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

Initially the goal of the project was comparing different models on transformed images, however, after it was understood that the topic of project should be narrowed down to meed deadlines. Now 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, occluded images and noisy images. Several widely recognized models, including AlexNet, VGGNet, ResNet, EfficientNet are about to be considered for this analysis. **Qualitative** analysis has been made to pick those models since they are considered by experts to be the best.

Choosing an appropriate data set is one of the most important parts in projects involving machine learning. Initially traditional datasets such as Cifar-10 and ImageNet should be picked since they can be easily accessed. But then it was understood that some of models that will be tested might be pretrained on those datasets, which will definitely affect the results of experiments. Hence the vegetable dataset from Kaggle was found out and picked as main dataset for this particular project. In this dataset there are 21000 images from 15 classes, where each class contains a total of 1400 images. This dataset is split into three parts, where 70% for training and 15% for testing, and the rest 15% for validation. Although in Kaggle it was said that each class has an equal proportion and image resolution is 224×224 and in *.jpg format, it was detected that there are 9 images with different shapes:

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 from train dataset:
1 0741.jpgwith shape(210, 224, 3)
2 0176.jpgwith shape(198, 224, 3)
3 0126.jpgwith shape(211, 224, 3)
4 0609.jpgwith shape(200, 224, 3)
5 0430.jpgwith shape(193, 224, 3)
6 0526.jpgwith shape(205, 224, 3)

 from validation dataset:
7 1138.jpgwith shape(187, 224, 3)
8 1150.jpgwith shape(223, 224, 3)

 from test dataset:
9 1246.jpgwith shape(207, 224, 3)
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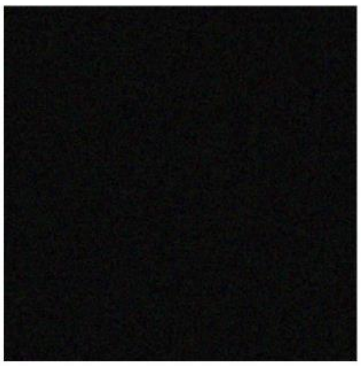
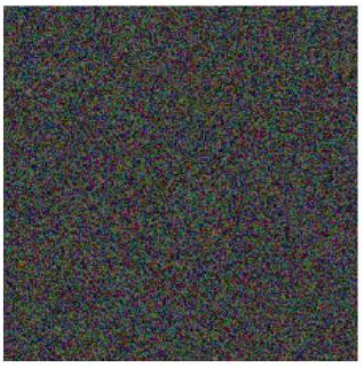
Considering that all images will be resized before training and testing it was decided that this anomaly is insignificant. Furthermore, images were mixed with noise. For that Gaussian noise was opted to be used in 10, 30, 50, 70 and 100% percentages. The picture below shows the difference between different percentages of noise:

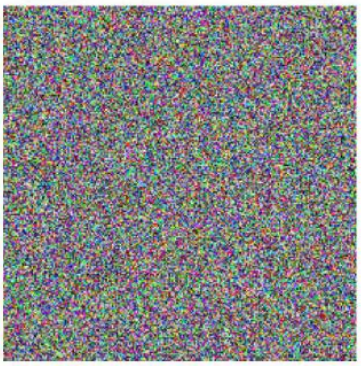
10%



50%



100%

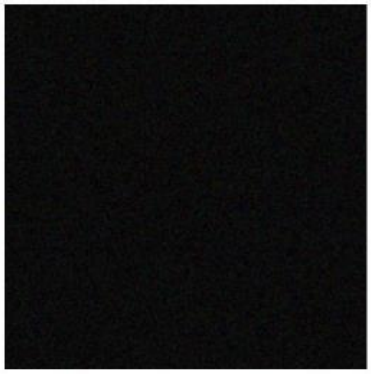


Next pictures will show how the image is corrupted after applying different noise levels:

10%

Original

Gaussian Noise

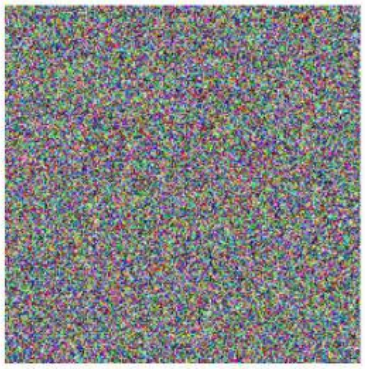


Combined

100%

Original

Gaussian Noise



Combined

Currently, all the efforts are spent on working with noisy images, so the topic of research might be even narrowed down further to “Comparative Analysis of Image Classification Models for Efficient and Accurate Classification across ***Vegetable Noisy*** Images”.

To achieve an in-depth and unbiased analysis, the study considered 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 time efficiency. Additionally, the model's size in terms of parameters will also be observed. So, our final table with results will include Accuracy, Precision, Recall, F1-Score, Time, and number of parameters of each classification models.

At this point the first problem has already been faced. While the accuracies of models tested on images without noise were gotten to be around 100%, the accuracies of models tested on noisy images were not above 15%. Currently, the main reasons behind such phenomenon are being studied. Moreover, I am also considering studying and testing several denoising techniques and then getting accuracy of the models on denoised images. In this case I will come up with a result in which the most powerful combination of denoised techniques and classification models will be chosen.