

# BioMLStudio

## Machine Learning Analysis Report

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## 1. Dataset Summary

| Property      | Value              |
|---------------|--------------------|
| Dataset Name  | seq_001_unaffected |
| Dataset Type  | dna                |
| Total Samples | 120                |
| Features      | 7                  |
| File Size     | 0.01 MB            |

## 2. Preprocessing Steps

### Step 1: Load and Clean Data

- Loaded 120 sequences from FASTA
- Removed invalid characters
- Extracted labels from headers
- Label distribution: {'affected': 120}

### Step 2: Handle Missing Values

- No missing values found

### Step 3: Feature Engineering (Biological)

- Added 6 engineered features

### Step 4: Sequence Encoding (auto)

- Unknown encoding method: auto

### Step 5: Feature Normalization (standard)

- Normalized 7 features using standard scaling

### Step 6: Data Splitting

- Encoded target variable (1 classes)
- Split data: 84 train, 12 val, 24 test

### 3. Model Selection & Training

| Model         | Training Time | Score  |
|---------------|---------------|--------|
| Random Forest | 3.62s         | 1.0000 |

**Best Model:** Random Forest

## 4. Performance Metrics

### Training Metrics:

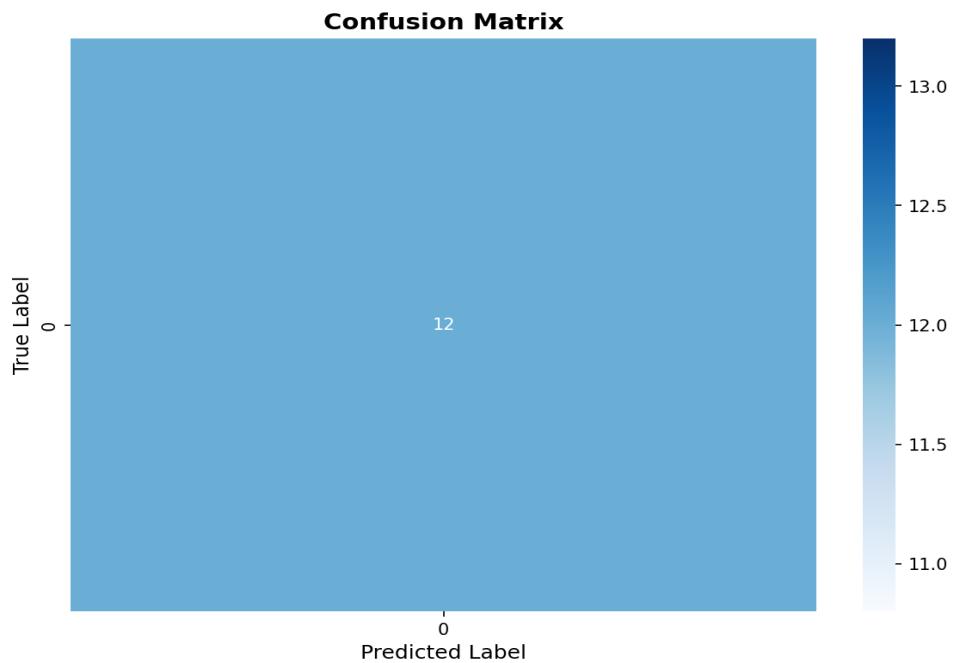
| Metric    | Value  |
|-----------|--------|
| Accuracy  | 1.0000 |
| Precision | 1.0000 |
| Recall    | 1.0000 |
| F1 Score  | 1.0000 |

### Validation Metrics:

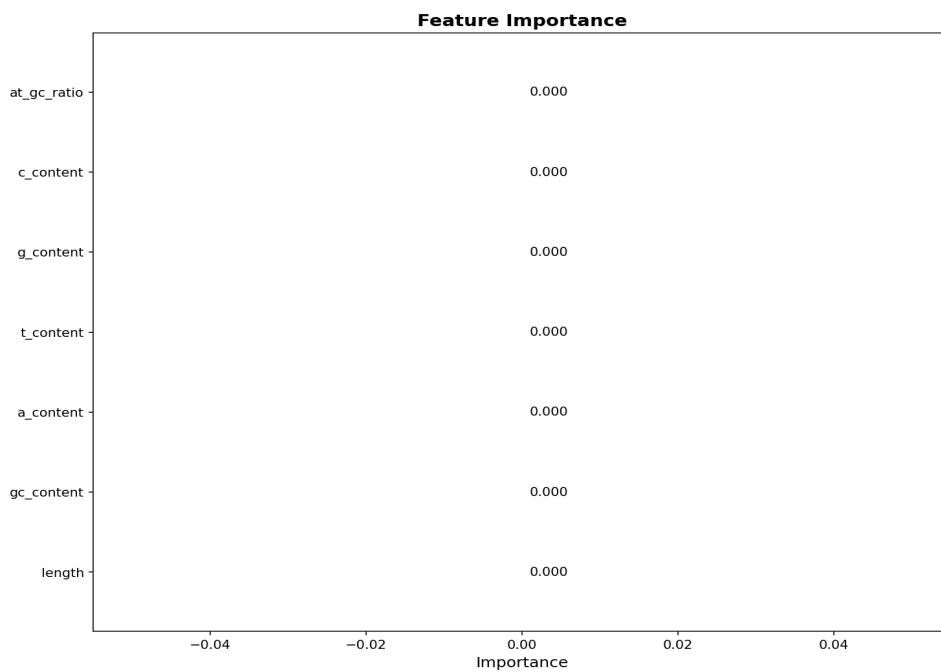
| Metric    | Value  |
|-----------|--------|
| Accuracy  | 1.0000 |
| Precision | 1.0000 |
| Recall    | 1.0000 |
| F1 Score  | 1.0000 |

## 5. Visualizations

### *Confusion Matrix*



### *Feature Importance*



## 6. Training Summary

**Total training time:** 4.96 seconds

### **Key Events:**

[ERROR] Error training Logistic Regression: This solver needs samples of at least 2 classes in the data, but the data contains only one class: 0

[SUCCESS] Random Forest - Score: 1.0000

[ERROR] Error training Gradient Boosting: y contains 1 class after sample\_weight trimmed classes with zero weights, while a minimum of 2 classes are required.

[SUCCESS] Best model: Random Forest (Score: 1.0000)

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