Introduction

This Software Requirements Specification (SRS) document outlines the requirements for an AI-powered assistant system designed to interact with users via text and voice. The system aims to provide a seamless user experience, similar to platforms like ChatGPT, by offering both text-based and voice-based interaction options. It will include features such as Speech-to-Text (STT), Text-to-Speech (TTS), and real-time two-way voice calls, making it suitable for a wide range of applications, from customer support to personal assistance. The document also details the system’s functional and non-functional requirements, external interfaces, and the overall architecture, ensuring that all aspects of the system are clearly defined and well understood. The AI assistant is expected to handle multiple concurrent sessions, offer real-time responses, and maintain secure, logged conversations for future reference. The system will be deployed across web and mobile platforms, ensuring accessibility and convenience for end users.

**Definitions and Acronyms**

* **AI (Artificial Intelligence)**: The simulation of human intelligence processes by machines, especially computer systems, that enables them to learn, reason, and perform tasks typically requiring human intelligence such as decision-making, language translation, and visual recognition.
* **STT (Speech-to-Text)**: A technology that converts spoken language into written text, enabling voice inputs to be processed as text for further analysis or response generation.
* **TTS (Text-to-Speech)**: A technology that converts written text into spoken words, allowing the system to communicate responses to the user through voice.
* **NLP (Natural Language Processing)**: A field of AI focused on enabling machines to understand and interpret human language in a way that is both meaningful and useful for tasks like translation, sentiment analysis, and question answering.
* **JWT (JSON Web Token)**: A compact, URL-safe token format used for securely transmitting information between parties as a JSON object, often used for authentication and authorization in APIs.
* **UI (User Interface)**: The means by which a user interacts with a computer or system, including graphical elements, input controls, and navigation features.
* **API (Application Programming Interface)**: A set of protocols, tools, and definitions that allow one software system to communicate and interact with another system or application.
* **LLM (Large Language Model)**: A type of AI model trained on vast amounts of text data to understand, generate, and interpret human language in a sophisticated way.
* **Twilio**: A cloud communications platform that enables developers to add voice, messaging, and video capabilities to applications through APIs, often used for creating communication systems like virtual call centers.

**1.User Requirements**

| **ID** | **User Requirement Description** | **Rationale / Benefit** | **Testable** |
| --- | --- | --- | --- |
| UR-1 | Users shall be able to send text messages to the AI and receive replies | Enables basic interaction through typing | Send message → Verify AI reply received |
| UR-2 | Users shall be able to speak to the AI via microphone | Supports hands-free and natural interaction | Record voice → Transcribed and replied |
| UR-3 | Users shall be able to hear AI responses as synthesized voice | Accessible for users who cannot read the screen | Voice response plays clearly |
| UR-4 | Users shall be able to make voice calls to the AI, similar to a phone call | Practical for real-time, natural conversations | Make a call → Bidirectional voice interaction |
| UR-5 | Users shall be able to view past conversations and call logs | Useful for referencing past discussions | Open history → Content and timestamp shown correctly |
| UR-6 | Users shall log in to access the system to protect personal data | Ensures security and access control | User logs in → Access restricted by token |
| UR-7 | Users shall be able to use the system on both mobile and desktop devices | Flexibility for varied use cases | System works on both platforms without layout issues |

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| UR-8 | The user must be able to rate the quality of the system’s responses (e.g., 1-5 stars) | Helps improve service quality and the AI’s learning ability | Test rating feature and store results |
| UR-6 | The user must be able to set personal preferences for AI interactions (e.g., response style, language, etc.) | Enhances flexibility in communication and makes the user experience more personalized | Test configuration feature and apply user preferences |
| UR-9 | The user must be able to receive notifications via email or SMS about important conversations or system updates | Helps the user stay informed about system activities in real-time | Test notification sending functionality via email or SMS |
| UR-10 | The user must be able to request direct voice call support from the system | Provides flexible and immediate support for situations requiring human intervention | Test direct call initiation and reception |
| UR-11 | The user must be able to schedule events and receive reminders from the system (e.g., meetings, appointments) | Helps users manage time and keep track of important events | Test scheduling and reminder feature |
| UR-12 | The user must be able to upload documents or images for analysis and receive feedback from the system | Allows the user to get detailed analysis or feedback on documents and images | Test file/image upload and processing feature |
| UR-13 | The user must be able to create and manage tasks or reminders in the system | Helps users track tasks and deadlines more effectively | Test task creation, management, and deletion functionality |
| UR-14 | The user must be able to choose the type of response from the system (e.g., brief, detailed) | Increases flexibility to meet user preferences for response length and detail | Test response style selection feature |
| UR-15 | The user must be able to share conversation or call results via email or social media | Makes it convenient to share information or results with others | Test sharing functionality through different platforms |
| UR-16 | The user must be able to request suggestions or advice based on their preferences and interaction history | Personalizes the user experience and makes the system more helpful | Test suggestion feature and verify accuracy of information |
| UR-17 | The user must be able to report issues or send feedback directly to the development team | Supports rapid improvement and issue resolution | Test issue reporting and feedback submission functionality |
| UR-18 | The user must be able to set restrictions or rules on the type of information the system can provide (e.g., only educational information, no political content) | Ensures safety and meets specific user requirements regarding information security | Test setting and applying information restrictions |
| UR-19 | The user must be able to receive high-quality voice and video calls from the system | Enhances communication and information exchange through video calls | Test video call functionality and ensure call quality |
| UR-20 | The user must be able to schedule and receive automatic notifications or messages at a specified time | Helps users stay on top of important updates and schedules | Test scheduling and sending of automatic notifications |
| UR-21 | The user must be able to change the system's interface (light/dark mode, font style, color schemes) | Increases personalization and comfort during system usage | Test interface customization and user configuration |
| UR-22 | The user must be able to make group calls and exchange information in a shared conversation | Supports group collaboration and improves work efficiency | Test group calling functionality and information sharing |

