Logistic Regression
Comprehensive Demo Report

Binary classification via the sigmoid function.
Transforms linear output into probabilities using sigmoid activation,
then applies binary cross-entropy loss for training.

This is the building block for neural network output layers.

Random Seed: 42

Generated with NumPy-only implementation

Summary of Results

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Example 1: 2D Classification
    - Training accuracy: 94.00%
    - Successfully visualized decision boundary

Example 2: Convergence Analysis
    - Initial loss: 0.693147
    - Final loss: 0.248877
    - Iterations: 500

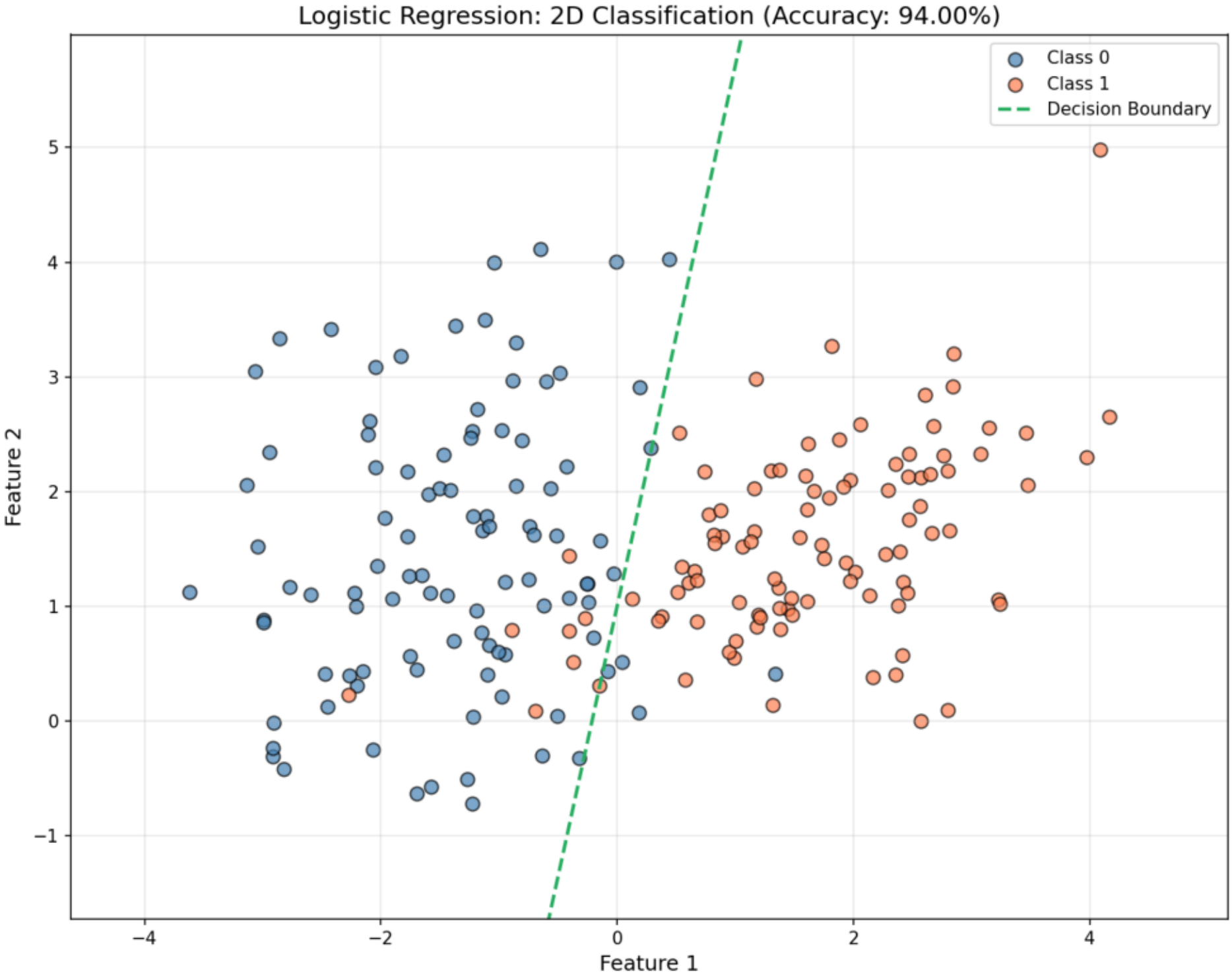
Example 3: Learning Rate Comparison
    - LR=0.01: Final accuracy 85.50%
    - LR=0.1:  Final accuracy 92.00%
    - LR=0.5:  Final accuracy 93.50%
    - LR=1.0:  Final accuracy 93.50%

