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Submitted to
MISS MAIDA

Subject
SOFTWARE ENGINEERING

Department
**BS SOFTWARE ENGINEERING
(3RD SEMESTER)**

Software Requirements Specification (SRS)

Emotion-Aware Virtual Assistant

1. Introduction

1.1 Purpose

This document specifies the software requirements for the "Emotion-Aware Virtual Assistant." The primary purpose of this system is to enhance user interactions by analyzing emotional cues derived from tone, facial expressions, and sentiment in text. This enables empathetic and context-sensitive responses, facilitating improved mental health support, customer service, and personalized experiences.

1.2 Scope

The "Emotion-Aware Virtual Assistant" is a sophisticated software solution that leverages artificial intelligence and machine learning. The system is designed to analyze user inputs through text, audio, and visual channels to identify emotional states and respond empathetically. Key application areas include:

1. **Mental Health:** Providing real-time emotional support and suggesting coping strategies.
2. **Customer Support:** Enhancing interactions by recognizing frustration or satisfaction and tailoring responses.
3. **Personal Assistance:** Creating a more human-like interaction experience.

1.3 Definitions, Acronyms, and Abbreviations

- **SRS:** Software Requirements Specification
- **AI:** Artificial Intelligence
- **ML:** Machine Learning
- **NLP:** Natural Language Processing
- **API:** Application Programming Interface
- **UI:** User Interface
- **GDPR:** General Data Protection Regulation

1.4 References

1. Research paper: Sentiment Analysis in Textual and Multimodal Interactions.
2. Azure Cognitive Services API documentation.
3. Ethical Guidelines for AI-based Emotional Analysis.

1.5 Overview

- **Section 1:** Introduction
- **Section 2:** Overall Description
- **Section 3:** Specific Requirements
- **Section 4:** Appendices

2. Overall Description

2.1 Product Perspective

The "Emotion-Aware Virtual Assistant" is a cloud-based AI application designed for real-time emotional analysis and empathetic interaction. It integrates seamlessly with existing platforms such as CRM tools, mental health apps, and voice assistants. The application is built using AI frameworks like TensorFlow for deep learning and natural language processing, and it utilizes Azure Cognitive Services for sentiment and facial recognition APIs.

2.2 Product Functions

The main functions of the software include:

1. **Emotion Detection:** Analyzing textual, vocal, and visual inputs to identify emotional states.
2. **Empathetic Response Generation:** Crafting responses tailored to detected emotional states.
3. **Real-Time Feedback:** Providing dynamic emotional analysis and suggestions in active conversations.

2.3 User Classes and Characteristics

1. **Administrators:** Responsible for configuring the system, managing integrations, and monitoring performance.
2. **End Users:** Individuals interacting with the assistant for support, including:
 - Mental health patients
 - Customer service representatives
 - General users seeking assistance

2.4 Operating Environment

- **Platform:** Web-based and mobile-compatible.
- **Web Browser:** Chrome, Firefox, Edge, Safari.
- **Server:** AWS cloud with GPU instances for AI computation.
- **Mobile Devices:** Android and iOS support.

2.5 Constraints

- Compliance with GDPR for data privacy.
- HIPAA compliance for applications in healthcare.
- Response time must not exceed 500 milliseconds.
- Requires continuous internet connectivity.

2.6 Assumptions and Dependencies

- Reliable external APIs for sentiment analysis and facial recognition.
- Users' devices must support camera and microphone access.
- The system assumes integration with CRM or similar platforms for customer service applications.

3. Specific Requirements

3.1 Functional Requirements

Emotion Detection

- The system shall analyze text inputs using NLP to determine sentiment (positive, negative, neutral).
- The system shall detect facial expressions (e.g., happiness, anger, sadness) via the user's camera.
- The system shall process vocal inputs to identify tone and emotion.

Empathetic Response Generation

- The system shall generate text or audio responses tailored to the user's emotional state.
- The system shall offer context-sensitive advice, such as calming techniques for stress.

Integration with External Systems

- The system shall integrate with third-party APIs for sentiment analysis.
- The system shall support integration with CRM platforms for customer service.

User Management

- The system shall allow users to register and manage profiles securely.
- The system shall store interaction history for personalized responses.

3.2 Non-Functional Requirements

Performance Requirements

- The system shall handle up to 10,000 concurrent users.
- Average response latency must not exceed 500 milliseconds.

Security Requirements

- Data storage and transmission shall use AES-256 encryption.
- The system shall implement role-based access control for administrators and users.

Scalability Requirements

- The system shall scale horizontally to handle increased traffic.

Reliability Requirements

- The system shall maintain 99.9% uptime.

3.3 External Interface Requirements

User Interfaces

- The system shall provide a responsive web UI and mobile application.
- The UI shall include accessibility features, such as voice interaction.

Hardware Interfaces

- The system shall utilize device cameras and microphones for input.

Software Interfaces

- The system shall integrate with APIs like Azure Cognitive Services for facial and sentiment analysis.

3.4 System Features

Real-Time Sentiment Analysis

- Detects sentiment in multi-lingual text inputs.
- Provides a dashboard with graphical insights into emotional trends.

Facial Emotion Detection

- Captures real-time facial expressions using device cameras.
- Supports lighting adjustments for accurate detection.

Audio Tone Analysis

- Recognizes vocal tones indicative of emotions like anger or calmness.

4. Appendices

4.1 Glossary

- **Sentiment Analysis:** The process of determining the emotional tone behind a body of text.
- **Facial Recognition:** AI technology for analyzing facial expressions to infer emotions.
- **Natural Language Processing (NLP):** A field of AI focused on the interaction between computers and humans through language.

4.2 References

- Research papers and AI frameworks mentioned in Section 1.4.
- API documentation for Azure Cognitive Services.

4.3 Revision History

| Version | Date | Description | Author |
|---------|---------------|----------------------------------|-------------|
| 1.0 | [Insert Date] | Initial Draft | [Your Name] |
| 1.1 | [Insert Date] | Updated after stakeholder review | [Your Name] |