**2.Functional Requirements**

| **System Requirement Statement** | **Related UR** | **Verifiable/Testable** |
| --- | --- | --- |
| **FR-1**: The system must allow users to interact with the chatbot in real-time. | UR-5, UR-6 | Test that the chatbot responds to user input in real-time (within 2 seconds). |
| **FR-2**: The system must provide users with the ability to rate the quality of responses from the chatbot (e.g., 1-5 stars). | UR-5 | Verify that users can rate the responses, and the ratings are correctly stored in the database. |
| **FR-3**: The system must allow users to set personal preferences (e.g., language, tone of responses). | UR-6 | Test that users can successfully configure their preferences and the system applies these settings. |
| **FR-4**: The system must allow users to schedule calls or meetings with support staff. | UR-8 | Test the scheduling feature, ensuring users can schedule calls and receive reminders. |
| **FR-5**: The system must support the upload and analysis of documents or images for feedback. | UR-10 | Test the file upload and processing system to ensure accurate feedback is given based on the document or image. |
| **FR-6**: The system must allow users to send messages and notifications for key events, such as system updates or new tasks. | UR-7 | Verify that notifications are correctly sent and received (email or SMS). |
| **FR-7**: The system must allow users to initiate voice and video calls for support or conversations. | UR-17 | Test the functionality of initiating and receiving voice/video calls with high quality. |
| **FR-8**: The system must allow users to create and manage tasks or reminders. | UR-11 | Verify that users can create, edit, and delete tasks and reminders in the system. |
| **FR-9**: The system must provide users with suggestions or advice based on interaction history. | UR-14 | Test the suggestion feature to ensure it provides relevant advice based on previous interactions. |
| **FR-10**: The system must allow users to report issues or submit feedback to the development team. | UR-15 | Test the issue reporting mechanism to verify users can submit feedback or report problems efficiently. |
| **FR-11**: The system must allow users to access analytics and performance dashboards for insights. | UR-9 | Test the analytics dashboard for accuracy and real-time updates on metrics. |
| **FR-12**: The system must support the sharing of conversation or call results via email or social media. | UR-13 | Test the sharing functionality to ensure users can send information through various platforms. |
| **FR-13**: The system must support role-based access control to manage user permissions. | UR-13 | Verify that the system restricts access based on roles, allowing or denying permissions according to user roles. |
| **FR-14**: The system must allow users to access support or troubleshooting guides directly from the interface. | UR-18 | Test that users can access support documentation and troubleshooting guides easily from the system interface. |
| **FR-15**: The system must support continuous integration for faster updates. | UR-20 | Verify the continuous integration and deployment pipeline, ensuring updates are deployed without significant downtime. |
| **FR-16**: The system must allow users to search for past interactions or conversations using keywords or tags. | UR-12 | Test that the search functionality returns relevant past interactions based on user-provided keywords or tags. |
| **FR-17**: The system must enable users to filter search results based on time period, category, or interaction type. | UR-12 | Verify that the filter options work correctly and return appropriate results based on selected criteria. |
| **FR-18**: The system must allow users to export conversation or call logs in various formats (e.g., CSV, PDF). | UR-16 | Test the export functionality, ensuring users can download logs in their preferred formats. |
| **FR-19**: The system must allow users to set recurring tasks or reminders (e.g., daily, weekly). | UR-11 | Verify that users can create recurring tasks and receive reminders as specified. |
| **FR-20**: The system must provide an option to customize notification preferences (e.g., frequency, channels). | UR-7 | Test the notification settings to ensure users can choose how often they receive notifications and via which channels (email, SMS, etc.). |
| **FR-21**: The system must allow users to block or mute specific contacts or groups to avoid unwanted communication. | UR-8 | Test that users can block or mute contacts/groups, preventing any future communication from those entities. |
| **FR-22**: The system must support voice recognition to transcribe audio messages or conversations. | UR-17 | Verify the voice recognition accuracy and ensure that audio content is transcribed correctly into text. |
| **FR-23**: The system must allow users to rate the overall experience after every call or conversation. | UR-5 | Verify that users can rate their overall experience, and the ratings are captured and stored correctly. |
| **FR-24**: The system must provide users with AI-generated suggestions for improving communication or task efficiency. | UR-9 | Test that the AI generates relevant suggestions based on user behavior or tasks, ensuring usefulness and accuracy. |
| **FR-25**: The system must support integration with external calendar systems (e.g., Google Calendar, Outlook) for scheduling calls and meetings. | UR-8 | Test integration with external calendars by scheduling a meeting and verifying it syncs correctly across platforms. |
| **FR-26**: The system must support the use of natural language processing (NLP) to interpret and respond to complex user inputs. | UR-5, UR-6 | Verify that the NLP engine correctly processes and responds to complex user inputs in a meaningful way. |
| **FR-27**: The system must allow users to attach multiple files to messages or tickets for detailed feedback. | UR-10 | Test the attachment feature by verifying that users can successfully attach and send multiple files. |

