131-HW4

```
library(tidymodels)
```

```
## -- Attaching packages --------------------------------------- tidymodels 0.2.0 --

## v broom        0.7.12     v recipes      0.2.0
## v dials        0.1.0      v rsample      0.1.1
## v dplyr        1.0.8      v tibble       3.1.6
## v ggplot2      3.3.5      v tidyr        1.2.0
## v infer        1.0.0      v tune         0.2.0
## v modeldata    0.1.1      v workflows    0.2.6
## v parsnip      0.2.1      v workflowsets 0.2.1
## v purrr        0.3.4      v yardstick    0.0.9

## -- Conflicts ------------------------------------------ tidymodels_conflicts() --
## x purrr::discard() masks scales::discard()
## x dplyr::filter()  masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## x recipes::step()  masks stats::step()
## * Learn how to get started at https://www.tidymodels.org/start/
```

```
library(ISLR)
library(ISLR2)
```

```
##
## Attaching package: 'ISLR2'

## The following objects are masked from 'package:ISLR':
##
##     Auto, Credit
```

```
library(discrim)
```

```
##
## Attaching package: 'discrim'

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

```
library(poissonreg)
library(corrr)
library(klaR)
```

```
## Loading required package: MASS

##
## Attaching package: 'MASS'

## The following object is masked from 'package:ISLR2':
##
##     Boston

## The following object is masked from 'package:dplyr':
##
##     select
```

```
library(dplyr)
library(MASS)
library(pROC)
```

```
## Type 'citation("pROC")' for a citation.

##
## Attaching package: 'pROC'

## The following objects are masked from 'package:stats':
##
##     cov, smooth, var
```

```
library(tune)
tidymodels_prefer()
library(readr)
titanic <- read_csv("~/Downloads/homework-4/data/titanic.csv")
```

```
## Rows: 891 Columns: 12

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (6): survived, name, sex, ticket, cabin, embarked
## dbl (6): passenger_id, pclass, age, sib_sp, parch, fare
##
## 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.
```

```
View(titanic)
```

Question 1

```
titanic$survived <- factor(titanic$survived, levels = c("Yes","No"))
titanic$pclass <- as.factor(titanic$pclass)

set.seed(891)

titanic_split <- initial_split(titanic, prop = 0.8, strata = survived)
titanic_train <- training(titanic_split)
titanic_test <- testing(titanic_split)

#verify
dim(titanic_train)
```

```
## [1] 712  12
```

```
dim(titanic_test)
```

```
## [1] 179  12
```

titanic_train: 712 observations of 12 variables titanic_test: 179 observations of 12 variables

```
#linear model
lm_spec <- linear_reg() %>%
  set_mode("regression") %>%
  set_engine("lm")


#recipe
titanic_recipe <- recipe(survived ~ pclass + sex + age +
                           sib_sp + parch + fare, titanic_train) %>%
  step_impute_linear(age, impute_with = imp_vars(sib_sp)) %>%
  step_dummy(all_nominal_predictors()) %>%
  step_interact(~ starts_with("sex"):age + age:fare) %>%
  step_poly(., degree = tune())
```

Question 2

```
#folds
titanic_folds <- vfold_cv(titanic_train, v=10)
titanic_folds
```

```
## #  10-fold cross-validation
## # A tibble: 10 x 2
##    splits           id
##    <list>           <chr>
##  1 <split [640/72]> Fold01
##  2 <split [640/72]> Fold02
##  3 <split [641/71]> Fold03
##  4 <split [641/71]> Fold04
##  5 <split [641/71]> Fold05
```

```
##  6 <split [641/71]> Fold06
##  7 <split [641/71]> Fold07
##  8 <split [641/71]> Fold08
##  9 <split [641/71]> Fold09
## 10 <split [641/71]> Fold10
```

Question 3

In Question 2, we are using the k-fold cross validation to estimate the skill of the model on new data. This resampling procedure has a single parameter called k that refers to the number of groups that a given data sample is to be split into. Sometimes it is preferred to use this method over a simple test/train split because it is simple to understand and generally results in a less biased/optimistic estimate of the model skill. If we were to use the entire training set, the resampling method used would be the "validation set" approach.

Question 4

```
#LOG
log_reg <- logistic_reg() %>%
  set_engine("glm") %>%
  set_mode("classification")

log_wkflow <- workflow() %>%
  add_model(log_reg) %>%
  add_recipe(titanic_recipe)

#LDA
lda_mod <- discrim_linear() %>%
  set_mode("classification") %>%
  set_engine("MASS")

lda_wkflow <- workflow() %>%
  add_model(lda_mod) %>%
  add_recipe(titanic_recipe)

#QDA
qda_mod <- discrim_quad() %>%
  set_mode("classification") %>%
  set_engine("MASS")

qda_wkflow <- workflow() %>%
  add_model(qda_mod) %>%
  add_recipe(titanic_recipe)
```

Typically, the k-fold cross-validation procedure involves fitting a model on all folds (training) but one (testing), so 3 models x 9 folds = 27 models total.

Question 5

```
degree_grid <- grid_regular(degree(range = c(1, 10)), levels = 10)
degree_grid
```

```
## # A tibble: 10 x 1
##    degree
##     <dbl>
##  1      1
##  2      2
##  3      3
##  4      4
##  5      5
##  6      6
##  7      7
##  8      8
##  9      9
## 10     10
```