Example 4: Sklearn Comparison
    - Our test accuracy: 80.00%
    - Sklearn test accuracy: 80.00%
    - Mean probability difference: 0.006120

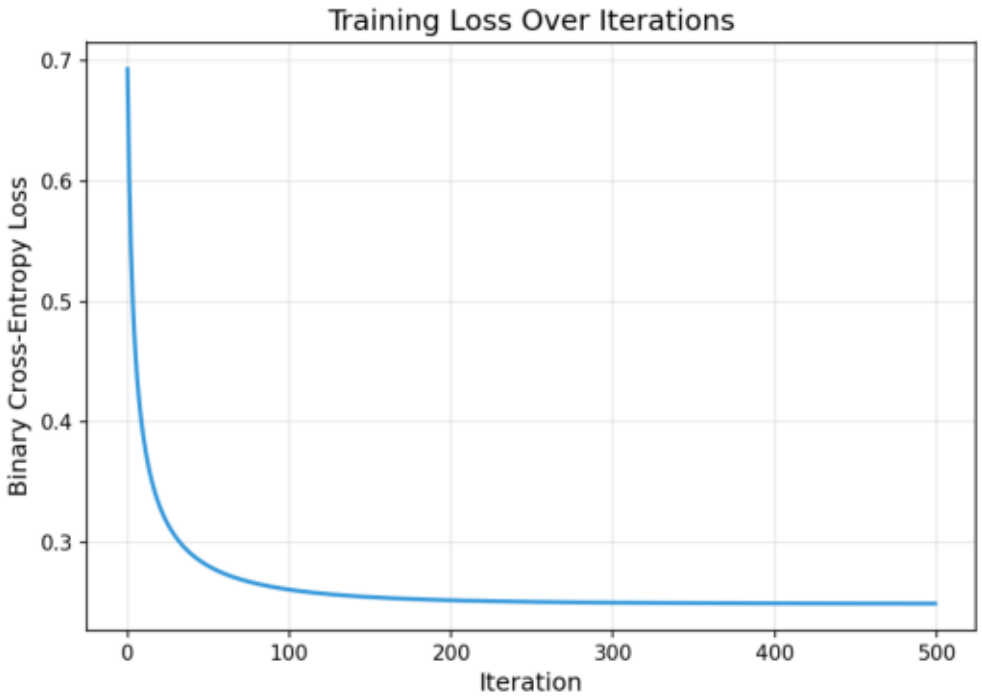
Example 5: Breast Cancer Dataset
    - Training accuracy: 98.99%
    - Test accuracy: 98.25%
    - Converged in 2000 iterations

