



# DIABETIC RETINOPATHY DETECTION

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**Abstract:** In today's world, Diabetes may be a quite common disease which affects tons of people's health. As the number of diabetic patients is increasing significantly in India, there is a rise in numerous associated diseases that have disturbed the society. Diabetic Retinopathy (DR) is taken into account to be one among such silent diseases which occur as results of either Type 1 or Type 2 diabetes. Late diagnosis of this disease may cause permanent eye blindness. Thus, for early diagnosis of Diabetic Retinopathy, a software-based algorithm is meant here. This technique are often promising for the pre-detection of DR with none involvement of an expert doctor and hence will save both time and money. Here, CNN based image processing is used which exploits the knowledge of Computer Science and Biomedical Engineering to identify whitish lesions, cotton wool spots and hard exudates associated with DR. Based on the worth of pixel counts, the image of the patient's eye under examination is assessed as a Diabetic Retinopathy eye or a Non-Diabetic Retinopathy eye.

**Keywords:** Amazon Web Server, Digital Ocean Server, Puttygen.exe, Putty.exe, Winscp

## I. INTRODUCTION

Analysis is that the process of breaking a posh topic or substance into smaller parts to realize a far better understanding of it. Analysts within the field of engineering check out requirements, structures, mechanisms, and systems dimensions. Analysis is an exploratory activity. The Analysis Phase is where the project lifecycle begins. The Analysis Phase is where you break down the deliverables within the high-level Project Charter into the more detailed business requirements. The Analysis Phase is additionally the part of the project where you identify the general direction that the project will take through the creation of the project strategy documents. Gathering requirements is that the main attraction of the Analysis Phase. The method of gathering requirements is typically quite simply asking the users what they have and writing their answers down. Counting on the complexity of the Appliance, the method for gathering requirements features a clearly defined process of its own. This process consists of a gaggle of repeatable processes that utilize certain techniques to capture, document, communicate, and manage requirements.

## II. LITERATURE SURVEY

[1] "Design and Implementing Diabetes Disease Prediction Using Naives Bayesian". The research focuses on Diabetes disease diagnosis by considering previous data and information. To achieve this (Smart Diabetes Disease Prediction) is built via Navies Bayesian in order to predict risk factors concerning Diabetes disease.

**Advantages:** Good Results with accuracy

**Disadvantages:** Doesn't handle the emergency cases .It's a Standalone solution

[2] "Blood Viscosity based Diabetes Disease Risk Prediction Model in Edge/Fog Computing 2019" In this paper, Diabetes disease prediction modelled using partially observable markov decision process (POMDP) is proposed. In emergency, the patient is alerted through the doctor by fog computing. Ambulance sent to the location of patient at critical situations. The doctor gets the data through fog computing FogSim.

**Advantages:** Handles the emergency cases.

**Disadvantages:** It's a standalone solution. Consumes lot of server resources

[3] "Disease Risk Prediction by Using Convolutional Neural Network". To overcome the problem of missing medical data, this paper Perform data cleaning and imputation to transform the incomplete data to complete data. They are working on Diabetes disease prediction on the basis of the dataset with help of Naïve bayes and KNN algorithm.

**Advantages:** This method is applicable for patients with missing medical data



**Disadvantages:** Doesn't handle the emergency cases. It's a Standalone solution .Doesn't handle the emergency cases. It's a standalone solution. Accuracy is poor.

### III. EXISTING SYSTEM

- Existing method takes input as a colour fundus image together with the binary mask of its region of interest (ROI).
- The ROI is the circular area surrounded by a black background and it results as the probability of colour map for red lesion detection.
- The prediction of Retinopathy is quite difficult Segmentation method may produce unwanted noise.
- PSNR value is high Image Assessment analysis and provides poor performance. Segmentation covers unwanted region. These problems can be rectified up to 97% with the help of our project.

### IV. PROPOSED SYSTEM

- In this project, CNN based image processing is used which exploits the knowledge of Computer Science and Biomedical Engineering to identify whitish lesions, cotton wool spots and hard exudates associated with DR.
- Based on the value of pixel counts, the image of the patient's eye under examination is classified as a Diabetic Retinopathy eye or a Non-Diabetic Retinopathy eye.
- This technique can be promising for the pre-detection of DR without any involvement of an expert doctor and hence will save both time and money.

