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DIABETIC RETINOPATHY DETECTION USING VGG-NIN A DEEP LEARNING

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Abstract: Diabetic Retinopathy (DR) is a disease that damages retinal blood vessels and leads to blindness. Usually, colored fundus shots are used to diagnose this irreversible disease. The manual analysis (by clinicians) of the mentioned images is monotonous and error-prone. Hence, various computer vision hands-on engineering techniques are applied to predict the occurrences of the DR and its stages automatically. The VGG16, spatial pyramid pooling layer (SPP) and network-in-network (NiN) are stacked to make a highly nonlinear scale-invariant deep model called the VGG-NiN model. The proposed VGG-NiN model can process a DR image at any scale due to the SPP layer's virtue

INTRODUCTION

The primary cause of DR development and its consequences are avoiding the precautionary measure for blood sugar control and a healthy lifestyle. Generally, DR in the early stages is hard to detect, and patients themselves feel asymptomatic. The proposed architecture of this paper is the Vgg16 model, which has been introduced with minor modifications. The output of Vgg16 is fed to a new version of Network in Network (NiN) architecture. Moreover, the paper concluded the effects of the Spatial Pyramid Pooling layer on the images provided.

LITERATURE SURVEY

2.1 S. Jan, I. Ahmad, S. Karim, Z. Hussain, M. Rehman, and A. A. Shah, "Status of diabetic retinopathy and its presentation patterns in diabetics at ophthalmology clinics," J. Postgraduate Medical Instrumentation (Peshawar-Pakistan), vol. 32, no. 1, 2018.

To determine the status of Diabetic Retinopathy and reasons for presentation at the time of initial ophthalmological examination of diabetic individuals. It was a descriptive study performed at the Department of Ophthalmology, Hayatabad Medical Complex, Peshawar and at Saeed Anwar Medical Center, Dabgari Garden Peshawar from July 2014 to June 2015. All diabetics (both type 1 and 2), who presented for the first time to ophthalmologist were included in their study. Diabetic retinopathy was classified according to Early Treatment Diabetic Retinopathy Study classification as mild, moderate, severe and very severe Non-Proliferative Diabetic Retinopathy and Proliferative Diabetic Retinopathy. Patients with vitreous hemorrhage, rubeosis iridis, neovascular glaucoma or tractional retinal detachment were classified as having Advanced Diabetic Eye Disease (ADED). Majority of diabetic patients had some form of diabetic retinopathy at the time of presentation to the ophthalmologists.

Advantages - Low risk of complications well studied and inexpensive.
Disadvantages - Many patients do not respond.

2.2 L. Math and R. Fatima, "Adaptive machine learning classification for diabetic retinopathy," Multimedia Tools Application, vol. 80, pp. 5173-5186, Oct. 2020.

Diabetic Retinopathy is the main cause of the blindness worldwide. However, the Diabetic Retinopathy is hard to be detected in the initial stages, and the procedure of diagnostic can be time-consuming even for experienced experts. The segment-based learning approach has shown the benefits over learning technique for detection of DR: only the annotation

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of image level is required get the lesions and detection of Diabetic Retinopathy. Anyways, the performance of existing methods is limited by the utilization of handcrafted features. This paper proposed the segment-based learning approach for detection of Diabetic Retinopathy, which mutually learns classifiers and features from the data and gets significant development on recognizing the images of Diabetic Retinopathy and they are inside the lesions. Specifically, the pre-trained CNN is adapted to get the segment level DRE and then Integrating all segment level of DRM is utilized to make the classification of diabetic retinopathy images. Lastly, an end-to-end segment-based learning approach to deal with the irregular lesions of diabetic retinopathy.

For detection of the diabetic retinopathy images obtain area under of ROC curve is 0.963 on the Kaggle dataset and also obtains sensitivity and specificity 96.37% and 96.37% on the higher specificity and sensitivity that outperforms much better than existing model.
Advantages - High accuracy rates.
Disadvantages - High computational requirements.

