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MIGRAINE AURA WITH OPTICAL ANALYSIS

In partial fulfilment of the requirements for the degree of

Bachelor of Science in Computer Science

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C e r t i f i c a t e

We accept the work contained in the report titled

"Aura Soft With Optical Analysis"

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Approved by:

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January 05, 2025

DECLARATION

We hereby declare that this project report is based on our original work except for citations and quotations which have been duly acknowledged. We also declare that it has not been previously and concurrently submitted for any other degree or award at Bahria University or other institutions.

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MIGRAINE AURA

WITH OPTICAL ANALYSIS

ABSTRACT

Aura-Soft is a new generation Mobile Application that helps a person to deal with migraine using latest machine learning, interactive UI and therapeutic tools. In this project, Aura-Soft is developed and deployed to monitor migraine activity, assess its potential severity using a Gradient Boosting Classifier, and provide non-pharmacological treatment using Audio Frequency Therapy. Also, the use of the chatbot support using artificial intelligence, and real-time cameras has been integrated in the application.

Some of the highlight of Aura-Soft include a symptom diary to track migraine, therapeutic sounds and availability of retinal view using device camera. This semi-supervised feature extraction approach enables feature selection and extraction on migraine severity and offers the end-users the options for racially beneficial decisions on their health. Using natural language processing of data set means that responses to the common questions will be fast and individual.

The app uses Flutter for the best and clean UI and utilizes multiple packages for capabilities like audio and camera. The backend part is also written in Python and it uses Flask as the framework of the application; it is the mediator between the app and the ML model. Less testing of Aura-Soft took place on smartphones solely as the application was optimized for use and cross-functional testing was carried out in order to establish a reliable and constant functionality of Aura-Soft across various devices for effective migraine treatment.

Future is further advancements of the retina analysis through AI, constant monitoring of symptoms with the help of applications and programs, individual advice regarding

migraine prevention and other ways to help alleviate the pain. Aura-Soft shows that integrating of AI and mobile technologies is helpful for enhancing the well-being of migraine sufferers and assists them to manage their pains in all-round ways with one application.

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LIST OF SYMBOLS / ABBREVIATIONS

***AI**: Artificial Intelligence*

***ML**: Machine Learning*

***Firestore**: Firebase NoSQL cloud database with real-time storage and retrieval capability*

***Flutter**: Free library of pre-designed components for developing applications across platforms*

***TF-IDF**: Term Frequency –Inverse Document Frequency used in natural language processing*

***REST API**: Here, Representational State Transfer Application Programming Interfac*

CHAPTER 1

INTRODUCTION

1.1 Background

Headaches in the form of migraines are common in the global population, but their treatment is difficult because of factors such as multiple and diverse origin, symptoms, and recurrence patterns. To meet this need, Aura-Soft provides the mobile application that helps track the symptoms, assess the likelihood of severity and get the therapeutic help.

The features that have been implemented in the application include: a symptom checker, retinal view through the device camera, sound frequency therapy and an Artificial Intelligence-centered chatbot. Developed with Flutter for interface purposes and Flask for combining with backend, Aura-Soft adapts machine learning algorithms to approximate the migraine up-to-severity based on the input data given by users.

With its focus to its clientele, Aura-Soft is an all-inclusive system for handling migraines. It offer streamlined, cross-device experience and shows how digital health solutions can improve the lives of those with migraines.

1.2 Problem Statements

A migraine is a chronic neurological disease that affects people all over the world and brings a significant amount of physical, emotional, and social suffering. However, the management of migraines still poses a significant set back because of the intermittent form of the disease, different causes and non homogeneous manner of presenting symptoms. Self-management remains an issue, as many people have no affordable yet efficient methods for observing changes in their conditions and obtaining timely help or a therapeutic intervention if self-care does not suffice to alleviate discomfort for a protracted period.

Present day solutions lack one single consolidated platform that supports both monitoring, analysis and prediction of the symptoms as well as availing instant response. Also lacking is the probability of creating practical usage of such modern technologies as artificial intelligence, machine learning, or mobile application to provide clients with comprehensive migraine treatment.

The large and untapped demand for a unified, easy-to-use tool that will help people to become more aware of their migraines and provide them with instant guidance & treatment options has been identified.

1.3 Aims and Objectives

The objectives of the project are as follows:

i) To develop a mobile application, Aura-Soft, that provides comprehensive tools for migraine management.

ii) To enable effective symptom tracking by allowing users to log detailed migraine information, including triggers, severity, and relief methods.

iii) To design and implement a machine learning model for predicting migraine severity based on user inputs.

iv) To integrate therapeutic features, such as sound frequency therapy and real-time retinal view via the device camera.

v) To provide 24/7 AI-powered chatbot support for personalized recommendations and instant assistance.

vi) To ensure a seamless, user-friendly interface with cross-platform compatibility using Flutter.

1.4 Scope of Project

The focus of this work is to design a smart, ubiquitously accessible mobile application named Aura-Soft that offers a full range of services for handling migraines. The application's purpose is to help users monitor symptoms, find out which stimuli cause them, and use therapeutic resources. It utilizes technology such as machine learning in providing the heads-up of a migraine's intensity depending on inputs given by the user while offering an AI enveloped chatbot for immediate help with recommendations.

The project combines services such as sound frequency therapy and Retinal View through the device camera to provide an all round solution to migraines. The application is developed with Flutter, which guarantees its cross-platform compatibility and fine performance on Android device. Further, Flask used in the backend enables proper interaction between the constructed application and the predictive model.

Thus, Aura-Soft has a clear focus on the clients with migraines and each feature of the application is designed to be easily understandable. The project even lays the ground work for future addition such as an artificial intelligence driven retinal scan and monitoring of the progression to enable more improved capaci

CHAPTER 2

SRS (Software Requirement Specification)

2.1 Purpose

The objective of this document is the specification of the software that Aura-Soft is, to be precise – it is a migraine management application. Aura-Soft helps the user to monitor symptoms, forecast the intensity of the migraine and offer therapeutic intervention through features such as sound frequency therapy, retinal view in real-time, and conversational AI chatbot support. Firebase is used for safe and scalable solutions for user sign up and authorization, data storage, and real-time updates of the application backend.

2.2 Scope

Aura-Soft is a mobile application for both IOS and Android Platforms to be used in managing Migraines. The project includes the following functionalities:

• **Symptom Tracking**: Record the frequency, the type of migraines, factors that trigger them, the degree of pain felt and ways that would help to reduce the pain.

• **Migraine Severity Prediction**: In real-time make predictions using machine learning models.

• **Therapeutic Relief**: Use tones for the treatment of migraine and use the device camera for the retinal view.

