                           9.84    NEG
##  3 ari                                                    5.09    NEG
##  4 word_count                                             4.36    NEG
##  5 RuleLongSentences.max_length                           3.32    POS
##  6 fre                                                    2.55    NEG
##  7 gf                                                     2.25    NEG
##  8 RuleTooFewVerbs.min_verb_frac                          1.74    NEG
##  9 activity                                               1.64    POS
## 10 smog                                                   1.53    POS
## 11 sent_count                                             1.21    POS
## 12 RuleCaseRepetition.max_repetition_frac.v               1.20    POS
## 13 mattr                                                  1.19    NEG
## 14 hpoint                                                 1.19    NEG
## 15 ttr                                                    1.06    NEG
## 16 atl                                                     1.02    POS
## 17 maentropy.v                                             0.900   POS
## 18 maentropy                                               0.892   POS
## 19 RuleLongSentences.max_length.v                          0.830   POS
## 20 RuleCaseRepetition.max_repetition_frac                  0.821   POS
## 21 cli                                                     0.791   NEG
## 22 entropy                                                 0.598   NEG
## 23 num_hapax                                               0.547   POS
## 24 RuleMultiPartVerbs                                      0.534   POS
## 25 RulePredSubjDistance.max_distance                       0.519   NEG
## 26 RuleAnaphoricReferences                                 0.516   POS
## 27 RulePassive                                             0.492   NEG
## 28 RulePredSubjDistance                                    0.466   POS
## 29 RuleLiteraryStyle                                       0.410   NEG
## 30 mattr.v                                                 0.405   NEG
## 31 RuleGPadjective                                         0.392   POS
## 32 verb_dist                                               0.327   POS
## 33 RuleInfVerbDistance.max_distance                        0.322   POS
## 34 RulePredObjDistance.max_distance                        0.320   NEG
## 35 RuleTooManyNominalConstructions.max_noun_frac           0.319   NEG
## 36 RuleTooManyNominalConstructions.max_allowable_nouns     0.291   POS
## 37 RuleTooLongExpressions                                  0.290   POS
## 38 RuleRelativisticExpressions                             0.257   NEG
## 39 RulePredAtClauseBeginning.max_order                     0.255   NEG
## 40 RuleCaseRepetition.max_repetition_count                 0.249   NEG
## 41 RuleGPdeverbaddr                                        0.246   NEG
## 42 RuleInfVerbDistance.max_distance.v                      0.243   NEG
## 43 RuleCaseRepetition.max_repetition_count.v               0.236   NEG
## 44 RuleTooManyNegations.max_allowable_negations            0.230   POS
## 45 RuleRedundantExpressions                                0.195   NEG
## 46 RuleGPdeverbsubj                                        0.189   NEG
## 47 RuleConfirmationExpressions                             0.186   POS
## 48 RuleInfVerbDistance                                     0.166   POS
## 49 RuleGPpatbenperson                                      0.162   NEG
## 50 RuleMultiPartVerbs.max_distance.v                       0.157   POS
## 51 RuleGPwordorder                                         0.142   NEG
## 52 RuleTooManyNegations.max_negation_frac                  0.134   POS
## 53 RuleTooManyNegations.max_allowable_negations.v          0.133   NEG
## 54 RuleGPpatinstr                                          0.125   NEG
## 55 RuleWeakMeaningWords                                    0.118   NEG
## 56 RuleAbstractNouns                                       0.103   POS
## 57 mamr                                                    0.102   NEG
## 58 RuleDoubleAdpos.max_allowable_distance.v                0.0976  POS
## 59 RuleMultiPartVerbs.max_distance                         0.0891  POS
## 60 RuleReflexivePassWithAnimSubj                           0.0819  NEG
## 61 RuleTooManyNominalConstructions.max_noun_frac.v         0.0799  POS
## 62 RulePredSubjDistance.max_distance.v                     0.0700  NEG
## 63 RuleDoubleAdpos                                         0.0563  POS
## 64 RuleVerbalNouns                                         0.0556  NEG
## 65 RuleTooManyNegations.max_negation_frac.v                0.0552  NEG
## 66 RuleGPcoordovs                                          0.0487  NEG
## 67 RuleDoubleAdpos.max_allowable_distance                  0.0357  NEG
## 68 RulePredAtClauseBeginning.max_order.v                   0.0334  POS
## 69 RulePredObjDistance.max_distance.v                      0.0322  POS
## 70 RulePredObjDistance                                          0.00271 POS
## 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  0.0180 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 char_count                                            13.8     POS
##  2 syllab_count                                           9.84    NEG
##  3 ari                                                    5.09    NEG
##  4 word_count                                             4.36    NEG
##  5 RuleLongSentences.max_length                           3.32    POS
##  6 fre                                                    2.55    NEG
##  7 gf                                                     2.25    NEG
##  8 RuleTooFewVerbs.min_verb_frac                          1.74    NEG
##  9 activity                                               1.64    POS
## 10 smog                                                   1.53    POS
## 11 sent_count                                             1.21    POS
## 12 RuleCaseRepetition.max_repetition_frac.v               1.20    POS
## 13 mattr                                                  1.19    NEG
## 14 hpoint                                                 1.19    NEG
## 15 ttr                                                    1.06    NEG
## 16 atl                                                    1.02    POS
## 17 maentropy.v                                            0.900   POS
## 18 maentropy                                              0.892   POS
## 19 RuleLongSentences.max_length.v                         0.830   POS
## 20 RuleCaseRepetition.max_repetition_frac                 0.821   POS
## 21 cli                                                    0.791   NEG
## 22 entropy                                                0.598   NEG
## 23 num_hapax                                              0.547   POS
## 24 RuleMultiPartVerbs                                     0.534   POS
## 25 RulePredSubjDistance.max_distance                      0.519   NEG
## 26 RuleAnaphoricReferences                                0.516   POS
## 27 RulePassive                                            0.492   NEG
## 28 RulePredSubjDistance                                   0.466   POS
## 29 RuleLiteraryStyle                                      0.410   NEG
## 30 mattr.v                                                0.405   NEG
## 31 RuleGPadjective                                        0.392   POS
## 32 verb_dist                                              0.327   POS
## 33 RuleInfVerbDistance.max_distance                       0.322   POS
## 34 RulePredObjDistance.max_distance                       0.320   NEG
## 35 RuleTooManyNominalConstructions.max_noun_frac          0.319   NEG
## 36 RuleTooManyNominalConstructions.max_allowable_nouns    0.291   POS
## 37 RuleTooLongExpressions                                 0.290   POS
## 38 RuleRelativisticExpressions                            0.257   NEG
## 39 RulePredAtClauseBeginning.max_order                    0.255   NEG
## 40 RuleCaseRepetition.max_repetition_count                0.249   NEG
## 41 RuleGPdeverbaddr                                       0.246   NEG
## 42 RuleInfVerbDistance.max_distance.v                     0.243   NEG
## 43 RuleCaseRepetition.max_repetition_count.v              0.236   NEG
## 44 RuleTooManyNegations.max_allowable_negations           0.230   POS
## 45 RuleRedundantExpressions                               0.195   NEG
## 46 RuleGPdeverbsubj                                       0.189   NEG
## 47 RuleConfirmationExpressions                            0.186   POS
## 48 RuleInfVerbDistance                                    0.166   POS
## 49 RuleGPpatbenperson                                     0.162   NEG
## 50 RuleMultiPartVerbs.max_distance.v                      0.157   POS
## 51 RuleGPwordorder                                        0.142   NEG
## 52 RuleTooManyNegations.max_negation_frac                 0.134   POS
## 53 RuleTooManyNegations.max_allowable_negations.v         0.133   NEG
## 54 RuleGPpatinstr                                         0.125   NEG
## 55 RuleWeakMeaningWords                                   0.118   NEG
## 56 RuleAbstractNouns                                      0.103   POS
## 57 mamr                                                   0.102   NEG
## 58 RuleDoubleAdpos.max_allowable_distance.v               0.0976  POS
## 59 RuleMultiPartVerbs.max_distance                        0.0891  POS
## 60 RuleReflexivePassWithAnimSubj                          0.0819  NEG
## 61 RuleTooManyNominalConstructions.max_noun_frac.v        0.0799  POS
## 62 RulePredSubjDistance.max_distance.v                    0.0700  NEG
## 63 RuleDoubleAdpos                                        0.0563  POS
## 64 RuleVerbalNouns                                        0.0556  NEG
## 65 RuleTooManyNegations.max_negation_frac.v               0.0552  NEG
## 66 RuleGPcoordovs                                         0.0487  NEG
## 67 RuleDoubleAdpos.max_allowable_distance                 0.0357  NEG
## 68 RulePredAtClauseBeginning.max_order.v                  0.0334  POS
## 69 RulePredObjDistance.max_distance.v                     0.0322  POS
## 70 RulePredObjDistance                                    0.00271 POS
## 71 fkgl                                                   0       NEG
```

Indicators, averages, and coefficients

Remove correlating

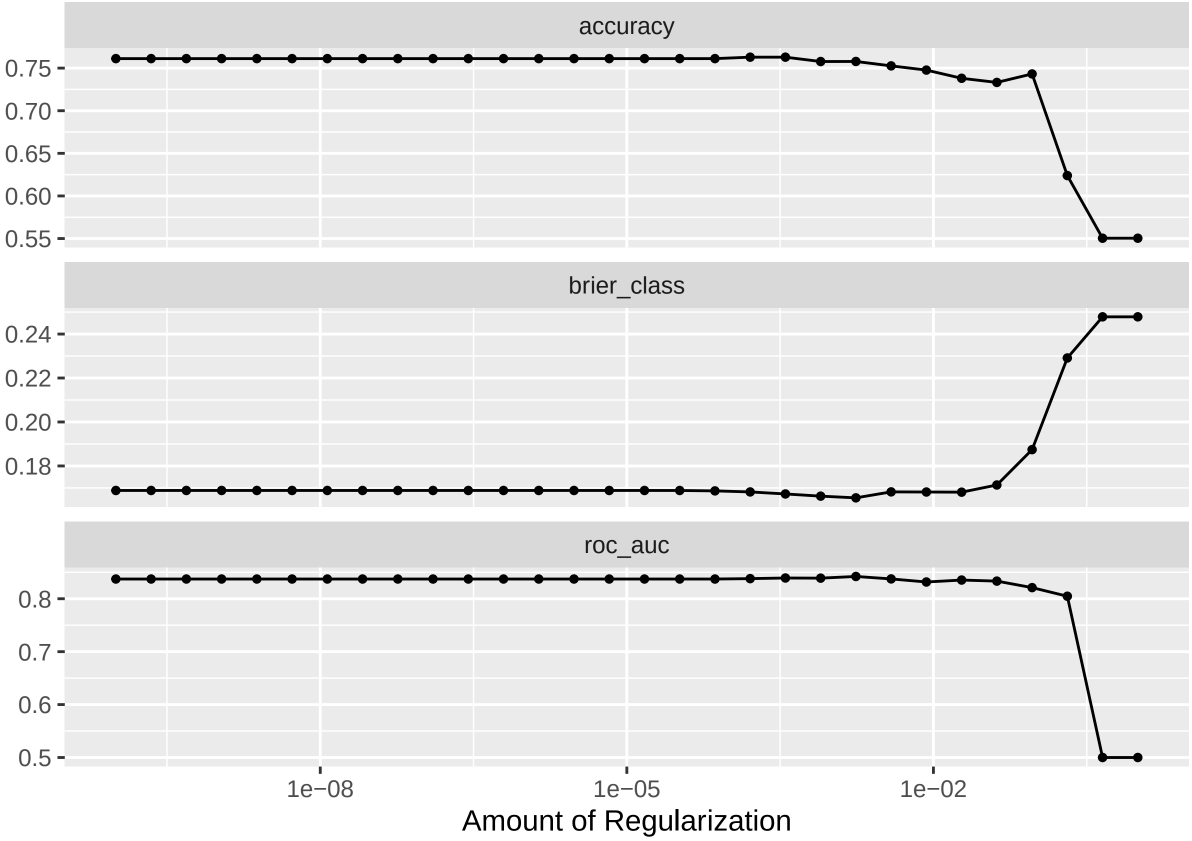
```
# train_lasso(recipe_iac, training_set, folds)
```

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 RuleCaseRepetition.max_repetition_frac.v                 49.6     POS
##  2 maentropy.v                                              46.4     POS
##  3 RuleTooFewVerbs.min_verb_frac                            39.6     NEG
##  4 RuleCaseRepetition.max_repetition_frac                   33.7     POS
##  5 mattr                                                    19.5     NEG
##  6 mattr.v                                                  17.2     NEG
##  7 activity                                                 16.6     POS
##  8 RuleTooManyNominalConstructions.max_noun_frac            13.8     NEG
##  9 ttr                                                       4.91    NEG
## 10 RuleTooManyNominalConstructions.max_noun_frac.v           3.68    POS
## 11 maentropy                                                 3.60    POS
## 12 RuleCaseRepetition.max_repetition_count.v                 2.97    NEG
## 13 atl                                                       2.13    POS
## 14 RuleLongSentences.max_length.v                            1.90    POS
## 15 RuleTooManyNominalConstructions.max_allowable_nouns.v     1.33    NEG
## 16 RuleTooManyNegations.max_allowable_negations.v            1.19    NEG
## 17 mamr                                                      1.05    POS
## 18 RuleInfVerbDistance.max_distance.v                        0.923   NEG
## 19 RuleTooManyNegations.max_negation_frac                    0.851   POS
## 20 ari                                                       0.816   NEG
## 21 entropy                                                   0.382   NEG
## 22 RuleTooManyNegations.max_allowable_negations              0.377   POS
## 23 RuleMultiPartVerbs.max_distance.v                         0.351   POS
## 24 RuleDoubleAdpos.max_allowable_distance.v                  0.291   NEG
## 25 gf                                                        0.285   NEG
## 26 RuleTooManyNegations.max_negation_frac.v                  0.276   POS
## 27 RulePredAtClauseBeginning.max_order.v                     0.233   NEG
## 28 RuleLongSentences.max_length                              0.223   POS
## 29 RuleTooManyNominalConstructions.max_allowable_nouns       0.203   POS
## 30 RuleCaseRepetition.max_repetition_count                   0.198   POS
## 31 fre                                                       0.173   NEG
## 32 RulePredSubjDistance.max_distance                         0.127   NEG
## 33 RuleInfVerbDistance.max_distance                          0.106   POS
## 34 hpoint                                                    0.0650  NEG
## 35 RulePredObjDistance.max_distance                          0.0644  NEG
## 36 verb_dist                                                0.0525  POS
## 37 RulePredSubjDistance.max_distance.v                      0.0480  POS
## 38 cli                                                      0.0475  NEG
## 39 RulePredAtClauseBeginning.max_order                      0.0357  NEG
## 40 RuleDoubleAdpos.max_allowable_distance                   0.0303  POS
## 41 RuleMultiPartVerbs.max_distance                          0.0229  POS
## 42 RulePredObjDistance.max_distance.v                       0.00554 POS
## 43 fkgl                                                     0       NEG
## 44 smog                                                     0       NEG
```

Counts

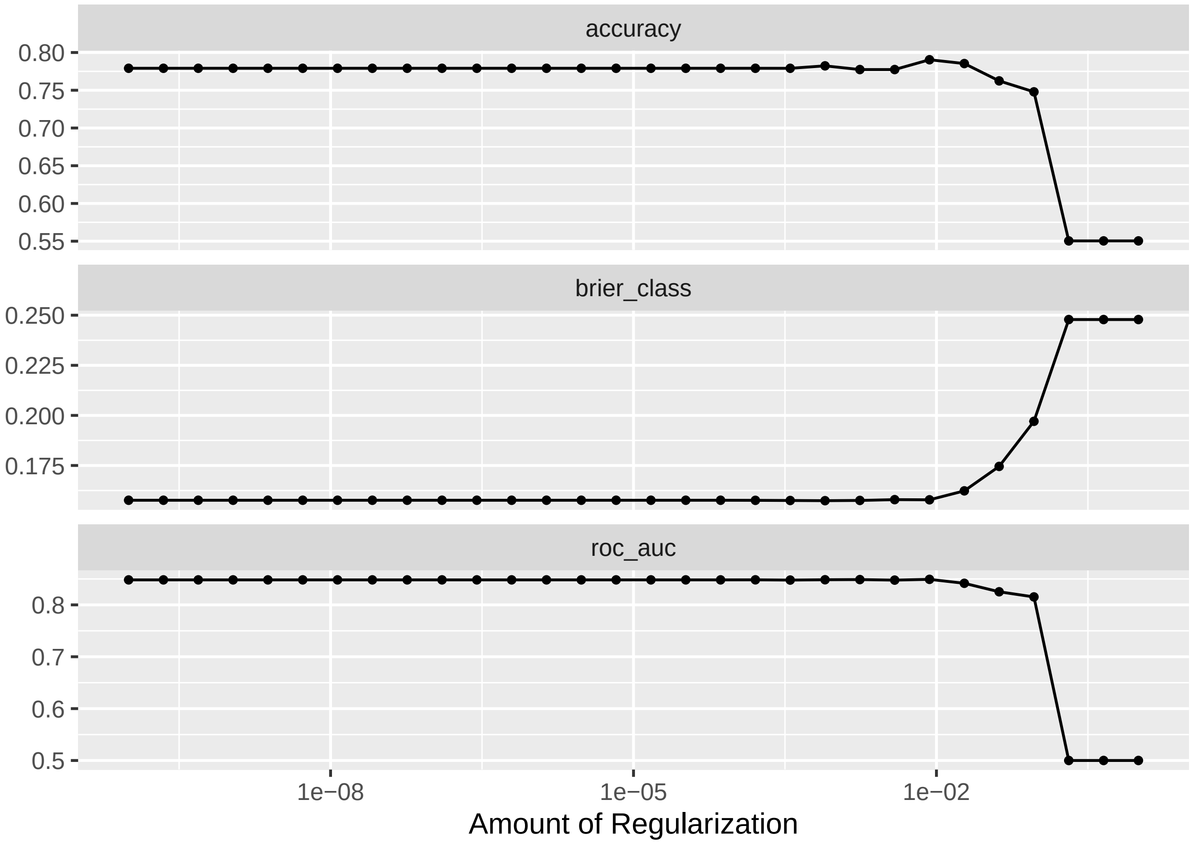
Remove correlating

```
# 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     0.849    10  0.0192 Preprocessor1_Model24
## 2 0.00174      roc_auc binary     0.849    10  0.0188 Preprocessor1_Model22
## 3 0.000788     roc_auc binary     0.848    10  0.0190 Preprocessor1_Model21
## 4 0.000161     roc_auc binary     0.848    10  0.0188 Preprocessor1_Model19
## 5 0.0000000001 roc_auc binary     0.848    10  0.0186 Preprocessor1_Model01
## # A tibble: 5 x 7
##    penalty .metric  .estimator  mean     n std_err .config
##      <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
## 1 8.53e- 3 accuracy binary     0.790    10  0.0171 Preprocessor1_Model24
## 2 1.89e- 2 accuracy binary     0.785    10  0.0205 Preprocessor1_Model25
## 3 7.88e- 4 accuracy binary     0.782    10  0.0179 Preprocessor1_Model21
## 4 1   e-10 accuracy binary     0.779    10  0.0172 Preprocessor1_Model01
## 5 2.21e-10 accuracy binary     0.779    10  0.0172 Preprocessor1_Model02
## 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: 29 x 3
##    term                             estimate penalty
##    <chr>                               <dbl>   <dbl>
##  1 RuleRedundantExpressions      -616.        0.0189
##  2 RuleRelativisticExpressions   -332.        0.0189
##  3 RuleGPdeverbsubj              -149.        0.0189
##  4 RuleLiteraryStyle             -123.        0.0189
##  5 RulePassive                   -119.        0.0189
##  6 RuleGPdeverbaddr               -92.8       0.0189
##  7 (Intercept)                     -1.69      0.0189
##  8 word_count                      -0.000438  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 RulePredObjDistance              0         0.0189
## 19 syllab_count                     0         0.0189
## 20 char_count                       0         0.0189
## 21 num_hapax                        0         0.0189
## 22 sent_count                       0.00502   0.0189
## 23 RuleInfVerbDistance              0.912     0.0189
## 24 RuleVerbalNouns                  5.83      0.0189
## 25 RulePredSubjDistance            18.2       0.0189
## 26 RuleMultiPartVerbs              34.1       0.0189
## 27 RuleTooLongExpressions          60.5       0.0189
## 28 RuleGPadjective                113.        0.0189
## 29 RuleAnaphoricReferences        157.        0.0189
## Variable importance:
## # A tibble: 28 x 3
##    Variable                         Importance Sign
##    <chr>                                 <dbl> <chr>
##  1 RuleRedundantExpressions      2170.          NEG
##  2 RuleRelativisticExpressions    563.          NEG
##  3 RuleGPdeverbaddr               487.          NEG
##  4 RuleConfirmationExpressions    410.          POS
##  5 RuleAnaphoricReferences        349.         POS
##  6 RuleGPdeverbsubj               336.         NEG
##  7 RuleGPadjective                311.         POS
##  8 RuleGPpatbenperson             170.         NEG
##  9 RuleTooLongExpressions         161.         POS
## 10 RuleGPwordorder                157.         NEG
## 11 RulePassive                    124.         NEG
## 12 RuleLiteraryStyle              121.         NEG
## 13 RuleGPcoordovs                  87.9        NEG
## 14 RuleGPpatinstr                  48.6        NEG
## 15 RuleDoubleAdpos                 35.3        NEG
## 16 RuleMultiPartVerbs              27.0        POS
## 17 RuleWeakMeaningWords            26.5        NEG
## 18 RuleReflexivePassWithAnimSubj   18.6        POS
## 19 RulePredSubjDistance            16.0        POS
## 20 RuleVerbalNouns                  7.89       POS
## 21 RuleAbstractNouns                3.67       NEG
## 22 num_hapax                        2.87       NEG
## 23 RulePredObjDistance              0.866      POS
## 24 RuleInfVerbDistance              0.412      POS
## 25 sent_count                       0.0306     POS
## 26 word_count                       0.00242    NEG
## 27 syllab_count                     0.000220   POS
## 28 char_count                       0.00000347 POS
```

