ABSTRACT

The quality of tuna loin significantly influences its market value, especially in international trade. Manual grading by human experts is often subjective and inconsistent. This study proposes an automated grading system using computer vision and deep learning to classify tuna loins into Grades A, B, and C based on color and texture.

An EfficientNetV2-M model was selected for its high accuracy, fast inference, and large input resolution (480×480), which better preserves image detail. The model achieved 96% test accuracy when trained with the Adam optimizer and Cyclic learning rate scheduler on a preprocessed dataset using Self Adaptive Illumination Correction and Contrast Limited Adaptive Histogram Equalization. Preprocessing ensured consistent lighting and enhanced texture visibility across the dataset.

The trained model was deployed on Google Cloud Platform and integrated into a Flutter-based mobile application. Users can capture or upload tuna loin images and receive real-time grading results. The app was developed following a structured UI/UX workflow using Figma and implemented in Dart, with cloud-based authentication and profile management.

Cloud integration enables scalable and efficient inference, making the system reliable in practical settings. This solution offers a fast, objective, and scalable alternative for quality control in the tuna industry, enhancing export readiness and consistency in grading standards.

Keywords : computer vision, deep learning, EfficientNetV2-M, Figma, Flutter, Google Cloud Platform, learning rate scheduler, mobile application, optimizer, tuna loin