• **AI-Powered Chatbot**: Give custom advice and help as soon as possible.

• **Firebase Integration**:

- User Authentication: Secure login and signup.
- Cloud Firestore: Manage and access user personal data related to symptoms as well as the history of the same.
- Firebase Storage: If required in future use to store media files only in that particular folder.

• **User-Friendly Interface**: Mobile support and Optimized navigation as well as choice of the themes.

2.3 Definitions, Acronyms, and Abbreviations

- **AI**: Artificial Intelligence
- **ML**: Machine Learning
- **Firestore**: Firebase NoSQL cloud database with real-time storage and retrieval capability
- **Flutter**: Free library of pre-designed components for developing applications across platforms
- **TF-IDF**: Term Frequency –Inverse Document Frequency used in natural language processing
- **REST API**: Here, Representational State Transfer Application Programming Interface

2.4 Overall Description

Product Perspective

Front end and back end programming as well as cloud based storage are incorporated in Aura-Soft to get a good approach to managing migraine. Firebase provides optimal secure user authentication and the feature of real-time synchronization and last but not the least the Flutter provides smooth operating experience and compact UI design for android versions.

Product Features

The proposed system will incorporate several features in order to covers all the aspects for those who suffer from migraines. It pays attention to location, intensity and duration of the symptoms, and what might have led to these symptoms. Historical migraine data is collected, processed and stored at Firebase Firestore, where users and developers can view an archive of data related to migraine conditions. A DNN model is employed in order to forecast the severity of migraines depending on user inputs, to further increase the individuality. For therapeutic relief, the system can play therapeutic frequencies and the client receives real time retinal view through a camera attached to the device. With the help of a chatbot which was created using Flask, the users get prompt answers and personalized advices as well as they are can manage their state.

To enhance efficiency in the functionality, the system uses the Firebase feature of authentication to help in the signing in and registration of the users. Firestore can be used as a symptom log and to store user's information; Cloud Functions represents automated backend operations like sending reminders. For instance, the user-interface of this website allows users both a light and a dark theme, and in a bid to supported that the number of switching screens was reduced. Altogether, this system unites data analysis and predictive modelling, real-time tracking and AI-based support providing for a unique approach to migraine treatment.

User Characteristics

- **Primary Users:**
    - Individuals managing migraines who require symptom tracking and relief tools.
    - Users with minimal technical expertise.
- **Secondary Users:**
    - Healthcare professionals seeking data-driven insights into patients' migraines.

2.5 Functional Requirements

The functional requirements of the system are designed in a way that will allow user intuitive interface to manage migraines. It uses Firebase Authentication to ensure safe interaction with users by creating sign-in, registration, and password recovery options as well as protecting their accounts. A symptom tracker allows the user to enter details of migraine and store them in Firebase Firestore and it was possible to retrieve historical data for analysis of time series data. Overall, there is a backend model for severity prediction exposed through a REST API for returning accurate severity of migraine to users. Therapeutic tools include the use of Sound therapies and real time retinal visualization using a device camera. Also, the system provides a combination of chatbots built using Flask that answers the user's queries and provides them with appropriate recommendations regarding the management of migraines.

2.6 Non-Functional Requirements

System must contain performance and operation specifications in order to be satisfying for the users. It guarantees efficient functionality because the app launches in 3 seconds and allows real-time data synchronization with the help of Firebase. Firebase addresses scalability as it is able to cater even higher use by users without its performance being affected. Security is maintained by ensuring all data placed in Firebase is encrypted and the use of secure authentication methods from Firebase Authentication. It sustains compatibility through Android 8.0 (Oreo) thus makes it easily accessible to many users. In order to perform easier updates and debugging the software is divided into modules, which improves its maintainability as well as ability to manage future alterations.

2.7 External Interface Requirements

The system has very friendly UI and the design is made for interactiveness, the user fills in forms which are friendly with the system and easy to use, they can switch from tracking to prediction to chatbot section using the navigation bar on the system's main page. On the hardware side, the application is built for a smartphone that has a camera to display real-time retinal visualization and speaker or headphones for sound therapy. The application has built the frontend part of the software interface with the help of Flutter while the backend part has been created using Flask for chatbot controlling and model results generation. Realtime database and real time cloud storage services are provided by firebase services, namely Firestore for storage and Firebase Authentication to provide secure user account management to the application.

2.8 System Design

Architecture

- **Frontend:** Flutter manages all UI and integrates Firebase for database and authentication.
- **Backend:** Flask handles chatbot queries and machine learning model predictions.
- **Database:** Firebase Firestore stores user data (symptoms, triggers, etc.).
- **Cloud Storage:** Firebase Storage may be used for media files (e.g., pupil images).

CHAPTER 3

DESIGN AND METHODOLOGY

3.1 System Architecture

The system architecture for Aura-Soft: The purpose of developing Migraine Management Application is planned to comprise of separate layers of functionality which consist of a front-end, back-end, machine learning model for migraine severity prediction and Firebase, a cloud database. Figure 3.1 visually shows the system architecture of app how its work.

3.1.1 Components of the System:

1. **Frontend:**
    - Built using Flutter to provide a responsive and interactive user interface.
    - Key functionalities include symptom tracking, severity prediction display, therapeutic relief, and chatbot interaction.
2. **Backend:**
    - Developed with Flask to manage communication between the machine learning model and the frontend.
    - Handles API requests for severity prediction and chatbot queries.
3. **Machine Learning Model:**
    - A Gradient Boosting Classifier model predicts migraine severity based on user inputs.

4. **Database:**
    - Firebase Firestore stores user data, including symptom history and personal preferences.
    - Firebase Authentication manages secure user login and registration.