SVM

All variables

Remove correlating

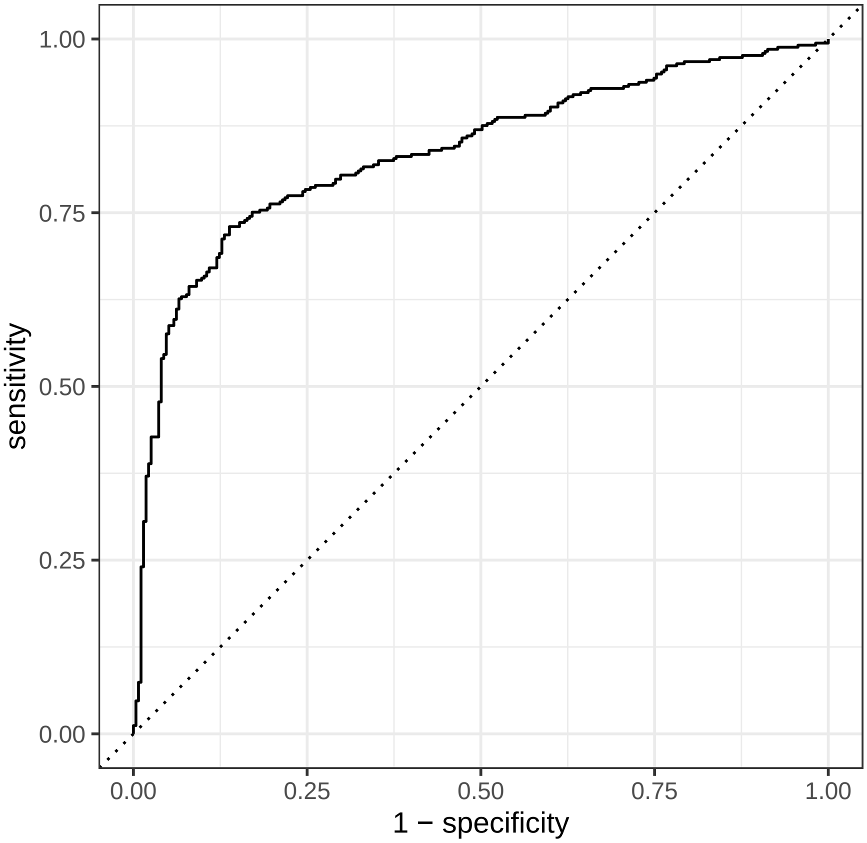
```
# train_svm(recipe_all, training_set, folds)
```

Keep correlating

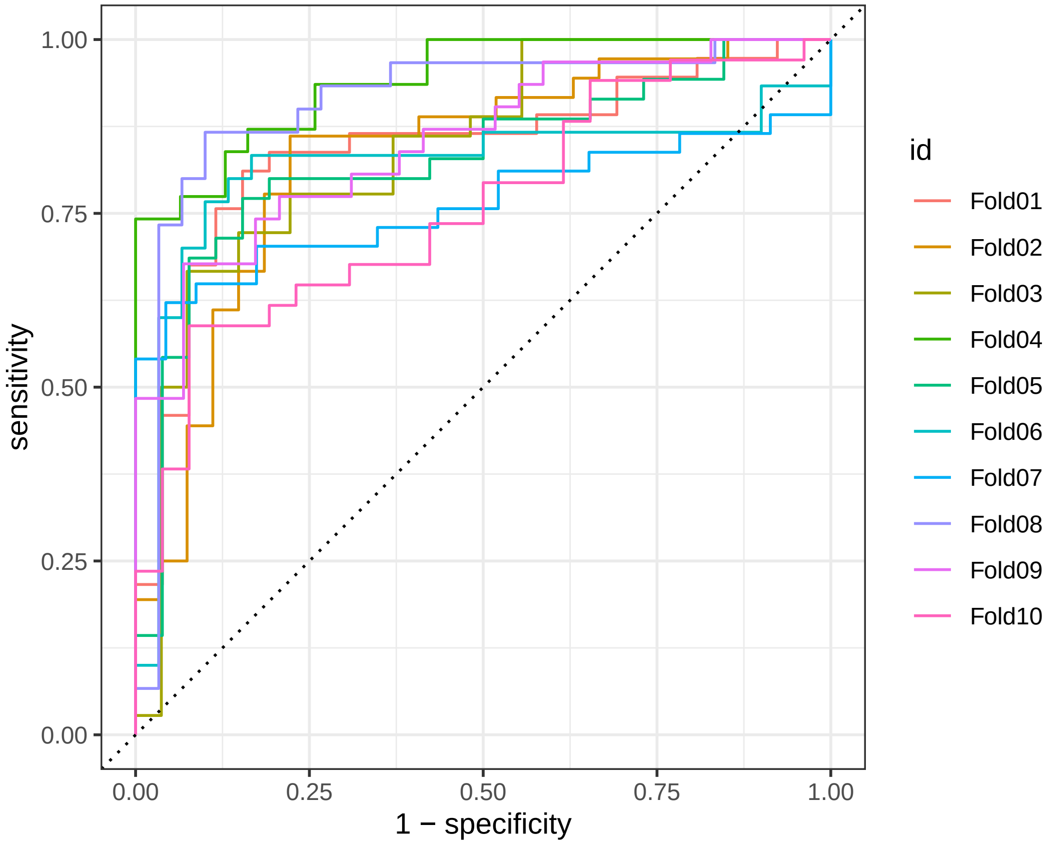
```
model_svm_all <- train_svm(recipe_all_nocorr, training_set, folds)
```

```
## 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:
```

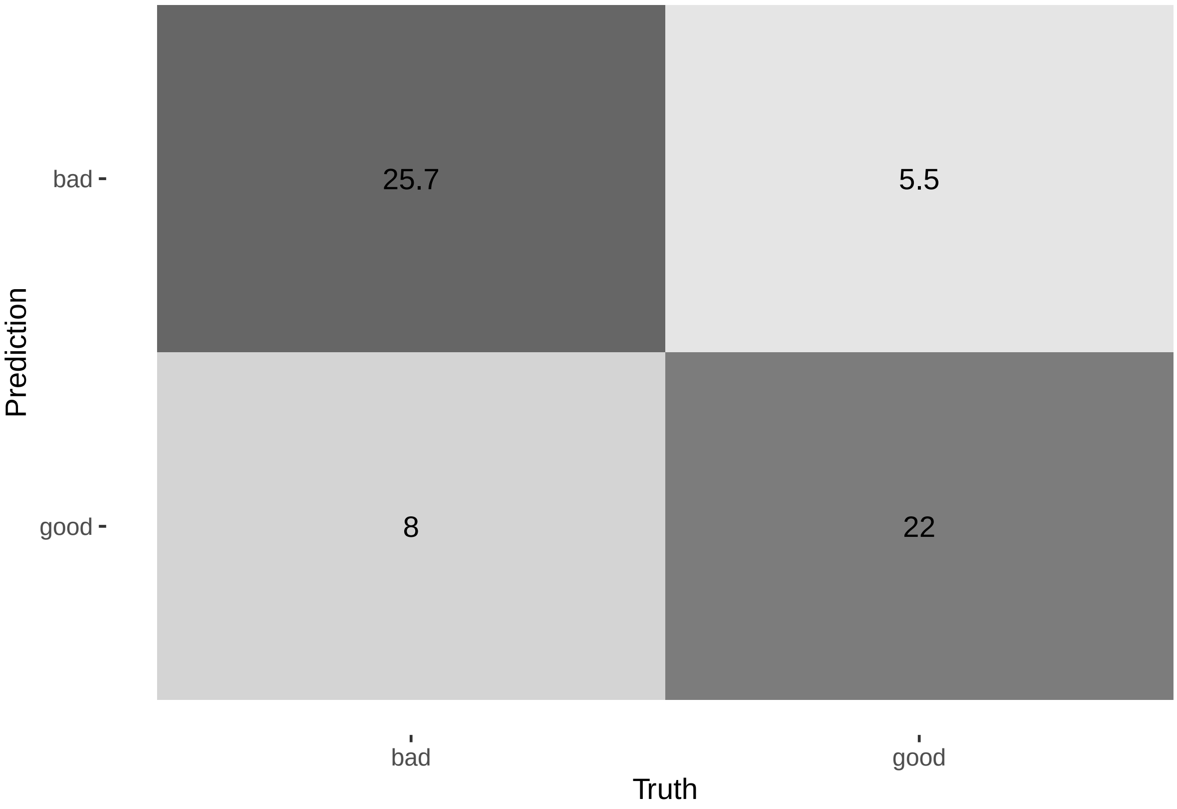
```
## # A tibble: 3 x 6
##   .metric     .estimator  mean     n std_err .config
##   <chr>       <chr>      <dbl> <int>   <dbl> <chr>
## 1 accuracy    binary     0.779    10 0.0174  Preprocessor1_Model1
## 2 brier_class binary     0.167    10 0.00766 Preprocessor1_Model1
## 3 roc_auc     binary     0.839    10 0.0177  Preprocessor1_Model1
```



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


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

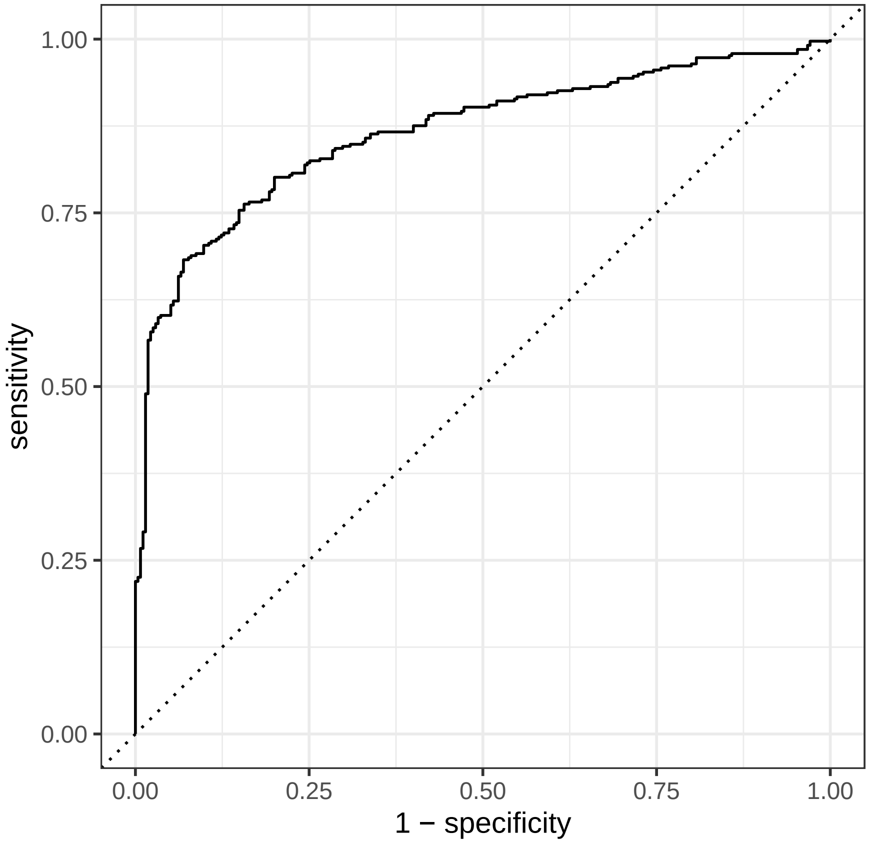
```
## [1] "\n"
```


Prediction
bad
good
25.7
5.5
8
22
bad
good
Truth

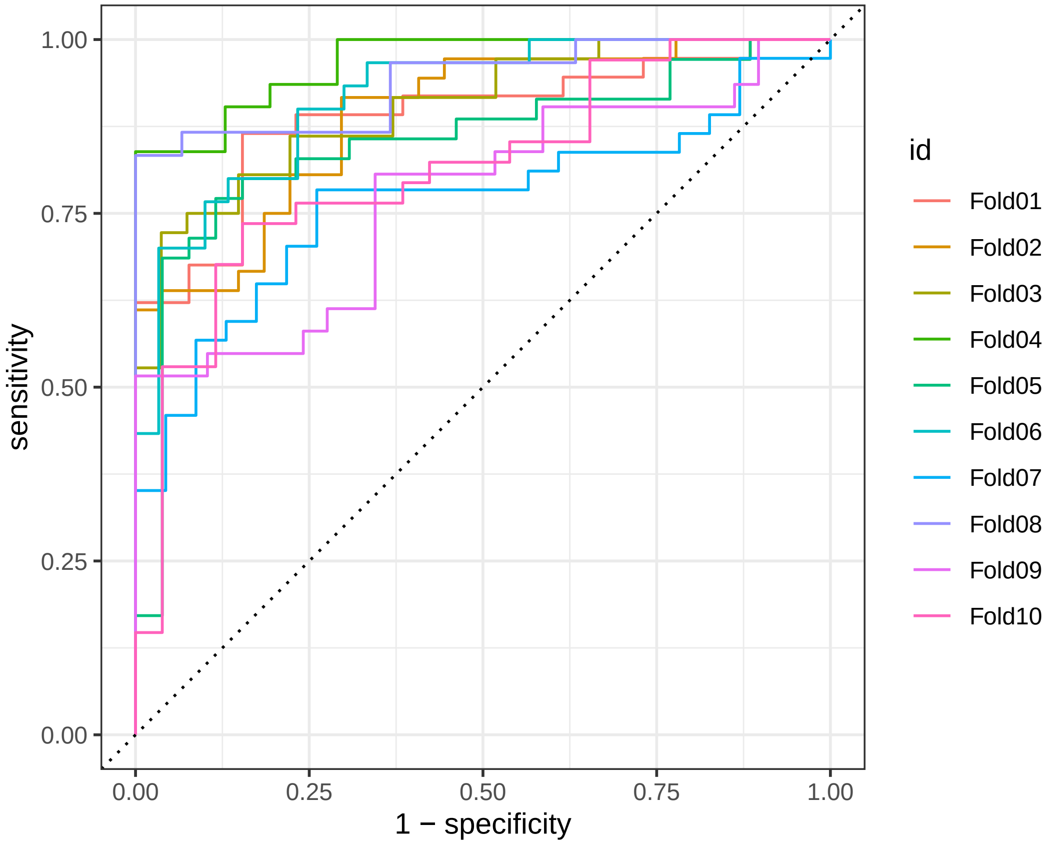
```
## [1] "\n"
```

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

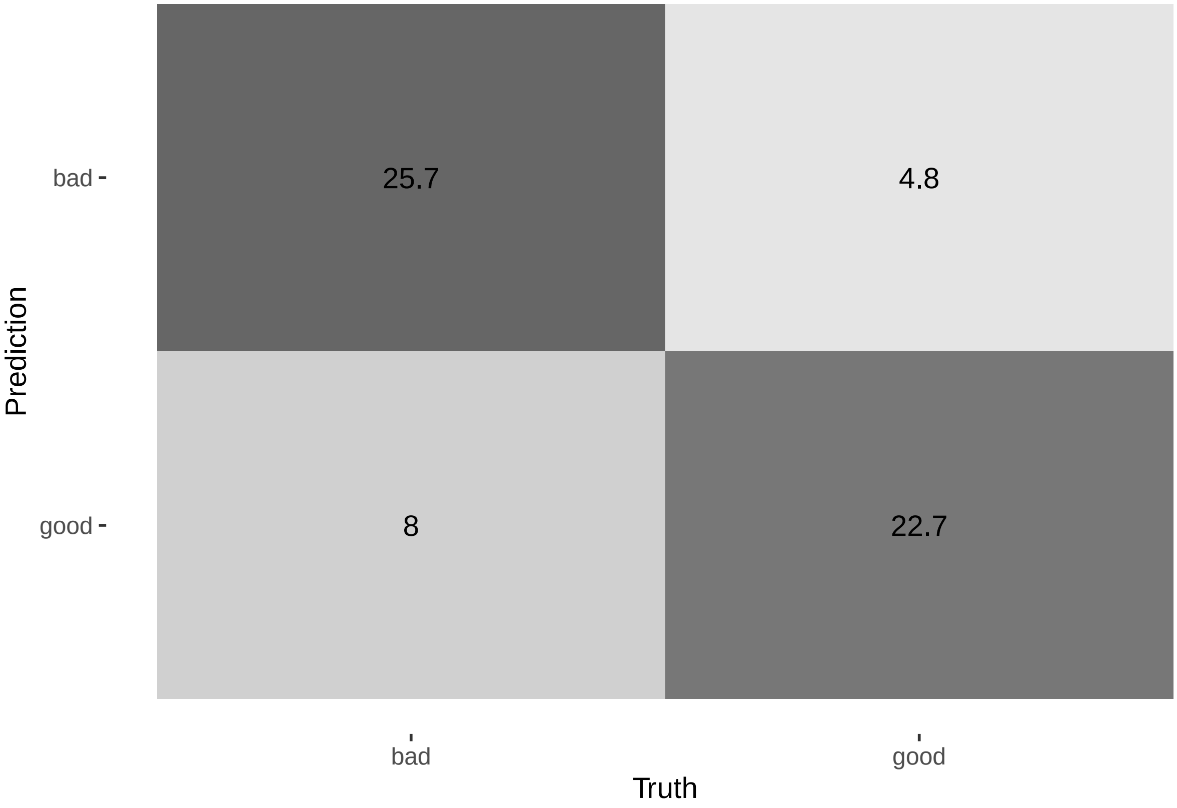
```
## SVM workflow:
## == Workflow =====================================================================
## Preprocessor: Recipe
## Model: svm_rbf()
## 
## -- Preprocessor -----------------------------------------------------------------
## 1 Recipe Step
## 
## * step_normalize()
## 
## -- Model ------------------------------------------------------------------------
## 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"
```


sensitivity
1.00
0.75
0.50
0.25
0.00
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"
```


Prediction
bad
good
25.7
4.8
8
22.7
bad
good
Truth

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

Random forest

All variables

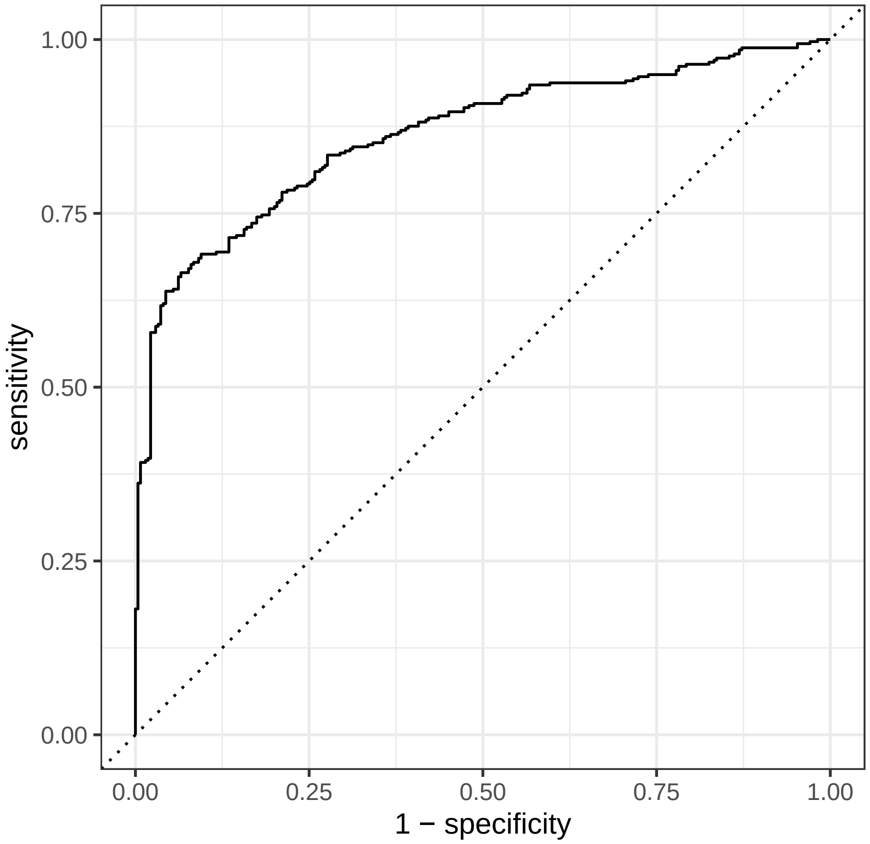
Remove correlating

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

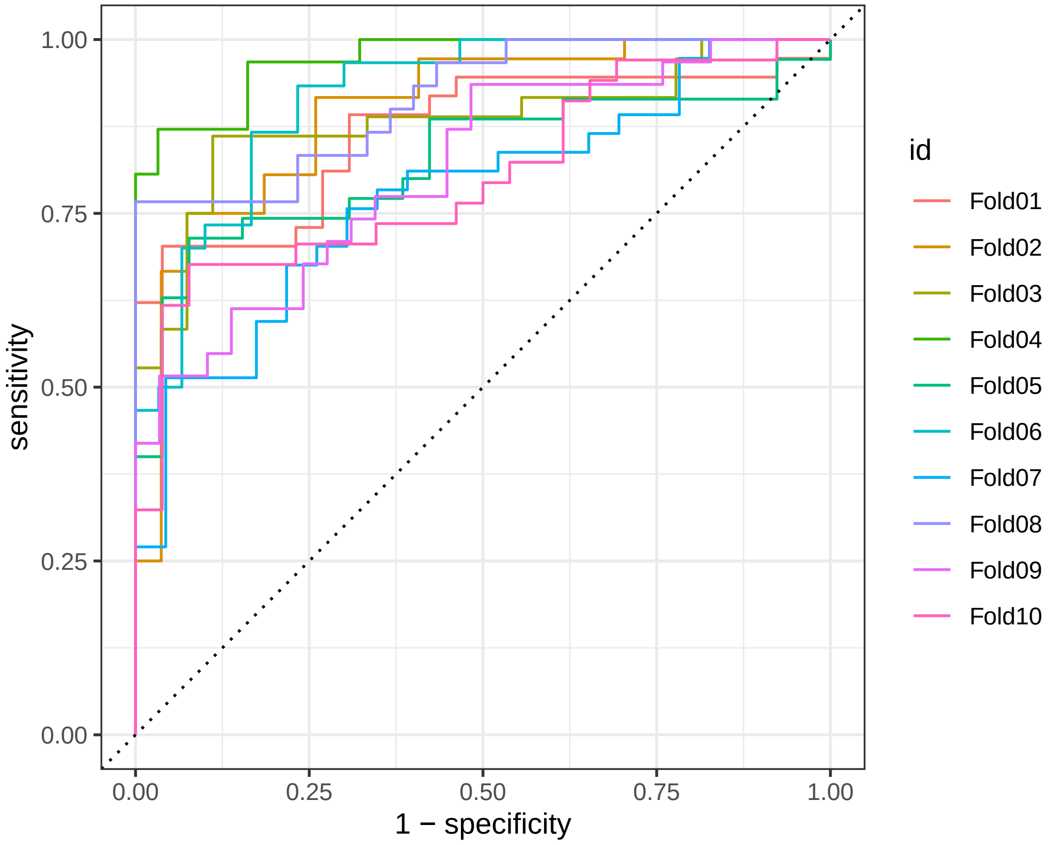
Keep correlating

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

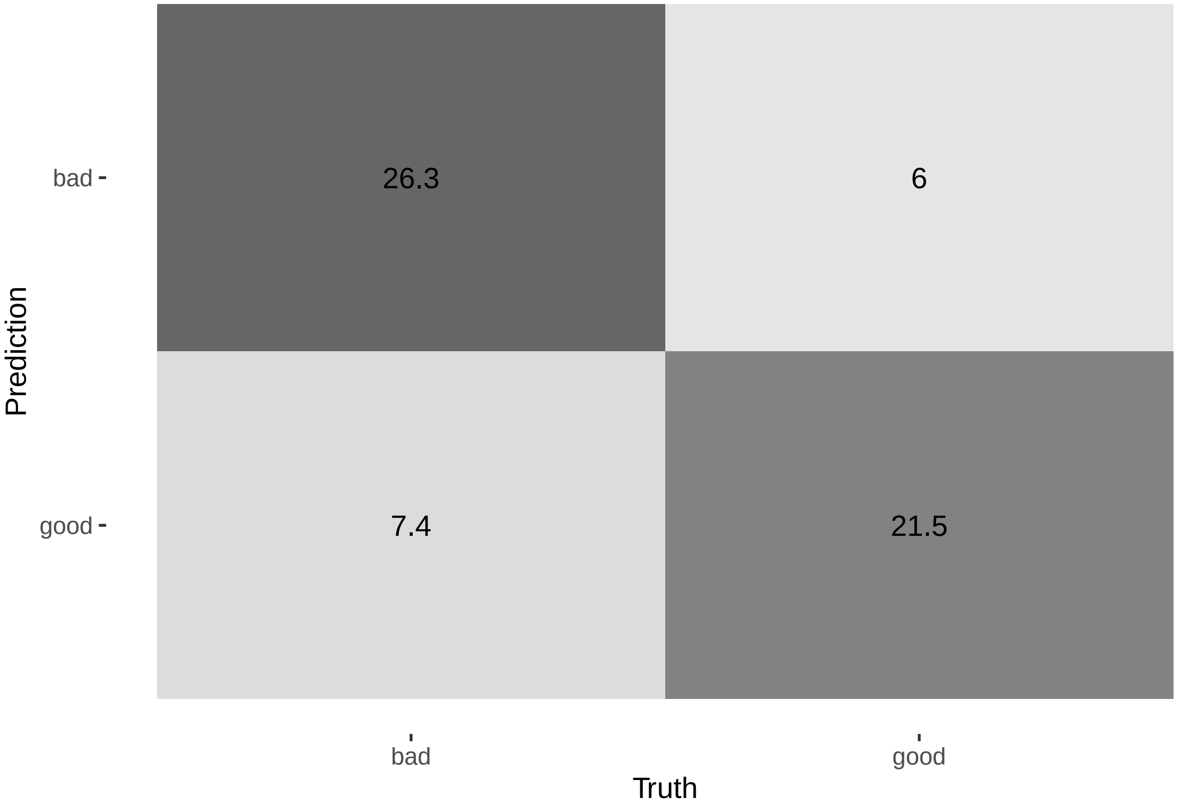
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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"
```

