

Requirements Analysis Document

1. Introduction

1.1 Purpose

This document outlines the requirements for a prototype to analyze recorded conversations between patients and medical agents/nurses. The primary objective is to identify and predict potential adverse events based on the content of these conversations, leveraging speech-to-text conversion, sentiment analysis, and a prediction model.

1.2 Scope

The web application will process audio recordings, convert them to text, and analyze the text to detect adverse events. It will also perform sentiment analysis at various points in the conversation. The application will return predictions about potential adverse events, list of drugs mentioned, and adverse reactions described by the patient.

1.3 Definitions

- Adverse Event (AE): Any unfavorable or harmful event related to the use of a medication or other intervention.
- Sentiment Analysis: The process of determining the emotional tone behind a series of words.
- Speech-to-Text (STT): The process of converting spoken language into written text.

2. Problem Statement

Millions of conversations occur daily between medical agents/nurses and patients regarding medical conditions and medications. Adverse events, which might not be immediately obvious to either party, could be mentioned in these conversations. Identifying and flagging these potential adverse events is crucial to prevent or remediate them effectively.

3. Functional Requirements

3.1 Speech-to-Text Conversion

- Requirement: Convert audio recordings of conversations into text.
- Input: Audio file (e.g., WAV, MP3).

- Output: Text transcript of the conversation.

3.2 Adverse Event Detection

- Requirement: Analyze the text to determine if an adverse event is mentioned.
- Input: Text transcript.
- Output: Dictionary containing-
 - is_ae (boolean) - Indicates whether an adverse event is present.
 - drugs (list) - Names of drugs mentioned in the conversation.
 - adverse_events (list) - List of reactions mentioned.

3.3 Sentiment Analysis

- Requirement: Analyze the sentiment of the patient at different times during the conversation.
- Input: Text transcript with timestamps.
- Output: Sentiment score and analysis at various points in the conversation.

3.4 API Integration

- Requirement: Integrate with a web API to process the text and perform analysis.
- Input: Text transcript.
- Output: Structured data including AE prediction, drugs, and adverse events.

3.5 User Interface

- Requirement: Provide a web-based user interface for uploading audio files, viewing analysis results, and interacting with the application.
- Input: User interactions (e.g., file uploads, data requests).
- Output: Display of analysis results and visualizations.

4. Non-Functional Requirements

4.1 Performance

The application should process audio recordings and return results within a reasonable time frame (e.g., < 5 minutes for a 30-minute conversation).

4.2 Scalability

The system should handle a large number of concurrent users and audio files efficiently.

4.3 Security

Ensure data privacy and security for sensitive patient information. Implement anonymization of patient personal information.

4.4 Usability

The user interface should be intuitive and easy to navigate for medical professionals.

4.5 Reliability

The system should be robust and handle various input formats and possible errors gracefully.

5. System Architecture

5.1 Components

1. Speech-to-Text Module: Converts audio recordings into text.
2. Text Analysis Module: Performs adverse event detection and sentiment analysis.
3. API: Handles requests and responses between the frontend and backend.
4. Frontend Interface: Web-based user interface for interaction.
5. Database: Stores conversation transcripts, analysis results, and user data.

5.2 Data Flow

1. Input: Audio file → Speech-to-Text Conversion → Text Transcript
2. Processing: Text Transcript → Adverse Event Detection and Sentiment Analysis
3. Output: Results → API → Frontend Interface

6. Constraints

Audio Quality: Poor audio quality may affect the accuracy of speech-to-text conversion.

Language and Accents: Variations in language and accents may impact the performance of text analysis and sentiment detection.

8. Dependencies

Speech-to-Text Service: Integration with a third-party or proprietary STT service such as deepgram

Text Analysis Libraries: Libraries or services for performing sentiment analysis and adverse event detection.

This document provides a comprehensive overview of the requirements needed to develop a web application for analyzing conversations between patients and medical agents/nurses for adverse events. The focus is on capturing and processing audio, converting it to text, analyzing it for potential adverse events and sentiments, and presenting the results in a user-friendly interface.