Performance Analysis

The classification task aimed to identify the correctness of bicep curls using sensor data from Myoware (EMG) and a 3-axis accelerometer (X, Y, Z). Multiple machine learning models were evaluated for importance of performance and features.

Model Performance Summary

Classifier	Accuracy	Precision (Class 1)	Recall (Class 1)	F1-Score (Class 1)
Stacking	**92.40%**	0.93	0.90	**0.92**
XGBoost	91.50%	0.94	0.87	0.90
LightGBM	90.20%	0.93	0.85	0.89
CatBoost	89.30%	0.92	0.83	0.88

- Class 0: Incorrect Form
- Class 1: Correct Form

All models performed well, with **Stacking Classifier** showing the best overall performance in terms of accuracy and balanced precision-recall.

Feature Importance Overview

- Across all models, **Myoware** consistently appeared as the most important sensor feature, followed closely by the **Y-axis** accelerometer readings.
- The **Stacking Classifier** (based on permutation importance) indicated:
    - **Y-axis** had the highest impact on accuracy.
    - **Myoware** and **X/Z-axis** contributed less comparatively but were still meaningful.

Conclusion

The results suggest that combining EMG and IMU sensor data effectively helps in classifying bicep curl form. The stacking classifier achieved the highest accuracy (92.4%) and demonstrated robust performance across precision, recall, and F1-score. The Y-axis motion and muscle activity (Myoware) were key contributors in identifying correct vs. incorrect motion.