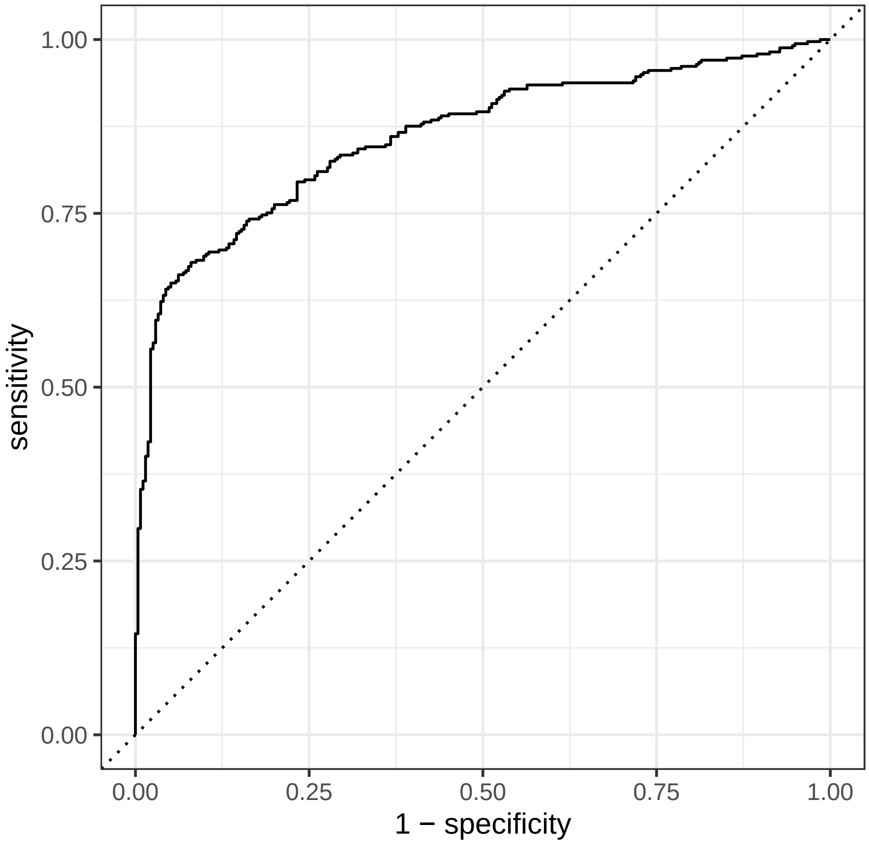

bad
good
Prediction
26.3
6
7.4
21.5
bad
good
Truth

```
## [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
```

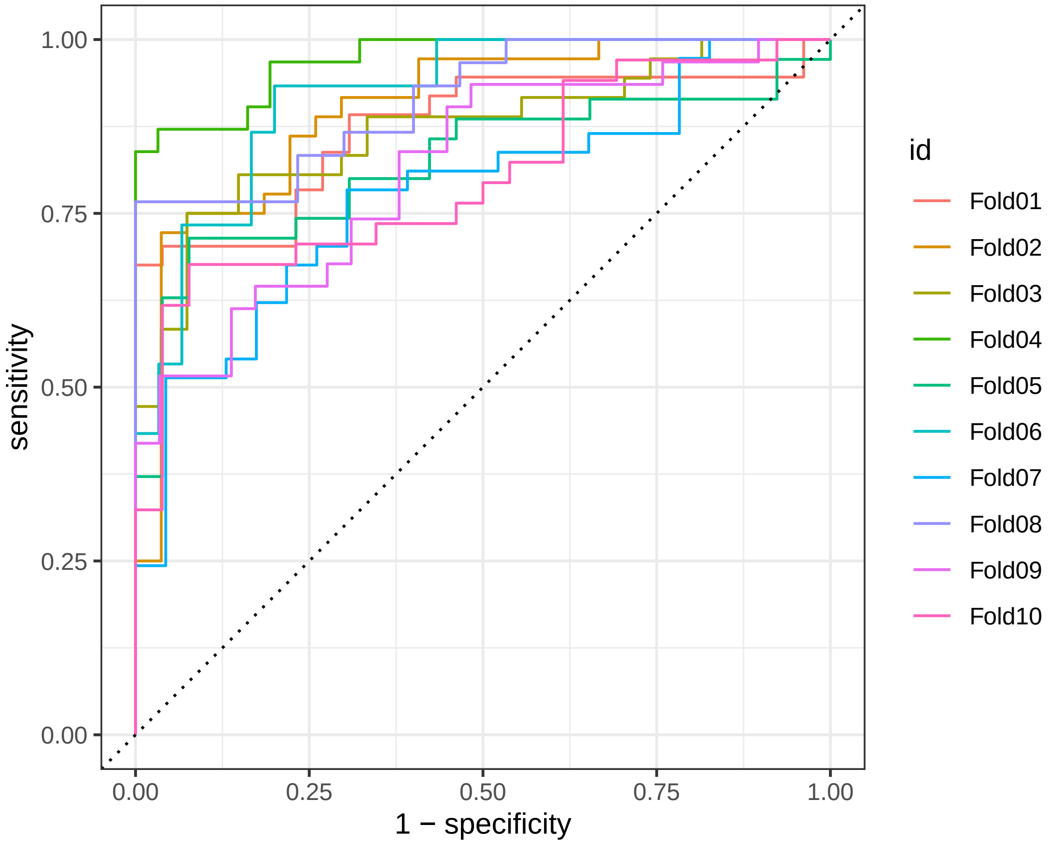
No TL

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

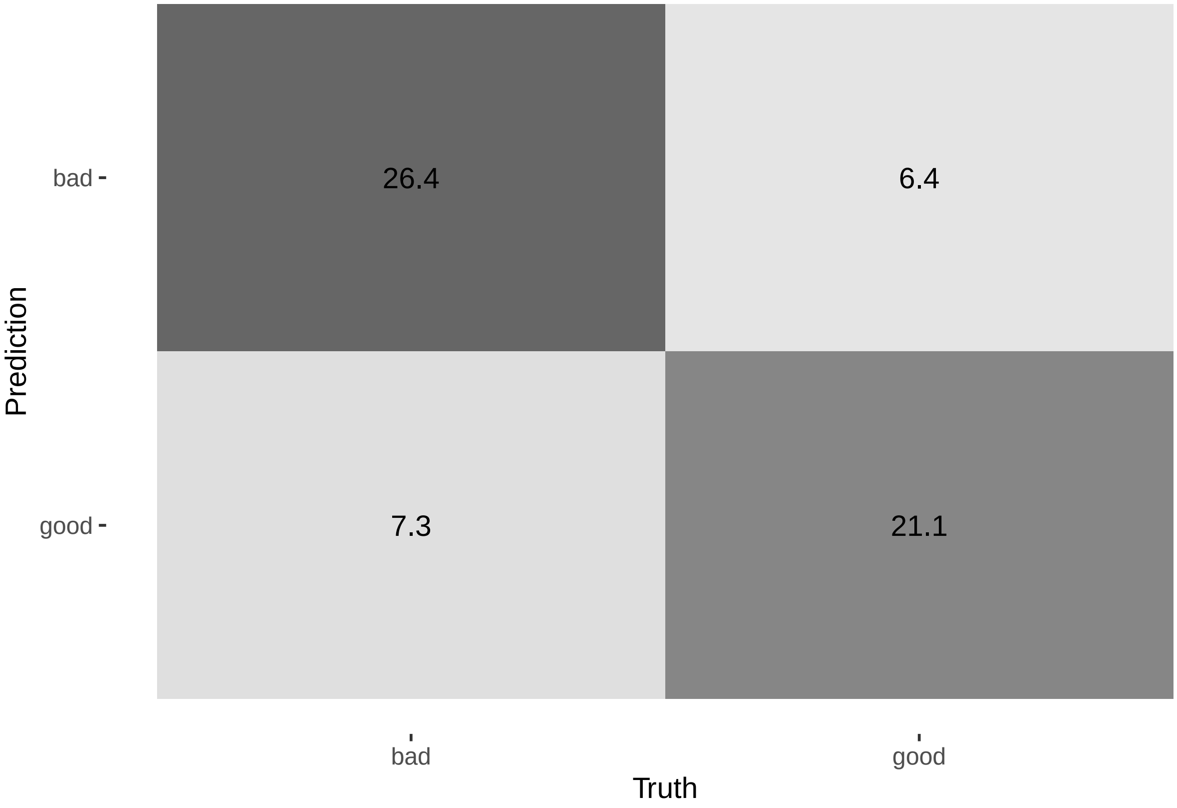
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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     0.776    10 0.0178  Preprocessor1_Model1
## 2 brier_class binary     0.150    10 0.00941 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"
```

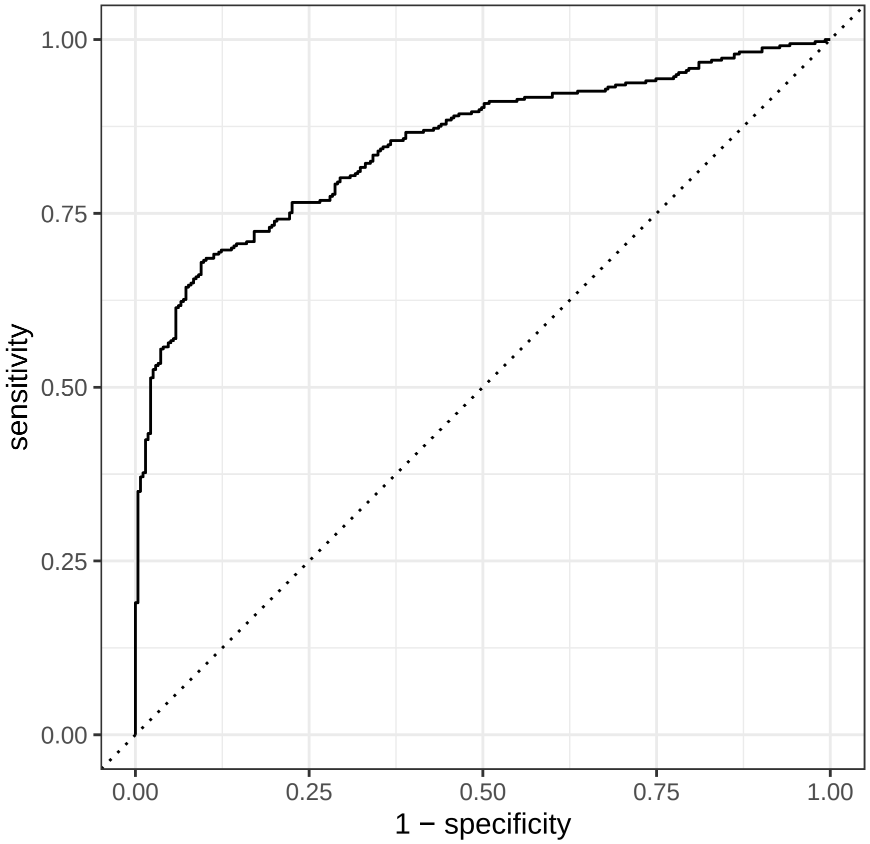

bad
good
Prediction
26.4
6.4
7.3
21.1
bad
good
Truth

```
## [1] "\n"
## # A tibble: 71 x 2
##    Variable                                            Importance
##    <chr>                                                    <dbl>
##  1 activity                                                14.0  
##  2 verb_dist                                               12.4  
##  3 RuleTooManyNominalConstructions.max_allowable_nouns     11.7  
##  4 ari                                                     11.5  
##  5 RuleLongSentences.max_length                            10.6  
##  6 gf                                                      10.1  
##  7 RuleTooFewVerbs.min_verb_frac                           10.0  
##  8 smog                                                     9.49
##  9 RuleLiteraryStyle                                        8.95
## 10 RulePredAtClauseBeginning.max_order                      7.58
## 11 RulePassive                                              6.47
## 12 fkgl                                                     5.22
## 13 atl                                                      5.21
## 14 mamr                                                     5.11
## 15 RuleMultiPartVerbs                                       4.57
## 16 RulePredAtClauseBeginning.max_order.v                    4.55
## 17 RuleTooManyNegations.max_negation_frac                   4.15
## 18 maentropy                                                4.11
## 19 mattr                                                    4.10
## 20 RuleTooLongExpressions                                   3.82
## 21 RuleVerbalNouns                                          3.77
## 22 RuleTooManyNominalConstructions.max_noun_frac            3.72
## 23 RulePredSubjDistance                                     3.66
## 24 entropy                                                  3.64
## 25 RuleAnaphoricReferences                                  3.61
## 26 cli                                                      3.42
## 27 maentropy.v                                              3.34
## 28 RuleLongSentences.max_length.v                           3.30
## 29 mattr.v                                                  3.17
## 30 RuleCaseRepetition.max_repetition_count.v                3.04
## 31 RulePredSubjDistance.max_distance                        2.93
## 32 RuleDoubleAdpos.max_allowable_distance.v                 2.87
## 33 RuleCaseRepetition.max_repetition_frac.v                 2.83
## 34 RulePredObjDistance                                      2.79
## 35 RuleTooManyNegations.max_negation_frac.v                 2.61
## 36 RuleInfVerbDistance.max_distance.v                       2.59
## 37 RulePredSubjDistance.max_distance.v                      2.57
## 38 num_hapax                                                2.55
## 39 RuleCaseRepetition.max_repetition_count                  2.55
## 40 word_count                                               2.50
## 41 RuleTooManyNegations.max_allowable_negations             2.48
## 42 RuleInfVerbDistance.max_distance                         2.46
## 43 RuleMultiPartVerbs.max_distance.v                        2.45
## 44 RuleTooManyNegations.max_allowable_negations.v           2.45
## 45 RulePredObjDistance.max_distance                         2.40
## 46 char_count                                               2.40
## 47 ttr                                                      2.37
## 48 RuleCaseRepetition.max_repetition_frac                   2.37
## 49 RulePredObjDistance.max_distance.v                       2.34
## 50 RuleDoubleAdpos                                          2.33
## 51 RuleMultiPartVerbs.max_distance                          2.31
## 52 RuleInfVerbDistance                                       2.31
## 53 syllab_count                                              2.30
## 54 fre                                                       2.26
## 55 RuleDoubleAdpos.max_allowable_distance                    2.01
## 56 RuleTooManyNominalConstructions.max_noun_frac.v           1.95
## 57 sent_count                                                1.94
## 58 RuleAbstractNouns                                         1.91
## 59 RuleWeakMeaningWords                                      1.81
## 60 hpoint                                                    1.62
## 61 RuleReflexivePassWithAnimSubj                             1.59
## 62 RuleGPwordorder                                           1.33
## 63 RuleGPdeverbaddr                                          1.26
## 64 RuleGPpatinstr                                            1.25
## 65 RuleRelativisticExpressions                               0.969
## 66 RuleGPdeverbsubj                                          0.901
## 67 RuleGPcoordovs                                            0.893
## 68 RuleGPpatbenperson                                        0.751
## 69 RuleRedundantExpressions                                  0.285
## 70 RuleGPadjective                                           0.281
## 71 RuleConfirmationExpressions                               0.218
```

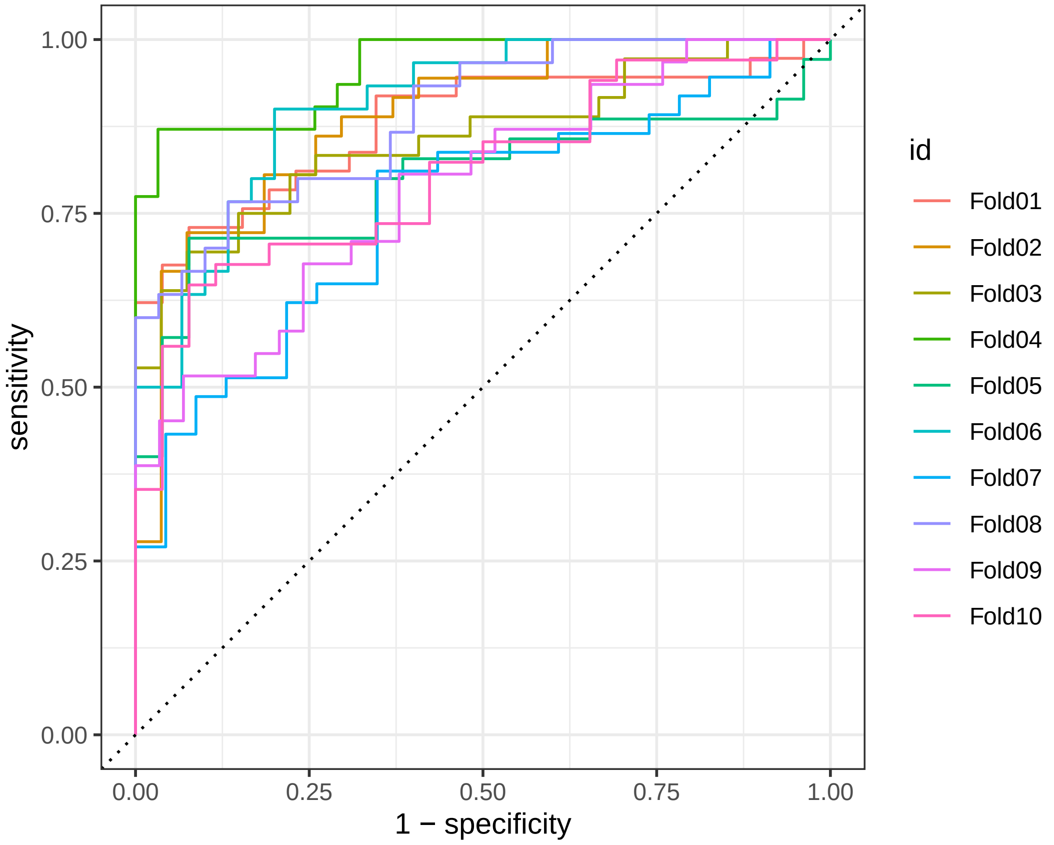
IAC

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

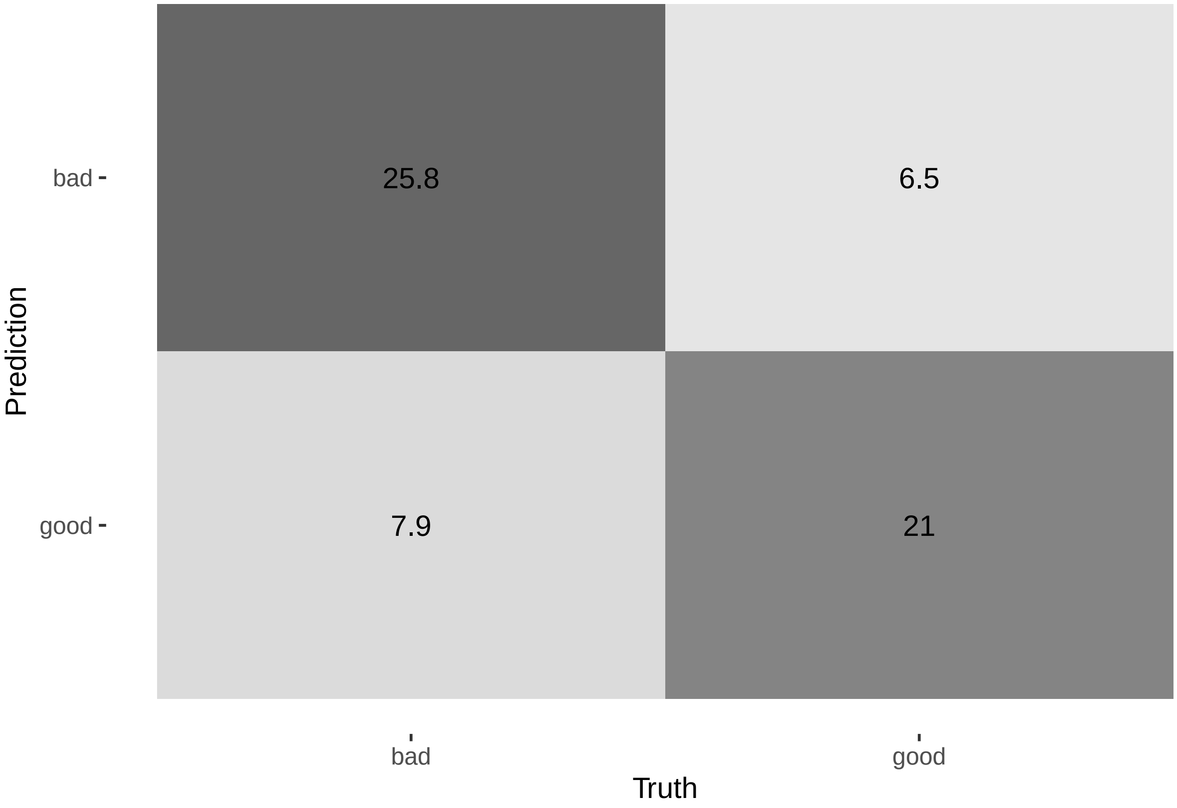
```
## RF workflow:
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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"
```


sensitivity
1.00
0.75
0.50
0.25
0.00
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"
```


