

## African Center of Excellence in Internet of Things

### Virtual Research Seminar

**Title: An Instance-based Deep Transfer Learning Approach for Resource Constrained Environments**

**Date : 3<sup>rd</sup> June 2022**

**Time: 10:00 am – 11:00 am**



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**Abstract:** Although Deep Learning (DL) is revolutionising practices across fields, it requires a large amount of data and computing resources, requires considerable training time, and is thus expensive. This study proposes a transfer learning approach by adopting a simplified version of a standard Convolution Neural Network (CNN), which is successful in another domain. We explored three transfer learning approaches: freezing all layers except the first and the last layer of the CNN model, which we had modified, freezing the first layer, updating the weights of the rest of the layers, and fine-tuning the entire network. Furthermore, we trained a DL model from scratch to act as a baseline. We performed the experiments on the Edge Impulse platform. We evaluated the models based on plant-village, tea diseases and land use datasets. Fine-tuning the whole network produced the best precision, accuracy, recall, f measure and sensitivity across the datasets. All three transfer learning schemes significantly reduced the training by more than half. Further, we deployed the finetuned model in the detection of diseases in tea two months after the conception of the idea, and it showed a good correlation with the experts' decisions. The evaluation results showed that it is viable to perform transfer learning among domains to accelerate solutions deployments. Additionally, Edge Impulse is ideal in resource constrained environments, especially in developing countries lacking computing resources and expertise to train DL models from scratch. This insight can potentially propel the development and rollout of various applications addressing the Sustainable Development Goals targeted at zero hunger and no poverty, among other goals.