Poster ID :

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# Automated Diabetic Retinopathy Detection using Deep Neural Network

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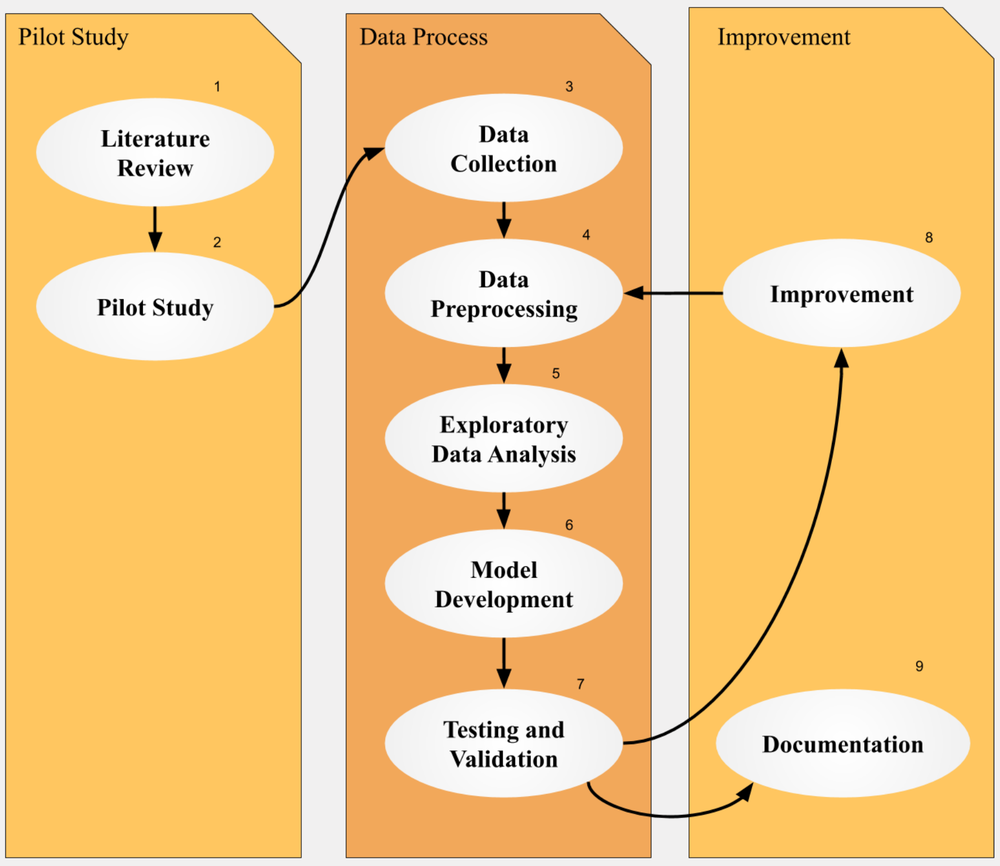
## ABSTRACT

Diabetic retinopathy(DR) is a disease that occurs in patients with a long period history of diabetes. With a high level of blood sugar, small vessels get damaged resulting in vision problems such as blurriness, and without proper treatment it will eventually lead to irreversible blindness. The diagnosis of DR using retinal fundus photography requires and depends on a skilled reader for the manual assessment. However, this method opens to the inconsistency of the diagnosis. Thus, using Deep Neural Network, Automated Diabetic Retinopathy Detection aims to reduce the burden of ophthalmologists and mitigate diagnostic inconsistencies between manual readers by classifying DR stages.

## OBJECTIVE

1. To construct DR into image model
2. To develop an interface for DR detection
3. To evaluate and test the constructed model
4. To improve the model's performance

## METHODOLOGY




## ALGORITHM

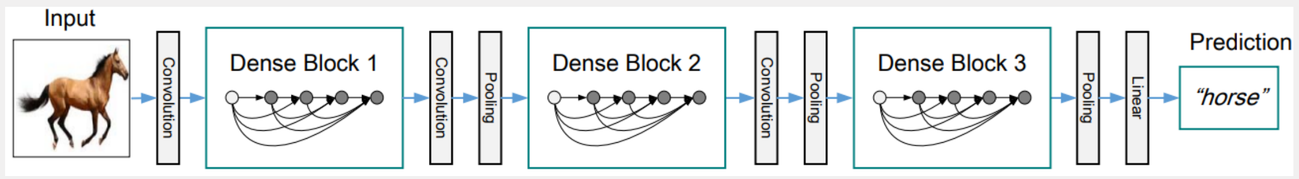



Figure 1 : DenseNet Algorithm

## SETUP & RESULT

Table 1 : Experimental setup details

| Experiment | Method | No classes |
|---|---|---|
| 1 | 15000 random sampling from the dataset | 5 |
| 2 | | 3 |
| 3 | Undersampling technique | 5 |
| 4 | | 3 |

