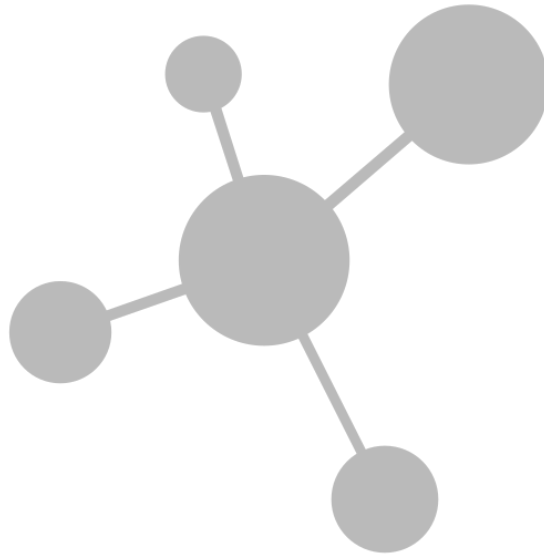


# AI Software Engineer Take Home Assignment

Jun 6, 2025



# Engineering Interview

## Introduction

Welcome aboard! At Spike we're keen to see how you tackle brand-new problems. At AI Labs, we work at the intersection of large-language models and real-time interactive voice systems, and this project will let you play with both. You'll assemble an end-to-end voice pipeline from a few third-party "Lego blocks" that will imitate a "Spike Clinical" hospital call to "Best Health Insurance" insurance provider to ask relevant information about the patient's insurance coverage so that they are verified for the upcoming visit to their doctor. Have fun and show us how you think!

## Task

Build a self-contained voice pipeline that lets a user pretend to be an insurance provider at "Best Health Insurance" and the AI agent has to represent "Spike Clinical" and verify coverage details for some patient. Your program—either a command-line tool or a small web app—must:

- Capture live microphone audio.
- Stream that audio to [Deepgram](#) for speech-to-text transcription.
- Send the transcript to an OpenAI model that maintains conversational context and responds as a helpful insurance-provider representative.
- Turn the model's reply into natural-sounding speech via [ElevenLabs](#).
- Play the synthesized audio back to the user, completing the conversational loop in (near) real time.

In short, you're wiring together STT → LLM → TTS → playback so that "Spike Clinical" can automatically verify a patient's coverage through a lifelike, interactive call with our AI insurer.

### 1. Voice Input

- Implement a voice recording system using any method of your choice (e.g., browser's MediaRecorder API for web or python's sounddevice for CLI or any other)
- The system should be able to record audio from the user's microphone

### 2. Speech-to-Text (STT)

- Integrate with an STT external service [Deepgram](#). We are going to attach the api key for this task at the end of this document

### 3. LLM Integration

- Use an LLM service ([OpenAI](#)) to process the transcribed text
- The LLM should act as a helpful assistant that can engage in conversation
- Maintain conversation context for a more natural dialogue flow



#### 4. Text-to-Speech (TTS)

- Integrate with a TTS service [ElevenLabs](#) - the API key will be provided below
- Convert the LLM's response to speech

#### 5. Audio Playback

- Implement audio playback of the generated speech



# Insurance Verification Flow

In addition to building the voice pipeline, your AI agent should complete a realistic insurance verification call.

This call simulates a Spike Clinical staff member contacting an insurer to verify coverage for a patient ahead of a scheduled visit. Your agent should be able to initiate, guide, and complete the verification flow conversationally.

The Conversation Should Include:

## Patient and Clinic Identification

The rep may ask for identifying information like:

- Patient name
- Date of birth
- Member ID
- Insurance active to date
- Date of treatment

Your agent should be able to provide these if prompted.

