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Health Care Prediction System Using Deep Learning

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Abstract*— Every year around the world 12 million people suffered due to misdiagnosis of diseases. An idea was proposed for diagnosing the diseases at early stages of inception. If the patients are affected by malaria, pneumonia and lung cancer, they can check their disease levels as mild, moderate, severe and proliferative. The patients can upload their medical reports on the website and use the deep learning model to predict the probability of chances of the diseases. This proposed system targets the customer (i.e.), patients who are having diseases and the hospitals. It uses unique image processing for the deep learning model which will be giving higher accuracy. The deep learning model build for diabetic retinopathy, malaria and pneumonia is implemented for diagnosing more diseases like lung cancer, breast cancer etc.. This system is distributed in the website, so that anyone from anywhere can access it. Widely anyone with disease can check their result, if they get a bad result they have to consider themselves for consultation with the doctor.

Keywords- Deep learning model, Flask, Deep Convolutional neural network, Image processing, Artificial intelligence.

I. INTRODUCTION

Diabetic Retinopathy:

Diabetic retinopathy otherwise called diabetic eye disease, will be At harm happens of the retina because of diabetes. It's An systemic disease, which influences up to 80 percent about at patients who have required diabetes for 20 a considerable length of time or additional. Notwithstanding these scaring statistics,

Scrutinize indicates that no less than 90% for these new instances Might be lessened though there were best possible Also vigilant medication What's more following of the eyes. Those more extended an individual need diabetes, those higher as much alternately her possibilities of Creating diabetic retinopathy

Malaria:

Malaria is the most common disease in world. It is also the number one cause of death among young children and a significant cause of miscarriages among pregnant mothers. About 95% of children brought to health facilities with fever suffer from Malaria. A significant amount of suffering, complications and death due to malaria can be prevented through prompt and correct treatment and prevention measures.

Pneumonia:

Pneumonia is a common lung infection characterized by collection of pus and other fluids in the lung air sacs (alveoli). Lung air sacs are structures that help in the exchange of oxygen and carbon dioxide. Collection of pus in them makes breathing difficult. Pneumonia can be caused by many kinds of micro organisms (germs) including bacteria, viruses, fungi or parasites. It is of various types occurring in individuals of all ages, affecting millions of people worldwide. The condition varies from mild to severe depending on the type of organism involved, age and the underlying health of the individual.

II. EXISTING SYSTEM

In the existing system approach of diagnosing the diabetic retinopathy using traditional machine learning algorithm, there is no high level of accuracy. Logistics regression, random forest and XGBoost are not able to give higher accurate predicted results. Deep learning is recommended if there are more inputs for analysis.

III. DISADVANTAGES OF EXISTING SYSTEM

1. Accuracy will not be held
2. Only small amount of inputs data can be trained
3. Take more time for computation
4. traditional Machine Learning algorithm can be used
5. Common preprocessing techniques only can be used for image preprocessing

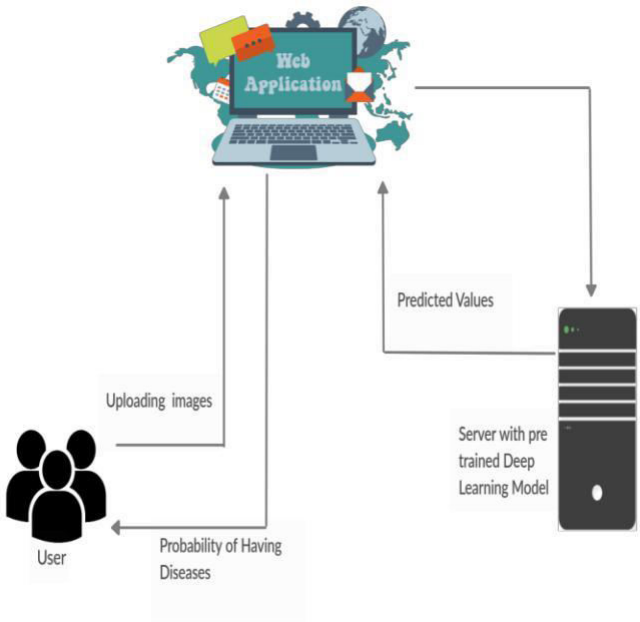
IV. SYSTEM REQUIREMENTS

Software Requirements

- Operating system : UBUNTU 18.04 OS
- Front End : Flask Framework
- Back End : Python
- Application : Web Application
- Preprocessing : Python Imaging Library (PIL)
- Pakages :TensorFlow, Keras, PyTorch, numpy, SK learn, matplotlib.

V. PROPOSED SYSTEM

In general, especially classification of diseases with the proposed architecture a DCNN, there are some basic steps to achieve maximum accuracy from the images dataset. They are Data Augmentation, Pre-processing, Initialization of Networks, Training, Activation function selections, Regularizations and Ensemble the multiple met hods.



