

Design and analysis of Medical Image to prediction of disease using ML over AWS cloud

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ABSTRACT

Digital imaging and communication in medicine (DICOM), MRI, CT, PET, etc. are used by various medical implements. Medical image analysis and visualization systems have become a very important tool that affects humanity and affects people's web content for collecting opinions on medical images, working with real-time interaction with online web discussions. Medical Image Analysis and Imagination Basically focus on developing image properties and finally detect wounds. With the increasing popularity and usage of mobile and tablet devices, the need for mobile partner tele-radio radiology applications has also increased. Our project targets are not only aimed at creating a portable medication image viewer but also providing collaborative entitlement capabilities. The purpose behind the use of the Android platform for the proposed mobile system is because of the creation and licensing of high and third parties. In the mobile environment, Decom Viewer applications satisfy additional surplus criteria satisfied with desktop equivalents, such as portability, ease of use etc. Here we present the proposed Android-based Portable Medical Image Viewer and collaborative annotation system architecture. We have targeted viewers and associate annotation systems and discussed their important problems and challenges. The proposed mobile system can help enable quick suggestions / experts at any time. Mobile technologies (especially in times of danger / critical moments), these experts can always stay connected wherever they are.

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I. SYSTEM COMPONENTS

It has four parts: viewer components, preferred store components, browse and import components and collaborative modules.

Viewer components are critically important components of the proposed mobile phone. It connects to other components and manages the flow of information between the user and the system, and it uses the touch gestures required for system control. Its first sub-component is the DICOM reader, which creates the necessary functionality to read DICOM images and related metadata. The second sub-element is a generic image reader that focuses on understanding compact damaged JPEG images. The last sub-component is the tools needed to highlight the areas of interest, the equipment module. Viewer components are browsed and imported with components, preferences shops, and cooperative module components.

The Preferred Store module applies the conventional system preferences settings to load mobile devices.

The browse and import element is a module that is designed to scan the local directory of mobile devices for disoch files. An import function is used

to import local DoCoMo files and its location and metadata are stored in SQLite database.

Collaborative module elements are an important element in the medical image viewer vaccine system. It is a very different physical site, real time, without real data change. Medical professionals can use this function to see proper medical images or Radiologist reports and to handle conferences in real-time. Associate Module uses tools from tool modules. Drawing member's rectangle, freehand size, or measurement device in the discussion session. Associate models are used to import medical images from foreign sources.

Two sub-components have been created to support collaboration modules: row manager and socket communication.

Routes manager is created to manage multiple users' notes by applying the authorization process to avoid data loss at the same time - the queue created in collaboration with multi-mobile users.

Later, Socket Communications Modules design an ideal socket-based system on Android to connect to Java Sockets running towards the server. Collaborative modules offer seamless collaborative extension functions, depending on a stable client-based server implementation,

For the database, we use SQLite relational embedded database to store information. We design the implementation of a collaborative server with the provision of framework for the proposed mobile system collaboration entitlement.

II. PROPOSED SYSTEM COMPONENTS

It has four parts: viewer components, preferred store components, browse and import components and collaborative modules.

Viewer components are critically important components of the proposed mobile phone. It connects other elements and manages the flow of data between the user and the system, it also applies the touch gestures needed to control the system. Its first sub-component is the DICOM reader, which creates the necessary functionality to read DICOM images and related metadata. The second sub-element is a generic image reader that focuses on understanding compact damaged JPEG images. The last sub-component is the tools needed to highlight the areas of interest, the equipment module. Viewer components are browsed and imported with components, preferences shops, and cooperative module components.

The Preferred Store module applies the conventional system preferences settings to load mobile devices.

The browse and import element is a module that is designed to scan the local directory of mobile devices for disoch files. An import function is used to import local decomo files and its location and metadata are stored in SQLite database.

Collaborative is one of our recommended collaborative annotation systems. It allows many experts from various and annotates during the photo without changing the original data. Medical professionals can use this function to see proper medical images or Radiologist reports and to handle conferences in real-time. Associate Module uses tools from tool modules. All members' display screens in the discussion session cover rectangles, freehand shapes, or drawings of measurement devices. Associate Module also provides imported medical images from foreign sources.