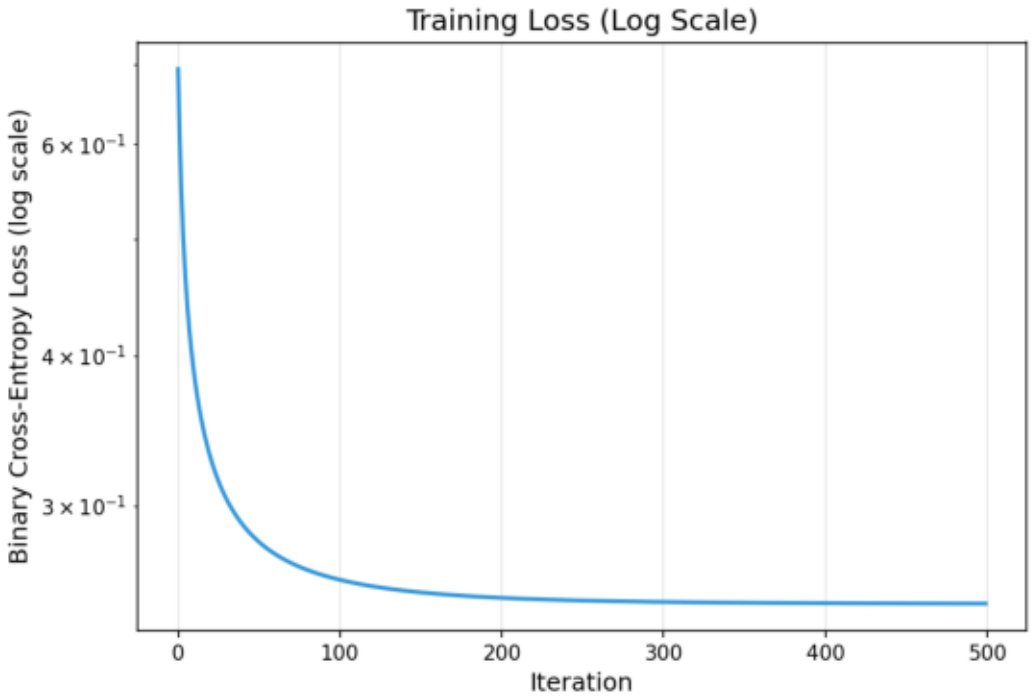
Example 6: Probability Calibration
    - Learned weight: 0.7943 (true: 1.0)
    - Learned bias: 0.1431 (true: 0.0)
```

