Naive Bayes on SMS Spam Dataset – Documentation

# 📦 Dataset

- Name: SMS Spam Collection Dataset  
- Shape: 5572 messages  
- Target labels: ham (non-spam), spam  
- Location: /Users/anirudhravipudi/Desktop/AI/Practice/SMSSpamCollection.txt

# 🔍 Preprocessing Steps

1. Loaded data using pandas.read\_csv with tab separator.  
2. Renamed columns to ['label', 'message']  
3. Encoded labels: ham = 0, spam = 1  
4. Split into training and test sets (80-20) using train\_test\_split  
5. Two types of vectorization tested:  
 - CountVectorizer  
 - TfidfVectorizer

# 📈 Model 1: Multinomial Naive Bayes + CountVectorizer

- Accuracy: ~99.19%  
- Confusion Matrix:  
 [[966 0]  
 [ 9 140]]  
- Highlights:  
 - Very high precision and recall.  
 - Minimal false negatives.  
 - Great baseline performance.

# 📉 Model 2: Multinomial Naive Bayes + TF-IDF

- Accuracy: ~96.68%  
- Confusion Matrix:  
 [[966 0]  
 [ 37 122]]  
- Observation:  
 - Precision stayed high.  
 - Recall dropped: more spam messages were missed.  
 - Model became more cautious.

# 💡 Conclusion

- CountVectorizer worked better for MultinomialNB on this dataset.  
- TF-IDF may underperform if frequent spam indicators are down-weighted.