EXISTING SYSTEM

In the existing system, classification had been conducted on the two stages of DR (NDPR and normal). This system used a Deep Convolutional Neural Network (DCNN) with two networks, global and local. The local network highlights the lesions and sends them to the global network for further grading. The evaluation parameter of the kappa score was used in their study.
Disadvantage - The significant limitation of the existing system was that it has not considered the entire dataset of five stages.The quality of annotated fundus data are not enough.

PROPOSED SYSTEM

VGG-NiN is a hybrid deep learning architecture that combines elements of the VGG and Network in Network (NiN) architectures. It has been shown to be effective for various computer vision tasks, including diabetic retinopathy prediction. Here are the steps to train a VGG-NiN model for diabetic retinopathy prediction:

Data collection	Model training
Data pre-processing	Model evaluation
Model deployment	Model testing

Advantage-The VGG-NiN architecture has several advantages for diabetic retinopathy prediction:

- High accuracy
- Transfer learning
- Robustness
- Interpretability
- Scalability

Overall, the VGG-NiN architecture is a powerful deep learning technique for diabetic retinopathy prediction, with several advantages over other methods**.**

DATASET PREPARATION

In our experimental setup, we used the Kaggle dataset, it is the largest dataset of fundus images for diabetic retinopathy. In the EyePACS dataset, there are 88,702 images; out of the 35126 are labelled images, and the remaining 53,576 images are not labelled.

The task is to classify different stages of diabetic retinopathy, which is a supervised learning problem; hence, only the labelled images from this dataset is used

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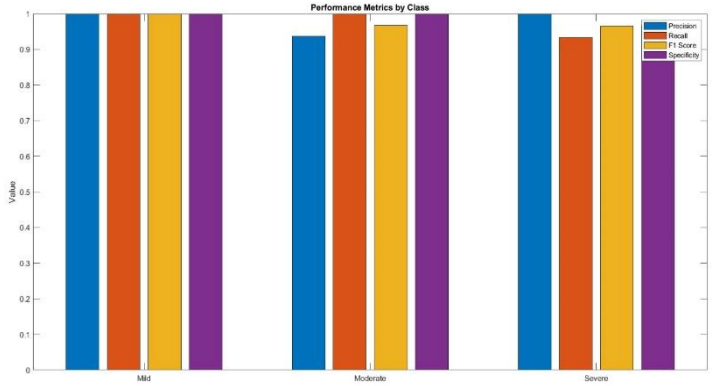
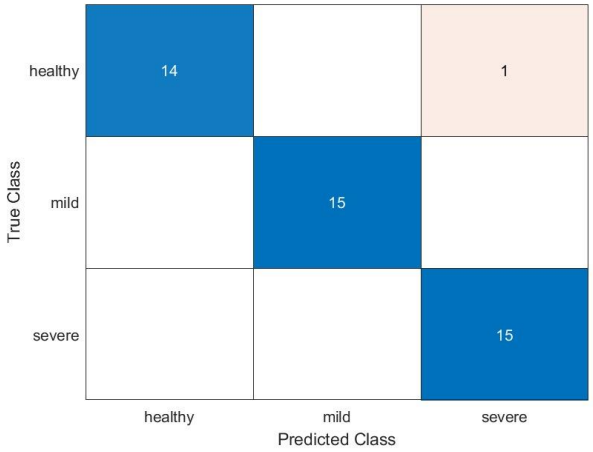
RESULT SCREENSHOTS





CONCLUSION

This project proposed a deep learning-based ensemble approach for Diabetic Retinopathy detection. The major drawback of the ensemble model is the number of learnable parameters. In this project, we brought architectural changes in existing CNN to enhance the efficiency and accuracy of classification of the DR's stages in color fundus images and reduce the number of learnable parameters. We used imbalanced versions of the Kaggle dataset to validate the performance measures of the proposed model. The results depict that the proposed model is low in computation and better than other state-of-the-art ensemble and non-ensemble methods

FUTURE WORK

In the future, we plan to bring some other productive changes in the existing model's architecture and some preprocessing techniques and discuss how these changes affect the working of a model on the classification of DR's stages, especially the early ones.

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