Report of training

# Introduction

Report of search and training made on March 25, 2021 at 09:58:34.

## Training data

There are 690 training samples. The distribution of the labels is the following:

* Class 1: 307 instances.
* Class 0: 383 instances.

## Optimizing procedure

The parameters for the bayesian search are:

* Nested Cross Validation using 9 outer folds and 10 inner folds.
* Some of the folds will be skipped. In particular, [0, 2, 3, 4, 6, 8] outer folds and [0, 2, 4, 6, 8, 9] inner folds will be skipped.
* For each outer fold search, a model will be fitted. In order to search for the best hyperparameters, 10 initial points will be evaluated, and 10 additional calls will be made.
* Models will not be calibrated.
* A final model will be fitted using the whole inner dataset.
* The optimizing metric for the bayesian search is average\_precision.
* The function used for the bayesian search is gbrt\_minimize.
* Additionally, 20 instances will be left out for assessing the variance of all models.

The search spaces for the optimization is the following:

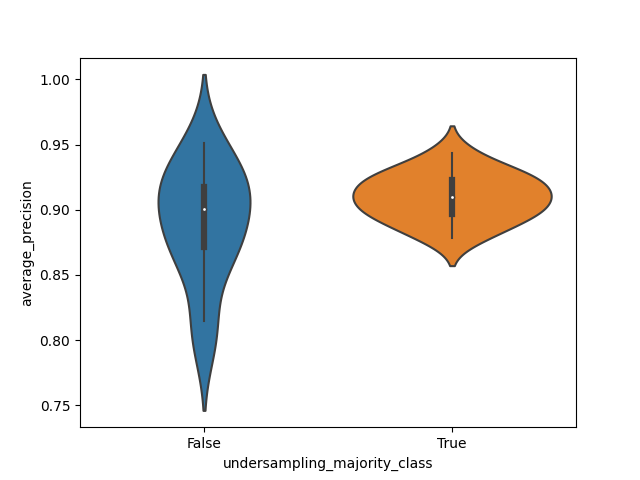
* Search space for xgboost model.
* model: XGBClassifier(base\_score=None, booster=None, colsample\_bylevel=None,  
   colsample\_bynode=None, colsample\_bytree=None, gamma=None,  
   gpu\_id=None, importance\_type='gain', interaction\_constraints=None,  
   learning\_rate=None, max\_delta\_step=None, max\_depth=None,  
   min\_child\_weight=None, missing=nan, monotone\_constraints=None,  
   n\_estimators=100, n\_jobs=None, num\_parallel\_tree=None,  
   random\_state=None, reg\_alpha=None, reg\_lambda=None,  
   scale\_pos\_weight=None, subsample=None, tree\_method=None,  
   validate\_parameters=None, verbosity=None)
* pipeline\_post\_process: Pipeline(steps=[('post\_process',  
   <nestedcvtraining.api.OptionedPostProcessTransformer object at 0x000001CFBE5E1160>),  
   ('resample', SMOTE())])
* Search space:
* undersampling\_majority\_class: Categorical(categories=(True, False), prior=None)
* max\_k\_undersampling: Integer(low=5, high=6, prior='uniform', transform='identity')
* resample\_\_sampling\_strategy: Categorical(categories=('minority', 'all'), prior=None)
* post\_process\_\_option: Categorical(categories=('option\_1', 'option\_2', 'option\_3'), prior=None)
* model\_\_max\_depth: Integer(low=5, high=15, prior='uniform', transform='identity')
* model\_\_learning\_rate: Real(low=0.05, high=0.31, prior='log-uniform', transform='identity')
* model\_\_min\_child\_weight: Integer(low=1, high=10, prior='uniform', transform='identity')
* model\_\_subsample: Real(low=0.8, high=1, prior='log-uniform', transform='identity')
* model\_\_colsample\_bytree: Real(low=0.13, high=0.8, prior='log-uniform', transform='identity')
* model\_\_scale\_pos\_weight: Real(low=0.1, high=10, prior='log-uniform', transform='identity')
* model\_\_objective: Categorical(categories=('binary:logistic',), prior=None)
* Search space for random\_forest model.
* model: RandomForestClassifier()
* pipeline\_post\_process: None
* Search space:
* undersampling\_majority\_class: Categorical(categories=(True, False), prior=None)
* model\_\_bootstrap: Integer(low=0, high=1, prior='uniform', transform='identity')
* model\_\_n\_estimators: Integer(low=10, high=100, prior='uniform', transform='identity')
* model\_\_max\_depth: Integer(low=2, high=10, prior='uniform', transform='identity')
* model\_\_min\_samples\_split: Integer(low=5, high=20, prior='uniform', transform='identity')
* model\_\_min\_samples\_leaf: Integer(low=1, high=4, prior='uniform', transform='identity')
* model\_\_max\_features: Categorical(categories=('auto', 'sqrt'), prior=None)
* model\_\_class\_weight: Categorical(categories=('balanced', 'balanced\_subsample'), prior=None)

# Report of validation of the model in the outer Cross Validation

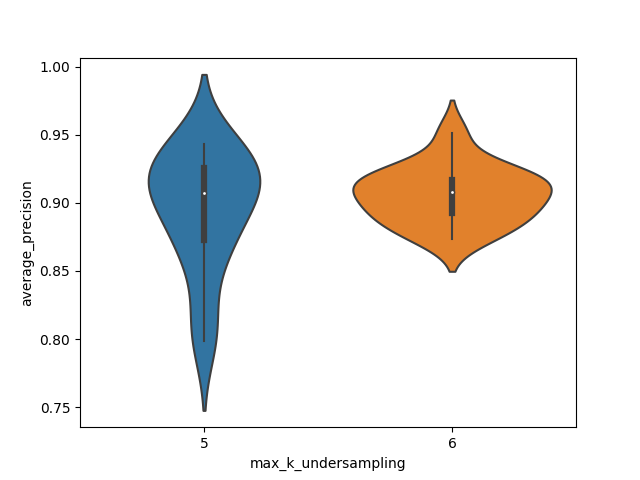
# Plots for all trained models and params with respect to loss metric on the inner folds

## Plots for xgboost model

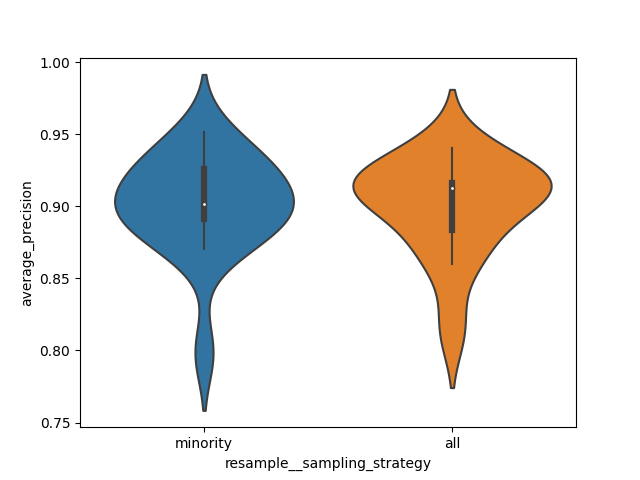
### Plots for undersampling\_majority\_class param



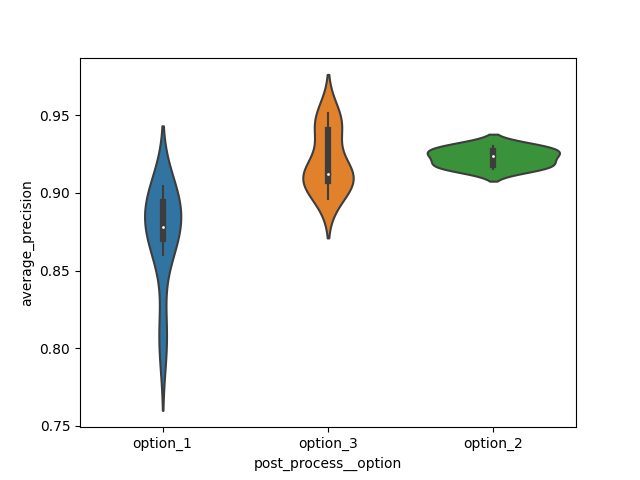
### Plots for max\_k\_undersampling param



