**Synopsis**

**For**

**Detection of Diabetic Retinopathy and Thyroiditis using Artificial Neural Networks**

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**Motivation**

* Autoimmune diseases are highly misdiagnosed, due to having symptoms very similar to other diseases.
* These diseases get detected at very severe stages where no cure can help.
* If these diseases are detected at an early stage, it can be cured.
* For detection of these diseases, expert clinicians are needed and a lot of time is consumed in detection.
* Our goal is to help clinicians detect these diseases quicker and more accurately, so as to help patients get the cure.

**Problem Statement**

Making a software which assists a clinician to detect

* Presence of Thyroiditis and it’s type or absence of specified disease using artificial neural network
* Presence of Diabetic Retinopathy and its level of severity or absence of it using convolutional neural network

Assumptions:

* Dataset used while training have same attributes which are used for detection manually
* In case of thyroiditis clinician operates software on same data attributes which were used during training

Constraints:

* Getting datasets from hospital was difficult due to privacy reasons hence use of standard data available online was required limiting model to train of real time data.
* High end resources required for faster training isn’t available for us hence training will take long

**Method**

* Diabetic Retinopathy
  + Using image preprocessing techniques such as normalization,scaling,etc for improving image quality for model to perform better
  + Building convolutional neural network using tensorflow framework and keras library
  + Training performed on google colab
  + Prediction is on 1-5 class. 1 - no DR, 2 - mild DR, 3 - moderate DR, 4 - severe DR, 5 - proliferative DR.
* Thyroiditis
* Preprocessing thyroid dataset to remove missing and erroneous values
* Construction of artificial neural network in python and training it using cross validation method in order to make efficient use of available dataset
* Prediction is on 1-3 class. 1 - hypothyroidism, 2 - hyperthyroidism, 3 - no thyroiditis

**Expected Result**

* Diabetic Retinopathy
  + A system which should give fast and highly accurate results.
  + The system should properly preprocess the input images.
  + The system should detect and classify Diabetic Retinopathy.
  + System should be easy to use and should be robust.
* Thyroiditis
  + The system should be highly accurate, robust and easy to use.
  + The system should properly preprocess the input values and handle missing values.
  + System should detect and classify Thyroiditis in acceptable time.

**Related Work**

* Alex et al.[1] proposed a model for classifying retina images as having Diabetic Retinopathy using convolutional neural networks trained with transfer learning. This system could not classify the severity of Diabetic Retinopathy.
* Pratt et al.[2] proposed a CNN approach to diagnosing DR from digital fundus images and accurately classifying its severity.
* Xu et al.[3] explored the use of deep convolutional neural network methodology for the automatic classiﬁcation of diabetic retinopathy using color fundus image, and obtained an accuracy of 94.5%. They also experimented various other methods like Support vector machines, Linear discriminant analysis, K-nearest neighbour and later compared their accuracies with each other.

**References**

* [1]Alex Tamkin , ”Deep CNNs for Diabetic Retinopathy Detection”
* [2]Harry Pratt, ”Convolutional Neural Networks for Diabetic Retinopathy” International Conference On Medical Imaging Understanding and Analysis, 2016
* [3]Kele Xu, ”Deep Convolutional Neural Network-Based Early Automated Detection of Diabetic Retinopathy Using Fundus Image” Molecules MDPI, 2007