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# An Hospital Application Involving Deep Learning Methodology for Detecting Six Different Types of Thyroid Diseases

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**ABSTRACT:** In detection of six different types of thyroid disease using Deep learning methodology we develop and apply a novel deep learning architecture to effectively detect and identify the presence of five different thyroid diseases such as Hyperthyroidism, Hypothyroidism, Thyroid cancer, Thyroid nodules, Thyroiditis and to check for normal thyroid without the need of several consultations from different doctors. This leads to earlier prediction of the presence of the disease and allows us to take prior actions immediately to avoid further consequences in an effective and cheap manner avoiding human error rate. A web application will also be developed in which an input scanned image will give the output of the type of thyroid disease saving a lot of time and money invested by the patients.

**KEYWORDS:** Preprocessing, Neural networks, Novel Architecture, Deep learning

## I. INTRODUCTION

Thyroid is one of the most important parts of our body. As part of the endocrine system, this small gland in our neck secretes thyroid hormone, which is responsible for directing all our metabolic functions. When the thyroid malfunctions, it can affect every facet of our health. Thyroid disease is a major cause of formation in medical diagnosis and in the prediction, onset to which it is a difficult axiom in the medical research. Early detection of thyroid diseases is the top priority for saving the lives of many. Typically, visual examination and manual techniques are used for these types of a thyroid disease's diagnosis. This manual interpretation of medical images demands high time consumption and is highly prone to mistakes.

## II. RELATED WORK

The earliest work is to propose a highly automatic and objective model named online transfer learning (OTL) for the differential diagnosis of benign and malignant thyroid nodules from ultrasound (US) images. The OTL method combined the strategy of transfer learning and online learning.

## III. METHODOLOGY

The CT images of thyroid gland undergo various processes such as Preprocessing, Training, Prediction and finally subjected for the Classification. The Schematic Diagram of this process is shown

