

# ORES Preparation IV

Tom Gülenman

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*Disclaimer: No guarantee for the correctness of information / explanations / sources is given.*

## Goals

1. Adjust crucial metrics list
  - to match the damaging model metrics ✓
  - add 2 last metrics
2. Check out mail attachments
3. Check out new Confluence pages and goals
4. Research
  - Check out FAT Conference Docs
  - In what other cases than confusion matrices are those parameters explained?
  - Are there already visualizations of some of these parameters in any contexts?
  - Are there any applications, where I can filter for these parameters → visualizations or just about anything?

# 1 Crucial metrics: damaging-model

Metrics simple list:

!f1	✓
!precision	✓
!recall	✓
accuracy	✓
counts	
f1	✓
filter_rate	✓
fpr	✓
match_rate	✓
pr_auc	✓
precision	✓
rates	
recall	✓
roc_auc	✓

The metrics are the same for the damaging and itemquality models, but a few changes will be made to the explanatory parts nonetheless (compared to the version in oresDoc3). Also the structure of explanations will be changed to the following:

For each metric (if possible) there will be:

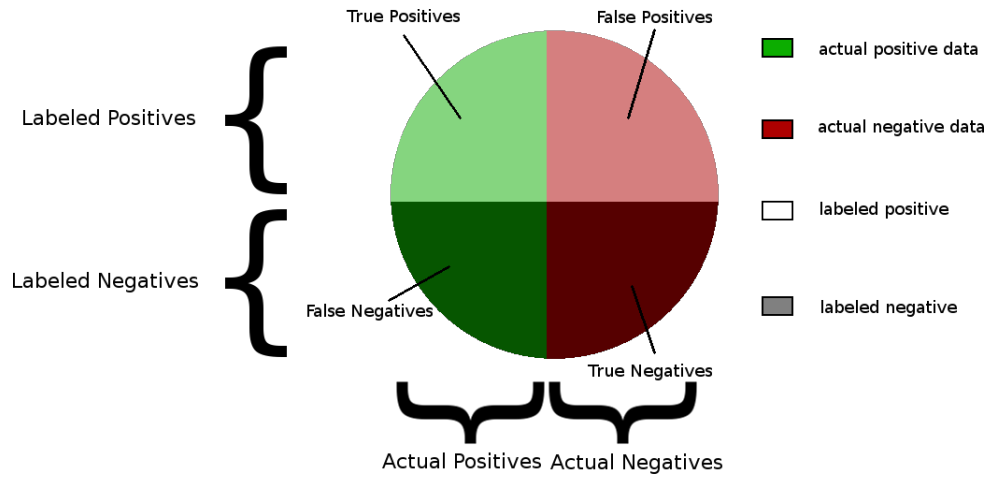
1. An intuitive explanation
2. The formula based on the **confusion matrix**
3. Its meaning based on the “**confusion circle**”
4. Its meaning based on the **loan threshold** representation by Google (Link)

