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AutoMID : A Novel Framework for Automated Computer Aided Diagnosis of Medical Images

A Dissertation by

Mr. Ayeshmantha Wijegunathileke

Supervised by

Mr. Achala Aponso

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Abstract

As a subset of Artificial Intelligence, or AI, Machine Learning allows computers to replicate specific human behaviours without explicit programming. In basic words, machine learning is the process of algorithms learning from a given data sample and then using what they've learnt to make educated recommendations. This study aims to bridge the gap between medical image diagnosis and machine learning by automating the manual process of training a model.

To solve the afore mentioned problem, the author applied neural architecture search and hyperparameter optimization to a pretrained model from the mxnet model zoo and adopted the pretrained model for the medical image dataset. The neural architecture search algorithm used is provided by the AutoGluon framework and it uses a categorical approach to selecting the best neural architecture for the given dataset. To make the process of hyperparameter tuning quick and efficient, two hyperparameters were manually specified which were the batch size and the learning rate. The system would then train each of the neural architectures while optimizing the hyperparameters and then select the model that produced the best accuracy. This model would then be saved and can be used by the clinician or radiologist to produce a diagnosis. To demonstrate the use of this application in a practical scenario, an application with a GUI has been developed.

Compared to the existing non-automated computer aided diagnosis systems, this system provides better performance by being able to train models on the CPU while keeping the training times low. Furthermore, the models produced by the system had high accuracies (above 80%). Hence, we can conclude that this system can bridge the gap between medical image diagnosis and machine learning by automating the manual process of creating a machine learning model.

Keywords : AutoML, Hyperparameter Tuning, Neural Architecture Search, Healthcare

Subject Descriptors : Applied computing, Life and medical sciences, Health care information systems