List Of Modules:

The modules of the diagnosis process are

- Data collection
- Training the dataset by DCNN
- Uploading of user Images
- Image Conversion
- Probability of Chances for diseases

Data Collection:

The datas are collected from the kaggle website and user. The images of the retina, malaria blood cells and pneumonia lung scan are preprocessed for the building the deep learning model. The raw data collection are rearranged for the better data set. The diabetic retinopathy have five different kind of stages for raw data. The malaria and the pneumonia have only two stages

Training The Dataset By Dcnn:

Deep Learning is becoming a very popular subset of machine learning due to its high level of performance across many types of data. A great way to use deep learning to classify images is to build a Convolutional Neural Network (CNN). The Keras library in Python makes it pretty simple to build a CNN.

Computers see images using pixels. Pixels in images are usually related. For example, a certain group of pixels may signify an edge in an image or some other pattern. Convolutions use this to help identify images. A convolution multiplies a matrix of pixels with a filter matrix or 'kernel' and sums up the multiplication values. Then the convolution slides over to the next pixel and repeats the same process until all the image pixels have been covered.

Uploading Of User Images:

The user can upload the images like retina, blood cells and lung scan image on the web application. This web application sends the image to the deep learning model. The deep learning model processes the image and give the probability of having diseases.

Image Conversion:

The user uploaded original images are converted into another kind of image like Grayscale, thermal and matrix transformation because that kind of images gives more information about the diseases. When the normal image is converted into grayscale and thermal image, then all RGB values are changed. The image conversion is based on the RGB values of the images. The matrix transformation is having the collection of the values in the array format. It is used for training the deep learning model. The user uploaded images are finally converted into the matrix transformation

. The image will be converted to greyscale and the computer will assign each pixel a value based on how dark it is. All the numbers are put into an array and the computer does computations on that array. Colors could be represented as RGB values which is a combination of red, green and blue ranging from 0 to 255. Computers could then extract the RGB value of each pixel and put the result in an array for interpretation. When the computer interprets a new image, it will convert the image into an array by using the same technique, which then compares the patterns of numbers against the already-known objects

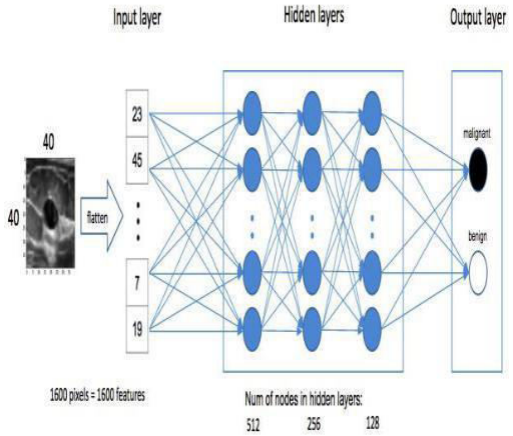
Probability Of Chances For Diseases:

The deep learning model tests the user uploaded image by the DCNN. The predicted result is shown to the user. The deep learning model gives only the probability of chances having the diseases. The diabetic retinopathy have five stages, so the deep learning model is depicted in the bar chart showing the probability of chances having diabetic retinopathy. Both malaria and pneumonia have only two stages, and it is also represented in bar chat. The predicted results are shown to the user in the form of graphical representation.

VI. RELATED WORKS

Prediction Of Pneumonia:

Build an algorithm to automatically identify whether a patient is suffering from pneumonia or not by looking at chest X-ray images. The algorithm had to be extremely accurate because lives of people is at stake



This can be described in the following 5 steps.

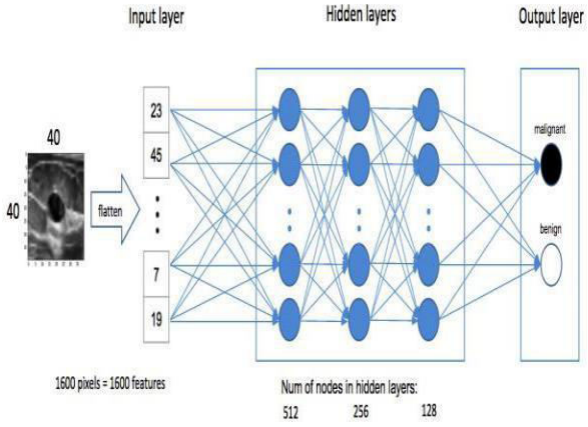
1. Five convolutional blocks comprised of convolutional layer, max-pooling and batch-normalization.
2. On top of it, flatten layer is used and followed it by four fully connected layers.
3. The dropouts is used to reduce over-fitting.
4. Activation function was Relu throughout except for the last layer where it was Sigmoid as this is a binary classification problem.
5. Adam optimizer is used and cross-entropy as the loss.

Before training, the model is useful to define one or more callbacks. Pretty handy one are, ModelCheckpoint and EarlyStopping.

