

## SEARS HOME SERVICES

AI Engineering Team

# Take-Home Technical Project

## Voice AI: Home Appliance Diagnostic Agent

*AI Engineer Candidates*

### 1. Overview

This take-home technical project is designed to give you an opportunity to demonstrate your approach designing and building an end-to-end voice AI system.

You will create an inbound call agent that assists customers experiencing issues with their home appliances. The agent should guide callers through diagnostic steps, attempt troubleshooting, and—when appropriate—facilitate technician scheduling.

This project reflects real-world scenarios encountered by our AI team at Sears Home Services. We are looking for candidates who can balance practical engineering with thoughtful system design.

### 2. Scenario

A homeowner calls in because their appliance is malfunctioning. They may not know the exact problem—just that something is not working right. Your voice agent should be able to:

1. Greet the caller professionally and establish rapport
2. Identify the appliance type and understand the symptoms
3. Guide the caller through relevant diagnostic questions
4. Provide troubleshooting steps when appropriate
5. Schedule a technician visit if the issue cannot be resolved
6. Optionally capture an image of the appliance for enhanced diagnosis

### 3. Project Scope and Capabilities

The capabilities below are intended to describe the functional scope of the project.

#### Tier 1: Core Functionality

- **Inbound Call Handling:** The system must accept inbound phone calls and engage in natural voice conversation.

- **Appliance Identification:** Identify the type of appliance (washer, dryer, refrigerator, dishwasher, oven, HVAC, etc.) through conversation.
- **Symptom Collection:** Gather relevant information about the problem—what's happening, when it started, any error codes or unusual sounds.
- **Diagnostic Guidance:** Walk the caller through basic troubleshooting steps appropriate for the identified issue.
- **Conversation Memory:** Maintain context throughout the call; do not ask for information already provided.

## Tier 2: Technician Scheduling

- **Database Design:** Create and populate a database of technicians including: name, available zip codes, specialties (appliance types), and available time slots.
- **Availability Matching:** Given the caller's zip code and appliance type, find appropriate technician.
- **Scheduling Flow:** Collect customer availability and propose matching technician time slots.
- **Confirmation:** Verbally confirm the scheduled appointment details before concluding the call.

## Tier 3: Visual Diagnosis

- **Email Capture:** During the call, request the caller's email address when visual input would aid diagnosis.
- **Image Upload Link:** Send an email with a unique link allowing the caller to upload a photo of their appliance.
- **Appliance Recognition:** When an image is uploaded, identify the appliance type and any visible issues using computer vision.
- **Enhanced Troubleshooting:** Use visual information to provide more specific diagnostic guidance.

## 4. Technical Specifications

### Technology Stack

You have complete freedom in choosing your technology stack. We are interested in understanding your technical decisions and how you justify them.

Your choices may include but are not limited to:

- **Voice/Telephony:** Twilio, Vonage, Plivo, Telsnyx, or any provider of your choice
- **Speech-to-Text:** OpenAI Whisper, Google Speech-to-Text, Deepgram, AssemblyAI, etc.
- **Text-to-Speech:** ElevenLabs, OpenAI TTS, Google TTS, Amazon Polly, etc.
- **LLM/Agent Framework:** OpenAI GPT-4, Claude, LangChain, Llamaindex, custom implementation
- **Database:** PostgreSQL, MySQL, SQLite, MongoDB, or any database system
- **Backend:** Python (FastAPI, Flask), Node.js, Go, or any language

- **Vision (if applicable):** GPT-4 Vision, Claude Vision, Google Vision API, custom models

## Database Schema (Technician Scheduling)

Design your own schema to support the scheduling functionality. At minimum, consider:

- Technicians: identity, contact info, employment details
- Service Areas: zip codes or geographic regions each technician covers
- Specialties: appliance types each technician is qualified to service
- Availability: time slots and scheduling constraints
- Appointments: booked sessions linking customers to technicians

Populate your database with representative sample data for at least 5-10 technicians across multiple zip codes and specialties.

## 5. Deliverables

Please include the following with your submissions:

- **Source Code:** Complete source code in a Git repository (GitHub, GitLab, or similar)
- **Docker Deployment:** Docker Compose configuration that launches the entire system with a single command
- **Live Phone Number:** A functioning phone number we can call to test your agent
- **README Documentation:** Setup instructions, architecture overview, and any configuration steps
- **Technical Design Document:** A brief (1-2 page) document explaining your architectural decisions, tradeoffs considered, and rationale for your technological choices

## Submission Format

Your final submission should include:

- A link to your Git repository
- The phone number for testing
- Any API keys or credentials needed for review (shared securely)
- Expected availability window for the live system (we will coordinate testing)

## 6. What We Value

- **Working software over perfect software.** We prefer a functional system with room for improvement over an incomplete but theoretically elegant design.
- **Pragmatic engineering.** Use existing tools and services where appropriate rather than reinventing the wheel.
- **Clear communication.** Your design document should explain you're thinking as if to a colleague.
- **Attention to user experience.** The caller's experience matters—latency, natural conversation flow, and helpful responses.

## 7. Timeline and Support

### Timeline

- **Duration:** You have 7 days from receipt of this assignment to submit your solution.
- **Expected effort:** We estimate 8-16 hours of focused work for a complete Tier 1 + Tier 2 solution.
- **Extensions:** If you need more time due to work or personal commitments, please let us know in advance.

### Questions and Clarifications

If you have questions about the requirements or need clarification, please reach out to your recruiting contact. We want you to succeed and are happy to help clarify expectations.

### Cost Considerations

This project may incur small costs for telephony and API usage. Please select free tiers where possible. If cost is a barrier, let us know—we can discuss alternatives.

## **8. Important Notes**

### **Intellectual Property**

All work you create for this project remains your intellectual property. Submissions will be reviewed solely for hiring-related purposes and will not be used in production or for any other purpose.

### **Use of AI Tools**

You are welcome to use AI coding assistants (GitHub Copilot, Claude, ChatGPT, etc.) as you would in a real engineering role. You should be prepared to explain and discuss the resulting code and design decisions.

We appreciate the time and effort you put into this project and look forward to reviewing your solution.

**Good luck!**

SHS AI Team  
Sears Home Services