```
#fit log
tune_res <- tune_grid(
  object = log_wkflow,
  resamples = titanic_folds,
  grid = degree_grid,
  control = control_grid(verbose = TRUE)
)
```

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## i Fold01: preprocessor 1/10

## v Fold01: preprocessor 1/10

## i Fold01: preprocessor 1/10, model 1/1

## v Fold01: preprocessor 1/10, model 1/1

## i Fold01: preprocessor 1/10, model 1/1 (predictions)

## i Fold01: preprocessor 2/10

## v Fold01: preprocessor 2/10

## i Fold01: preprocessor 2/10, model 1/1

## v Fold01: preprocessor 2/10, model 1/1

## i Fold01: preprocessor 2/10, model 1/1 (predictions)

## i Fold01: preprocessor 3/10
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## v Fold01: preprocessor 3/10

## i Fold01: preprocessor 3/10, model 1/1

## v Fold01: preprocessor 3/10, model 1/1

## i Fold01: preprocessor 3/10, model 1/1 (predictions)

## i Fold01: preprocessor 4/10

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## v Fold01: preprocessor 4/10, model 1/1

## i Fold01: preprocessor 4/10, model 1/1 (predictions)

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## i Fold01: preprocessor 6/10, model 1/1 (predictions)

## i Fold01: preprocessor 7/10

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## i Fold01: preprocessor 7/10, model 1/1

## v Fold01: preprocessor 7/10, model 1/1

## i Fold01: preprocessor 7/10, model 1/1 (predictions)
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## i Fold01: preprocessor 8/10, model 1/1

## v Fold01: preprocessor 8/10, model 1/1

## i Fold01: preprocessor 8/10, model 1/1 (predictions)

## i Fold01: preprocessor 9/10

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## i Fold01: preprocessor 9/10, model 1/1

## v Fold01: preprocessor 9/10, model 1/1

## i Fold01: preprocessor 9/10, model 1/1 (predictions)

## i Fold01: preprocessor 10/10

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## v Fold01: preprocessor 10/10, model 1/1

## i Fold01: preprocessor 10/10, model 1/1 (predictions)

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## i Fold02: preprocessor 1/10, model 1/1 (predictions)

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## i Fold02: preprocessor 2/10, model 1/1

## v Fold02: preprocessor 2/10, model 1/1
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## i Fold02: preprocessor 2/10, model 1/1 (predictions)

## i Fold02: preprocessor 3/10

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## i Fold02: preprocessor 3/10, model 1/1

## v Fold02: preprocessor 3/10, model 1/1

## i Fold02: preprocessor 3/10, model 1/1 (predictions)

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## i Fold02: preprocessor 4/10, model 1/1 (predictions)

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## i Fold02: preprocessor 5/10, model 1/1 (predictions)

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## i Fold02: preprocessor 6/10, model 1/1 (predictions)

## i Fold02: preprocessor 7/10

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## v Fold02: preprocessor 10/10, model 1/1

## i Fold02: preprocessor 10/10, model 1/1 (predictions)

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## v Fold03: preprocessor 1/10, model 1/1

## i Fold03: preprocessor 1/10, model 1/1 (predictions)

## i Fold03: preprocessor 2/10

## v Fold03: preprocessor 2/10
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## i Fold03: preprocessor 2/10, model 1/1

## v Fold03: preprocessor 2/10, model 1/1

## i Fold03: preprocessor 2/10, model 1/1 (predictions)

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## i Fold03: preprocessor 3/10, model 1/1 (predictions)

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## i Fold04: preprocessor 1/10, model 1/1

## v Fold04: preprocessor 1/10, model 1/1

## i Fold04: preprocessor 1/10, model 1/1 (predictions)
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## i Fold08: preprocessor 7/10

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## i Fold08: preprocessor 7/10, model 1/1

## v Fold08: preprocessor 7/10, model 1/1

## i Fold08: preprocessor 7/10, model 1/1 (predictions)

## i Fold08: preprocessor 8/10

## v Fold08: preprocessor 8/10

## i Fold08: preprocessor 8/10, model 1/1

## v Fold08: preprocessor 8/10, model 1/1

## i Fold08: preprocessor 8/10, model 1/1 (predictions)

## i Fold08: preprocessor 9/10

## v Fold08: preprocessor 9/10

## i Fold08: preprocessor 9/10, model 1/1

## v Fold08: preprocessor 9/10, model 1/1

## i Fold08: preprocessor 9/10, model 1/1 (predictions)
```

```
## i Fold08: preprocessor 10/10

## v Fold08: preprocessor 10/10

## i Fold08: preprocessor 10/10, model 1/1

## v Fold08: preprocessor 10/10, model 1/1

## i Fold08: preprocessor 10/10, model 1/1 (predictions)

## i Fold09: preprocessor 1/10

## v Fold09: preprocessor 1/10

## i Fold09: preprocessor 1/10, model 1/1

## v Fold09: preprocessor 1/10, model 1/1

## i Fold09: preprocessor 1/10, model 1/1 (predictions)

## i Fold09: preprocessor 2/10

## v Fold09: preprocessor 2/10

## i Fold09: preprocessor 2/10, model 1/1

## v Fold09: preprocessor 2/10, model 1/1

## i Fold09: preprocessor 2/10, model 1/1 (predictions)

## i Fold09: preprocessor 3/10

## v Fold09: preprocessor 3/10

## i Fold09: preprocessor 3/10, model 1/1

## v Fold09: preprocessor 3/10, model 1/1

## i Fold09: preprocessor 3/10, model 1/1 (predictions)

## i Fold09: preprocessor 4/10

## v Fold09: preprocessor 4/10

## i Fold09: preprocessor 4/10, model 1/1

## v Fold09: preprocessor 4/10, model 1/1
```

```
## i Fold09: preprocessor 4/10, model 1/1 (predictions)

## i Fold09: preprocessor 5/10

## v Fold09: preprocessor 5/10

## i Fold09: preprocessor 5/10, model 1/1

## v Fold09: preprocessor 5/10, model 1/1

## i Fold09: preprocessor 5/10, model 1/1 (predictions)

## i Fold09: preprocessor 6/10

## v Fold09: preprocessor 6/10

## i Fold09: preprocessor 6/10, model 1/1

## v Fold09: preprocessor 6/10, model 1/1

## i Fold09: preprocessor 6/10, model 1/1 (predictions)

## i Fold09: preprocessor 7/10

## v Fold09: preprocessor 7/10

## i Fold09: preprocessor 7/10, model 1/1

## v Fold09: preprocessor 7/10, model 1/1

## i Fold09: preprocessor 7/10, model 1/1 (predictions)

## i Fold09: preprocessor 8/10

## v Fold09: preprocessor 8/10

## i Fold09: preprocessor 8/10, model 1/1

## v Fold09: preprocessor 8/10, model 1/1

## i Fold09: preprocessor 8/10, model 1/1 (predictions)

## i Fold09: preprocessor 9/10

## v Fold09: preprocessor 9/10

## i Fold09: preprocessor 9/10, model 1/1
```

```
## v Fold09: preprocessor 9/10, model 1/1

## i Fold09: preprocessor 9/10, model 1/1 (predictions)

## i Fold09: preprocessor 10/10

## v Fold09: preprocessor 10/10

## i Fold09: preprocessor 10/10, model 1/1

## v Fold09: preprocessor 10/10, model 1/1

## i Fold09: preprocessor 10/10, model 1/1 (predictions)

## i Fold10: preprocessor 1/10

## v Fold10: preprocessor 1/10

## i Fold10: preprocessor 1/10, model 1/1

## v Fold10: preprocessor 1/10, model 1/1

## i Fold10: preprocessor 1/10, model 1/1 (predictions)

## i Fold10: preprocessor 2/10

## v Fold10: preprocessor 2/10

## i Fold10: preprocessor 2/10, model 1/1

## v Fold10: preprocessor 2/10, model 1/1

## i Fold10: preprocessor 2/10, model 1/1 (predictions)

## i Fold10: preprocessor 3/10

## v Fold10: preprocessor 3/10

## i Fold10: preprocessor 3/10, model 1/1

## v Fold10: preprocessor 3/10, model 1/1

## i Fold10: preprocessor 3/10, model 1/1 (predictions)

## i Fold10: preprocessor 4/10

## v Fold10: preprocessor 4/10
```

```
## i Fold10: preprocessor 4/10, model 1/1

## v Fold10: preprocessor 4/10, model 1/1

## i Fold10: preprocessor 4/10, model 1/1 (predictions)

## i Fold10: preprocessor 5/10

## v Fold10: preprocessor 5/10

## i Fold10: preprocessor 5/10, model 1/1

## v Fold10: preprocessor 5/10, model 1/1

## i Fold10: preprocessor 5/10, model 1/1 (predictions)

## i Fold10: preprocessor 6/10

## v Fold10: preprocessor 6/10

## i Fold10: preprocessor 6/10, model 1/1

## v Fold10: preprocessor 6/10, model 1/1

## i Fold10: preprocessor 6/10, model 1/1 (predictions)

## i Fold10: preprocessor 7/10

## v Fold10: preprocessor 7/10

## i Fold10: preprocessor 7/10, model 1/1

## v Fold10: preprocessor 7/10, model 1/1

## i Fold10: preprocessor 7/10, model 1/1 (predictions)

## i Fold10: preprocessor 8/10

## v Fold10: preprocessor 8/10

## i Fold10: preprocessor 8/10, model 1/1

## v Fold10: preprocessor 8/10, model 1/1

## i Fold10: preprocessor 8/10, model 1/1 (predictions)

## i Fold10: preprocessor 9/10
```

```
## v Fold10: preprocessor 9/10

## i Fold10: preprocessor 9/10, model 1/1

## v Fold10: preprocessor 9/10, model 1/1

## i Fold10: preprocessor 9/10, model 1/1 (predictions)

## i Fold10: preprocessor 10/10

## v Fold10: preprocessor 10/10

## i Fold10: preprocessor 10/10, model 1/1

## v Fold10: preprocessor 10/10, model 1/1

## i Fold10: preprocessor 10/10, model 1/1 (predictions)
```

```
tune_res
```

```
## # Tuning results
## # 10-fold cross-validation
## # A tibble: 10 x 4
##    splits           id     .metrics          .notes
##    <list>           <chr>  <list>            <list>
##  1 <split [640/72]> Fold01 <tibble [20 x 5]> <tibble [0 x 3]>
##  2 <split [640/72]> Fold02 <tibble [20 x 5]> <tibble [0 x 3]>
##  3 <split [641/71]> Fold03 <tibble [20 x 5]> <tibble [0 x 3]>
##  4 <split [641/71]> Fold04 <tibble [20 x 5]> <tibble [0 x 3]>
##  5 <split [641/71]> Fold05 <tibble [20 x 5]> <tibble [0 x 3]>
##  6 <split [641/71]> Fold06 <tibble [20 x 5]> <tibble [0 x 3]>
##  7 <split [641/71]> Fold07 <tibble [20 x 5]> <tibble [0 x 3]>
##  8 <split [641/71]> Fold08 <tibble [20 x 5]> <tibble [0 x 3]>
##  9 <split [641/71]> Fold09 <tibble [20 x 5]> <tibble [0 x 3]>
## 10 <split [641/71]> Fold10 <tibble [20 x 5]> <tibble [0 x 3]>
```

```
#fit LDA
tune_res2 <- tune_grid(
  object = lda_wkflow,
  resamples = titanic_folds,
  grid = degree_grid,
  control = control_grid(verbose = TRUE)
)
```

```
## i Fold01: preprocessor 1/10

## v Fold01: preprocessor 1/10

## i Fold01: preprocessor 1/10, model 1/1
```

```
## v Fold01: preprocessor 1/10, model 1/1

## i Fold01: preprocessor 1/10, model 1/1 (predictions)

## i Fold01: preprocessor 2/10

## v Fold01: preprocessor 2/10

## i Fold01: preprocessor 2/10, model 1/1

## v Fold01: preprocessor 2/10, model 1/1

## i Fold01: preprocessor 2/10, model 1/1 (predictions)

## i Fold01: preprocessor 3/10

## v Fold01: preprocessor 3/10

## i Fold01: preprocessor 3/10, model 1/1

## v Fold01: preprocessor 3/10, model 1/1

## i Fold01: preprocessor 3/10, model 1/1 (predictions)

## i Fold01: preprocessor 4/10

## v Fold01: preprocessor 4/10

## i Fold01: preprocessor 4/10, model 1/1

## v Fold01: preprocessor 4/10, model 1/1

## i Fold01: preprocessor 4/10, model 1/1 (predictions)

## i Fold01: preprocessor 5/10

## v Fold01: preprocessor 5/10

## i Fold01: preprocessor 5/10, model 1/1

## v Fold01: preprocessor 5/10, model 1/1

## i Fold01: preprocessor 5/10, model 1/1 (predictions)

## i Fold01: preprocessor 6/10

## v Fold01: preprocessor 6/10
```

```
## i Fold01: preprocessor 6/10, model 1/1

## v Fold01: preprocessor 6/10, model 1/1

## i Fold01: preprocessor 6/10, model 1/1 (predictions)

## i Fold01: preprocessor 7/10

## v Fold01: preprocessor 7/10

## i Fold01: preprocessor 7/10, model 1/1

## v Fold01: preprocessor 7/10, model 1/1

## i Fold01: preprocessor 7/10, model 1/1 (predictions)

## i Fold01: preprocessor 8/10

## v Fold01: preprocessor 8/10

## i Fold01: preprocessor 8/10, model 1/1

## v Fold01: preprocessor 8/10, model 1/1

## i Fold01: preprocessor 8/10, model 1/1 (predictions)

## i Fold01: preprocessor 9/10

## v Fold01: preprocessor 9/10

## i Fold01: preprocessor 9/10, model 1/1

## v Fold01: preprocessor 9/10, model 1/1

## i Fold01: preprocessor 9/10, model 1/1 (predictions)

## i Fold01: preprocessor 10/10

## v Fold01: preprocessor 10/10

## i Fold01: preprocessor 10/10, model 1/1

## v Fold01: preprocessor 10/10, model 1/1

## i Fold01: preprocessor 10/10, model 1/1 (predictions)

## i Fold02: preprocessor 1/10
```

```
## v Fold02: preprocessor 1/10

## i Fold02: preprocessor 1/10, model 1/1

## v Fold02: preprocessor 1/10, model 1/1

## i Fold02: preprocessor 1/10, model 1/1 (predictions)

## i Fold02: preprocessor 2/10

## v Fold02: preprocessor 2/10

## i Fold02: preprocessor 2/10, model 1/1

## v Fold02: preprocessor 2/10, model 1/1

## i Fold02: preprocessor 2/10, model 1/1 (predictions)

## i Fold02: preprocessor 3/10

## v Fold02: preprocessor 3/10

## i Fold02: preprocessor 3/10, model 1/1

## v Fold02: preprocessor 3/10, model 1/1

## i Fold02: preprocessor 3/10, model 1/1 (predictions)

## i Fold02: preprocessor 4/10

## v Fold02: preprocessor 4/10

## i Fold02: preprocessor 4/10, model 1/1

## v Fold02: preprocessor 4/10, model 1/1

## i Fold02: preprocessor 4/10, model 1/1 (predictions)

## i Fold02: preprocessor 5/10

## v Fold02: preprocessor 5/10

## i Fold02: preprocessor 5/10, model 1/1

## v Fold02: preprocessor 5/10, model 1/1

## i Fold02: preprocessor 5/10, model 1/1 (predictions)
```