## Insurance Coverage Details to Obtain

Whether the rep volunteers these details or the agent needs to ask, the following must be gathered:

- Visit Limit: Whether the visits are limited, and the allowed number.
- Visit Limit Structure: How the limit is tracked (calendar year, fiscal year, benefit period, etc.) (only if a visit limit exists)
- Visits Used: How many visits have been used prior to this contact (only if a visit limit exists)
- Copay: The copay amount per visit.
- Deductible: Whether there is a deductible, and the total amount.
- Deductible Met: How much of the deductible has been met (only if a deductible exists)
- Out-of-Pocket Maximum: Whether there's a cap on out-of-pocket expenses, and the total amount.
- Out-of-Pocket Met: How much has already been paid toward the out-of-pocket max (only if applicable)
- Initial Authorization: Whether pre-authorization is required before beginning care.



## Reference Number

At some point, the rep may offer—or should be asked for—a reference number for the call. Ensure this is captured.

## Recap & Confirmation

Before ending the call, the agent should recap the collected information back to the rep to ensure it's accurate. If any details are unclear or missing, it should ask follow-up questions.

## End the Call Gracefully

Once everything is confirmed, thank the rep and politely end the call.

## Example

This example is here to give you a better understanding of a real-world scenario and is rather extensive. It is okay if you want to use a subset of these details in your bot, just make sure that it is representative and suitable for testing out the flow.

Rep: Hi there. This is Luis. May I have your name?

AI: Hi Luis, my name is Bot Name

Rep: You're calling on behalf of Spike Clinical?

AI: Yes, that's correct.

Rep: Provide me the member ID.

AI: MOY93832338

Rep: Verify patient's name and date of birth.

AI: The patient's name is Robot, last name Funky, spelled F-U-N-K-Y. Date of birth is January 1st, 1985.

Rep: Okay, wonderful. What information would you like to find out?

AI: What is the visit limit and its structure?

Rep: The visit limit is 30 and it includes Physical Therapy, Occupational Therapy and Speech Therapy.

AI: Got it, is this a calendar year plan or some other structure?

Rep: It's a calendar year plan, yes.

AI: And how many visits has the patient used so far?

Rep: Let me check. They've used 5 so far.

AI: Got it. What's the co-pay per visit?

Rep: It's \$30, and there's also a deductible of \$200.

AI: Uh-huh. And what portion of it has been met?

Rep: All of it has been met already.

AI: Perfect. Is there an out-of-pocket maximum?

Rep: Yes, it's \$800. And the user has already met \$240.89 of it.

AI: Understood. Will authorization be required before the first visit?



Rep: No, it is not.

**AI:** Great, and could I get the reference number for this call, please?

Rep: Sure, its NP and today's date

**AI:** Thank you very much. So just to cross-check it with you. For this patient, the visit limit is 30 visits per calendar year, it includes Physical Therapy, Occupational Therapy and Speech Therapy, and the patient already used 5. There's a co-pay of \$30, a deductible of \$200, which is fully met, and an out-of-pocket maximum of \$800, of which \$240.89 is already met. Initial authorization is not required before the initial visit. The reference number for this call is NP04252026. Did I get that correct?

Rep: Yep, you got that right.

**AI:** Wonderful, thank you for your time and have a great day!

## Technical Requirements

### Coding

- Use any language you are most comfortable with (we use typescript mostly)
- Include proper documentation (README.md with setup instructions)
- Implement error handling and logging
- Include basic unit tests for core functionality
- Use environment variables for API keys and configuration [ please :) ]
- Include example configuration files
- If you feel that you need a database or a cache, or anything else, feel free to write a docker-compose or any other script to use a local instance of those services so that we can easily replicate the whole infrastructure

### Bonus Points

- Real-time processing capabilities (with human-like reaction to interruptions)
- Voice activity detection
- Multiple voice/personality options
- Docker support
- Websocket implementation for real-time communication

### Submission

- Provide a GitHub repository with your solution
- Include a README.md with:
  - Setup instructions
  - Architecture overview
  - Design decisions and trade-offs
  - Future improvements