Prediction
bad
good
25.8
6.5
7.9
21
bad
good
Truth

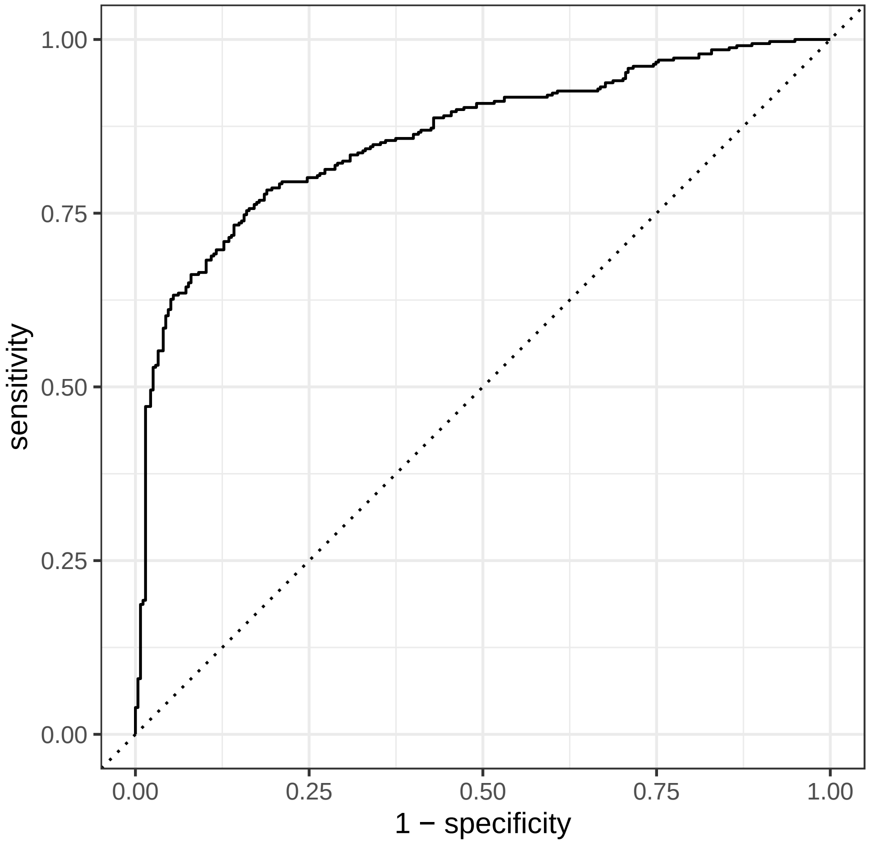
```
## [1] "\n"
## # A tibble: 44 x 2
##    Variable                                               Importance
##    <chr>                                                       <dbl>
##  1 RuleTooManyNominalConstructions.max_allowable_nouns         15.5
##  2 activity                                                    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

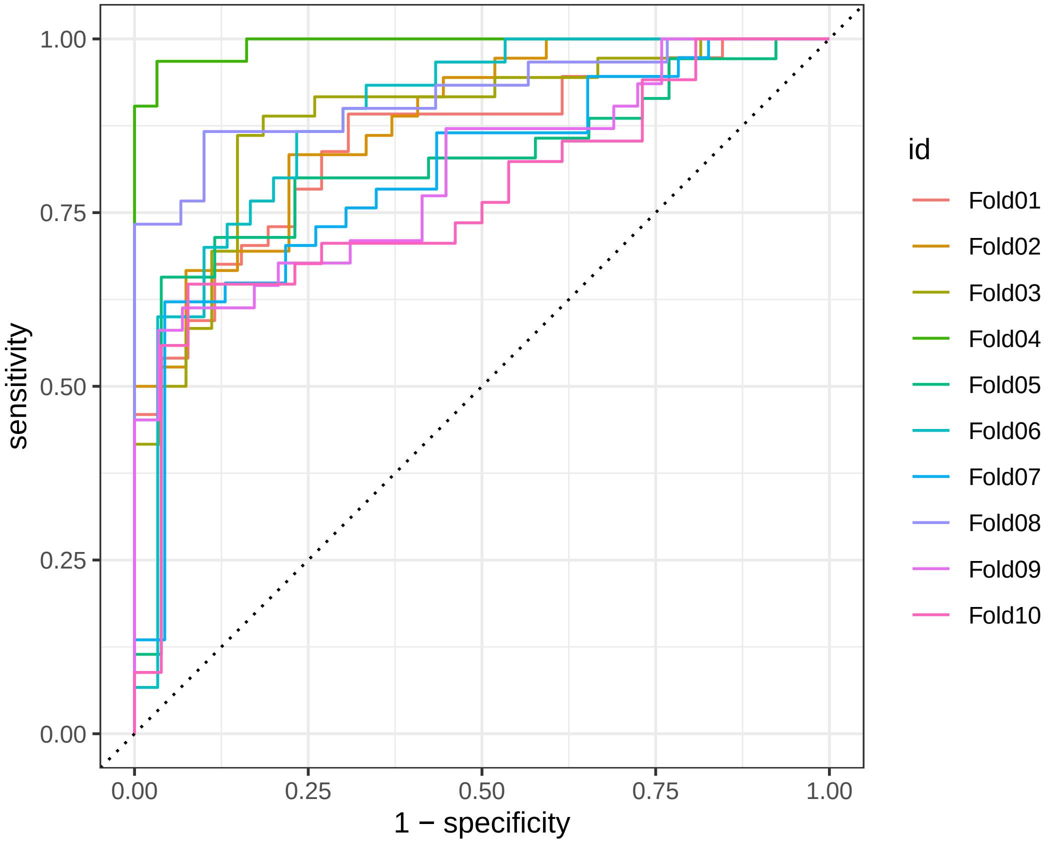
```
model_rf_counts <- train_random_forest(recipe_counts_nocorr, training_set, folds)
```

```
## RF workflow:
```

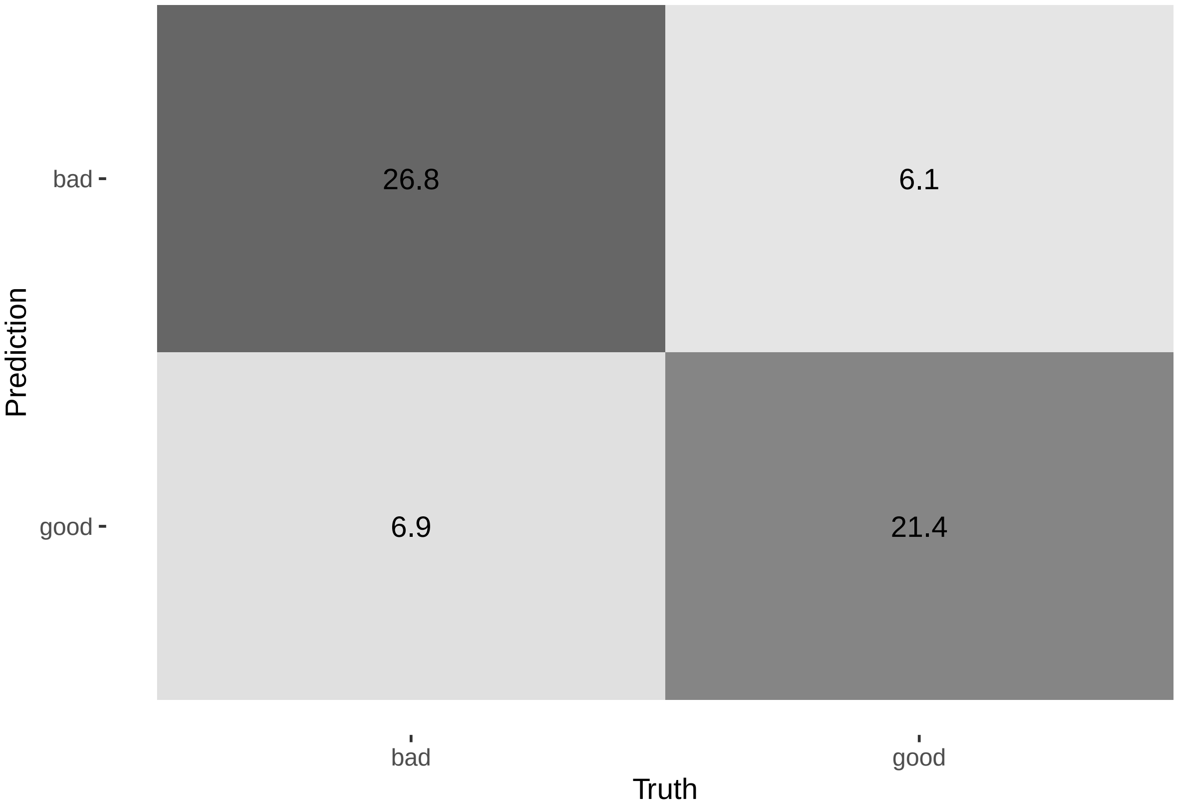
```
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: rand_forest()
##
## -- Preprocessor ----------------------------------------------------------------
## 1 Recipe Step
##
## * step_normalize()
##
## -- Model -----------------------------------------------------------------------
## 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     0.787    10 0.0199  Preprocessor1_Model1
## 2 brier_class binary     0.155    10 0.00814 Preprocessor1_Model1
## 3 roc_auc     binary     0.862    10 0.0207  Preprocessor1_Model1
```



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


sensitivity
1.00
0.75
0.50
0.25
0.00
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: 28 x 2
##    Variable                      Importance
##    <chr>                              <dbl>
##  1 RuleMultiPartVerbs                30.7
##  2 RuleLiteraryStyle                 28.3
##  3 RulePassive                       28.0
##  4 RulePredSubjDistance              20.0
##  5 RuleInfVerbDistance               15.2
##  6 sent_count                        12.7
##  7 RuleVerbalNouns                   11.6
##  8 word_count                        10.6
##  9 num_hapax                          8.93
## 10 char_count                         8.75
## 11 RuleTooLongExpressions             8.48
## 12 RulePredObjDistance                8.26
## 13 syllab_count                       8.26
## 14 RuleDoubleAdpos                    7.74
## 15 RuleAbstractNouns                  6.96
## 16 RuleAnaphoricReferences            6.64
## 17 RuleGPwordorder                    6.49
## 18 RuleWeakMeaningWords               5.91
## 19 RuleReflexivePassWithAnimSubj      5.76
## 20 RuleGPdeverbsubj                   3.72
## 21 RuleGPpatinstr                     3.42
## 22 RuleGPdeverbaddr                   2.99
## 23 RuleGPpatbenperson                 2.16
## 24 RuleGPcoordovs                     1.86
## 25 RuleRelativisticExpressions        1.84
## 26 RuleConfirmationExpressions        1.36
## 27 RuleRedundantExpressions           0.550
## 28 RuleGPadjective                    0.550
```

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)
```

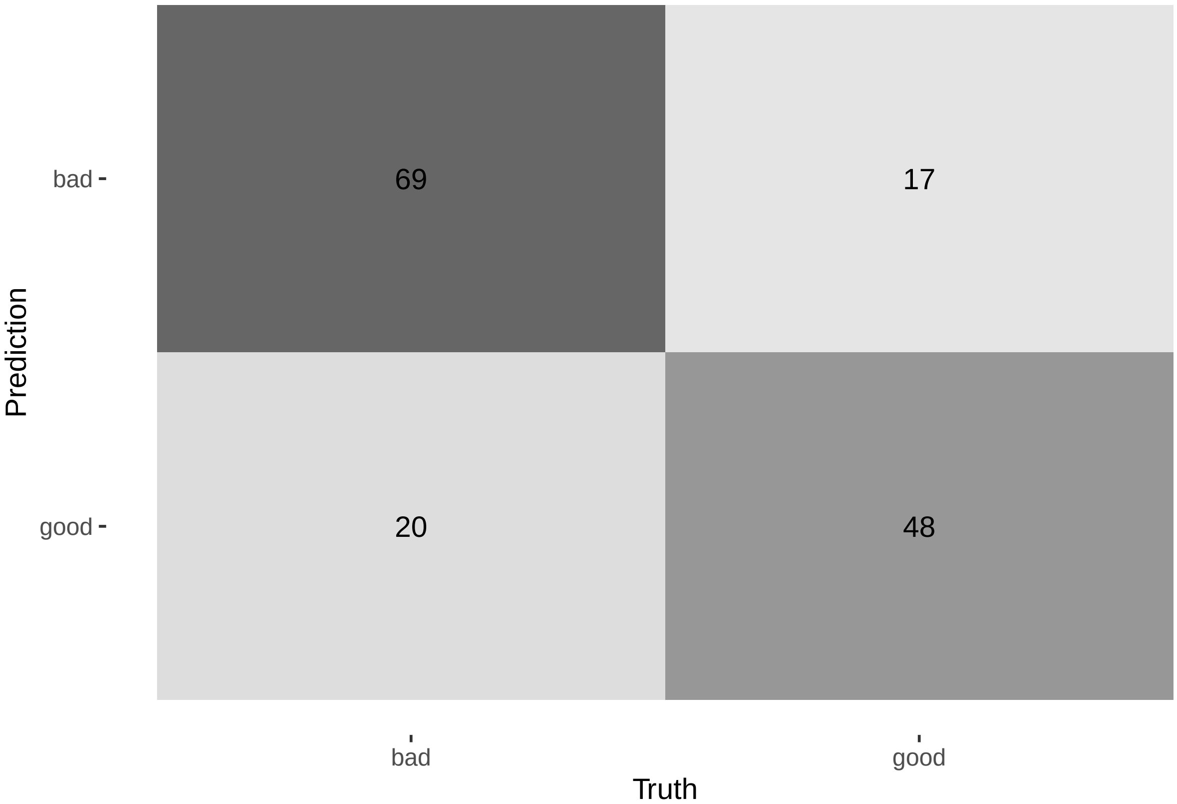
```
## Confusion Matrix and Statistics
## 
##           Reference
## Prediction bad good
##       bad   65   16
##       good  24   49
## 
##                Accuracy : 0.7403
##                  95% CI : (0.6635, 0.8075)
##     No Information Rate : 0.5779
##     P-Value [Acc > NIR] : 2.051e-05
## 
##                   Kappa : 0.4763
## 
##  Mcnemar's Test P-Value : 0.2684
## 
##             Sensitivity : 0.7538
##             Specificity : 0.7303
##          Pos Pred Value : 0.6712
##          Neg Pred Value : 0.8025
##              Prevalence : 0.4221
##          Detection Rate : 0.3182
##    Detection Prevalence : 0.4740
##       Balanced Accuracy : 0.7421
## 
##        'Positive' Class : good
## 
```

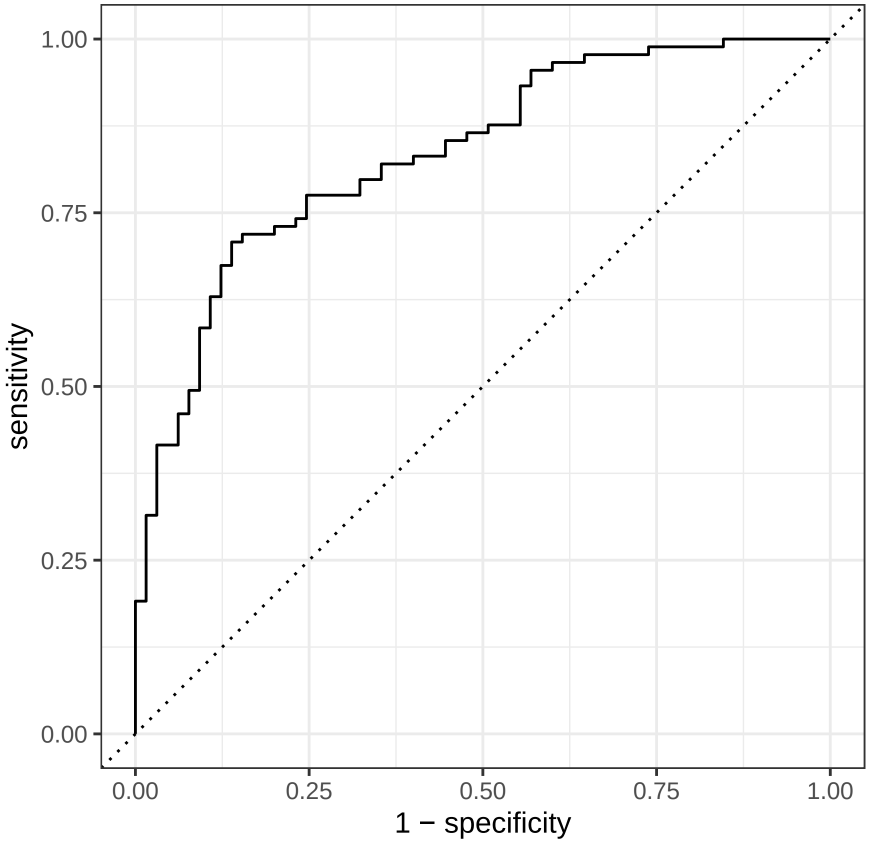
Lasso

All

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

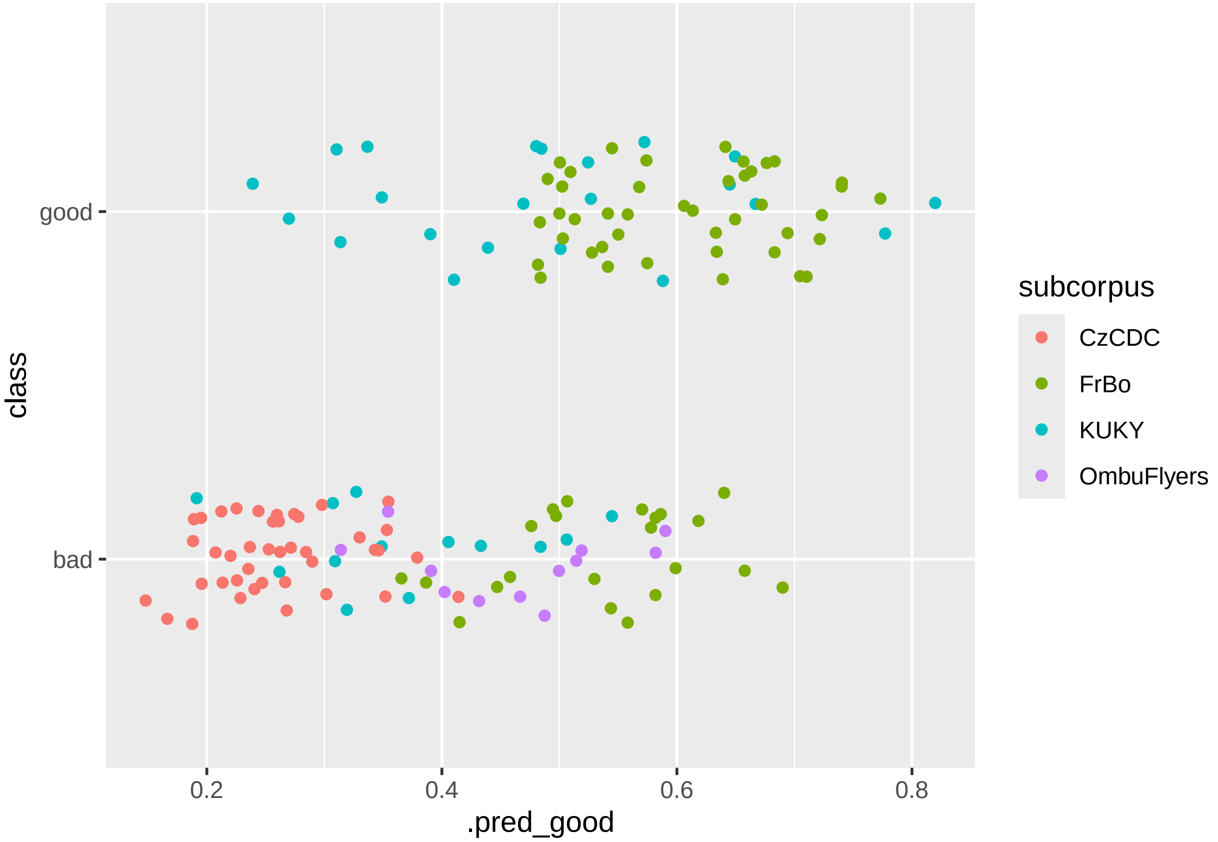
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.760 Preprocessor1_Model1
## 2 roc_auc     binary         0.835 Preprocessor1_Model1
## 3 brier_class binary         0.178 Preprocessor1_Model1
```





```
## # A tibble: 71 x 3
##    Variable                                                Importance Sign
##    <chr>                                                    <dbl> <chr>
##  1 char_count                                            13.8     POS
##  2 syllab_count                                           9.84    NEG
##  3 ari                                                    5.09    NEG
##  4 word_count                                             4.36    NEG
##  5 RuleLongSentences.max_length                           3.32    POS
##  6 fre                                                    2.55    NEG
##  7 gf                                                     2.25    NEG
##  8 RuleTooFewVerbs.min_verb_frac                          1.74    NEG
##  9 activity                                               1.64    POS
## 10 smog                                                   1.53    POS
## 11 sent_count                                             1.21    POS
## 12 RuleCaseRepetition.max_repetition_frac.v               1.20    POS
## 13 mattr                                                  1.19    NEG
## 14 hpoint                                                 1.19    NEG
## 15 ttr                                                    1.06    NEG
## 16 atl                                                    1.02    POS
## 17 maentropy.v                                            0.900   POS
## 18 maentropy                                              0.892   POS
## 19 RuleLongSentences.max_length.v                         0.830   POS
## 20 RuleCaseRepetition.max_repetition_frac                 0.821   POS
## 21 cli                                                    0.791   NEG
## 22 entropy                                                0.598   NEG
## 23 num_hapax                                              0.547   POS
## 24 RuleMultiPartVerbs                                     0.534   POS
## 25 RulePredSubjDistance.max_distance                      0.519   NEG
## 26 RuleAnaphoricReferences                                0.516   POS
## 27 RulePassive                                            0.492   NEG
## 28 RulePredSubjDistance                                   0.466   POS
## 29 RuleLiteraryStyle                                      0.410   NEG
## 30 mattr.v                                                0.405   NEG
## 31 RuleGPadjective                                        0.392   POS
## 32 verb_dist                                              0.327   POS
## 33 RuleInfVerbDistance.max_distance                       0.322   POS
## 34 RulePredObjDistance.max_distance                       0.320   NEG
## 35 RuleTooManyNominalConstructions.max_noun_frac          0.319   NEG
## 36 RuleTooManyNominalConstructions.max_allowable_nouns    0.291   POS
## 37 RuleTooLongExpressions                                 0.290   POS
## 38 RuleRelativisticExpressions                            0.257   NEG
## 39 RulePredAtClauseBeginning.max_order                    0.255   NEG
## 40 RuleCaseRepetition.max_repetition_count                0.249   NEG
## 41 RuleGPdeverbaddr                                       0.246   NEG
## 42 RuleInfVerbDistance.max_distance.v                     0.243   NEG
## 43 RuleCaseRepetition.max_repetition_count.v              0.236   NEG
## 44 RuleTooManyNegations.max_allowable_negations           0.230   POS
## 45 RuleRedundantExpressions                               0.195   NEG
## 46 RuleGPdeverbsubj                                       0.189   NEG
## 47 RuleConfirmationExpressions                            0.186   POS
## 48 RuleInfVerbDistance                                    0.166   POS
## 49 RuleGPpatbenperson                                     0.162   NEG
## 50 RuleMultiPartVerbs.max_distance.v                      0.157   POS
## 51 RuleGPwordorder                                        0.142   NEG
## 52 RuleTooManyNegations.max_negation_frac                 0.134   POS
## 53 RuleTooManyNegations.max_allowable_negations.v         0.133   NEG
## 54 RuleGPpatinstr                                         0.125   NEG
## 55 RuleWeakMeaningWords                                   0.118   NEG
## 56 RuleAbstractNouns                                      0.103   POS
## 57 mamr                                                   0.102   NEG
## 58 RuleDoubleAdpos.max_allowable_distance.v               0.0976  POS
## 59 RuleMultiPartVerbs.max_distance                        0.0891  POS
## 60 RuleReflexivePassWithAnimSubj                          0.0819  NEG
## 61 RuleTooManyNominalConstructions.max_noun_frac.v        0.0799  POS
## 62 RulePredSubjDistance.max_distance.v                    0.0700  NEG
## 63 RuleDoubleAdpos                                        0.0563  POS
## 64 RuleVerbalNouns                                        0.0556  NEG
## 65 RuleTooManyNegations.max_negation_frac.v               0.0552  NEG
## 66 RuleGPcoordovs                                         0.0487  NEG
## 67 RuleDoubleAdpos.max_allowable_distance                 0.0357  NEG
## 68 RulePredAtClauseBeginning.max_order.v                  0.0334  POS
## 69 RulePredObjDistance.max_distance.v                     0.0322  POS
## 70 RulePredObjDistance                                    0.00271 POS
## 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
```

