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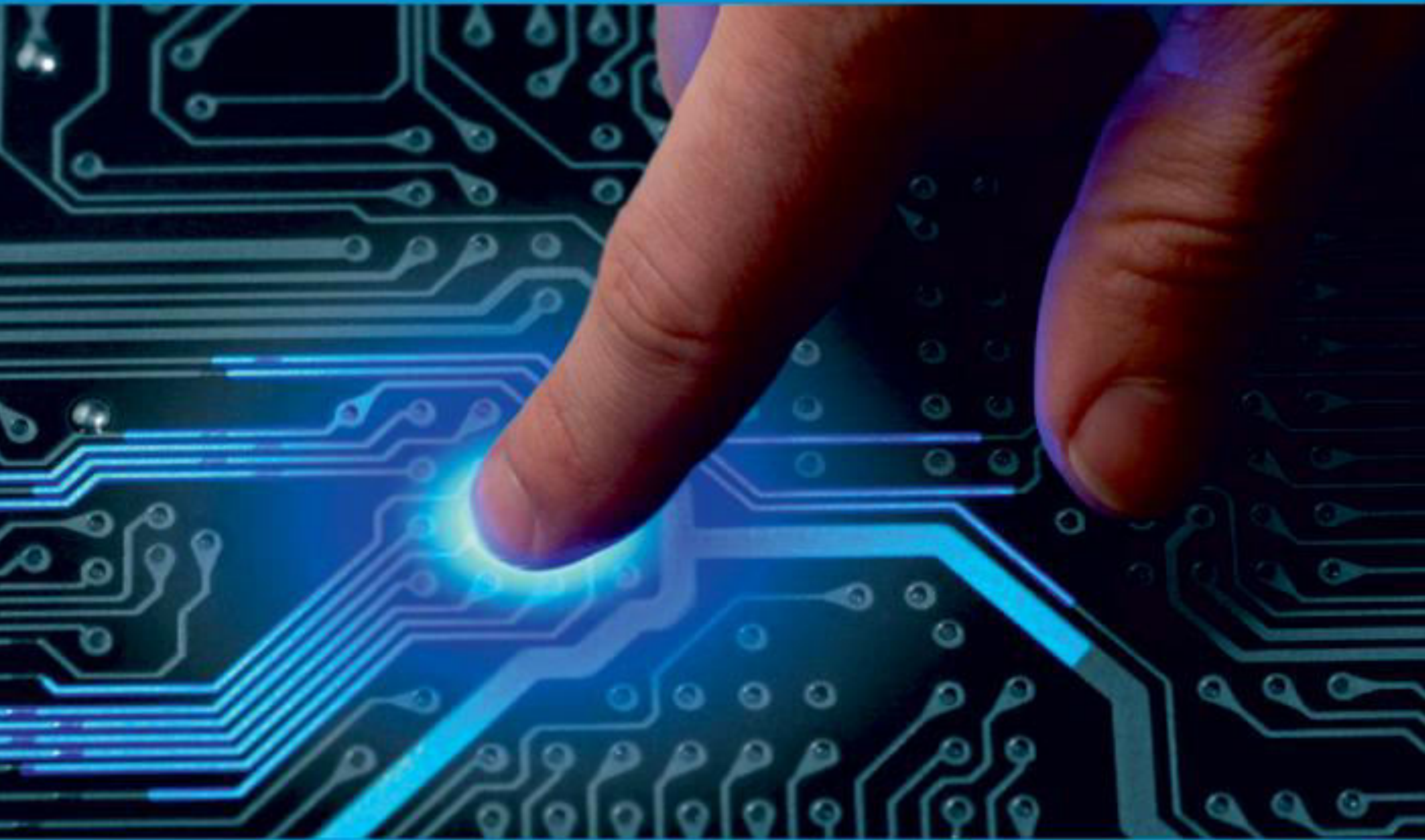

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Multiple Diabetic Levels Prediction from Fundus Images Using Deep Learning Algorithm

