

## ABSTRAK

Penelitian ini bertujuan untuk mengembangkan dan menerapkan metode klasifikasi anggur merah menggunakan algoritma *Support Vector Machine (SVM)* berdasarkan atribut yang terdapat dalam *dataset*. *Dataset* yang digunakan terdiri dari atribut-atribut numerik yaitu *fixed acidity*, *volatile acidity*, *citric acid*, *residual sugar*, *chlorides*, *free sulfur dioxide*, *total sulfur dioxide*, *density*, *pH*, *sulphates*, *alcohol*, dan *quality*. Dengan *kernel Radial Basis Function (RBF)* dan parameter  $C=100$ . Penelitian ini juga melibatkan dua langkah penting dalam *preprocessing*, yaitu *Min-Max Scaler* untuk normalisasi fitur-fitur dan teknik pemrosesan *SMOTE ENN (Synthetic Minority Over-sampling Technique with Edited Nearest Neighbors)* untuk menyeimbangkan *dataset* yang tidak seimbang. Evaluasi performa model dilakukan menggunakan *K-Fold Cross Validation* dengan  $K=10$ . Data kualitas anggur merah yang memiliki ketidakseimbangan kualitas dianalisis dalam penelitian ini. Hasil penelitian menunjukkan bahwa penggunaan *SMOTE ENN* dalam kombinasi dengan *SVM RBF* dan *Min-Max Scaler* berhasil meningkatkan akurasi klasifikasi. Dari hasil penelitian ini, hasil akhir yang di dapat adalah, Akurasi Optimal model ini diperoleh sebesar 94,5%, *precision* untuk setiap kelas sebagai berikut, untuk Kelas 3 = 100%, Kelas 4 = 100%, Kelas 5 = 100%, Kelas 6 = 80%, Kelas 7 = 100%, Kelas 8 = 98%. *Recall* (sensitivitas) sebesar 100% untuk Kelas 3, Kelas 4 = 94%, Kelas 5 = 62%, Kelas 6 = 80%, Kelas 7 = 99%, dan Kelas 8 = 100%.

**Kata Kunci** = Klasifikasi, Support Vector Machine, Kernel, K-Fold, *Accuracy*, *Precision*, *Recall*.

**ABSTRACT**

*This research aims to develop and implement a red wine classification method using the Support Vector Machine (SVM) algorithm based on the attributes contained in the dataset. The dataset used consists of numerical attributes namely fixed acidity, volatile acidity, citric acid, residual sugar, chlorides, free sulfur dioxide, total sulfur dioxide, density, pH, sulphates, alcohol, and quality. With Radial Basis Function (RBF) kernel and parameter  $C=100$ . This research also involves two important steps in preprocessing, namely Min-Max Scaler for normalization of features and SMOTE ENN (Synthetic Minority Over-sampling Technique with Edited Nearest Neighbors) processing technique for balancing unbalanced datasets. Model performance evaluation is performed using K-Fold Cross Validation with  $K=10$ . Red wine quality data that has quality imbalance is analyzed in this study. The results showed that the use of SMOTE ENN in combination with SVM RBF and Min-Max Scaler successfully improved the classification accuracy. From the results of this study, the final results obtained are, Optimal Accuracy of this model is obtained at 94.5%, precision for each class as follows, for Class 3 = 100%, Class 4 = 100%, Class 5 = 100%, Class 6 = 80%, Class 7 = 100%, Class 8 = 98%. Recall (sensitivity) is 100% for Class 3, Class 4 = 94%, Class 5 = 62%, Class 6 = 80%, Class 7 = 99%, and Class 8 = 100%.*

**Keywords** = Classification, Support Vector Machine, Kernel, K-Fold, Accuracy, Precision, Recall.