**Military Institute of Science & Technology**

**User and System Requirements**

**Project Title:** Health AI: A Personal Healthcare Companion

**Course Name:** IDP/Capstone Project

**Course Code:** CSE-360

**Program:** CSE-20

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**Group No:** B3

1. **Preface**

Healthcare is considered one of the fundamental human rights. But still, it is seen that healthcare is not always available for everyone. Most of the time it is hard to find suitable doctor’s contact information for a particular illness. Sometimes it is hard to detect if a person is seriously ill or if it’s just a casual illness. Knowing the seriousness of the illness is very significant. Most times people neglect their medical situation and then suffer from major illnesses. Some people don’t like to visit doctors/medical checkups as they find it a waste of time and energy. For some people, it is too costly to visit a doctor for a simple illness. This is where an AI-based healthcare system can help. AI can detect illness by analyzing a few health metrics and symptoms. Based on the detected illness, AI can suggest basic instructions for the cure and the appropriate doctor’s contact information.

Moreover, most people don’t have emergency ambulance numbers saved in their phonebooks. In case of an emergency, people get panicked. A smart application system can help people to find the closest hospital for an ambulance in this scenario.

1. **Introduction**
   1. **Purpose**

“Health AI” is a personal healthcare companion application system. There will also be a hardware device for collecting real-time health metrics. This app will be able to analyze these data and it will talk with the patient to understand the symptoms. By analyzing, it will predict the illness type. Many people cannot afford to go to doctors for help. This app will be able to suggest basic instructions for the cure based on the detected illness. It will also suggest contact information for relevant doctors. For emergencies, this app will have a built-in emergency SOS button. The SOS button will send messages to the closest contacts and the nearest hospital for the ambulance.

* 1. **Intended Audience**

This application system is intended for almost everyone. Mostly it will be helpful for the people living in remote areas who don’t have access to fundamental healthcare. Also, this app will be beneficial for people below the poverty line as this app will give them free healthcare support. This app will help a patient to find suitable doctors. So, doctors are also benefited along with the patient.

* 1. **Scope**

This healthcare system is mainly a cloud-based mobile application. An Internet connection is required for this app. There will be a hardware device along with various sensors to collect various health metrics such as blood pressure, heart rate, oxygen level, and temperature. Based on the input data and talking with the patient, the app will be able to detect the type and seriousness of some common illnesses. It will provide some general instructions for the cure and suggest relevant doctors in that field. The SOS service will send auto messages to the nearest hospital and to close contacts.

1. **Glossary**

**Healthcare:** Healthcare is the collection of efforts made to maintain physical, mental, and emotional well-being.

**AI:** Artificial Intelligence refers to systems that mimic human intelligence to perform a task and iteratively improve themselves.

**SOS:** SOS is used to call for help during an emergency.

**Cloud-based application:** Cloud-based applications refers to applications that run on shared computing resources via the internet.

**Oximeter:** An oximeter is a device to measure oxygen levels.

**Arduino:** Arduino is an open-source electronics platform based on hardware and software.

**ML:** Machine learning is a branch of AI and computer science that focuses on the use of data and algorithms to imitate humans.

**Database:** A database is a structured set of data held in a computer.

**NLP:** Natural language processing is a branch of AI that helps computers to understand human text and speech.

1. **Requirements discovery**
   1. **Literature Review:**

A good number of articles, journals, conferences, and research papers were recited, and some important viewpoints were observed. Based on health, there is a lot of research, projects, documents & applications. But there are only a few such documents or applications which can act like a personal doctor or a healthcare assistant. The existing applications have a lot of limitations too. One of these apps is based on AI analysis of a patient’s symptoms which suggests doctors. But this app cannot suggest any physical activities to the patient. Another app is an online doctor appointment booking app and a medicine shop giving telemedicine & ambulance services. There is no app on the market that can talk with the patient to analyze the symptoms and give predictions on the patient’s health problems along with giving valuable suggestions. There is no existing system that takes real-time diagnostic values for analysis purposes. So, it is found from the reviews that users need a fully functional medical one-stop solution that can do all these jobs easily.

