

## **ABSTRACT**

### **IMPACT OF MULTIPLE USE OF EARLY STOPPING AND DROPOUT IN IMAGE DETECTION MODEL BASED ON KERAS AND TENSORFLOW**

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Overfitting happens when the model fits the training data too well whilst Underfitting happens when the model is too simple or complex to understand the corresponding features of the data used. In this research, the machine learning model may undergo Overfitting, which then be solved by Dropout and/or Early Stopping method. The model used 3 different datasets naming Flowers, CIFAR-10, and MNIST. Then, the methods above are combined in hope of achieving better results.

When trained using dropout, MNIST dataset achieved 97,95% and when early stopping is applied, it achieved 98,02% accuracy on the validation sets. The accuracy drops a little when dropout and early stopping are applied. It achieves 97,98% accuracy on validation. CIFAR-10 dataset achieved 72.25% accuracy on the validation data when using dropout. Compared to the initial basic training, there are still a slight differences between them, suggesting that the model may still be overfitting slightly. When trained using early stopping, it achieves accuracy of 78.85% on the training data and 69.96% on the validation data. Although it improves the accuracy, the accuracy on the validation data plateaus after a few epochs, indicating that the model may have reached its optimal performance. When early stopping and dropout is used, it achieves a final accuracy of approximately 97.97%. Interestingly, in the flower dataset when both dropout and early stopping combined, the model's performance slightly decreased compared to using early stopping alone. The model achieved a validation accuracy of 0.6294 and a validation loss of 0.9380 while with early stopping alone achieves validation accuracy of 0.6526 and a validation loss of 0.9194. This indicates that adding dropout regularization in addition to early stopping did not provide significant benefits in this particular case. Adding dropout regularization alone showed improvements but combining it with early stopping did not provide additional benefits.

**Keywords:** Machine Learning, Overfitting, Dropout, Early Stopping