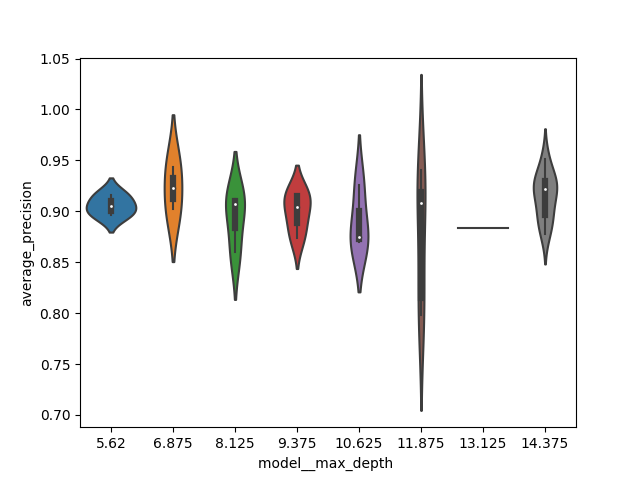
### Plots for resample\_\_sampling\_strategy param



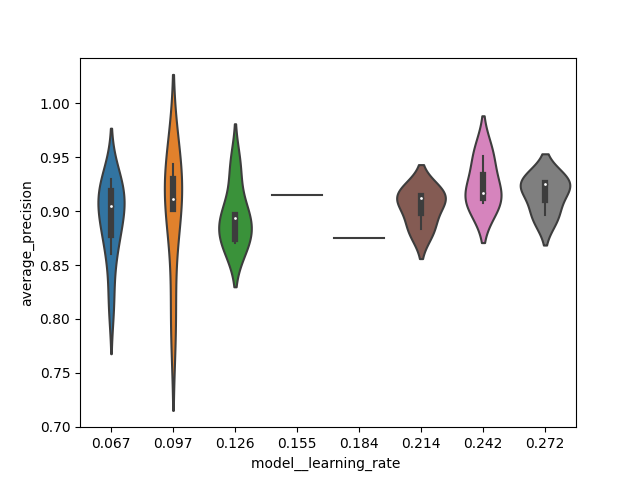
### Plots for post\_process\_\_option param



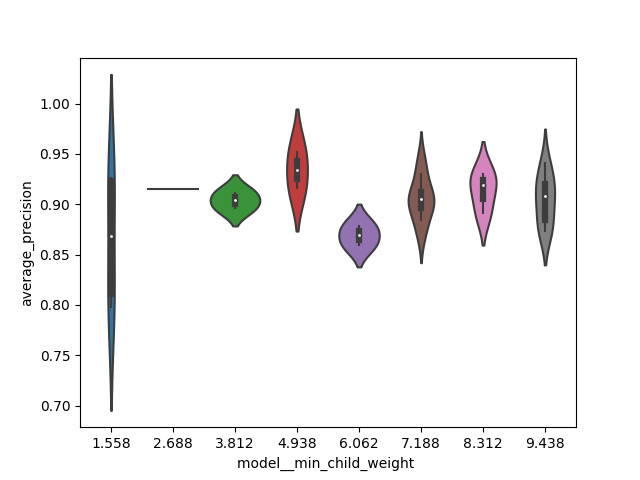
### Plots for model\_\_max\_depth param



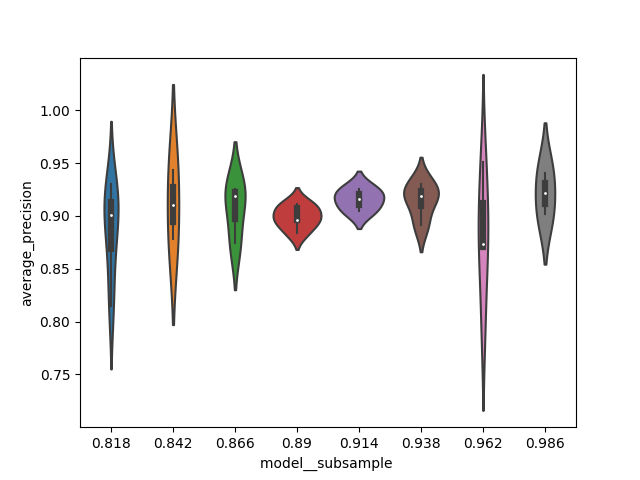
### Plots for model\_\_learning\_rate param



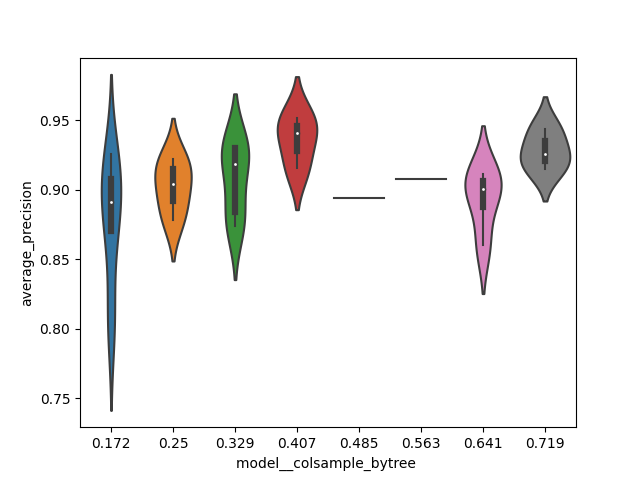
### Plots for model\_\_min\_child\_weight param



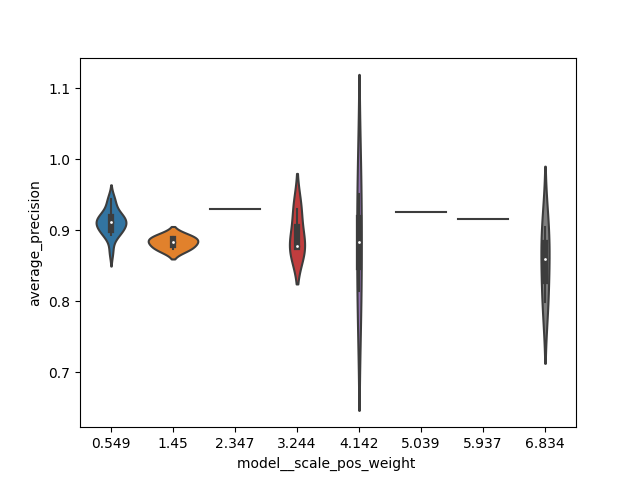
### Plots for model\_\_subsample param



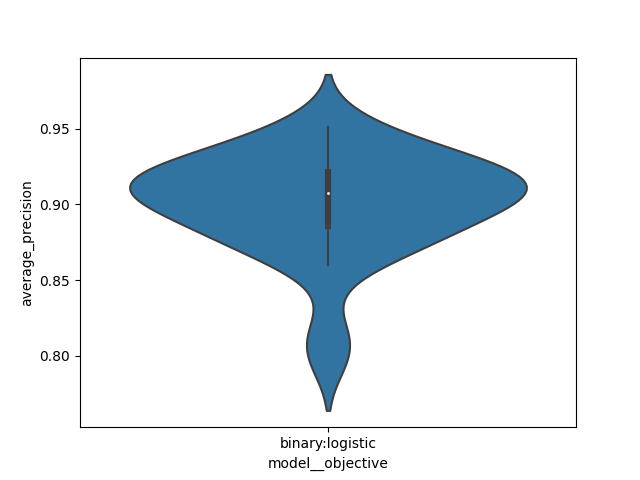
### Plots for model\_\_colsample\_bytree param