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## i Fold02: preprocessor 6/10

## v Fold02: preprocessor 6/10

## i Fold02: preprocessor 6/10, model 1/1

## v Fold02: preprocessor 6/10, model 1/1

## i Fold02: preprocessor 6/10, model 1/1 (predictions)

## i Fold02: preprocessor 7/10

## v Fold02: preprocessor 7/10

## i Fold02: preprocessor 7/10, model 1/1

## v Fold02: preprocessor 7/10, model 1/1

## i Fold02: preprocessor 7/10, model 1/1 (predictions)

## i Fold02: preprocessor 8/10

## v Fold02: preprocessor 8/10

## i Fold02: preprocessor 8/10, model 1/1

## v Fold02: preprocessor 8/10, model 1/1

## i Fold02: preprocessor 8/10, model 1/1 (predictions)

## i Fold02: preprocessor 9/10

## v Fold02: preprocessor 9/10

## i Fold02: preprocessor 9/10, model 1/1

## v Fold02: preprocessor 9/10, model 1/1

## i Fold02: preprocessor 9/10, model 1/1 (predictions)

## i Fold02: preprocessor 10/10

## v Fold02: preprocessor 10/10

## i Fold02: preprocessor 10/10, model 1/1

## v Fold02: preprocessor 10/10, model 1/1
```

```
## i Fold02: preprocessor 10/10, model 1/1 (predictions)

## i Fold03: preprocessor 1/10

## v Fold03: preprocessor 1/10

## i Fold03: preprocessor 1/10, model 1/1

## v Fold03: preprocessor 1/10, model 1/1

## i Fold03: preprocessor 1/10, model 1/1 (predictions)

## i Fold03: preprocessor 2/10

## v Fold03: preprocessor 2/10

## i Fold03: preprocessor 2/10, model 1/1

## v Fold03: preprocessor 2/10, model 1/1

## i Fold03: preprocessor 2/10, model 1/1 (predictions)

## i Fold03: preprocessor 3/10

## v Fold03: preprocessor 3/10

## i Fold03: preprocessor 3/10, model 1/1

## v Fold03: preprocessor 3/10, model 1/1

## i Fold03: preprocessor 3/10, model 1/1 (predictions)

## i Fold03: preprocessor 4/10

## v Fold03: preprocessor 4/10

## i Fold03: preprocessor 4/10, model 1/1

## v Fold03: preprocessor 4/10, model 1/1

## i Fold03: preprocessor 4/10, model 1/1 (predictions)

## i Fold03: preprocessor 5/10

## v Fold03: preprocessor 5/10

## i Fold03: preprocessor 5/10, model 1/1
```

```
## v Fold03: preprocessor 5/10, model 1/1

## i Fold03: preprocessor 5/10, model 1/1 (predictions)

## i Fold03: preprocessor 6/10

## v Fold03: preprocessor 6/10

## i Fold03: preprocessor 6/10, model 1/1

## v Fold03: preprocessor 6/10, model 1/1

## i Fold03: preprocessor 6/10, model 1/1 (predictions)

## i Fold03: preprocessor 7/10

## v Fold03: preprocessor 7/10

## i Fold03: preprocessor 7/10, model 1/1

## v Fold03: preprocessor 7/10, model 1/1

## i Fold03: preprocessor 7/10, model 1/1 (predictions)

## i Fold03: preprocessor 8/10

## v Fold03: preprocessor 8/10

## i Fold03: preprocessor 8/10, model 1/1

## v Fold03: preprocessor 8/10, model 1/1

## i Fold03: preprocessor 8/10, model 1/1 (predictions)

## i Fold03: preprocessor 9/10

## v Fold03: preprocessor 9/10

## i Fold03: preprocessor 9/10, model 1/1

## v Fold03: preprocessor 9/10, model 1/1

## i Fold03: preprocessor 9/10, model 1/1 (predictions)

## i Fold03: preprocessor 10/10

## v Fold03: preprocessor 10/10
```

```
## i Fold03: preprocessor 10/10, model 1/1

## v Fold03: preprocessor 10/10, model 1/1

## i Fold03: preprocessor 10/10, model 1/1 (predictions)

## i Fold04: preprocessor 1/10

## v Fold04: preprocessor 1/10

## i Fold04: preprocessor 1/10, model 1/1

## v Fold04: preprocessor 1/10, model 1/1

## i Fold04: preprocessor 1/10, model 1/1 (predictions)

## i Fold04: preprocessor 2/10

## v Fold04: preprocessor 2/10

## i Fold04: preprocessor 2/10, model 1/1

## v Fold04: preprocessor 2/10, model 1/1

## i Fold04: preprocessor 2/10, model 1/1 (predictions)

## i Fold04: preprocessor 3/10

## v Fold04: preprocessor 3/10

## i Fold04: preprocessor 3/10, model 1/1

## v Fold04: preprocessor 3/10, model 1/1

## i Fold04: preprocessor 3/10, model 1/1 (predictions)

## i Fold04: preprocessor 4/10

## v Fold04: preprocessor 4/10

## i Fold04: preprocessor 4/10, model 1/1

## v Fold04: preprocessor 4/10, model 1/1

## i Fold04: preprocessor 4/10, model 1/1 (predictions)

## i Fold04: preprocessor 5/10
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## v Fold04: preprocessor 5/10

## i Fold04: preprocessor 5/10, model 1/1

## v Fold04: preprocessor 5/10, model 1/1

## i Fold04: preprocessor 5/10, model 1/1 (predictions)

## i Fold04: preprocessor 6/10

## v Fold04: preprocessor 6/10

## i Fold04: preprocessor 6/10, model 1/1

## v Fold04: preprocessor 6/10, model 1/1

## i Fold04: preprocessor 6/10, model 1/1 (predictions)

## i Fold04: preprocessor 7/10

## v Fold04: preprocessor 7/10

## i Fold04: preprocessor 7/10, model 1/1

## v Fold04: preprocessor 7/10, model 1/1

## i Fold04: preprocessor 7/10, model 1/1 (predictions)

## i Fold04: preprocessor 8/10

## v Fold04: preprocessor 8/10

## i Fold04: preprocessor 8/10, model 1/1

## v Fold04: preprocessor 8/10, model 1/1

## i Fold04: preprocessor 8/10, model 1/1 (predictions)

## i Fold04: preprocessor 9/10

## v Fold04: preprocessor 9/10

## i Fold04: preprocessor 9/10, model 1/1

## v Fold04: preprocessor 9/10, model 1/1

## i Fold04: preprocessor 9/10, model 1/1 (predictions)
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## i Fold04: preprocessor 10/10

## v Fold04: preprocessor 10/10

## i Fold04: preprocessor 10/10, model 1/1

## v Fold04: preprocessor 10/10, model 1/1

## i Fold04: preprocessor 10/10, model 1/1 (predictions)

## i Fold05: preprocessor 1/10

## v Fold05: preprocessor 1/10

## i Fold05: preprocessor 1/10, model 1/1

## v Fold05: preprocessor 1/10, model 1/1

## i Fold05: preprocessor 1/10, model 1/1 (predictions)

## i Fold05: preprocessor 2/10

## v Fold05: preprocessor 2/10

## i Fold05: preprocessor 2/10, model 1/1

## v Fold05: preprocessor 2/10, model 1/1

## i Fold05: preprocessor 2/10, model 1/1 (predictions)

## i Fold05: preprocessor 3/10

## v Fold05: preprocessor 3/10

## i Fold05: preprocessor 3/10, model 1/1

## v Fold05: preprocessor 3/10, model 1/1

## i Fold05: preprocessor 3/10, model 1/1 (predictions)

## i Fold05: preprocessor 4/10

## v Fold05: preprocessor 4/10

## i Fold05: preprocessor 4/10, model 1/1

## v Fold05: preprocessor 4/10, model 1/1
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## i Fold05: preprocessor 4/10, model 1/1 (predictions)

## i Fold05: preprocessor 5/10

## v Fold05: preprocessor 5/10

## i Fold05: preprocessor 5/10, model 1/1

## v Fold05: preprocessor 5/10, model 1/1

## i Fold05: preprocessor 5/10, model 1/1 (predictions)

## i Fold05: preprocessor 6/10

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## i Fold05: preprocessor 6/10, model 1/1

## v Fold05: preprocessor 6/10, model 1/1

## i Fold05: preprocessor 6/10, model 1/1 (predictions)

## i Fold05: preprocessor 7/10

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## i Fold05: preprocessor 7/10, model 1/1

## v Fold05: preprocessor 7/10, model 1/1

## i Fold05: preprocessor 7/10, model 1/1 (predictions)

## i Fold05: preprocessor 8/10

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## i Fold05: preprocessor 8/10, model 1/1

## v Fold05: preprocessor 8/10, model 1/1

## i Fold05: preprocessor 8/10, model 1/1 (predictions)

## i Fold05: preprocessor 9/10

## v Fold05: preprocessor 9/10

## i Fold05: preprocessor 9/10, model 1/1
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## v Fold05: preprocessor 9/10, model 1/1

## i Fold05: preprocessor 9/10, model 1/1 (predictions)

## i Fold05: preprocessor 10/10

## v Fold05: preprocessor 10/10

## i Fold05: preprocessor 10/10, model 1/1

## v Fold05: preprocessor 10/10, model 1/1

## i Fold05: preprocessor 10/10, model 1/1 (predictions)

## i Fold06: preprocessor 1/10

## v Fold06: preprocessor 1/10

## i Fold06: preprocessor 1/10, model 1/1

## v Fold06: preprocessor 1/10, model 1/1

## i Fold06: preprocessor 1/10, model 1/1 (predictions)

## i Fold06: preprocessor 2/10

## v Fold06: preprocessor 2/10

## i Fold06: preprocessor 2/10, model 1/1

## v Fold06: preprocessor 2/10, model 1/1

## i Fold06: preprocessor 2/10, model 1/1 (predictions)

## i Fold06: preprocessor 3/10

## v Fold06: preprocessor 3/10

## i Fold06: preprocessor 3/10, model 1/1

## v Fold06: preprocessor 3/10, model 1/1

## i Fold06: preprocessor 3/10, model 1/1 (predictions)

## i Fold06: preprocessor 4/10

## v Fold06: preprocessor 4/10
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```
## i Fold06: preprocessor 4/10, model 1/1

