

# NeuroAssist AI – Detailed Software Requirements Document (SRD)

**Version:** 4.0 (MAX Requirements)

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**\*\*Purpose\*\*:** This is the definitive engineering specification. It includes API contracts, Failure Mode Analysis (FMEA), UI component specs, and full traceability.

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## 1. System Architecture & Deployment

**SRD-1.1:** The system **shall** be architected as a set of Docker containers: Frontend (React/Nginx), Backend (FastAPI/Uvicorn), and Database (PostgreSQL).

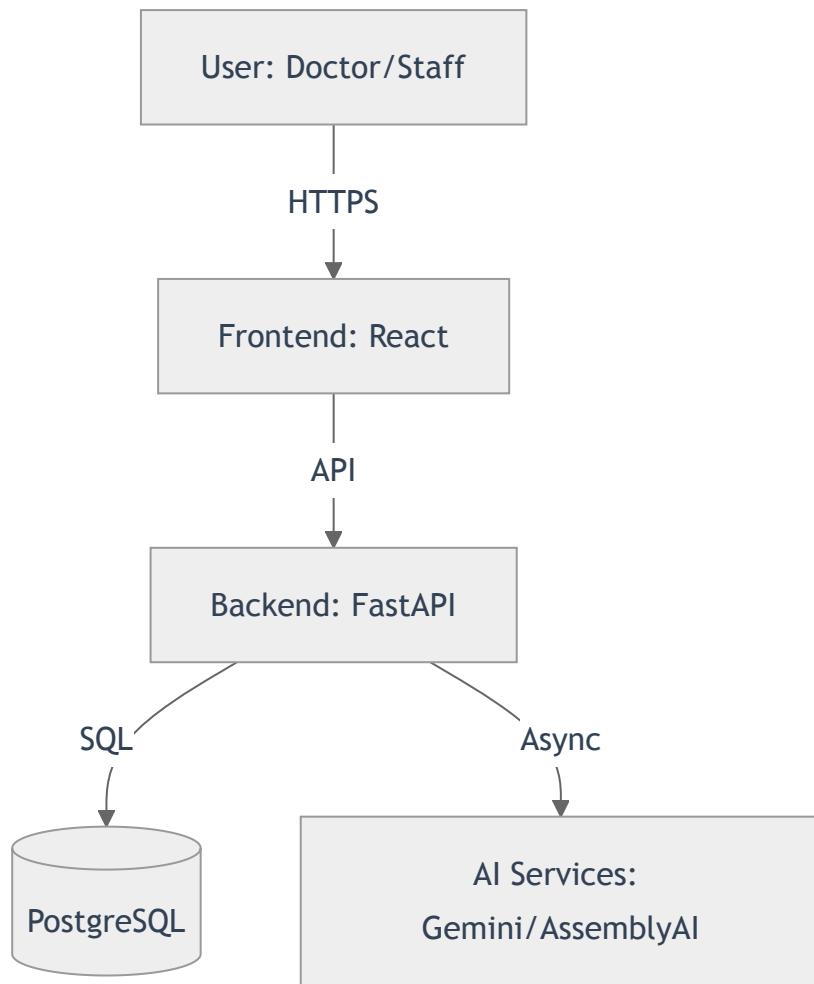
**SRD-1.2:** The backend service **shall** be stateless to allow horizontal scaling behind a load balancer.

**SRD-1.3:** The system **shall** be deployable on a local developer machine using `docker-compose`.

**SRD-1.4:** The system **shall** be compatible with cloud-managed PostgreSQL services (e.g., AWS RDS, GCP Cloud SQL).

**SRD-1.5:** All inter-service and client-server communication **shall** be encrypted using TLS 1.2 or higher (HTTPS).

## 1.1 Architecture Diagram



**SRD-1.5:** All inter-service and client-server communication **shall** be encrypted using TLS 1.2 or higher (HTTPS).

## 2. API Contract Requirements

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## 2.1 Consultation Endpoints

### 2.2 Triage Endpoints

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## 3. Failure Mode & Effects Analysis (FMEA)

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## 4. Audio Capture & Transcription

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**SRD-4.1:** The frontend **shall** provide a single, accessible UI control to toggle recording Start/Stop.

**SRD-4.2:** The frontend **shall** render a real-time visual waveform of the audio input.

**SRD-4.3:** The system **shall** automatically stop recording if the duration exceeds 15 minutes.

**SRD-4.4:** The system **shall** utilize the AssemblyAI API for asynchronous speech-to-text processing.

**SRD-4.5:** The transcription request **shall** enable Speaker Diarization ("Doctor" vs "Patient").

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## 5. SOAP Note Generation

**SRD-5.1:** The system **shall** use the Google Gemini 2.5 Flash model for generating clinical notes.

**SRD-5.2:** The AI prompt **shall** enforce a strict JSON output schema containing `subjective`, `objective`, `assessment`, and `plan`.