### Plots for model\_\_scale\_pos\_weight param

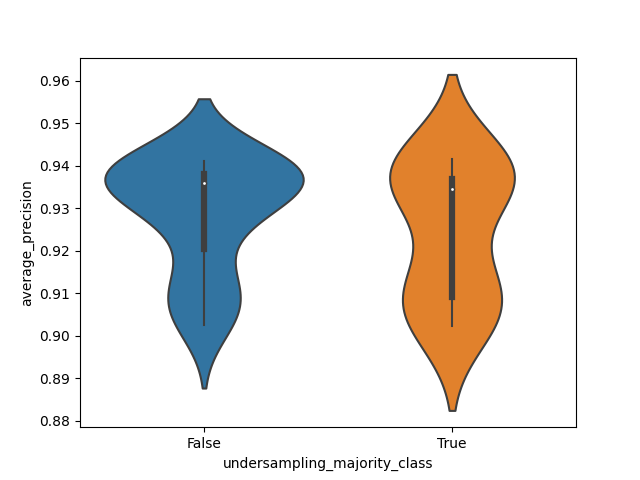


### Plots for model\_\_objective param

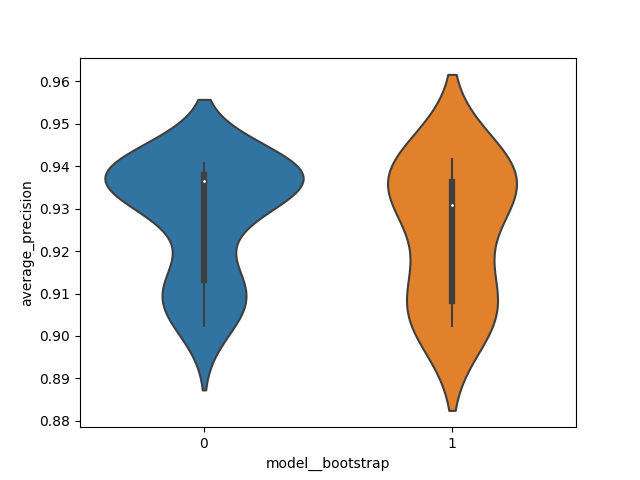


## Plots for random\_forest model

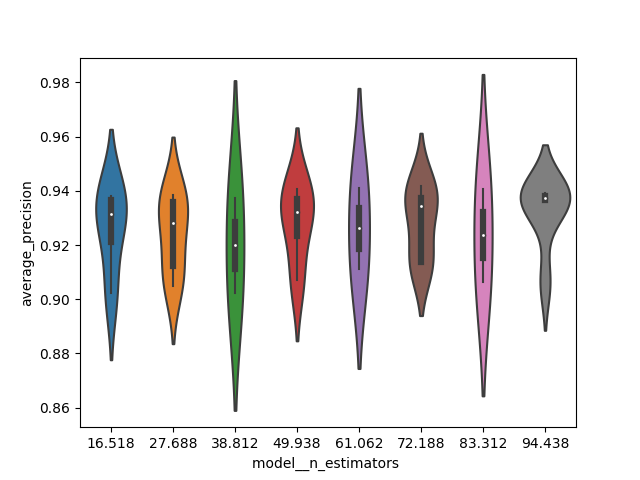
### Plots for undersampling\_majority\_class param



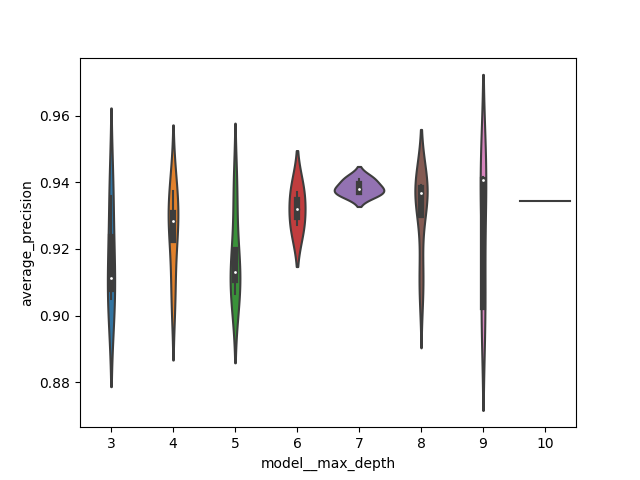
### Plots for model\_\_bootstrap param



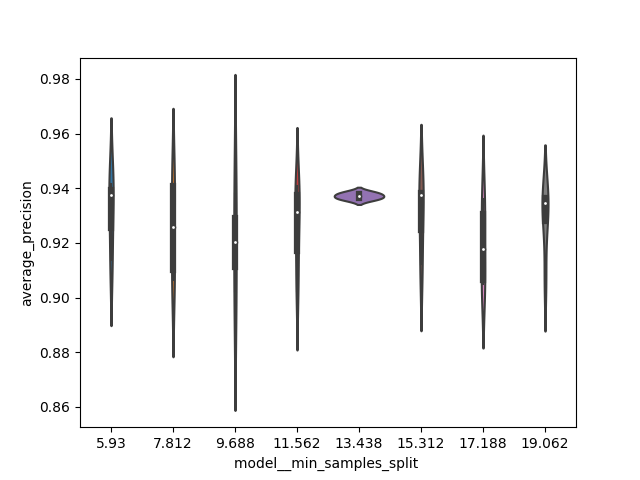
### Plots for model\_\_n\_estimators param



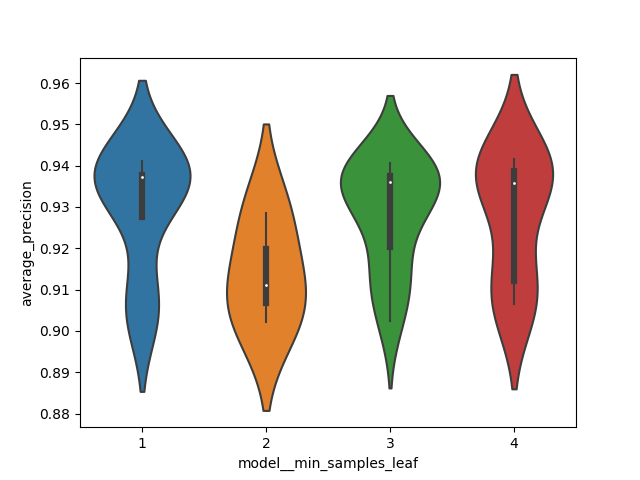
### Plots for model\_\_max\_depth param



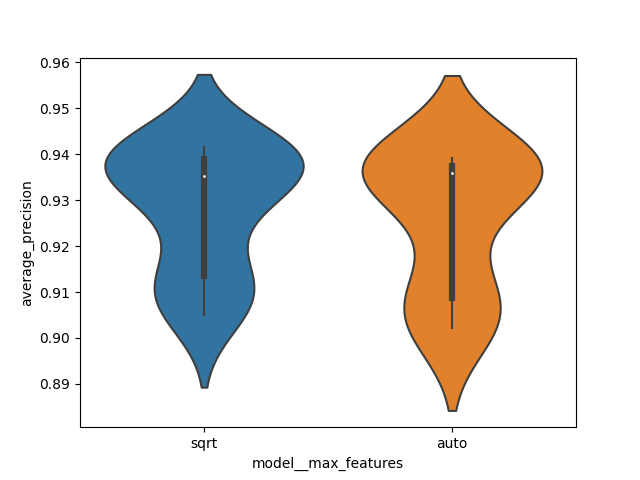
### Plots for model\_\_min\_samples\_split param



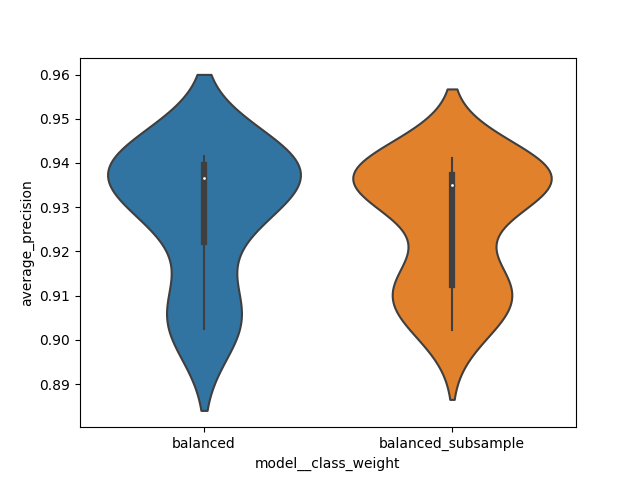
### Plots for model\_\_min\_samples\_leaf param



