
Developing A Single Deep Learning Framework Designed To Model And Understand A Spectrum Of Different Diseases

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Abstract

Now-a-days several people die due to various diseases. Also, for every disease detection there include multiple technologies and techniques. As there are various Techniques and technologies, we developed a platform combining several diseases detection under one platform. In this we included the diseases Brain Tumor detection, Breast Cancer, Alzheimer, Pneumonia, Heart Disease detection and Diabetes detection. here we create a online web application where we merge all the techniques which are needed for various disease detection. A convolutional neural community is a deep getting to know set of rules which takes picture as an input and assign some weights and bias to various objects in picture and as a end result in a position to differentiate one from some other. Convolutional neural community can be capable of efficiently capture the spatial and temporal dependencies in an image via applicable filters in an utility. The main advantage of this convolutional neural is it process the image into a format where we cannot any features and also it becomes easier to process and we can get the results accurately. The architecture of convolutional networks is similar to human brains regarding the connectivity of neurons. For Brain tumor detection, Pneumonia detection and Alzheimer detection we use convolutional neural network. It is used for feature extraction. For Breast cancer and we use Random Forest algorithm. For heart disease detection we use XGboost which is a popular and efficient open-source implementation of the gradient boosted trees algorithm. The main advantage of this project is we can get the test results immediately with few clicks. By sitting in our home we can able to predict the whether the person is suffering from particular disease or not with a basic detail. This project is mainly focused on patients' perspective.

Keywords: convolutional neural networks, Brain Cancer, Alzheimer, Breast Cancer Pneumonia ,Vgg-16, Heart Disease , Diabetes Xgboost.

1. INTRODUCTION

Present there are many applications for detecting diseases. Those are for only one disease detection. In this case for detecting more than one disease it takes time, as all those applications are individual and only for one particular disease. It takes a lot of time and we need to go through many applications through image processing and some basic details. For heart disease Xgboost implementation of the ensemble learning algorithm boosting. Brain Tumor causes severe mental disabilities and other issues related to central nervous system. Excess growth of these tissues causes complications like paralysis and even sometimes death. Considering all these complications it would be better to detect brain tumor in early stage. Alzheimer is a neurocognitive disease occurring in people which causes memory loss, unusual behavior, language problems etc., A convolutional neural community with multi layers which includes pooling, SoftMax and completely interconnected layers assist to hit upon the ailment. A neural network increases the size of image and also decreases its complexity. Pooling process reduces the no of parameters and also the problem

of overfitting. Breast most cancers is one of the most dangerous cancers particularly amongst ladies The risk factors include family history, personal history, genetic factors etc., Genetic factors lead to change in BRAC1 and BRAC2 genes. The developing fashion of the prevalence of breast most cancers and the urgent want to give you a approach to reduce these probabilities, prognosis at an early degree can improve survival chances. For this we use Random Forest classifier. Here we proposed a solution of bringing various diseases under one platform. The disease includes of Heart disease, Breast cancer, Brain tumor, Pneumonia a, this platform we combined the above-mentioned diseases and we can able to detect the diseases in this platform. Pneumonia is a life-threatening infectious disease caused affecting lungs in humans. Diabetes is an extended lasting ceaseless This disease impacts the frame by using lowering the enzyme that incorporates sugar into the platelets. Random wooded area is a supervised reading set of policies. it is growing woods and randomizing it one manner or the alternative, the wooded location it constructs is a set of preference trees.

2. LITERATURE SURVEY

2.1. A coronary heart disorder Prediction version based on feature Optimization and Smote-Xgboost

This paper mainly explains about the heart disease detection using Xg-boost algorithm. in this information processing is a crucial level earlier than education since the nice of the data will at once affect the predictions made through the version. Xgboost is an implementation of the ensemble gaining knowledge of set of rules boosting [1]. The vital principle of the Xgboost is to train the model the use of residuals. The final results of the most today's tree education is applied as the input for the subsequent new release, and the mistake is regularly decreased over sever serial iterations. Finally, all weak learners are linearly weighted to produce the ensemble learner.

2.2. Brain Tumor Detection Using Convolutional Neural

This paper particularly explains approximately the mind tumor detection the usage of convolutional neural networks. Tumor is a aberrant boom of cells in a particular vicinity of a human frame. Brain Tumor causes severe mental disabilities and other issues related to central nervous system. Excess growth of these tissues causes complications like paralysis and even sometimes death [3]. Considering all these complications it would be better to detect brain tumor in early stage. This studies art work has proposed a model that involves an self-sufficient tumor detection approach for detecting cancerous tumor named Gliomas using convolutional neural networks, sturdy networks like VGG16 and VGG- 19 are used within the manner of detection of tumor and in addition this studies has used deconvolution technique at the VGG-16 version for a better feature extraction observed with the aid of CRF- RNN within the very last layer for kind purpose in place of FCN. a number of these outstanding fashions used for detecting mind tumor have done well and has yielded us a totally high accuracy fee [4].