### V. WORKING SYSTEM

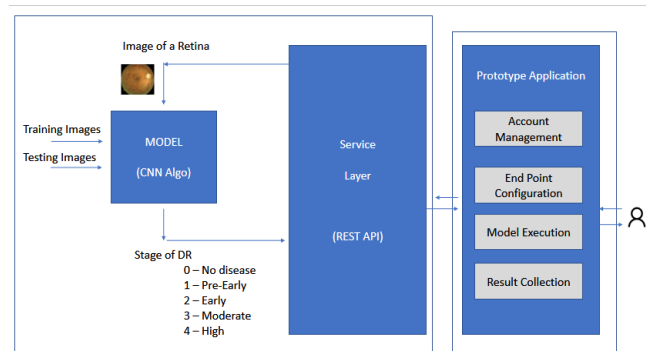


Fig -1: Cloud based deployment process of the model

#### PUTTY.EXE:-

PuTTY is a terminal emulation program. If you want to manage or configure a device from pc you can use PuTTY for that purpose. PuTTY is the recommended application to use for SSH connections from a Windows operating system.

**PUTTYGEN.EXE:-** PuTTYgen is a key generator tool for creating SSH keys for PuTTY. For both cloud machines, we have to generate SSH key for higher security purpose.

#### WINSCP FOR DIGITALOCEAN CLOUD SERVICE:-

WinSCP is an open source free SFTP client, FTP client, WebDAV client, S3 client and SCP client for Windows. Its main function is file transfer between a local and a remote computer.

#### WINSCP FOR AWS CLOUD SERVICE:-

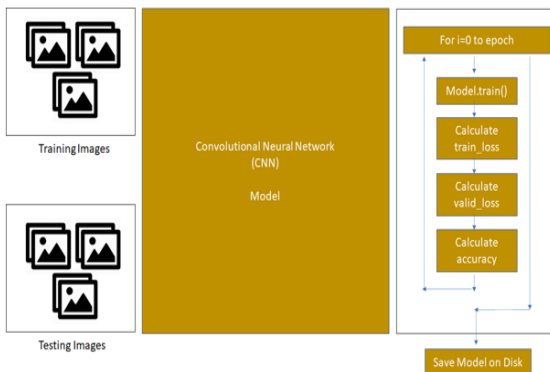
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## VI. MODULES

The Diabetic Retinopathy is based on the following models:

1. Module Implementation – Training, Testing and saving the model.
2. Model Implementation - Loading the model to work on new dataset.
3. Web service Implementation.
4. Third party application.



**Fig -2:** Module Training and Testing

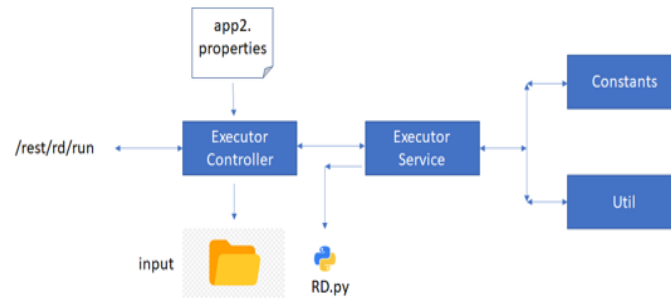
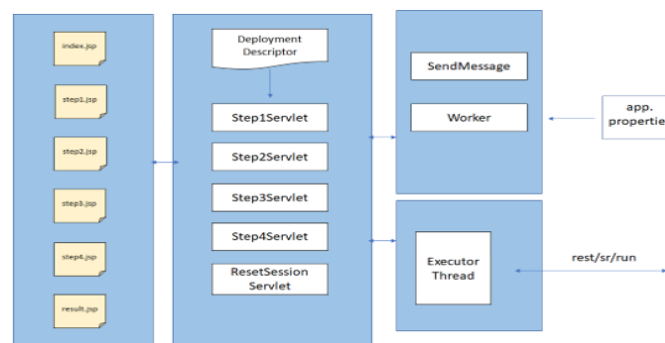