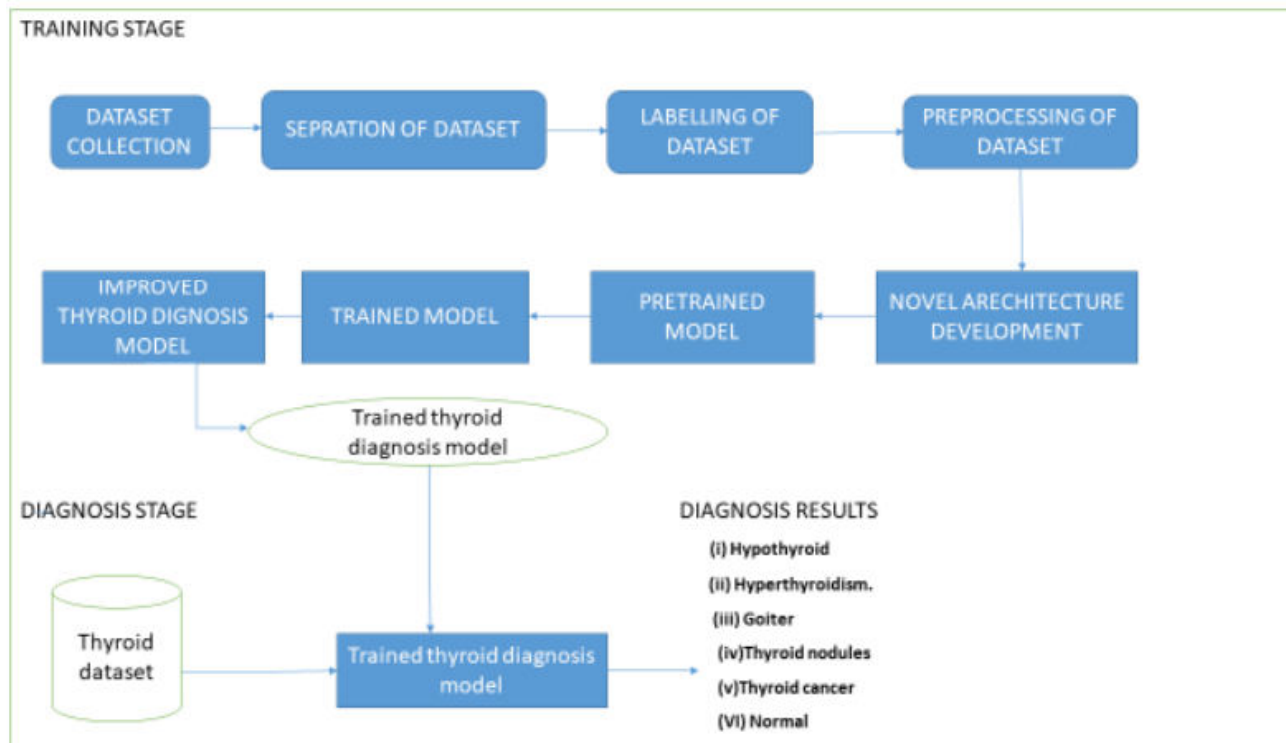


Figure 1: Schematic Representation of thyroid disease detection

- **DATASET COLLECTION**

In any deep learning projects dataset is necessary to train the model to perform various actions.

- **DATASET SEPARATION**

In this project dataset will be separated in 75:25 ratio (i.e. 75% of the data will be used for training the model while 25% will be used for testing the model)

- **DATASET LABELING**

In deep learning dataset labeling is the process of identifying raw images and makes system to track the required information easily.

- **PREPROCESSING**

Pre-processing is the process done before any further analysis of the image is done in order to improve the quality of the image so that analysis becomes easier. In this Preprocessing stage we are going to make all the dataset to the same resolution.

