

INTISARI

OPTIMASI K-NEAREST NEIGHBOUR DENGAN ANT COLONY OPTIMIZATION UNTUK KLASIFIKASI AROMA BIJI KOPI ARABIKA PADA E-NOSE

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Kopi merupakan komoditas yang populer di kalangan masyarakat dunia. Sebelum menjadi minuman yang siap diseduh, kopi yang baru dipetik memerlukan proses pengeringan, pemanggangan (*roasting*), dan penggilingan. Tingkatan proses pemanggangan yang biasa digunakan berupa *green beans*, *light*, *medium* dan *dark*. Masing –masing tingkatan ini berpengaruh terhadap rasa dan aroma kopi. Padahal rasa dan aroma kopi merupakan indikator kualitas produk sehingga harus terus dijaga standarnya. Pada penelitian sebelumnya yang dilakukan Adi (2022) telah dilakukan penelitian perancangan system *electronic nose* untuk klasifikasi tingkat *roasting* biji kopi dengan nilai *k* di-*tunning* secara manual dan menunjukkan nilai akurasi rata-rata pengenalan biji kopi sesuai kelas aslinya sebesar 83.75%. Oleh karena itu diperlukan suatu metode pengolahan sinyal dan pengoptimalan pencarian nilai *k* agar nilai akurasi meningkat. Data dari empat jenis tingkatan *roasting* biji kopi arabika, yakni tingkatan *green beans*, *ligh roast*, *medium roast*, dan *dark roast* yang diambil menggunakan 10 jenis sensor gas diolah melalui proses *preprocessing*, ekstraksi ciri, filterisasi sinyal menggunakan Savitzky-Golay, dan diklasifikasi menggunakan K-Nearest Neighbor. Nilai *k* pada KNN dioptimasi menggunakan Ant Colony Optimization. Hasil penelitian menunjukkan nilai *k* paling optimal bernilai 1 dengan akurasi *train* 100% dan akurasi validasi 88.67%. Model klasifikasi KNN yang dibangun ketika diuji menggunakan *cross validation* menggunakan nilai K-Fold terbaik yakni 10 dapat mengenali data berdasarkan kelas aslinya dengan peningkatan akurasi dari penelitian awalnya sebesar 9.58%. Penelitian kali ini berhasil mendapatkan rata-rata akurasi sebesar 93.33%, rata-rata presisi sebesar 87.07% dan rata-rata recall sebesar 87.05%.

Kata kunci: Kopi, *electronic nose*, Savitzky-Golay, Ant Colony Optimization, K-Nearest Neighbor

ABSTRACT

OPTIMIZATION OF K-NEAREST NEIGHBOUR USING ANT COLONY OPTIMIZATION FOR ARABICA COFFEE AROMA CLASSIFICATION ON E-NOSE

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Coffee is a commodity that is popular among the world community. Before becoming a ready-to-brew beverage, freshly picked coffee requires drying, roasting and grinding processes. The levels of roasting processes commonly used are unroasted, light, medium and dark. Each of these levels affects the taste and aroma of coffee. Even though the taste and aroma of coffee are indicators of product quality, the standards must be maintained. Research on the design of an electronic nose system has been carried out for the classification of coffee bean roasting levels. However, the value of k is tuned manually and shows an average accuracy value of recognizing coffee beans according to the original class of 83.75%. Therefore we need a method of signal processing and optimizing the search for k values so that the accuracy value increases. Data from four types of arabica coffee bean roasting levels, namely green beans, light roast, medium roast, and dark roast levels were taken using 10 types of sensors which were processed through preprocessing, feature extraction, signal filtering using Savitzky-Golay, and classified using K. - The closest neighbor. The value of k in KNN was optimized using Ant Colony Optimization. The results showed that the most optimal k value was 1 with 100% train accuracy and 88.67% test accuracy. The KNN classification model that was built when tested using cross validation using the best K-Fold value of 10 can recognize data based on the original class with an increase in accuracy from the initial research of 9.58%. The average accuracy is 93.33%, the average precision is 87.07% and the average recall is 87.05%.

Keywords: *Coffee, electronic nose, Savitzky-Golay, Ant Colony Optimization, K-Nearest Neighbor*