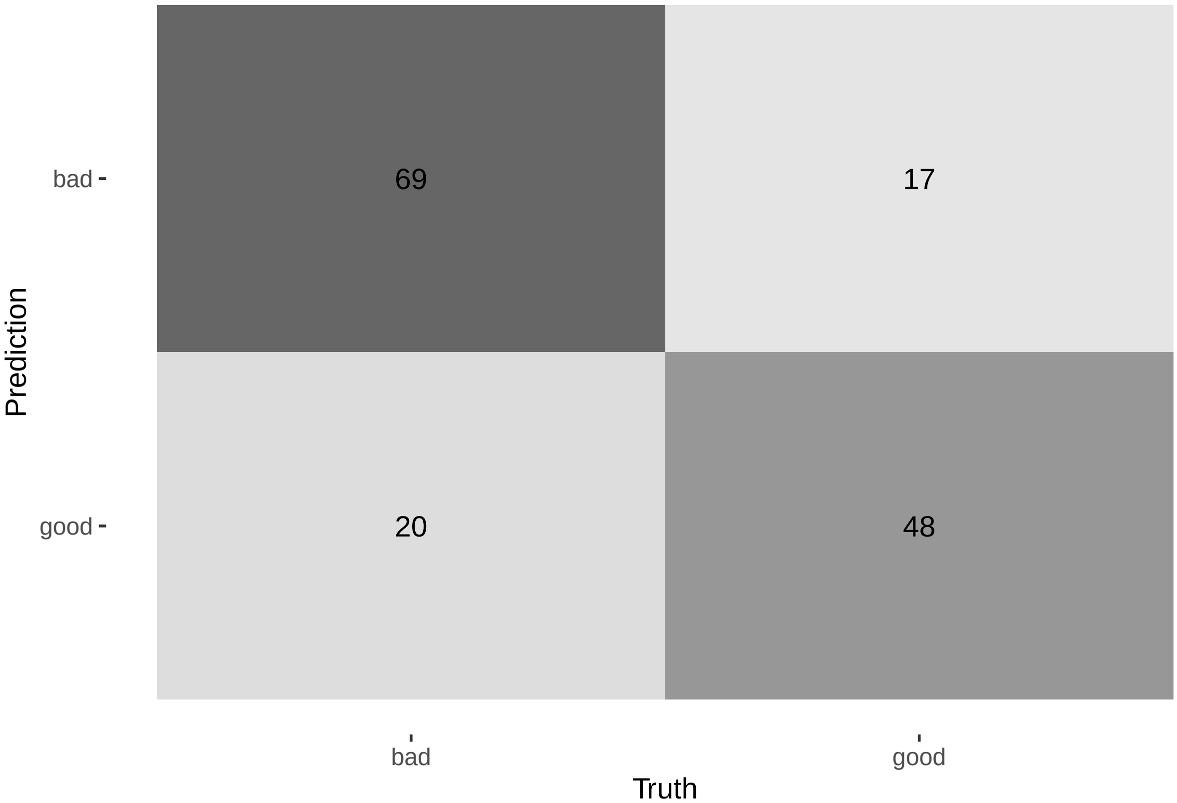
```
lfit_lasso_all %>%
  lasso_get_coefficients() %>%
  print(n = 100)
```

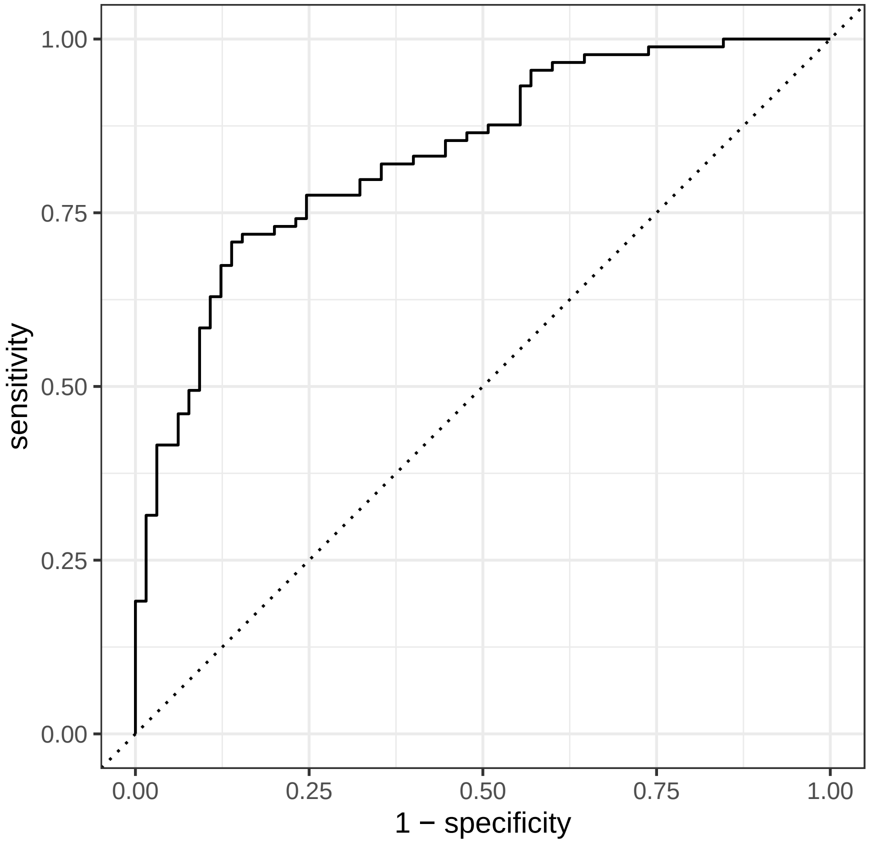
```
## # A tibble: 72 x 3
##    term                                                 estimate penalty
##    <chr>                                                   <dbl>   <dbl>
##  1 (Intercept)                                         -0.230     0.0924
##  2 smog                                                -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
```

No TL

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

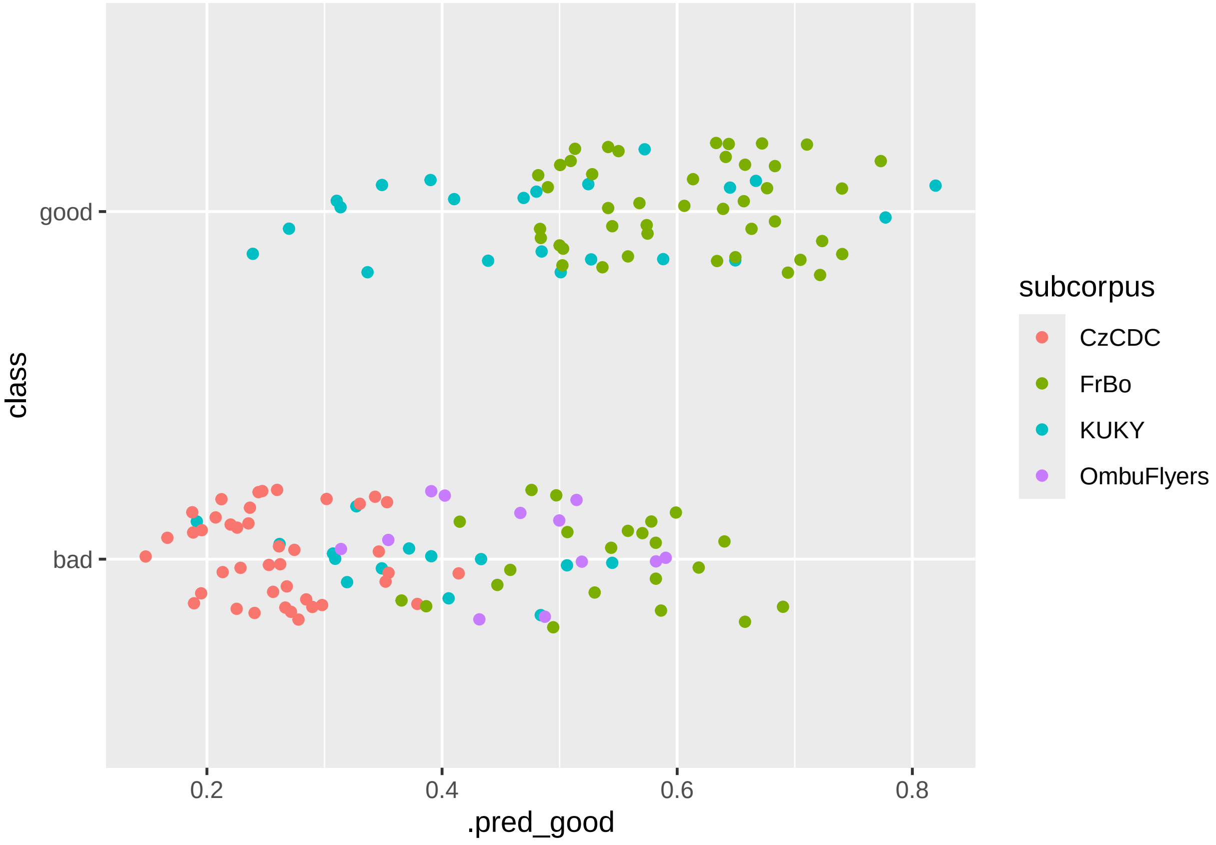
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.760 Preprocessor1_Model1
## 2 roc_auc     binary         0.835 Preprocessor1_Model1
## 3 brier_class binary         0.178 Preprocessor1_Model1
```





```
## # A tibble: 71 x 3
##    Variable                                                          Importance Sign
##    <chr>                                                    <dbl> <chr>
##  1 char_count                                           13.8     POS
##  2 syllab_count                                          9.84    NEG
##  3 ari                                                   5.09    NEG
##  4 word_count                                            4.36    NEG
##  5 RuleLongSentences.max_length                          3.32    POS
##  6 fre                                                   2.55    NEG
##  7 gf                                                    2.25    NEG
##  8 RuleTooFewVerbs.min_verb_frac                         1.74    NEG
##  9 activity                                              1.64    POS
## 10 smog                                                  1.53    POS
## 11 sent_count                                            1.21    POS
## 12 RuleCaseRepetition.max_repetition_frac.v              1.20    POS
## 13 mattr                                                 1.19    NEG
## 14 hpoint                                                1.19    NEG
## 15 ttr                                                   1.06    NEG
## 16 atl                                                   1.02    POS
## 17 maentropy.v                                           0.900   POS
## 18 maentropy                                             0.892   POS
## 19 RuleLongSentences.max_length.v                        0.830   POS
## 20 RuleCaseRepetition.max_repetition_frac                0.821   POS
## 21 cli                                                   0.791   NEG
## 22 entropy                                               0.598   NEG
## 23 num_hapax                                             0.547   POS
## 24 RuleMultiPartVerbs                                    0.534   POS
## 25 RulePredSubjDistance.max_distance                     0.519   NEG
## 26 RuleAnaphoricReferences                               0.516   POS
## 27 RulePassive                                           0.492   NEG
## 28 RulePredSubjDistance                                  0.466   POS
## 29 RuleLiteraryStyle                                     0.410   NEG
## 30 mattr.v                                               0.405   NEG
## 31 RuleGPadjective                                       0.392   POS
## 32 verb_dist                                             0.327   POS
## 33 RuleInfVerbDistance.max_distance                      0.322   POS
## 34 RulePredObjDistance.max_distance                      0.320   NEG
## 35 RuleTooManyNominalConstructions.max_noun_frac         0.319   NEG
## 36 RuleTooManyNominalConstructions.max_allowable_nouns    0.291   POS
## 37 RuleTooLongExpressions                                0.290   POS
## 38 RuleRelativisticExpressions                           0.257   NEG
## 39 RulePredAtClauseBeginning.max_order                   0.255   NEG
## 40 RuleCaseRepetition.max_repetition_count               0.249   NEG
## 41 RuleGPdeverbaddr                                      0.246   NEG
## 42 RuleInfVerbDistance.max_distance.v                    0.243   NEG
## 43 RuleCaseRepetition.max_repetition_count.v             0.236   NEG
## 44 RuleTooManyNegations.max_allowable_negations          0.230   POS
## 45 RuleRedundantExpressions                              0.195   NEG
## 46 RuleGPdeverbsubj                                      0.189   NEG
## 47 RuleConfirmationExpressions                           0.186   POS
## 48 RuleInfVerbDistance                                   0.166   POS
## 49 RuleGPpatbenperson                                    0.162   NEG
## 50 RuleMultiPartVerbs.max_distance.v                     0.157   POS
## 51 RuleGPwordorder                                       0.142   NEG
## 52 RuleTooManyNegations.max_negation_frac                0.134   POS
## 53 RuleTooManyNegations.max_allowable_negations.v        0.133   NEG
## 54 RuleGPpatinstr                                         0.125   NEG
## 55 RuleWeakMeaningWords                                   0.118   NEG
## 56 RuleAbstractNouns                                      0.103   POS
## 57 mamr                                                   0.102   NEG
## 58 RuleDoubleAdpos.max_allowable_distance.v               0.0976  POS
## 59 RuleMultiPartVerbs.max_distance                        0.0891  POS
## 60 RuleReflexivePassWithAnimSubj                          0.0819  NEG
## 61 RuleTooManyNominalConstructions.max_noun_frac.v        0.0799  POS
## 62 RulePredSubjDistance.max_distance.v                    0.0700  NEG
## 63 RuleDoubleAdpos                                        0.0563  POS
## 64 RuleVerbalNouns                                        0.0556  NEG
## 65 RuleTooManyNegations.max_negation_frac.v               0.0552  NEG
## 66 RuleGPcoordovs                                         0.0487  NEG
## 67 RuleDoubleAdpos.max_allowable_distance                 0.0357  NEG
## 68 RulePredAtClauseBeginning.max_order.v                  0.0334  POS
## 69 RulePredObjDistance.max_distance.v                     0.0322  POS
## 70 RulePredObjDistance                                    0.00271 POS
## 71 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
```

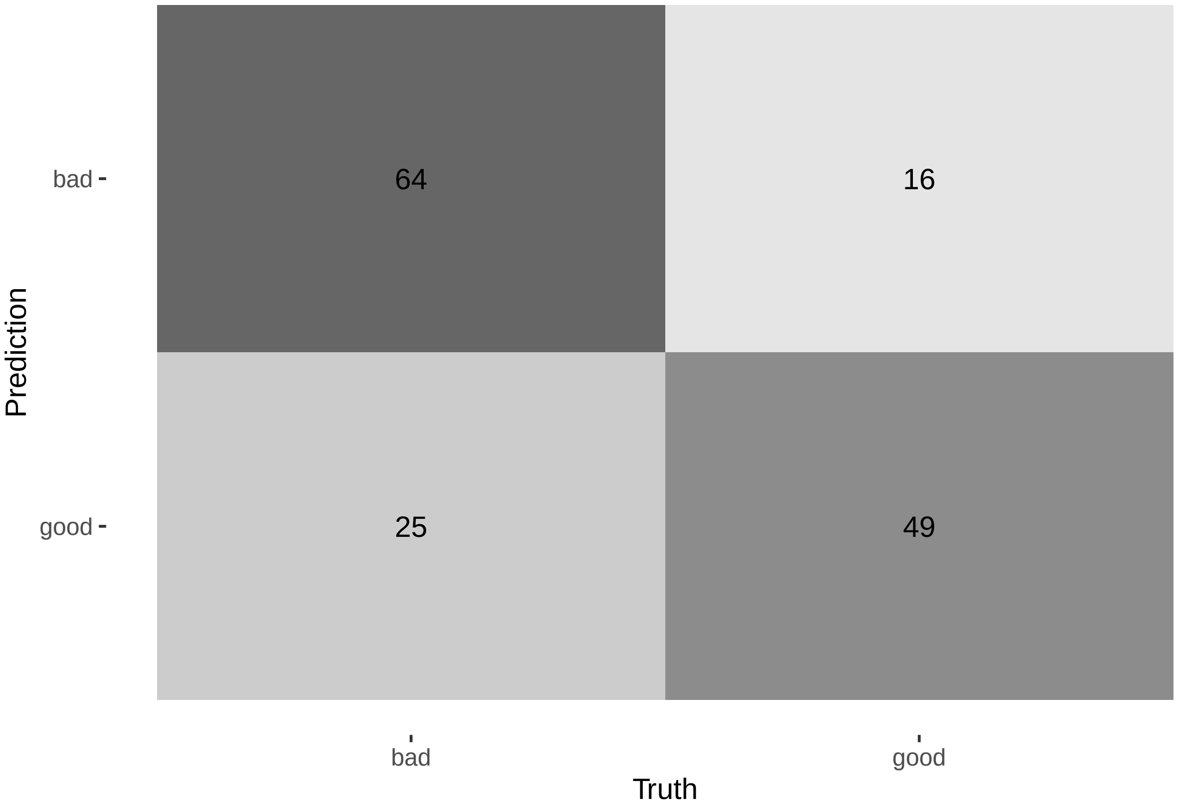
```r
lfit_lasso_notl %>%
  lasso_get_coefficients() %>%
  print(n = 100)
```

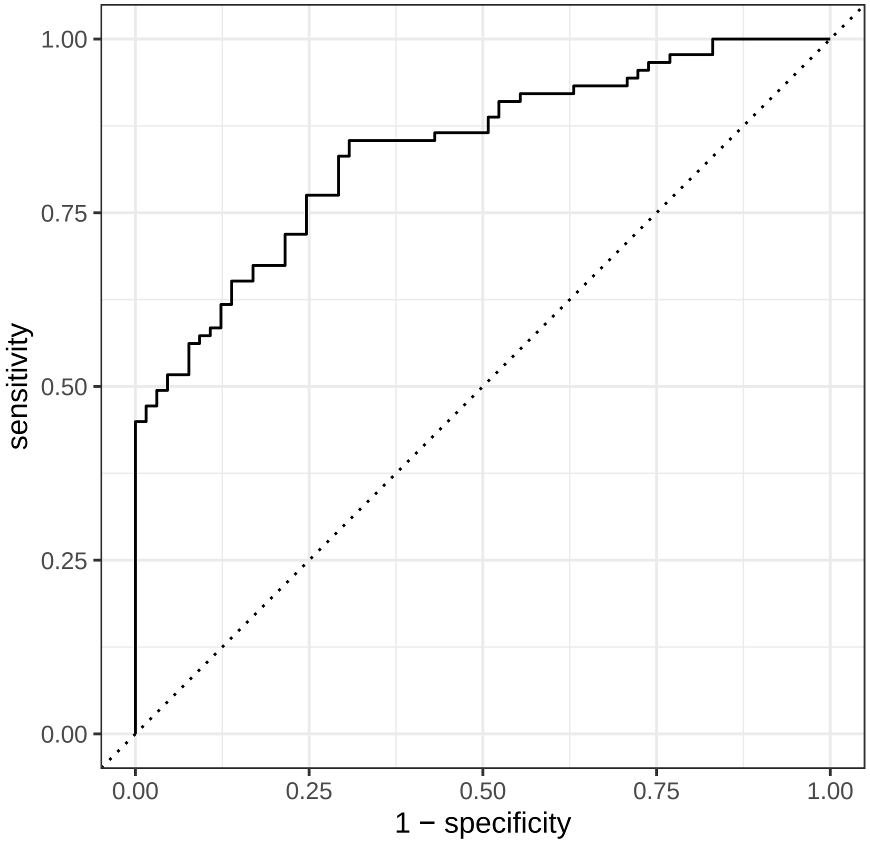
```
## # A tibble: 72 x 3
##    term                                                 estimate penalty
##    <chr>                                                   <dbl>   <dbl>
##  1 (Intercept)                                         -0.230     0.0924
##  2 smog                                                -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
```

IAC

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

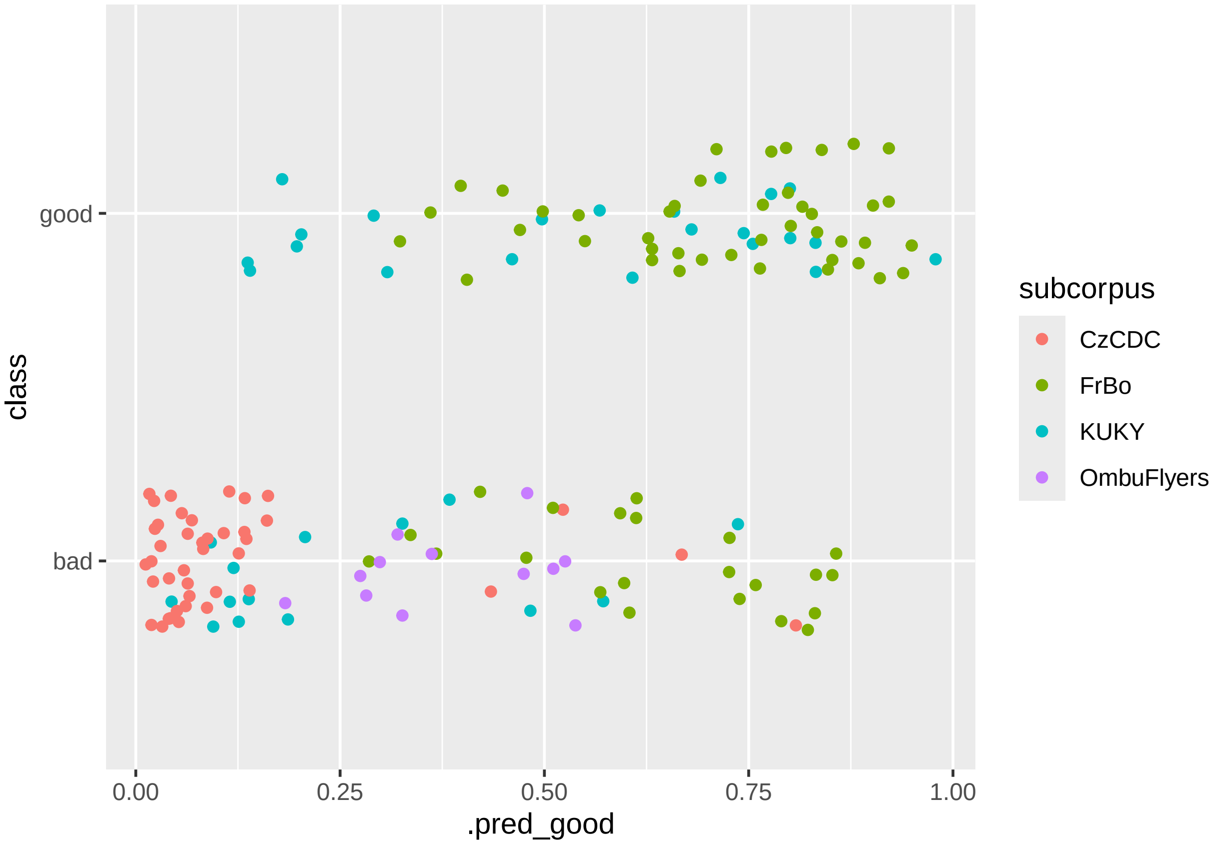
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.734 Preprocessor1_Model1
## 2 roc_auc     binary         0.840 Preprocessor1_Model1
## 3 brier_class binary         0.164 Preprocessor1_Model1
```





```
## # A tibble: 44 x 3
##    Variable                                                   Importance Sign
##    <chr>                                                      <dbl> <chr>
##  1 RuleCaseRepetition.max_repetition_frac.v                49.6     POS
##  2 maentropy.v                                             46.4     POS
##  3 RuleTooFewVerbs.min_verb_frac                           39.6     NEG
##  4 RuleCaseRepetition.max_repetition_frac                  33.7     POS
##  5 mattr                                                   19.5     NEG
##  6 mattr.v                                                 17.2     NEG
##  7 activity                                                16.6     POS
##  8 RuleTooManyNominalConstructions.max_noun_frac           13.8     NEG
##  9 ttr                                                      4.91    NEG
## 10 RuleTooManyNominalConstructions.max_noun_frac.v          3.68    POS
## 11 maentropy                                                3.60    POS
## 12 RuleCaseRepetition.max_repetition_count.v                2.97    NEG
## 13 atl                                                      2.13    POS
## 14 RuleLongSentences.max_length.v                           1.90    POS
## 15 RuleTooManyNominalConstructions.max_allowable_nouns.v    1.33    NEG
## 16 RuleTooManyNegations.max_allowable_negations.v           1.19    NEG
## 17 mamr                                                     1.05    POS
## 18 RuleInfVerbDistance.max_distance.v                       0.923   NEG
## 19 RuleTooManyNegations.max_negation_frac                   0.851   POS
## 20 ari                                                      0.816   NEG
## 21 entropy                                                  0.382   NEG
## 22 RuleTooManyNegations.max_allowable_negations             0.377   POS
## 23 RuleMultiPartVerbs.max_distance.v                        0.351   POS
## 24 RuleDoubleAdpos.max_allowable_distance.v                 0.291   NEG
## 25 gf                                                       0.285   NEG
## 26 RuleTooManyNegations.max_negation_frac.v                 0.276   POS
## 27 RulePredAtClauseBeginning.max_order.v                    0.233   NEG
## 28 RuleLongSentences.max_length                             0.223   POS
## 29 RuleTooManyNominalConstructions.max_allowable_nouns      0.203   POS
## 30 RuleCaseRepetition.max_repetition_count                  0.198   POS
## 31 fre                                                      0.173   NEG
## 32 RulePredSubjDistance.max_distance                        0.127   NEG
## 33 RuleInfVerbDistance.max_distance                         0.106   POS
## 34 hpoint                                                   0.0650  NEG
## 35 RulePredObjDistance.max_distance                         0.0644  NEG
## 36 verb_dist                                                0.0525  POS
## 37 RulePredSubjDistance.max_distance.v                      0.0480  POS
## 38 cli                                                      0.0475  NEG
## 39 RulePredAtClauseBeginning.max_order                      0.0357  NEG
## 40 RuleDoubleAdpos.max_allowable_distance                   0.0303  POS
## 41 RuleMultiPartVerbs.max_distance                          0.0229  POS
## 42 RulePredObjDistance.max_distance.v                       0.00554 POS
## 43 fkgl                                                     0       NEG
## 44 smog                                                     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
```