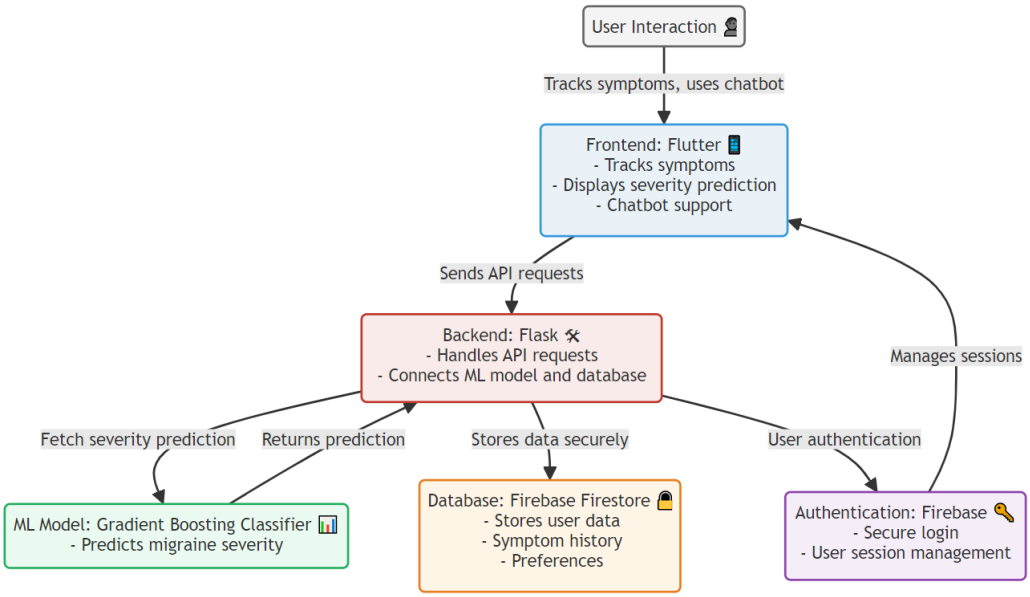

Figure 3.1: Aura-Soft System Architecture

3.2 Workflow Methodology

The system workflow follows a structured methodology to ensure seamless operation:

Workflow Steps:

Migraine data is entered securely by the users, who then obtain predictions of migraine severity, as well as recommendations through a simple to use interface. Figure 3.2 shows the sequence workflow of app. The therapeutic tools are supplemented with an ophthalmic monitoring system and a chatbot; all information is synchronized to ensure its availability.

User Registration:

- Users register or log in securely using Firebase Authentication.
- User profiles are created and stored in Firestore for personalization.

Symptom Tracking:

- Users input migraine-related data (severity, triggers, symptoms, and relief methods).
- Data is stored in Firestore for real-time access and historical analysis.

Severity Prediction:

- User inputs are sent to the backend, where the machine learning model predicts migraine severity.
- Predictions and actionable recommendations are displayed on the app.

Therapeutic Tools:

- Users access sound frequency therapy and real-time pupil view via the camera.

Chatbot Support:

- Users interact with the AI-powered chatbot for recommendations or assistance.

Workflow Sequence Diagram

The following diagram represents the sequential workflow of the system:

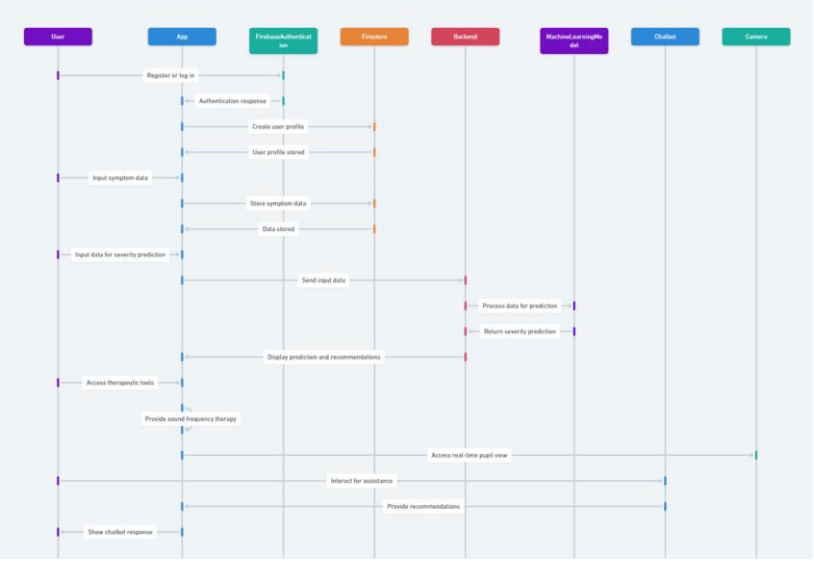

Figure 3.2: Aura-Soft Sequence Workflow Diagram

3.3 Design Approach

The project implements good architecture of frontend and backend design, and makes sure that the functions are good and catchy to the users. A frontend created using Flutter has good compatibility with Android and iOS devices and has an appealing simple clear, and user interactive interface. This encompasses easy navigation to key areas including symptoms, severity prediction, therapeutic aspects with animated input transitions between services and relative services and mode preferences. The backend with Flask framework receives and processes API requests, includes the machine learning model and chatbot, and controls connections to Firebase, the used database. Migraine has many features and from the dataset containing such features in the CSV format machine learning classifier Gradient Boosting Classifier is used for more accurate severity prediction. It encodes and standardizes user inputs, then delivers severity predictions and advisories to improve the user experience

3.4 Class Diagram

The class diagram illustrates the structure of the **Migraine Management App**, highlighting key components, their attributes, and methods. Core classes include figure 3.3 visually represents the class diagam.

- **StartApp**: Root application class managing Firebase initialization and routing.
- **LoginScreen, SignUpScreen, ForgetPasswordScreen**: Handle user authentication and account management.
- **LandingScreen**: Main dashboard for navigation to app features.
- **ChatBotScreen**: AI-powered chatbot for user assistance.
- **TrackSymptomsPage**: Symptom tracker with AI severity prediction.
- **UserProfileScreen, SettingsScreen**: Manage user profiles and app settings, including theme preferences.
- **SleepTrackerScreen**: Logs and analyzes sleep data.
- **ResultPage**: Displays migraine severity predictions and remedies.

