

ABSTRAK

Perilaku mengemudi yang melibatkan akselerasi, pengereman, dan perubahan arah secara mendadak dapat diidentifikasi berdasarkan pola pergerakan yang direkam oleh sensor *accelerometer* dan *gyroscope*. Penelitian ini bertujuan menerapkan serta membandingkan kinerja algoritma *K-Nearest Neighbor* (KNN) dan *Support Vector Machine* (SVM) dalam mengklasifikasikan perilaku mengemudi mobil berdasarkan data hasil ekstraksi fitur kedua sensor tersebut. Dataset yang digunakan merupakan *Driving Behavior Dataset* yang diperoleh dari Kaggle dan terdiri atas 1.102 data, 60 fitur numerik, serta empat kelas target, yaitu *Sudden Acceleration*, *Sudden Right Turn*, *Sudden Left Turn*, dan *Sudden Brake*. Untuk memperoleh evaluasi yang lebih representatif, dilakukan pengujian ulang dengan menggunakan 79 sampel evaluasi yang tidak saling tumpang tindih dengan tetap mempertahankan 60 fitur. Proses evaluasi dilakukan menggunakan *5-Fold Cross-Validation* dengan *StandardScaler* yang diterapkan di dalam *pipeline*. Model KNN menggunakan nilai $k = 5$, sedangkan model SVM menggunakan *kernel Radial Basis Function* (RBF). Hasil *5-Fold Cross-Validation* menunjukkan bahwa KNN memperoleh rata-rata akurasi sebesar 89,92% dengan standar deviasi 4,94%, sedangkan SVM memperoleh rata-rata akurasi sebesar 92,50% dengan standar deviasi 6,12%. Berdasarkan prediksi *out-of-fold*, KNN memperoleh akurasi sebesar 89,87%, *macro precision* 91,81%, *macro recall* 90,31%, dan *macro F1-score* 90,08%. Sementara itu, SVM memperoleh akurasi sebesar 92,41%, *macro precision* 93,06%, *macro recall* 93,05%, dan *macro F1-score* 92,86%. Hasil tersebut menunjukkan bahwa SVM memiliki kinerja klasifikasi yang lebih tinggi dibandingkan KNN pada skema evaluasi yang digunakan. Model KNN dan SVM selanjutnya diimplementasikan ke dalam aplikasi web berbasis Flask yang memungkinkan pengguna mengunggah berkas CSV berisi 60 fitur hasil ekstraksi sensor, memilih model klasifikasi, dan memperoleh hasil prediksi perilaku mengemudi secara otomatis.

Kata kunci: perilaku mengemudi, sensor *accelerometer* dan *gyroscope*, *K-Nearest Neighbor*, *Support Vector Machine*, Flask.

ABSTRACT

Driving behaviors involving sudden acceleration, braking, and directional changes can be identified based on movement patterns recorded by accelerometer and gyroscope sensors. This study aims to implement and compare the performance of the K-Nearest Neighbor (KNN) and Support Vector Machine (SVM) algorithms in classifying car driving behavior based on features extracted from both sensors. The dataset used in this study is the Driving Behavior Dataset obtained from Kaggle, consisting of 1,102 instances, 60 numerical features, and four target classes, namely Sudden Acceleration, Sudden Right Turn, Sudden Left Turn, and Sudden Brake. To obtain a more representative evaluation, the models were re-evaluated using 79 non-overlapping evaluation samples while retaining all 60 features. The evaluation process was conducted using 5-Fold Cross-Validation, with StandardScaler incorporated into the model pipeline. The KNN model used $k = 5$, while the SVM model employed the Radial Basis Function (RBF) kernel. The 5-Fold Cross-Validation results showed that KNN achieved a mean accuracy of 89.92% with a standard deviation of 4.94%, whereas SVM achieved a mean accuracy of 92.50% with a standard deviation of 6.12%. Based on out-of-fold predictions, KNN achieved an accuracy of 89.87%, a macro precision of 91.81%, a macro recall of 90.31%, and a macro F1-score of 90.08%. Meanwhile, SVM achieved an accuracy of 92.41%, a macro precision of 93.06%, a macro recall of 93.05%, and a macro F1-score of 92.86%. These results indicate that SVM provides higher classification performance than KNN under the evaluation scheme used in this study. The KNN and SVM models were subsequently implemented in a Flask-based web application that allows users to upload CSV files containing 60 extracted sensor features, select a classification model, and automatically obtain driving behavior prediction results.

Keywords: driving behavior, accelerometer and gyroscope sensors, K-Nearest Neighbor, Support Vector Machine, Flask.