### Plots for model\_\_max\_features param



### Plots for model\_\_class\_weight param



## Winner models of each fold and main metrics

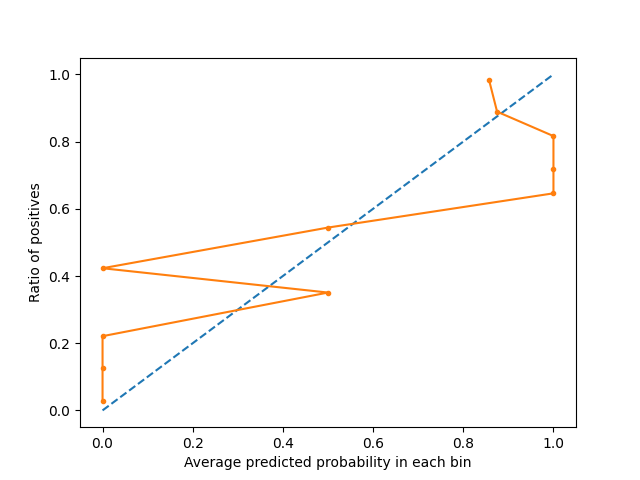
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Fold** | **Model** | **Params** | **Comments** | **roc\_auc** | **neg\_log\_loss** | **average\_precision** | **neg\_brier\_score** |
| 1 | xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_3 * model\_\_max\_depth: 15 * model\_\_learning\_rate: 0.243 * model\_\_min\_child\_weight: 5 * model\_\_subsample: 0.968 * model\_\_colsample\_bytree: 0.418 * model\_\_scale\_pos\_weight: 3.883 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.954 | 0.273 | 0.934 | 0.076 |
| 5 | random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 1 * model\_\_n\_estimators: 56 * model\_\_max\_depth: 7 * model\_\_min\_samples\_split: 7 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.962 | 0.275 | 0.965 | 0.079 |
| 7 | xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_2 * model\_\_max\_depth: 5 * model\_\_learning\_rate: 0.231 * model\_\_min\_child\_weight: 5 * model\_\_subsample: 0.906 * model\_\_colsample\_bytree: 0.156 * model\_\_scale\_pos\_weight: 5.958 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.92 | 0.579 | 0.92 | 0.181 |

For the selected optimization metric average\_precision the average score is 0.939, and the standard deviation is 0.019.

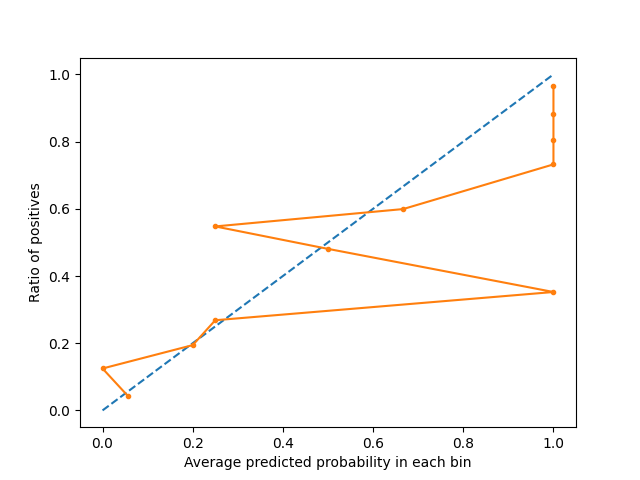
## Main plots

### Calibration plots

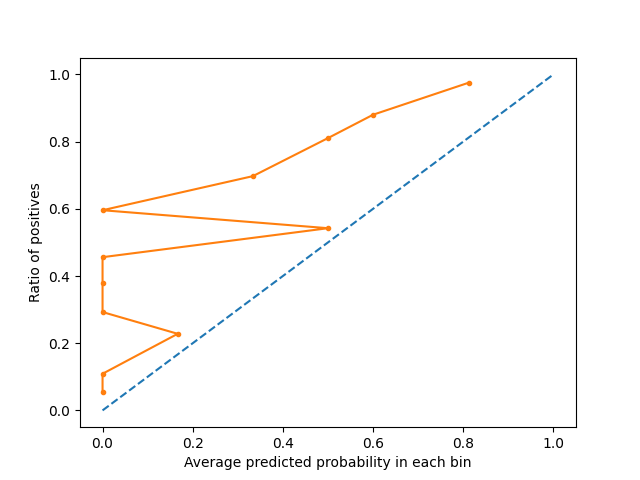
#### Calibration plot of fold 1



#### Calibration plot of fold 5

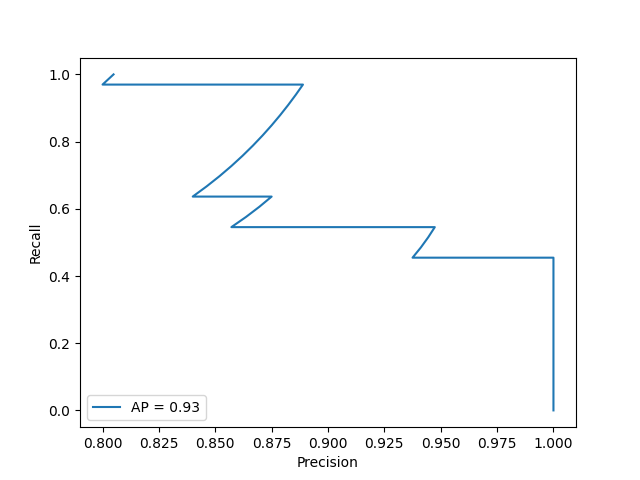


#### Calibration plot of fold 7

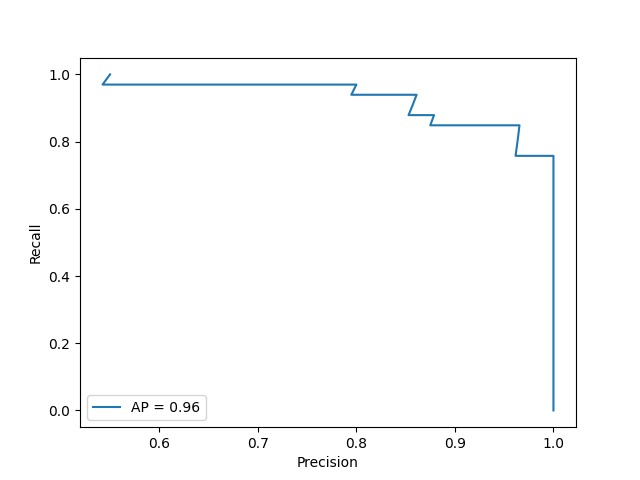


### Precision-recall curve plots

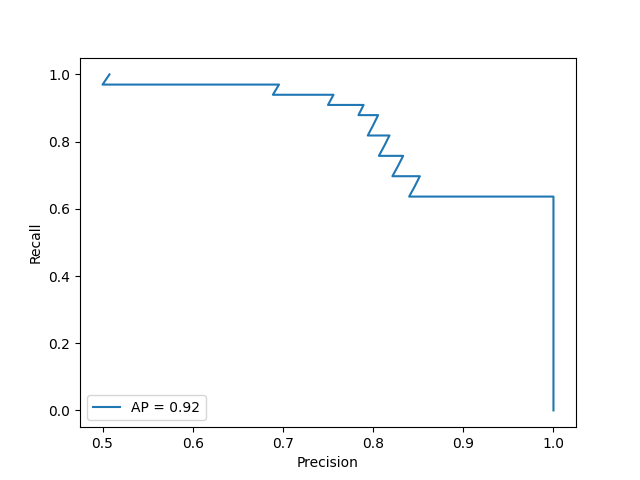
#### Precision-recall curve plot of fold 1