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ABSTRACT: The eye is sometimes said to provide a window into the health of a person for it is only in the e Diabetic retinopathy (DR) is a serious eye disease originating from diabetes mellitus that one can actually see the exposed flesh of the subject without using invasive procedures. There are a number of diseases, particularly vascular disease that leave tell-tale markers in the retina. Microaneurysms (MAs) are early signs of DR, so the detection of these dark object is essential in an efficient screening program to meet clinical protocols. Retinal images provide considerable information on pathological changes caused by local optical disease which reveals diabetes, hypertension, arteriosclerosis, cardiovascular disease, and stroke. Computer-aided analysis of retinal image plays a central role in diagnostic procedures. However, automatic retinal segmentation is complicated by the fact that retinal images are often noisy, poorly contrasted, and the vessel widths can vary from very large to very small. This project presents image processing techniques such as dark object detection to analyse the condition or enhance the input image in order to make it suitable for further processing and improve the visibility of vessels in colour fundus images. Then we can implement automate classification algorithm named as Convolutional neural network algorithm. The CNN architecture is designed to effectively extract features from retinal images, capturing intricate patterns associated with diabetic retinopathy. The model is trained using a combination of loss functions and optimization techniques to ensure convergence and generalization. Hyperparameter tuning is performed to optimize the model's performance on the validation set. The trained CNN is evaluated on a separate test set, and its performance metrics, including accuracy, precision, recall, and F1 score, are reported. Additionally, the model's interpretability is explored to rectina.

KEYWORDS: Rectina , deep learning, algorithm, machine learning;

I. INTRODUCTION

Diabetic retinopathy (DR) is a serious complication of diabetes mellitus and a leading cause of vision impairment and blindness globally. This microvascular complication affects the retina, the light-sensitive tissue at the back of the eye, and is characterized by progressive damage to the blood vessels within the retina. The prevalence of diabetes is rising at an alarming rate, with an estimated 463 million adults affected worldwide in 2019, and this number is expected to reach 700 million by 2045 according to the International Diabetes Federation. The retina plays a crucial role in vision, capturing and processing light signals that are then transmitted to the brain for interpretation. In individuals with diabetes, prolonged exposure to elevated blood glucose levels can lead to damage of the retinal blood vessels, causing leakage and swelling. As the condition progresses, abnormal blood vessels may form, leading to a variety of complications such as hemorrhages, exudates, and, in severe cases, retinal detachment. Early detection and intervention are paramount in preventing irreversible vision loss due to diabetic retinopathy. Traditional screening methods involve manual examination of retinal images by ophthalmologists, a time-consuming process that may not be scalable given the increasing prevalence of diabetes. Consequently, there is a growing interest in leveraging advanced technologies, such as deep learning and computer vision, to develop automated systems for the early detection and classification of diabetic retinopathy

II. RELATED WORK

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There are several types of deep learning algorithms, each of which is designed to solve different types of problems. Some of the most popular deep learning algorithms include: Convolutional Neural Networks (CNNs): These are commonly used for image and video processing. They use a technique called convolution to extract features from the input image or video. Recurrent Neural Networks (RNNs): These are used for sequential data processing, such as natural language processing. They can capture the context and relationship between different elements in a sequence. Generative Adversarial Networks (GANs): These are used for generating new data that is similar to the input data. They consist of two networks: a generator network that generates new data and a discriminator network that evaluates whether the generated data is similar to the real data. Autoencoders: These are used for unsupervised learning and feature extraction. They consist of an encoder network that compresses the input data into a lower-dimensional representation, and a decoder network that reconstructs the original input from the compressed representation. Deep Belief Networks (DBNs): These are used for unsupervised learning and feature extraction. They consist of multiple layers of restricted Boltzmann machines (RBMs) that can learn hierarchical representations of the input data.

III. PROPOSED ALGORITHM

A proposed system for diabetic and glaucoma prediction from retinal images using Convolutional Neural Networks (CNNs) involves several key steps The pre-processed images can then be segmented to extract regions of interest, such as the optic nerve head and retinal blood vessels. Once the images have been preprocessed and segmented, they can be used to train a CNN model. CNNs are particularly suited to image classification tasks as they are able to automatically extract relevant features from the images. The CNN model can be trained using a combination of labeled retinal images and corresponding diagnosis labels. After training the CNN model, it can be evaluated on a separate test dataset to assess its accuracy and generalizability. The model can also be fine-tuned by adjusting its hyperparameters or by using transfer learning techniques to improve its performance. In addition to training the CNN model, it's important to also visualize the features learned by the model to gain insights into the diagnostic process. This can involve techniques such as activation mapping, which highlights the regions of the image that are most important for the model's prediction. Visualizing the features can help to identify the key characteristics of retinal images that are indicative of diabetic retinopathy or glaucoma. Furthermore, it's important to consider the interpretability of the CNN model in a clinical setting. While CNNs have shown excellent performance in image classification tasks, their "black box" nature can make it difficult to interpret their predictions. One approach to increasing the interpretability of the model is to use techniques such as saliency mapping or class activation mapping, which highlight the regions of the image that contribute most to the model's prediction. This can help clinicians to better understand the model's reasoning and make more informed decisions about patient care. Finally, the trained CNN model can be deployed in a clinical setting to provide early diagnosis and treatment to patients with diabetic retinopathy.