Two sub-components have been created to support collaboration modules: row manager and socket communication.

To avoid data loss for multiple reasons at multiple times, the vaccine manager is ready to create notes by promoting the process of annotations to handle different user annotations. Designed to cooperate servers to serve multi-million queue users.

Later, the Socket Communications module designs an ideal socket-based approach to Android to connect to Java Sockets on the server side. Collaborative Modules to offer simulated

collaborative encryption functionality based on a stable client-based server implementation,

For the database, we use SQLite relational embedded database to store information. We design the implementation of a collaborative server with the provision of framework for the proposed mobile system collaboration entitlement.

Implementation:-

This project consists of 3 things, i.e. An android application for the user interface, A Server for uploading images, the Machine learning algorithm for analysis.

Description:-

Main Activity:-



Fig1 : Home Screen of Android App

Login id and password is provided to the user to use the application. Else, he has to register himself. These all information is stored in the mobile database. Means every mobile has its database. Multiple users can use that application. Once log in user need not log in repeatedly, he will redirect to another activity directly.

Register Activity:-



Fig2: Registration Screen of Android App

In this activity, the user registers himself by providing his name, email, password, mobile number, address and specialisation. There is a constraint on email id. As it is unique, no two users can have the same email id. This whole information is stored in Sqlite Database in the User table. Once added, a Message would appear that "User added" which confirms that user details are successfully entered in the database.

Menu Activity:-



Fig3: Upload image on Android App for analysis

There are two options

1. Info – this will show the details or profile of user login in the system.
2. Upload Photo – this will give the power to upload the picture from the gallery and analyse it.

Details Activity:-



Fig4: Out of MIA on Android App

This merely displays the information that the user has entered. It is just a view. One cannot change the information in it.

Upload Activity:-



Fig5: Image show at MIA on Android App

The upper part, the, i.e. image is showing the preview of the perception that the user has chosen from the gallery.

Choose button helps the user to choose the image from the gallery and analyses it.

Upload button will upload this image to the server, and when the response comes back, it will take the user to another activity and show the user.

Consult Activity:-

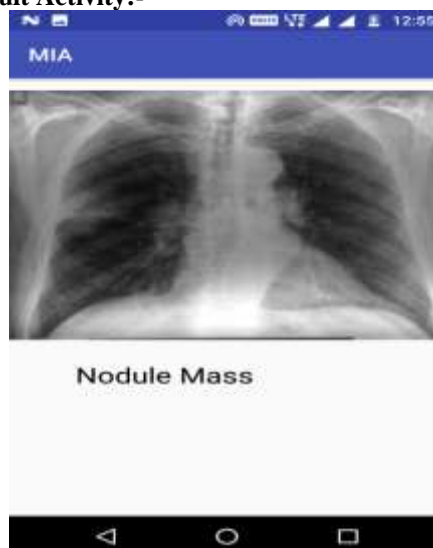


Fig 6 : Output after analysis of MIA on Android App

This activity is showing the image that the user chooses and its result after analysis.

Machine Learning Process

It consists of two parts, first is a training model and the second other is prediction using the trained model before. For connecting with android app Django is used, which web framework is written in python.

- From frontend side (i.e. android app) POST request is generated which contain an image as a multipart file object. This request hits on the server endpoint (<http://ip-address:port/api/>)
- Django project is running, where the application is processed, and the response is sent back.

Basic flow (backend)

Data Flowchart:-

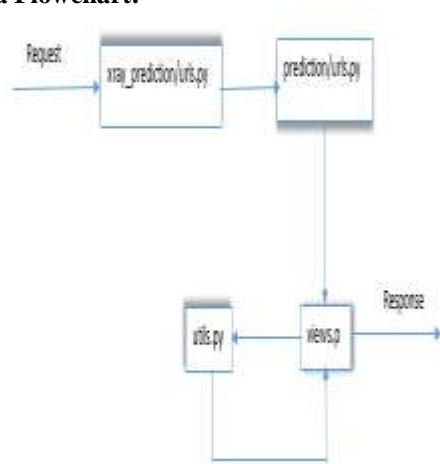


Fig 7 : Framework design for MIA

Model Training Part

For the training part, the most important step is preprocessing. The accuracy of the trained model depends on this step. Pandas, python library, is used for this. These are the steps:

1. First drop unused column (i.e. view position, OriginalImageWidth ...)
2. Second, create new columns for labels, which contain diseases names which we want to predict.
3. Third, fix missing values. Fill missing values with the mean of that column.
4. That's all for preprocessing, at this stage we got cleaned data.
5. Now we create a function, which process images and resize all the images and store pixel information in numpy array.
6. Now split data for training and testing, for this we use `train_test_split()` function it is available with scikit-learn a python library. It takes input, output and ratio in which our data is distributed.
7. It is time to define our model. For model training Keras is used, which is high-level neural

networks API, written in python and backed byTheano. We use VGG16 predefined weight available with Keras application. We only need to instantiate our model.

8. After this, the above-defined model needs to compile with our data and save it into the disk.
9. The output of this process is the two files `model.json` and `model.h5`. One contains information about the model, and the other one includes weights.

Prediction Part:

1. First, we need to load the model by using the `model.json` and `model.h5`
2. After this read image and convert into numpy array and feed into the model it gives the response in the form of the vector you need to turn it first by using the `numpy.argmax` function, and finally you get the label value to compare it with the defined dictionary you got the disease name.
3. To connect it with android Django is used.

Backend workflow:

1. Initial file structure.

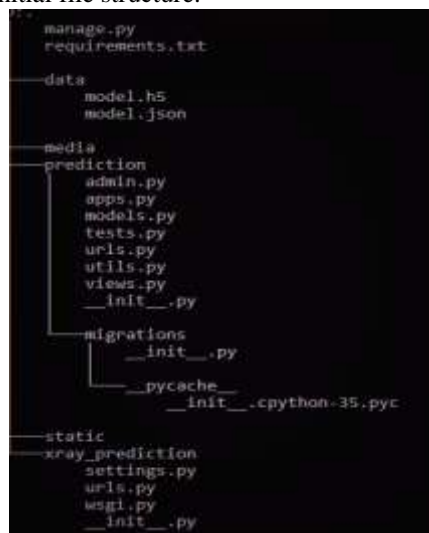


Fig 9: Background server configuration detail

2. When Post request is hit on the server, then slug is compared in the path mentioned in `urls.py` in `xray_prediction`. The post request is hit on <http://ip-address:port/api/> then slug is API. In `urls.py`, similar views are defined, i.e. it includes another `url.py` from `prediction` and in `prediction/urls.py` `get_image` is mapped.
3. `get_image` is function defined in `prediction/views.py`
4. First, it takes the image from request body as the `request.FILES['file']` and stores in the media folder.

5. After this predict function is called, it takes image path as argument. predict function is defined in prediction/utills.py
6. In this first pre-trained model is loaded and compiled, then read an image from the path using pillow a python library and resize and convert into numpy array.
7. Now call loaded_model.predict() and pass the image array, it returns vector, first converted into the key using np.argmax function and return the value of that key mapped in dict_characters(mentioned in utills.py).
8. Now we got the result from the predict function, and we have to give the response of the request we received, so return JsonResponse result as the key and predict output as value.
9. After this response is shown on the android screen.

III. CONCLUSION

We have developed a viewer and collaborative annotation system and discussed its significant difficulties and challenges. The proposed mobile system could help to enable rapid consultation/diagnosis by allowing medical specialists to arrive at any time. These experts can always stay connected wherever they are by mobile technologies (especially during dangers/critical moments). We proposed to create an viewer and collaborative annotation system and we debated its important advantages and disadvantages. The proposed mobile network is used to enable rapid consultation by allowing medical experts to reach at any time. These experts can always stay connected wherever they are by mobile technology (especially during emergencies/grave moments). This collaborative feature, believe is a first for Android based mobile devices, could help in providing enhanced diagnosis and cure in surgical planning and the procedures that follow.

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