#### Precision-recall curve plot of fold 5

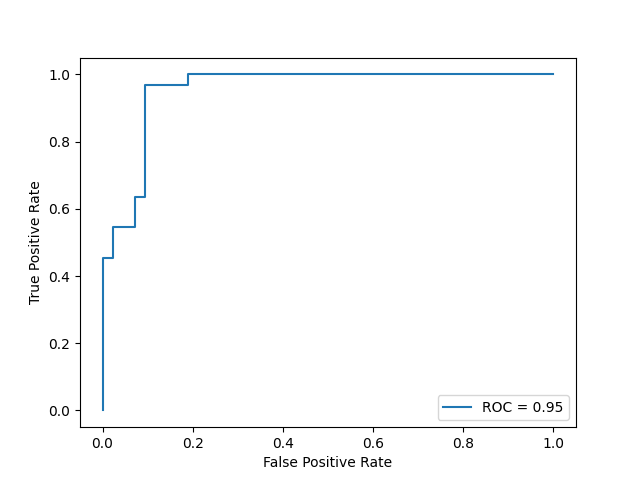


#### Precision-recall curve plot of fold 7

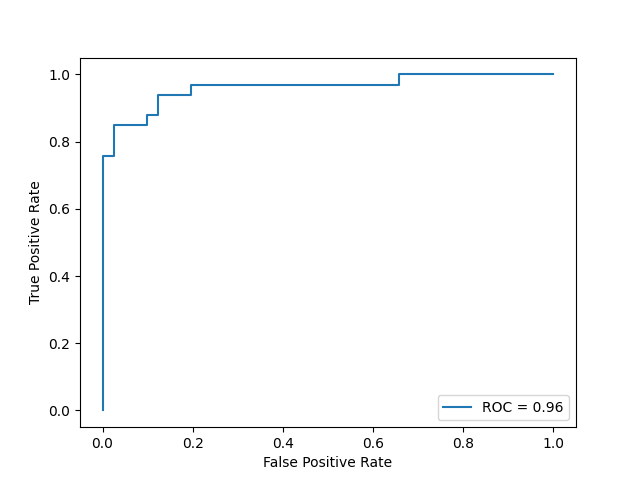


### ROC curve plots

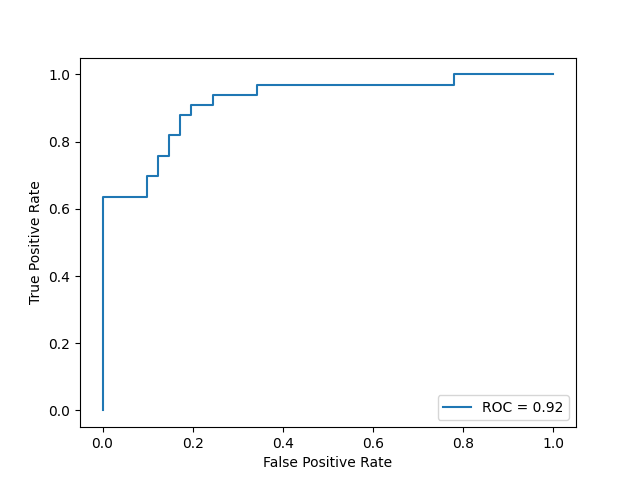
#### ROC curve plot of fold 1



#### ROC curve plot of fold 5

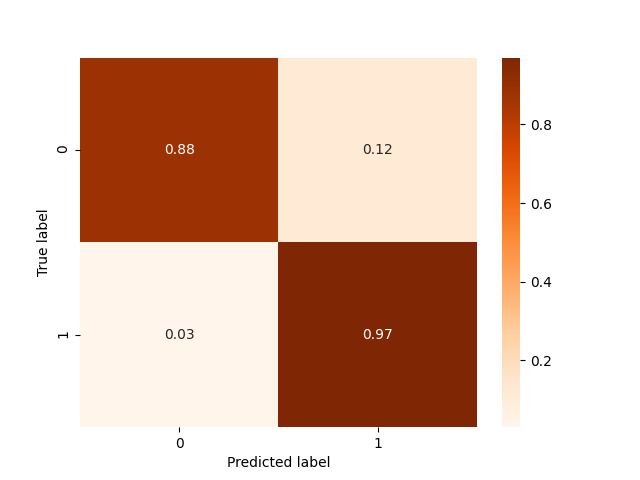


#### ROC curve plot of fold 7

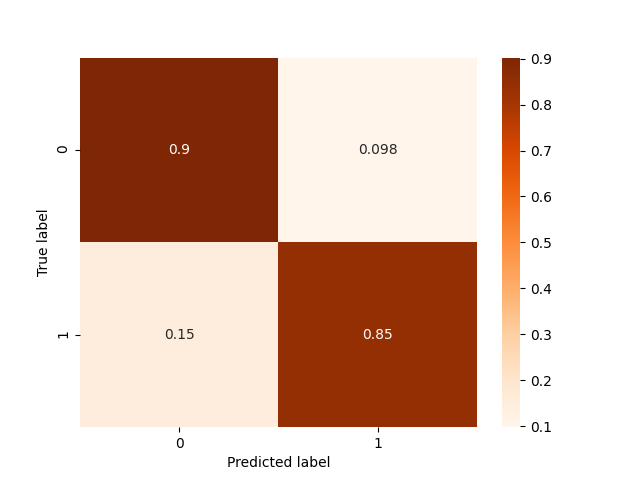


### Confusion matrix

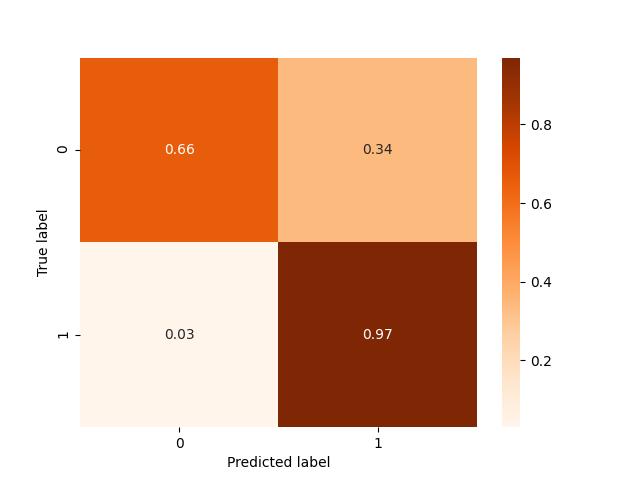
#### Confusion matrix of fold 1



#### Confusion matrix of fold 5

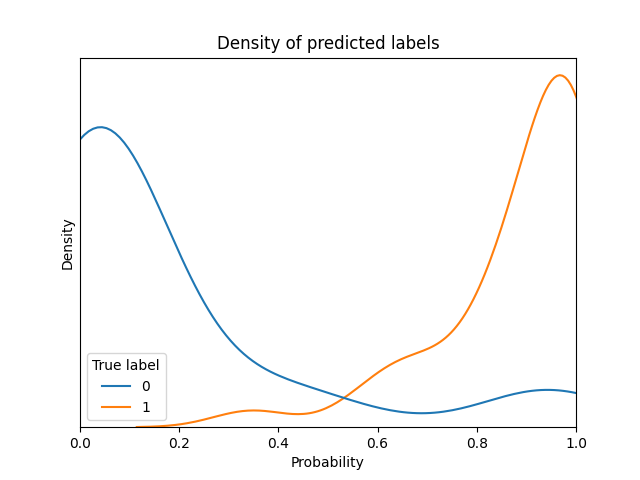


#### Confusion matrix of fold 7

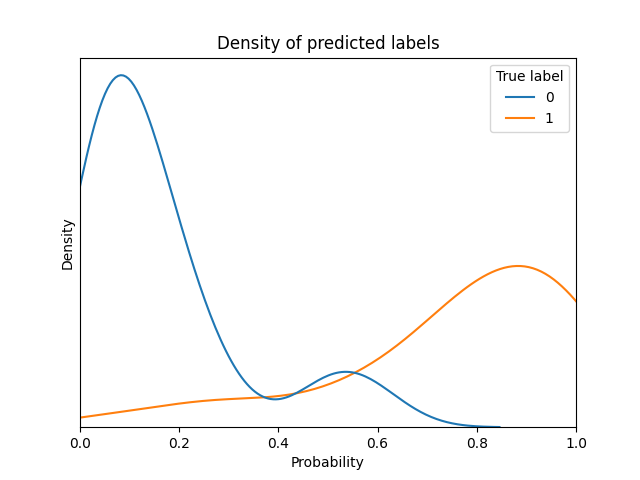


### Histograms

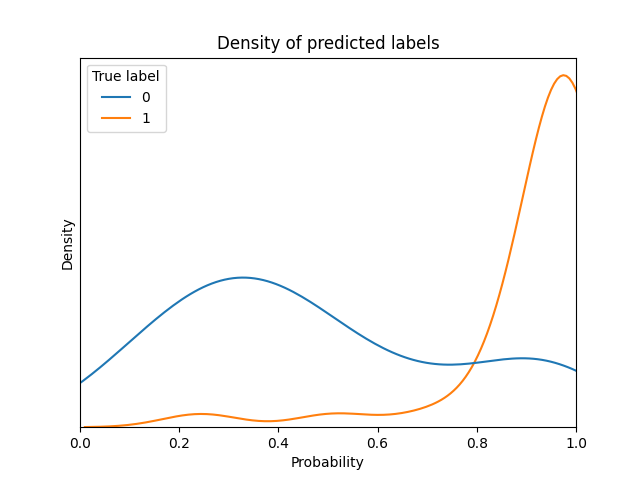
#### Histogram of fold 1



#### Histogram of fold 5



#### Histogram of fold 7



## Comparison of several predictions to assess variance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Instance** | **Real label** | **Prediction by model of fold 1** | **Prediction by model of fold 5** | **Prediction by model of fold 7** | **Standard deviation in predictions of this instance** |
| 1 | 0 | 0.061 | 0.123 | 0.469 | 0.18 |
| 2 | 1 | 0.991 | 0.945 | 0.992 | 0.022 |
| 3 | 1 | 0.043 | 0.146 | 0.197 | 0.064 |
| 4 | 0 | 0.006 | 0.312 | 0.439 | 0.182 |
| 5 | 0 | 0.309 | 0.211 | 0.894 | 0.302 |
| 6 | 0 | 0.039 | 0.226 | 0.711 | 0.283 |
| 7 | 1 | 0.995 | 0.859 | 0.988 | 0.063 |
| 8 | 1 | 0.999 | 0.991 | 0.995 | 0.003 |
| 9 | 1 | 0.996 | 0.956 | 0.995 | 0.018 |
| 10 | 0 | 0.146 | 0.075 | 0.557 | 0.212 |
| 11 | 0 | 0.449 | 0.049 | 0.373 | 0.173 |
| 12 | 1 | 0.995 | 0.95 | 0.996 | 0.021 |
| 13 | 1 | 0.999 | 0.976 | 0.998 | 0.01 |
| 14 | 0 | 0.364 | 0.188 | 0.65 | 0.19 |
| 15 | 0 | 0.702 | 0.493 | 0.923 | 0.175 |
| 16 | 0 | 0.01 | 0.367 | 0.808 | 0.326 |
| 17 | 0 | 0.079 | 0.292 | 0.854 | 0.327 |
| 18 | 1 | 0.7 | 0.696 | 0.938 | 0.113 |
| 19 | 0 | 0.745 | 0.766 | 0.944 | 0.089 |
| 20 | 1 | 1.0 | 0.972 | 0.998 | 0.013 |

The average standard deviation is 0.138

# Report of inner trainings

## Report of inner training in fold 1 of outer Cross Validation

## Report of training in this outer fold

Best model with respect to selected metric is xgboost with the following params:

* undersampling\_majority\_class: False
* max\_k\_undersampling: 6
* resample\_\_sampling\_strategy: minority
* post\_process\_\_option: option\_3
* model\_\_max\_depth: 15
* model\_\_learning\_rate: 0.243
* model\_\_min\_child\_weight: 5
* model\_\_subsample: 0.968
* model\_\_colsample\_bytree: 0.418
* model\_\_scale\_pos\_weight: 3.883
* model\_\_objective: binary:logistic

### Comparison of all models trained in this outer fold

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Params** | **Comments** | **roc\_auc on inner fold** | **neg\_log\_loss on inner fold** | **average\_precision on inner fold** | **neg\_brier\_score on inner fold** | **roc\_auc on outer fold** | **neg\_log\_loss on outer fold** | **average\_precision on outer fold** | **neg\_brier\_score on outer fold** |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 12 * model\_\_learning\_rate: 0.106 * model\_\_min\_child\_weight: 1 * model\_\_subsample: 0.965 * model\_\_colsample\_bytree: 0.199 * model\_\_scale\_pos\_weight: 6.455 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.821 | 0.612 | 0.798 | 0.196 | 0.865 | 0.555 | 0.842 | 0.185 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_1 * model\_\_max\_depth: 10 * model\_\_learning\_rate: 0.113 * model\_\_min\_child\_weight: 10 * model\_\_subsample: 0.952 * model\_\_colsample\_bytree: 0.332 * model\_\_scale\_pos\_weight: 1.338 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.889 | 0.419 | 0.874 | 0.129 | 0.886 | 0.437 | 0.866 | 0.137 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_3 * model\_\_max\_depth: 7 * model\_\_learning\_rate: 0.094 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.831 * model\_\_colsample\_bytree: 0.684 * model\_\_scale\_pos\_weight: 0.605 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.0 * average prop of minority class before resampling: 0.384 * average size of training set after resampling: 477.0 * average prop of minority class after resampling: 0.5 | 0.941 | 0.311 | 0.944 | 0.092 | 0.955 | 0.277 | 0.939 | 0.083 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_2 * model\_\_max\_depth: 15 * model\_\_learning\_rate: 0.07 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.819 * model\_\_colsample\_bytree: 0.291 * model\_\_scale\_pos\_weight: 2.551 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.0 * average prop of minority class before resampling: 0.384 * average size of training set after resampling: 477.0 * average prop of minority class after resampling: 0.5 | 0.922 | 0.407 | 0.93 | 0.125 | 0.948 | 0.41 | 0.943 | 0.131 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 11 * model\_\_learning\_rate: 0.171 * model\_\_min\_child\_weight: 9 * model\_\_subsample: 0.868 * model\_\_colsample\_bytree: 0.142 * model\_\_scale\_pos\_weight: 2.809 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.892 | 0.447 | 0.875 | 0.138 | 0.879 | 0.498 | 0.859 | 0.158 