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**Deteksi Kebusukan Daging Ayam Berbasis Electronic Nose Menggunakan Metode Principal Component
Analysis dan Random Forest**
Yovanti Trifa Mivea, Dr. Dyah Aruming Tyas, S.Si. ; Dr. Danang Lelono, S.Si., M.T
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INTISARI

Deteksi Kebusukan Daging Ayam Berbasis *Electronic Nose* Menggunakan Metode *Principal Component Analysis* Dan *Random Forest*

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Daging ayam merupakan sumber protein hewani yang banyak dikonsumsi di Indonesia, sehingga menjaga kualitas dan kesegarannya penting untuk keamanan pangan. Penelitian ini bertujuan merancang sistem deteksi kebusukan daging ayam menggunakan *Electronic Nose* (e-nose) berbasis sensor semikonduktor logam oksida (MOS) dan menganalisis pengaruh Principal Component Analysis (PCA) terhadap kinerja klasifikasi.

Sampel daging ayam segar dan busuk diukur menggunakan sensor MQ7, MQ8, MQ135, dan MQ136, kemudian data diproses melalui normalisasi, windowing, dan ekstraksi ciri statistik (mean, min, max, std). Klasifikasi dilakukan menggunakan algoritme *Random Forest*, baik langsung maupun setelah reduksi dimensi dengan PCA. Hasil pengujian menunjukkan akurasi model *Random Forest* tanpa PCA sebesar 97,78%, sedangkan penerapan PCA meningkatkan akurasi menjadi 100%. Evaluasi per kelas melalui confusion matrix menunjukkan seluruh kelas berhasil diklasifikasikan dengan benar, dengan recall, presisi, specificity, dan F1-score mencapai 100% pada model PCA. PCA digunakan untuk menyederhanakan dimensi data sensor, dan model *Random Forest* berhasil membedakan daging ayam segar dan busuk.

Kata kunci: *Electronic Nose, Sensor MOS, Principal Component Analysis, Random Forest*

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ABSTRACT

Detection of Chicken Meat Spoilage Using Electronic Nose Based on Principal Component Analysis and Random Forest

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Chicken meat is a widely consumed source of animal protein in Indonesia, making its quality and freshness critical for food safety. This study aims to design a spoilage detection system for chicken meat using a metal-oxide semiconductor (MOS)-based *Electronic Nose* (e-nose) and to evaluate the effect of Principal Component Analysis (PCA) on classification performance.

Fresh and spoiled chicken samples were measured using MQ7, MQ8, MQ135, and MQ136 sensors, and the data were processed through normalization, windowing, and statistical feature extraction (mean, min, max, std). Classification was performed using the *Random Forest* algorithm, both directly and after dimensionality reduction with PCA. Test results showed that *Random Forest* without PCA achieved an accuracy of 97.78%, while PCA application increased accuracy to 100%. Class-wise evaluation using the confusion matrix indicated that all classes were correctly classified, with recall, precision, specificity, and F1-score reaching 100% in the PCA model. PCA was applied to reduce the dimensionality of sensor data, and the *Random Forest* model successfully distinguished fresh and spoiled chicken meat.

Keywords: *Electronic Nose, MOS Sensor, Random Forest, Principal Component Analysis*