ABSTRACT

The conventional assessment of green tea quality still relies on organoleptic tests conducted by human sensory panels. This method has limitations as it is subjective, time-consuming, and dependent on the expertise of the evaluators. Therefore, a more objective and efficient approach is required for evaluating green tea quality. This study aims to develop a predictive model for the organoleptic score of Gambung Green Tea using Electronic Nose (E-Nose) and regression-based Machine Learning algorithms, along with the implementation of Explainable AI (XAI) to analyze the key factors influencing the model's predictions. Aroma data were collected using gas sensors (MQ3, MQ5, MQ138, TGS822, TGS2602, TGS2620) and analyzed with five regression algorithms: Decision Tree, K-Nearest Neighbors (KNN), Random Forest, XGBoost, and AdaBoost. Experimental results demonstrated that Random Forest achieved the highest performance with an R-squared value of 0.9857 and a Mean Squared Error (MSE) of 0.0854. Furthermore, Explainable AI analysis using LIME (Local Interpretable Model-agnostic Explanations) revealed that TGS822, MQ138, and MQ3 sensors contributed the most to the organoleptic score predictions. This approach is expected to provide an innovative solution for assessing green tea quality more accurately and objectively, making it applicable in the tea industry to enhance the efficiency of quality control processes.

Keywords: electronic nose, organoleptic score, regression, explainable ai, green tea