Software Requirements and Specification

Project Name: Anxiety Disorder Detection Using Machine Learning

Aligned SDG: 3-Good Health and Well Being

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**References**

**Use Case**

Predict the likelihood of an individual developing an anxiety disorder based on a set of relevant features based on GAD 7 questionnaire. This predictive model could be integrated into mental health assessment tools, healthcare systems, or applications aimed at promoting early intervention.

# Introduction

The subsections under this section are a brief overview of the Software Require1ments and Specifications (SRS) document for the application program titled “Anxiety Disorder Detection Using Machine learning”. The document highlights various tools, methodologies, techniques and approaches that have been used for the completion of the program.

## Purpose and Intended Audience

The purpose of this document is to provide a comprehensive outline of the requirements for the development of an Anxiety Detection System aimed at helping individuals manage and reduce their anxiety. The intended audience includes developers, designers, Students, project managers, and stakeholders involved in the development process.

## Project Scope

ML Model API: Building the anxiety Detection model [5] as an API that can be integrated into various products and services to enable anxiety screening.

* The Anxiety Detection System is an application that does predictive analysis to offer users personalized insights and strategies for anxiety reduction. The system will not provide medical advice or diagnoses but gives personalized recommendations on coping strategies and treatment options.
* Currently, the built of the application is for individual usage only[1], however it has the potential and the scope to scale into an enterprise edition, wherein it shall be usable by organizations and industries for more large-scale tracking of developmental expenses, if there are any.

## Terms, Definitions, and Acronyms

This document is prepared according to the IEEE SRS Standards and uses technical terminology, different formats of text and abbreviations to provide clarity and distinction to its readability.

* **Bold** text refers to headings.
* **SRS:** Software Requirement Specification
* **Predictive analytics:** The 3rd type of Data Analytics to “predict” future outcomes, in this case, the amount of money an individual must save in order to end up with a certain lump sum at the completion of a stipulated time.
* **Project:** refers to the application program that helps in anxiety disorder detection of an individual developing an anxiety disorder based on a set of relevant features based on GAD 7 questionnaire.
* **ML**: Machine Learning algorithms[4] process and analyze large amounts of data to identify patterns, correlations, and risk factors associated with anxiety disorders.
* **API**: Application Programming Interface

Building the anxiety detection model as an API that can be integrated into various products and services to enable anxiety screening. Providing personalized recommendation.

* **UI**: User Interface

Upon opening the application, users are supposed to fill basic demographic information based on GAD 7. This information can help contextualize the predictions and provide relevant resources.

# Overall Description

## Product Perspective

The Anxiety Detection System will function as a standalone application, providing users with a platform to understand their anxiety triggers and access strategies for anxiety reduction. It will not be integrated with external systems.

* The giveaway of this segment is that it uses Predictive Analytics to perform its main functionality, which is to help the user save a certain amount of time for getting to know their anxiety levels and issues

The key features of the Anxiety Detection System include:

* User input
* Anxiety tracking and input
* Predictive analysis based on user input and historical data
* Gives the result based on the user’s data
* Personalized anxiety management strategies
* Access to resources for anxiety reduction

## User Classes and Characteristics

There are two main classes of users for the application program, while keeping in mind its expansion to an enterprise level.

**1. Individuals Seeking Self-Assessment:** These users are concerned about their mental well-being and want to understand their risk of anxiety disorders.

They may not have a clinical diagnosis but are experiencing symptoms or have concerns about their mental health. [3]

**2. Mental Health Professionals:** These users are mental health practitioners such as psychologists, therapists, or counselors. They use the tool to complement their clinical assessments and provide personalized interventions.

**3. Researchers and Academics:** These users are interested in studying trends and patterns related to anxiety disorders. They may use the tool to gather data for research purposes.

**Operating Environment**

The Anxiety Prediction System will operate on multiple platforms. It will require an internet connection for real-time interaction, analysis, and content updates.

