IMPLEMENTATION OF THE WEIGHTED K-NEAREST NEIGHBORS (WKNN) METHOD FOR QUALITY CLASSIFICATION OF VANAME SHRIMP RAW

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ABSTRACT

Quality assessment of raw vaname shrimp (Litopenaeus vannamei) in Indonesia is still performed manually by trained panels, making it prone to inconsistency and subjectivity, especially when handling large harvest volumes. This study develops an integrated computer vision system based on a hybrid architecture to classify the quality of fresh vaname shrimp according to the visual parameters of SNI 01-2728.1-2006. The system combines three main components: a YOLOv8 segmentation model for automatic detection and isolation of shrimp objects from complex market backgrounds; OpenCV algorithms for the simultaneous extraction of three visual parameters, namely the percentage of black spots/melanosis using dark pixel contour analysis in the CIELAB color space, color degradation using the mean a chromaticity value in the CIELAB color space, and foreign object/contaminant identification using the HSV color space; and a Weighted K-Nearest Neighbors (WKNN) classifier with K=5 and the Euclidean distance metric as the final classifier that maps the visual feature vector into four SNI quality classes (Prima, Baik, Menengah, Rendah).*

The dataset consists of 2,000 vaname shrimp images collected from Probolinggo Market, with a balanced distribution of 500 samples per class. The dataset was split into training data (1,300 samples), validation data (300 samples), and testing data (400 samples). System evaluation using a confusion matrix on the test data yielded an overall accuracy of 96.0%, with a macro precision of 96.5%, macro recall of 96.0%, and macro F1-score of 96.0%. The Baik and Rendah classes achieved perfect precision, recall, and F1-score (100%). The Prima class had

100% precision and 84% recall (F1=91%), indicating that 16% of Prima samples were identified as the Menengah class. Conversely, the Menengah class achieved 100% recall but 86% precision (F1=93%), showing that all Menengah shrimp were correctly detected, but some Prima samples were mispredicted as Menengah. The system is implemented as a Flask-based web application that can run on a standard laptop with an inference time of less than 5 seconds per image, making it feasible as an objective visual pre-screening tool to support the export quality assessment process for vaname shrimp in Indonesia.

***Keywords**: weighted k-nearest neighbors, computer vision, vaname shrimp, quality classification, SNI, YOLOv8-Segmentation, CIELAB, OpenCV*