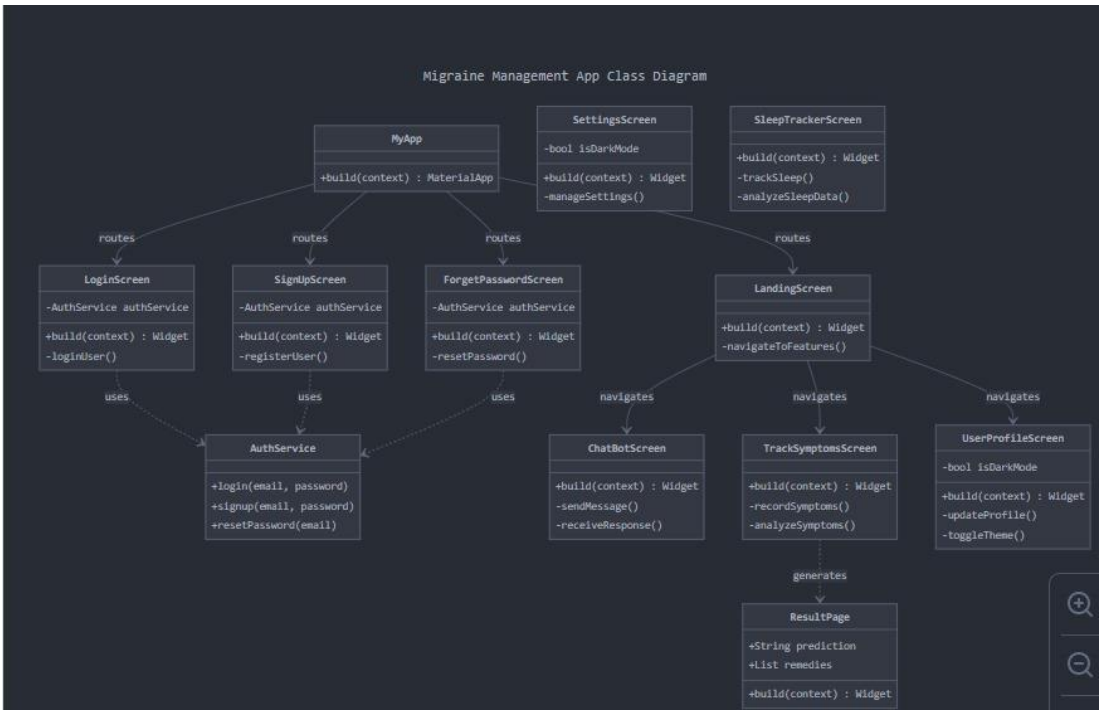

Figure 3.3: Class Diagram

3.5 Database Design

Firebase Firestore is the main component for storing the user's profile and a history of symptoms; therefore, gaining access to all the needed information in real-time without interruptions is crucial. This allows the users to record their migraine details longitudinally so they can access it anywhere at any given time. Firebase Authentication is used to handle the user login and registering and allow users safely operate with their personal information within the system.

Figure 3.4 visually shows database structure. In combination, these Firebase services make the application to run as smoothly and securely as possible, without a lot of underlying inefficiency.

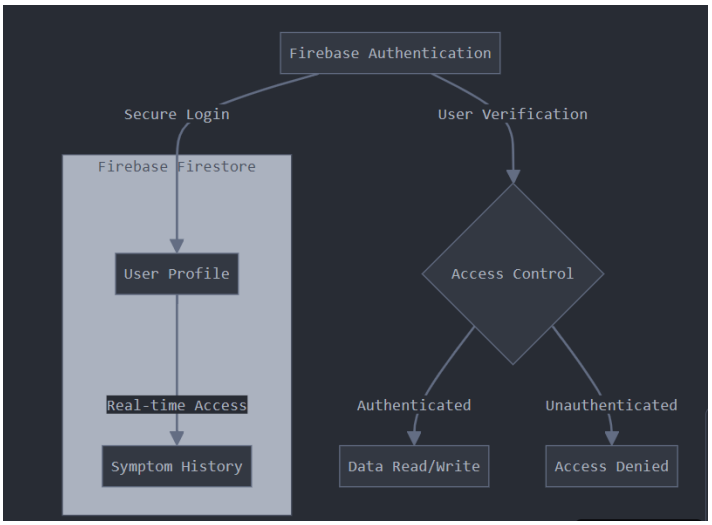

Figure 3.4: Key Diagram of Database Structure

3.6 Firestore Data Entities:

The database Entity-Relationship Diagram (ERD) outlines the structure and relationships between key entities such as login details, user profiles, symptom history. It illustrates how data is stored in Firebase Firestore, with secure connections managed by Firebase Authentication. Figure 3.5 shows the ERD. The ERD ensures a clear understanding of data flow and organization within the system.

1. **Users Collection:**
    - User ID
    - Email
    - Phone
    - Age
    - Gender
    - Migraine Type
2. **Symptoms Collection:**
    - User ID (Reference)
    - Symptom details (severity, triggers, duration, etc.)
    - Timestamp for tracking history.

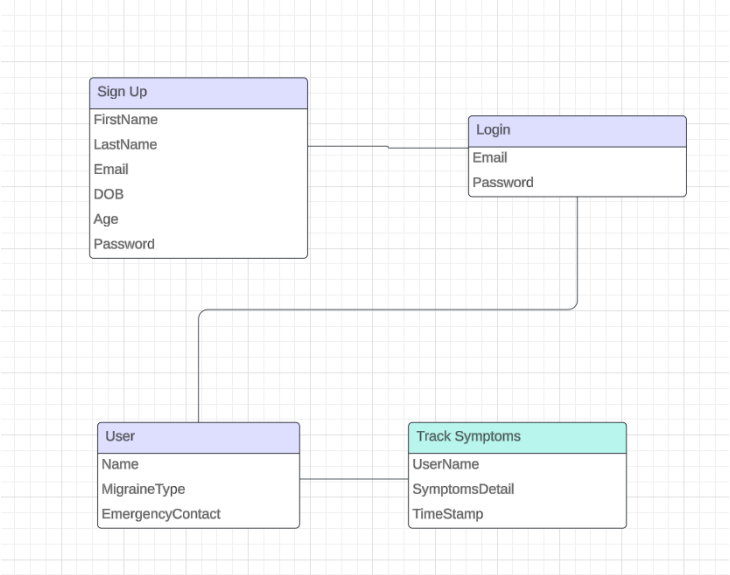

Figure 3.5: ERD

3.7 UI Flow Diagram

The following UI flow diagram illustrates the user interaction with the system:

Key Screens:

1. **Login and Signup:** For secure authentication.

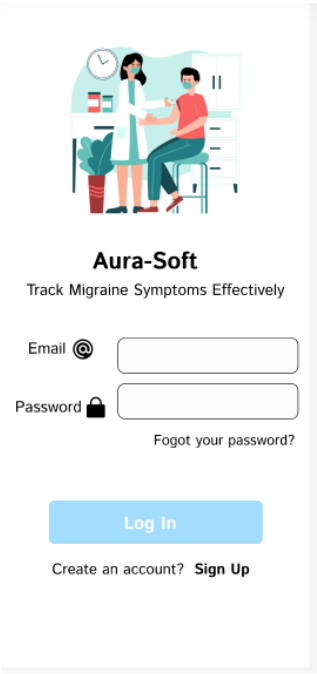

Figure 3.6: Login Screen

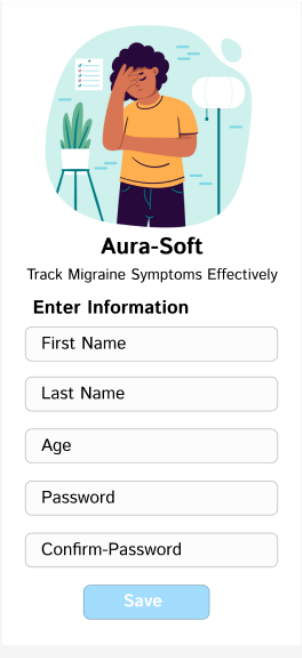

Figure 3.7: Sign Up Screen

2. **Landing Page:** Displays main features like symptom tracking and therapeutic tools.