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 6 * model\_\_learning\_rate: 0.06 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.923 * model\_\_colsample\_bytree: 0.656 * model\_\_scale\_pos\_weight: 7.282 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.0 * average prop of minority class before resampling: 0.384 * average size of training set after resampling: 477.0 * average prop of minority class after resampling: 0.5 | 0.908 | 0.553 | 0.905 | 0.181 | 0.9 | 0.591 | 0.886 | 0.19 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_1 * model\_\_max\_depth: 12 * model\_\_learning\_rate: 0.08 * model\_\_min\_child\_weight: 2 * model\_\_subsample: 0.822 * model\_\_colsample\_bytree: 0.133 * model\_\_scale\_pos\_weight: 4.142 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.836 | 0.569 | 0.815 | 0.185 | 0.864 | 0.552 | 0.87 | 0.189 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_3 * model\_\_max\_depth: 12 * model\_\_learning\_rate: 0.122 * model\_\_min\_child\_weight: 10 * model\_\_subsample: 0.998 * model\_\_colsample\_bytree: 0.388 * model\_\_scale\_pos\_weight: 0.342 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.934 | 0.365 | 0.941 | 0.106 | 0.946 | 0.328 | 0.934 | 0.102 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_3 * model\_\_max\_depth: 15 * model\_\_learning\_rate: 0.243 * model\_\_min\_child\_weight: 5 * model\_\_subsample: 0.968 * model\_\_colsample\_bytree: 0.418 * model\_\_scale\_pos\_weight: 3.883 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.946 | 0.326 | 0.951 | 0.092 | 0.954 | 0.28 | 0.933 | 0.076 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_2 * model\_\_max\_depth: 12 * model\_\_learning\_rate: 0.074 * model\_\_min\_child\_weight: 8 * model\_\_subsample: 0.871 * model\_\_colsample\_bytree: 0.346 * model\_\_scale\_pos\_weight: 0.213 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 535.5 * average prop of minority class before resampling: 0.445 * average size of training set after resampling: 594.0 * average prop of minority class after resampling: 0.5 | 0.909 | 0.463 | 0.919 | 0.141 | 0.931 | 0.427 | 0.919 | 0.135 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 0 * model\_\_n\_estimators: 53 * model\_\_max\_depth: 9 * model\_\_min\_samples\_split: 7 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 387.0 * average prop of minority class: 0.384 | 0.936 | 0.33 | 0.941 | 0.098 | 0.96 | 0.302 | 0.946 | 0.087 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 23 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 14 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 535.5 * average prop of minority class: 0.445 | 0.936 | 0.322 | 0.938 | 0.096 | 0.96 | 0.285 | 0.948 | 0.082 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 73 * model\_\_max\_depth: 4 * model\_\_min\_samples\_split: 6 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 535.5 * average prop of minority class: 0.445 | 0.937 | 0.343 | 0.937 | 0.101 | 0.952 | 0.326 | 0.933 | 0.092 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 1 * model\_\_n\_estimators: 22 * model\_\_max\_depth: 6 * model\_\_min\_samples\_split: 11 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 535.5 * average prop of minority class: 0.445 | 0.927 | 0.341 | 0.927 | 0.102 | 0.952 | 0.316 | 0.93 | 0.09 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 0 * model\_\_n\_estimators: 100 * model\_\_max\_depth: 5 * model\_\_min\_samples\_split: 20 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 387.0 * average prop of minority class: 0.384 | 0.935 | 0.338 | 0.937 | 0.1 | 0.951 | 0.321 | 0.934 | 0.091 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 1 * model\_\_n\_estimators: 25 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 17 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 387.0 * average prop of minority class: 0.384 | 0.933 | 0.343 | 0.936 | 0.102 | 0.958 | 0.315 | 0.949 | 0.091 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 35 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 16 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 535.5 * average prop of minority class: 0.445 | 0.932 | 0.325 | 0.937 | 0.097 | 0.963 | 0.286 | 0.949 | 0.082 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 91 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 15 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: auto * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 535.5 * average prop of minority class: 0.445 | 0.937 | 0.324 | 0.939 | 0.097 | 0.96 | 0.287 | 0.943 | 0.082 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 1 * model\_\_n\_estimators: 74 * model\_\_max\_depth: 9 * model\_\_min\_samples\_split: 5 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 387.0 * average prop of minority class: 0.384 | 0.938 | 0.334 | 0.942 | 0.1 | 0.961 | 0.312 | 0.95 | 0.089 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 21 * model\_\_max\_depth: 3 * model\_\_min\_samples\_split: 14 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 535.5 * average prop of minority class: 0.445 | 0.93 | 0.368 | 0.936 | 0.108 | 0.949 | 0.358 | 0.934 | 0.102 |