IV. SIMULATION RESULTS

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. Efficient and intelligent output design improves the system’s relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

2. Select methods for presenting information.

3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

- Convey information about past activities, current status or projections of the Future.
- Signal important events, opportunities, problems, or warnings.
- Trigger an action.
- Confirm an action.
- Prediction

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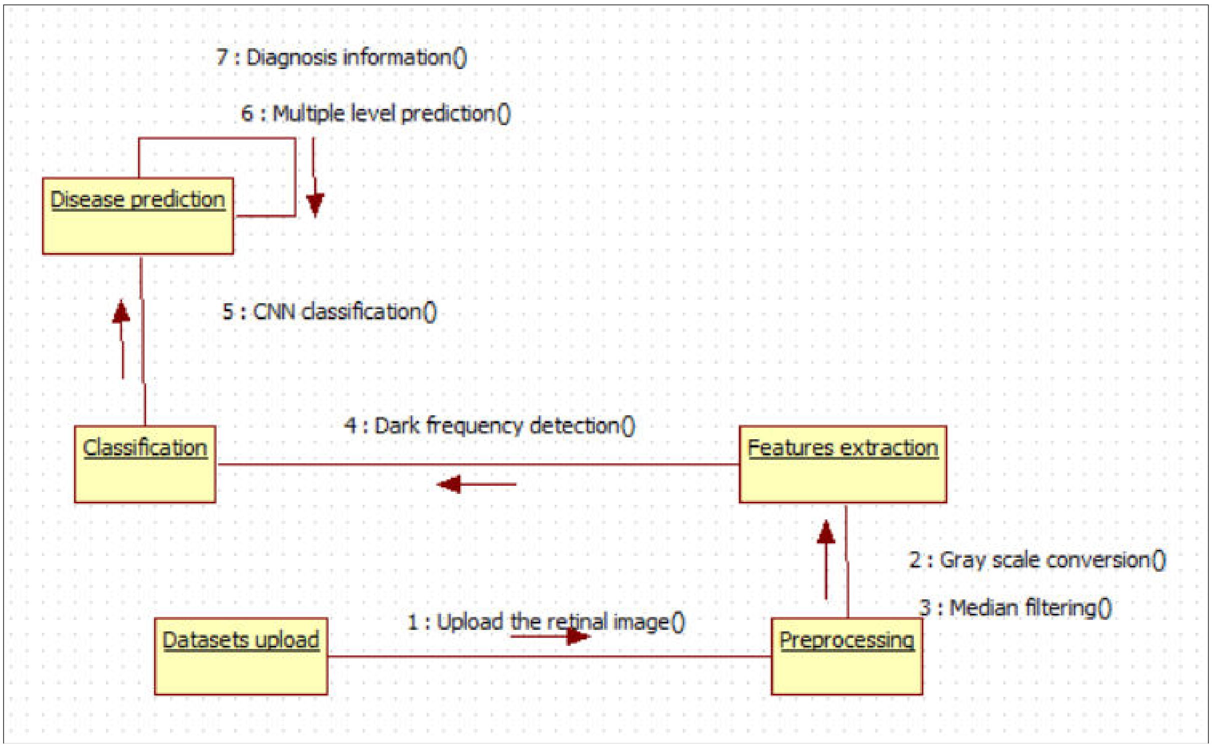

