This Product Design Document (PDD) is structured specifically to be ingested by an AI coding agent (like GitHub Copilot Workspace, Cursor, or a custom LLM agent). It focuses on **architecture, data schemas, and logic flows** rather than just narrative.
You can copy and paste this entire block below the line to your AI agent.

Product Design Document: Maitri (AI-Driven IVR & Health Dashboard)

1. Project Overview

Maitri is a dual-interface health intervention system designed for rural India. It bridges the digital divide by using accessible feature-phone technology (IVR) to connect rural women with AI-driven triage and human ASHA (Accredited Social Health Activist) workers.

Core Value Proposition:

1. **Caller Interface:** A toll-free, voice-only IVR system where women speak in local dialects to receive empathy and guidance.
2. **Responder Interface:** A web dashboard for ASHA workers to view anonymized trends and receive real-time "Break-Glass" emergency alerts.

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2. Technical Architecture Stack

- **Telephony/Gateway:** Twilio Programmable Voice (or local equivalent like Exotel).
- **Backend:** Python (FastAPI or Flask).
- **Database:** PostgreSQL (for structured call logs/ASHA user data).
- **AI Pipeline:**
    - **ASR (Voice-to-Text):** OpenAI Whisper (optimized for multilingual/Indic accents).
    - **LLM (Reasoning/Triage):** Llama 3 (70B or 8B fine-tuned) via Groq or local inference.
    - **TTS (Text-to-Speech):** IndicBERT or Coqui TTS (fine-tuned for empathy/dialect).
- **Frontend (Dashboard):** React.js / Next.js + Tailwind CSS.
- **Real-time Communication:** WebSockets (Socket.io) for pushing emergency alerts to the dashboard.

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3. System Logic & Workflows

A. The IVR Call Flow (User Journey)

1. **Incoming Call:** User dials toll-free number.
2. **Greeting:** System plays pre-recorded welcome in local dialect.

3. **Listening Mode:** System records user audio input (concern/symptom).
4. **Processing (The "Black Box"):**
    - Audio sent to **Whisper** $\rightarrow$ Transcribed text.
    - Text sent to **Llama 3** with *System Prompt A* (see Section 5).
    - **LLM Output Analysis:** The LLM returns a JSON object containing:
        - `response_text`: Empathetic advice.
        - `severity_score`: 1 (Low) to 5 (Critical).
        - `category`: e.g., "Maternal," "Menstrual," "General."
5. **Branching Logic:**
    - **IF Severity < 4:** TTS converts `response_text` to audio $\rightarrow$ Played to user $\rightarrow$ Call ends/Loops.
    - **IF Severity >= 4 (Emergency):** Trigger **"Break-Glass Protocol"**.
        - System plays: *"I am concerned about this. To help you better, please say the name of your village."*
        - User speaks village name.
        - System de-anonymizes the call session.
        - **Trigger Alert:** Send payload to ASHA Dashboard via WebSocket.

B. The ASHA Dashboard Flow (Admin Journey)

1. **Default View:** Anonymized heatmaps of symptoms (e.g., "30% increase in fever reports in District X").
2. **Emergency State:** When "Break-Glass" is triggered:
    - Dashboard flashes Red/Alert modal.
    - Displays: Caller Phone #, Village Name, Risk Label (e.g., "Postpartum Haemorrhage").
    - Action Button: "Mark as Responded."

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4. Data Schema Specifications

Table: `call_logs`

Field	Type	Description
`id`	UUID	Unique Session ID.

caller_hash	String	Anonymized hash of phone number (Default).
encrypted_phone	String	Real phone number (AES-256 encrypted, only decrypted on Break-Glass).
transcription	Text	The user's spoken query.
ai_response	Text	The advice given.
severity_level	Integer	1-5 scale.
is_break_glass	Boolean	True if emergency protocol activated.
village_location	String	Null unless is_break_glass is True.
created_at	Timestamp	Time of call.

Table: alerts

Field	Type	Description
id	UUID	Unique Alert ID.
call_id	FK	Links to call_logs.

asha_worker_id	FK	Assigned ASHA worker (based on village mapping).
status	Enum	PENDING, IN_PROGRESS, RESOLVED.

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5. AI Prompts & Configuration

System Prompt (Llama 3)

Role: You are 'Maitri', a compassionate, non-medical older sister ('Didi') helping rural women in India.

Input: A transcription of a woman's health concern.

Task:

1. Analyze the symptom severity on a scale of 1-5.
2. Generate a brief, empathetic response (max 2 sentences) in simple English (to be translated) or Hindi. Do NOT diagnose. Suggest home care or visiting an ASHA worker.
3. **CRITICAL:** Output **ONLY** valid JSON.

JSON Format:

```
JSON
```

```
{
  "severity": "integer (1-5)",
  "category": "string (Maternal/Infant/Menstrual/General)",
  "response_text": "string (The spoken response)",
  "emergency_reason": "string or null (If severity > 3, explain why)"
}
```

Examples of Severity:

- "I feel tired" = Severity 1.

- "My baby has a high fever and won't wake up" = Severity 5.
- "I am bleeding heavily after birth" = Severity 5.

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6. API Endpoint Requirements

1. POST /ivr/incoming

- **Trigger:** Twilio Webhook.
- **Action:** returns TwiML to record user voice.

2. POST /ivr/process-audio

- **Input:** Audio file URL (from Twilio).
- **Action:** Runs Whisper $\rightarrow$ Llama 3 $\rightarrow$ Logic Check.
- **Logic:**
    - If `severity >= 4`: Returns TwiML to ask for Village Name.
    - If `severity < 4`: Returns TwiML to play generated advice.

3. POST /ivr/break-glass-confirm

- **Input:** Audio of village name.
- **Action:** Updates DB record with location, decrypts phone number for the dashboard payload, emits WebSocket event `emergency_alert`.

4. GET /api/dashboard/stats

- **Action:** Returns aggregated, anonymized stats for charts.

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7. Security & Privacy Constraints

1. **PII Handling:** Phone numbers must be hashed by default. They are only stored in the encrypted column and only decrypted programmatically when `severity >= 4`.
2. **Audio retention:** Audio files should be deleted after processing (24-hour retention policy) unless flagged for training data by an admin.
3. **Offline Fallback:** If the AI service times out (>5s), the IVR must default to a hardcoded message: *"I am having trouble hearing you. Please contact your ASHA worker immediately."*