## Explanations: References

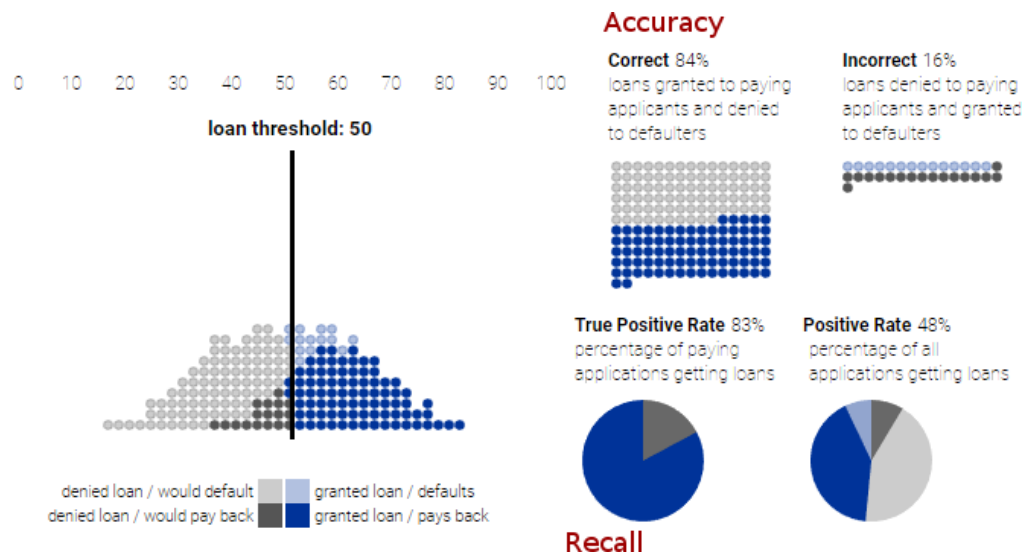
- Confusion Matrix

		Actual	
		Positive	Negative
Predicted	Positive	<b>True Positive</b>	<b>False Positive</b>
	Negative	<b>False Negative</b>	<b>True Negative</b>

- “Confusion Circle”

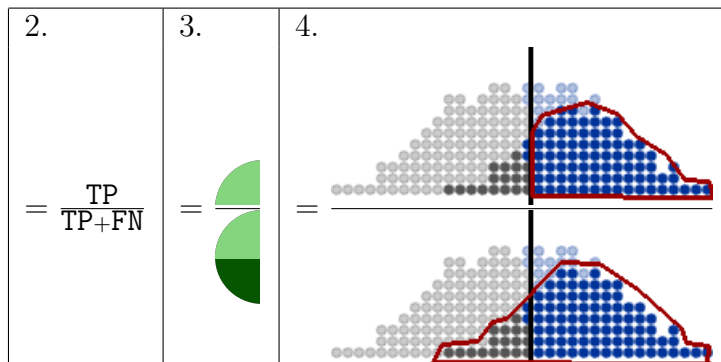


- Loan Threshold



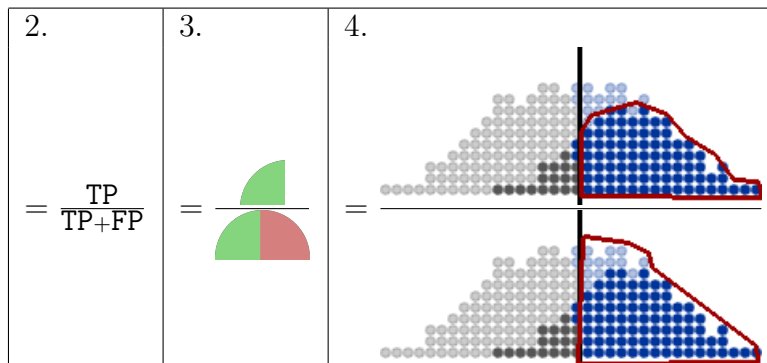
## 1.1 recall

1. Recall ( $\equiv$  True Positive Rate) is defined as the ability of a model to find all relevant cases within the dataset.



## 1.2 precision

1. Ability of the model to find only relevant cases within the dataset



## 1.3 f1

1. F1-Score, the harmonic mean of recall and precision, a metric from 0 (worst) to 1 (best), used to evaluate the accuracy of a model by taking recall and precision into account

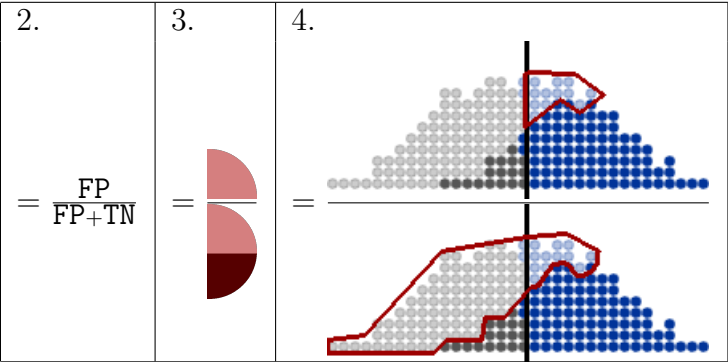
2.	3.	4.
-	-	-

$$= 2 * \frac{\text{precision} * \text{recall}}{\text{precision} + \text{recall}}$$

Compared to the simple average (of recall and precision), the harmonic mean punishes extreme values (e.g. precision 1.0 and recall 0.0  $\rightarrow$  average 0.5, but F1 = 0)

