

Prediction of Students' Adaptability Using Explainable AI in Educational Machine Learning Models

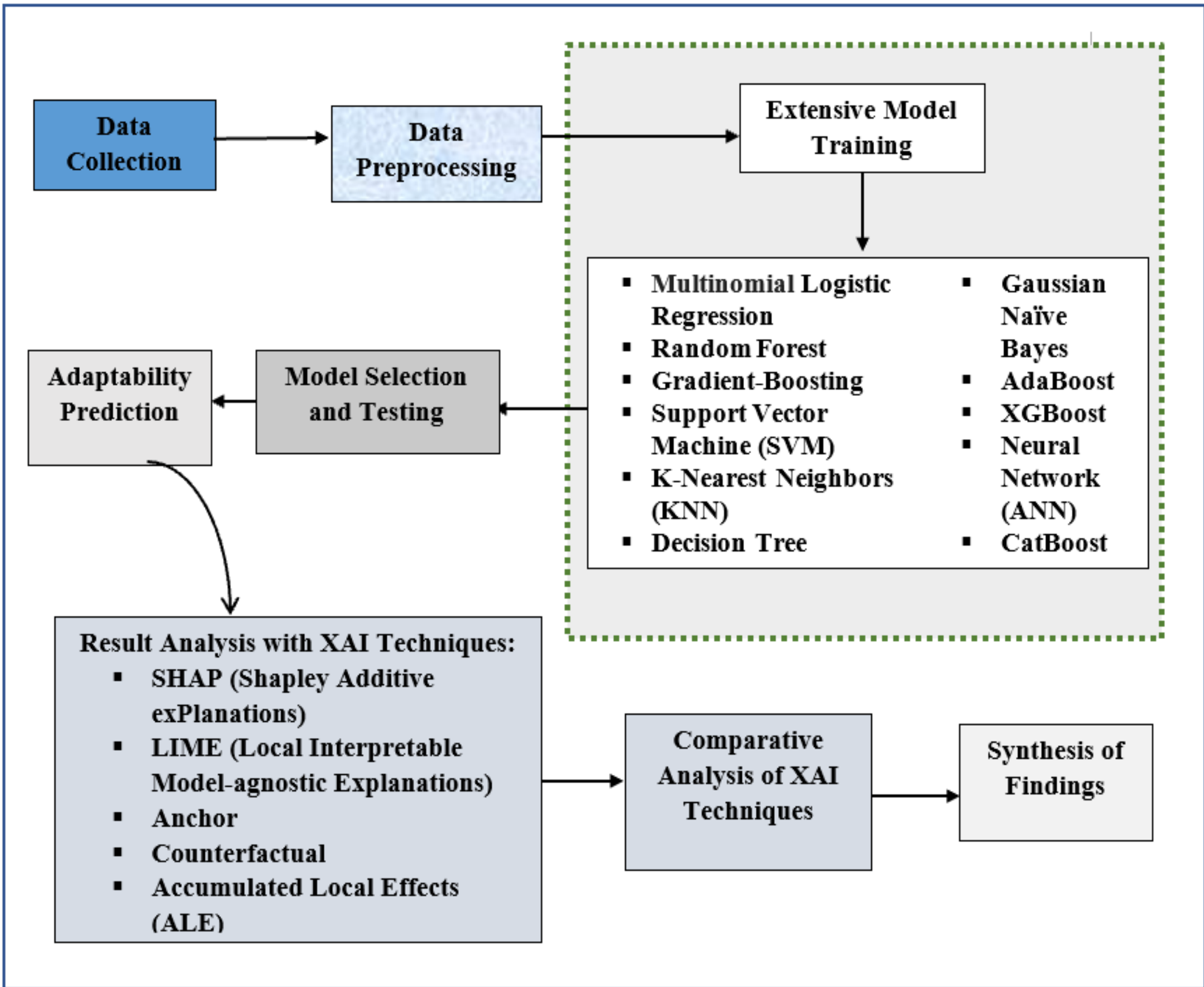


Nnadi Leonard Chukwualuka (d8252105) supervised by Prof. Yutaka Watanobe

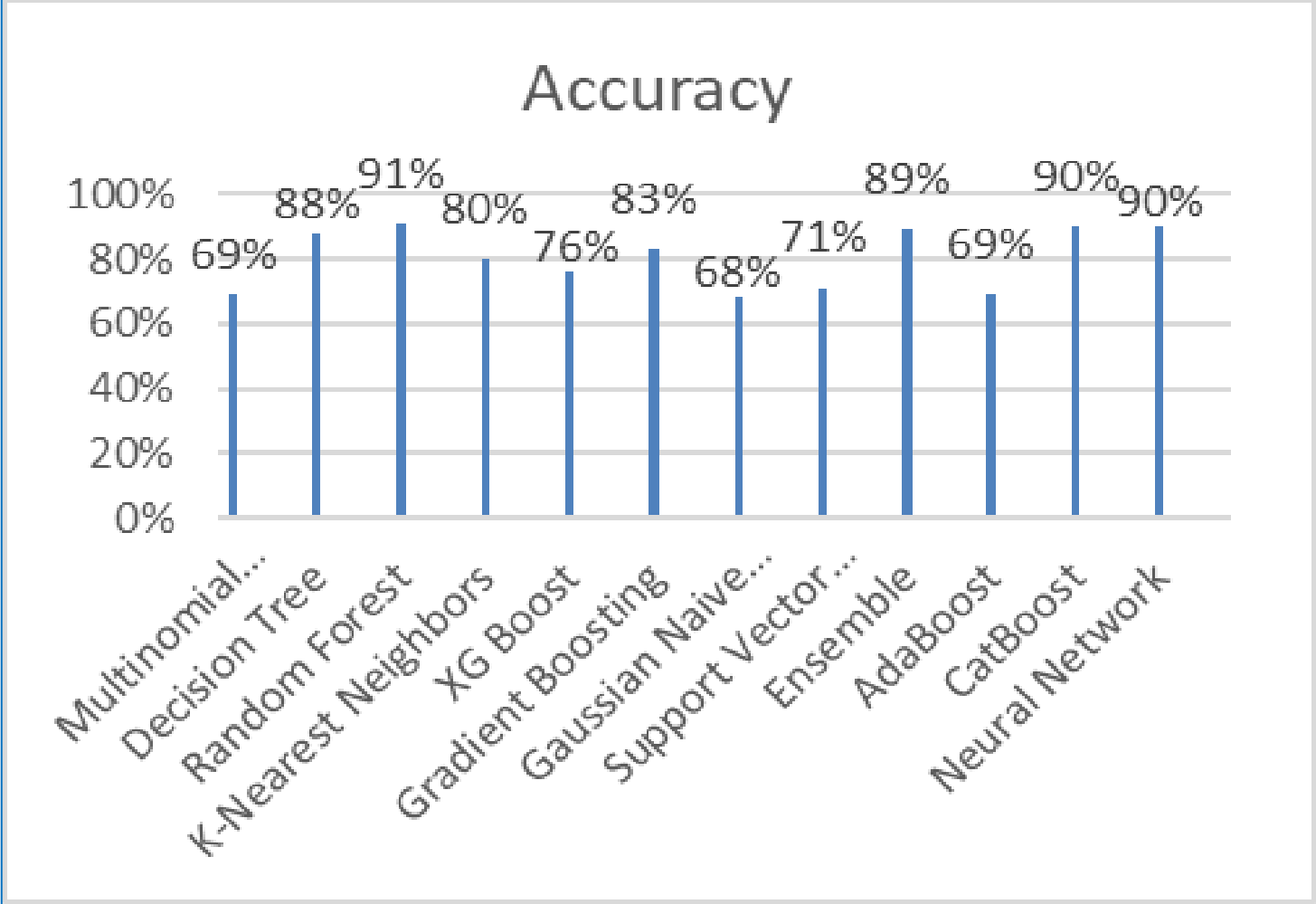
Abstract

This study analyses machine learning models to classify student adaptability levels in education. Using a dataset of 1205 instances, the study uses algorithms like Random Forest, SHAP, LIME, Anchors, ALE, and Counterfactual to reveal the impact of various features on adaptability predictions. Key factors identified include class duration, financial condition, institution type, and load-shedding. The study suggests that educational policies should accommodate socioeconomic factors, instructional time, and infrastructure stability to enhance student adaptability. This research contributes to responsible AI application in education and promotes predictive and interpretable models for equitable educational strategies.

