MV Project Report

Diabetic Retinopathy Detection

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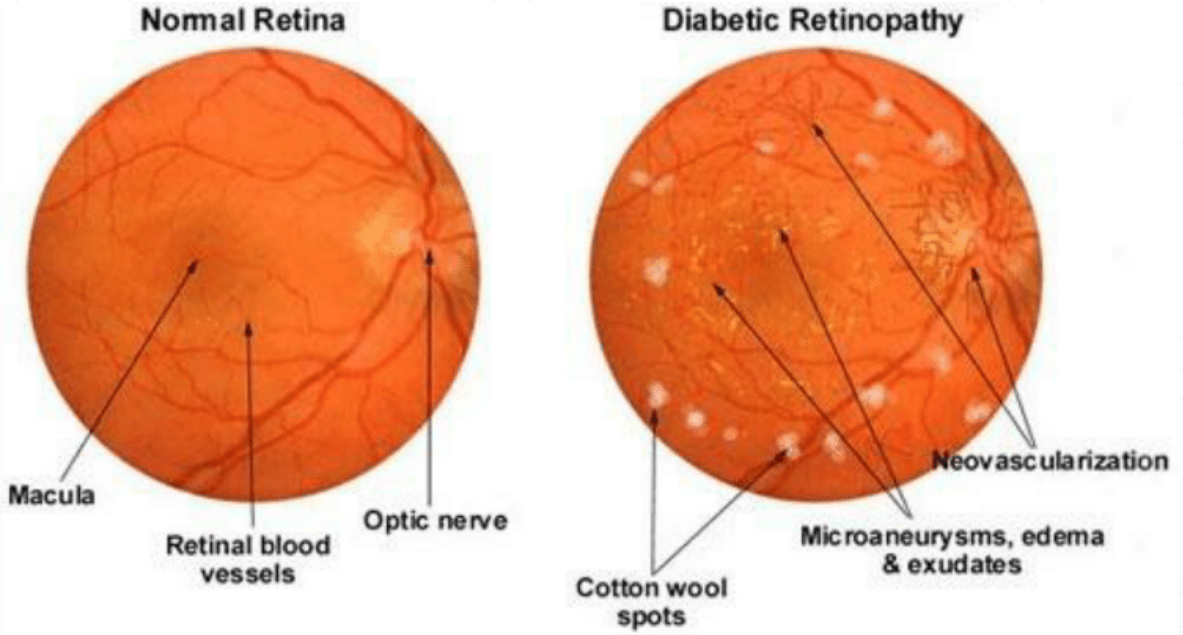
Introduction

- Diabetic Retinopathy (DR) is an eye disease associated with diabetes
- Detection and grading DR at an early stage would help in preventing permanent vision
- we implement a simple transfer-learning based approach using a deep Convolutional Neural Network (CNN) to **detect DR**.



What is accomplished and what is not

- Accomplished
  - Detection successfully completed with average accuracy of 98%
  - article results : 98.4%

- Not Accomplished
  - Detection has been done based on just one approach however in referenced article a hybrid approach was proposed (Reason : training time increased drastically)
  - Didn’t manage to implement grading analysis for DR (Reason : first issue)

Learning Steps : 1- Data Set

- The Kaggle blindness detection challenge dataset (APTOS 2019 Dataset) contains separate training and testing cases

- In this research, we solely utilize the training dataset to study and estimate the performance

- These images were captured at the Aravind Eye Hospital, India. The training dataset contains 3662 images marked into different categories (Normal, Mild DR, Moderate DR, Severe DR, and Proliferative DR) by expert clinicians

