Medical Diagnosis using AI

Github Repository for Prototype: -
https://github.com/sarthaksahni1/AiConclave-Medical

Final solution:

Our final solution consists of three Deep Learning models that offer accuracies of over 90%, and can be quite reliably used for a quick check or a second opinion on diseases. These models are hosted using a Flask-based API, for which these models had to be turned into a service.

After installing the required libraries, one would just need to run the api.py file, which would start the server on the local host. This would host three links, which, after payment for the service, allow users to upload their image and give them an accurate prediction of the disease.

Some of the diseases we would be tackling with this project are:

1. **Eye diseases -**
    a. Choroidal neovascularization (CNV)
    b. Macular Edema (DME)
    c. Drusen (DRUSEN)

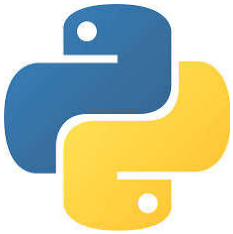
    These diseases can be diagnosed using OCT imaging. This technique makes use of images of the retina and a physician checks them to reach a conclusion. However, this is not very accurate.

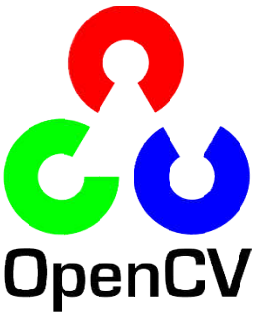
2. **Malaria Detection -**
    Here we are using Keras to detect Malaria from Images. The model used is a ResNet50 which is trained from scratch. The images in this dataset are divided into two categories: -
    Parasitized
    Uninfected

3. **Skin Cancer -**
    Skin cancer, the most common human malignancy, is primarily diagnosed visually, beginning with an initial clinical screening and followed potentially by dermoscopic analysis, a biopsy and histopathological examination.

Automated classification of skin lesions using images is a challenging task owing to the fine-grained variability in the appearance of skin lesions.

TECH STACK





REFERENCES AND DATASETS

1. **Diagnosis of eye diseases using OCT imaging**
   Dataset used – We are using OCT images dataset found on Kaggle (https://www.kaggle.com/kmader/eye-oct-datasets/home)

2. **Malaria Detection using keras**
   Dataset used – The dataset contains 2 folders:
   Infected
   Uninfected
   And a total of 27,558 images.
   (https://www.kaggle.com/iarunava/cell-images-for-detecting-malaria)

3. **Skin Cancer (Melanoma) detection**
   Research paper link -
   https://web.stanford.edu/group/blau/pdfs/Esteva_Thrun_2017.pdf
   Dataset - https://s3-us-west-1.amazonaws.com/udacity-dlnfd/datasets/skin-cancer/train.zip\

MODELS USED

1. **Diagnosis of eye diseases using OCT imaging**

Approach used – Transfer learning + Feature Extraction

- We would be using an InceptionV3 model trained for the ImageNet dataset as the base model for transfer learning; after removing the fully connected upper layers.
- This base model would be used to extract bottle-neck features for the next layer.
- The next layer is a shallow neural network with a Convolution 2d layer that can take the saved inputs from the previous layer.

2. **Malaria Detection using keras**

Approach used – 4-class classification using deep neural networks with CNN

- Unsupervised feature extraction using ImageNet dataset.
- Using LightGBM as a fast, distributed, high performance implementation of gradient boosted trees for supervised classification.
- Training using a 10-fold cross validation method with data augmentation.

3. **Skin Cancer (Melanoma) detection**

Approach used – Deep CNN using ImageNet model as base for transfer learning

- Google InceptionV3 model used to train to the dataset.
- Developing CNN that matches performance of dermatologists in melanoma classification, melanoma classification using dermoscopy and carcinoma classification.

4. **Flask implementation**

We are running the above-mentioned systems under a single Flask based portal. This would allow a democratization of our service and thus, extending our cause.

Competitive Analysis and/or Business Impact

Our solution provides an accuracy of more than 90%. But what truly makes this solution novel is that it would be open for development. Anybody can propose a medical imaging model and we would add that to our service so that we can help people out.

Each request would cost a nominal amount to the end user, which would be executed through online payment apps like PayTM or Google Pay using the QR code. This code would flash on the screen and users would be allowed to proceed only after the payment has been made.

We believe that this product has a lot of greatness to achieve and we would be open to any and everything that would help us get it there

FUTURE SCOPE

We would be adding other AI models that would provide diagnosis for:

- Tumor
- Colon Cancer
- Prostate Cancer
- Diabetic Retinopathy

Moreover, any other model developed by anybody can be deployed on the website.