## v Fold06: preprocessor 4/10, model 1/1

## i Fold06: preprocessor 4/10, model 1/1 (predictions)

## i Fold06: preprocessor 5/10

## v Fold06: preprocessor 5/10

## i Fold06: preprocessor 5/10, model 1/1

## v Fold06: preprocessor 5/10, model 1/1

## i Fold06: preprocessor 5/10, model 1/1 (predictions)

## i Fold06: preprocessor 6/10

## v Fold06: preprocessor 6/10

## i Fold06: preprocessor 6/10, model 1/1

## v Fold06: preprocessor 6/10, model 1/1

## i Fold06: preprocessor 6/10, model 1/1 (predictions)

## i Fold06: preprocessor 7/10

## v Fold06: preprocessor 7/10

## i Fold06: preprocessor 7/10, model 1/1

## v Fold06: preprocessor 7/10, model 1/1

## i Fold06: preprocessor 7/10, model 1/1 (predictions)

## i Fold06: preprocessor 8/10

## v Fold06: preprocessor 8/10

## i Fold06: preprocessor 8/10, model 1/1

## v Fold06: preprocessor 8/10, model 1/1

## i Fold06: preprocessor 8/10, model 1/1 (predictions)

## i Fold06: preprocessor 9/10
```

```
## v Fold06: preprocessor 9/10

## i Fold06: preprocessor 9/10, model 1/1

## v Fold06: preprocessor 9/10, model 1/1

## i Fold06: preprocessor 9/10, model 1/1 (predictions)

## i Fold06: preprocessor 10/10

## v Fold06: preprocessor 10/10

## i Fold06: preprocessor 10/10, model 1/1

## v Fold06: preprocessor 10/10, model 1/1

## i Fold06: preprocessor 10/10, model 1/1 (predictions)

## i Fold07: preprocessor 1/10

## v Fold07: preprocessor 1/10

## i Fold07: preprocessor 1/10, model 1/1

## v Fold07: preprocessor 1/10, model 1/1

## i Fold07: preprocessor 1/10, model 1/1 (predictions)

## i Fold07: preprocessor 2/10

## v Fold07: preprocessor 2/10

## i Fold07: preprocessor 2/10, model 1/1

## v Fold07: preprocessor 2/10, model 1/1

## i Fold07: preprocessor 2/10, model 1/1 (predictions)

## i Fold07: preprocessor 3/10

## v Fold07: preprocessor 3/10

## i Fold07: preprocessor 3/10, model 1/1

## v Fold07: preprocessor 3/10, model 1/1

## i Fold07: preprocessor 3/10, model 1/1 (predictions)
```

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## i Fold07: preprocessor 4/10

## v Fold07: preprocessor 4/10

## i Fold07: preprocessor 4/10, model 1/1

## v Fold07: preprocessor 4/10, model 1/1

## i Fold07: preprocessor 4/10, model 1/1 (predictions)

## i Fold07: preprocessor 5/10

## v Fold07: preprocessor 5/10

## i Fold07: preprocessor 5/10, model 1/1

## v Fold07: preprocessor 5/10, model 1/1

## i Fold07: preprocessor 5/10, model 1/1 (predictions)

## i Fold07: preprocessor 6/10

## v Fold07: preprocessor 6/10

## i Fold07: preprocessor 6/10, model 1/1

## v Fold07: preprocessor 6/10, model 1/1

## i Fold07: preprocessor 6/10, model 1/1 (predictions)

## i Fold07: preprocessor 7/10

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## i Fold07: preprocessor 7/10, model 1/1

## v Fold07: preprocessor 7/10, model 1/1

## i Fold07: preprocessor 7/10, model 1/1 (predictions)

## i Fold07: preprocessor 8/10

## v Fold07: preprocessor 8/10

## i Fold07: preprocessor 8/10, model 1/1

## v Fold07: preprocessor 8/10, model 1/1
```

```
## i Fold07: preprocessor 8/10, model 1/1 (predictions)

## i Fold07: preprocessor 9/10

## v Fold07: preprocessor 9/10

## i Fold07: preprocessor 9/10, model 1/1

## v Fold07: preprocessor 9/10, model 1/1

## i Fold07: preprocessor 9/10, model 1/1 (predictions)

## i Fold07: preprocessor 10/10

## v Fold07: preprocessor 10/10

## i Fold07: preprocessor 10/10, model 1/1

## v Fold07: preprocessor 10/10, model 1/1

## i Fold07: preprocessor 10/10, model 1/1 (predictions)

## i Fold08: preprocessor 1/10

## v Fold08: preprocessor 1/10

## i Fold08: preprocessor 1/10, model 1/1

## v Fold08: preprocessor 1/10, model 1/1

## i Fold08: preprocessor 1/10, model 1/1 (predictions)

## i Fold08: preprocessor 2/10

## v Fold08: preprocessor 2/10

## i Fold08: preprocessor 2/10, model 1/1

## v Fold08: preprocessor 2/10, model 1/1

## i Fold08: preprocessor 2/10, model 1/1 (predictions)

## i Fold08: preprocessor 3/10

## v Fold08: preprocessor 3/10

## i Fold08: preprocessor 3/10, model 1/1
```

```
## v Fold08: preprocessor 3/10, model 1/1

## i Fold08: preprocessor 3/10, model 1/1 (predictions)

## i Fold08: preprocessor 4/10

## v Fold08: preprocessor 4/10

## i Fold08: preprocessor 4/10, model 1/1

## v Fold08: preprocessor 4/10, model 1/1

## i Fold08: preprocessor 4/10, model 1/1 (predictions)

## i Fold08: preprocessor 5/10

## v Fold08: preprocessor 5/10

## i Fold08: preprocessor 5/10, model 1/1

## v Fold08: preprocessor 5/10, model 1/1

## i Fold08: preprocessor 5/10, model 1/1 (predictions)

## i Fold08: preprocessor 6/10

## v Fold08: preprocessor 6/10

## i Fold08: preprocessor 6/10, model 1/1

## v Fold08: preprocessor 6/10, model 1/1

## i Fold08: preprocessor 6/10, model 1/1 (predictions)

## i Fold08: preprocessor 7/10

## v Fold08: preprocessor 7/10

## i Fold08: preprocessor 7/10, model 1/1

## v Fold08: preprocessor 7/10, model 1/1

## i Fold08: preprocessor 7/10, model 1/1 (predictions)

## i Fold08: preprocessor 8/10

## v Fold08: preprocessor 8/10
```

```
## i Fold08: preprocessor 8/10, model 1/1

## v Fold08: preprocessor 8/10, model 1/1

## i Fold08: preprocessor 8/10, model 1/1 (predictions)

## i Fold08: preprocessor 9/10

## v Fold08: preprocessor 9/10

## i Fold08: preprocessor 9/10, model 1/1

## v Fold08: preprocessor 9/10, model 1/1

## i Fold08: preprocessor 9/10, model 1/1 (predictions)

## i Fold08: preprocessor 10/10

## v Fold08: preprocessor 10/10

## i Fold08: preprocessor 10/10, model 1/1

## v Fold08: preprocessor 10/10, model 1/1

## i Fold08: preprocessor 10/10, model 1/1 (predictions)

## i Fold09: preprocessor 1/10

## v Fold09: preprocessor 1/10

## i Fold09: preprocessor 1/10, model 1/1

## v Fold09: preprocessor 1/10, model 1/1

## i Fold09: preprocessor 1/10, model 1/1 (predictions)

## i Fold09: preprocessor 2/10

## v Fold09: preprocessor 2/10

## i Fold09: preprocessor 2/10, model 1/1

## v Fold09: preprocessor 2/10, model 1/1

## i Fold09: preprocessor 2/10, model 1/1 (predictions)

## i Fold09: preprocessor 3/10
```

```
## v Fold09: preprocessor 3/10

## i Fold09: preprocessor 3/10, model 1/1

## v Fold09: preprocessor 3/10, model 1/1

## i Fold09: preprocessor 3/10, model 1/1 (predictions)

## i Fold09: preprocessor 4/10

## v Fold09: preprocessor 4/10

## i Fold09: preprocessor 4/10, model 1/1

## v Fold09: preprocessor 4/10, model 1/1

## i Fold09: preprocessor 4/10, model 1/1 (predictions)

## i Fold09: preprocessor 5/10

## v Fold09: preprocessor 5/10

## i Fold09: preprocessor 5/10, model 1/1

## v Fold09: preprocessor 5/10, model 1/1

## i Fold09: preprocessor 5/10, model 1/1 (predictions)

## i Fold09: preprocessor 6/10

## v Fold09: preprocessor 6/10

## i Fold09: preprocessor 6/10, model 1/1

## v Fold09: preprocessor 6/10, model 1/1

## i Fold09: preprocessor 6/10, model 1/1 (predictions)

## i Fold09: preprocessor 7/10

## v Fold09: preprocessor 7/10

## i Fold09: preprocessor 7/10, model 1/1

## v Fold09: preprocessor 7/10, model 1/1

## i Fold09: preprocessor 7/10, model 1/1 (predictions)
```

```
## i Fold09: preprocessor 8/10

## v Fold09: preprocessor 8/10

## i Fold09: preprocessor 8/10, model 1/1

## v Fold09: preprocessor 8/10, model 1/1

## i Fold09: preprocessor 8/10, model 1/1 (predictions)

## i Fold09: preprocessor 9/10

## v Fold09: preprocessor 9/10

## i Fold09: preprocessor 9/10, model 1/1

## v Fold09: preprocessor 9/10, model 1/1

## i Fold09: preprocessor 9/10, model 1/1 (predictions)

## i Fold09: preprocessor 10/10

## v Fold09: preprocessor 10/10

## i Fold09: preprocessor 10/10, model 1/1

## v Fold09: preprocessor 10/10, model 1/1

## i Fold09: preprocessor 10/10, model 1/1 (predictions)

## i Fold10: preprocessor 1/10

## v Fold10: preprocessor 1/10

## i Fold10: preprocessor 1/10, model 1/1

## v Fold10: preprocessor 1/10, model 1/1

## i Fold10: preprocessor 1/10, model 1/1 (predictions)

## i Fold10: preprocessor 2/10

## v Fold10: preprocessor 2/10

## i Fold10: preprocessor 2/10, model 1/1

## v Fold10: preprocessor 2/10, model 1/1
```

```
## i Fold10: preprocessor 2/10, model 1/1 (predictions)

## i Fold10: preprocessor 3/10

## v Fold10: preprocessor 3/10

## i Fold10: preprocessor 3/10, model 1/1

## v Fold10: preprocessor 3/10, model 1/1

## i Fold10: preprocessor 3/10, model 1/1 (predictions)

## i Fold10: preprocessor 4/10

## v Fold10: preprocessor 4/10

## i Fold10: preprocessor 4/10, model 1/1

## v Fold10: preprocessor 4/10, model 1/1

## i Fold10: preprocessor 4/10, model 1/1 (predictions)

## i Fold10: preprocessor 5/10

## v Fold10: preprocessor 5/10

## i Fold10: preprocessor 5/10, model 1/1

## v Fold10: preprocessor 5/10, model 1/1

## i Fold10: preprocessor 5/10, model 1/1 (predictions)

## i Fold10: preprocessor 6/10

## v Fold10: preprocessor 6/10

## i Fold10: preprocessor 6/10, model 1/1

## v Fold10: preprocessor 6/10, model 1/1

## i Fold10: preprocessor 6/10, model 1/1 (predictions)

## i Fold10: preprocessor 7/10

## v Fold10: preprocessor 7/10

## i Fold10: preprocessor 7/10, model 1/1
```

```