## Design and Implementation Constraints

* Requires a well-fitted broadband/internet connection always.
* Interface is available only in English.
* Doesn’t allow guest logins.
* Can operate and provide its functionalities solely on the data provided by the user.
* Has no compatibility restrictions.
* It will be designed with a user-friendly interface and accessibility considerations.

## Assumptions

Assumptions made during the development of this system include:

* Users should provide accurate and honest input data for analysis.
* The system's predictive accuracy will improve over time as it learns from user data.
* Users will use the provided anxiety management strategies at their discretion.
* Every user shall be having the appropriate hardware and software components as per the requirements.
* Every user shall provide realistic data.
* All variables will be flexible with Regression Analysis used for Prediction.

# Specific Requirements

This section features key requirements that the application program must fulfill.

## Functional Requirements.

The major and challenging requirement of Building an anxiety disorder detection is to gather data.

* Data Collection by conducting Survey based on GAD 7 questionnaire.

### User data Input

* Users are supposed to give the right data.

### Anxiety Tracking and Input

* Users can log daily activities, mood, stressors, and anxiety levels.
* Users can input data through intuitive forms and interactive elements.

### Predictive Analysis

* The system will analyze user input and historical data to predict potential anxiety triggers.
* Machine learning algorithms will be employed to improve prediction accuracy over time.

### Personalized Strategies and Resources

* The system will provide tailored anxiety management strategies and techniques based on user data and predictions.

## Non-Functional Requirements

### Security and Privacy

* User data will be encrypted during transmission and storage.
* User data will be anonymized and aggregated for analysis to protect user privacy.

### Performance

* The system should provide predictions and coping strategies within a few seconds.
* The application should load quickly, ensuring a seamless user experience.

### Usability and Accessibility

* The user interface should be intuitive, responsive, and accessible to users with diverse abilities.
* Content should be organized logically, and navigation should be user-friendly.

## External Interface Requirements

While keeping in mind the possibility of the application being enterprise-appropriate, each individual, belonging to either of the user classes, shall have distinctive access to this platform, paired with unique IDs to access. Other interfaces described below are:

### User Interfaces

* The user interface should be visually appealing, with clear forms and interactive elements.
* Users should be able to easily navigate between different sections of the application.

### Hardware Interfaces

* The system should be compatible with a wide range of devices, including desktops, laptops, and mobile devices.

### Software Interfaces

There are various tools and techniques that shall be used for the creation of this project. The tools that will be using majorly are:

* **Anaconda Jupyter Notebook:** for Exploratory Data Analysis, creation of dashboards, data visualization, and for implementing predictive analytics using Regression.
* **Python:** for data science and for the predictive analytics.
* **Microsoft Excel:** to store the user data in a structured format, and increased readability of .csv files via Python.
* **ML Model API:** for front-end development that is the exterior switch for the user, in the entire switchboard mechanism. Deployment of the model using Streamlit.

**References**

[1] Carpenter, KLH, Sprechmann P, Calderbank R, Sapiro G, Egger HL. Quantifying Risk for Anxiety Disorders in Preschool Children: A Machine Learning Approach. (2016).

[2] Sprechmann, P, Carpenter, KLH, Calderbank, R, Sapiro, G, Egger, HL. Quantifying Risk for Anxiety Disorders in Preschool Children: A Machine Learning Approach. (2023).

[3] Egger, HL, Carpenter, KLH, Sprechmann, P, Calderbank, R, Sapiro, G. Quantifying Risk for Anxiety Disorders in Preschool Children: A Machine Learning Approach. (2023).

[4] Nemesure, M.D., Heinz, M.V., Huang, R. et al. Predictive modeling of depression and anxiety using electronic health records and a novel machine learning approach with artificial intelligence. (2021)

[5] A. Ahmed, R. Sultana, M. T. R. Ullas, M. Begom, M. M. I. Rahi and M. A. Alam, "A Machine Learning Approach to detect Depression and Anxiety using Supervised Learning," (2020)