

Understanding Classification Evaluation Metrics



Accuracy Explained

- Accuracy is the overall correctness.
- It measures the percentage of correct predictions.
- Calculated as $(\text{True Positives} + \text{True Negatives}) / \text{Total Predictions}$.
- High accuracy doesn't always mean a good model.
- Can be misleading when classes are imbalanced.



What is Precision?

- Precision measures the accuracy of positive predictions.
- Out of all the instances predicted as positive, how many are actually positive?
- Calculated as $\text{True Positives} / (\text{True Positives} + \text{False Positives})$.
- High precision minimizes false positives.
- Important when false positives are costly.



Recall Defined

- Recall (Sensitivity) measures the model's ability to find all relevant instances.
- Out of all the actual positive instances, how many did the model identify?
- Calculated as $\text{True Positives} / (\text{True Positives} + \text{False Negatives})$.
- High recall minimizes false negatives.
- Important when missing important positive cases is detrimental.



The Trade-off

- Precision and Recall often conflict.
- Improving one can decrease the other.
- It's a balancing act depending on the application.
- Consider the costs of false positives vs. false negatives.



F1-Score Introduced

- F1-score combines precision and recall.
- It's the harmonic mean of precision and recall.
- Provides a single score to assess a model's performance.
- Useful when you want a balanced view.



Confusion Matrix

- A visual representation of predictions vs. actual values.
- Shows True Positives, False Positives, True Negatives, and False Negatives.
- Helps in understanding the model's strengths and weaknesses.
- Excellent for diagnosing model errors.



Choosing the Right Metric

- The best metric depends on the problem.
- For example, in medical diagnosis, recall is crucial.
- In spam detection, precision might be more important.
- Always consider the context of your application.



Beyond Basic Metrics

- Consider other evaluation metrics like ROC curves and AUC.
- These metrics provide a more comprehensive view.
- Experiment with different metrics to find the best fit.
- Continuous monitoring is key to model performance.



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