## v Fold10: preprocessor 7/10, model 1/1

## i Fold10: preprocessor 7/10, model 1/1 (predictions)

## i Fold10: preprocessor 8/10

## v Fold10: preprocessor 8/10

## i Fold10: preprocessor 8/10, model 1/1

## v Fold10: preprocessor 8/10, model 1/1

## i Fold10: preprocessor 8/10, model 1/1 (predictions)

## i Fold10: preprocessor 9/10

## v Fold10: preprocessor 9/10

## i Fold10: preprocessor 9/10, model 1/1

## v Fold10: preprocessor 9/10, model 1/1

## i Fold10: preprocessor 9/10, model 1/1 (predictions)

## i Fold10: preprocessor 10/10

## v Fold10: preprocessor 10/10

## i Fold10: preprocessor 10/10, model 1/1

## v Fold10: preprocessor 10/10, model 1/1

## i Fold10: preprocessor 10/10, model 1/1 (predictions)
```

```
tune_res2
```

```
## # Tuning results
## # 10-fold cross-validation
## # A tibble: 10 x 4
##    splits           id     .metrics          .notes
##    <list>           <chr>  <list>            <list>
##  1 <split [640/72]> Fold01 <tibble [20 x 5]> <tibble [0 x 3]>
##  2 <split [640/72]> Fold02 <tibble [20 x 5]> <tibble [0 x 3]>
##  3 <split [641/71]> Fold03 <tibble [20 x 5]> <tibble [0 x 3]>
##  4 <split [641/71]> Fold04 <tibble [20 x 5]> <tibble [0 x 3]>
##  5 <split [641/71]> Fold05 <tibble [20 x 5]> <tibble [0 x 3]>
##  6 <split [641/71]> Fold06 <tibble [20 x 5]> <tibble [0 x 3]>
##  7 <split [641/71]> Fold07 <tibble [20 x 5]> <tibble [0 x 3]>
##  8 <split [641/71]> Fold08 <tibble [20 x 5]> <tibble [0 x 3]>
##  9 <split [641/71]> Fold09 <tibble [20 x 5]> <tibble [0 x 3]>
## 10 <split [641/71]> Fold10 <tibble [20 x 5]> <tibble [0 x 3]>
```

```r
#fit QDA

tune_res3 <- tune_grid(
  object = qda_wkflow,
  resamples = titanic_folds,
  grid = degree_grid,
  control = control_grid(verbose = TRUE)
)
```

```
## i Fold01: preprocessor 1/10

## v Fold01: preprocessor 1/10

## i Fold01: preprocessor 1/10, model 1/1

## v Fold01: preprocessor 1/10, model 1/1

## i Fold01: preprocessor 1/10, model 1/1 (predictions)

## i Fold01: preprocessor 2/10

## v Fold01: preprocessor 2/10

## i Fold01: preprocessor 2/10, model 1/1

## v Fold01: preprocessor 2/10, model 1/1

## i Fold01: preprocessor 2/10, model 1/1 (predictions)

## i Fold01: preprocessor 3/10

## v Fold01: preprocessor 3/10

## i Fold01: preprocessor 3/10, model 1/1

## v Fold01: preprocessor 3/10, model 1/1

## i Fold01: preprocessor 3/10, model 1/1 (predictions)

## i Fold01: preprocessor 4/10

## v Fold01: preprocessor 4/10

## i Fold01: preprocessor 4/10, model 1/1

## v Fold01: preprocessor 4/10, model 1/1

## i Fold01: preprocessor 4/10, model 1/1 (predictions)
```

```
## i Fold01: preprocessor 5/10

## v Fold01: preprocessor 5/10

## i Fold01: preprocessor 5/10, model 1/1

## v Fold01: preprocessor 5/10, model 1/1

## i Fold01: preprocessor 5/10, model 1/1 (predictions)

## i Fold01: preprocessor 6/10

## v Fold01: preprocessor 6/10

## i Fold01: preprocessor 6/10, model 1/1

## v Fold01: preprocessor 6/10, model 1/1

## i Fold01: preprocessor 6/10, model 1/1 (predictions)

## i Fold01: preprocessor 7/10

## v Fold01: preprocessor 7/10

## i Fold01: preprocessor 7/10, model 1/1

## v Fold01: preprocessor 7/10, model 1/1

## i Fold01: preprocessor 7/10, model 1/1 (predictions)

## i Fold01: preprocessor 8/10

## v Fold01: preprocessor 8/10

## i Fold01: preprocessor 8/10, model 1/1

## v Fold01: preprocessor 8/10, model 1/1

## i Fold01: preprocessor 8/10, model 1/1 (predictions)

## i Fold01: preprocessor 9/10

## v Fold01: preprocessor 9/10

## i Fold01: preprocessor 9/10, model 1/1

## v Fold01: preprocessor 9/10, model 1/1
```

```
## i Fold01: preprocessor 9/10, model 1/1 (predictions)

## i Fold01: preprocessor 10/10

## v Fold01: preprocessor 10/10

## i Fold01: preprocessor 10/10, model 1/1

## v Fold01: preprocessor 10/10, model 1/1

## i Fold01: preprocessor 10/10, model 1/1 (predictions)

## i Fold02: preprocessor 1/10

## v Fold02: preprocessor 1/10

## i Fold02: preprocessor 1/10, model 1/1

## v Fold02: preprocessor 1/10, model 1/1

## i Fold02: preprocessor 1/10, model 1/1 (predictions)

## i Fold02: preprocessor 2/10

## v Fold02: preprocessor 2/10

## i Fold02: preprocessor 2/10, model 1/1

## v Fold02: preprocessor 2/10, model 1/1

## i Fold02: preprocessor 2/10, model 1/1 (predictions)

## i Fold02: preprocessor 3/10

## v Fold02: preprocessor 3/10

## i Fold02: preprocessor 3/10, model 1/1

## v Fold02: preprocessor 3/10, model 1/1

## i Fold02: preprocessor 3/10, model 1/1 (predictions)

## i Fold02: preprocessor 4/10

## v Fold02: preprocessor 4/10

## i Fold02: preprocessor 4/10, model 1/1
```

```
## v Fold02: preprocessor 4/10, model 1/1

## i Fold02: preprocessor 4/10, model 1/1 (predictions)

## i Fold02: preprocessor 5/10

## v Fold02: preprocessor 5/10

## i Fold02: preprocessor 5/10, model 1/1

## v Fold02: preprocessor 5/10, model 1/1

## i Fold02: preprocessor 5/10, model 1/1 (predictions)

## i Fold02: preprocessor 6/10

## v Fold02: preprocessor 6/10

## i Fold02: preprocessor 6/10, model 1/1

## v Fold02: preprocessor 6/10, model 1/1

## i Fold02: preprocessor 6/10, model 1/1 (predictions)

## i Fold02: preprocessor 7/10

## v Fold02: preprocessor 7/10

## i Fold02: preprocessor 7/10, model 1/1

## v Fold02: preprocessor 7/10, model 1/1

## i Fold02: preprocessor 7/10, model 1/1 (predictions)

## i Fold02: preprocessor 8/10

## v Fold02: preprocessor 8/10

## i Fold02: preprocessor 8/10, model 1/1

## v Fold02: preprocessor 8/10, model 1/1

## i Fold02: preprocessor 8/10, model 1/1 (predictions)

## i Fold02: preprocessor 9/10

## v Fold02: preprocessor 9/10
```

```
## i Fold02: preprocessor 9/10, model 1/1

## v Fold02: preprocessor 9/10, model 1/1

## i Fold02: preprocessor 9/10, model 1/1 (predictions)

## i Fold02: preprocessor 10/10

## v Fold02: preprocessor 10/10

## i Fold02: preprocessor 10/10, model 1/1

## v Fold02: preprocessor 10/10, model 1/1

## i Fold02: preprocessor 10/10, model 1/1 (predictions)

## i Fold03: preprocessor 1/10

## v Fold03: preprocessor 1/10

## i Fold03: preprocessor 1/10, model 1/1

## v Fold03: preprocessor 1/10, model 1/1

## i Fold03: preprocessor 1/10, model 1/1 (predictions)

## i Fold03: preprocessor 2/10

## v Fold03: preprocessor 2/10

## i Fold03: preprocessor 2/10, model 1/1

## v Fold03: preprocessor 2/10, model 1/1

## i Fold03: preprocessor 2/10, model 1/1 (predictions)

## i Fold03: preprocessor 3/10

## v Fold03: preprocessor 3/10

## i Fold03: preprocessor 3/10, model 1/1

## v Fold03: preprocessor 3/10, model 1/1

## i Fold03: preprocessor 3/10, model 1/1 (predictions)

## i Fold03: preprocessor 4/10
```

```
## v Fold03: preprocessor 4/10

## i Fold03: preprocessor 4/10, model 1/1

## v Fold03: preprocessor 4/10, model 1/1

## i Fold03: preprocessor 4/10, model 1/1 (predictions)

## i Fold03: preprocessor 5/10

## v Fold03: preprocessor 5/10

## i Fold03: preprocessor 5/10, model 1/1

## v Fold03: preprocessor 5/10, model 1/1

## i Fold03: preprocessor 5/10, model 1/1 (predictions)

## i Fold03: preprocessor 6/10

## v Fold03: preprocessor 6/10

## i Fold03: preprocessor 6/10, model 1/1

## v Fold03: preprocessor 6/10, model 1/1

## i Fold03: preprocessor 6/10, model 1/1 (predictions)

## i Fold03: preprocessor 7/10

## v Fold03: preprocessor 7/10

## i Fold03: preprocessor 7/10, model 1/1

## v Fold03: preprocessor 7/10, model 1/1

## i Fold03: preprocessor 7/10, model 1/1 (predictions)

## i Fold03: preprocessor 8/10

## v Fold03: preprocessor 8/10

## i Fold03: preprocessor 8/10, model 1/1

## v Fold03: preprocessor 8/10, model 1/1

## i Fold03: preprocessor 8/10, model 1/1 (predictions)
```

```
## i Fold03: preprocessor 9/10

## v Fold03: preprocessor 9/10

## i Fold03: preprocessor 9/10, model 1/1

## v Fold03: preprocessor 9/10, model 1/1

## i Fold03: preprocessor 9/10, model 1/1 (predictions)

## i Fold03: preprocessor 10/10

## v Fold03: preprocessor 10/10

## i Fold03: preprocessor 10/10, model 1/1

## v Fold03: preprocessor 10/10, model 1/1

## i Fold03: preprocessor 10/10, model 1/1 (predictions)

## i Fold04: preprocessor 1/10

## v Fold04: preprocessor 1/10

## i Fold04: preprocessor 1/10, model 1/1

## v Fold04: preprocessor 1/10, model 1/1

## i Fold04: preprocessor 1/10, model 1/1 (predictions)

## i Fold04: preprocessor 2/10

## v Fold04: preprocessor 2/10

## i Fold04: preprocessor 2/10, model 1/1

## v Fold04: preprocessor 2/10, model 1/1

## i Fold04: preprocessor 2/10, model 1/1 (predictions)

## i Fold04: preprocessor 3/10

## v Fold04: preprocessor 3/10

## i Fold04: preprocessor 3/10, model 1/1

## v Fold04: preprocessor 3/10, model 1/1
```

```
## i Fold04: preprocessor 3/10, model 1/1 (predictions)

## i Fold04: preprocessor 4/10

## v Fold04: preprocessor 4/10

## i Fold04: preprocessor 4/10, model 1/1

## v Fold04: preprocessor 4/10, model 1/1

## i Fold04: preprocessor 4/10, model 1/1 (predictions)

## i Fold04: preprocessor 5/10

## v Fold04: preprocessor 5/10

## i Fold04: preprocessor 5/10, model 1/1

## v Fold04: preprocessor 5/10, model 1/1

## i Fold04: preprocessor 5/10, model 1/1 (predictions)

## i Fold04: preprocessor 6/10

## v Fold04: preprocessor 6/10

## i Fold04: preprocessor 6/10, model 1/1

## v Fold04: preprocessor 6/10, model 1/1

## i Fold04: preprocessor 6/10, model 1/1 (predictions)

## i Fold04: preprocessor 7/10

## v Fold04: preprocessor 7/10

## i Fold04: preprocessor 7/10, model 1/1

## v Fold04: preprocessor 7/10, model 1/1

## i Fold04: preprocessor 7/10, model 1/1 (predictions)

## i Fold04: preprocessor 8/10

## v Fold04: preprocessor 8/10

## i Fold04: preprocessor 8/10, model 1/1
```