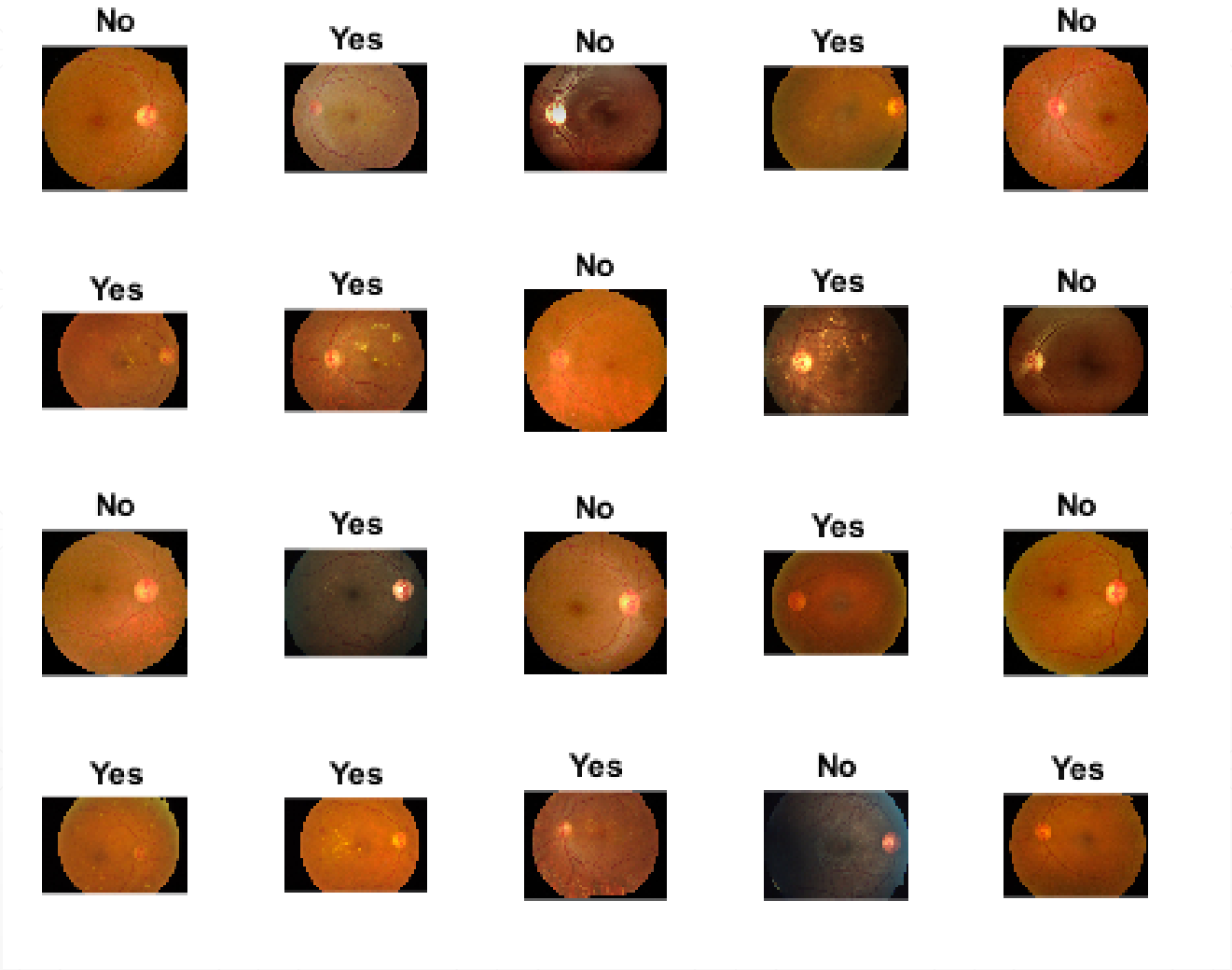
Learning Steps : 2- Preprocessing and Loading Database

```
% Image Datastore
imds=imageDatastore(two_class_datapath, ...
    'IncludeSubfolders',true, ...
    'LabelSource','foldernames',"FileExtensions",".png");
```

total_split = 2×2 table

	Label	Count
1	No	1805
2	Yes	1857

Learning Steps : 2- Visualize the Images



Learning Steps : 3- Training, Testing and Validation

- we are splitting the dataset into groups of 80% (training & validation) and 20% (testing). Make sure to split equal quantity of each class.