**SRD-5.3:** The system **shall** allow the Doctor to manually edit any section of the generated SOAP note.

### 5.1 AI Data Pipeline



**SRD-5.3:** The system **shall** allow the Doctor to manually edit any section of the generated SOAP note.

## 6. Triage & Queue Management

**SRD-6.1:** The `TriageService` **shall** calculate a risk score (0-100) based on keyword checking.

**SRD-6.2:** The system **shall** categorize urgency as:

**CRITICAL ( $\geq 95$ ):** "Stroke", "Suicide".

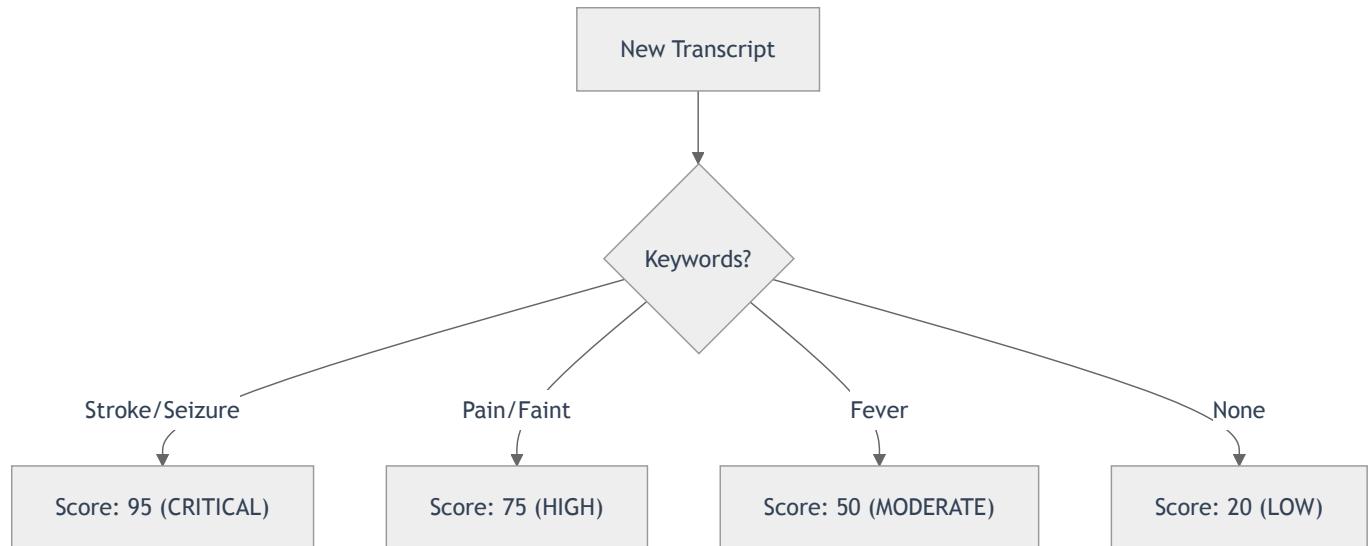
**HIGH ( $\geq 75$ ):** "Fainting".

**MODERATE ( $\geq 50$ ):**

**LOW ( $< 50$ ):**

**SRD-6.3:** Patients with `CRITICAL` status **shall** be displayed with a visual Red Badge indicator.

## 6.1 Triage Logic



**SRD-6.3:** Patients with 'CRITICAL' status **shall** be displayed with a visual Red Badge indicator.

## 7. UI/UX Component Specifications

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## 8. Security & Compliance

**SRD-8.1:** API Authentication **shall** utilize stateless JSON Web Tokens (JWT).

**SRD-8.2:** Patient Health Information (PHI) **shall** be encrypted at rest in the database and file storage.

**SRD-8.3:** The system **shall** log detailed audit trails sufficient for HIPAA compliance reviews.

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## 9. Performance Standards

**SRD-9.1:** Login API < 500ms (95th percentile).

**SRD-9.2:** SOAP Note generation < 10 seconds under load.

**SRD-9.3:** Triage evaluation < 1 second.

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## 10. Traceability Matrix

METHOD	ENDPOINT	SRD REQUIREMENT
`POST`	`/api/v1/consultations`	**SRD-2.1.1**: Shall accept `patient_id` and create a `SCHEDULED` record.
`POST`	`/api/v1/consultations/{id}/upload`	**SRD-2.1.2**: Shall accept `multipart/form-data` audio file (< 50MB).
`GET`	`/api/v1/consultations/{id}/transcript`	**SRD-2.1.3**: Shall return 403 Forbidden for `FRONT_DESK` role.
Method	Endpoint	SRD Requirement

METHOD	ENDPOINT	SRD REQUIREMENT	
'GET'	`/api/v1/admin/triage_queue`	**SRD-2.2.1**: Shall return list sorted by `urgency_score` DESC.	
Failure Mode	Severity	Required System Response	
**STT API Down**	High	**SRD-3.1**: Queue the job for retry (exponential backoff x3). Notify user "Processing Delayed".	
**LLM Hallucination**	Med	**SRD-3.2**: Display "AI Generated - Verify Content" warning. Allow manual edit.	
**Microphone Blocked**	High	**SRD-3.3**: Show modal "Enable Mic Access" with link to browser settings.	
**DB Connection Lost**	Critical	**SRD-3.4**: Return HTTP 503. Frontend shows "System Maintenance" page.	
Component	State	Hex Color	Icon
**Risk Badge**	Critical	`#EF4444` (Red-500)	
**Risk Badge**	High	`#F59E0B` (Amber-500)	
**Record Btn**	Active	`#EF4444` (Red-500)	
**Record Btn**	Idle	`#3B82F6` (Blue-500)	
SRD ID	PRD Feature	Tech Component	

METHOD	ENDPOINT	SRD REQUIREMENT
**SRD-4.4**	Transcription	`stt_service.py` (AssemblyAI)
**SRD-5.1**	SOAP Gen	`llm_service.py` (Gemini)
**SRD-6.1**	Triage Engine	`triage_service.py`
**SRD-2.1.2**	Audio Upload	`/api/v1/consultations.py`

**SRD-9.3:** Triage evaluation < 1 second.

## 11. Database Schema (Visual)