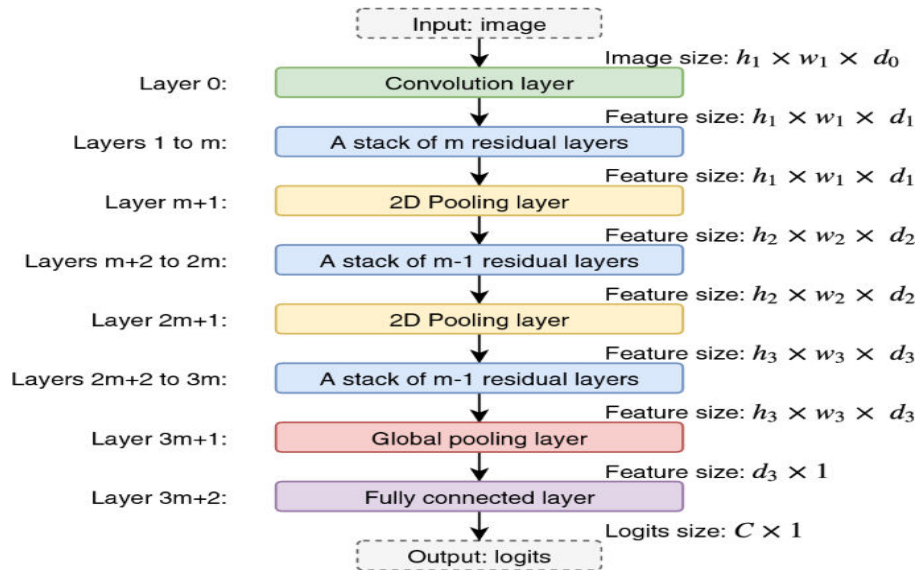


Figure 2: Novel architecture diagram

• TRAINING PROCESS

Training process is iterative, it progresses step by step with small updates to the model weights for each iteration and, in turn, a change in the performance of the model each iteration.

```

Activities Text Editor
Wed 15:08
thyroid_dtypes.txt
Save

epoch 14/20
151/151 [=====] - 5s 32ms/sample - loss: 0.5598 - acc: 0.9868
15/15 [=====] - 109s 7s/step - loss: 0.6467 - acc: 0.9448 - val_loss: 0.5615 - val_acc: 0.9868
Epoch 15/20
151/151 [=====] - 5s 34ms/sample - loss: 0.5600 - acc: 0.9868
15/15 [=====] - 107s 7s/step - loss: 0.7882 - acc: 0.9294 - val_loss: 0.5618 - val_acc: 0.9868
Epoch 16/20
151/151 [=====] - 5s 31ms/sample - loss: 0.5531 - acc: 0.9868
15/15 [=====] - 107s 7s/step - loss: 0.6644 - acc: 0.9647 - val_loss: 0.5543 - val_acc: 0.9868
Epoch 17/20
151/151 [=====] - 5s 34ms/sample - loss: 0.5543 - acc: 0.9868
15/15 [=====] - 107s 7s/step - loss: 0.6190 - acc: 0.9647 - val_loss: 0.5557 - val_acc: 0.9868
Epoch 18/20
151/151 [=====] - 5s 32ms/sample - loss: 0.5486 - acc: 0.9934
15/15 [=====] - 107s 7s/step - loss: 0.6464 - acc: 0.9536 - val_loss: 0.5489 - val_acc: 0.9934
Epoch 19/20
151/151 [=====] - 5s 34ms/sample - loss: 0.5604 - acc: 0.9801
15/15 [=====] - 107s 7s/step - loss: 0.6609 - acc: 0.9735 - val_loss: 0.5619 - val_acc: 0.9801
Epoch 20/20
151/151 [=====] - 5s 32ms/sample - loss: 0.5549 - acc: 0.9868
15/15 [=====] - 106s 7s/step - loss: 0.6451 - acc: 0.9382 - val_loss: 0.5563 - val_acc: 0.9868
loss
acc
val_loss
val_acc
[INFO] evaluating after fine-tuning...
      precision    recall  f1-score   support

thyroid_cancer      0.96      0.96      0.96        26
thyroid_dttis      0.95      1.00      0.98        21
thyroid_gotter     1.00      1.00      1.00        20
thyroid_hyper      1.00      1.00      1.00        27
thyroid_nodule     1.00      1.00      1.00        34
thyroid_normal     1.00      0.96      0.98        23

 avg / total      0.99      0.99      0.99       151

[INFO] serializing model...
    
```