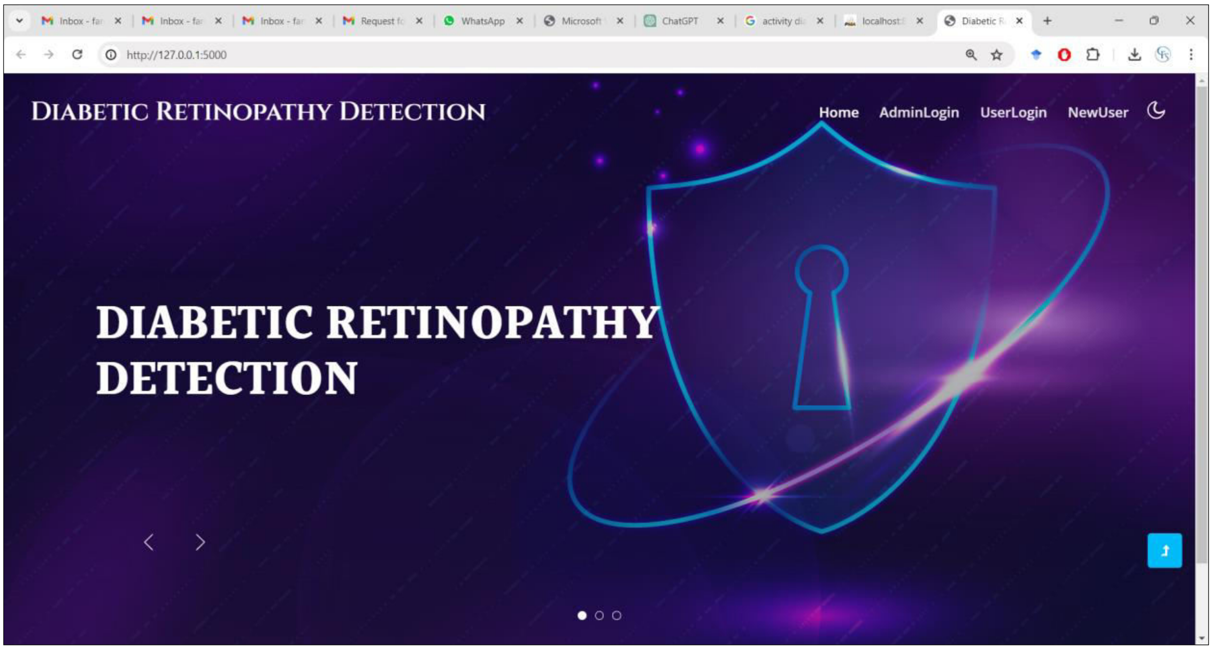

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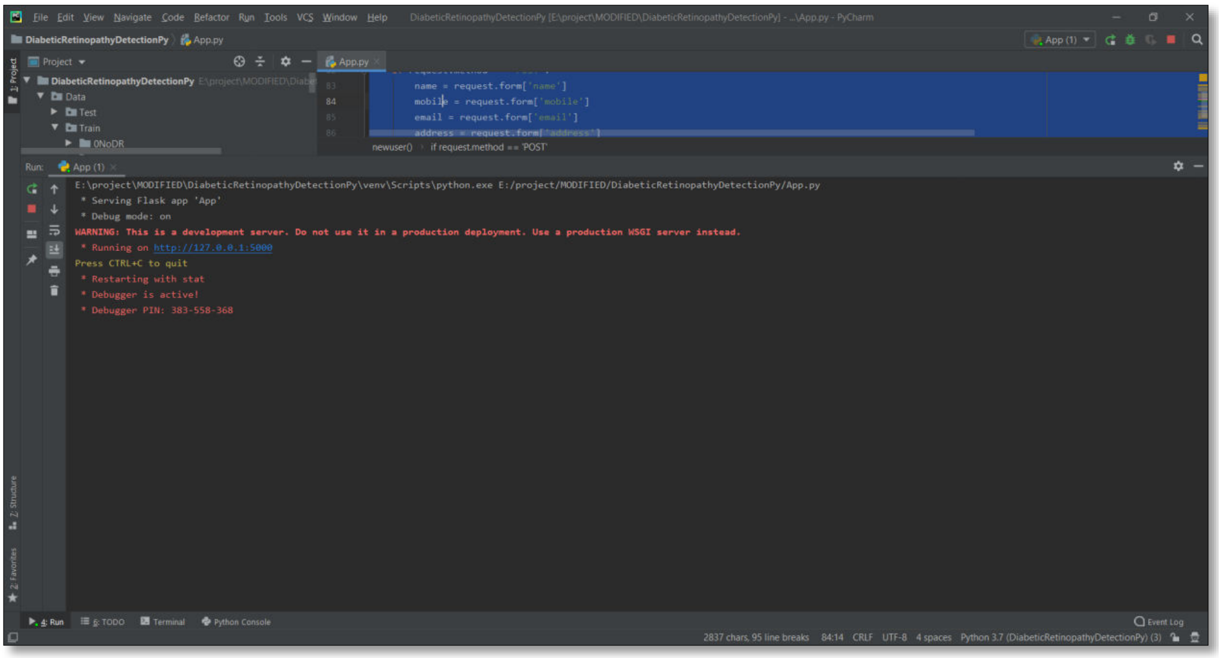

V. CONCLUSION AND FUTURE WORK

The output form of an information system should accomplish one or more of the following objectives.

- Convey information about past activities, current status or projections of the Future.
- Signal important events, opportunities, problems, or warnings.
- Trigger an action.
- Confirm an action

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