	Yes	No
Training Set:	1337	1300
Validation Set:	144	149
Test Set:	361	371

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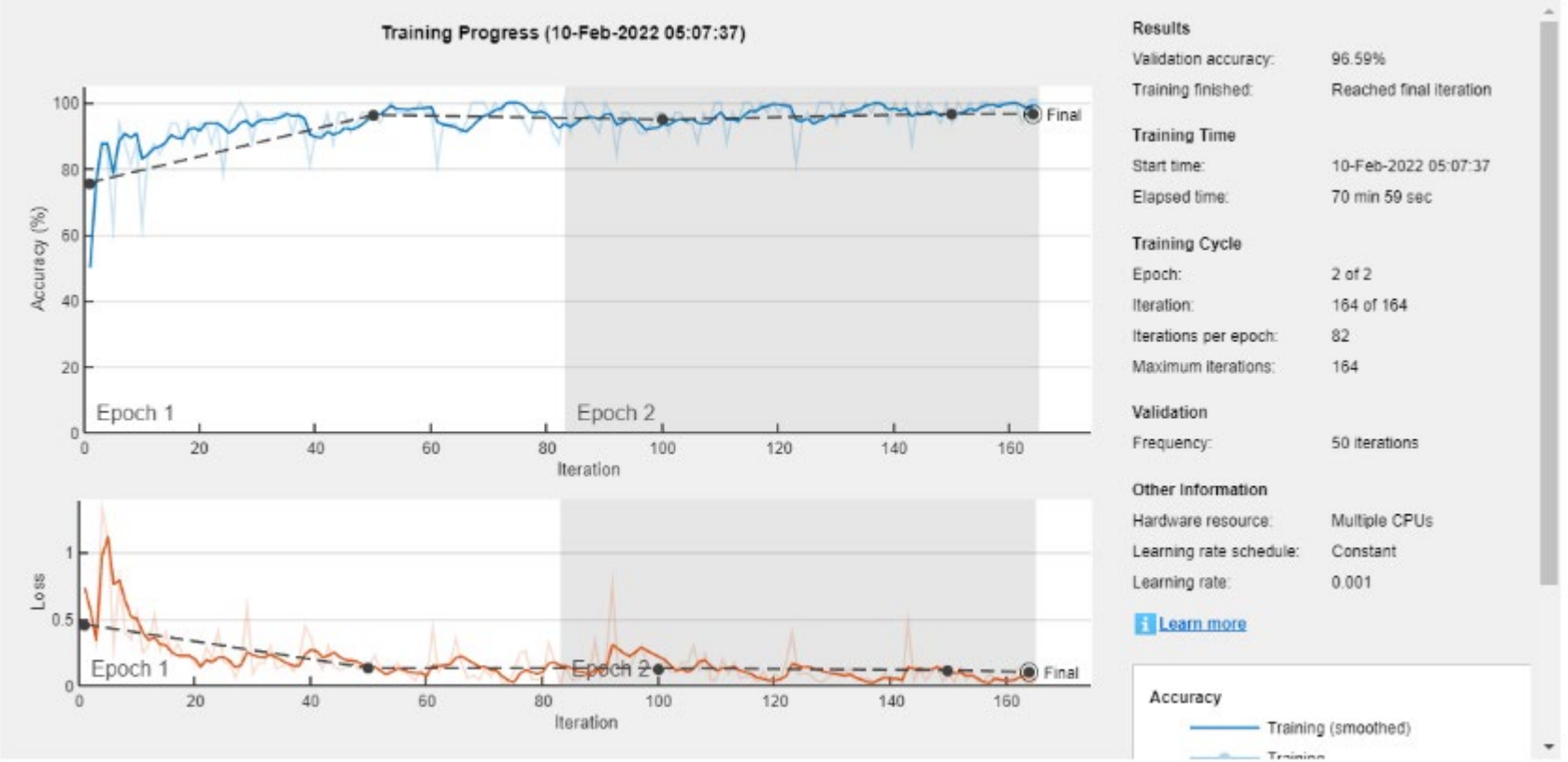
Learning Steps : 4- Deep Learning Approach