01 2D Classification

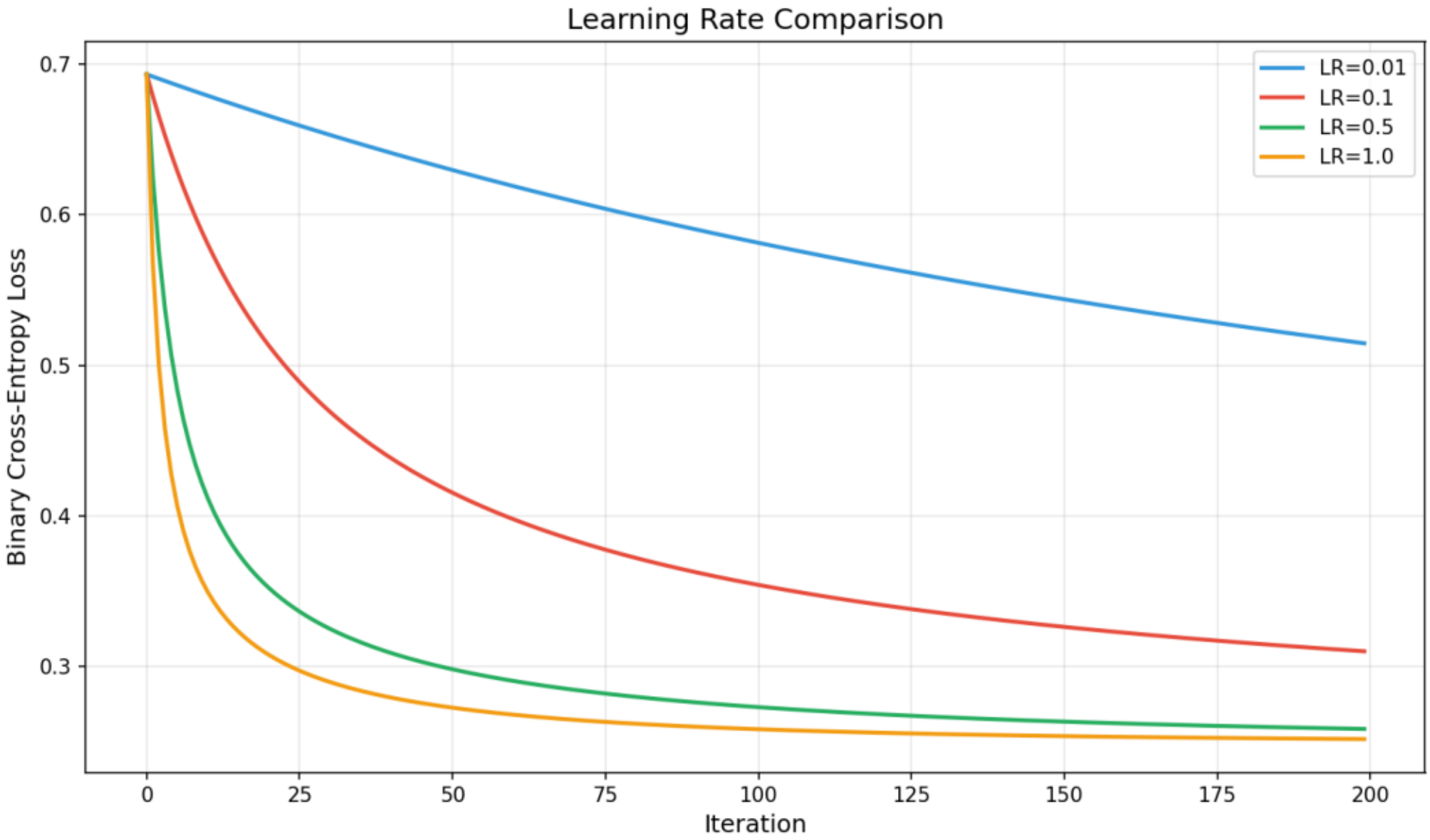


02 Convergence

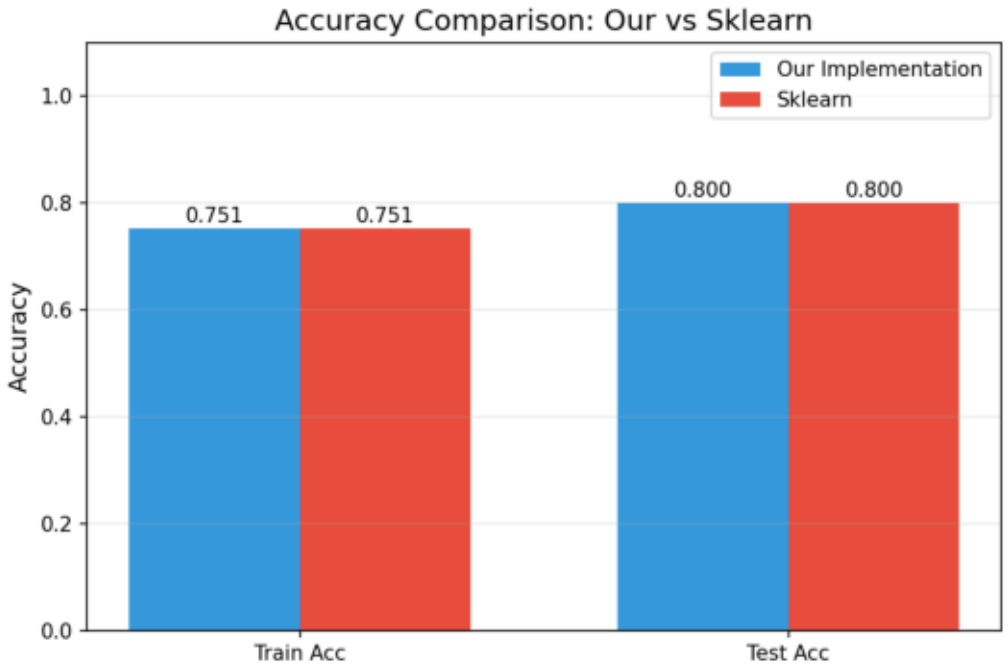


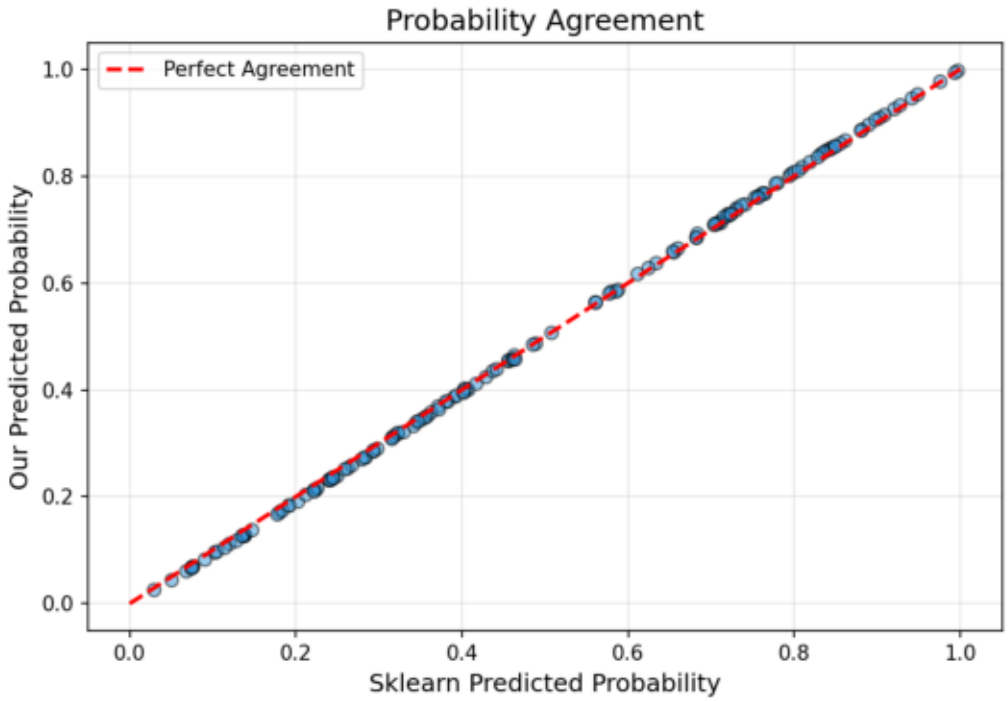


03 Learning Rate Comparison