- **ModelCheckpoint**: When training requires a lot of time to achieve a good result, often many iterations are required. In this case, it is better to save a copy of the best performing model only when an epoch that improves the metrics ends.
- **EarlyStopping**: During training, the generalization gap used (i.e. the difference between training and validation error) starts to increase, instead of decreasing. This is a symptom of overfitting that can be solved in many ways. Often a practical and efficient solution is to stop training when the generalization gap is getting worse.

Prediction Of Malaria

There are several methods and tests which can be used for malaria detection and diagnosis. These include thick and thin blood smear examinations, polymerase chain reaction and rapid diagnostic tests. Based on the guidelines from the WHO protocol, this procedure involves intensive examination of the blood smear at a 100X magnification, where people manually count red blood cells that contain parasites out of 5000 cells. With regular manual diagnosis of blood smears, it is an intensive manual process requiring proper expertise in classifying and counting the parasitized and uninfected cells.



Some advancements have been made in leveraging state-of-the-art image processing and analysis techniques to extract hand-engineered features and build machine learning based classification models. Convolution layers learn spatial hierarchical patterns from the data, which are also translation invariant. Thus they are able to learn different aspects of images. For example, the first convolution layer will learn small and local patterns such as edges and corners, a second convolution layer will learn larger patterns based on the features from the first layers, and so on. This allows CNNs to automate feature engineering and learn effective features which generalize well on new data points. Pooling layers help with downsampling and dimension reduction.

Thus, CNNs help us with automated and scalable feature engineering. Also, plugging in dense layers at the end of the model enables us to perform tasks like image classification. Automated malaria detection using deep learning models like CNNs could be very effective, cheap and scalable especially with the advent of transfer learning and pre-trained models which work quite well even with constraints like less data.

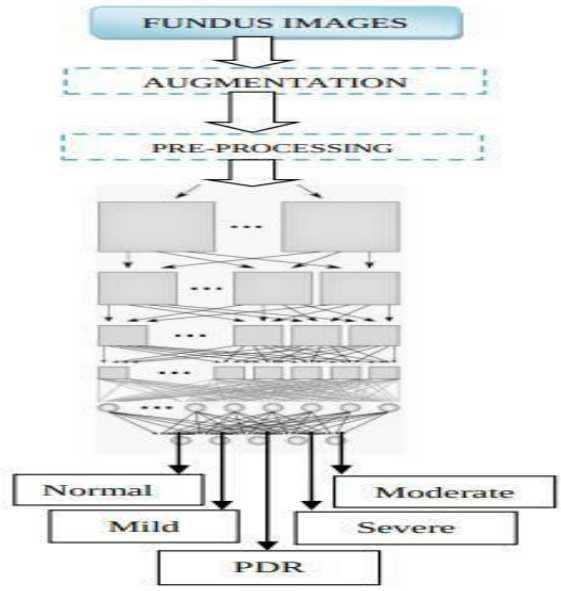
Prediction Of Diabetic Retinopathy

Machine Learning has been leveraged for a variety of medical images classification task including automated classification of DR. However, much of the work has focused on feature extraction engineering which involves computing image features specified by experts, resulting in algorithms built to detect specific lesions or predict the presence of many types of DR severity. Deep Learning is a machine learning technique that avoids such feature engineering by learning the most predictive features directly from the images given a large data set of tagged examples. Identifying candidate regions in medical images is of uttermost importance since it provides intuitive visual hints for doctors and patients of how the

diagnosis is inferred. Recently, advances in Deep Learning have dramatically improved the performance of DR detection.

Two-Step Paradigm:

The two-step automated DR detection paradigm was predominant in the field of DR detection for many years. Given a color fundus image, this type of solutions basically extracted visual features from the image based on anatomical structures like blood vasculature, fovea and optic disc using standard image processing methods such as Wavelet transform, Gabor iterations, Local Binary patterns, etc. With the extracted features, an object classification algorithm like Random Forests or AdaBoost is usually applied to identify and localize DR lesions. This approach forms the first phase of the work, producing feature-annotated images.



VII. ADVANTAGES OF PROPOSED SYSTEM

- It gives higher accuracy
- Show the probability of occurrences for different kinds of diseases
- Training of large amount of the inputs data.
- Give recommendations to the patient for further proceeding

VIII. CONCLUSION

Among other existing supervising algorithms, most of them are requiring more pre-processing or post-processing stages for identifying the different stages of the diseases. In our proposed solution, Deep convolutional Neural Network(DCNN) is a wholesome approach to all level of diabetic retinopathy, malaria and pneumonia. No manual feature extraction stages are needed. This network architecture with dropout techniques yielded significant classification accuracy. This approach easily enables the patient to analyse the presence of diseases on their own at the early stages of diagnosis. It will render a greater support for the doctors to treat their patients in an accurate way.

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