2.3. Early prediction of Alzheimer's disease using convolutional neural

Alzheimer is a neurocognitive disease occurring in people which causes memory loss, unusual behavior, language problems etc., Early detection is essential and this paper concludes CNN with multilayer fetch more accurate results. A convolutional neural network with multi layers such as pooling, SoftMax and completely interconnected layers help to detect the disease. A neural network increases the size of image and also decreases its complexity. Pooling technique reduces the no of parameters and additionally the hassle of overfitting. The custom designed shape consists of data series, preprocessing[five], quality tuning and the class levels. wonderful-tuning is used to lessen mistakes with the assist of ImageNet. It uses the residual network with most efficient parameters ReLU and stochastic gradient descent set of regulations.

2.4. Early Diagnosis of Breast cancer prediction using Random Forest

This paper in particular explains approximately the Breast most cancers detection the usage of random wooded area set of guidelines. In current days Breast cancer is one of the most volatile cancers mainly amongst girls. The risk factors include family history, genetic factors etc., Genetic factors lead to change in BRAC1 and BRAC2 genes. once the data is collected Random Forest algorithm selects random subset of data and it generates a various number of decision trees. After that it compares decisions of all the generated trees. This is because a single decision tree had more probability of error, so when we include many decision trees the error will be reduced and accuracy increases [7]. This set of rules makes use of the idea of weights while considering the effect of each output selection from any of the selection timber. A tree with immoderate mistakes is given low weight and tree with low errors is given high weight.

2.5. Pneumonia Detection using CNN based feature Extraction

Pneumonia is a existence threatening infectious disease delivered on affecting lungs. as the deep mastering Algorithms are successful in analyzing scientific images, Convolutional Neural Networks have gained an entire lot interest for category of illnesses. in addition to that talents located with the aid of pre-knowledgeable CNN fashions are an awful lot beneficial in photo type responsibilities [11]. The main goal of using CNN is to reduce the computational complexity of models. with CNN it is also easy to process the image without losing any critical features. After the features were extracted through exceptional versions of pre-professional CNN fashions and with applicable capabilities, the photos may be classified based totally on the skilled models.

2.6. class of Diabetes using Random wooded place with function choice

This paper mainly deals with predicting diabetes using Random Forest. Diabetes is a long-lasting ceaseless illness that impacts the body via decreasing the enzyme that contains sugar into the platelets. This will increase the frame's glucose quantity, inflicting full-size problems along with stroke, lung infection, vision, renal disability, and mortality. Diabetic patients indicate loss of weight, obscured vision, infections, frequent urination, and lots of others. Random wooded area is a supervised studying set of guidelines. [13] It is developing woods and randomizing it come what may. Additionally, the forest it constructs is a set of choice bushes, knowledgeable maximum of the instant through the bagging technique.

3. DESIGN

3.1. PROPOSED SOLUTION

The main aim behind this application implementation is to combine all the various disease detections under one platform. In this we use different techniques for different diseases detections. As we are considering the image processing for classification of diseases. MRI scan images is required. For scanning of MRI scan images CNN is best suitable option, because CNN reduces the size of the image without losing its features. Moreover, it also reduces the nod of parameters and computational complexity. CNN makes the image easier for recessing. Due to this reason CNN is very successful in detecting or classifying the diseases. In this application we give the MRI scan images as input. when we upload the image, it compares the given image with trained models and give the output result based on the trained models. As it includes all the diseases detection in one platform it is easy to check whether that particular person is suffering from disease or not with the help of MRI scan images and basic details. The main advantage is we can check it from anywhere. Even sitting in home, we can get the test results immediately with one click. It saves time and accuracy will be more.

3.2. RELATED WORK OF SYSTEM

In this project mainly we designed a attractive web site regarding the details of patients, uploading a image, various types of diseases. In this application for any disease, we collect the basic details including name, age, mobile number and upload image in order to upload their scan image. once the image successfully uploaded it give the test report whether it is positive or negative.

4. METHODOLOGY

In this project, we construct a frontend for a webpage using HTML, CSS, Bootstrap, Flask to display the results to the users and Patients, which employs the Python programming language to grasp different algorithms and the workings of Deep Learning technology.

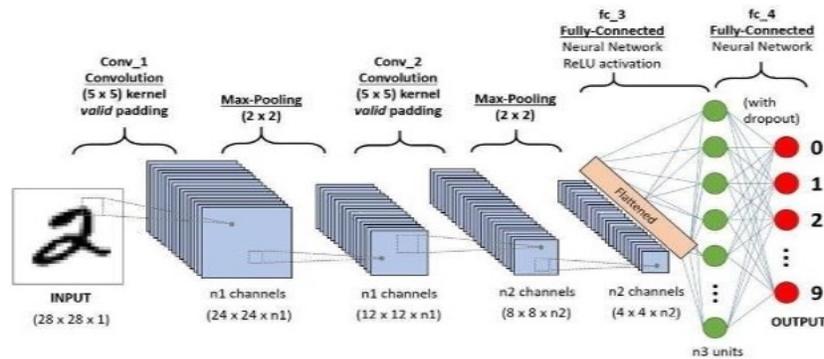


Fig : Project Architecture

Patients can check the status of the disease by using this application by uploading the data given by the test samples. User Interface is very easy to understand no need of any know the process to check the status of the disease.

