# Random Forest Classifier Report

Project: Multi-Class Classification of Personality Types (MBTI)

## 1. Executive Summary

The Random Forest Classifier was trained to predict 16 MBTI personality types based on 60 survey questions. The model achieved an outstanding 97.57% accuracy through ensemble learning with 100 decision trees.

## 2. Model Configuration

**Data Split:**

- Training: 70% (42,023 samples)
- Validation: 15% (8,976 samples)
- Test: 15% (9,000 samples)

**Hyperparameters:**

- Algorithm: Random Forest Classifier
- Number of Trees: 100
- Max Depth: 20
- Max Features: sqrt
- Min Samples Split: 5
- Min Samples Leaf: 2

## 3. Performance Metrics

| Measure | Score | Notes |
|---|---|---|
| Test Accuracy | 97.57% | Overall classification accuracy |
| Validation Accuracy | 97.48% | Validation set performance |
| Train Accuracy | 99.34% | Training set performance |
| Top-3 Accuracy | 99.08% | Correct type in top 3 predictions |
| Macro F1-Score | 0.9757 | Balanced across all 16 classes |

## 4. Visualizations

### 4.1 Confusion Matrix

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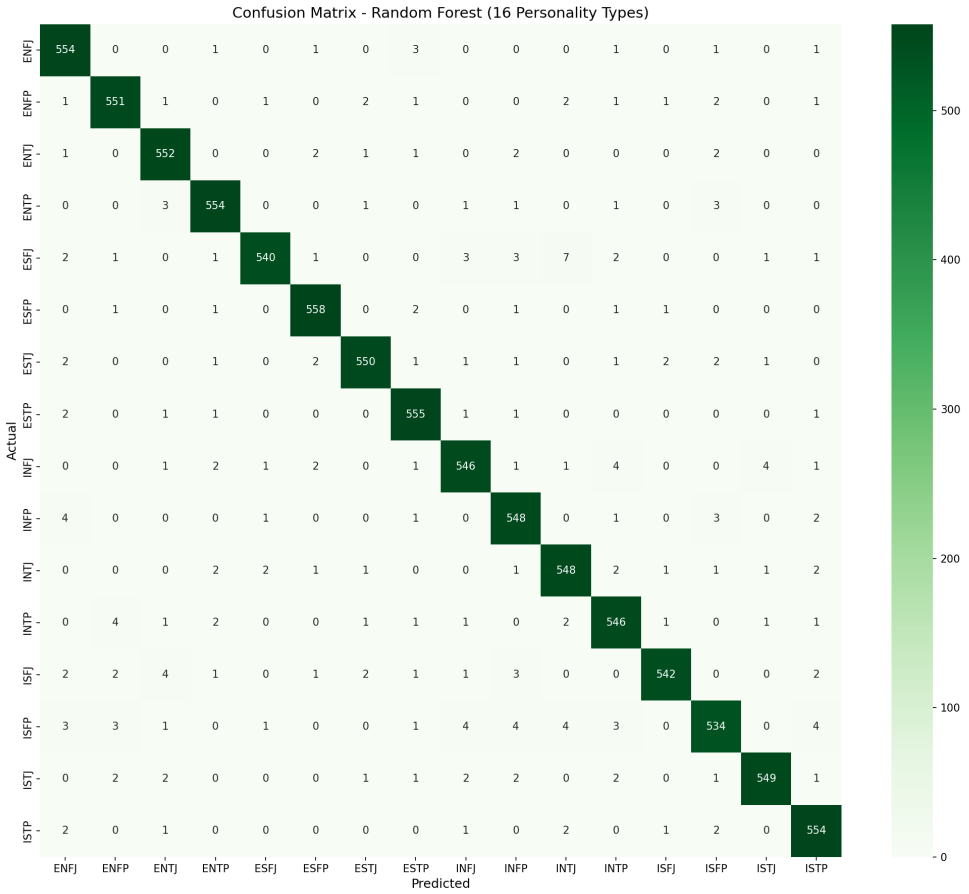