## Report of inner training in fold 5 of outer Cross Validation

## Report of training in this outer fold

Best model with respect to selected metric is random\_forest with the following params:

* undersampling\_majority\_class: False
* model\_\_bootstrap: 1
* model\_\_n\_estimators: 56
* model\_\_max\_depth: 7
* model\_\_min\_samples\_split: 7
* model\_\_min\_samples\_leaf: 1
* model\_\_max\_features: sqrt
* model\_\_class\_weight: balanced\_subsample

### Comparison of all models trained in this outer fold

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Params** | **Comments** | **roc\_auc on inner fold** | **neg\_log\_loss on inner fold** | **average\_precision on inner fold** | **neg\_brier\_score on inner fold** | **roc\_auc on outer fold** | **neg\_log\_loss on outer fold** | **average\_precision on outer fold** | **neg\_brier\_score on outer fold** |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_1 * model\_\_max\_depth: 8 * model\_\_learning\_rate: 0.081 * model\_\_min\_child\_weight: 6 * model\_\_subsample: 0.806 * model\_\_colsample\_bytree: 0.622 * model\_\_scale\_pos\_weight: 6.6 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 536.25 * average prop of minority class before resampling: 0.444 * average size of training set after resampling: 596.0 * average prop of minority class after resampling: 0.5 | 0.893 | 0.54 | 0.86 | 0.165 | 0.914 | 0.431 | 0.91 | 0.143 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_3 * model\_\_max\_depth: 5 * model\_\_learning\_rate: 0.26 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.878 * model\_\_colsample\_bytree: 0.286 * model\_\_scale\_pos\_weight: 0.111 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.91 | 0.537 | 0.896 | 0.175 | 0.934 | 0.477 | 0.937 | 0.15 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_2 * model\_\_max\_depth: 11 * model\_\_learning\_rate: 0.261 * model\_\_min\_child\_weight: 2 * model\_\_subsample: 0.875 * model\_\_colsample\_bytree: 0.758 * model\_\_scale\_pos\_weight: 5.113 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.933 | 0.481 | 0.926 | 0.139 | 0.962 | 0.356 | 0.958 | 0.116 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 11 * model\_\_learning\_rate: 0.121 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.96 * model\_\_colsample\_bytree: 0.193 * model\_\_scale\_pos\_weight: 0.41 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 536.25 * average prop of minority class before resampling: 0.444 * average size of training set after resampling: 596.0 * average prop of minority class after resampling: 0.5 | 0.896 | 0.428 | 0.87 | 0.134 | 0.916 | 0.396 | 0.921 | 0.123 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_1 * model\_\_max\_depth: 13 * model\_\_learning\_rate: 0.205 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.881 * model\_\_colsample\_bytree: 0.328 * model\_\_scale\_pos\_weight: 1.625 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.902 | 0.431 | 0.884 | 0.136 | 0.921 | 0.388 | 0.918 | 0.124 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_2 * model\_\_max\_depth: 14 * model\_\_learning\_rate: 0.054 * model\_\_min\_child\_weight: 1 * model\_\_subsample: 0.945 * model\_\_colsample\_bytree: 0.218 * model\_\_scale\_pos\_weight: 0.104 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.933 | 0.515 | 0.922 | 0.174 | 0.952 | 0.522 | 0.955 | 0.177 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 14 * model\_\_learning\_rate: 0.068 * model\_\_min\_child\_weight: 8 * model\_\_subsample: 0.93 * model\_\_colsample\_bytree: 0.151 * model\_\_scale\_pos\_weight: 1.513 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.908 | 0.459 | 0.891 | 0.146 | 0.914 | 0.445 | 0.917 | 0.14 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_2 * model\_\_max\_depth: 15 * model\_\_learning\_rate: 0.287 * model\_\_min\_child\_weight: 10 * model\_\_subsample: 0.909 * model\_\_colsample\_bytree: 0.153 * model\_\_scale\_pos\_weight: 0.671 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 536.25 * average prop of minority class before resampling: 0.444 * average size of training set after resampling: 596.0 * average prop of minority class after resampling: 0.5 | 0.94 | 0.313 | 0.926 | 0.095 | 0.955 | 0.278 | 0.955 | 0.081 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_2 * model\_\_max\_depth: 14 * model\_\_learning\_rate: 0.106 * model\_\_min\_child\_weight: 8 * model\_\_subsample: 0.943 * model\_\_colsample\_bytree: 0.358 * model\_\_scale\_pos\_weight: 3.244 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.94 | 0.431 | 0.93 | 0.133 | 0.958 | 0.38 | 0.958 | 0.117 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_3 * model\_\_max\_depth: 10 * model\_\_learning\_rate: 0.163 * model\_\_min\_child\_weight: 10 * model\_\_subsample: 0.806 * model\_\_colsample\_bytree: 0.733 * model\_\_scale\_pos\_weight: 0.352 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 536.25 * average prop of minority class before resampling: 0.444 * average size of training set after resampling: 596.0 * average prop of minority class after resampling: 0.5 | 0.929 | 0.352 | 0.915 | 0.109 | 0.969 | 0.292 | 0.966 | 0.087 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 29 * model\_\_max\_depth: 4 * model\_\_min\_samples\_split: 20 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: auto * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.942 | 0.344 | 0.928 | 0.101 | 0.953 | 0.317 | 0.957 | 0.089 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 1 * model\_\_n\_estimators: 89 * model\_\_max\_depth: 7 * model\_\_min\_samples\_split: 20 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 387.25 * average prop of minority class: 0.385 | 0.95 | 0.333 | 0.936 | 0.098 | 0.961 | 0.3 | 0.966 | 0.084 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 1 * model\_\_n\_estimators: 56 * model\_\_max\_depth: 7 * model\_\_min\_samples\_split: 7 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.953 | 0.306 | 0.941 | 0.092 | 0.963 | 0.277 | 0.966 | 0.078 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 54 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 11 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.947 | 0.31 | 0.936 | 0.094 | 0.964 | 0.272 | 0.967 | 0.077 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 1 * model\_\_n\_estimators: 75 * model\_\_max\_depth: 10 * model\_\_min\_samples\_split: 20 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 387.25 * average prop of minority class: 0.385 | 0.95 | 0.332 | 0.934 | 0.099 | 0.956 | 0.3 | 0.963 | 0.084 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 88 * model\_\_max\_depth: 9 * model\_\_min\_samples\_split: 11 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.949 | 0.309 | 0.941 | 0.094 | 0.956 | 0.283 | 0.962 | 0.08 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 91 * model\_\_max\_depth: 6 * model\_\_min\_samples\_split: 13 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: auto * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.949 | 0.318 | 0.937 | 0.095 | 0.962 | 0.28 | 0.965 | 0.079 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 54 * model\_\_max\_depth: 4 * model\_\_min\_samples\_split: 17 * model\_\_min\_samples\_leaf: 2 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.943 | 0.35 | 0.929 | 0.103 | 0.958 | 0.315 | 0.961 | 0.088 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 22 * model\_\_max\_depth: 7 * model\_\_min\_samples\_split: 10 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.946 | 0.321 | 0.938 | 0.098 | 0.959 | 0.286 | 0.964 | 0.081 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 89 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 12 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.949 | 0.315 | 0.938 | 0.095 | 0.958 | 0.279 | 0.963 | 0.079 |

## Report of inner training in fold 7 of outer Cross Validation

## Report of training in this outer fold

Best model with respect to selected metric is xgboost with the following params:

* undersampling\_majority\_class: True
* max\_k\_undersampling: 5
* resample\_\_sampling\_strategy: all
* post\_process\_\_option: option\_2
* model\_\_max\_depth: 5
* model\_\_learning\_rate: 0.231
* model\_\_min\_child\_weight: 5
* model\_\_subsample: 0.906
* model\_\_colsample\_bytree: 0.156
* model\_\_scale\_pos\_weight: 5.958
* model\_\_objective: binary:logistic