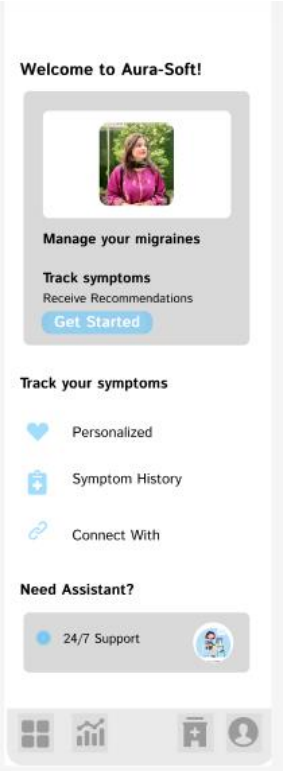

Figure 3.8: Landing Page

3. **Symptom Tracker:** Allows users to input migraine data.

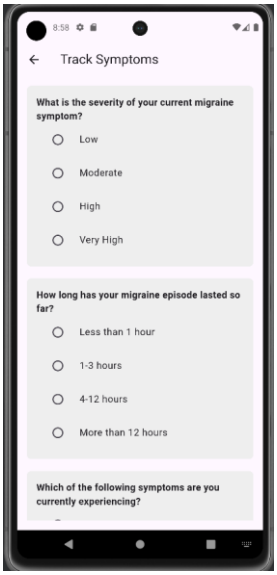

Figure 3.9: Track Symptom Page

4. **Chatbot Page:** Provides assistance to user

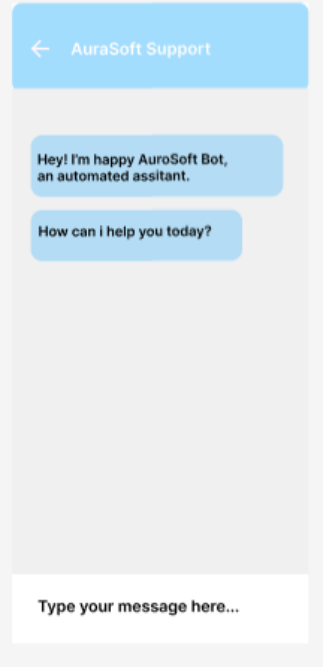

Figure 3.10: Chatbot Page

5. **Sleep Tracker:** Track weekly sleep cycle of user

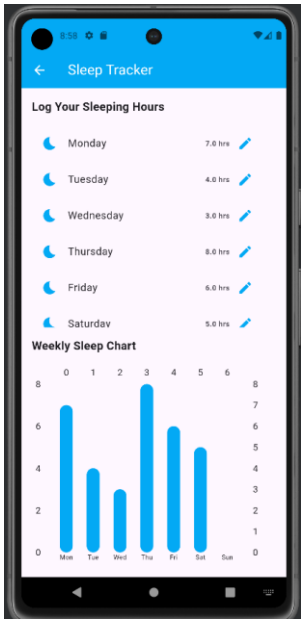

Figure 3.11: Sleep Tracker

6. **Precaution Screen:** Provide precautions to avoid migraine

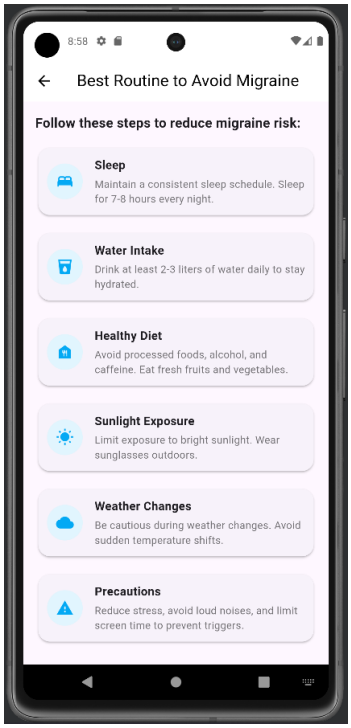

Figure 3.12: Precaution Screen

7. **Therapeutic Tool:** Provide therapy to users

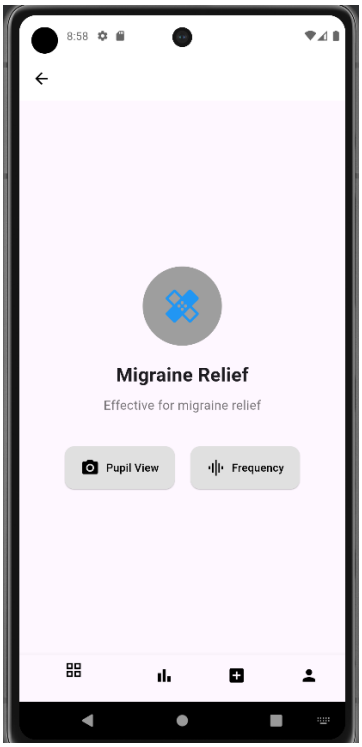

Figure 3.13: Therapeutic Tool

8. **Sounds Screen:** Provide soothing sounds to users so they can have some relief

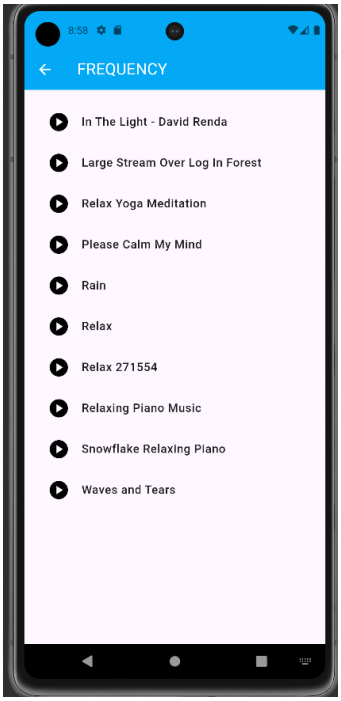

Figure 3.14: Sounds Screen

CHAPTER 4

IMPLMENTATION

4.1 Implementation

The system leverages the following technologies to build a robust and efficient migraine management application Figure 4.1 visually shows the methodology of app:

- **Frontend:** Flutter for cross-platform mobile development.
- **Backend:** Flask (Python) for managing API endpoints and AI model integration.
- **Database:** Firebase Firestore for real-time database services and Firebase Authentication for secure user management.
- **Machine Learning:** Gradient Boosting Classifier for migraine severity prediction.
- **Other Tools:** Camera and Audio Player packages in Flutter for retinal view and sound therapy functionalities.