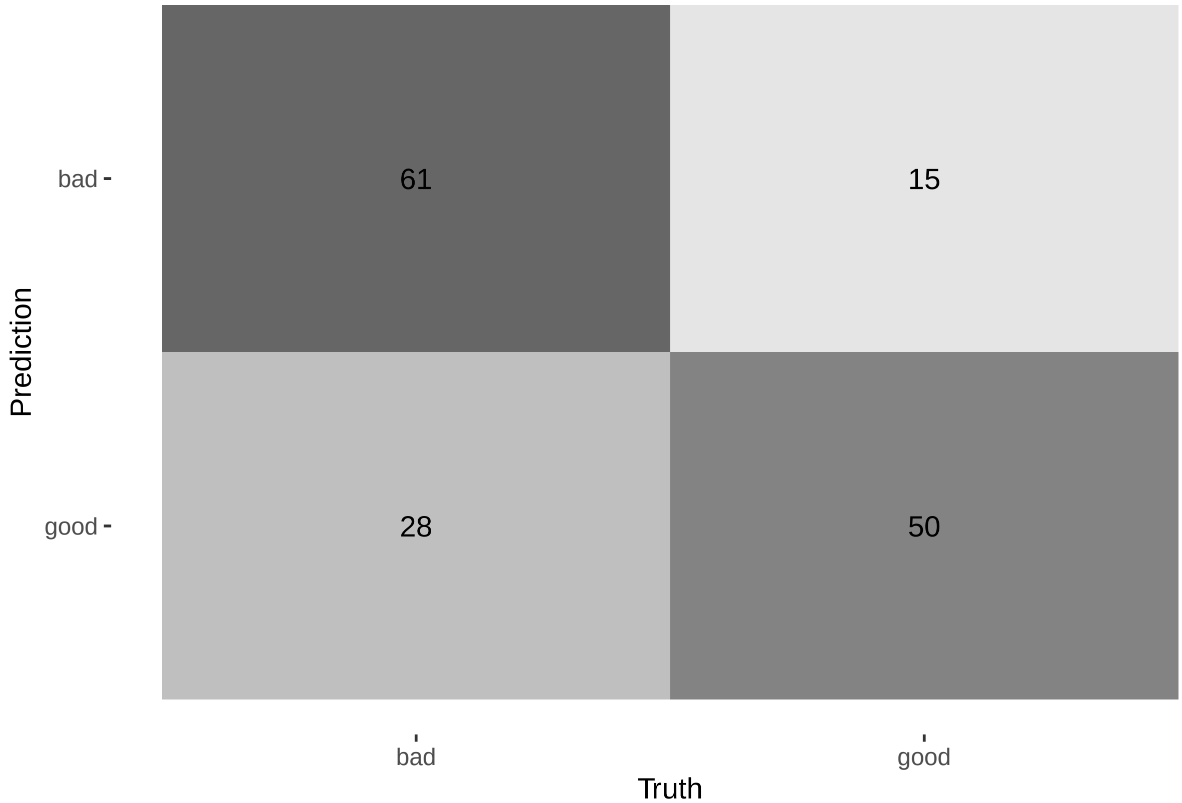
```
lfit_lasso_iac %>%
  lasso_get_coefficients() %>%
  print(n = 100)
```

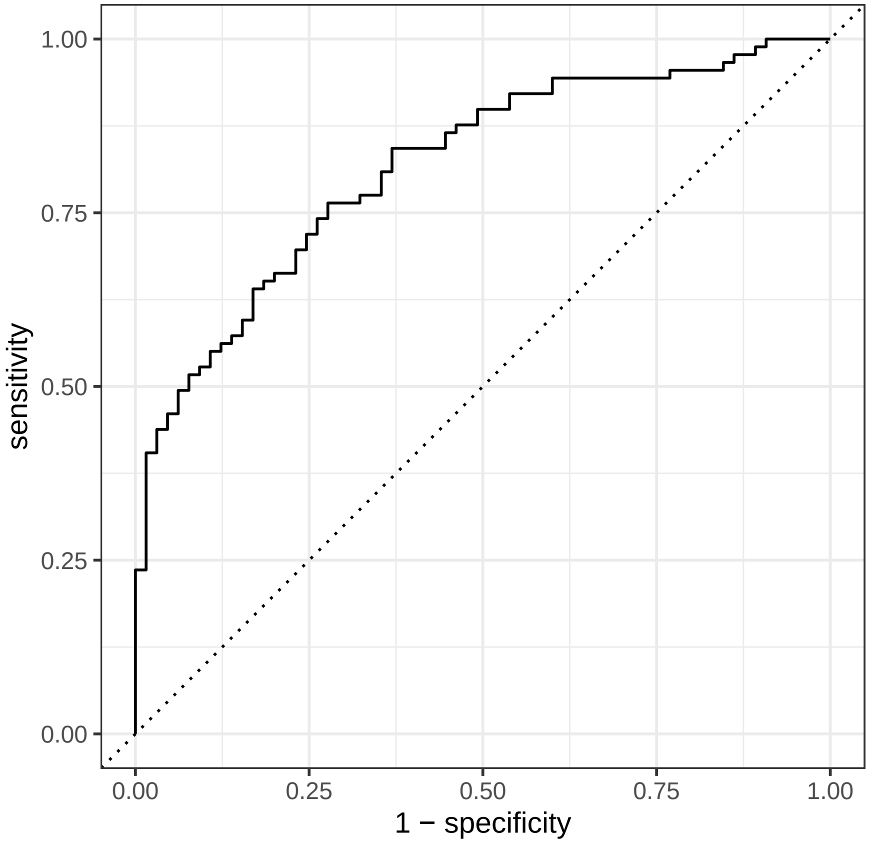
```
## # A tibble: 45 x 3
##    term                                                   estimate penalty
##    <chr>                                                     <dbl>   <dbl>
##  1 RuleTooFewVerbs.min_verb_frac                         -16.1     0.00386
##  2 RuleCaseRepetition.max_repetition_frac                -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
```

Counts

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

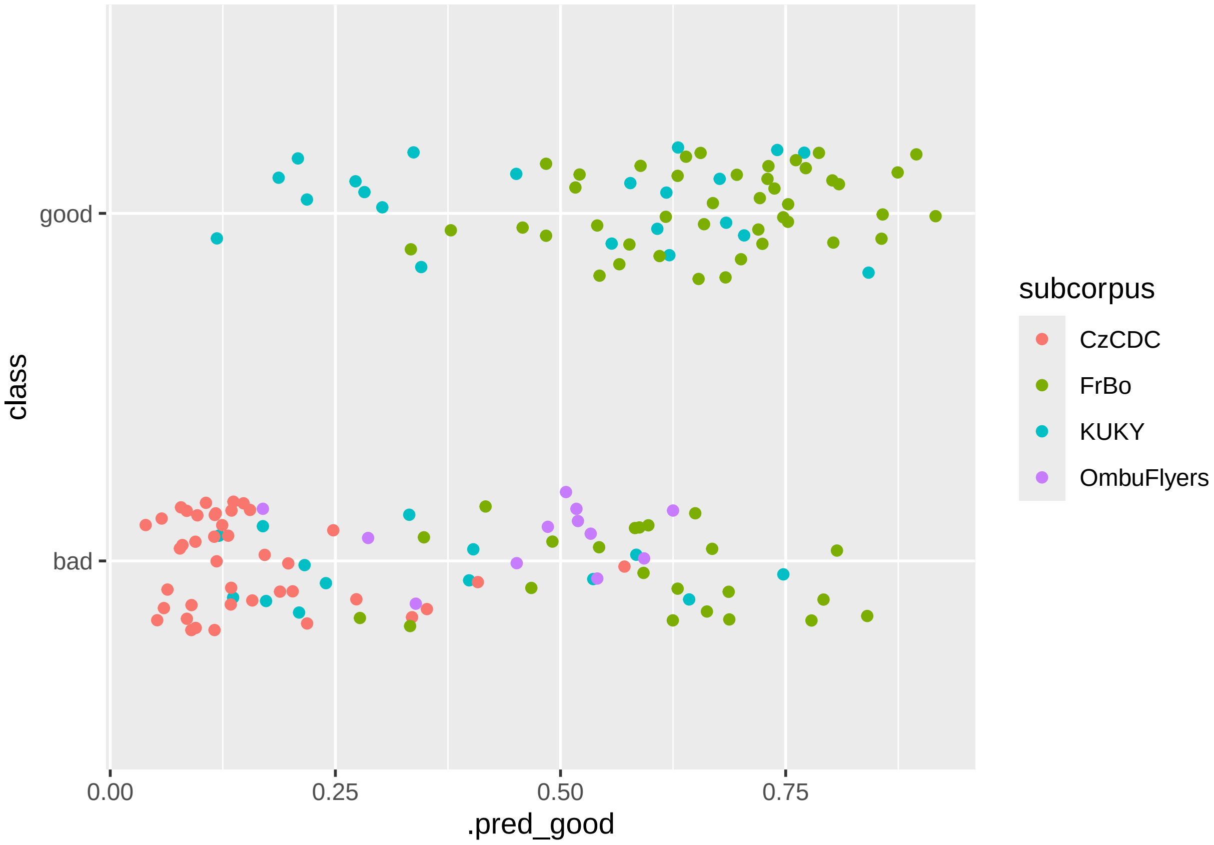
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.721 Preprocessor1_Model1
## 2 roc_auc     binary         0.816 Preprocessor1_Model1
## 3 brier_class binary         0.174 Preprocessor1_Model1
```





```
## # A tibble: 28 x 3
##    Variable                                Importance Sign
##    <chr>                                 <dbl> <chr>
##  1 RuleRedundantExpressions      2170.         NEG
##  2 RuleRelativisticExpressions    563.         NEG
##  3 RuleGPdeverbaddr               487.         NEG
##  4 RuleConfirmationExpressions    410.         POS
##  5 RuleAnaphoricReferences        349.         POS
##  6 RuleGPdeverbsubj               336.         NEG
##  7 RuleGPadjective                311.         POS
##  8 RuleGPpatbenperson             170.         NEG
##  9 RuleTooLongExpressions         161.         POS
## 10 RuleGPwordorder                157.         NEG
## 11 RulePassive                    124.         NEG
## 12 RuleLiteraryStyle              121.         NEG
## 13 RuleGPcoordovs                  87.9        NEG
## 14 RuleGPpatinstr                  48.6        NEG
## 15 RuleDoubleAdpos                 35.3        NEG
## 16 RuleMultiPartVerbs              27.0        POS
## 17 RuleWeakMeaningWords            26.5        NEG
## 18 RuleReflexivePassWithAnimSubj   18.6        POS
## 19 RulePredSubjDistance            16.0        POS
## 20 RuleVerbalNouns                  7.89       POS
## 21 RuleAbstractNouns                3.67       NEG
## 22 num_hapax                        2.87       NEG
## 23 RulePredObjDistance              0.866      POS
## 24 RuleInfVerbDistance              0.412      POS
## 25 sent_count                       0.0306     POS
## 26 word_count                       0.00242    NEG
## 27 syllab_count                     0.000220   POS
## 28 char_count                       0.00000347 POS
```