**3.Non-Functional Requirements**

| **Statement** | **Category** | **Measurable/Testable** |
| --- | --- | --- |
| **SR-1**: The system must support 99.9% uptime and minimal downtime during maintenance. | Availability | Uptime is measured and must meet or exceed 99.9%. Test by monitoring system uptime and maintenance periods. |
| **SR-2**: The system must be able to handle up to 1,000 concurrent users without performance degradation. | Scalability | Test system performance with 1,000 users, ensuring it functions within acceptable limits (e.g., no significant latency or errors). |
| **SR-3**: The system must process user input and provide a response within 2 seconds for 95% of all requests. | Performance | Measure the system's response time during peak usage to ensure 95% of requests are processed in under 2 seconds. |
| **SR-4**: The system must support processing of at least 10,000 transactions per day without degradation. | Throughput | Stress test with 10,000 transactions per day, ensuring no system slowdown or failure. |
| **SR-5**: The system must comply with GDPR and CCPA data privacy regulations. | Compliance | Verify through legal audits and tests that the system adheres to data privacy standards (e.g., data retention, user consent, data handling). |
| **SR-6**: The system must be responsive and accessible on various platforms (web, mobile). | Usability | Test the system's interface on web and mobile platforms across multiple devices and screen sizes to ensure it is fully responsive. |
| **SR-7**: All sensitive data must be encrypted in transit and at rest using modern encryption standards (e.g., AES-256). | Security | Perform encryption tests to ensure data is encrypted properly during storage and while transmitted over networks. |
| **SR-8**: The system must support at least 5 different languages and region-specific configurations. | Internationalization | Test the system in multiple languages and regions to ensure functionality and localization of content. |
| **SR-9**: The system must have a user-friendly interface, requiring no more than 3 clicks to access key features. | Usability | Conduct usability tests to ensure the interface is intuitive, with users able to reach key features within 3 clicks. |
| **SR-10**: The system must log all user interactions for auditing purposes. | Auditability | Verify that all user interactions are captured in audit logs and can be  traced back to specific actions or transactions. |
| **SR-11**: The system must be able to recover within 5 minutes after any unplanned downtime. | Reliability | Test system recovery time during simulated downtime, ensuring recovery is completed within 5 minutes. |
| **SR-12**: The system must support automated backups of all critical data at least once every 24 hours. | Data Integrity | Verify that backups are successfully completed every 24 hours and are restorable. |
| **SR-13**: The system must allow for role-based access control (RBAC) to restrict users' access based on their roles. | Security | Test role-based access control by creating various user roles and verifying access restrictions according to their role. |
| **SR-14**: The system must provide real-time analytics and dashboards for users to track key metrics and performance indicators. | Functionality | Test the real-time analytics functionality by verifying the dashboard’s accuracy and update speed in displaying metrics. |
| **SR-15**: The system must be capable of logging at least 500,000 records of user interactions per day. | Performance | Perform stress tests to ensure the system can log and store at least 500,000 interaction records daily without degradation in performance. |
| **SR-16**: The system must support single sign-on (SSO) for third-party authentication (e.g., Google, Facebook). | Integration | Test SSO functionality by logging in with various third-party authentication methods and ensuring seamless access. |
| **SR-17**: The system must be able to process and analyze at least 5 different file formats (e.g., PDF, Word, Excel, JPG, PNG). | Compatibility | Test the system’s ability to process different file formats by uploading and processing various files, ensuring they are correctly handled. |
| **SR-18**: The system must provide error handling mechanisms that display user-friendly error messages when issues occur. | Usability | Test error scenarios and verify that the system provides clear and informative error messages to the user. |
| **SR-19**: The system must ensure data redundancy across multiple servers to prevent data loss in case of server failure. | Reliability | Test the data redundancy by simulating server failure and checking that data remains accessible and intact from other servers. |
| **SR-20**: The system must support continuous integration and deployment (CI/CD) for faster updates and maintenance. | Development Process | Verify the CI/CD pipeline is set up correctly and that new versions of the system can be deployed with minimal downtime. |