4.1. Algorithm:

Algorithms we used in this project are XG-Boost, CNN, VGG16, Random Forest.

- **XG-Boost:**

XG-Boost is a gradient-boosting decision tree-based ensemble learning algorithm that uses a gradient boosting framework. It is used for both classification and regression. It predicts the results based on decisions of tree outputs. Initially it forms a weak classifier based on some features. It is a step by step process, for every new feature adding it forms a new classifier and it compares the performance of a current classifier with before one. While adding features one by one, it also reduces the overfitting problem. In this project we use XG-Boost for heart disease based on the parameters like type of chest pain, maximum heart rate achieved, thalassemia, major vessels etc.,

VGG-16:

VGG-16 is a convolutional neural network model used for image recognition. It's unique in that it has only 16 layers that have weights and hyperparameters. Among 16 layers, 13 are convolutional neural network layers and 3 are fully connected layers. Feature extraction, object detection and semantic detection are the features of algorithm. In this project we use VGG-16 for brain tumor based on the parameters like intensity, texture, abnormal condition of brain, growth of tissues etc.,

CNN:

A convolutional neural network is a type of deep learning neural network architecture, neural networks are used in various datasets like images, audio and text. In this project we use CNN mainly for image processing. CNN takes the input image, it resizes the image i.e. change in length or breadth without losing its features. It also adds some weights and bias and thus is able to differentiate from another. Pneumonia, Alzheimer are detected by using CNN.

B

Random Forest is a famous machine learning algorithm that belongs to the supervised learning technique. It's based totally on the concept of ensemble learning. The extremely good range of timber within the wooded location ends in better accuracy and stops the trouble of overfitting. Initially it selects some random samples from a given data. This algorithm will construct a decision tree for every training data.

Balloting will take region through averaging the selection tree. Ultimately, choose the maximum voted prediction consequences due to the fact the very last prediction is the end result. For diabetes and Breast most cancers we use the Random Forest vicinity set of rules.

1. Mentioned the algorithms used for specific disease: pneumonia 83.17% (CNN)

heart disease: 86.96% (XGBoost) Diabetes: 66.8% (Random Forest) Alzheimer: 73.54% (CNN)

breast cancer: 91.81% (Random Forest) brain tumor: 100% (CNN, VGG16)

2. User Interface (UI):

We design User Interface for uploading the images/reports and checking the status of the disease. User Interface shows the Patients or Users can interact the website regarding to know the status of the patients.

5. RESULT AND ANALYSIS:

Clients need to open the website and add their credentials in the form.

The image shows a registration form at the top with fields for Firstname, Lastname, Phone No., Email, Gender (with a dropdown menu showing 'Male'), Age, Concave Points Mean, Area Mean, Radius Mean, Perimeter Mean, and Concavity Mean. Below the form are two test result screens. The left screen is titled 'Brain Disease Test Results' and shows a brain scan image with the following details: First Name: john, Last Name: player, Age: 20, Phone: 9676926948, Email: johnplayer@gmail.com, Gender: male, BrainTumor: No Tumor, Alzheimer: ModerateDemented. The right screen is titled 'Breast Cancer Test Results' and shows a 'Fight Breast Cancer' logo with the following details: First Name: Sarjana, Last Name: Kumar, Age: 22, Gender: female, Result: BENIGN.

Fig 2: Breast Cancer Test Results

The image shows an 'Alzheimer Test Results' screen with a brain scan image and the following details: First Name: Abhishek, Last Name: Sharma, Age: 21, Gender: male, Result: NonDemented.

Fig 4: Diabetes Test Results5.Pnuemonia Detection

The image shows a 'Pneumonia Detection' registration form with fields for Firstname, Lastname, Phone No., Email, Gender (with a dropdown menu showing 'Male'), Age, and a file upload section for 'Upload your Chest Scan' with a 'Choose File' button and 'No file chosen' text. A 'Submit' button is at the bottom.

Fig 5:Pnuemonia Detection6.Heart Disease

Fig 6: Heart Disease Test Results

6. CONCLUSION

CNNs to predict various diseases under one platform has the potential to transform medical diagnosis and treatment by providing highly accurate and automated disease classification systems that are efficient and cost-effective. It could potentially save lives by enabling earlier diagnosis and treatment of various diseases. CNN-based disease prediction platforms have shown promising results in identifying and classifying various diseases such as Breast Cancer, Heart Disease, breast cancer, Pneumonia and many others. As the use of medical imaging continues to grow, the potential for CNN-based disease prediction platforms to improve patient care and outcomes will only increase.

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