

# Hyperparameter optimization of multi-layers deep ResNet models based on random search optimization

Abbas Jafar<sup>1</sup>, Myungho Lee<sup>2</sup>

<sup>1</sup> *Department of Computer Engineering, Myongji University, Republic of Korea*

<sup>2</sup> *Department of Computer Engineering, Myongji University, Republic of Korea*

Corresponding author (Electronic mail: myunghol@mju.ac.kr)

The hyperparameters in deep neural networks (DNNs) have significant control over the behavior of the networks and directly affect the performance of the models. For better performance, there is a need for optimization of hyperparameters. Efficient optimization algorithms are used to optimize the hyperparameters of models. This optimal set of hyperparameters is implemented in DNNs as convolutional neural network(CNN) and improves the efficiency of the model. In this paper, multi-layers-based deep ResNet models are optimized by random search to obtain the optimal combinations of hyperparameters that improves performance. CIFAR-10 dataset is investigated for the hyperparameter tuning of the ResNet models, and results are compared with the manual optimization approach. For the classification, hyperparameters optimization using the random search algorithm improved the error rate with training time. We obtained the 5.05% error rate of the deep ResNet-164, and it took 3 hours to train the model on NVIDIA Tesla P100 GPU.

**Acknowledgments** This work was supported by the Supercomputer Development Leading Program of the National Research Foundation of Korea (NRF) funded by the Korean government (MSIT) (No. 2020M3H6A1084853).

## References

- [1] K. He *et al.*, “Deep Residual learning for Image Recognition,” in CVPR (2015).
- [2] J. Abbas *et al.*, “High-speed hyperparameter optimization for deep ResNet models in image recognition,” in *Cluster Computing, Springer*, (2021).
- [3] J. Bergstra *et al.*, “Random search for Hyper-Parameter Optimization,” *journal of machine learning research*, 3 (2012).
- [4] J. Abbas *et al.*, “Hyperparameter optimization for Deep Residual Learning for Image Classification,” *IEEE International Conference on Autonomic Computing and Self-Organizing System Companion (ACSOS-C)*, (2020).