Smart Energy Assistant

Group 5

Project Overview

Our project entails developing an AI-powered energy assistant with an open-source LLM model for transparent responses to user queries.

Key functionalities with the user friendly interface include:

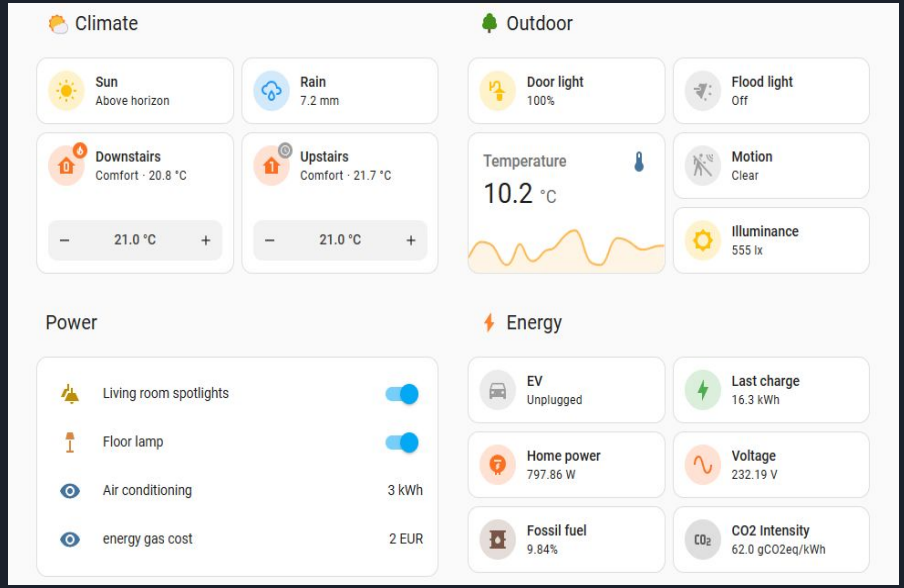
- Offering personalized suggestions for energy optimization,
- Predicting monthly usage based on historical data and weather forecasts,
- Assessing appliance efficiency by continuous monitoring
- Anomaly detection mechanisms and alerts for prompt intervention,
- An explainability component for transparent insights into model predictions.

Existing applications

1. Home Assistant - Free and open-source software for home automation. Easy to use. Many add-ons available.
2. OpenHAB - Open source home automation software written in Java. More flexibility, less abstraction.
3. Apple Home - Smart home platform that allows you to control compatible accessories. Limited devices support.
4. Google Home - Personalized smart home assistant. Expensive and limited compatibility with other devices.

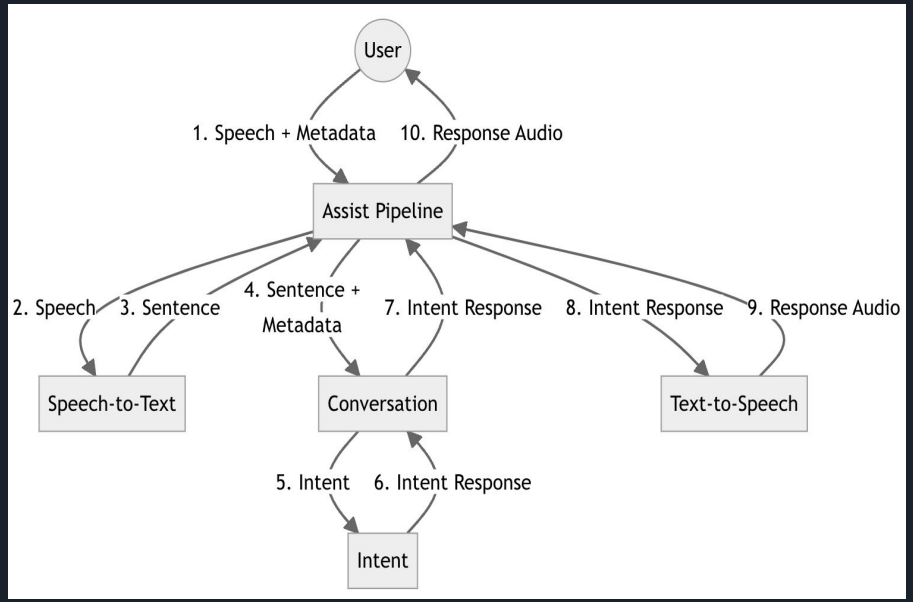
Home Assistant

- Home Assistant is an open-source home automation software platform.
- Supports around 2800 integrations available and has tons of addons.
- Built-in energy dashboard for tracking usage and efficiency across connected devices.
- Doesn't require cloud services in order to function. This means data is only stored on your device, providing you with privacy.



