



Figure 13: Performance of different classifiers in the time-domain defense.

use designed inverse filters to compensate the speaker amplitude response, mitigating the decay of frequency components.

D CLASSIFIERS IN TIME-DOMAIN DEFENSE

In the time-domain defense, the local extreme ratio (LER) is a robust feature that can describe the ringing artifacts in modulated replay audios. Therefore, the classifier selection has little impact on the defense performance. To verify this hypothesis, we conduct experiments to evaluate the effects of different classifiers on the feature classification.

We classify the LER features using five common classifiers, including Support Vector Machine (SVM), Decision Tree (DT), Naive Bayes (NB), Gaussian Mixture Model (GMM), and K-Star. The 10-fold cross-validation accuracy is used as the evaluation standard. The performance of different classifiers is shown in Figure 13. We can see that SVM, Decision Tree, and KStar achieve better performance than other classifiers. Gaussian Mixture Model obtains the worst accuracy since the data distribution of LER features does not subject to the normal distribution. Above all, we choose the SVM model in our system due to its easy deployment and high performance.