# 1.4 fpr

1. The false positive rate (**FPR**) is the probability of a false alarm

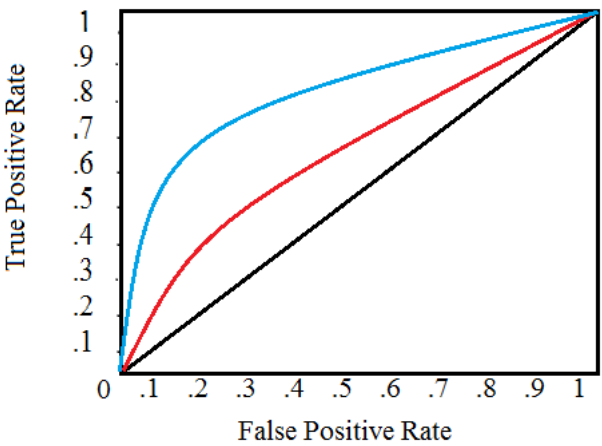


# 1.5 roc\_auc

1. The **area under the curve** of the **ROC**-curve, a measure between 0.5 (worthless) and 1.0 (perfect: getting no FPs), rates the ability of a model to achieve a blend of recall and precision

2.	3.	4.
-	-	-

The receiver operating characteristic (ROC) curve plots the TPR versus FPR as a function of the model's threshold for classifying a positive



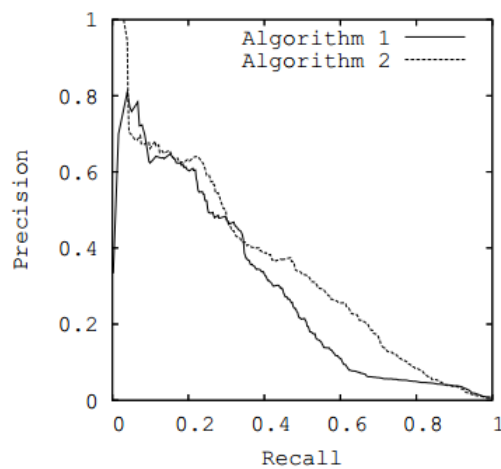
Increasing the threshold → moving up a curve ( $\equiv$  model) to the top right corner, where all data is predicted as positive (threshold = 1.0) and vice versa

## 1.6 pr\_auc

(see: link 1 and link 2)

1. The **area under the curve** of the **PR**-curve, same: similar objective as the **roc\_auc**, but PR curves are better than ROC curves if the populations are imbalanced

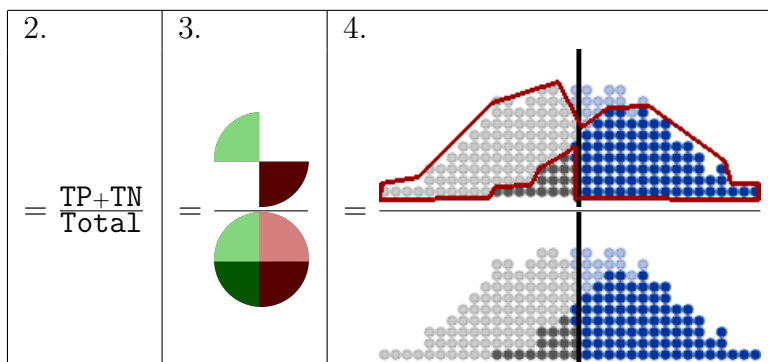
The PR-curve plots the Precision versus the Recall



Instead of the top left corner for the ROC-curve, here, we want to be in the top right corner for our classifier to be perfect


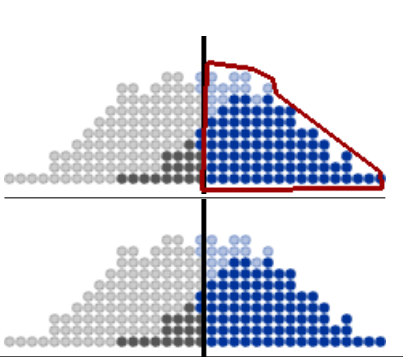
## 1.7 accuracy

1. Measuring the portion of correctly predicted data




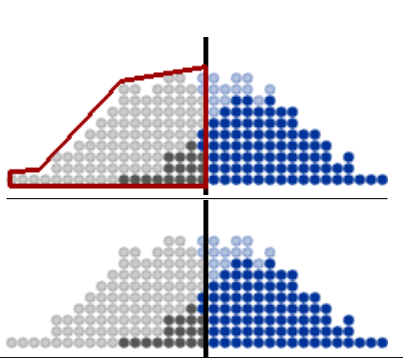
1.8 match\_rate

1. The proportion of observations matched/not-matched

2.  $= \frac{TP+FP}{Total}$	3.  	4. 
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1.9 filter\_rate

