# 📊 Model Evaluation Metrics – Classification

## 1. Accuracy

Accuracy = Correct Predictions / Total Predictions  
Measures overall correctness. Simple and intuitive but can be misleading when class imbalance exists.

## 2. Precision

Precision = True Positives / (True Positives + False Positives)  
Answers: Of all predicted positives, how many were actually correct?  
Useful when false positives are costly.

## 3. Recall

Recall = True Positives / (True Positives + False Negatives)  
Answers: Of all actual positives, how many did we correctly find?  
Useful when missing true cases is costly.

## 4. F1 Score

F1 Score = 2 \* (Precision \* Recall) / (Precision + Recall)  
Harmonic mean of precision and recall. Best when you need a balance between the two, especially with class imbalance.

## 5. Support

Support = Number of true instances for each class in the test set.  
Not a performance metric but gives context to other scores.

## 6. Macro Avg vs Weighted Avg

Macro Avg: Averages metrics across classes equally, regardless of class size.  
Weighted Avg: Averages metrics weighted by the number of true instances in each class.  
- Use Macro Avg when class balance matters.  
- Use Weighted Avg for overall performance.

## ✅ Summary: When to Use What

| Metric | Use When... |  
|------------|-------------|  
| Accuracy | Classes are balanced and all errors have equal cost |  
| Precision | False positives are expensive |  
| Recall | Missing true cases is costly |  
| F1 Score | You want a balance between Precision and Recall |