Master Thesis Defense Mohandass Muthuraja

Date: Monday, 23.03.2020
Time: 10:00 am
Room: Online via Zoom.

Title: Black-Box Optimization of Object Detector Hyper-Parameters.

Abstract:

Object detectors have improved considerably in the last years by using advanced Convolutional Neural Networks (CNNs) architectures. However, many detector hyper-parameters are not generally tuned, and they are used with values set by the detector authors.

Blackbox optimization methods have gained more attention in recent years because of its ability to optimize the hyper-parameters of various machine learning algorithms and deep learning models. However, these methods are not explored in improving CNN-based object detector's hyper-parameters.

In this research work, we propose the use of blackbox optimization methods such as Gaussian Process based Bayesian Optimization (BOGP), Sequential Model-based Algorithm Configuration (SMAC), and Covariance Matrix Adaptation Evolution Strategy (CMA-ES) to tune the hyper-parameters in Faster R-CNN and Single Shot MultiBox Detector (SSD).

In Faster R-CNN, tuning the input image size, prior box anchor scales and ratios using BOGP, SMAC, and CMA-ES has increased the performance around 1.5% in terms of Mean Average Precision (mAP) on PASCAL VOC. Tuning the anchor scales of SSD has increased the mAP by 3% on PASCAL VOC and marine debris datasets. On the COCO dataset with SSD, mAP improvement is observed in the medium and large objects, but mAP decreases by 1% in small objects. The experimental results show that the blackbox optimization methods have proved to increase the mAP performance by optimizing the object detectors. Moreover, it has achieved better results than the hand-tuned configurations in most of the cases. Furthermore, regression analysis is also performed to find the significant hyper-parameters to tune.