Software Requirements Specifications

SentiCare

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Project Manager's Signature

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Definition of Terms, Acronyms and Abbreviations

Term	Description
STT	Speech-to-text
RL	Reinforcement Learning
NLU	Natural Language Understanding
MFCC’s	Mel-Frequency Cepstral Coefficients
BERT	Bidirectional Encoder Representations
PPO	Proximal Policy Optimization
API	Application Programming Interface
TTS	Text-to-Speech

Table of Contents

1. Introduction

1.1 Purpose of Document

This Software Requirements Specification document will outline SentiCare, a bilingual chatbot for accessible psychological assistance to users. Developers, project managers and other stakeholders participating in the platform's development will be the target audience for this document.

1.2 Project Overview

The goal of SentiCare is to provide a stigma-free, 24/7 accessible and privacy-preserving platform for emotional support where users can interact through voice. The system will analyze it using voice biomarkers and provide contextually appropriate responses like therapies and exercises.

1.3 Scope

Using SentiCare, users will be able to easily assess their mental health via dialogue-based assessment, make use of AI-powered features and manage their mental health through therapies and exercises that SentiCare will provide based on CBT techniques and user's emotional progress over time.
It will not replace professional psychiatric treatment, prescribe medications or clinical diagnoses. It will not share user data with third parties or provide medical advice beyond emotional support.

2. Overall System Description

2.1 User characteristics

SentiCare will be designed for developers, professionals and students for improvement in mental health domain. Basically, it will be for customers to improve their mental well-being. SentiCare will provide a simple, intuitive web interface and generate easy-to-understand responses, allowing non-technical users to quickly grasp it without any technical knowledge.

2.2 Operating environment

SentiCare will operate in a web-based environment and be accessible through modern browsers like Google Chrome, Firefox, and Edge. The backend will be cloud-hosted along with AI model using Python libraries. Tools (e.g., Google Collab, mBERT) were used during development to ethically assess mental health on users. Basic hardware with a stable internet connection will be sufficient for smooth operations.

2.3 System constraints

a. Software Constraints:

SentiCare will require modern browsers (Google Chrome, Firefox, Edge) for accessing mental health. The backend will depend on Python-based libraries which must be supported by the hosting environment.

b. Hardware Constraints:

SentiCare will require at least 4-8 GB RAM and a stable internet connection to perform real-time detection and AI model processing efficiently.

c. Cultural Constraints:

SentiCare currently will support English and Urdu languages for the interface and responses. Future updates may consider multilingual support.

d. Legal Constraints:

SentiCare will be designed solely for emotional support and self-assessment purposes. Unauthorized use will be prohibited to ensure ethical and legal compliance.

e. Environmental Constraints:

SentiCare will be web-based and not affected by physical environmental factors. However, users will need an active internet connection.

f. User Constraints:

SentiCare will be designed to be user-friendly, avoiding complex jargon. It will provide simple voice responses so that non-technical users can easily understand.

3. External Interface Requirements

3.1 Hardware Interfaces

SentiCare will be a web-based tool, meaning it has minimal hardware dependencies. However, certain hardware interfaces will be essential for smooth execution, efficiency and security. It will require a dedicated or cloud-based server to process data, handle user requests, and generate responses. A stable internet connection will be necessary as the framework needs to fetch data and assess mental health. Any interruption could lead to incomplete or inaccurate results. High-performance CPU/GPU can significantly enhance processing speed and accuracy. Faster computation will reduce detection time and enable efficient deep-learning analysis.

3.2 Software Interfaces

SentiCare will interact with external tools and components. It will use Python as the primary programming environment along with relevant libraries. During analysis, voice biomarkers and mBERT will be used. Backend database (e.g. SQL/MongoDB) will be used. SentiCare will operate efficiently on a standard local environment. The final responses will be generated that allow users to interact with the system via user-friendly interface.

3.3 Communications Interfaces

In SentiCare, communication will be facilitated primarily through the web interface. When a user will interact for assessment, the system will communicate with the backend over HTTPS

to ensure secure transmission of data. The user's input will be received in the form of an HTTP request, which will contain the target data. User's interaction will be conducted via secure web requests to ensure data confidentiality. For communication security, SSL/TLS encryption will be employed to protect data.

4. Functional Requirements

SentiCare will be designed to provide users with the ability to improve mental well-being. The system will allow users to interact through a secure web interface. Upon submission, the backend will process the voice by using NLU and mBERT. Users will receive exercises and therapies based on CBT templates. The system will provide real-time responses to users to support emotional well-being efficiently.

5. Non-functional Requirements

5.1 Performance Requirements

SentiCare should be able to assess and analyze mental health quickly, without long delays. Up to 10-30 users can utilize the system at once, without experiencing any performance issue.

5.2 Safety Requirements

SentiCare must follow ethical guidelines and avoid harmful actions. Any potentially harmful actions, like unauthorized data access or changes, must be strictly prevented. It should comply with legal and institutional safety regulations to avoid misuse or unintended consequences.

5.3 Security Requirements

User's data must be encrypted. Proper authentication mechanisms will stop unwanted access. Any stored data should be handled securely and kept confidential. It will follow best practices relevant to domain and comply with relevant privacy standards to maintain data integrity and user trust.

5.4 User Documentation

To support users of all technical levels, the system will include clear and helpful documentation. This will include a user manual, step-by-step guide and online help resources.

6. Assumptions and Dependencies

SentiCare is based on several assumptions. First, we assume that the datasets collected during development will remain valid and representative of real-world scenarios. If these datasets

change significantly or become outdated, the performance of model might be affected. Next, we assume that users of the system have basic internet access and a modern web browser to interact effectively. We also assume that users have access to a microphone for clear voice.
There are also some dependencies. For example, the project will depend on the availability of third-party tools and libraries such as AI algorithms for machine learning, Flutter for web interaction and Google Collab for training and testing the model. Any major changes or downtime in these tools could delay development or affect system performance. Since SentiCare is planned to be deployed online, it will rely on stable hosting services and internet infrastructure. Any disruption in these services could impact the system's accessibility and reliability.

7. References

Ref. No.	Document Title	Date of Release/ Publication	Document Source
1.	Project Proposal	Oct 06, 2025	https://github.com/sheikh-zain786/SentiCare-Capstone/tree/main/proposal
2.	Dataset Description	Oct 10,2025	https://github.com/sheikh-zain786/SentiCare-Capstone/tree/main/Datasets

8. Appendices

1. UI Mockups: Visuals of key interfaces (Homepage, Language Selection, Voice Input Screen, Assessment Questionnaire, CBT Exercise Interface, Progress Dashboard).

2. Database Schema: Tables for Users, Sessions, Assessment_Scores, Voice_Biomarkers, CBT_Templates, RL_Rewards, and Crisis_Detection_Logs.

3. API Documentation: Key API endpoints (User Authentication, Voice Upload, STT Processing, Emotion Detection, CBT Template Retrieval, Session Storage, TTS Generation).

4. Compliance:

- Data Privacy: GDPR compliance, data protection laws, user consent protocols

- Ethical Guidelines: Mental health data handling, crisis referral procedures, anonymization standards

5. System Requirements: Hardware/software specifications (Server: 4-8 GB RAM, 2 CPU cores; Client: Browser with microphone access; Python 3.9+, MongoDB, required libraries).

6. CBT Template Library: Complete collection of 30-45 structured CBT templates in English and Urdu with clinical references.

7. Evaluation Metrics: Success measurements (User engagement rate, sentiment improvement scores, technique effectiveness by disorder type, RL convergence metrics).