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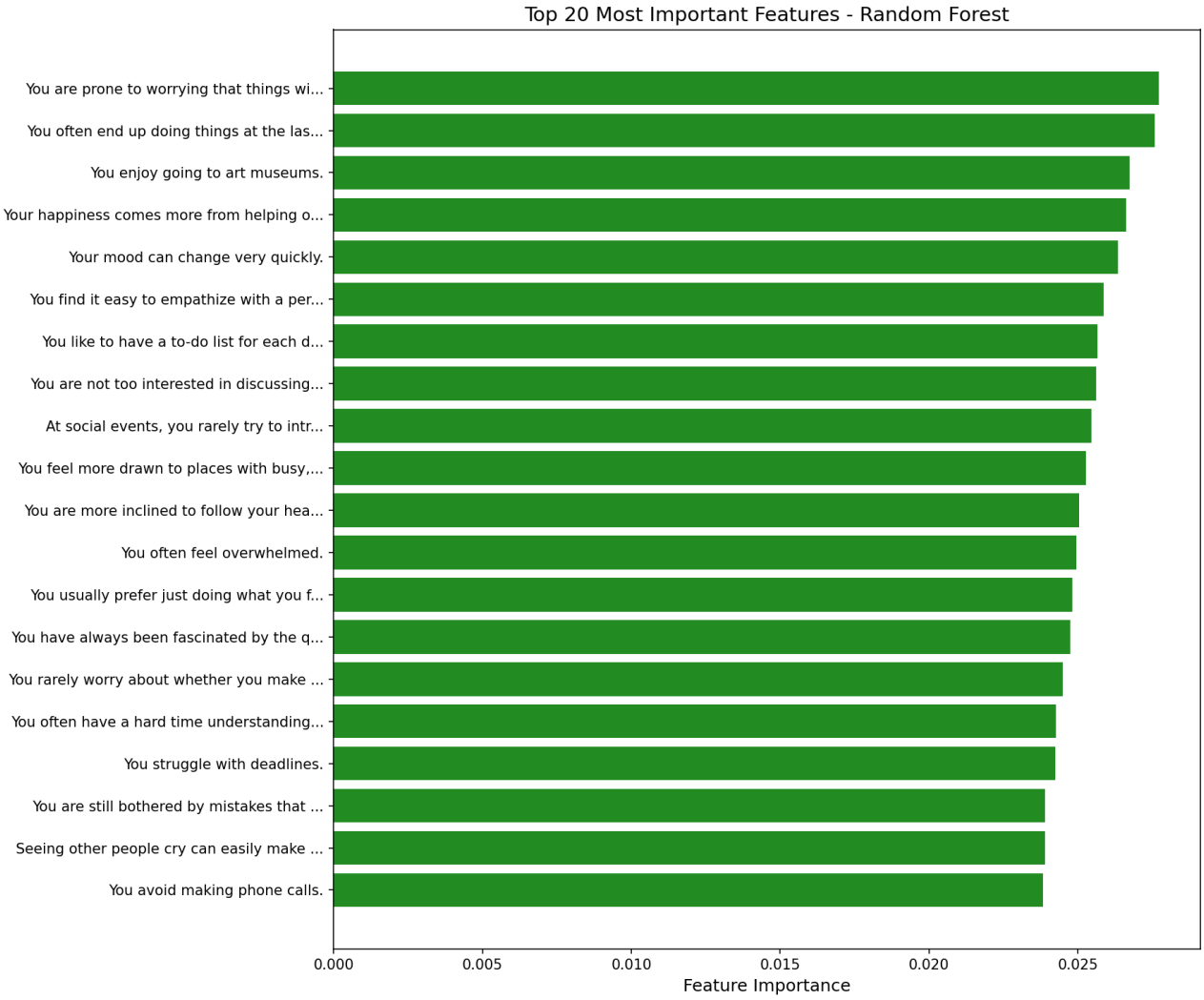
## 4.2 Feature Importance




## 4.3 Per-Class Accuracy

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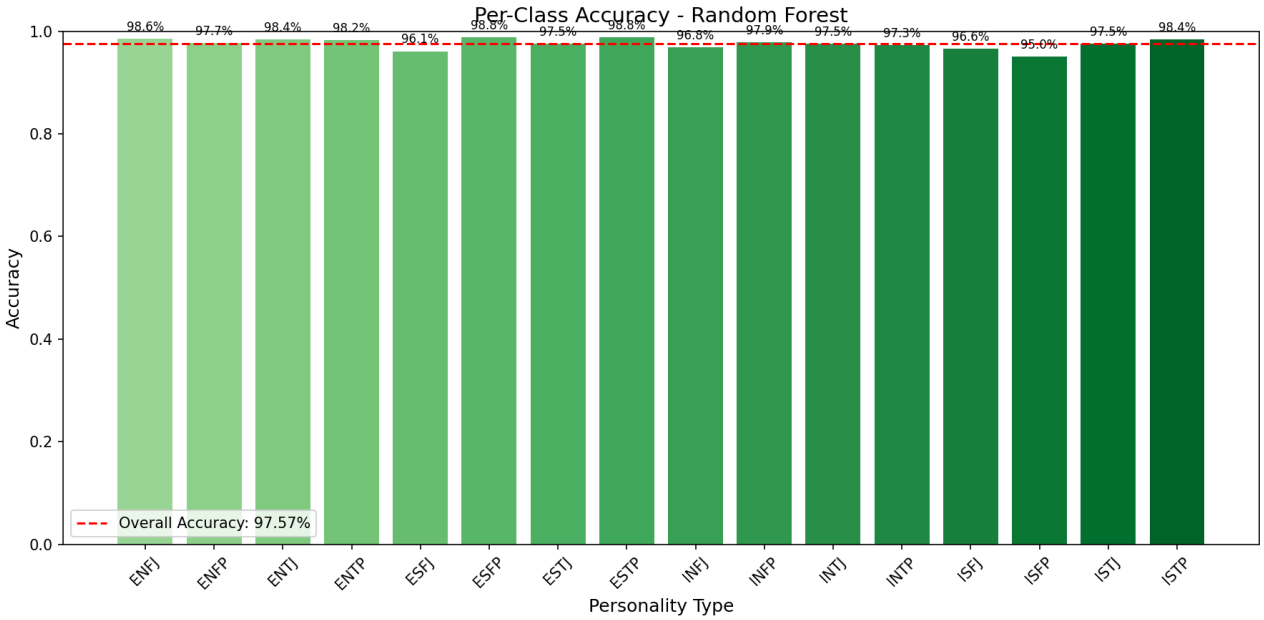

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## 5. Conclusion

Random Forest achieves 97.57% test accuracy on the 16-class MBTI personality prediction task. The ensemble of 100 decision trees provides robust predictions through voting, reducing variance while maintaining interpretability through feature importance analysis.

Key Takeaways:
- Excellent generalization (train-test gap only 1.77%)
- Very high top-k accuracy (99.08% for top-3)
- Robust through ensemble learning
- Clear feature importance rankings
- All personality types perform well (>95% F1-score)
- Strong balance between bias and variance