



Confusion Matrix, FPR and FNR

Confusion Matrix

In a two class problem, the results of the correctly and incorrectly classified samples are recorded in a confusion matrix:

	Predicted Negative	Predicted Positive
Actual Negative	TN	FP
Actual Positive	FN	TP

- **TN**: # of negative samples correctly classified - True Negatives
- **FP**: # of negative samples incorrectly classified as positive - False Positives
- **FN**: # of positive samples incorrectly classified as negative - False Negatives
- **TP**: # of positive samples correctly classified - True positives

FPR and FNR

- False Positive Rate, $FPR = FP / (FP + TN)$
- False Negative Rate $FNR = FN / (TP + FN)$

FPR and FNR

- Both FPR and FNR vary between 0 and 1
- Our goal is to minimize both FPR and FNR.
- The confusion matrix, FPR and FNR depend on a probability threshold
 - Values vary depending on the threshold we use to determine the class output

FPR and FNR

- Minimise FNR:
 - Disease diagnosis → we want to minimise the number of sick people that we do not diagnose correctly
- Minimise FPR:
 - Drug discovery: → we want to minimise the number of drugs that we think could be beneficial, but they are not

FPR

Target	Prediction
0	0
0	0
0	0
0	1
0	1
0	0
0	0
1	0
1	1
1	1

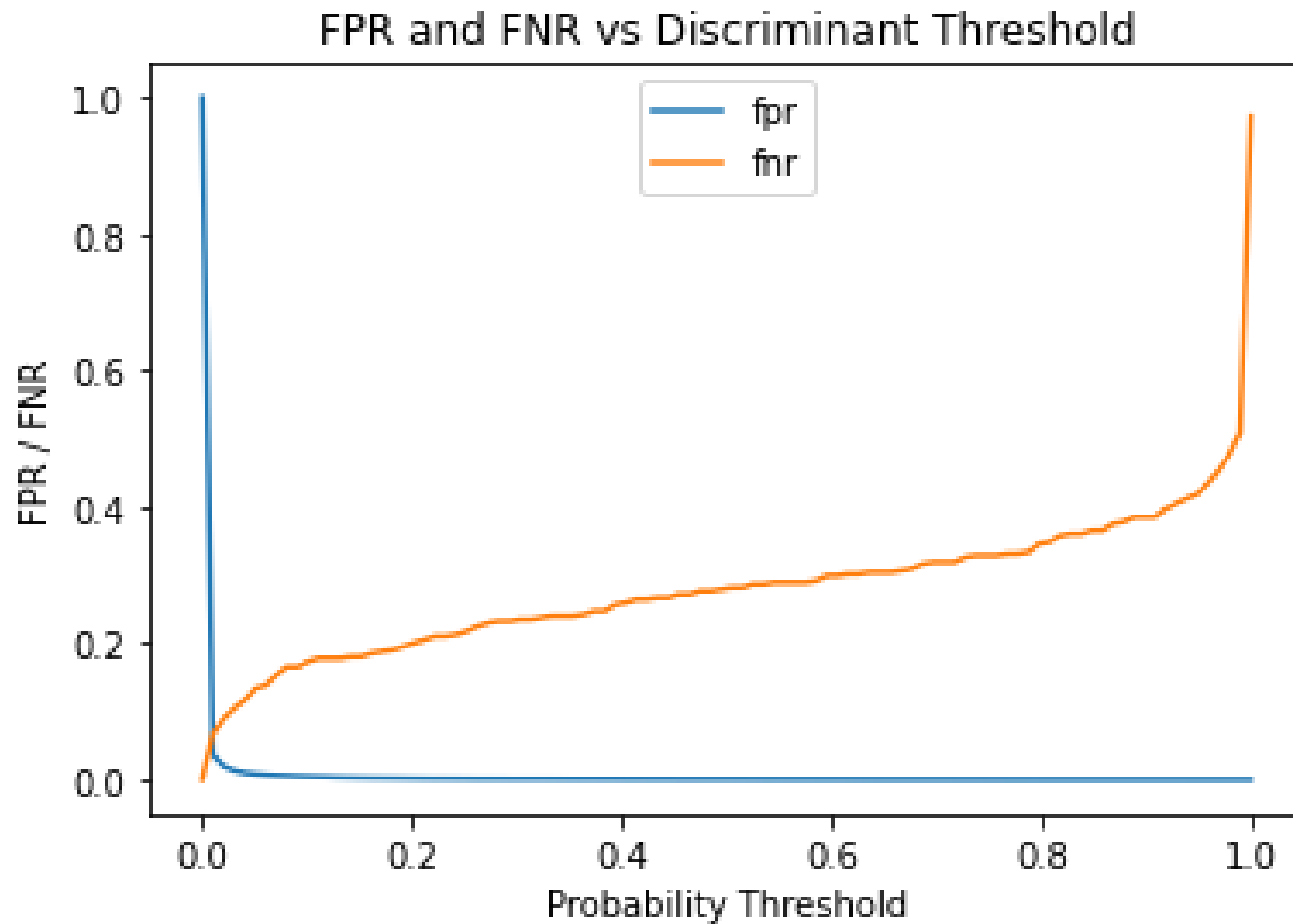
- $FPR = FP / (FP + TN)$
- $FPR = 2 / (2+5) = 2 / 7 = 0.286$

FNR

Target	Prediction
0	0
0	0
0	0
0	1
0	1
0	0
0	0
1	0
1	1
1	1

- $FNR = \text{FN} / (\text{TP} + \text{FN})$
- $FNR = 1 / (1+2) = 1 / 3 = 0.33$

FPR and FNR vs threshold



THANK YOU

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