Software Quality Assurance Plan Document

For Hayat System

**Faculty of Prince Al-Hussein Bin Abdallah II
for Information Technology**

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Presented to:
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As for the tasks among the students, they were distributed as follows:

✚ <u>**Mahmoud Ibrahim Mahmoud Abu Aqel, 1936150:**</u>

- Write and design the System's documentation.

1. Introduction to the project

2. Purpose of software quality plan

3. Project scope

4. General constraints

✚ <u>**Ala'a Saed Fathi Moh'd Younis, 1933981**</u>

5. Functional and non-functional requirements

6. Quality goals

✚ <u>**Abdallah Najeh Faleh Thabet, 1933987**</u>

7. Planned reviews

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9. Planned acceptance tests

10. Project team quality responsibilities

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1. Introduction to the Project

This introduction gives a scope description and an overview of Hayat Project, identifying the purposes and the aims of the project and the problem we're trying to solve and defining our project objectives and goals we are hoping to achieve.

1.1 An Overview

Thyroid disease is a medical problem that prevents one's thyroid from producing enough hormones or producing too much. It can affect everyone: men, women, children, youths, and the elderly. The most common types of abnormal Thyroid functions are Hyperthyroidism or overproduction of hormones, and hypothyroidism or underproduction of hormones which are results of the malfunctioning of thyroid hormones. A lot of people here in Jordan are suffering from Thyroid related diseases, but many of them are unaware of having these diseases, and from here we came up with our project idea to empower users with information, raise awareness about thyroid and its related diseases, and the most important is to allow users to get an instant guidance on their thyroid status.

Our project **< Hayat >** is a Thyroid diseases Detector, Healthcare AI Application helps patients to get information regarding their Thyroid condition based on their provided symptoms. The system processes the symptoms provided by the user as input and gives the output as the probability of having Thyroid related diseases or not.

The major goal of our project **< Hayat >** is to make Thyroid diagnosis easier and categorize thyroid diseases based on users' blood test results into three categories: hyperthyroidism, hypothyroidism, and normal, by applying artificial intelligence machine learning prediction algorithms and data mining techniques.

1.2 Background

The Thyroid gland is a butterfly-shaped endocrine gland that is normally located in the lower front of the neck as shown below (1). It's one of the most important organs in our body. The thyroid's job is making thyroid hormones, which are secreted into the blood and then carried to every tissue in the body. Thyroid hormones speed up or slow down the metabolism of the body. Help the body using energy, stay warm and keep the brain, heart, muscles, and other organs working as they should. Two of the most prevalent disorders caused by thyroid gland irregularities are hyperthyroidism and hypothyroidism (2).
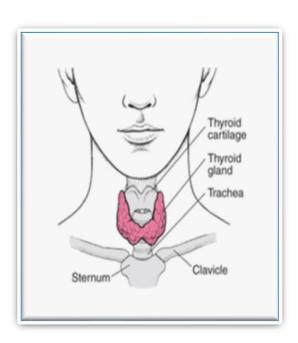

Figure No. 1   Thyroid Gland

Thyroid diseases have increased recently and patients are not aware of it because the symptoms of this disease are usually not easily detected at early stages, because it varies depending on the type, and hence we try to implement prediction of thyroid disease system as not much work has been done on thyroid here in Jordan. This project builds a system which helps predict a normal person about his/her possibility of having thyroid and the type of this thyroid if he/she has.

This system is completely done with help of machine learning algorithms and Code is written in Python programing language. The algorithm is first trained using the data set available from the repository and then tested on the dataset. Then the user enters his/her details and the algorithm starts running, according to the values entered by the user the algorithm predicts that the user is having thyroid or will be in future or not. This system will help doctors as well as individuals to have a possible disease diagnosed. And once a person predicts whether or not he/she can be diagnosed with thyroid disease, our system will provide the users with a lab service whom they can visit and do their thyroid tests there, and the results will be uploaded into the system as soon they are ready, and this will save users searching, effort and time. Moreover, each user will have his/her own information record which can be checked up and viewed when ever wanted.