- CNN With Inception-v3 architecture utilized for classification. other classification state in article is: AlexNet, ResNet ,VGG16
- Inception-v3 architecture is a pretrained neural network , so we used transfer learning approach to boost our learning time
- Transfer learning has been done by changing two layers of original network

Network	Raw images
AlexNet	96.15 ± 1.7
VGG16	96.23 ± 1.6
ResNet	96.7 ± 1.7
Inception-v3	96.6 ± 1.7
Average-of-all	96.9 ± 1.7

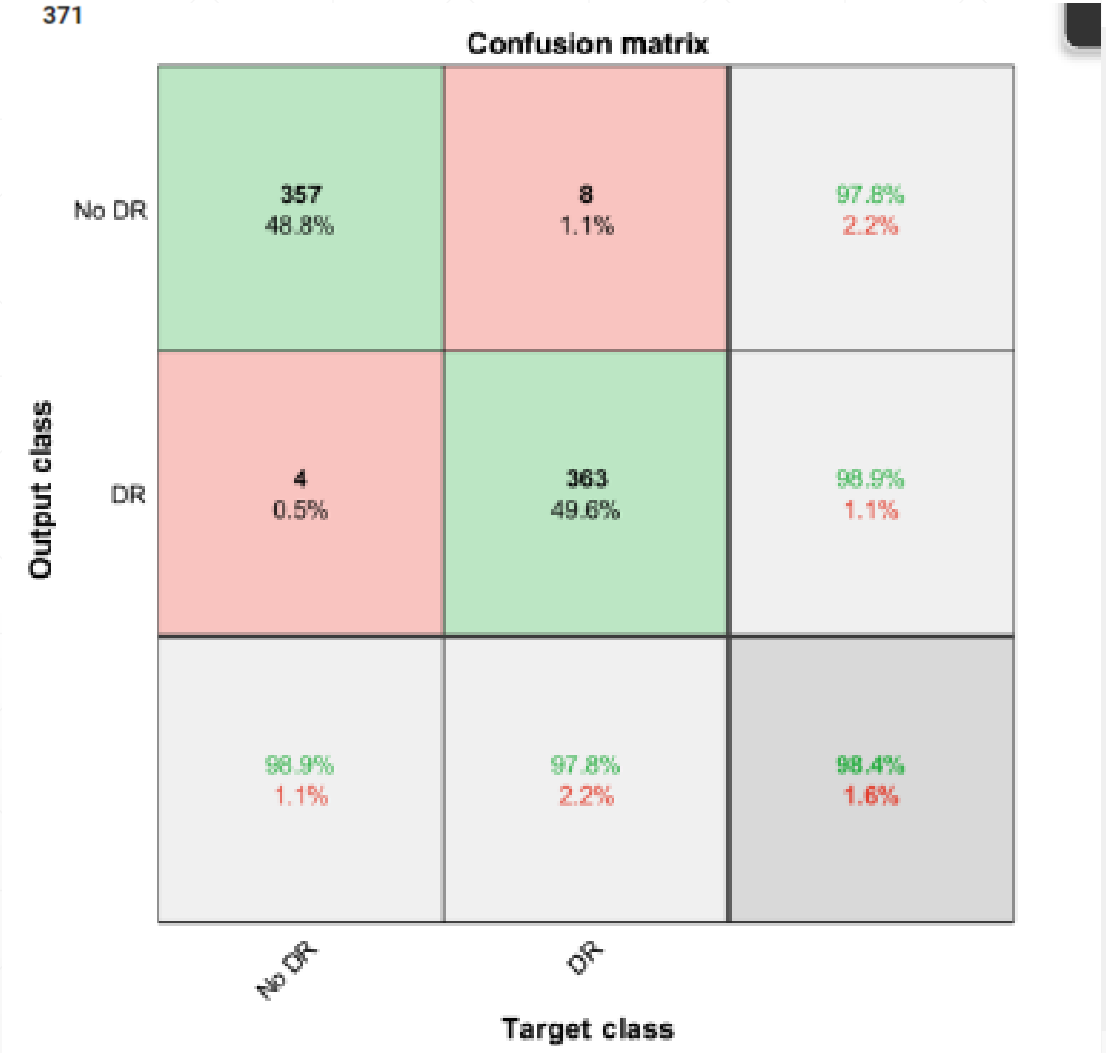
Learning Steps : 5- Training

- We have utilized **validation patience of 3** (Validation patience is the number of epochs that the algorithm tries to improve the performance before giving up (if the error is not decreasing)). **as the stopping criteria**. **For starters, we use 'MaxEpochs' as 2**