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## v Fold04: preprocessor 8/10, model 1/1

## i Fold04: preprocessor 8/10, model 1/1 (predictions)

## i Fold04: preprocessor 9/10

## v Fold04: preprocessor 9/10

## i Fold04: preprocessor 9/10, model 1/1

## v Fold04: preprocessor 9/10, model 1/1

## i Fold04: preprocessor 9/10, model 1/1 (predictions)

## i Fold04: preprocessor 10/10

## v Fold04: preprocessor 10/10

## i Fold04: preprocessor 10/10, model 1/1

## v Fold04: preprocessor 10/10, model 1/1

## i Fold04: preprocessor 10/10, model 1/1 (predictions)

## i Fold05: preprocessor 1/10

## v Fold05: preprocessor 1/10

## i Fold05: preprocessor 1/10, model 1/1

## v Fold05: preprocessor 1/10, model 1/1

## i Fold05: preprocessor 1/10, model 1/1 (predictions)

## i Fold05: preprocessor 2/10

## v Fold05: preprocessor 2/10

## i Fold05: preprocessor 2/10, model 1/1

## v Fold05: preprocessor 2/10, model 1/1

## i Fold05: preprocessor 2/10, model 1/1 (predictions)

## i Fold05: preprocessor 3/10

## v Fold05: preprocessor 3/10
```

```
## i Fold05: preprocessor 3/10, model 1/1

## v Fold05: preprocessor 3/10, model 1/1

## i Fold05: preprocessor 3/10, model 1/1 (predictions)

## i Fold05: preprocessor 4/10

## v Fold05: preprocessor 4/10

## i Fold05: preprocessor 4/10, model 1/1

## v Fold05: preprocessor 4/10, model 1/1

## i Fold05: preprocessor 4/10, model 1/1 (predictions)

## i Fold05: preprocessor 5/10

## v Fold05: preprocessor 5/10

## i Fold05: preprocessor 5/10, model 1/1

## v Fold05: preprocessor 5/10, model 1/1

## i Fold05: preprocessor 5/10, model 1/1 (predictions)

## i Fold05: preprocessor 6/10

## v Fold05: preprocessor 6/10

## i Fold05: preprocessor 6/10, model 1/1

## v Fold05: preprocessor 6/10, model 1/1

## i Fold05: preprocessor 6/10, model 1/1 (predictions)

## i Fold05: preprocessor 7/10

## v Fold05: preprocessor 7/10

## i Fold05: preprocessor 7/10, model 1/1

## v Fold05: preprocessor 7/10, model 1/1

## i Fold05: preprocessor 7/10, model 1/1 (predictions)

## i Fold05: preprocessor 8/10
```

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## v Fold05: preprocessor 8/10

## i Fold05: preprocessor 8/10, model 1/1

## v Fold05: preprocessor 8/10, model 1/1

## i Fold05: preprocessor 8/10, model 1/1 (predictions)

## i Fold05: preprocessor 9/10

## v Fold05: preprocessor 9/10

## i Fold05: preprocessor 9/10, model 1/1

## v Fold05: preprocessor 9/10, model 1/1

## i Fold05: preprocessor 9/10, model 1/1 (predictions)

## i Fold05: preprocessor 10/10

## v Fold05: preprocessor 10/10

## i Fold05: preprocessor 10/10, model 1/1

## v Fold05: preprocessor 10/10, model 1/1

## i Fold05: preprocessor 10/10, model 1/1 (predictions)

## i Fold06: preprocessor 1/10

## v Fold06: preprocessor 1/10

## i Fold06: preprocessor 1/10, model 1/1

## v Fold06: preprocessor 1/10, model 1/1

## i Fold06: preprocessor 1/10, model 1/1 (predictions)

## i Fold06: preprocessor 2/10

## v Fold06: preprocessor 2/10

## i Fold06: preprocessor 2/10, model 1/1

## v Fold06: preprocessor 2/10, model 1/1

## i Fold06: preprocessor 2/10, model 1/1 (predictions)
```

```
## i Fold06: preprocessor 3/10

## v Fold06: preprocessor 3/10

## i Fold06: preprocessor 3/10, model 1/1

## v Fold06: preprocessor 3/10, model 1/1

## i Fold06: preprocessor 3/10, model 1/1 (predictions)

## i Fold06: preprocessor 4/10

## v Fold06: preprocessor 4/10

## i Fold06: preprocessor 4/10, model 1/1

## v Fold06: preprocessor 4/10, model 1/1

## i Fold06: preprocessor 4/10, model 1/1 (predictions)

## i Fold06: preprocessor 5/10

## v Fold06: preprocessor 5/10

## i Fold06: preprocessor 5/10, model 1/1

## v Fold06: preprocessor 5/10, model 1/1

## i Fold06: preprocessor 5/10, model 1/1 (predictions)

## i Fold06: preprocessor 6/10

## v Fold06: preprocessor 6/10

## i Fold06: preprocessor 6/10, model 1/1

## v Fold06: preprocessor 6/10, model 1/1

## i Fold06: preprocessor 6/10, model 1/1 (predictions)

## i Fold06: preprocessor 7/10

## v Fold06: preprocessor 7/10

## i Fold06: preprocessor 7/10, model 1/1

## v Fold06: preprocessor 7/10, model 1/1
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```
## i Fold06: preprocessor 7/10, model 1/1 (predictions)

## i Fold06: preprocessor 8/10

## v Fold06: preprocessor 8/10

## i Fold06: preprocessor 8/10, model 1/1

## v Fold06: preprocessor 8/10, model 1/1

## i Fold06: preprocessor 8/10, model 1/1 (predictions)

## i Fold06: preprocessor 9/10

## v Fold06: preprocessor 9/10

## i Fold06: preprocessor 9/10, model 1/1

## v Fold06: preprocessor 9/10, model 1/1

## i Fold06: preprocessor 9/10, model 1/1 (predictions)

## i Fold06: preprocessor 10/10

## v Fold06: preprocessor 10/10

## i Fold06: preprocessor 10/10, model 1/1

## v Fold06: preprocessor 10/10, model 1/1

## i Fold06: preprocessor 10/10, model 1/1 (predictions)

## i Fold07: preprocessor 1/10

## v Fold07: preprocessor 1/10

## i Fold07: preprocessor 1/10, model 1/1

## v Fold07: preprocessor 1/10, model 1/1

## i Fold07: preprocessor 1/10, model 1/1 (predictions)

## i Fold07: preprocessor 2/10

## v Fold07: preprocessor 2/10

## i Fold07: preprocessor 2/10, model 1/1
```

```
## v Fold07: preprocessor 2/10, model 1/1

## i Fold07: preprocessor 2/10, model 1/1 (predictions)

## i Fold07: preprocessor 3/10

## v Fold07: preprocessor 3/10

## i Fold07: preprocessor 3/10, model 1/1

## v Fold07: preprocessor 3/10, model 1/1

## i Fold07: preprocessor 3/10, model 1/1 (predictions)

## i Fold07: preprocessor 4/10

## v Fold07: preprocessor 4/10

## i Fold07: preprocessor 4/10, model 1/1

## v Fold07: preprocessor 4/10, model 1/1

## i Fold07: preprocessor 4/10, model 1/1 (predictions)

## i Fold07: preprocessor 5/10

## v Fold07: preprocessor 5/10

## i Fold07: preprocessor 5/10, model 1/1

## v Fold07: preprocessor 5/10, model 1/1

## i Fold07: preprocessor 5/10, model 1/1 (predictions)

## i Fold07: preprocessor 6/10

## v Fold07: preprocessor 6/10

## i Fold07: preprocessor 6/10, model 1/1

## v Fold07: preprocessor 6/10, model 1/1

## i Fold07: preprocessor 6/10, model 1/1 (predictions)

## i Fold07: preprocessor 7/10

## v Fold07: preprocessor 7/10
```

```
## i Fold07: preprocessor 7/10, model 1/1

## v Fold07: preprocessor 7/10, model 1/1

## i Fold07: preprocessor 7/10, model 1/1 (predictions)

## i Fold07: preprocessor 8/10

## v Fold07: preprocessor 8/10

## i Fold07: preprocessor 8/10, model 1/1

## v Fold07: preprocessor 8/10, model 1/1

## i Fold07: preprocessor 8/10, model 1/1 (predictions)

## i Fold07: preprocessor 9/10

## v Fold07: preprocessor 9/10

## i Fold07: preprocessor 9/10, model 1/1

## v Fold07: preprocessor 9/10, model 1/1

## i Fold07: preprocessor 9/10, model 1/1 (predictions)

## i Fold07: preprocessor 10/10

## v Fold07: preprocessor 10/10

## i Fold07: preprocessor 10/10, model 1/1

## v Fold07: preprocessor 10/10, model 1/1

## i Fold07: preprocessor 10/10, model 1/1 (predictions)

## i Fold08: preprocessor 1/10

## v Fold08: preprocessor 1/10

## i Fold08: preprocessor 1/10, model 1/1

## v Fold08: preprocessor 1/10, model 1/1

## i Fold08: preprocessor 1/10, model 1/1 (predictions)

## i Fold08: preprocessor 2/10
```