1.3 Proposed Methodology

The algorithm is first trained with the help of the data base values. The algorithm learns that what inputs could give a positive output and what inputs would result in a negative output. Then the system will allow the user to enter their details -symptoms and the lab to inter the blood test results, then algorithm runs and predicts the result.
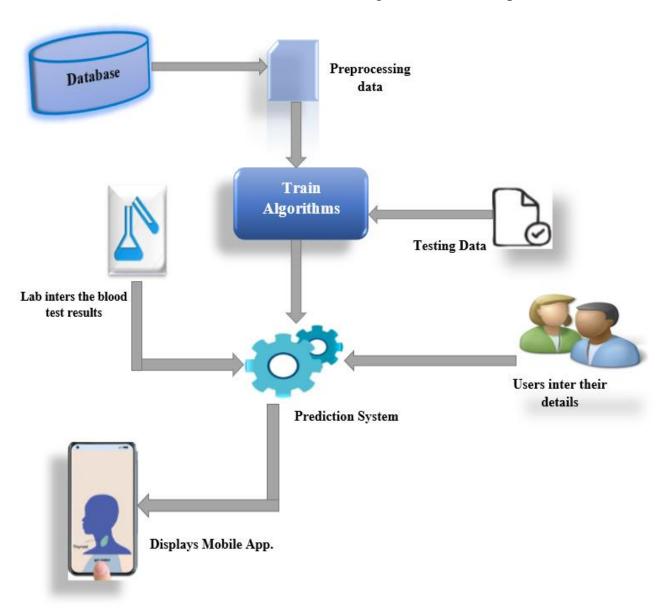

Figure No. 2 Proposed System Architecture

1.4 Problem Statement

Nowadays a lot of people suffering from thyroid diseases and some of them are even not aware of that. These diseases have many side effects and symptoms such as gain or loss weight, stress, muscle weakness, blood pressure and so on. If these diseases are detected in earlier stage, then patients can get an instant guidance about their thyroid situation and doctors can give them the proper treatment. So thyroid disease diagnosis involves analyzing these symptoms and detecting whether a disease persists in a body, and this is exactly the purpose of our system predicting the risk of obtaining thyroid disease at early stages with higher accuracy to protect and avoid the worst health condition of the patients, and in this regard, the machine learning plays a crucial role to detect the disease accurately. So, the problem is that we want to build a machine learning model to identify people affected by thyroid diseases, and to solve this problem we will have to analyze the data, do any required transformation and applying a machine learning algorithm to make the proper disease diagnosis. Further, if thyroid disease is present then algorithms are applied to classify the type of thyroid whether hyperthyroidism or hypothyroidism based on the patients' blood test results.

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2. The Purposes of Hayat SQA Plan

The objective of Hayat SQA Plan in general is to make sure that the service we are offered to our users should be of best quality and meet the desired result from our system. There are two main goals for our SQA Plan we are planning to achieve:

2.1 Requirements Quality

2.1.1 Accuracy

The purpose of our system is predicting the risk of obtaining thyroid disease at early stages with higher accuracy to protect and avoid the worst health condition of the patients, and in this regard, the machine learning plays a crucial role to detect the disease accurately and reduce the defects to less than 2%.

2.1.2 Benchmarking

In our system we build a machine learning model to identify people affected by thyroid diseases, and to solve this problem we will apply a machine learning algorithm to make the proper disease diagnosis. Further, if thyroid disease is present then algorithms are applied to classify the type of thyroid whether hyperthyroidism or hypothyroidism based on the patients' blood test results. Therefore. We need to compare the decisioning and the speed of our system algorithms with the competitors to measure competitive advantages and disadvantages.

2.1.3 Service quality

Trying to reduce the average wait time for user-interface screen which shall respond within 5 seconds.

2.1.4 Availability of the service

The system is available for use at 24 hours a day, 7 days a week. So, the user can inter the system and fill out the questionnaire, and the system will predict if he/she has the possibility of having thyroid and the type of this thyroid if he/she has.

2.1.5 Consistency

Making the services predictable, stable and consistent.