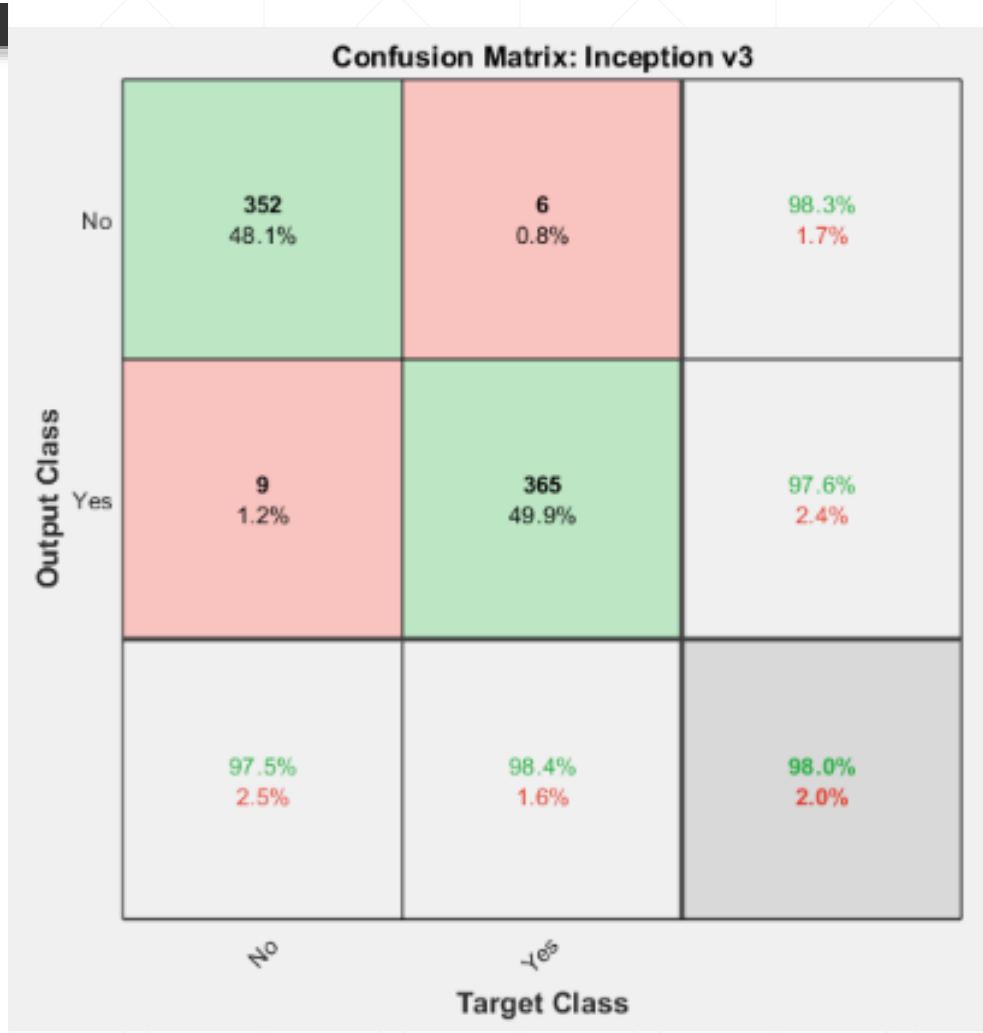


Learning Steps : 5- Testing and Performance Evaluation

	Yes	No
Training Set:	1337	1300
Validation Set:	144	149
Test Set:	361	371

