Problem Statement
The current smart home speakers on the market rely on smart home control through cloud computing. These cloud computing companies then profit off of selling and using the personal data collected. This is a huge privacy concern, as well as limits many potential customers from owning their own smart home system.

Our Solution
Homie, the smart home speaker system, specializes in keeping your data within your network. Homie is an open source software with a dedicated backend to handle voice recognition. Data has no reason to leave your personal network or to be stored and sold.

User-Overview
Homie Frontend
Homie Backend / Raspberry Pi 4

System Diagram

Hardware
The Homie PCB is built to take in a single 12V line and via power conditioning done on the development board we power the: microphone, 8-segment display, LED’s, WiFi controller, volume knob, digital to analog amplifier, and speakers. The Homie PCB allows us to have an all in one unit that controls each of the individual subsystems needed for the Homie Frontend.

Frontend Features
- Secure TCP connection between Frontend and Backend through Wi-Fi Coprocessor.
- High Speed board communication through SPI, I2C, and I2S protocols.
- Elaborate visual indication and feedback through Alphanumeric displays and Neopixels.

Backend Support
- Implemented using python 3
  - Implemented with
    - Tensorflow Lite
    - VOSK
    - Embedded Neural Network
    - X-Cube-AI
    - Single Custom Wake Word Recognition
    - Levenstein and Cosine Similarity
    - Auto Silence detection

Artificial Intelligence

Next Steps
Given more time and resources, we would improve the sound quality of Homie. We would also implement more local storage capacity on the Homie speaker itself to allow quick reconnection, on board voice recognition and command creation, and additional frontend IoT device support.

All the Homie files are free to access and use at https://github.com/JJGEEX/HOMIE_RELEASE

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