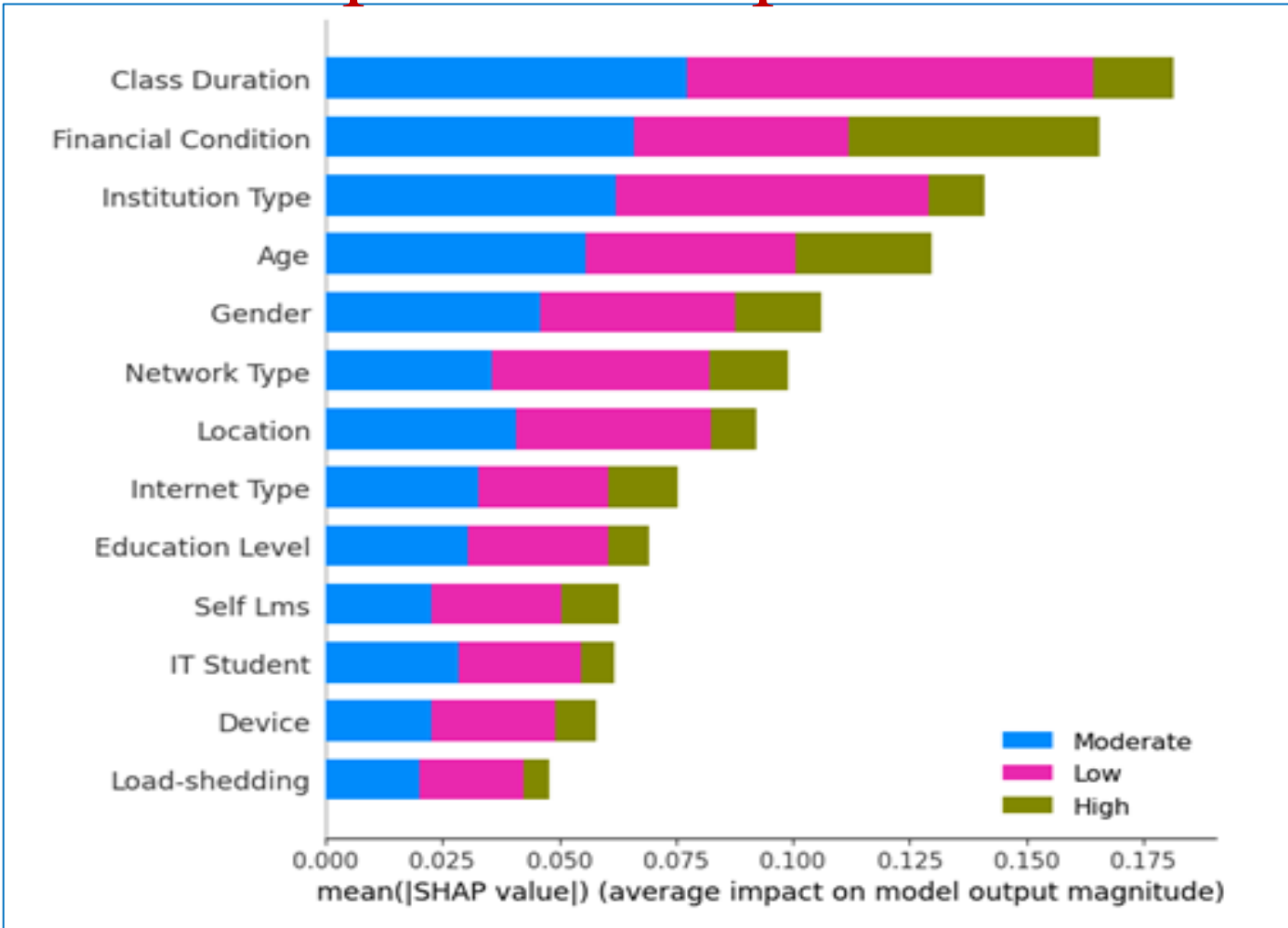
Proposed framework



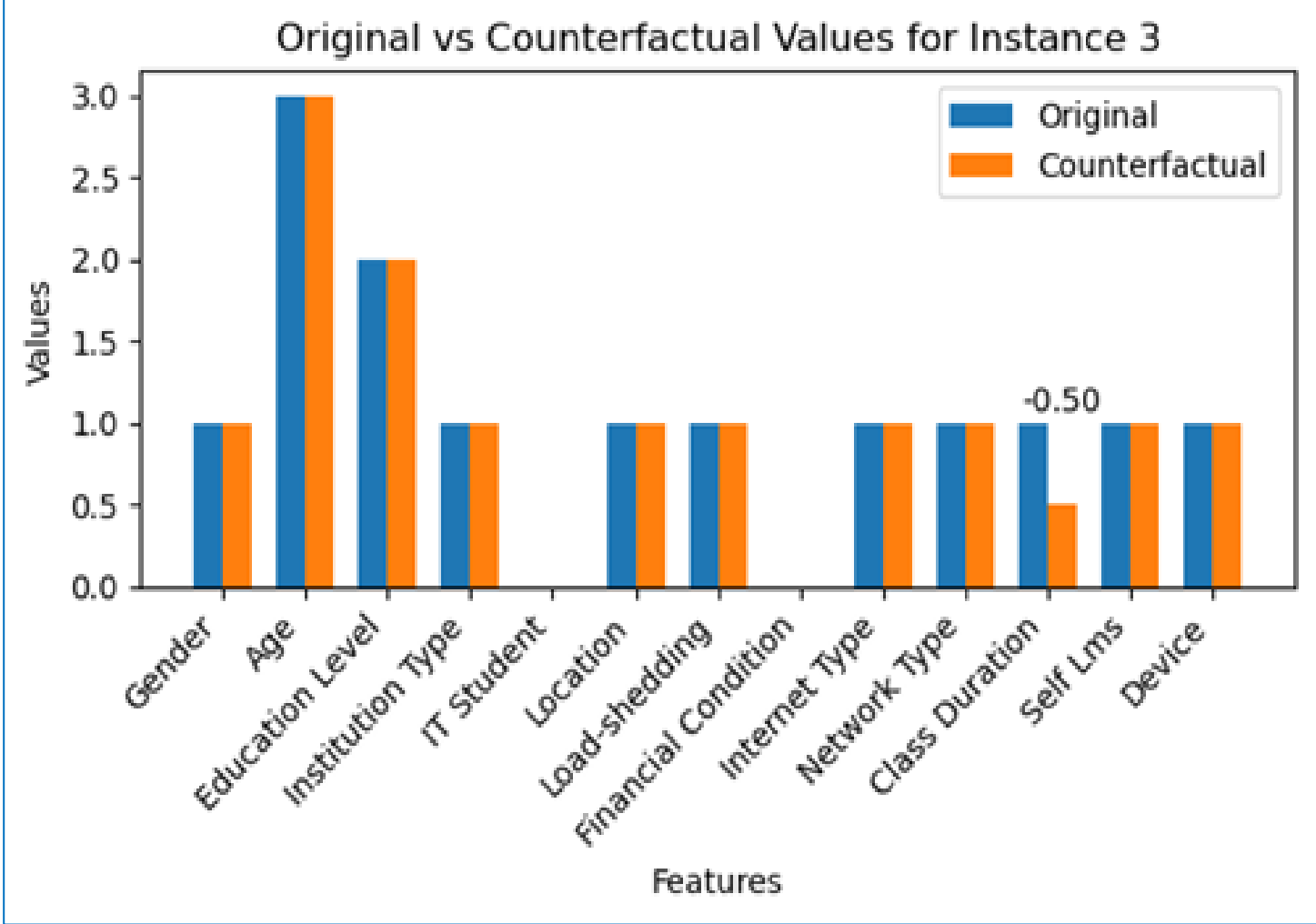
Model accuracy comparison



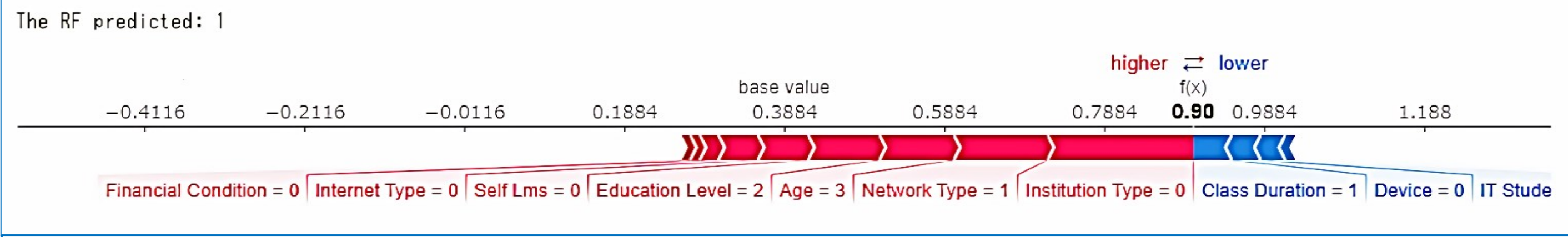
Shap Global explanation



Counterfactual explanation

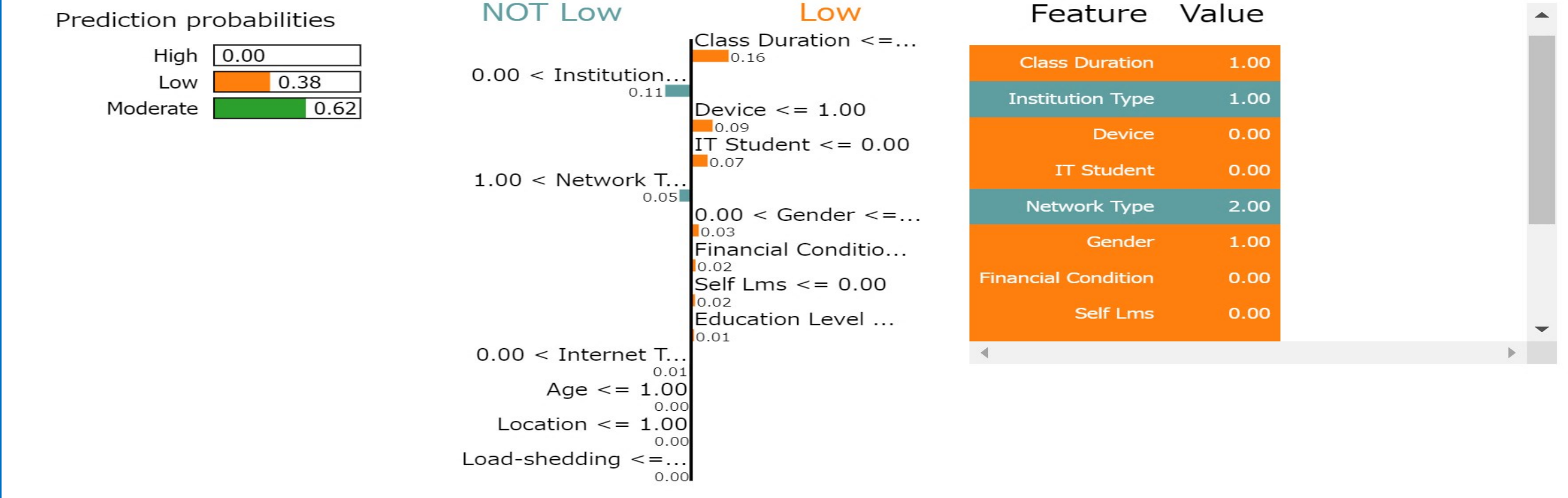


Force plot (Shap Local explanation)



The force plot shows that the model predicts a 'Low' adaptability level, with features like Education Level and Network Type contributing to higher predictions and features like Financial Condition and Self Lms indicating lower predictions.

LIME Local explanation



The machine learning model predicts student adaptability levels as 'Moderate' and 'Low', with 'High' adaptability highly unlikely. The model's weighted impact on prediction decisions is significant, with features like 'Class Duration' and 'Institution Type' contributing to 'Not Low' adaptability. Conversely, 'Device' and 'IT Student' status have a negative impact. This visualization helps understand local behaviour and offers insights for educators and policymakers to improve student adaptability and emphasizes the complexity of educational outcomes.

(Local) Anchor explanation

Anchor Explanation Condition	
Feature	Condition
Institution Type	>1.00
Age	<=1.00
Gender	>0.00
Financial Condition	<=1.00
Precision	0.9732360097323601
Coverage	0.0888
Predicted Class	Moderate

The Anchor algorithm predicts a moderate level of adaptability in students based on specific features. Network Type greater than 1.00 indicates reliable internet access, while age less than or equal to 1.00 indicates late adolescence. Gender greater than 0.00 suggests female students have moderate adaptability, while institution type greater than 0.00 indicates non-government institutions with different resource levels or pedagogical approaches. Financial condition less than or equal to 1.00 indicates middle or poor economic backgrounds.