ABSTRAK

Aswin Ardiansyah, NIM 4213550023 (2025). Implementasi Algoritma K-Nearest Neighbor (KNN) Untuk Klasifikasi Mutu Telur Berdasarkan Fitur Warna dan Tekstur

Telur ayam merupakan sumber protein hewani vital bagi masyarakat Indonesia, namun proses penilaian mutunya secara manual seringkali terkendala subjektivitas dan inefisiensi, terutama dalam skala industri. Kelemahan sortir manual seperti inkonsistensi dan kelelahan dapat mempengaruhi kualitas produk akhir. Penelitian ini bertujuan mengembangkan sistem klasifikasi mutu telur ayam ras otomatis untuk mengatasi permasalahan tersebut, dengan mengimplementasikan algoritma K-Nearest Neighbor (KNN) berdasarkan fitur visual cangkang. Dataset awal yang terdiri dari 400 citra telur dibagi rata dalam empat kelas mutu: sangat bersih, bersih, sedikit kotor, kotor diperbanyak menjadi total 3200 citra (800 per kelas) menggunakan teknik augmentasi data berupa rotasi pada sudut 0°, ±15°, dan 30°, serta *flip* horizontal untuk meningkatkan keragaman data latih. Tahap pra-pemrosesan citra melibatkan segmentasi objek telur dari latar belakang menggunakan thresholding berdasarkan rentang warna pada ruang HSV, diikuti operasi morfologi untuk penyempurnaan *mask*. Fitur warna diekstraksi dengan menghitung nilai rata-rata komponen *Hue, Saturation*, dan *Value* (HSV) dari area telur. Fitur tekstur, yaitu *contrast, correlation, energy*, dan *homogeneity*, diekstraksi menggunakan metode *Gray Level Co-occurrence Matrix* (GLCM) dari citra grayscale hasil segmentasi. Fitur-fitur ini kemudian dinormalisasi menggunakan *Min-Max Scaler* sebelum digunakan dalam model KNN. Data dibagi dengan rasio 80% untuk pelatihan dan 20% untuk pengujian. Melalui validasi silang K-Fold, ditemukan bahwa nilai K=3 merupakan parameter optimal, yang mampu mencapai akurasi klasifikasi rata-rata sebesar 89% pada data uji. Sebagai implementasi praktis, algoritma yang telah dilatih diintegrasikan ke dalam sebuah *website*, memungkinkan pengguna mengunggah citra telur dan mendapatkan hasil klasifikasi mutunya secara langsung. Pengembangan sistem ini diharapkan dapat menjadi solusi alternatif untuk proses sortir telur yang lebih objektif, konsisten, dan efisien.

Kata Kunci: Telur, *K-Nearest Neighbor* (KNN), , *HSV*, *GLCM*, *Website*

ABSTRACT

Aswin Ardiansyah, NIM 4213550023 (2025). Implementation of the K-Nearest Neighbor (KNN) Algorithm for Egg Quality Classification Based on Color and Texture Features

Chicken eggs are a vital animal protein source for the Indonesian population, yet manual quality assessment is often hampered by subjectivity and inefficiency, particularly on an industrial scale. Weaknesses in manual sorting, such as inconsistency and fatigue, can affect final product quality. This research aims to develop an automatic quality classification system for chicken eggs to address these problems by implementing the K-Nearest Neighbor (KNN) algorithm based on shell visual features. An initial dataset consisting of 400 egg images, equally divided into four quality classes (very clean, clean, slightly dirty, dirty), was augmented to a total of 3200 images (800 per class) using data augmentation techniques including rotation at 0°, ±15°, and 30° angles, as well as horizontal flips to increase training data diversity. The image preprocessing stage involved segmenting the egg object from the background using thresholding based on the color range in the HSV space, followed by morphological operations for mask refinement. Color features were extracted by calculating the mean values of the Hue, Saturation, and Value (HSV) components from the egg area. Texture features, namely contrast, correlation, energy, and homogeneity, were extracted using the Gray Level Co-occurrence Matrix (GLCM) method from the segmented grayscale image. These features were then normalized using a Min-Max Scaler before being used in the KNN model. The data was split with an 80% ratio for training and 20% for testing. Through K-Fold cross-validation, it was found that K=3 was the optimal parameter, capable of achieving an average classification accuracy of 89% on the test data. As a practical implementation, the trained algorithm was integrated into a website, allowing users to upload egg images and receive direct quality classification results. The development of this system is expected to provide an alternative solution for a more objective, consistent, and efficient egg sorting process.

***Keywords**: Egg, K-Nearest Neighbor (KNN), HSV, GLCM, Website*