4.2 Backend Implementation

4.2.1 API Endpoints

- /api/predict: Accepts user symptom data and returns a migraine severity prediction.
- /api/chat: Processes user queries and provides personalized chatbot responses.
- /api/symptom-history: Retrieves the user's logged symptom data from Firebase Firestore.

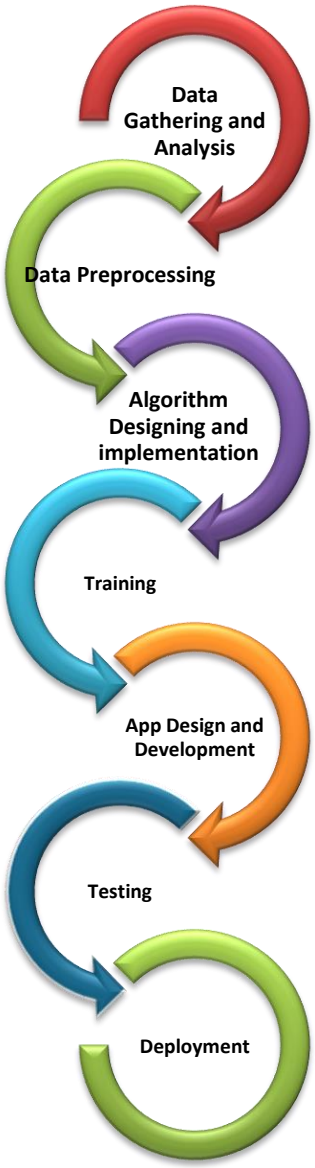

Figure 4.1 Methodology

4.2.2 AI Model Integration

An accurate predictor for the severity of migraines is developed through using a Gradient Boosting Classifier where the input is the symptoms of migraine. This predictive model is integrated with Flask through REST API and this allows for real time prediction from user inputs and the overall improvement of the general response rate of the system.

4.2.3 Firebase Integration

Firebase Authentication manages user registration and login.

- **Database:** Firebase Firestore stores:

- User symptom data.
- User preferences (e.g., light/dark mode, notification settings).
- Historical migraine data for trend analysis.

4.3 Frontend Implementation

The refers to a number of important features that will help individuals deal with migraines within the system. Patients and health care consumers can enter quite specific information about their migraines: severity, possible triggers, symptoms, and the like through an animated cartoon-style quiz format. The migraine severity prediction feature makes recommendations on what actions should be taken based with the predicted severity of the migraine therefore allowing for planning. The existent therapeutic tools that involve the use of the device include sound therapy where predefined frequencies are played to the patient, the pupil view which takes an eye pic and uploads a pic. Figure 4.1 visually represents the workflow of implementation. Also, a chatbot operated by artificial intelligence provides individualized advice and assists users in handling their symptoms effectively.

4.3.1 Components

1. **Login and Registration Screens:**
   - Provides Firebase Authentication for secure user management.
   - Allows users to create and manage their profiles.
2. **Landing Page:**
   - Serves as the main navigation hub for all features, including symptom tracking, sound therapy, and chatbot.
3. **Symptom Tracker:**
   - Collects user input on migraine details (severity, triggers, etc.).
   - Sends data to the backend for processing and stores it in Firestore.
4. **Chatbot:**
   - Processes user queries using the Flask API.

- Displays responses dynamically in a chat interface.

5. **Therapeutic Tools:**
   - **Sound Therapy:** Integrates audio files for therapeutic sound frequency playback.
   - **Pupil View:** Uses the Flutter camera package for accessing device cameras.

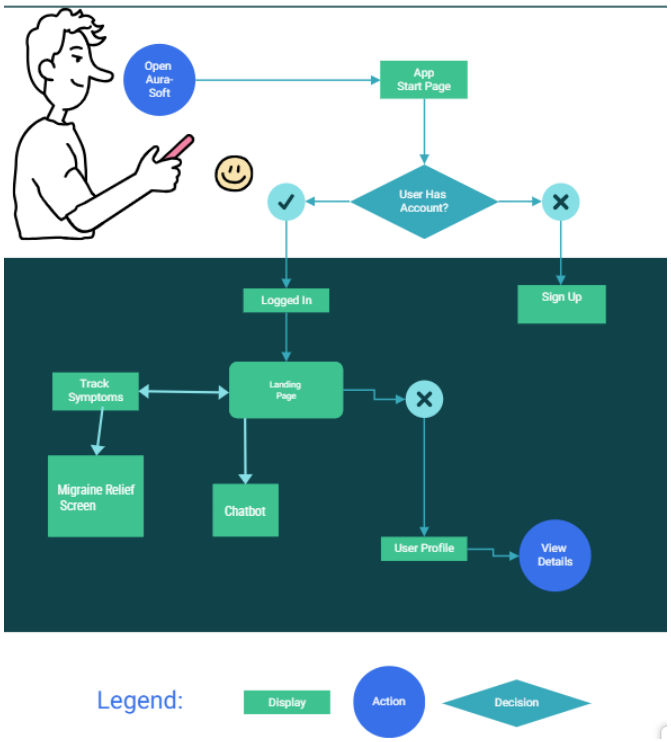

Figure 4.2 Frontend Screens Workflow

4.4 Machine Learning Model Implementation

To determine the severity of the migraines the system was built to employ the Gradient Boosting Classifier algorithm. This predictive model is built based on a filtered dataset from which are collected detailed descriptions of migraine symptoms, migraine triggers, and severities of these symptoms associated with the trigger factors. In order to help make the data usable for training and prediction models, preprocessing steps are taken. The data on symptoms and triggers is label encoded for changing categorical labels into a format which

would be understood by the machine Learning model, while numerical data is standardized by using the StandardScaler to make the data more amenable to machine learning. The above steps make the model more reliable in that it is accurate in giving out the right information to the users.

4.4.1 Training:

- 80% of the data is used for training, and 20% is used for testing.
- Model achieves high accuracy in predicting severity levels.

4.5 Prediction Workflow

The system is functional in a way that it handles migraine severity in response to the inputs of the user. Patients input symptom data through the user interface layer while the layers below this process the entered information. This information received a transformation with the help of a relevant scaler and encoders to adapt to the possibilities of the predictive model. The Gradient Boosting Classifier, derived by taking data from migraine history, takes the inputs and then assesses the degree of migraine. Last but not least, the results of the prediction are returned to the frontend for presentation in consumable forms.

CHAPTER 5

RESULTS AND DISCUSSIONS (or USER MANUAL)

5.1 System Requirements

To use the **Aura-Soft** application, ensure the following system requirements are met:

Hardware Requirements

A smartphone (Android) with internet connectivity.

Software Requirements

Mobile OS: Android (version 5.0 and above).

