# Precision and Recall

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## Metrics for evaluating Binary Classifiers

- Accuracy is not always appropriate
- Precision, Recall and F-Measure
  - True Positives (TP)
  - False Positives (FP)
  - True Negatives (TN)
  - False Negatives (FN)

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## TP and FP

- We compare the positive and negatives as determined in the annotated set (gold set) vs the positive and negatives predicted by the binary classifier (being evaluated)
- Consider an instance predicted as positive by the classifier. This can be a TP (true positive) or a FP (false positive)
  - A TP is an instance predicted to be a positive by the classifier and also annotated as positive in the gold set.
  - A FP is an instance predicted to be a positive by the classifier BUT is annotated as negative in the gold set. The classifier got it wrong.

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## TN and FN

- Similarly consider an instance predicted as negative by the classifier. This can be a TN (true negative) or a FN (false negative)
  - A TN is an instance predicted to be a negative by the classifier and also annotated as negative in the gold set.
  - A FN is an instance predicted to be a negative by the classifier BUT is annotated as positive in the gold set. The classifier got it wrong.
- Thus TP and TN correspond to instances where the classifier gets it right but FP and FN are the cases where the classifier has made a mistake.

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## Summary

| | Predicted as positive | Predicted as negative |
|---|---|---|
| Annotated as Positive | TP | FN |
| Annotated as Negative | FP | TN |

Precision = TP / (TP + FP)

Recall = TP / (TP + FN)

$F_1$ = 1 / 1/2 (1/P + 1/R)
= 2PR / (P + R)

F is closer to the lower number

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