### Comparison of all models trained in this outer fold

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Params** | **Comments** | **roc\_auc on inner fold** | **neg\_log\_loss on inner fold** | **average\_precision on inner fold** | **neg\_brier\_score on inner fold** | **roc\_auc on outer fold** | **neg\_log\_loss on outer fold** | **average\_precision on outer fold** | **neg\_brier\_score on outer fold** |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 15 * model\_\_learning\_rate: 0.065 * model\_\_min\_child\_weight: 6 * model\_\_subsample: 0.848 * model\_\_colsample\_bytree: 0.239 * model\_\_scale\_pos\_weight: 3.133 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.898 | 0.513 | 0.878 | 0.169 | 0.834 | 0.61 | 0.793 | 0.211 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_3 * model\_\_max\_depth: 15 * model\_\_learning\_rate: 0.097 * model\_\_min\_child\_weight: 4 * model\_\_subsample: 0.888 * model\_\_colsample\_bytree: 0.672 * model\_\_scale\_pos\_weight: 0.827 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 536.25 * average prop of minority class before resampling: 0.444 * average size of training set after resampling: 596.0 * average prop of minority class after resampling: 0.5 | 0.938 | 0.322 | 0.911 | 0.094 | 0.93 | 0.338 | 0.938 | 0.101 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 9 * model\_\_learning\_rate: 0.125 * model\_\_min\_child\_weight: 10 * model\_\_subsample: 0.812 * model\_\_colsample\_bytree: 0.467 * model\_\_scale\_pos\_weight: 0.517 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 536.25 * average prop of minority class before resampling: 0.444 * average size of training set after resampling: 596.0 * average prop of minority class after resampling: 0.5 | 0.913 | 0.376 | 0.894 | 0.116 | 0.847 | 0.491 | 0.816 | 0.155 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 15 * model\_\_learning\_rate: 0.113 * model\_\_min\_child\_weight: 4 * model\_\_subsample: 0.893 * model\_\_colsample\_bytree: 0.643 * model\_\_scale\_pos\_weight: 0.158 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.918 | 0.434 | 0.897 | 0.135 | 0.86 | 0.536 | 0.842 | 0.161 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_2 * model\_\_max\_depth: 5 * model\_\_learning\_rate: 0.231 * model\_\_min\_child\_weight: 5 * model\_\_subsample: 0.906 * model\_\_colsample\_bytree: 0.156 * model\_\_scale\_pos\_weight: 5.958 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.941 | 0.492 | 0.916 | 0.144 | 0.92 | 0.579 | 0.92 | 0.181 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_3 * model\_\_max\_depth: 12 * model\_\_learning\_rate: 0.255 * model\_\_min\_child\_weight: 9 * model\_\_subsample: 0.827 * model\_\_colsample\_bytree: 0.598 * model\_\_scale\_pos\_weight: 0.654 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.943 | 0.311 | 0.908 | 0.091 | 0.925 | 0.343 | 0.924 | 0.101 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_3 * model\_\_max\_depth: 8 * model\_\_learning\_rate: 0.227 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.965 * model\_\_colsample\_bytree: 0.235 * model\_\_scale\_pos\_weight: 0.183 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.939 | 0.365 | 0.912 | 0.114 | 0.943 | 0.348 | 0.94 | 0.106 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: minority * post\_process\_\_option: option\_1 * model\_\_max\_depth: 7 * model\_\_learning\_rate: 0.103 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.985 * model\_\_colsample\_bytree: 0.139 * model\_\_scale\_pos\_weight: 0.116 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.915 | 0.577 | 0.902 | 0.196 | 0.834 | 0.653 | 0.787 | 0.218 |
| xgboost | * undersampling\_majority\_class: True * max\_k\_undersampling: 6 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_2 * model\_\_max\_depth: 9 * model\_\_learning\_rate: 0.21 * model\_\_min\_child\_weight: 3 * model\_\_subsample: 0.935 * model\_\_colsample\_bytree: 0.379 * model\_\_scale\_pos\_weight: 0.393 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 387.25 * average prop of minority class before resampling: 0.385 * average size of training set after resampling: 476.5 * average prop of minority class after resampling: 0.5 | 0.94 | 0.328 | 0.915 | 0.102 | 0.93 | 0.328 | 0.931 | 0.101 |
| xgboost | * undersampling\_majority\_class: False * max\_k\_undersampling: 5 * resample\_\_sampling\_strategy: all * post\_process\_\_option: option\_3 * model\_\_max\_depth: 8 * model\_\_learning\_rate: 0.053 * model\_\_min\_child\_weight: 7 * model\_\_subsample: 0.897 * model\_\_colsample\_bytree: 0.161 * model\_\_scale\_pos\_weight: 0.134 * model\_\_objective: binary:logistic | * option: build model with resampling * number of folds: 4 * average size of training set before resampling: 536.25 * average prop of minority class before resampling: 0.444 * average size of training set after resampling: 596.0 * average prop of minority class after resampling: 0.5 | 0.936 | 0.542 | 0.907 | 0.19 | 0.941 | 0.512 | 0.94 | 0.172 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 0 * model\_\_n\_estimators: 67 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 12 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 387.25 * average prop of minority class: 0.385 | 0.944 | 0.335 | 0.914 | 0.093 | 0.93 | 0.359 | 0.935 | 0.112 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 1 * model\_\_n\_estimators: 25 * model\_\_max\_depth: 3 * model\_\_min\_samples\_split: 18 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 387.25 * average prop of minority class: 0.385 | 0.94 | 0.367 | 0.905 | 0.106 | 0.933 | 0.373 | 0.938 | 0.111 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 0 * model\_\_n\_estimators: 43 * model\_\_max\_depth: 9 * model\_\_min\_samples\_split: 11 * model\_\_min\_samples\_leaf: 2 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 387.25 * average prop of minority class: 0.385 | 0.938 | 0.456 | 0.902 | 0.095 | 0.932 | 0.359 | 0.937 | 0.112 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 0 * model\_\_n\_estimators: 45 * model\_\_max\_depth: 8 * model\_\_min\_samples\_split: 18 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: auto * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 387.25 * average prop of minority class: 0.385 | 0.939 | 0.335 | 0.907 | 0.096 | 0.931 | 0.354 | 0.938 | 0.11 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 27 * model\_\_max\_depth: 5 * model\_\_min\_samples\_split: 15 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.943 | 0.326 | 0.912 | 0.094 | 0.926 | 0.346 | 0.934 | 0.105 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 1 * model\_\_n\_estimators: 70 * model\_\_max\_depth: 5 * model\_\_min\_samples\_split: 6 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.945 | 0.328 | 0.914 | 0.095 | 0.931 | 0.34 | 0.938 | 0.101 |
| random\_forest | * undersampling\_majority\_class: True * model\_\_bootstrap: 0 * model\_\_n\_estimators: 63 * model\_\_max\_depth: 3 * model\_\_min\_samples\_split: 7 * model\_\_min\_samples\_leaf: 2 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 387.25 * average prop of minority class: 0.385 | 0.942 | 0.37 | 0.911 | 0.107 | 0.928 | 0.383 | 0.933 | 0.115 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 0 * model\_\_n\_estimators: 93 * model\_\_max\_depth: 5 * model\_\_min\_samples\_split: 20 * model\_\_min\_samples\_leaf: 4 * model\_\_max\_features: auto * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.939 | 0.338 | 0.906 | 0.098 | 0.928 | 0.347 | 0.934 | 0.105 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 1 * model\_\_n\_estimators: 80 * model\_\_max\_depth: 4 * model\_\_min\_samples\_split: 8 * model\_\_min\_samples\_leaf: 1 * model\_\_max\_features: sqrt * model\_\_class\_weight: balanced\_subsample | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.942 | 0.344 | 0.907 | 0.099 | 0.928 | 0.354 | 0.935 | 0.106 |
| random\_forest | * undersampling\_majority\_class: False * model\_\_bootstrap: 1 * model\_\_n\_estimators: 11 * model\_\_max\_depth: 9 * model\_\_min\_samples\_split: 10 * model\_\_min\_samples\_leaf: 3 * model\_\_max\_features: auto * model\_\_class\_weight: balanced | * option: build model without resampling * number of folds: 4 * average size of training set: 536.25 * average prop of minority class: 0.444 | 0.939 | 0.462 | 0.902 | 0.098 | 0.918 | 0.366 | 0.926 | 0.113 |