```
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    5
##        good  16   38
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   10   10
##        good   4   12
##
## , , subcorpus = OmbuFlyers
##
##            class
## .pred_class bad good
##        bad    5    0
##        good   7    0
##
##
## Greatest deviations:
## # A tibble: 43 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.382  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  2        0.341  good        bad   FrBo       orig_Co je to EIA_final
##  3        0.313  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
##  4        0.307  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  5        0.292  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  6        0.292  bad         good  KUKY       AK_JH_Podani_US_podpis
##  7        0.282  bad         good  KUKY       invalidní důchod_1399-23_původní
##  8        0.279  good        bad   FrBo       orig_Co je to a jak probíhá integ~
##  9        0.247  good        bad   KUKY       Dopis vysvětlující dopis klientovi
## 10        0.228  bad         good  KUKY       Odvolani
## 11        0.218  bad         good  KUKY       1732_2023_VOP
## 12        0.198  bad         good  KUKY       Odvolani_proti_rozhodnuti_o_nepov~
## 13        0.187  good        bad   FrBo       orig_znalci, znalecké posudky
## 14        0.187  good        bad   FrBo       orig_Sousedské vztahy
## 15        0.168  good        bad   FrBo       orig_Jak probíhá správní řízení
## 16        0.166  bad         good  FrBo       190
## 17        0.163  bad         good  KUKY       29 A 80-2021_20231122101241
## 18        0.163  good        bad   FrBo       149
## 19        0.155  bad         good  KUKY       důchod-dorovnávací přídavek_1298-~
## 20        0.150  good        bad   FrBo       orig_územní řízení
## 21        0.143  good        bad   KUKY       Pravni rada_uver SVJ
## 22        0.130  good        bad   FrBo       orig_Jak zajistit, aby skládka do~
## 23        0.125  good        bad   OmbuFlyers Ochrana-osob-omezenych-na-svobode
## 24        0.125  good        bad   FrBo       64
## 25        0.122  bad         good  FrBo       red_Co je to úřední deska a jak j~
## 26        0.0975 good        bad   FrBo       orig_pravni_nastroje_ochrany_ovzd~
## 27        0.0928 good        bad   OmbuFlyers Studny
## 28        0.0922 good        bad   FrBo       orig_Jaké právní nástroje můžete ~
## 29        0.0876 good        bad   FrBo       142
## 30        0.0841 good        bad   KUKY       UOOUOsobniUdajePuvodne
## 31        0.0826 good        bad   FrBo       orig_Vyvlastnění podle zákona o u~
## # i 12 more rows
```

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

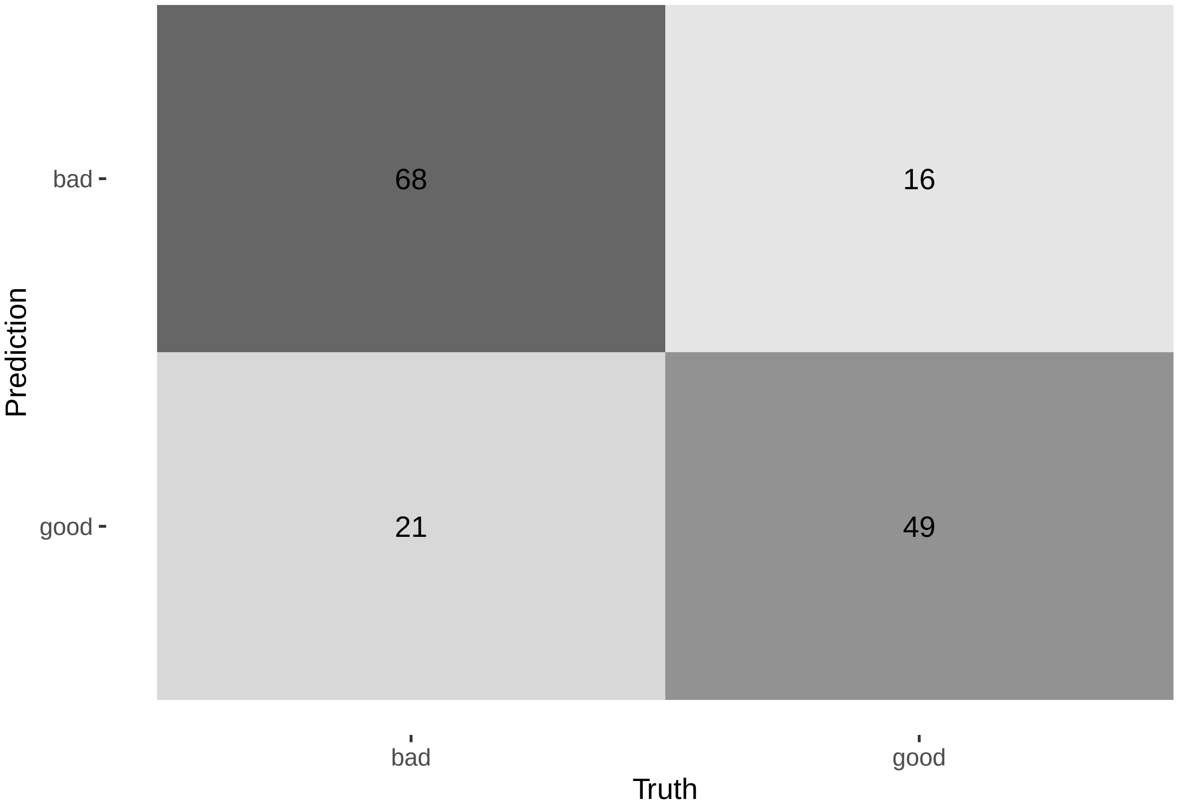
```
## # A tibble: 29 x 3
##    term                             estimate penalty
##    <chr>                               <dbl>   <dbl>
##  1 RuleRedundantExpressions      -616.        0.0189
##  2 RuleRelativisticExpressions   -332.        0.0189
##  3 RuleGPdeverbsubj              -149.        0.0189
##  4 RuleLiteraryStyle             -123.        0.0189
##  5 RulePassive                   -119.        0.0189
##  6 RuleGPdeverbaddr               -92.8       0.0189
##  7 (Intercept)                     -1.69      0.0189
##  8 word_count                      -0.000438  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 RulePredObjDistance              0          0.0189
## 19 syllab_count                     0          0.0189
## 20 char_count                       0          0.0189
## 21 num_hapax                        0          0.0189
## 22 sent_count                       0.00502    0.0189
## 23 RuleInfVerbDistance              0.912      0.0189
## 24 RuleVerbalNouns                  5.83       0.0189
## 25 RulePredSubjDistance            18.2        0.0189
## 26 RuleMultiPartVerbs              34.1        0.0189
## 27 RuleTooLongExpressions          60.5        0.0189
## 28 RuleGPadjective                113.         0.0189
## 29 RuleAnaphoricReferences        157.         0.0189
```

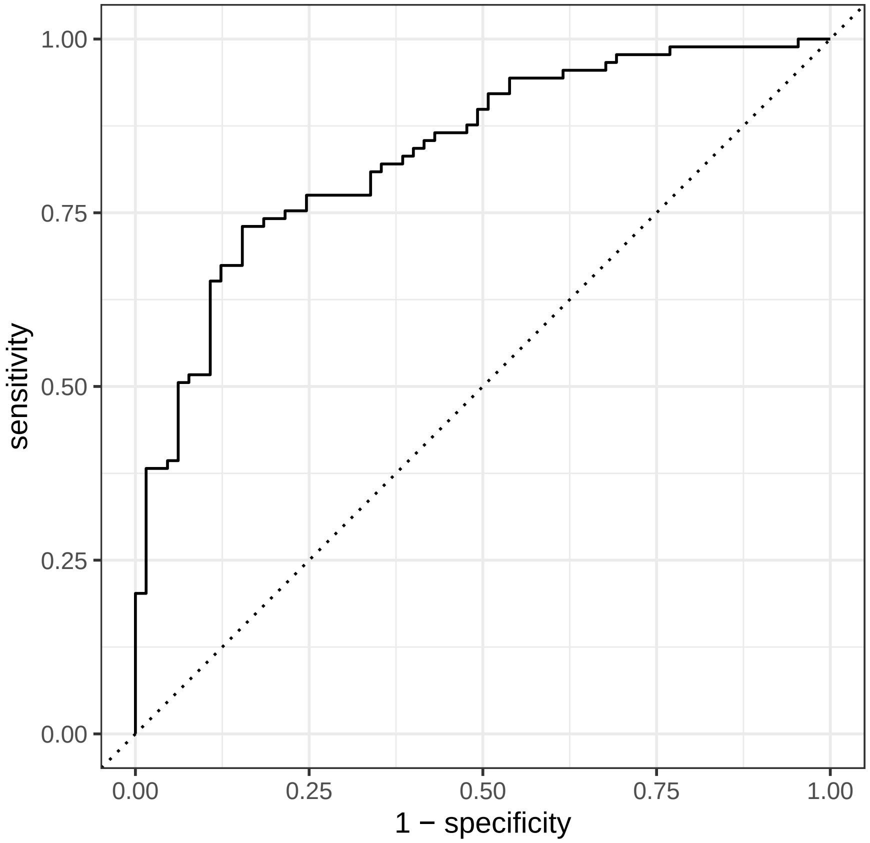
Random forest

All

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

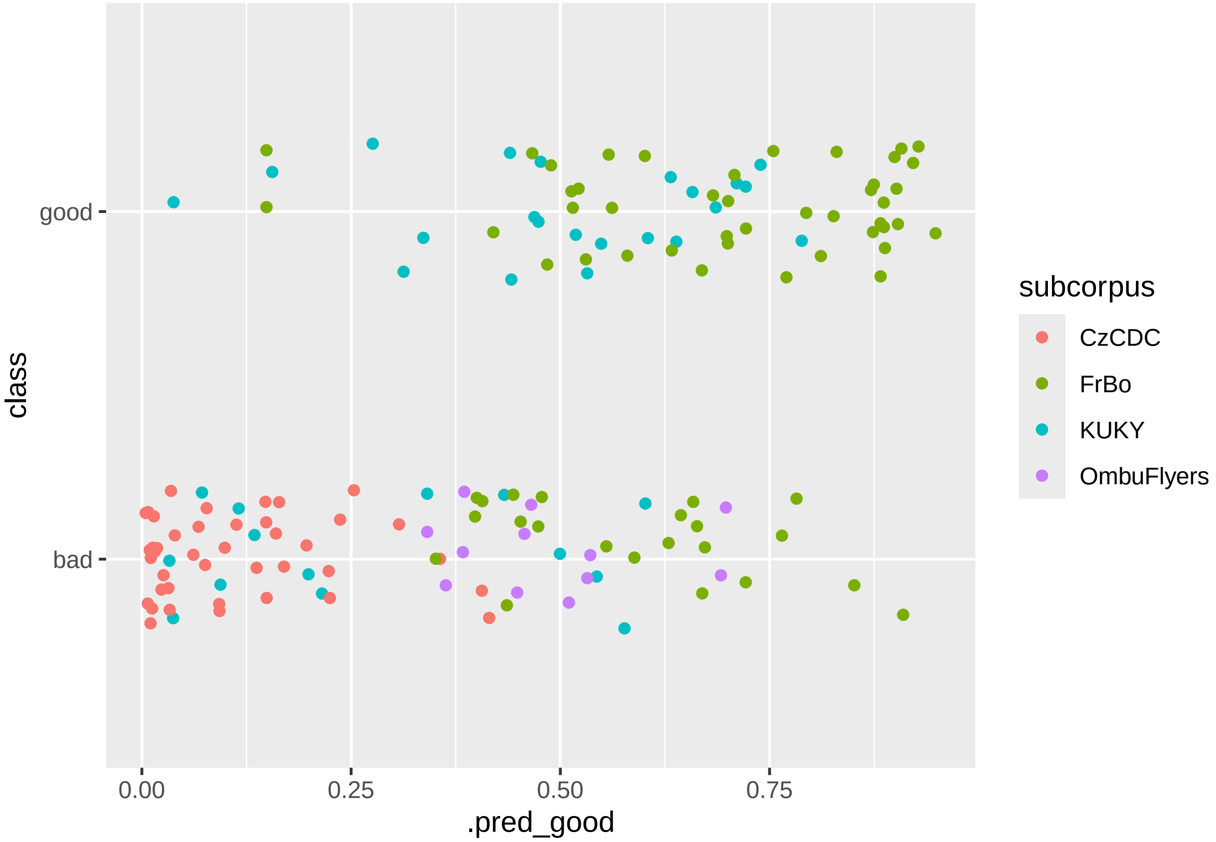
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.760 Preprocessor1_Model1
## 2 roc_auc     binary         0.838 Preprocessor1_Model1
## 3 brier_class binary         0.165 Preprocessor1_Model1
```





```
## # 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)
```



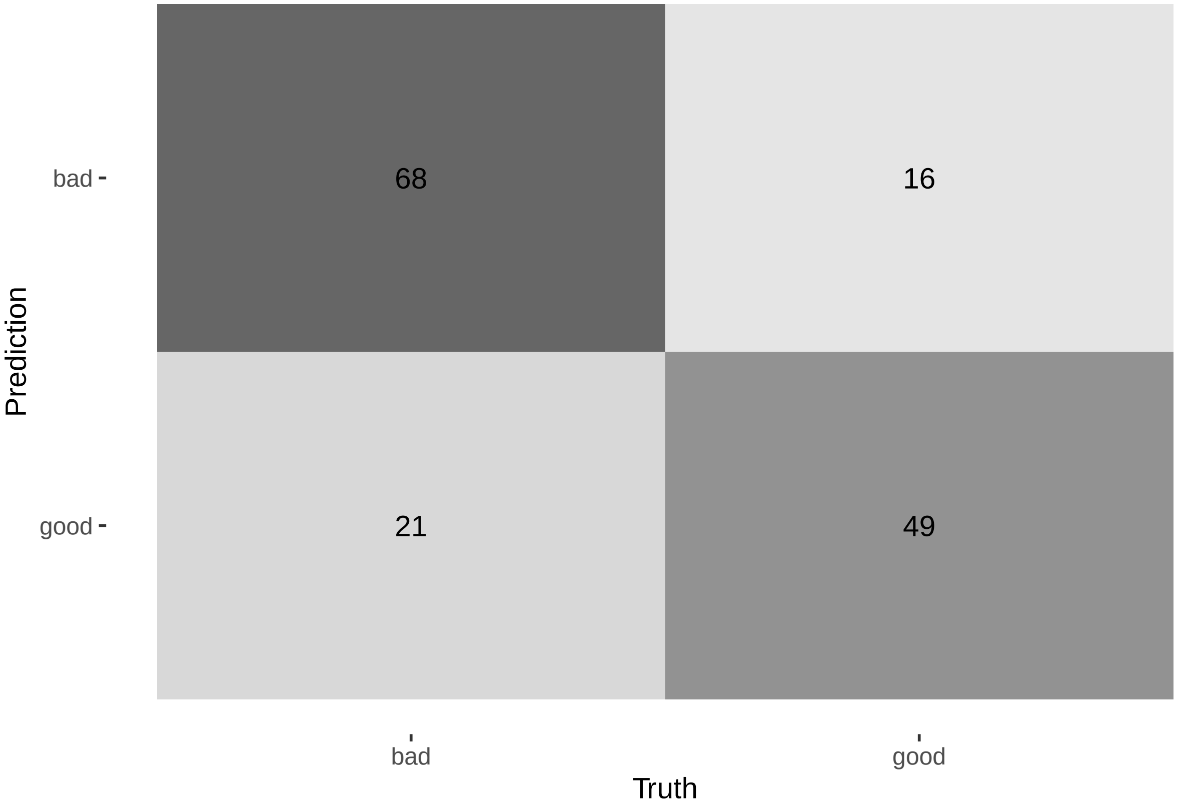
```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
##        good   0    0
```

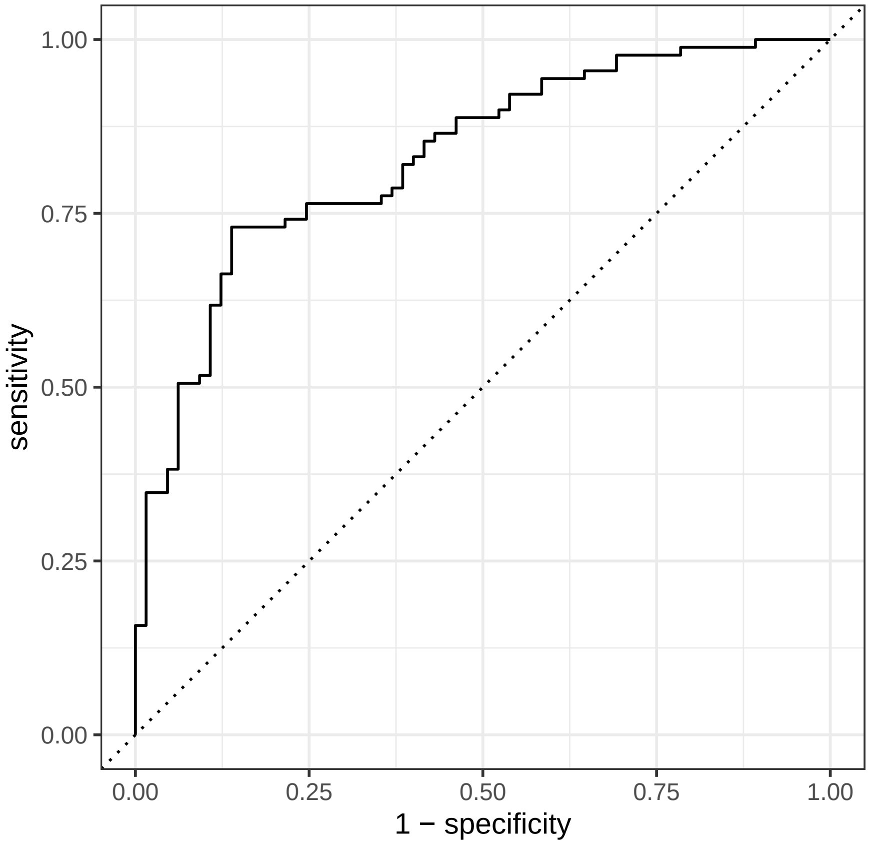
```
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    9    6
##        good  13   37
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   11   10
##        good   3   12
##
## , , subcorpus = OmbuFlyers
##
##            class
## .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)
```

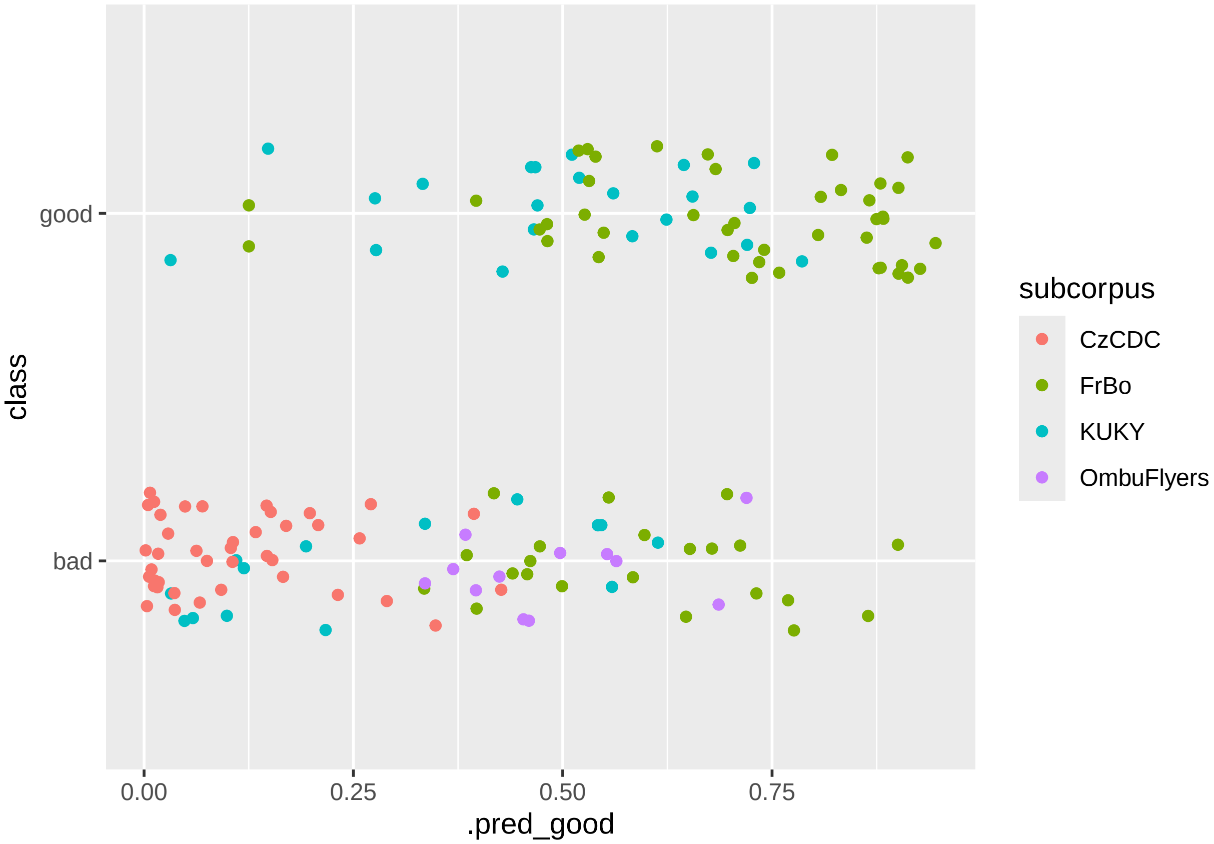
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.760 Preprocessor1_Model1
## 2 roc_auc     binary         0.830 Preprocessor1_Model1
## 3 brier_class binary         0.168 Preprocessor1_Model1
```





