



HUMAN RESOURCES ANALYTICS: PREDICTING EMPLOYEE CHURN IN PYTHON

# Tuning employee turnover classifier

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# Overfitting

Existance of overfitting:

- Training accuracy: 100%
- Testing accuracy: 97.23%

Methods to fight it:

- Limiting tree maximum depth
- Limiting minimum sample size in leafs



# Pruning the tree

## Limiting Depth

```
model_depth_5 = DecisionTreeClassifier(  
    max_depth=5, random_state=42)  
  
# Train set Accuracy: 97.71%  
# Test set Accuracy: 97.06%
```

## Limiting Samples

```
model_sample_100 = DecisionTreeClassifier(  
    min_samples_leaf=100, random_state=42)  
  
# Train set Accuracy: 96.58%  
# Test set Accuracy: 96.13%
```



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**Let's practice!**



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# Evaluating the model

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# Prediction errors

Confusion Matrix		Reality	
		0	1
		0	1
Predicted	0	TN	FN
	1	FP	TP



# Evaluation metrics 1

- If target is leavers, focus on FN
  - Recall score =  $TP/(TP+FN)$
  - Lower FN, higher Recall score
  - Recall score - % of correct predictions among 1s (leavers)
- If target is stayers, focus on FP
  - Specificity =  $TN/(TN+FP)$
  - Lower FP, higher Specificity,
  - Specificity - % of correct predictions among 0s (stayers)



# Evaluation metrics 2

- Even if target is leavers, you may still focus on FP:
  - Precision score =  $TP / (TP + FP)$
  - Lower FP, higher Recall score
  - Precision score - % of leavers in reality, among those predicted to leave





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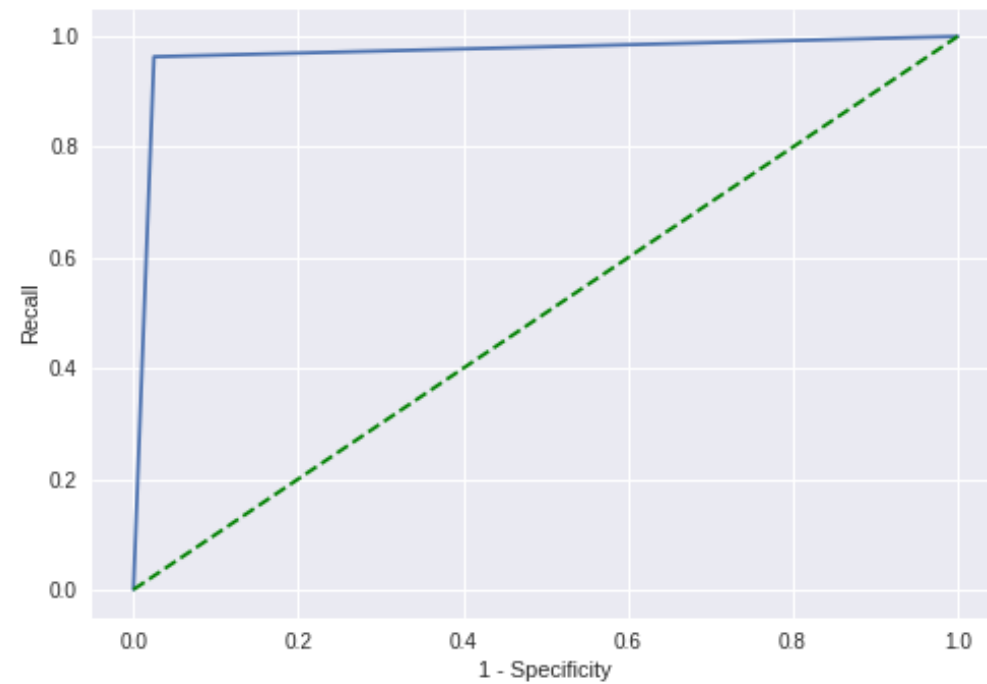
# Targeting both leavers and stayers

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# AUC score



- Vertical axis: Recall
- Horizontal axis: 1 - Specificity
- Blue line: ROC
- Green line: baseline
- Area between blue and green: AUC



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# Class Imbalance

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# Prior probabilities

## Without balance

- $P_0 = 0.76$
- $P_1 = 0.24$
- $Gini = 0.36$

## With balance

- $P_0 = 0.5$
- $P_1 = 0.5$
- $Gini = 0.5$



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