DOCUMENTATION ON QUALITY WEEK – ML/DL CONTEST ON IMAGE CLASSIFICATION

Team name: Team Name

Team members: Jaskaran Singh Walia (21BCE1089) Jesher Joshua (21BAI1925)

Introduction:

The ML/DL image classification competition was a challenge to identify four classes of eye diseases from the dataset provided - cataract, diabetic_retinopathy, glaucoma, and normal. The aim of the competition was to develop a deep learning model that could accurately classify the images and achieve high accuracy.

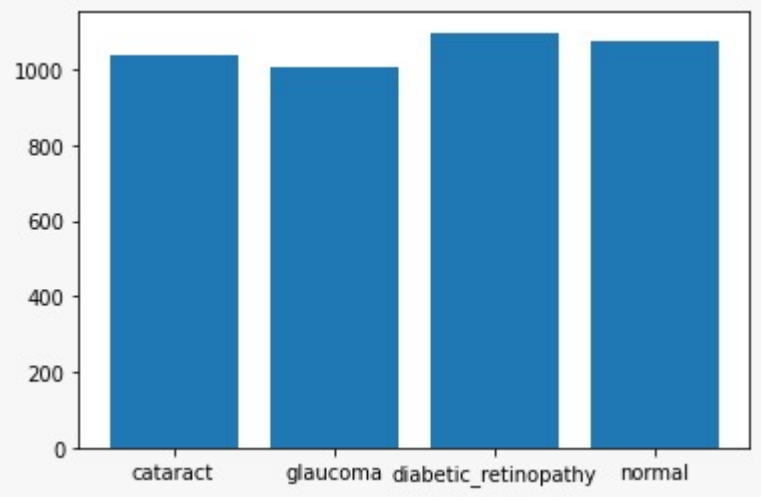


Fig 1. Dataset's class representation

Methodology:

We implemented deep learning methodologies to tabulate the results, and several models were tried before selecting the final one. The models tested were VGG19, MobileNet, GoogLeNet, Alexnet, and ElasticNet. The final model selected was Resnet50, which was fine-tuned and optimized for the dataset. The model was trained with the SGD loss function after trying out the Adam and LazyAdam optimizers.

Other hyperparameters used after extensive re-iteration and testing were

Batch size 64

Img size 32x32

Epochs 11

Optimizer SGD

Weights = imagenet (gave the best results)

Model Performance:

The Resnet50 model was fine-tuned and achieved an accuracy of 95% on the train dataset and 92% on the test dataset. This was achieved after hyperparameter tuning, including learning rate adjustments and batch size adjustments. The model was trained for a total of 11 epochs.

Model	Final Score
VGG19	82%
MobileNet	68%
GoogLeNet	73%
Alexnet	62%
ElasticNet	84%
Resnet50	92%

Results obtained by other transfer learning models.

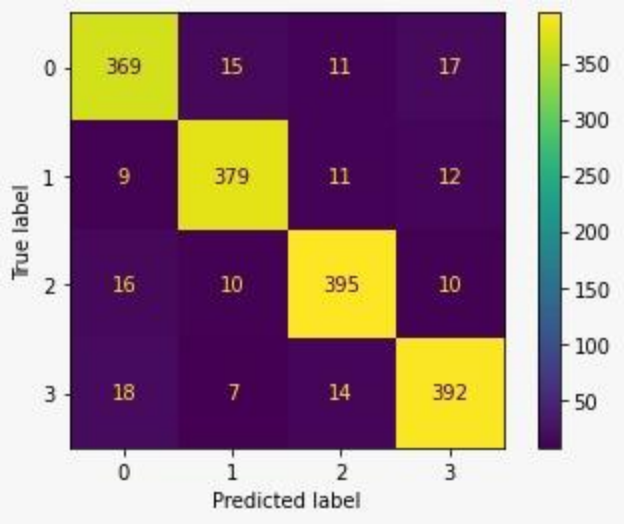
Evaluation metrics:

Total Train-Test split was 60% - 40% which concluded the images to be

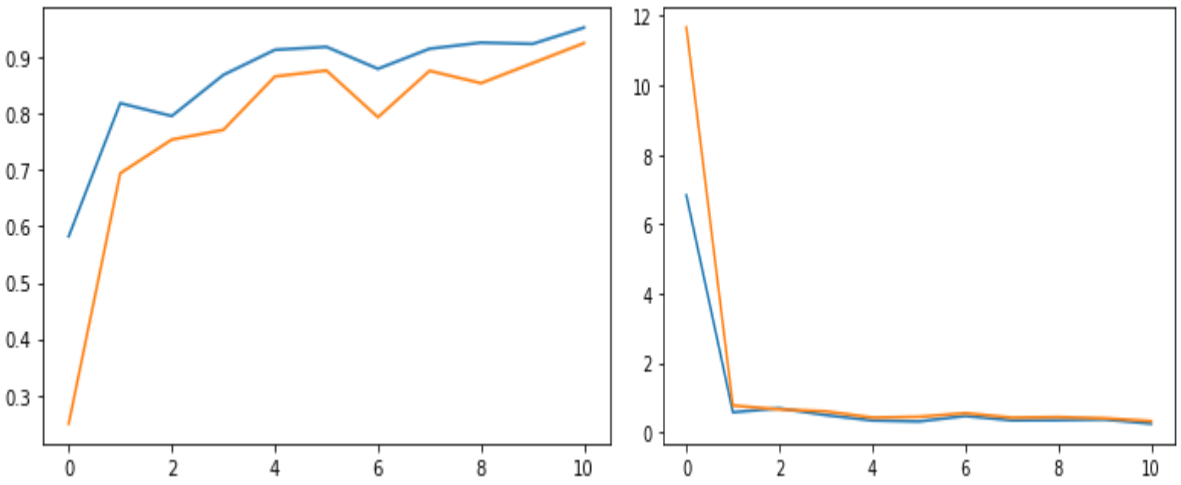
Train = 2532

Test = 1685

Confusion Matrix:



