Model Accuracy Report & Confusion Matrix

Model Used:

Random Forest Classifier — an ensemble-based machine learning model that operates by building multiple decision trees and merging their results to improve prediction accuracy and control overfitting. It is well-suited for classification problems such as employee attrition prediction.

Test Accuracy: 87.0%

This means that the model correctly predicted the outcome (attrition or no attrition) for 87 out of every 100 employees in the test dataset.

Detailed Classification Report (for "Attrition = Yes" class):

Metric	Value	Explanation
Precision	100%	All employees predicted as likely to leave **did in fact leave**. No false positives.
Recall	22.9%	Out of all employees who actually left, **only 22.9% were correctly predicted**. The rest were missed.
F1-Score	37.3%	A balance between precision and recall; low due to the model's inability to detect most attrition cases.

Confusion Matrix:

	Predicted: No Attrition	**Predicted: Attrition**
Actual: No Attrition	237 (True Negatives)	0 (False Positives)
Actual: Attrition	37 (False Negatives)	11 (True Positives)

Explanation of Terms:

- **True Negatives (TN = 237)**: Employees who stayed and were correctly predicted as such.
- **False Positives (FP = 0)**: None — the model did not falsely predict any employee as leaving who actually stayed.
- **False Negatives (FN = 37)**: Employees who actually left but were predicted as staying — the critical blind spot.

- **True Positives (TP = 11)**: Employees who left and were correctly identified by the model.

Interpretation & Insights:

1. **High Precision, Low Recall**:
    - The model is very confident and conservative in predicting attrition — it avoids raising false alarms.
    - However, its low recall means that many employees who actually resigned were not flagged in advance.
2. **Implications for HR Teams**:
    - This model is highly reliable when it predicts someone might leave.
    - But it fails to identify the majority of employees who are at risk, making it less useful as a standalone alert system.
3. **Recommendations**:
    - Use this model in conjunction with human HR judgment, periodic surveys, and departmental KPIs.
    - Consider balancing the model using techniques like SMOTE or cost-sensitive learning to improve recall.
    - Track model predictions over time and adjust thresholds to prioritize early intervention.