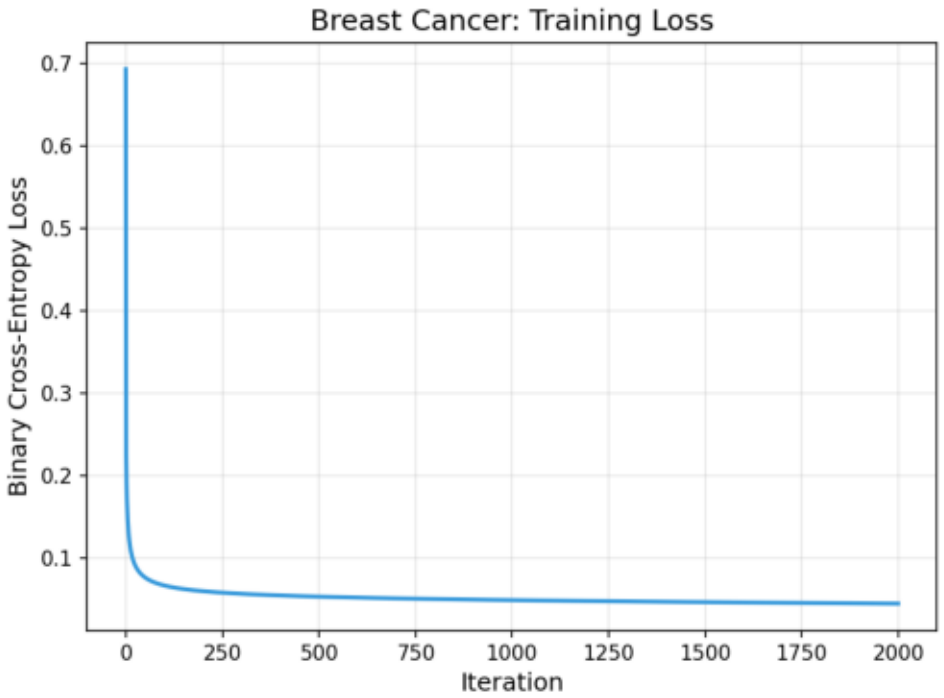


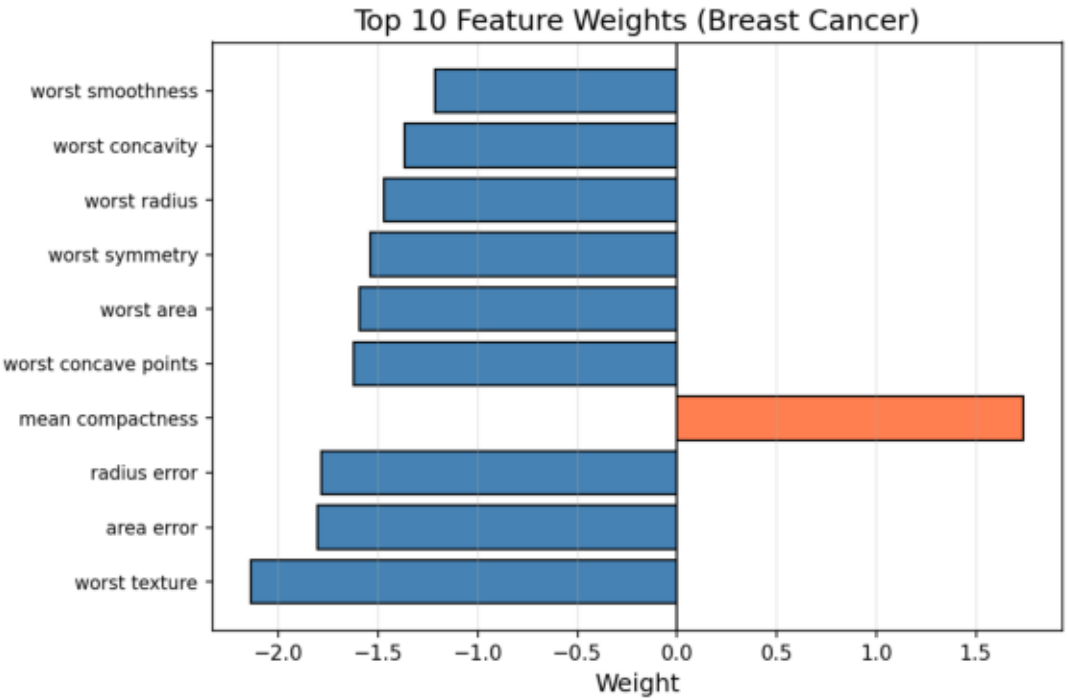
04 Sklearn Comparison





05 Breast Cancer





06 Probability Calibration