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An Evaluation of Neural Network Efficacies for Image Recognition on Edge-AI Computer Vision Platform

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Abstract : Image recognition, as one of the most critical technologies in computer vision, works to help machine-like robotics understand a scene, that is, if deployed appropriately, will trigger the revolution in remote sensing and industry automation. With the developments of AI technologies, there are many prevailing and sophisticated neural networks as technologies developed for image recognition. However, computer vision platforms as hardware, supporting neural networks for image recognition, as crucial as the neural network technologies, need to be more congruently addressed as the research subjects. In contrast, different computer vision platforms are deterministic to leverage the performance of different neural networks for recognition. In this paper, three different computer vision platforms – Jetson Nano(with 4GB), a standalone laptop(with RTX 3000s, using CUDA), and Google Colab (web-based, using GPU) are explored and four prominent neural network architectures (including AlexNet, VGG(16/19), GoogleNet, and ResNet(18/34/50)), are investigated. In the context of pairwise usage between different computer vision platforms and distinctive neural networks, with the merits of recognition accuracy and time efficiency, the performances are evaluated. In the case study using public imageNets, our findings provide a nuanced perspective on optimizing image recognition tasks across Edge-AI platforms, offering guidance on selecting appropriate neural network structures to maximize performance under hardware constraints.

Keywords : alexNet, VGG, googleNet, resNet, Jetson nano, CUDA, COCO-NET, cifar10, imageNet large scale visual recognition challenge (ILSVRC), google colab
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