2.1.6 Clarity & Usability

The system offers an easy-to-use interface and the new users shall get used too fast as possible, as its clear and unambiguous.

2.2 Code Quality

2.2.1 Code Readability

Improve the code Readability and reduce its complexity as its important because it leads to higher rates of understanding among developers. A code that's easy to read is also easy to improve.

2.2.2 Code Reliability

When testing reliability, potential errors or faults in the code may appear. These errors might make the system fail within a certain amount of time, so measuring reliability can help you determine your program's success.

2.2.3 Code Reusability

It's helpful when code is reusable, so it's functional for other work. You can measure your code's reusability to determine its quality. You can use a static analyzer to see how many interdependencies the code has to determine its reusability level.

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3. The Project Scope

Our system is aimed to be a Mobile Application built based on applying Machine Learning algorithms and data mining techniques to predict Thyroid diseases which consider one of the major diseases that are spreading widely nowadays including Jordan as well, especially hypothyroidism and hyperthyroidism. The normal and traditional methods of thyroid diagnosis are thorough inspection and also various blood tests. Therefore, the major goals for our project Hayat are as follows:

1. The main goal is to recognize the disease at the early stages with a very high correctness by applying Machine learning techniques which play a major role in medical field for making a correct decision, proper disease diagnosis and also saves cost and time for the patient.

2. Making the Thyroid diagnosis easier and reduce the risk of misdiagnosis, which happens too often.

3. Prediction of Thyroid diseases at early stage can identify patients at risk of disease, and this will help doctors to take the appropriate measures to minimize the risk, provide medication at the right time, and avoid the worst health condition of the patients.

4. The major goal of our project < **Hayat** > is categorizing thyroid diseases based on users' symptoms and blood test results into three categories: hyperthyroidism, hypothyroidism, and normal.

5. Disease diagnosis plays a vital role and it is a necessary, so a lot of Healthcare issues can be solved efficiently by applying Machine Learning Technology and data mining techniques.

6. In our system we try to provide the users with a lab service whom they can visit and do their thyroid tests there, and the results will be uploaded into the system as soon they are ready, and this will save them searching, effort and time.

7. Moreover, the system provides a list of information records about its users.

8. This system gives a user-friendly environment and easy to use. As the system is based on a Mobile application, the user can use this system from anywhere and at any time.

As for the Project Stakeholders (Actors) of the system and their responsibilities are as follows:

Patient: Can login and give in his/her symptoms with the help of which the application would predict the kind of thyroid disease he/she has, and give him/her instructions for doing the necessary blood tests and advice to consult a doctor if needed.

Laboratory: Providing the blood test services, and generates the Lab report conclusion based on the tests' results.

The System Administrator: will be managing every activity of the system for its intended purposes, and he/she is the highest privileged user who can access the system.
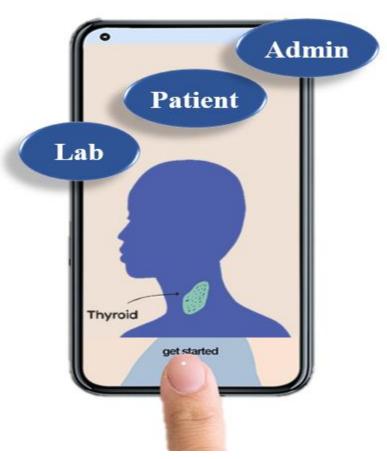

Figure No. 3 Stakeholders (Actors)

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4. General Constraints

The main constraints which face or may face our project are as following:

- System is only accessible for National ID holders, therefore non-Jordanian cant benefit from our system services.

- Providing services online only, so internet interruption will paralyze the system.

- Project helps patients to get information regarding their Thyroid condition based on their provided symptoms, so if the symptoms are inaccurate, the system may give a false prediction.

- If the laboratory enters test results wrongly will affect the prediction results.

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5. Functional And Non Functional Requirements

5.1 Functional Requirements

- The application sends a message to the patient's phone number reminding him to check his results.

- The user should be able to login by using his national ID.