```
## v Fold08: preprocessor 2/10

## i Fold08: preprocessor 2/10, model 1/1

## v Fold08: preprocessor 2/10, model 1/1

## i Fold08: preprocessor 2/10, model 1/1 (predictions)

## i Fold08: preprocessor 3/10

## v Fold08: preprocessor 3/10

## i Fold08: preprocessor 3/10, model 1/1

## v Fold08: preprocessor 3/10, model 1/1

## i Fold08: preprocessor 3/10, model 1/1 (predictions)

## i Fold08: preprocessor 4/10

## v Fold08: preprocessor 4/10

## i Fold08: preprocessor 4/10, model 1/1

## v Fold08: preprocessor 4/10, model 1/1

## i Fold08: preprocessor 4/10, model 1/1 (predictions)

## i Fold08: preprocessor 5/10

## v Fold08: preprocessor 5/10

## i Fold08: preprocessor 5/10, model 1/1

## v Fold08: preprocessor 5/10, model 1/1

## i Fold08: preprocessor 5/10, model 1/1 (predictions)

## i Fold08: preprocessor 6/10

## v Fold08: preprocessor 6/10

## i Fold08: preprocessor 6/10, model 1/1

## v Fold08: preprocessor 6/10, model 1/1

## i Fold08: preprocessor 6/10, model 1/1 (predictions)
```

```
## i Fold08: preprocessor 7/10

## v Fold08: preprocessor 7/10

## i Fold08: preprocessor 7/10, model 1/1

## v Fold08: preprocessor 7/10, model 1/1

## i Fold08: preprocessor 7/10, model 1/1 (predictions)

## i Fold08: preprocessor 8/10

## v Fold08: preprocessor 8/10

## i Fold08: preprocessor 8/10, model 1/1

## v Fold08: preprocessor 8/10, model 1/1

## i Fold08: preprocessor 8/10, model 1/1 (predictions)

## i Fold08: preprocessor 9/10

## v Fold08: preprocessor 9/10

## i Fold08: preprocessor 9/10, model 1/1

## v Fold08: preprocessor 9/10, model 1/1

## i Fold08: preprocessor 9/10, model 1/1 (predictions)

## i Fold08: preprocessor 10/10

## v Fold08: preprocessor 10/10

## i Fold08: preprocessor 10/10, model 1/1

## v Fold08: preprocessor 10/10, model 1/1

## i Fold08: preprocessor 10/10, model 1/1 (predictions)

## i Fold09: preprocessor 1/10

## v Fold09: preprocessor 1/10

## i Fold09: preprocessor 1/10, model 1/1

## v Fold09: preprocessor 1/10, model 1/1
```

```
## i Fold09: preprocessor 1/10, model 1/1 (predictions)

## i Fold09: preprocessor 2/10

## v Fold09: preprocessor 2/10

## i Fold09: preprocessor 2/10, model 1/1

## v Fold09: preprocessor 2/10, model 1/1

## i Fold09: preprocessor 2/10, model 1/1 (predictions)

## i Fold09: preprocessor 3/10

## v Fold09: preprocessor 3/10

## i Fold09: preprocessor 3/10, model 1/1

## v Fold09: preprocessor 3/10, model 1/1

## i Fold09: preprocessor 3/10, model 1/1 (predictions)

## i Fold09: preprocessor 4/10

## v Fold09: preprocessor 4/10

## i Fold09: preprocessor 4/10, model 1/1

## v Fold09: preprocessor 4/10, model 1/1

## i Fold09: preprocessor 4/10, model 1/1 (predictions)

## i Fold09: preprocessor 5/10

## v Fold09: preprocessor 5/10

## i Fold09: preprocessor 5/10, model 1/1

## v Fold09: preprocessor 5/10, model 1/1

## i Fold09: preprocessor 5/10, model 1/1 (predictions)

## i Fold09: preprocessor 6/10

## v Fold09: preprocessor 6/10

## i Fold09: preprocessor 6/10, model 1/1
```

```
## v Fold09: preprocessor 6/10, model 1/1

## i Fold09: preprocessor 6/10, model 1/1 (predictions)

## i Fold09: preprocessor 7/10

## v Fold09: preprocessor 7/10

## i Fold09: preprocessor 7/10, model 1/1

## v Fold09: preprocessor 7/10, model 1/1

## i Fold09: preprocessor 7/10, model 1/1 (predictions)

## i Fold09: preprocessor 8/10

## v Fold09: preprocessor 8/10

## i Fold09: preprocessor 8/10, model 1/1

## v Fold09: preprocessor 8/10, model 1/1

## i Fold09: preprocessor 8/10, model 1/1 (predictions)

## i Fold09: preprocessor 9/10

## v Fold09: preprocessor 9/10

## i Fold09: preprocessor 9/10, model 1/1

## v Fold09: preprocessor 9/10, model 1/1

## i Fold09: preprocessor 9/10, model 1/1 (predictions)

## i Fold09: preprocessor 10/10

## v Fold09: preprocessor 10/10

## i Fold09: preprocessor 10/10, model 1/1

## v Fold09: preprocessor 10/10, model 1/1

## i Fold09: preprocessor 10/10, model 1/1 (predictions)

## i Fold10: preprocessor 1/10

## v Fold10: preprocessor 1/10
```

```
## i Fold10: preprocessor 1/10, model 1/1

## v Fold10: preprocessor 1/10, model 1/1

## i Fold10: preprocessor 1/10, model 1/1 (predictions)

## i Fold10: preprocessor 2/10

## v Fold10: preprocessor 2/10

## i Fold10: preprocessor 2/10, model 1/1

## v Fold10: preprocessor 2/10, model 1/1

## i Fold10: preprocessor 2/10, model 1/1 (predictions)

## i Fold10: preprocessor 3/10

## v Fold10: preprocessor 3/10

## i Fold10: preprocessor 3/10, model 1/1

## v Fold10: preprocessor 3/10, model 1/1

## i Fold10: preprocessor 3/10, model 1/1 (predictions)

## i Fold10: preprocessor 4/10

## v Fold10: preprocessor 4/10

## i Fold10: preprocessor 4/10, model 1/1

## v Fold10: preprocessor 4/10, model 1/1

## i Fold10: preprocessor 4/10, model 1/1 (predictions)

## i Fold10: preprocessor 5/10

## v Fold10: preprocessor 5/10

## i Fold10: preprocessor 5/10, model 1/1

## v Fold10: preprocessor 5/10, model 1/1

## i Fold10: preprocessor 5/10, model 1/1 (predictions)

## i Fold10: preprocessor 6/10
```

```
## v Fold10: preprocessor 6/10

## i Fold10: preprocessor 6/10, model 1/1

## v Fold10: preprocessor 6/10, model 1/1

## i Fold10: preprocessor 6/10, model 1/1 (predictions)

## i Fold10: preprocessor 7/10

## v Fold10: preprocessor 7/10

## i Fold10: preprocessor 7/10, model 1/1

## v Fold10: preprocessor 7/10, model 1/1

## i Fold10: preprocessor 7/10, model 1/1 (predictions)

## i Fold10: preprocessor 8/10

## v Fold10: preprocessor 8/10

## i Fold10: preprocessor 8/10, model 1/1

## v Fold10: preprocessor 8/10, model 1/1

## i Fold10: preprocessor 8/10, model 1/1 (predictions)

## i Fold10: preprocessor 9/10

## v Fold10: preprocessor 9/10

## i Fold10: preprocessor 9/10, model 1/1

## v Fold10: preprocessor 9/10, model 1/1

## i Fold10: preprocessor 9/10, model 1/1 (predictions)

## i Fold10: preprocessor 10/10

## v Fold10: preprocessor 10/10

## i Fold10: preprocessor 10/10, model 1/1

## v Fold10: preprocessor 10/10, model 1/1

## i Fold10: preprocessor 10/10, model 1/1 (predictions)
```

```
tune_res3
```

```
## # Tuning results
## # 10-fold cross-validation
## # A tibble: 10 x 4
##    splits           id     .metrics          .notes
##    <list>           <chr>  <list>            <list>
##  1 <split [640/72]> Fold01 <tibble [20 x 5]> <tibble [0 x 3]>
##  2 <split [640/72]> Fold02 <tibble [20 x 5]> <tibble [0 x 3]>
##  3 <split [641/71]> Fold03 <tibble [20 x 5]> <tibble [0 x 3]>
##  4 <split [641/71]> Fold04 <tibble [20 x 5]> <tibble [0 x 3]>
##  5 <split [641/71]> Fold05 <tibble [20 x 5]> <tibble [0 x 3]>
##  6 <split [641/71]> Fold06 <tibble [20 x 5]> <tibble [0 x 3]>
##  7 <split [641/71]> Fold07 <tibble [20 x 5]> <tibble [0 x 3]>
##  8 <split [641/71]> Fold08 <tibble [20 x 5]> <tibble [0 x 3]>
##  9 <split [641/71]> Fold09 <tibble [20 x 5]> <tibble [0 x 3]>
## 10 <split [641/71]> Fold10 <tibble [20 x 5]> <tibble [0 x 3]>
```