Integrating Conversational Agent in Home Assistant

- Assist Pipeline integration turns the user's speech into text, gets it processed, and turns the response into speech.
- Conversation integration processes user's text.
- Intent integration executes the intent and returns a response.
- Text-to-Speech integration turns text into speech.
- Similarly, Speech-to-Text integration turns speech into text.



Home LLM Add-on For Home Assistant

What is Home LLM?

- Home LLM is an add-on for home assistant which provides necessary components to control the Home Assistant installation with a completely local Large Language Model acting as a personal assistant.
- The objective is to serve as a "conversation agent" component within Home Assistant.
- Home LLM is able to control devices in the user's house as well as perform basic questions and answering.

Large Language Models and Dataset:

- Two large language models are available for use belonging to the Phi model series by Microsoft and the StableLM model series by StabilityAI.
- Fine tuned on Home Assistant request dataset which comprises a collection of user requests and corresponding responses while engaging with a personal assistant.

Working:

- The Home LLM will obtain the information about the state of Home Assistant including available devices and callable services with the help of system prompt.

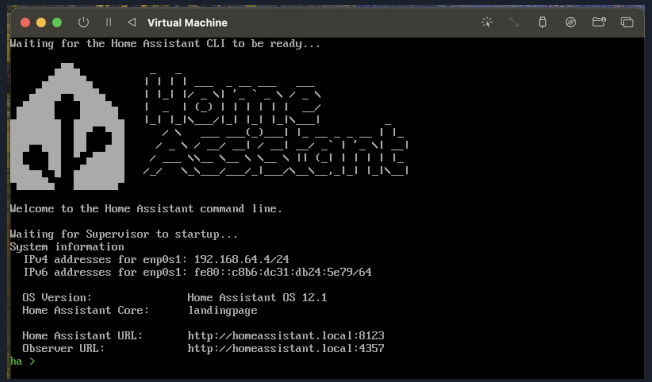
```
You are 'Al', a helpful AI Assistant that controls the devices in a house. Complete the following task as instructed
Services: light.turn_off(), light.turn_on(brightness,rgb_color), fan.turn_on(), fan.turn_off()
Devices:
light.office 'Office Light' = on;80%
fan.office 'Office fan' = off
light.kitchen 'Kitchen Light' = on;80%;red
light.bedroom 'Bedroom Light' = off
```

- Each time the user inputs a command to Home LLM, it generates an output comprising a user response along with a code block capable of activating different services within Home Assistant.

```
turning on the kitchen lights for you now
```homeassistant
{ "service": "light.turn_on", "target_device": "light.kitchen" }
```
```

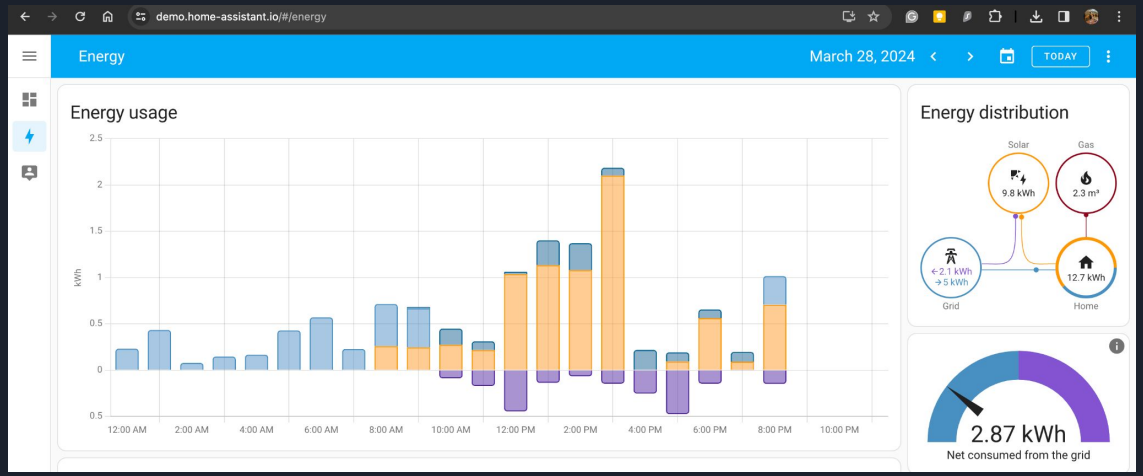
Home Assistant - Installation Steps

- Install Home Assistant Operating System
- Download the appropriate image - link
- After downloading, decompress the image and create a virtual machine.
- Load the appliance image into the virtual machine hypervisor.
- Start the virtual machine.
- Observe the boot process of the Home Assistant Operating System.
- Once completed, Home Assistant will be reachable on homeassistant.local:8123.



Home Assistant - Demo

- Local custom CSE551 dashboard
- ARS Home Dashboard
- Energy Usage Dashboard



Any Questions?