Dependencies:

- Firebase Authentication and Firestore integration.
- Camera and Audio support for therapeutic tools.
- AI server hosted with Flask.

5.2 Installation and Configuration

Step 1: Download Aura-Soft

- Visit the Google Play Store and search for **Aura-Soft**.
- Download and install the application.

Step 2: Configure the Application

- Open the app and log in using your credentials.
- First-time users must create an account by providing a valid email address and password.

Step 3: Allow Permissions

- Enable camera access for the retinal view functionality.
- Allow microphone and speaker access for sound therapy features.

5.3 Features and Navigation

It is a highly structured navigational system that integrates access to the primary functions of the system, namely the areas that track symptoms and their severity, as well as use therapeutic tools and a chatbot. Figure 5.1 visually shows. A further component implies a navigation bar to change between the modules and make the experience more fluid.

1. Registration

- Navigate to the **Sign-Up** page.
- Enter the required details (email and password).
- Confirm your account through Firebase Authentication.

2. Login

- Navigate to the **Login** page.
- Use your registered email and password to access the dashboard.

3. Symptom Tracking

- Click on the **Track Symptoms** tab on the main dashboard.
- Answer a series of symptom-related questions.
- Submit the data to view migraine severity predictions.
- Historical symptom data can be viewed under the **Symptom History** section.

4. AI-Powered Chatbot

- Open the **Chatbot** tab.
- Type in your query or select predefined questions.
- Receive instant assistance with recommendations tailored to your symptoms.

5. Sound Therapy

- Navigate to the **Sound Therapy** page.
- Select a therapeutic sound frequency and play it for non-invasive migraine relief.

6. Pupil View

- Access the **Pupil View** feature from the dashboard.
- Capture a real-time retinal image using your smartphone camera.

7. Personalized Recommendations

- Use the chatbot and severity prediction tools for actionable recommendations on migraine management.

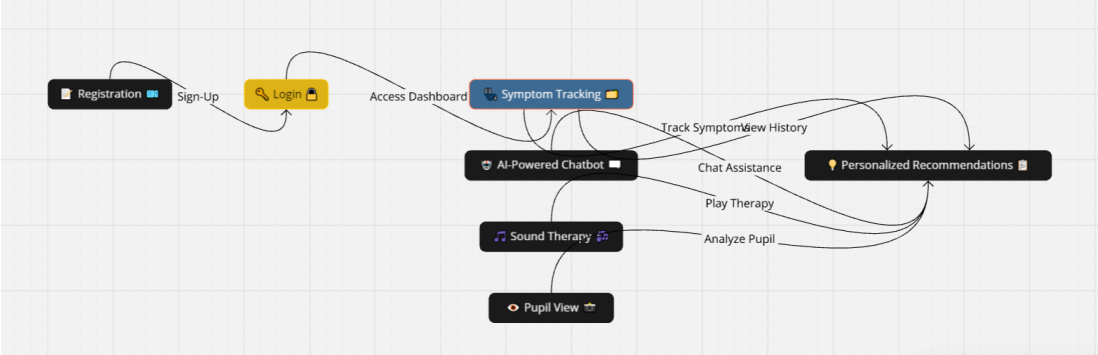

Figure 5.1: AuraSoft: Migraine Management System Workflow

5.4 Troubleshooting

The system also contains trouble shooting help with error message descriptions, frequently asked questions, and live chat. Its scalability lets the backend or frontend error be resolved as quickly as possible, and its performance remains dependable and effortless.

Issue 1: Unable to Log In

Solution: Ensure your internet connection is active. Verify your email and password. Reset the password if necessary.

Issue 2: Symptom Data Not Saved

Solution: Check that the Firebase Firestore integration is working. Ensure your account is properly synced with the database.

Issue 3: Sound Therapy Not Playing

Solution: Confirm that your device's speakers are functional and that the app has permission to access them.

Issue 4: Pupil View Fails to Open

Solution: Check camera permissions in your device settings and ensure the app is allowed to access the camera.

5.5 Feature Demonstrations

The system offers the full range of features to help with migraine support. Concerning symptom tracking, the users can go to this interface where they can enter information like severity, symptoms, triggers and aftereffect, and then send this data for the probability of migraine severity. The features of the AI chatbot includes that the user can either proceed through question and answer system or place a question/ query in their own words and get answer in a similar way. For the therapeutic relief, the app has list of preloaded sound frequencies to treat migraine discomfort incorporated into them. On the same note, the retinal view feature allow users to photograph the scene using the device camera in real-time and the images captured can be saved for later review.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The **Aura-Soft** application successfully addresses the challenges faced by individuals suffering from migraines by providing an innovative, user-friendly platform for migraine management. By integrating cutting-edge technologies such as machine learning, AI-driven chatbot support, and sound therapy, Aura-Soft offers users a comprehensive toolkit to manage their symptoms effectively. The application's key achievements include:

- **Personalized Symptom Management:** A symptom tracking tool that allows users to log and monitor their migraine-related data, helping them identify triggers and patterns.
- **AI-Powered Chatbot:** A conversational agent that provides instant recommendations and educational insights for migraine management.
- **Therapeutic Tools:** Features such as sound frequency therapy and pupil view functionality offer non-invasive and effective relief options.
- **Cross-Platform Accessibility:** Developed with Flutter, the application ensures smooth operation across both Android and iOS platforms.

This project demonstrates the potential of leveraging technology to improve health outcomes for individuals suffering from migraines. The combination of AI, machine learning, and mobile technologies ensures that Aura-Soft is not only effective but also accessible to a wide audience.

However, the current implementation has certain limitations, such as the dependency on predefined datasets for the chatbot and the lack of advanced

analytics for pupil view data. These limitations provide opportunities for future enhancements.

6.2 Recommendations

6.2.1 Enhancements of Current Features

It comes with new features; an improved interface for tracking the status; better prediction of severity of the disease; an updated collection of sounds that the system can play for the patient; better controls for viewing the pupils as a means of monitoring progress.

Advanced Chatbot Capabilities:

- Enhance the chatbot to provide more contextual and personalized responses by integrating a larger dataset or using advanced natural language processing (NLP) models like GPT.
- Add multi-language support to cater to a global audience.

Improved Symptom Tracking:

- Allow users to generate detailed reports of their symptoms over time.
- Include notifications for users to log symptoms at regular intervals for better data accuracy.

Integration of AI for pupil Analysis

- Develop AI-driven retinal analysis to detect early warning signs of migraines through captured images.
- Partner with medical professionals to validate and improve retinal analysis features.

6.2.2 Multi-Platform Support

In order to make Aura-Soft usable on a broader scale, a web-version of the application is being created, which will allow the users to control the course of their migraines from desktop or laptop interfaces. Furthermore, the cross-platform synchronization guarantees logical integration of the migraine

tracking system across multiple physical devices, thus giving users a chance to view or modify their records at their convenience.