* 1. **Interview:**

Two interviews regarding healthcare availability were conducted. From conducting these interviews, it is obvious that healthcare is still not easily accessible for all people. It's hard to find relevant doctor’s contact info for a particular illness most of the time.

Moreover, it is even harder to figure out which disease a person is suffering from without going for a formal checkup. Many people don’t want to go for a formal checkup as they see it as a waste of energy. Instead, they ask their friends/family for suggestions which is quite risky as healthcare is a sensitive issue.

* 1. **Survey:**

Google form was used to interact directly with the targeted users to know their requirements. The results of this survey helped to detect and discover requirements. The questions can be found in the following link:

<https://docs.google.com/forms/d/e/1FAIpQLSfb2fqjlt2i5ZfWzUiXpPurKCLoSCL4BQd_8p9Jau5jOf7l5A/viewform>

From the results of this survey, it is noticed that some healthcare-based problems of the participants can be solved by our system. These important points are given bellow

* About half of the participants think healthcare services are not always available to them and about 25% think that healthcare services are never available to them any time they want. So, an AI-based healthcare and consultancy app is helpful for our participants.
* About 75% of the participants search on the internet for finding the solution to their medical problems. 60% of people think the results from the internet are somehow (50%) acceptable. So, an ai based system can be a solution for them to find their queries.
* Only 1% of the participants check their blood pressure, heart rate, or oxygen level regularly whereas above 90% of participants agree that it is important to track these records continuously. This proposed system will be handy for keeping track of these records easily anywhere.
* In case of emergency, about 40% of people cannot remain calm, and also, they do not have any doctor’s or ambulance’s contact number saved. This requirement can be fulfilled by the proposed system’s SOS feature.
* About 40% of our participants are familiar with fitness or medical apps. So, it will not be harder for people to get used to our system. Most of the available systems don’t fulfill all the requirements of participants. This proposed app can solve this problem for them by being a one-stop solution.

1. **User Requirements**
   1. The system shall understand human language and various health metrics.
   2. The system shall detect illness/disease.
   3. The system shall suggest relevant general instructions for the cure.
   4. The system shall suggest relevant doctors.
   5. The system shall have an emergency ambulance/contact system.
2. **System Requirement Specification**
   1. **System Requirements**
      1. **Understanding human language and health metrics**
         1. The system shall take human voice/text as input via mobile phone to interpret the meaning and understand the symptoms.
         2. The system shall use a blood pressure machine to measure blood pressure and interpret the significance of the received value.
         3. The system shall use a finger oximeter heart rate module to measure oxygen level along with heart rate and interpret the significance of the received value.
         4. The system shall use a contactless temperature sensor module for Arduino to measure temperature and interpret the significance of the received value.
      2. **Detecting sickness/illness**
         1. The system shall process all the provided information using machine

learning and the database.

* + - 1. The system shall give a prediction about the illness/disease type with 99% accuracy.
      2. The system shall give predictions via text as well as voice output.
    1. **Suggesting Cure** 
       1. The system shall suggest various general instructions for the cure based on the predicted disease/illness by processing the database and machine learning model.
       2. Instructions shall be given via text as well as voice output.
    2. **Suggesting Doctors**
       1. The system shall have a database of available doctors’ contact information.
       2. Based on predicted disease and doctors’ expertise, the system shall suggest various doctors with contact information.
    3. **Emergency Contact**
       1. The system shall have an emergency button.
       2. If the button is pressed, an emergency message is sent to the nearest ambulance.
       3. Also, an emergency help message will be sent to predetermined close contacts.
  1. **Requirements Classification**

|  |  |  |
| --- | --- | --- |
| **System Requirements** | **Functional** | **Non-Functional** |
| Voice/text input | ✓ | 🗶 |
| Real-time data collection | ✓ | 🗶 |
| Accuracy of interpreting the significance of the received data | 🗶 | ✓ |
| Processing data using ML | ✓ | 🗶 |
| Prediction Accuracy | 🗶 | ✓ |
| Text and Voice Output | ✓ | 🗶 |
| Suggesting Cure | ✓ | 🗶 |
| Suggesting Doctors | ✓ | 🗶 |
| Emergency message | ✓ | 🗶 |
| Emergency ambulance service | ✓ | 🗶 |