Question 6

```
collect_metrics(tune_res)
```

```
## # A tibble: 20 x 7
##    degree .metric  .estimator  mean     n std_err .config
##     <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
##  1      1 accuracy binary     0.806    10  0.0133 Preprocessor01_Model1
##  2      1 roc_auc  binary     0.864    10  0.0153 Preprocessor01_Model1
##  3      2 accuracy binary     0.806    10  0.0133 Preprocessor02_Model1
##  4      2 roc_auc  binary     0.864    10  0.0153 Preprocessor02_Model1
##  5      3 accuracy binary     0.806    10  0.0133 Preprocessor03_Model1
##  6      3 roc_auc  binary     0.864    10  0.0153 Preprocessor03_Model1
##  7      4 accuracy binary     0.806    10  0.0133 Preprocessor04_Model1
##  8      4 roc_auc  binary     0.864    10  0.0153 Preprocessor04_Model1
##  9      5 accuracy binary     0.806    10  0.0133 Preprocessor05_Model1
## 10      5 roc_auc  binary     0.864    10  0.0153 Preprocessor05_Model1
## 11      6 accuracy binary     0.806    10  0.0133 Preprocessor06_Model1
## 12      6 roc_auc  binary     0.864    10  0.0153 Preprocessor06_Model1
## 13      7 accuracy binary     0.806    10  0.0133 Preprocessor07_Model1
## 14      7 roc_auc  binary     0.864    10  0.0153 Preprocessor07_Model1
## 15      8 accuracy binary     0.806    10  0.0133 Preprocessor08_Model1
## 16      8 roc_auc  binary     0.864    10  0.0153 Preprocessor08_Model1
## 17      9 accuracy binary     0.806    10  0.0133 Preprocessor09_Model1
## 18      9 roc_auc  binary     0.864    10  0.0153 Preprocessor09_Model1
## 19     10 accuracy binary     0.806    10  0.0133 Preprocessor10_Model1
## 20     10 roc_auc  binary     0.864    10  0.0153 Preprocessor10_Model1
```

```
collect_metrics(tune_res2)
```

```
## # A tibble: 20 x 7
```

```
##    degree .metric  .estimator  mean     n std_err .config
##     <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
##  1      1 accuracy binary     0.800    10  0.0165 Preprocessor01_Model1
##  2      1 roc_auc  binary     0.857    10  0.0162 Preprocessor01_Model1
##  3      2 accuracy binary     0.800    10  0.0165 Preprocessor02_Model1
##  4      2 roc_auc  binary     0.857    10  0.0162 Preprocessor02_Model1
##  5      3 accuracy binary     0.800    10  0.0165 Preprocessor03_Model1
##  6      3 roc_auc  binary     0.857    10  0.0162 Preprocessor03_Model1
##  7      4 accuracy binary     0.800    10  0.0165 Preprocessor04_Model1
##  8      4 roc_auc  binary     0.857    10  0.0162 Preprocessor04_Model1
##  9      5 accuracy binary     0.800    10  0.0165 Preprocessor05_Model1
## 10      5 roc_auc  binary     0.857    10  0.0162 Preprocessor05_Model1
## 11      6 accuracy binary     0.800    10  0.0165 Preprocessor06_Model1
## 12      6 roc_auc  binary     0.857    10  0.0162 Preprocessor06_Model1
## 13      7 accuracy binary     0.800    10  0.0165 Preprocessor07_Model1
## 14      7 roc_auc  binary     0.857    10  0.0162 Preprocessor07_Model1
## 15      8 accuracy binary     0.800    10  0.0165 Preprocessor08_Model1
## 16      8 roc_auc  binary     0.857    10  0.0162 Preprocessor08_Model1
## 17      9 accuracy binary     0.800    10  0.0165 Preprocessor09_Model1
## 18      9 roc_auc  binary     0.857    10  0.0162 Preprocessor09_Model1
## 19     10 accuracy binary     0.800    10  0.0165 Preprocessor10_Model1
## 20     10 roc_auc  binary     0.857    10  0.0162 Preprocessor10_Model1
```

```
collect_metrics(tune_res3)
```

```
## # A tibble: 20 x 7
##    degree .metric  .estimator  mean     n std_err .config
##     <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>
##  1      1 accuracy binary     0.788    10  0.0159 Preprocessor01_Model1
##  2      1 roc_auc  binary     0.833    10  0.0209 Preprocessor01_Model1
##  3      2 accuracy binary     0.788    10  0.0159 Preprocessor02_Model1
##  4      2 roc_auc  binary     0.833    10  0.0209 Preprocessor02_Model1
##  5      3 accuracy binary     0.788    10  0.0159 Preprocessor03_Model1
##  6      3 roc_auc  binary     0.833    10  0.0209 Preprocessor03_Model1
##  7      4 accuracy binary     0.788    10  0.0159 Preprocessor04_Model1
##  8      4 roc_auc  binary     0.833    10  0.0209 Preprocessor04_Model1
##  9      5 accuracy binary     0.788    10  0.0159 Preprocessor05_Model1
## 10      5 roc_auc  binary     0.833    10  0.0209 Preprocessor05_Model1
## 11      6 accuracy binary     0.788    10  0.0159 Preprocessor06_Model1
## 12      6 roc_auc  binary     0.833    10  0.0209 Preprocessor06_Model1
## 13      7 accuracy binary     0.788    10  0.0159 Preprocessor07_Model1
## 14      7 roc_auc  binary     0.833    10  0.0209 Preprocessor07_Model1
## 15      8 accuracy binary     0.788    10  0.0159 Preprocessor08_Model1
## 16      8 roc_auc  binary     0.833    10  0.0209 Preprocessor08_Model1
## 17      9 accuracy binary     0.788    10  0.0159 Preprocessor09_Model1
## 18      9 roc_auc  binary     0.833    10  0.0209 Preprocessor09_Model1
## 19     10 accuracy binary     0.788    10  0.0159 Preprocessor10_Model1
## 20     10 roc_auc  binary     0.833    10  0.0209 Preprocessor10_Model1
```

The logistic regression model seemed to have performed the best seeing as it is the model with the best accuracy.

Question 7

```
select_by_one_std_err(tune_res, degree, metric = "accuracy")
```

```
## # A tibble: 1 x 9
##   degree .metric  .estimator  mean     n std_err .config             .best .bound
##    <dbl> <chr>    <chr>      <dbl> <int>   <dbl> <chr>               <dbl>  <dbl>
## 1      1 accuracy binary     0.806    10  0.0133 Preprocessor01_Mo~ 0.806  0.793
```

```
best_degree <- select_by_one_std_err(tune_res, degree, metric = "accuracy")
final_wf <- finalize_workflow(log_wkflow, best_degree)
final_wf
```

```
## == Workflow ====================================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 4 Recipe Steps
##
## * step_impute_linear()
## * step_dummy()
## * step_interact()
## * step_poly()
##
## -- Model -----------------------------------------------------------------------
## Logistic Regression Model Specification (classification)
##
## Computational engine: glm
```

```
final_fit <- fit(final_wf, titanic_train)
final_fit
```

```
## == Workflow [trained] ==========================================================
## Preprocessor: Recipe
## Model: logistic_reg()
##
## -- Preprocessor ----------------------------------------------------------------
## 4 Recipe Steps
##
## * step_impute_linear()
## * step_dummy()
## * step_interact()
## * step_poly()
##
## -- Model -----------------------------------------------------------------------
##
## Call:  stats::glm(formula = ..y ~ ., family = stats::binomial, data = data)
##
## Coefficients:
##    (Intercept)             age          sib_sp           parch            fare
```

```
##     -3.8052602       0.0245258       0.2877607       0.2034763       0.0121500
##      pclass_X2       pclass_X3        sex_male  sex_male_x_age      age_x_fare
##      1.3748498       2.4565557       0.8082182       0.0732190      -0.0004456
##
## Degrees of Freedom: 711 Total (i.e. Null);  702 Residual
## Null Deviance:       948
## Residual Deviance: 608.3     AIC: 628.3
```

Question 8

```
testing_pred <-
  predict(final_fit, titanic_train) %>%
  bind_cols(predict(final_fit, titanic_train, type = "prob")) %>%
  bind_cols(titanic_train %>%
              select(survived))
testing_pred
```

```
## # A tibble: 712 x 4
##    .pred_class .pred_Yes .pred_No survived
##    <fct>           <dbl>    <dbl> <fct>
##  1 No             0.0545    0.945 No
##  2 No             0.277     0.723 No
##  3 No             0.191     0.809 No
##  4 No             0.0120    0.988 No
##  5 Yes            0.723     0.277 No
##  6 Yes            0.582     0.418 No
##  7 No             0.153     0.847 No
##  8 No             0.0713    0.929 No
##  9 No             0.0714    0.929 No
## 10 No             0.320     0.680 No
## # ... with 702 more rows
```

```
augment(final_fit, new_data = titanic_test) %>%
  accuracy(truth = survived, estimate = .pred_class)
```

```
## # A tibble: 1 x 3
##   .metric  .estimator .estimate
##   <chr>    <chr>          <dbl>
## 1 accuracy binary         0.810
```

The performance metrics from the test set are much closer to the performance metrics computed using resampling. Resampling allowed for the simulation of how well the model will perform on new data, and the test set acts as the final, unbiased check for the model's performance.