Table 2 : Testing datasets

| Level | Type of DR | No. of Sample |
|---|---|---|
| 0 | Normal | 20 |
| 1 | Moderate | 20 |
| 2 | Severe | 20 |

Table 3 : Summary Result of Training Phase

| Experiments | Multiple Binary Classification | | | | Best Cohen Kappa Score | Validation test accuracy | Best Threshold |
|---|---|---|---|---|---|---|---|
| | Accuracy | loss | Validation Accuracy | Validation loss | | | |
| 1 | 0.9524 | 0.1313 | 0.9372 | 0.1614 | 0.7333 | 0.79 | 0.5271 |
| 2 | 0.9403 | 0.1542 | 0.9296 | 0.1805 | 0.6473 | 0.80 | 0.5359 |
| 3 | 0.9814 | 0.0675 | 0.8679 | 0.4613 | 0.7523 | 0.48 | 0.5125 |
| 4 | 0.9306 | 0.1658 | 0.8838 | 0.3392 | 0.7515 | 0.69 | 0.2375 |

Table 4 : Result of Testing Phase

| Experiment | Best Cohen Kappa Score | Best Threshold | Testing Set Accuracy | False Negative | False Positive |
|---|---|---|---|---|---|
| 1 | 0.8205 | 0.5063 | 0.77 | 5 | 4 |
| 2 | 0.8205 | 0.5 | 0.82 | 4 | 3 |
| 3 | 0.4928 | 0.525 | 0.57 | 0 | 19 |
| 4 | 0.6761 | 0.525 | 0.62 | 1 | 13 |

## DEPLOYMENT

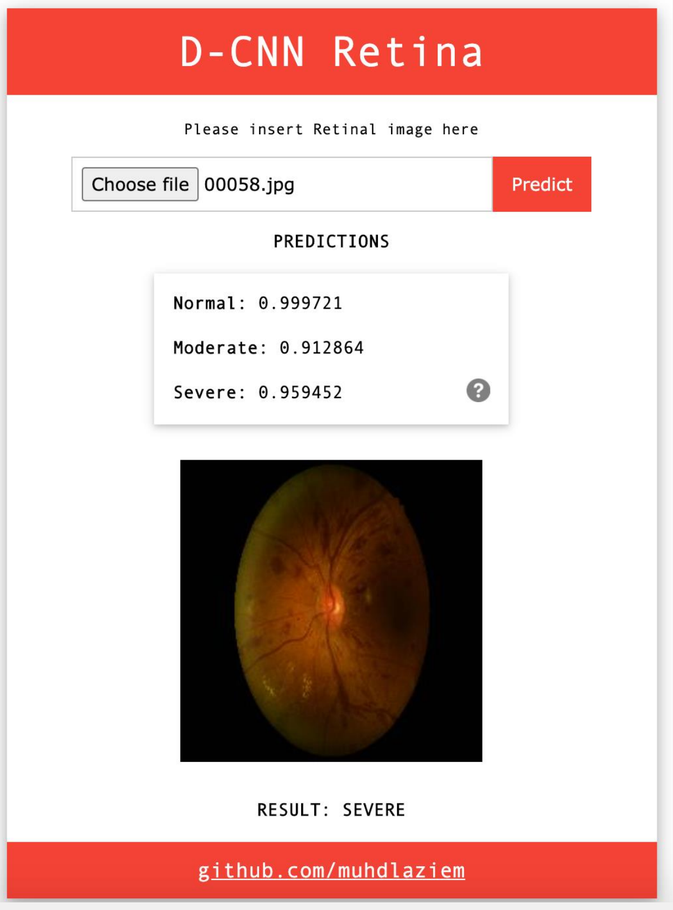



Figure 2 : Interface

## CONCLUSION

In this project, a model of random sampling and 3-ary classification from experiment 2 appears to be the best model with 0.82 accuracy, 0.80-0.85 precision for all classes, 0.8205 Cohen kappa score with 0.5 threshold on testing set. This model practically an improvement version from all models in the experimental setup. Hence, the best model will be deployed to the web application.

## FUTURE WORK

For future works, it will be focusing on training a large scale of dataset rather than taking only 15000 retinal images. Plus, improving the deep learning model and better image preprocessing will be added in future.

## TOOLS

## REFERENCE

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Doshi, D., Shenoy, A., Sidhpura, D., & Gharpure, P. (2017). Diabetic retinopathy Detection using deep convolutional neural networks. International Conference on Computing, Analytics and Security Trends, CAST 2016, 261–266. https://doi.org/10.1109/CAST.2016.7914977

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