```
## # A tibble: 71 x 2
##    Variable                                           Importance
##    <chr>                                                   <dbl>
##  1 verb_dist                                              13.0
##  2 activity                                               12.8
##  3 RuleTooManyNominalConstructions.max_allowable_nouns     12.0
##  4 RuleTooFewVerbs.min_verb_frac                          11.9
##  5 ari                                                    10.2
##  6 RuleLongSentences.max_length                           10.1
##  7 gf                                                      9.96
##  8 smog                                                    9.19
##  9 RuleLiteraryStyle                                       8.52
## 10 RulePredAtClauseBeginning.max_order                     8.37
## 11 RulePassive                                             7.04
## 12 mamr                                                    5.38
## 13 fkgl                                                    5.19
## 14 RulePredAtClauseBeginning.max_order.v                   4.91
## 15 atl                                                     4.82
## 16 maentropy                                               4.48
## 17 RuleTooManyNegations.max_negation_frac                  4.46
## 18 mattr                                                   4.19
## 19 RuleTooLongExpressions                                  3.95
## 20 RuleMultiPartVerbs                                      3.95
## 21 entropy                                                 3.89
## 22 RuleTooManyNominalConstructions.max_noun_frac           3.81
## 23 RuleAnaphoricReferences                                 3.79
## 24 cli                                                     3.64
## 25 maentropy.v                                              3.59
## 26 RuleVerbalNouns                                          3.52
## 27 RulePredSubjDistance                                     3.23
## 28 RuleLongSentences.max_length.v                           3.08
## 29 RuleDoubleAdpos.max_allowable_distance.v                 2.97
## 30 mattr.v                                                  2.90
## 31 RuleCaseRepetition.max_repetition_frac.v                 2.82
## 32 RuleInfVerbDistance.max_distance.v                       2.73
## 33 RuleCaseRepetition.max_repetition_count.v                2.71
## 34 RuleTooManyNegations.max_negation_frac.v                 2.71
## 35 RulePredSubjDistance.max_distance.v                      2.70
## 36 RulePredObjDistance                                      2.68
## 37 RulePredObjDistance.max_distance                         2.67
## 38 RuleCaseRepetition.max_repetition_frac                   2.64
## 39 word_count                                               2.60
## 40 RulePredObjDistance.max_distance.v                       2.59
## 41 RulePredSubjDistance.max_distance                        2.56
## 42 RuleInfVerbDistance.max_distance                         2.54
## 43 RuleCaseRepetition.max_repetition_count                  2.48
## 44 num_hapax                                                2.41
## 45 RuleTooManyNegations.max_allowable_negations             2.33
## 46 char_count                                               2.32
## 47 RuleDoubleAdpos                                          2.27
## 48 fre                                                      2.27
## 49 ttr                                                      2.26
## 50 RuleMultiPartVerbs.max_distance                          2.23
## 51 RuleInfVerbDistance                                      2.20
## 52 RuleMultiPartVerbs.max_distance.v                        2.18
## 53 syllab_count                                             2.17
## 54 RuleTooManyNegations.max_allowable_negations.v           2.16
## 55 RuleDoubleAdpos.max_allowable_distance                   2.05
## 56 sent_count                                               2.01
## 57 RuleTooManyNominalConstructions.max_noun_frac.v          2.00
## 58 RuleAbstractNouns                                        1.96
## 59 RuleWeakMeaningWords                                     1.92
## 60 hpoint                                                   1.77
## 61 RuleReflexivePassWithAnimSubj                            1.59
## 62 RuleGPwordorder                                          1.46
## 63 RuleGPdeverbaddr                                         1.27
## 64 RuleGPpatinstr                                           1.18
## 65 RuleRelativisticExpressions                              0.913
## 66 RuleGPcoordovs                                           0.800
## 67 RuleGPpatbenperson                                       0.797
## 68 RuleGPdeverbsubj                                         0.793
## 69 RuleRedundantExpressions                                 0.278
## 70 RuleGPadjective                                          0.224
## 71 RuleConfirmationExpressions                              0.208
```

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

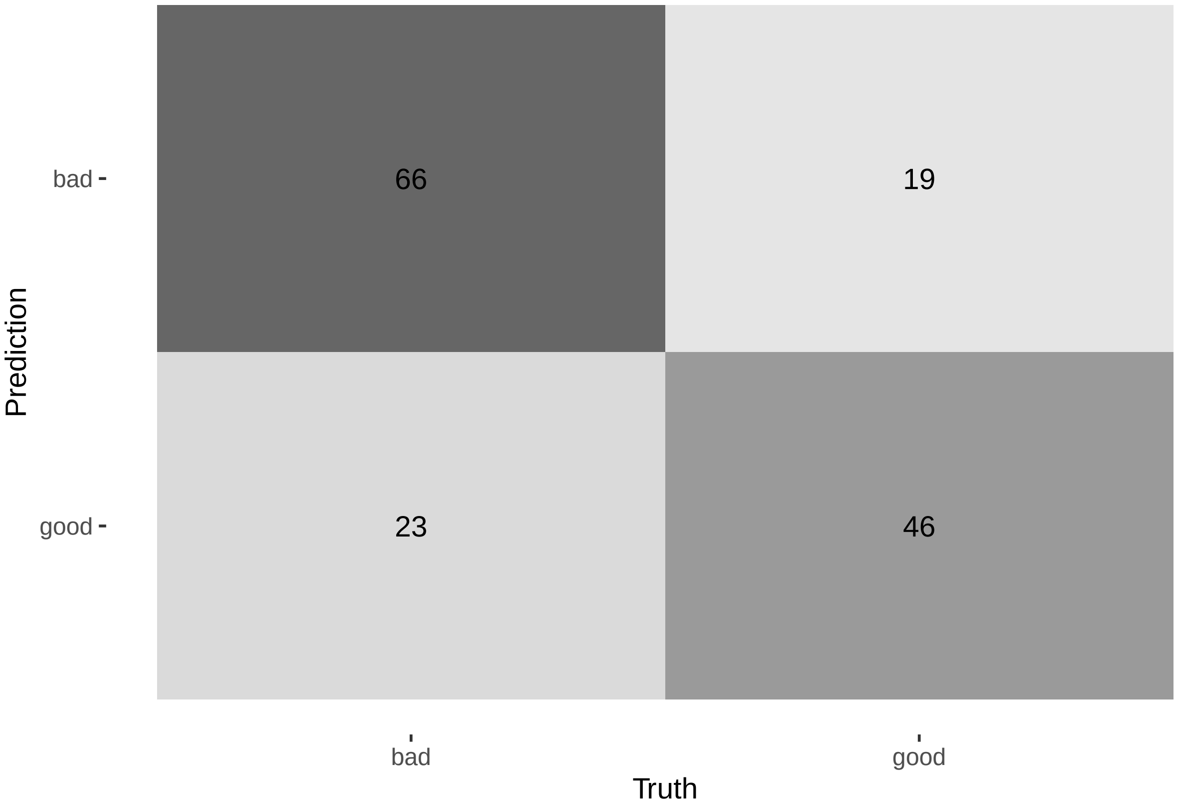


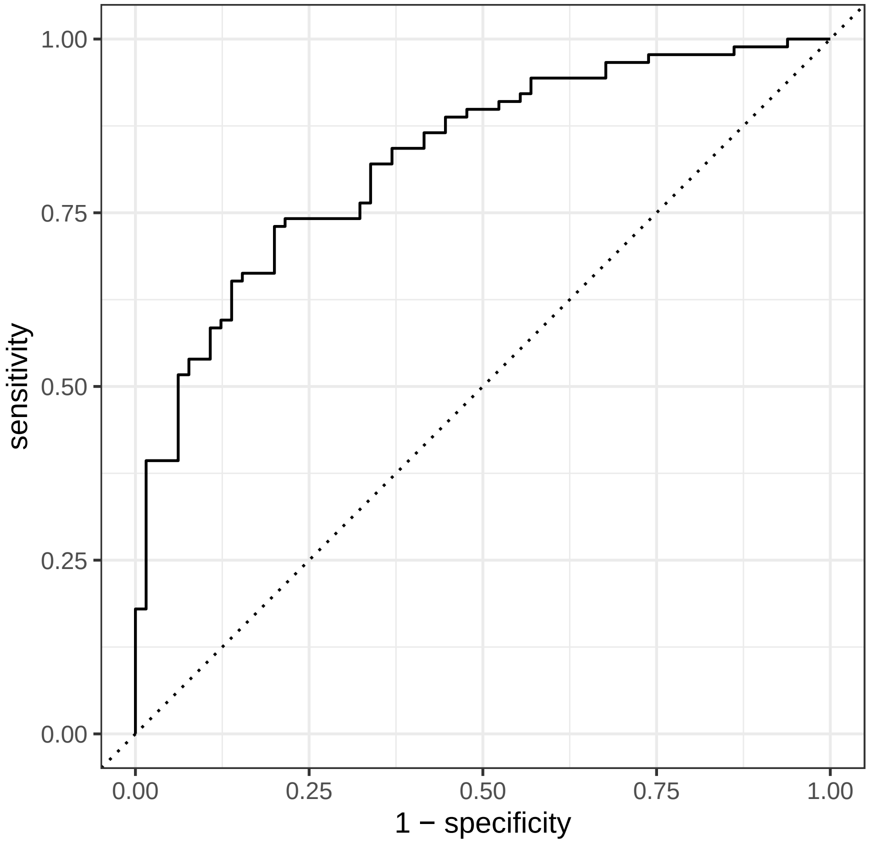
```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    9    6
##        good  13   37
##
## , , subcorpus = KUKY
##
##            class
## .pred_class bad good
##        bad   10   10
##        good   4   12
##
## , , 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         0.468 bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  2         0.400 good        bad   FrBo       orig_Jak zajistit, aby skládka do~
##  3         0.375 bad         good  FrBo       red_Mohou spolky ve správních žal~
##  4         0.375 bad         good  FrBo       red_Mohou spolky ve správních žal~
##  5         0.365 good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  6         0.352 bad         good  KUKY       Odvolani
##  7         0.276 good        bad   FrBo       orig_Jak probíhá správní řízení
##  8         0.269 good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  9         0.231 good        bad   FrBo       142
## 10         0.224 bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
## 11         0.223 bad         good  KUKY       invalidní důchod_1399-23_původní
## 12         0.219 good        bad   OmbuFlyers Studny
## 13         0.212 good        bad   FrBo       orig_územní řízení
## 14         0.196 good        bad   FrBo       orig_Jak využít svého práva být i~
## 15         0.186 good        bad   OmbuFlyers Soudni-poplatky
## 16         0.178 good        bad   FrBo       64
## 17         0.167 bad         good  KUKY       AK_JH_Podani_US_podpis
## 18         0.152 good        bad   FrBo       orig_Co je to a jak probíhá integ~
## 19         0.147 good        bad   FrBo       orig_Kdy a jak požadovat náhradu ~
## 20         0.114 good        bad   KUKY       Duchody
## 21         0.103 bad         good  FrBo       red_pravni_nastroje_ochrany_ovzdu~
## 22         0.0977 good       bad   FrBo       orig_znalci, znalecké posudky
## 23         0.0838 good       bad   FrBo       orig_Sousedské vztahy
## 24         0.0718 bad        good  KUKY       4842_2023_VOP
## 25         0.0641 good       bad   OmbuFlyers Katastr-nemovitosti
## 26         0.0589 good       bad   KUKY       Dopis vysvětlující dopis klientovi
## 27         0.0549 good       bad   FrBo       orig_Certifikáty autorizovaných i~
## 28         0.0530 good       bad   OmbuFlyers Detsky-domov
## 29         0.0461 good       bad   KUKY       UOOUOsobniUdajePuvodne
## 30         0.0420 good       bad   KUKY       Pravni rada_uver SVJ
## 31         0.0377 bad        good  KUKY       důchod-dorovnávací přídavek_1298-~
## # i 6 more rows
```

IAC

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

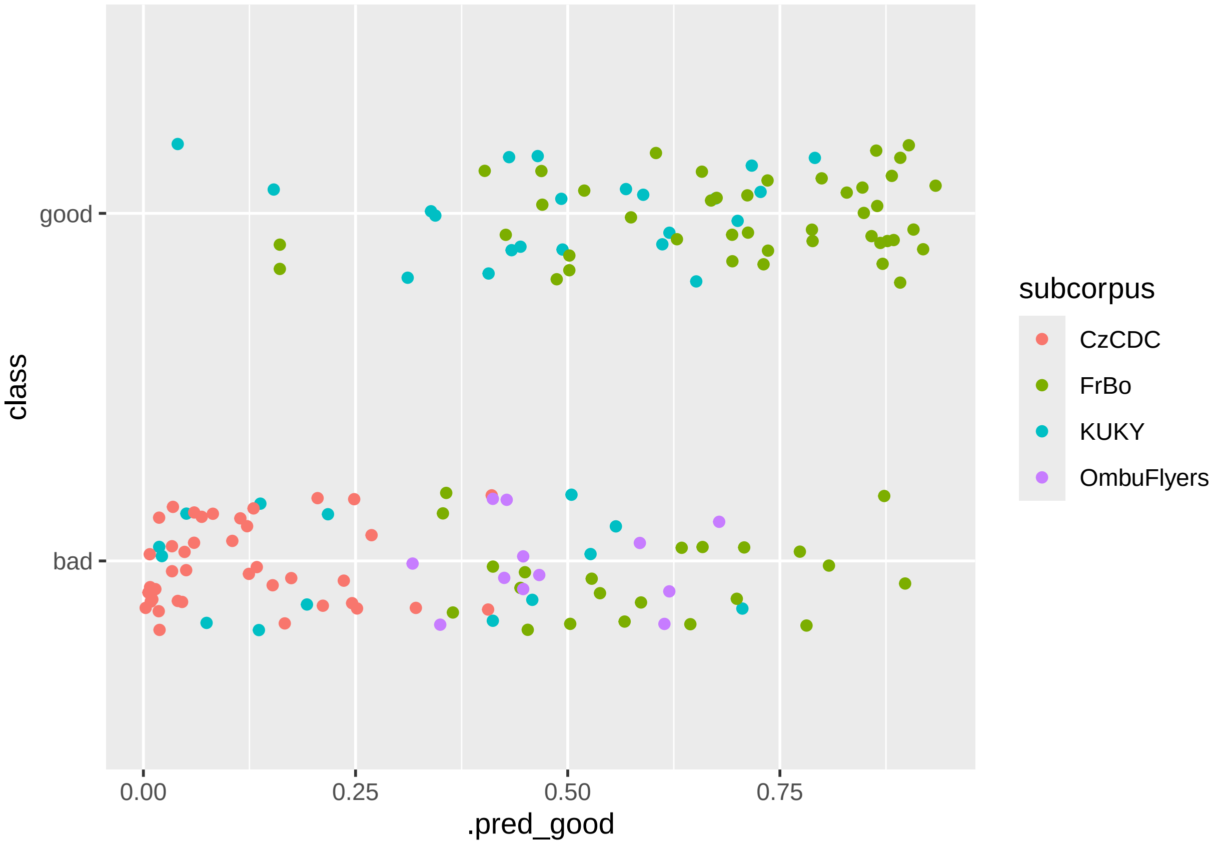
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.727 Preprocessor1_Model1
## 2 roc_auc     binary         0.828 Preprocessor1_Model1
## 3 brier_class binary         0.168 Preprocessor1_Model1
```





```
## # 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
```

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

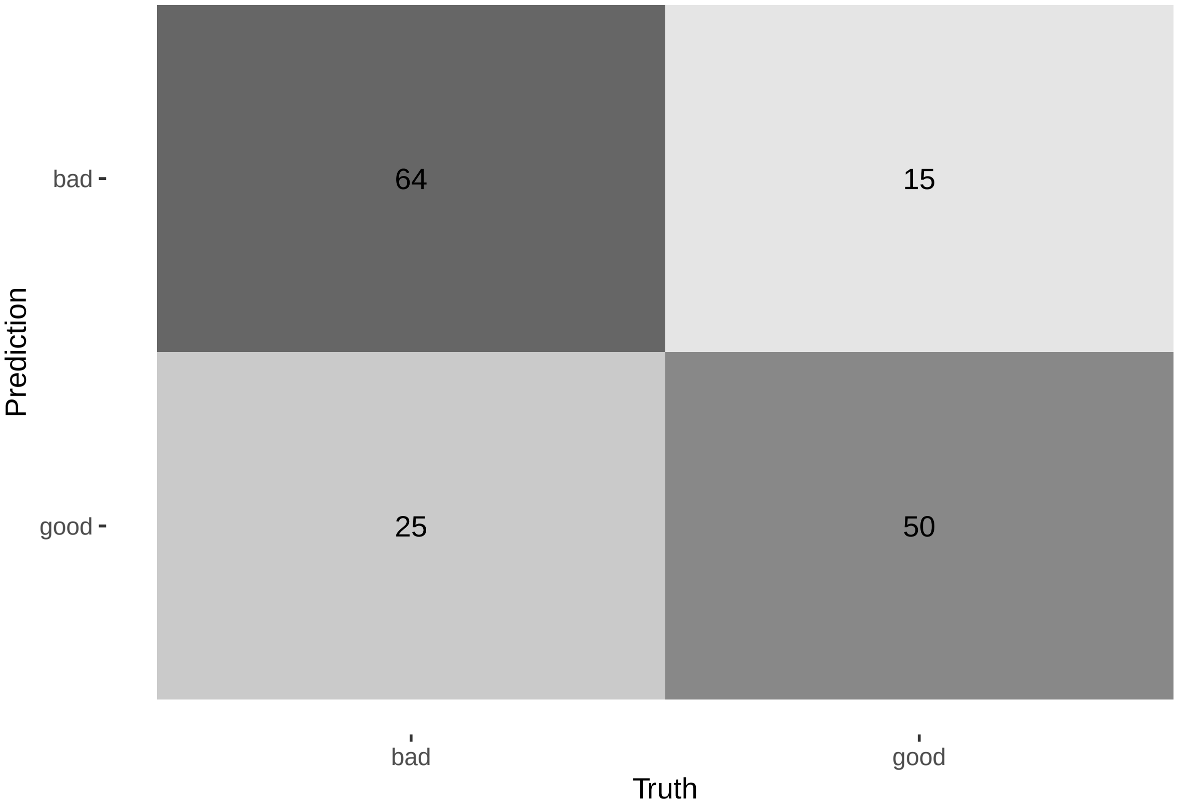


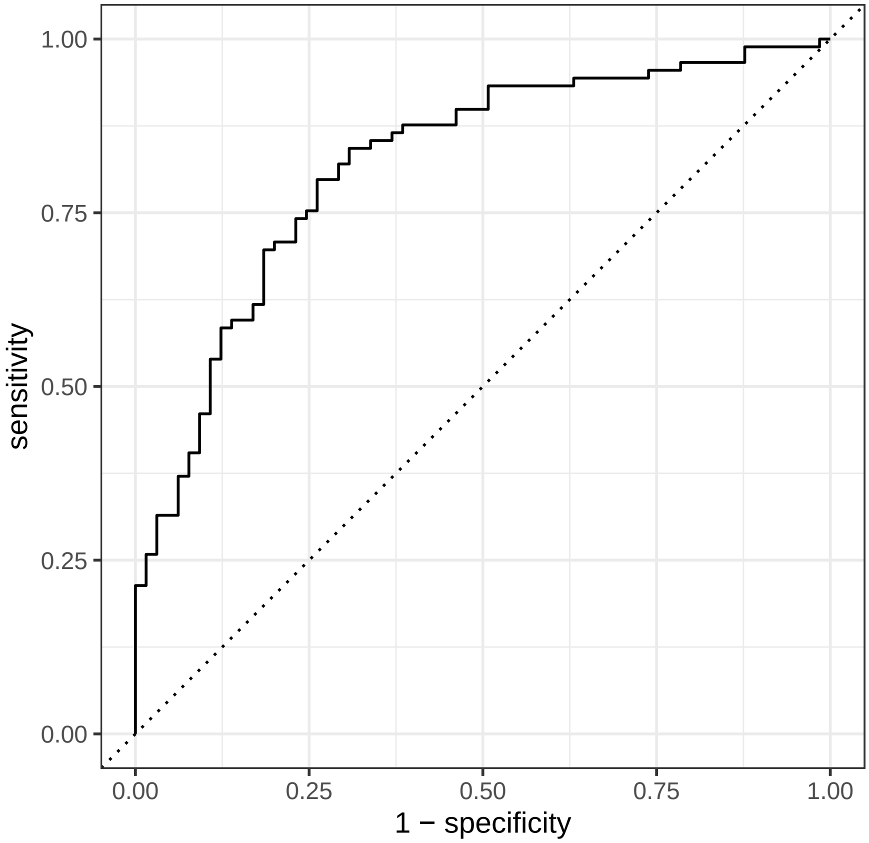
```
## Confusion matrices by subcorpora:
## , , subcorpus = CzCDC
##
##            class
## .pred_class bad good
##        bad   41    0
##        good   0    0
##
## , , subcorpus = FrBo
##
##            class
## .pred_class bad good
##        bad    7    7
##        good  15   36
##
## , , subcorpus = 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)
```

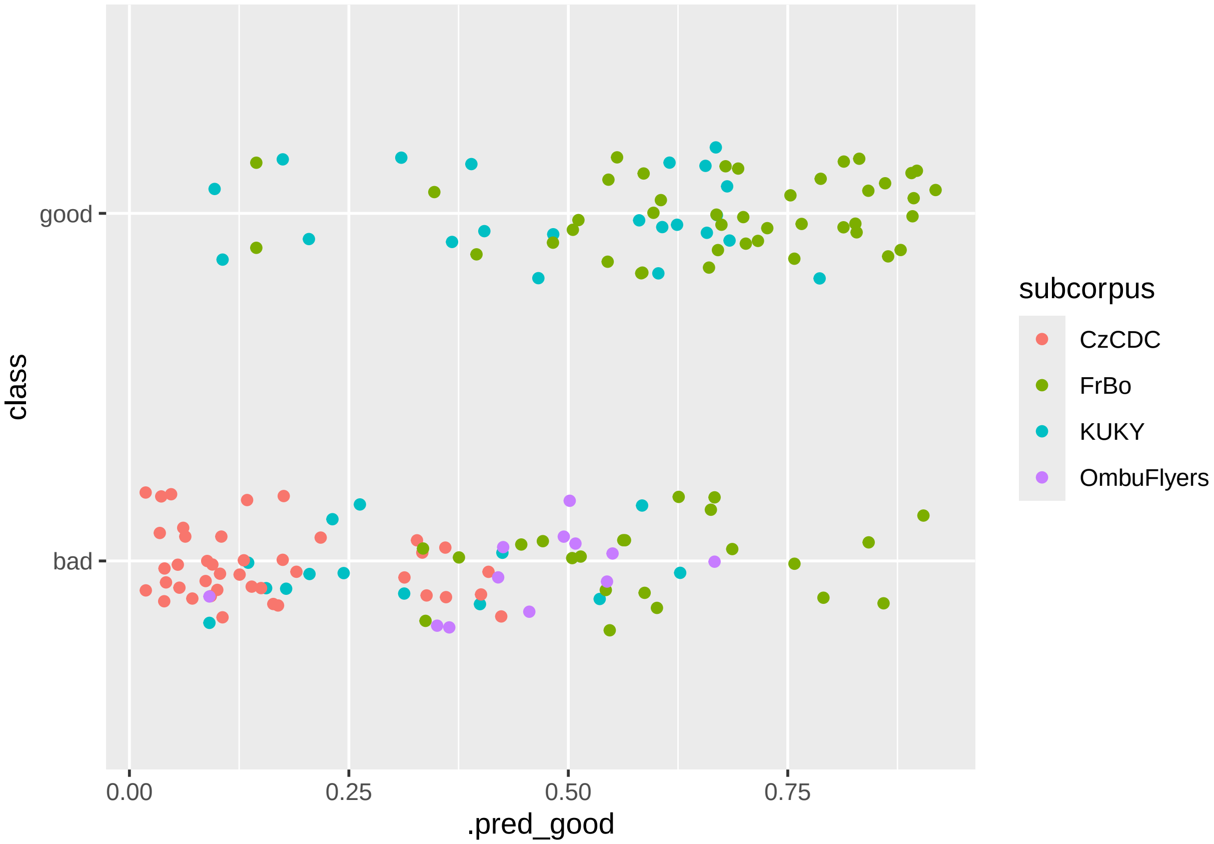
```
## # A tibble: 3 x 4
##   .metric     .estimator .estimate .config
##   <chr>       <chr>          <dbl> <chr>
## 1 accuracy    binary         0.740 Preprocessor1_Model1
## 2 roc_auc     binary         0.820 Preprocessor1_Model1
## 3 brier_class binary         0.175 Preprocessor1_Model1
```





```
## # A tibble: 28 x 2
##    Variable                            Importance
##    <chr>                                  <dbl>
##  1 RuleMultiPartVerbs                    29.9
##  2 RulePassive                           28.8
##  3 RuleLiteraryStyle                     27.8
##  4 RulePredSubjDistance                  19.9
##  5 RuleInfVerbDistance                   15.0
##  6 sent_count                            13.0
##  7 RuleVerbalNouns                       11.6
##  8 word_count                            10.2
##  9 num_hapax                              9.20
## 10 RulePredObjDistance                    8.86
## 11 char_count                             8.81
## 12 RuleTooLongExpressions                 8.61
## 13 syllab_count                           8.32
## 14 RuleDoubleAdpos                        7.65
## 15 RuleAbstractNouns                      7.29
## 16 RuleGPwordorder                        7.13
## 17 RuleAnaphoricReferences                6.61
## 18 RuleWeakMeaningWords                   5.55
## 19 RuleReflexivePassWithAnimSubj          5.33
## 20 RuleGPdeverbsubj                       3.51
## 21 RuleGPpatinstr                         3.38
## 22 RuleGPdeverbaddr                       3.02
## 23 RuleGPpatbenperson                     2.19
## 24 RuleGPcoordovs                         1.89
## 25 RuleRelativisticExpressions            1.89
## 26 RuleConfirmationExpressions            1.27
## 27 RuleGPadjective                        0.597
## 28 RuleRedundantExpressions               0.570
```

```
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    5    5
##        good  17   38
##
## , , 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: 40 x 5
##    abs_deviation .pred_class class subcorpus  FileName
##            <dbl> <fct>       <fct> <chr>      <chr>
##  1        0.405  good        bad   FrBo       orig_Co je to a jak probíhá integ~
##  2        0.403  bad         good  KUKY       Mestsky_urad_PRIKAZ_REV2
##  3        0.394  bad         good  KUKY       0217_6Afs_2000035_20210219141328_~
##  4        0.359  good        bad   FrBo       orig_Zastupitelstvo_o čem a jak r~
##  5        0.355  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  6        0.355  bad         good  FrBo       red_Mohou spolky ve správních žal~
##  7        0.342  good        bad   FrBo       orig_Jaké otázky (ne)můžete polož~
##  8        0.325  bad         good  KUKY       invalidní důchod_1399-23_původní
##  9        0.296  bad         good  KUKY       AK_JH_Podani_US_podpis
## 10        0.291  good        bad   FrBo       64
## 11        0.258  good        bad   FrBo       orig_Jak zajistit, aby skládka do~
## 12        0.190  bad         good  KUKY       Odvolani
## 13        0.187  good        bad   FrBo       orig_Jak probíhá správní řízení
## 14        0.167  good        bad   FrBo       orig_Sousedské vztahy
## 15        0.167  good        bad   OmbuFlyers Socialni-sluzby
## 16        0.162  good        bad   FrBo       orig_Jaké právní nástroje můžete ~
## 17        0.153  bad         good  FrBo       red_Co je to úřední deska a jak j~
## 18        0.132  bad         good  KUKY       1732_2023_VOP
## 19        0.127  good        bad   KUKY       Dopis vysvětlující dopis klientovi
## 20        0.126  good        bad   FrBo       149
## 21        0.110  bad         good  KUKY       29 A 80-2021_20231122101241
## 22        0.105  bad         good  FrBo       orig_Nástroje občana při kontrole~
## 23        0.101  good        bad   FrBo       orig_Co je to EIA_final
## 24        0.0956 bad         good  KUKY       4842_2023_VOP
## 25        0.0870 good        bad   FrBo       142
## 26        0.0841 good        bad   KUKY       UOOUOsobniUdajePuvodne
## 27        0.0646 good        bad   FrBo       orig_Změny v zákoně o EIA
## 28        0.0626 good        bad   FrBo       orig_znalci, znalecké posudky
## 29        0.0504 good        bad   OmbuFlyers Zvlastni-opravneni
## 30        0.0472 good        bad   FrBo       orig_Certifikáty autorizovaných i~
## 31        0.0441 good        bad   OmbuFlyers Studny
## # i 9 more rows
```