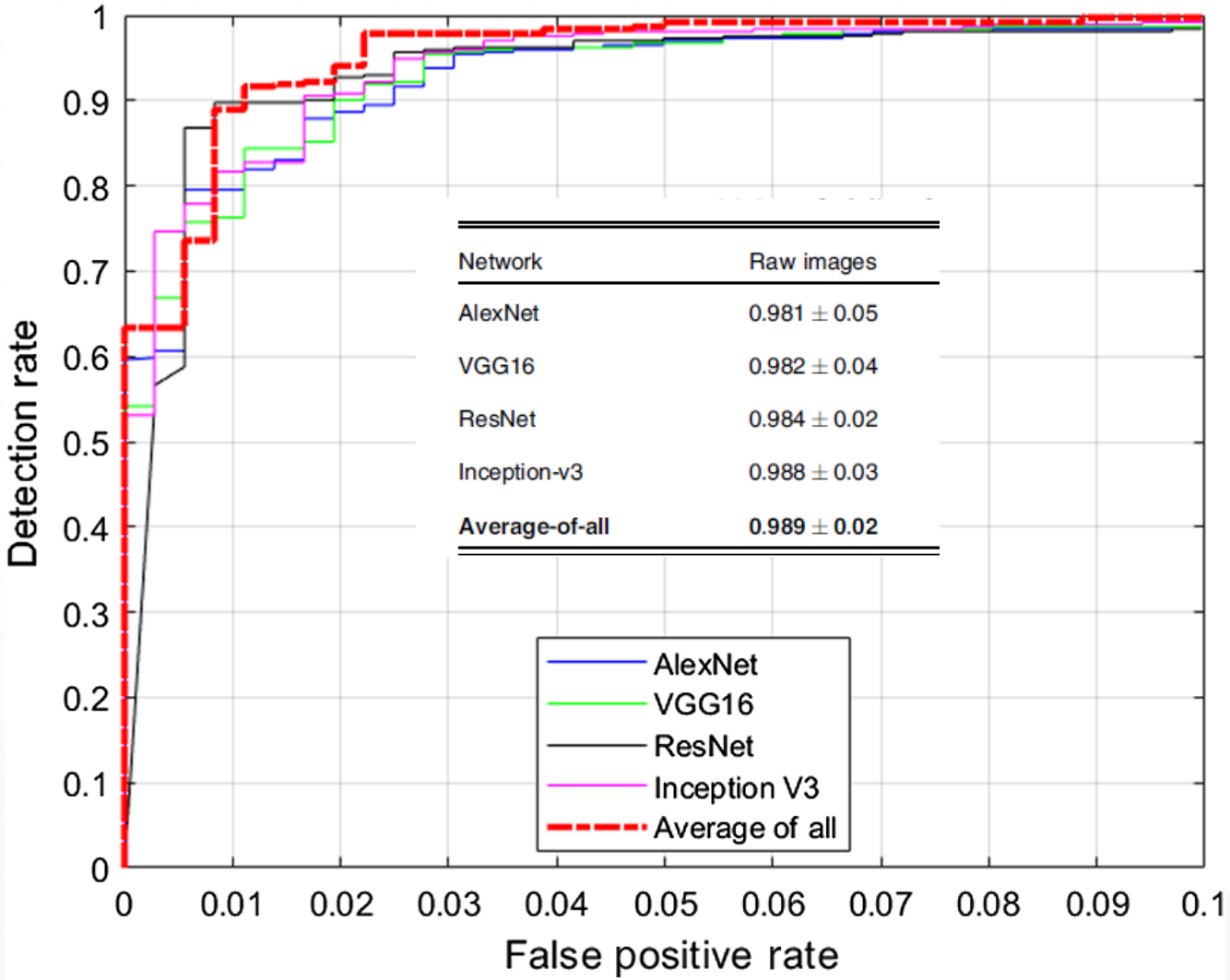


Article



Mine

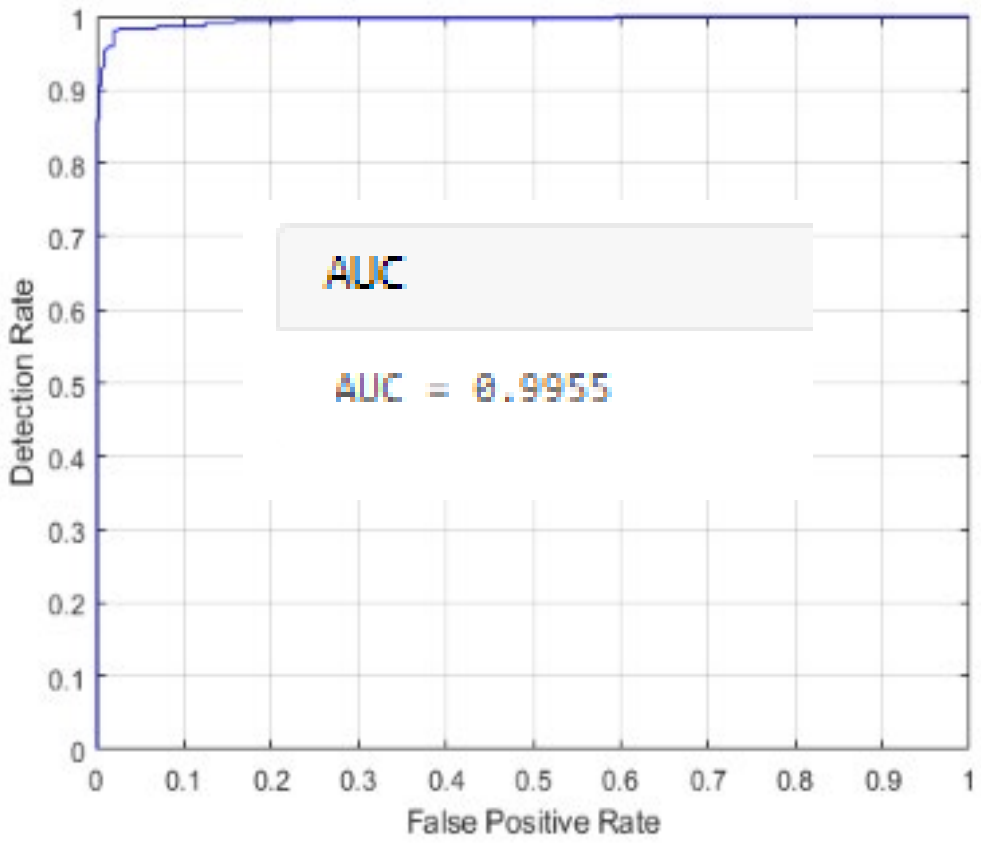
Learning Steps : 5- ROC and AUC



Network	Raw images
AlexNet	0.981 ± 0.05
VGG16	0.982 ± 0.04
ResNet	0.984 ± 0.02
Inception-v3	0.988 ± 0.03
Average-of-all	**0.989 ± 0.02**

Article

Incpection-v3



Mine

The End

(Q-A)