- The user can take a survey or questionnaire form to determine if he\she has possible diseases or not.

- The user can check test result and his diagnosis by login to application.

- The admin can manage patients' accounts in the app by deleting or adding accounts.

- The application has the functionality of adding test results to it.

- The admin must generate all patients' records.

- The admin must enter all information of patients.

- The laboratory must fill out lab reports for patients.

- The user can log out when finished using the application

5.2 Non-Functional Requirements

Performance:

- User-interface: The user-interface screen shall respond within 5 seconds.

- The system should be scalable.

Availability:

-The system is available for use 24 hours a day, 7 days a week.

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6. Quality Goals

- **Requirement Phase**: The correctness, completeness, and consistency of the requirements model will have a strong influence on the quality of all work products through these attributes:

- Ambiguity: reduce the amount of ambiguity in requirements.
- Completeness: ensure that there is no information left aside for requirements.
- Volatility: reduce change of requirements during the system development process or after the system has been become operational.
- Traceability: ensure requirements traceable that aim to link requirements to objectives, roles.
- Model clarity: reduce the number of errors in UML through increasing clarity in requirements.

- **Design Phase:** Every element of the design model should be ensured that it exhibits high quality and that the design itself conforms to requirements through these attributes:

- Architectural integrity: ensure integrity in architectural design model to avoid cost overruns.
- Component completeness: ensure that there is no component left aside for architectural model.
- Interface complexity: reduce degree of complexity to avoid extra estimation for procedural design.
- Patterns: select best pattern and number of patterns.

- **Code Phase:** exhibit characteristics that will facilitate coding and maintainability through these attributes:

- Complexity: ensure reduce Complexity to facilitate run coding and interact each other.
- Reusability: ensure increase in application to increases productivity and reduces effort.
- Maintainability: to ease correct faults and improve performance for coding.

- **Quality control effectiveness:** A software team should apply limited resources in a way that has the highest likelihood of achieving a high–quality result through these attributes:

- Resource allocation: ensure select best available resources to tasks and ensure under or overutilization doesn't happen.
- Review effectiveness: number of errors found and criticality in early phases and therefore reduces amount of effort.

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7. Planned Reviews:

- In the review process, we must target those who suffer from thyroid disease and who do tests just to feel the symptoms
- We conduct the review to ensure that the program provides services correctly to the target users
- Ensure that using the application and logging in to the program is easy
- Ensure that checks appear for users on time and without problems
- Ensure that the questionnaire is useful for people who feel some symptoms
- Ensure that the program reduces time, effort, and cost for users
- Ensure the ease of use of the program and the speed of performance and response

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8. Planned Validation Tests:

- At the end of the development process to determine whether it meets specified requirements.
- Ensure that the login process is done through national id
- Ensure that the results appear easily to the patient and that some instructions appear to him
- Ensure that the name and test type appear on the results page
- Ensure that the patient's test record appears correctly
- Ensure that the admin Can add/Edit/delete patient.
- Ensure that the admin can add and delete the test.
- Ensure that the admin can add and delete patient's record.

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9. Planned Acceptance Tests:

- Quality Assurance process that determines to what degree an application meets end -users approval.
- User Acceptance: he program meets the client's requests in terms of services. Ease of use. Reducing cost, effort, and time.
- Business Acceptance: The program meets the company's requirements in terms of work efficiency, profits, and services.
- Contract Acceptance: The program fully benefited the local community and achieved the goals for which it was designed.
- Regulations Acceptance: Ensure that the program complies with the laws and security procedures of the country
- Alpha testing: Test the application in the developer environment to ensure that the program is correct.
- Beta testing: Testing the program in the environment of the target group to ensure its usefulness to them.

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10.Project team quality responsibilities

- Documentation team: Introduction to the project and Purpose of software quality plan.
- Analysis team: Project scope and General constraints, Functional and non-functional requirements.
- Developing team: Quality goals and Planned reviews.
- Testing team: Planned validation tests and Planned acceptance tests.
- Team manager: Project team quality responsibilities.

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