**Fig 3:** Module Execution

In deep learning, a convolutional neural network (CNN, or Conv Net) may be a class of deep neural networks, most ordinarily applied to analysing visual imagery. They are also mentioned as shift invariant or space invariant artificial neural networks (SIANN), supported their shared-weights architecture and translation invariance characteristics. They have applications in image and video recognition, recommender systems, image classification, medical image analysis, tongue processing, and financial statistic .CNNs are regularized versions of multilayer perceptron's. Multilayer perceptron's usually mean fully connected networks, that is, each neuron in one layer is connected to all or any or any neurons within subsequent layer. The "fully-connectedness" of those networks makes them susceptible to over fitting data. Typical ways of regularization include adding some sort of magnitude measurement of weights to the loss function. CNNs take a special approach towards regularization: they take advantage of the hierarchical pattern in data and assemble more complex patterns using smaller and simpler patterns. Therefore, on the size of connectedness and complexity, CNNs are on the lower extreme.

Convolutional networks were inspired by biological processes therein the connectivity pattern between neurons resembles the organization of the animal visual area . Individual cortical neurons answer stimuli only during a restricted region of the sector of vision mentioned because the receptive field. The receptive fields of varied neurons partially overlap such they cover the entire field of vision .CNNs use relatively little pre-processing compared to other image classification algorithms. This means that the network learns the filters that in traditional algorithms were hand-engineered. This independence from prior knowledge and human effort in feature design may be a major advantage. The name “convolutional neural network” indicates that the network employs a mathematical operation called convolution. Convolution could also be a specialized quite linear operation. Convolutional networks are simply neural networks that use convolution in situ of general matrix operation in a minimum of one among their layers.

In this module, the model which is saved on local disk in the previous module will be loaded back into the processor memory. The library we are using to load and save the model is ‘Torch’. What we get after loading the trained model is the component which already has the intelligence to improve the resolution of images. This model is then provided with an input image to improve the resolution. By this approach of loading and saving the model to and from the local disk, we save a really lot of time when processing the real time images.

**Web service Implementation:****Fig 4: Rest API Implementation****Third party application:****Fig 5: Prototype Implementation**

In this module, we implement the web services to expose the model to the outside world. We expose an HTTP post API against which the user can upload a sample retina image and request for executing the model. The web service API upon receiving the request from the client, will store the uploaded image inside the '/home/ubuntu/input' location of the amazon EC2 machine and then it invokes the RD.py program by specifying this input folder. The output result written back to the caller with the detailed analysis of the predictions.

In this module, the sample third party application has been implemented to demonstrate the usage of the web services to the customers. In this application, we implement four steps:

- Step 1: User Identity: We collect the user's first name and the last name
- Step 2: Contact Information: We collect the email ID and mobile number of the client
- Step 3: Proof: We will send an OTP to customer and ask them to enter it to prove the identity
- Step 4: Execution: User uploads an input image here and clicking on Run button will invoke the web service implemented in the previous module. The downloadable image link will be displayed back to the client once the result is available

**VII. ADVANTAGES**

1. Proven High accuracy and try to maintain the accuracy level above 90%.
2. Memory and Time efficient
3. Solution can be re-usable by third-party applications
4. Multiple phases of DR
5. Deploying the project in cloud (AWS)
6. Provide data visualization features for the customers to get more valuable insight of the patient health
7. A robust solution will be obtained for predicting Diabetic Retinopathy from a given sample input image.

**VIII. CONCLUSION**

In this project, CNN based image processing is used which exploits the knowledge of Computer Science and Biomedical Engineering to identify whitish lesions, cotton wool spots and hard exudates associated with DR. Based on the value of pixel counts, the image of the patient's eye under examination is classified as a Diabetic Retinopathy eye



or a Non-Diabetic Retinopathy eye. This technique can be promising for the pre-detection of DR without any involvement of an expert doctor and hence will save both time and money

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