

SOFTWARE REQUIREMENT SPECIFICATION

AI-based Customer Support Automation Platform

1. Introduction

1.1 Purpose

The purpose of this document is to define the functional and non-functional requirements for the **AI-Powered Customer Support Platform (Clothing Brand Edition)**. This system is designed to automate first-line customer interactions using local, privacy-first Artificial Intelligence. The intended audience includes project stakeholders, developers, and quality assurance teams.

1.2 Scope

The software is a self-hosted, multi-modal support assistant capable of handling text, voice, and visual inputs. It operates entirely on local infrastructure to ensure data privacy. The system integrates Generative AI for conversation, Computer Vision for defect detection, and Speech Recognition for voice queries. It aims to reduce human agent workload by automating ticket creation, order status retrieval, and policy inquiries.

1.3 Definitions, Acronyms, and Abbreviations

- **SRS:** Software Requirement Specification
- **LLM:** Large Language Model (Generative AI for text)
- **RAG:** Retrieval-Augmented Generation (Connecting AI to documents)
- **CNN:** Convolutional Neural Network (AI for images)
- **STT:** Speech-to-Text (AI for audio)
- **ASR:** Automatic Speech Recognition
- **JWT:** JSON Web Token (For secure login)

2. Overall Description

2.1 Product Perspective

The system acts as a modular backend service with a frontend user interface. It functions independently of external cloud providers, relying solely on local computational resources

for inference. It interfaces with a local relational database for data storage and an email server for notifications.

2.2 Product Functions

The major functions of the system include:

- **Multi-Modal Interaction:** Accepting inputs via text, microphone (voice), and file upload (images).
- **Intelligent Query Resolution:** Answering policy questions and checking order status contextually.
- **Visual Defect Verification:** Analyzing uploaded images to validate return claims automatically.
- **Automated Ticketing:** Creating and prioritizing support tickets based on user sentiment and issue severity.
- **Self-Healing Workflows:** Automatically attempting to resolve issues via database lookups before escalating to humans.

2.3 User Characteristics

- **Customer:** End-users seeking support for orders, returns, or product inquiries.
- **Support Agent:** Staff members who manage escalated tickets and review AI decisions.
- **Administrator:** Technical users responsible for system configuration and model management.

2.4 General Constraints

- **Hardware:** The system must run effectively on standard consumer-grade workstations with CUDA-enabled GPU capabilities.
- **Connectivity:** The system must function primarily in an offline environment (intranet), with external access required only for email notifications.
- **Privacy:** Customer data must be processed locally and should not be transmitted to third-party public cloud AI services.

3. Specific Requirements

3.1 Functional Requirements

3.1.1 Authentication & User Management

- **REQ-01:** The system shall allow users to register and login using secure credentials.

- **REQ-02:** User passwords must be encrypted using industry-standard hashing algorithms before storage.
- **REQ-03:** Successful authentication shall issue a secure token (e.g., JWT) for session management.

3.1.2 Conversational AI (The "Brain")

- **REQ-04:** The system shall utilize a local Large Language Model (LLM) to generate natural language responses.
- **REQ-05:** The system shall maintain a conversational context window to understand follow-up questions effectively.
- **REQ-06:** The system shall utilize Retrieval-Augmented Generation (RAG) to prioritize retrieved FAQ/Policy documents over the model's internal training data.
- **REQ-07:** The system shall support automatic language detection and response generation in multiple supported languages.

3.1.3 Voice Processing (The "Ear")

- **REQ-08:** The system shall accept audio input via the user interface.
- **REQ-09:** The system shall transcribe audio inputs into text using a local Automatic Speech Recognition (ASR) engine.
- **REQ-10:** The system shall implement silence detection or manual stop controls to finalize recording sessions.

3.1.4 Visual Defect Detection (The "Eye")

- **REQ-11:** The system shall allow users to upload image files as part of return or complaint requests.
- **REQ-12:** The system shall analyze images using a Computer Vision model (e.g., CNN) trained to detect relevant product defects.
- **REQ-13:** The system shall implement a confidence threshold logic; if the AI's confidence is below a defined limit, the case shall be flagged for human review.

3.1.5 Business Logic & Automation

- **REQ-14:** The system shall provide tools allowing the AI to query the local database for real-time order status.
- **REQ-15:** The system shall perform sentiment analysis on user messages to classify emotional tone (Positive, Neutral, Negative).
- **REQ-16:** The system shall automatically generate support tickets based on predefined triggers, such as persistent negative sentiment or specific issue categories.

- **REQ-17:** Critical or high-priority tickets shall trigger an automated notification to support staff via email or internal messaging.

3.2 External Interface Requirements

3.2.1 User Interfaces

- **UI-01:** A responsive web-based dashboard accessible via standard web browsers.
- **UI-02:** A unified chat interface supporting text input, voice recording controls, and media upload functionality.

3.2.2 Software Interfaces

- **SI-01:** The backend shall expose a standard API (e.g., REST or GraphQL) for client-server communication.
- **SI-02:** The system shall interface with a relational database management system (RDBMS) for structured data.
- **SI-03:** The system shall interface with a vector store or similarity search engine for RAG operations.

4. Non-Functional Requirements

4.1 Performance Requirements

- **NFR-01 (Throughput):** The system shall support concurrent processing of multi-modal inputs (Text, Audio, Image) without service interruption.
- **NFR-02 (Latency):** The system shall target low-latency response generation suitable for real-time conversational interaction.

4.2 Reliability & Scalability

- **NFR-03:** The system architecture shall be modular (e.g., Microservices or modular monolith) to prevent single-point failures in AI sub-systems.
- **NFR-04:** The system shall be designed to allow the replacement or upgrade of individual AI models without restructuring the entire application.

4.3 Security & Privacy

- **NFR-05:** All AI inference and data processing must occur within the local deployment environment to ensure data sovereignty.
 - **NFR-06:** Access controls must be enforced so that users can only access their own transaction history and chat logs.
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5. Database Schema (Conceptual)

- **Users Entity:** Stores authentication credentials, roles, and profile information.
- **Orders Entity:** Stores transaction details, product information, and shipping status.
- **Tickets Entity:** Stores support case details, priority levels, and resolution status.
- **Messages Entity:** Stores chronological chat logs, identifying the sender (User vs. AI) and message type.
- **Returns Entity:** Stores details of return requests, including uploaded evidence and AI verification results.