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**CSC 227 (Retake)**

**HYPOTHYROID DISEASE DETECTION SYSTEM PROPOSAL**

# Problem Definition

Hypothyroid disease, or better known as thyroid disease, is a health complication that arises around the neck area when the patient’s body fails to produce enough thyroid, or produces too much thyroid.

*Types of thyroid disease*

1. Hyperthyroidism - When the thyroid gland produces too much thyroid hormones
2. Hypothyroidism - When the thyroid gland produces minimal thyroid hormones
3. Thyroiditis
4. Hashimoto’s thyroiditis

*Thyroid gland*

The thyroid gland is a small organ located at the front of your neck, and wraps around the trachea. The said gland produces vital hormones that help for normal functioning of someone’s body. The hormones also control the body’s metabolism.

When your thyroid doesn’t work properly, it can impact your entire body.

If your body makes too much thyroid hormone, you can develop a condition called [hyperthyroidism](https://my.clevelandclinic.org/health/diseases/14129-hyperthyroidism).

If your body makes too little thyroid hormone, it’s called [hypothyroidism](https://my.clevelandclinic.org/health/diseases/12120-hypothyroidism).

Both conditions are serious and need to be treated by your healthcare provider.



*Thyroid Disease*

Thyroid disease is a medical condition that prevents your body or in this case your thyroid gland from producing the right amount of hormones for metabolism.

This will cause swelling around the neck area and the body will start behaving abnormally.

In this case we will focus on hypothyroidism where the thyroid gland produces less than enough thyroid hormones. This causes symptoms such as tiredness and gaining weight among others.

Thyroid disease can affect anyone, symptoms being prevalent among men, women and children alike. It is more common among women, as they have a 5 times probability of contracting the disease as opposed to men or children.

People with a family history in thyroid disease and the elderly are also more likely to contact the ailment.

Patients with **diabetes** are also highly likely to contract the disease.

*Symptoms*

Symptoms of hypothyroidism include:

1. Fatigue
2. Gaining weight
3. Forgetfulness
4. Frequent menstrual periods (among women)
5. Dry hair
6. Course voice
7. Intolerance to cold temperatures

Early detection of the disease is important as it leads to early treatment to the thyroid gland.

# Proposed Solution

Thyroid disease can be examined in a variety of ways such as imaging using ultrasound, blood tests and physical tests. Unfortunately, most healthcare centers in Kenya dont have the resources for imaging using ultrasound save for the major Hospitals in Kenya. This is due to financial constraints.

This system will attempt to bring diagnosis of the disease to even the most obscure clinics in Kenya so as to raise awareness on the disease and diagnose patients early and cheaply.

This will be done by diagnosing the patients using a website that will take in details of the patient and measurements of a patient's blood will be taken by the doctor/physiotherapist and the website will run the information through a Deep learning model and an output/Diagnosis will be provided.

*Required tests:*

1. TSH Measurement (Thyroid stimulating Hormone)
2. T4 : Thyroxine
3. T3 : Triiodothyronine
4. TT4

*Other required tests*

1. Age of patient
2. Sex
3. Pregnancy status (If Female)
4. Medication query
5. Goiter condition

*Dataset :*

Sourced a dataset from Data Science platform known as Kaggle, the link to the API clipboard is here :

yasserhessein/thyroid-disease-detection-using-deep-learning -p /path/to/dest

Using Python and R, the data will be cleaned and Exploratory Data analysis performed on it so as to gather as much information about the data in hand and the disease.

*Data Cleaning techniques to be implemented will include :*

1. Checking for Null values
2. Duplicates
3. Data Types
4. Column Names
5. Uniformity in the data
6. Outliers and Anomaly Detection
7. Feature Selection using random forests

*EDA techniques include :*

1. Univariate analysis
2. Bivariate analysis
3. Multivariate analysis
4. Correlation

*Deep Learning*

The data will be separated into training data for building the model and testing data for model evaluation.

I will build a Neural Networks model with 4 or more layers that will be optimized the best and the model will be tested for accuracy.

A model with 90% or more accuracy will be deemed sufficient.

*Implementation*

Using web scripting languages such as HTML/CSS and JavaScript, a website will be built that a healthcare personnel can input details of the patient as stated above and the model will predict if the patient has the disease or not.

Will use Django, a framework that incorporates python and JS, it will be handling the deep learning model exported using Keras and have it available on the website for use by the healthcare workers.

The aim of the project is to save lives of Kenyans, using Machine Learning.