6.2.3 Advanced Features

It comes with new features which make app more appealing and provide more ease to users. These features will implement with new technologies.

Dynamic Sound Therapy:

- Personalize sound therapy sessions based on user feedback and symptom severity.
- Introduce binaural beats or frequency-based treatments that adapt in real time.

Migraine Prediction Analytics:

- Incorporate predictive analytics using user data to alert individuals about potential migraines before they occur.
- Provide actionable recommendations based on predicted outcomes.

6.2.4 Usability and Accessibility

In the future, Usability and Accessibility will be advanced to implement interface contours corresponding to the user requirements, additional support for the assistive technology needed for users, and broad compatibility of interfaces in various devices and operating systems for all users.

User Interface Improvements:

- Enhance the design with advanced visual elements, intuitive navigation, and accessibility features such as voice commands and larger fonts.

Educational Content:

- Include detailed educational modules about migraines, triggers, and effective coping strategies within the application.
- Regularly update the app with the latest medical insights.

6.2.5 Partnerships and Integration

Partnerships and Integration objectives are to engage healthcare providers and technology solutions to improve the system. It will enhance the ability of third-party health application and services so that the users of the application can get a better experience in managing migraine.

Integration with Wearables:

- Collaborate with wearable device manufacturers (e.g., Fitbit, Apple Watch) to integrate biometric data for better symptom analysis.

Healthcare Partnerships:

- Partner with neurologists and healthcare providers to offer teleconsultations through the app.
- Enable users to share their logged migraine data directly with healthcare professionals.

Pharmaceutical Recommendations:

- Collaborate with pharmaceutical companies to provide users with accurate information about over-the-counter and prescription medications.

REFERENCES

Reference link:

[1]: "Identification of Everyday Sounds Perceived as Noise by Migraine Patientshttps://www.ncbi.nlm.nih.gov/pmc/articles/PMC6599942/.

Journal Papers:

[2]: A. Maurizio Bellini, Andrea Tiberi, Matteo Sebastiani, Matteo Vitale, ‘’Large-Scale Test of Industry 4.0 Technologies for Predictive Maintenance in High-Speed Railways’’, IEEE Transactions on Industry Applications, vol. 57, no. 5, pp. 5545-5553, Sept.-Oct. 2021.

[3]: "Identification of Everyday Sounds Perceived as Noise by Migraine Patients." 06 Jun. 2019, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6599942/.

[4]: "Migraine management: Non-pharmacological points for patients and health care professionals." 23 Nov. 2022, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9691984/.

App:

https://migrainebuddy.com/

Migraine Buddy was created by Healint, a healthcare technology company, and was first released in 2014.

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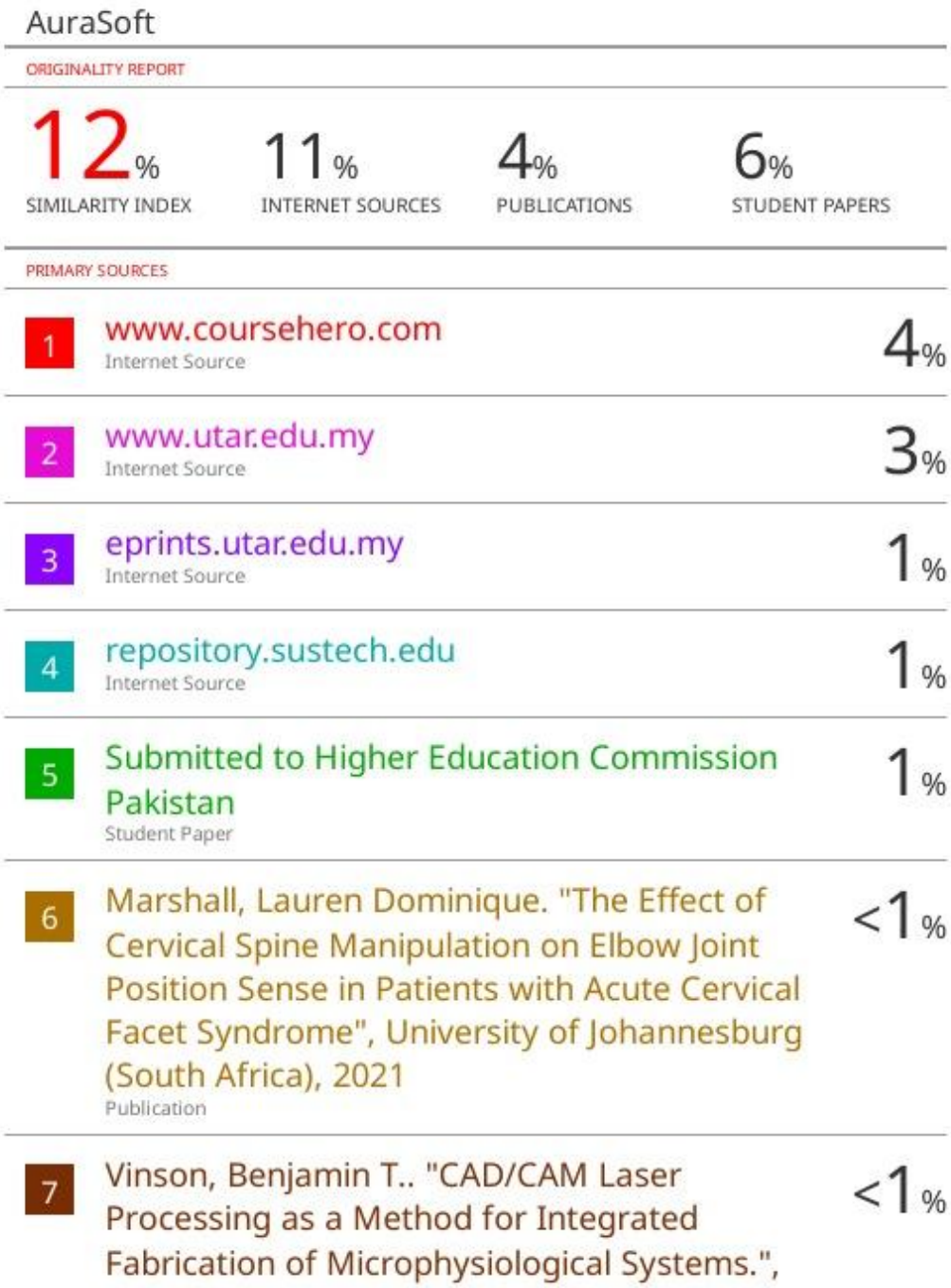

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