



Weekly Report

Comparative Analysis of Image Classification Models for Efficient and Accurate Classification across Diverse Image Types

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Short info about Research

The fundamental objective of this **quantitative** research is to identify the best image classification models in terms of both time efficiency and accuracy, under different image scenarios such as rotated images, flipped images, images of low quality and so on. Several widely recognized models, including LeNet-5, AlexNet, VGGNet, ResNet, MobileNet, EfficientNet will be considered for this analysis. **Qualitative** analysis has been made to pick those models since they are considered by experts to be the best.

The dataset chosen for this experiment will be a blend of standard image datasets such as CIFAR-10, ImageNet and custom datasets that incorporate the required image conditions. Data preprocessing will be carried out to facilitate the suitable conditions for each model, involving rotating, flipping, and reducing image quality. For flipping and rotating images with high resolution will be used.

To achieve an in-depth and unbiased analysis, the study will take into account several performance metrics. Classification accuracy will primarily measure the model's performance. Simultaneously, precision, recall, and F1-Score will also be considered to provide a good understanding of the model's performance. Moreover, the time taken for training and prediction will be recorded to measure the model's efficiency. Additionally, the model's size in terms of parameters will also be observed.

Week 1

Have been done:

During this week, significant progress has been made on the project. The following tasks has been completed:

1. Created AlexNet model in PyTorch: A PyTorch implementation of the AlexNet model has been developed. This model will serve as one of the models to be evaluated for image classification.
2. Testing on random data: The AlexNet model was tested on a subset of the CIFAR-10 dataset (1% of data) to ensure its functionality and assess its initial performance.
3. Setting up environment in ADA CEDAR computer: To leverage increased computational power, the project environment was configured on the ADA CEDAR computer for further development.
4. Data **cleansing** and **preprocessing**: Data cleansing and preprocessing steps were initiated. The focus was on preparing the image dataset, primarily sourced from ImageNet. The code for rotating and flipping the images was developed, enabling the creation of suitable conditions for the models' evaluation.

To do list:

Based on the progress made, the following tasks are planned for the upcoming week:

1. Downloading ImageNet datasets and further **cleansing**: The ImageNet dataset will be downloaded, and images of the high resolution will be selected for further usage in the project. These images will undergo rotation and flipping processes to simulate different image scenarios.

2. Create EfficientNet model: An EfficientNet model will be implemented using PyTorch, and then together with AlexNet model will be trained and tested on the preprocessed ImageNet and CIFAR 10 datasets.
3. Evaluate EfficientNet and AlexNet model: After the EfficientNet and Alexnet models are trained, it will be evaluated using various performance metrics such as classification accuracy, precision, recall, F1-Score, training and prediction time, and model size. This evaluation will provide insights into the model's effectiveness in comparison to other models considered in the project.