Figure 3. Module file generated



Figure 4: Graph plot after the training process

#### IV. RESULT

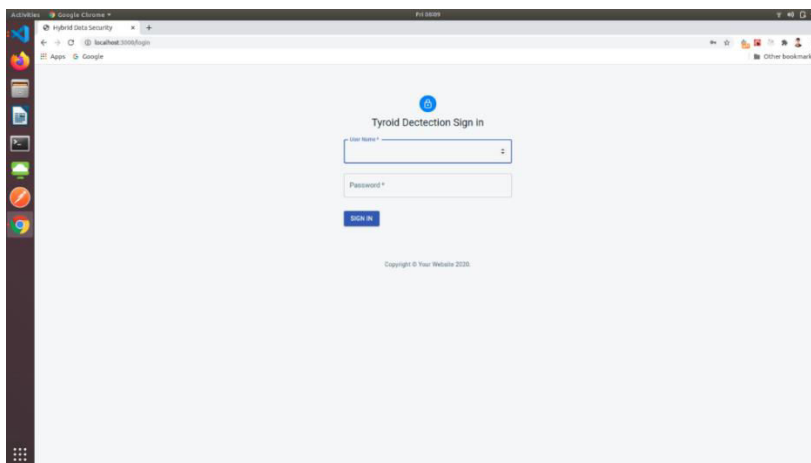


Figure 5: Thyroid webpage login page

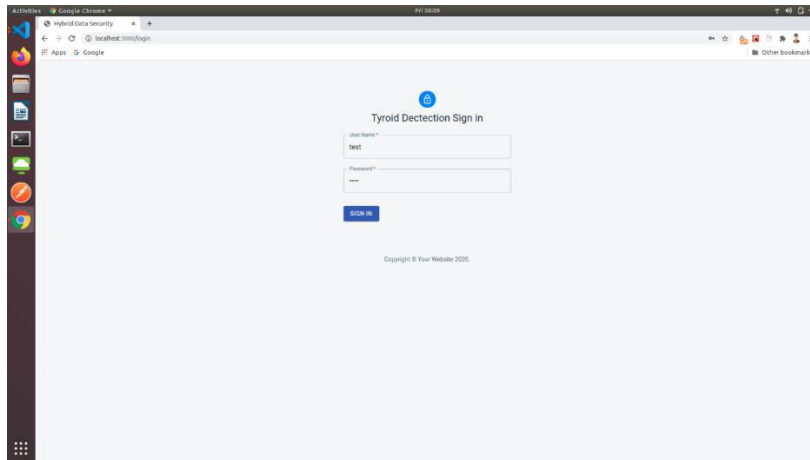


Figure 6: Thyroid sign-in page

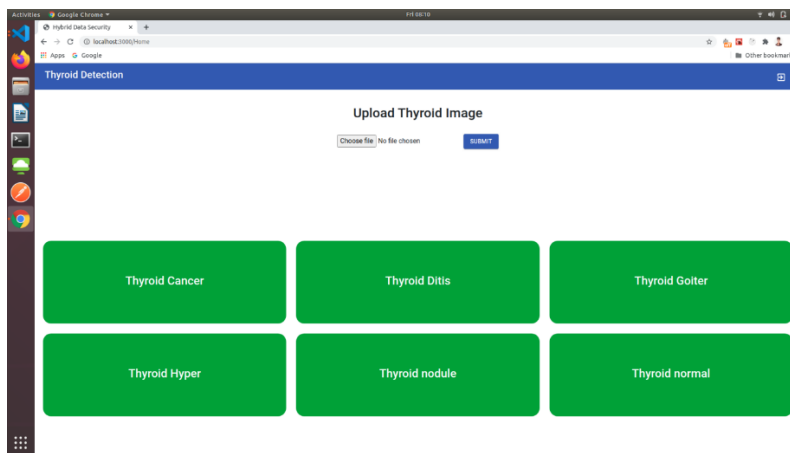


Figure 7: Sign-in successfully

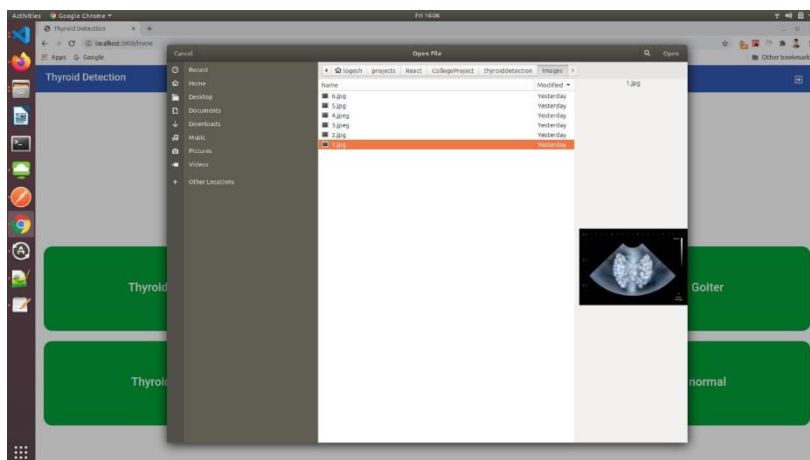


Figure 8: Image upload

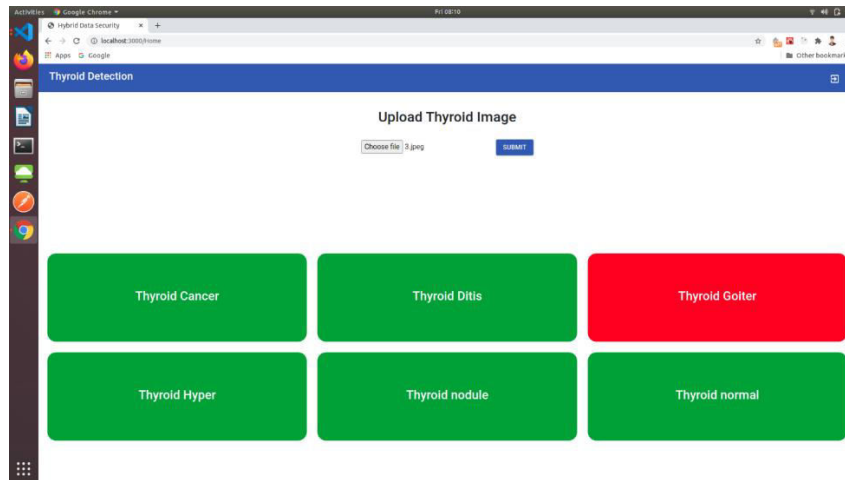


Figure 9: Result

## V. CONCLUSION

The principle objective of the paper is to provide an automated method which is used to find the presence of thyroid diseases and provide prior measures to avoid the disease, using a web application developed using reactJS. This also help in providing efficient treatment in a most cheap way and eventually reduce the time required for finding the thyroid diseases in the current state. it is done manually which consumes more time and also involves human error rate. So, reduces the time required for manual classification and eliminates the human error rate by this project.

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