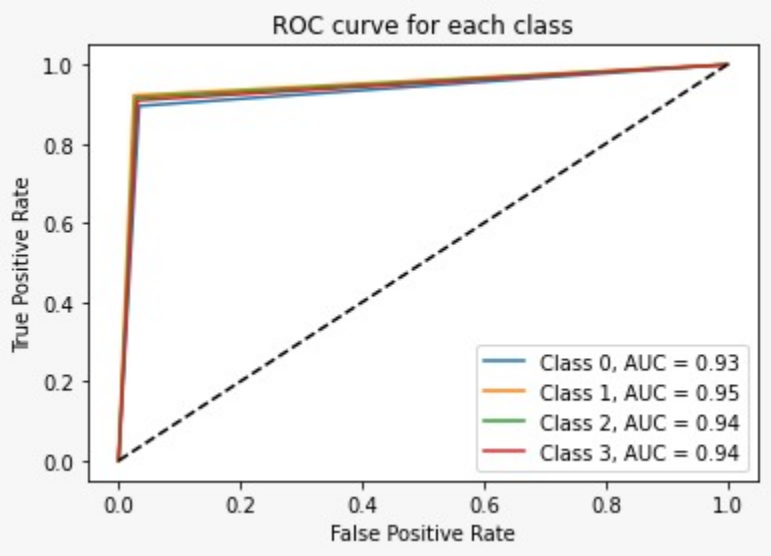
Accuracy & Loss:



Precision, Recall, F1-Score, Support:

	precision	recall	f1-score	support
0	0.90	0.90	0.90	412
1	0.92	0.92	0.92	411
2	0.92	0.92	0.92	431
3	0.91	0.91	0.91	431
accuracy			0.91	1685
macro avg	0.91	0.91	0.91	1685
weighted avg	0.91	0.91	0.91	1685

ROC Curve:



Sensitivity:

```
    conf_mat = confusion_matrix(y_true, ypredf)

    # calculate sensitivity and specificity for each class
    for i in range(conf_mat.shape[0]):
        tp = conf_mat[i, i]
        fn = sum(conf_mat[i, :]) - tp
        fp = sum(conf_mat[:, i]) - tp
        tn = sum(sum(conf_mat)) - tp - fp - fn
        sensitivity = tp / (tp + fn)
        specificity = tn / (tn + fp)
        print(f"Class {i}: Sensitivity = {sensitivity:.2f}, Specificity = {specificity:.2f}")
```

40] ✓ 0.0s MagicPython

```
Class 0: Sensitivity = 0.90, Specificity = 0.97
Class 1: Sensitivity = 0.92, Specificity = 0.97
Class 2: Sensitivity = 0.92, Specificity = 0.97
Class 3: Sensitivity = 0.91, Specificity = 0.97
```

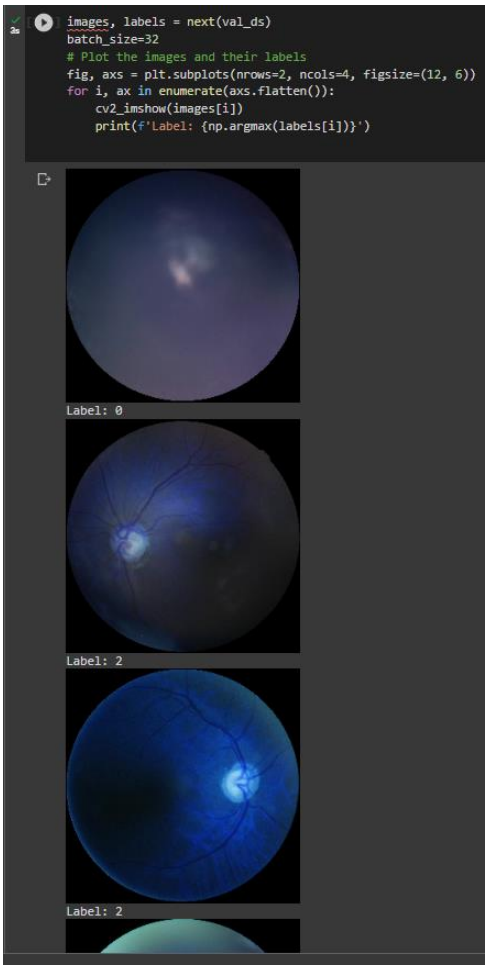
Kappa score:

```
    print(f'The Kappa Score is :{metrics.cohen_kappa_score(y_true,ypredf)}')
```

8] ✓ 0.0s

```
The Kappa Score is :0.8812844110814367
```

Visualizing results:



Conclusion:

The ML/DL image classification competition was a challenging task that required us to develop deep learning models capable of accurately classifying eye diseases. The Resnet50 model proved to be the most effective, achieving a high accuracy of 95% on the train dataset and 92% on the test dataset after performing hyperparameter tuning. The competition demonstrated the power of deep learning methodologies and the importance of fine-tuning and optimizing models to achieve the best results all of which are mentioned above.