1. The proportion of observations filtered/not-filtered

2.  $= 1 - \text{match\_rate} = \frac{TN+FN}{Total}$	3.  	4. 
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1.10 counts

1.

2.	3.	4.

1.11 rates

1.

2.	3.	4.

## 1.12 !<metric>

- Any <metric> with an exclamation mark is the same metric for the negative class
- e.g.  $\text{recall} = \frac{TP}{TP+FN} \Rightarrow !\text{recall} = \frac{TN}{TN+FP}$
- Example usage: find all items that are not “E” class  $\rightarrow$  look at !recall for “E” class.

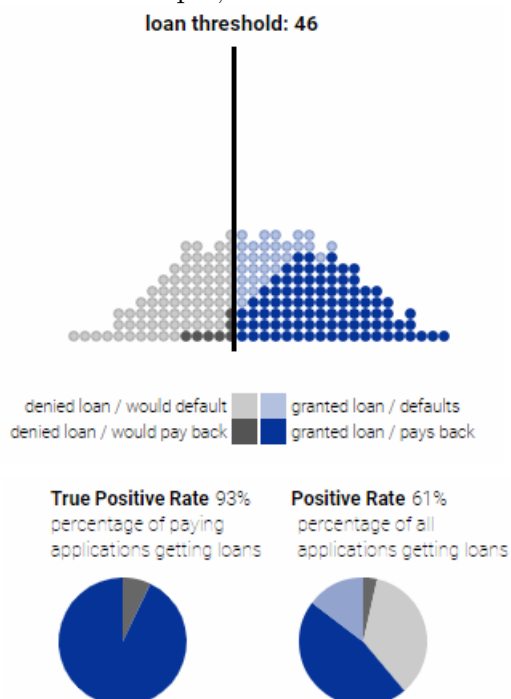
### 1.12.1 Existing !<metric>s

- !f1
- !precision
- !recall

## 1.13 Additional explanations

### 1.13.1 recall vs precision

When increasing one of these two, the other one naturally decreases. For an intuitive example, let's take a look at Google's Loan Threshold Simulation:





The dark grey / dark blue dots, representing clients that would actually pay back their loan, are more and more included ( $\rightarrow$  given loans) if we move the threshold further to the left.

But so are clients that would not. Thus moving the threshold to the left increases the **recall (tpr)** but decreases the **precision** and vice versa when moving to the right.

### 1.13.2 roc\_auc vs pr\_auc

see: <https://www.kaggle.com/general/7517>

- tl;dr: if the class imbalance problem exists, **pr\_auc** is more appropriate than **roc\_auc**

If TNs are not meaningful to the problem or there are a lot more negatives than positives, **pr\_auc** is the way to go (it does not account for TNs).

- In other words:
  - If the model needs to perform equally on the positive and negative class  $\rightarrow$  **roc\_auc**
  - If it's not interesting how the model performs on negative class  $\rightarrow$  **pr\_auc** (example: detecting cancer; find all positives and make sure they're correct!)

## Additional Information

- Confluence Link (Bachelor Thesis): <https://intern.hcc.mi.fu-berlin.de/confluence/pages/viewpage.action?pageId=33269659>
- Amir's mail links
  - New Filters for Edit Review Documentation Link
  - ORES API Call Link
    - “Basically it asks for threshold from the API when ”recall is at its maximum when precision is at least 0.995“”

## Questions

- Q: Should I ask Aaron how he would like us to work together? I'm not sure how he meant it.  
A:
- Q: In what situations exactly do we want to optimize the threshold in the context of user centered threshold optimization?  
A:
- Q: VPN recommendation?  
A: