

ESP32 Work Assistant

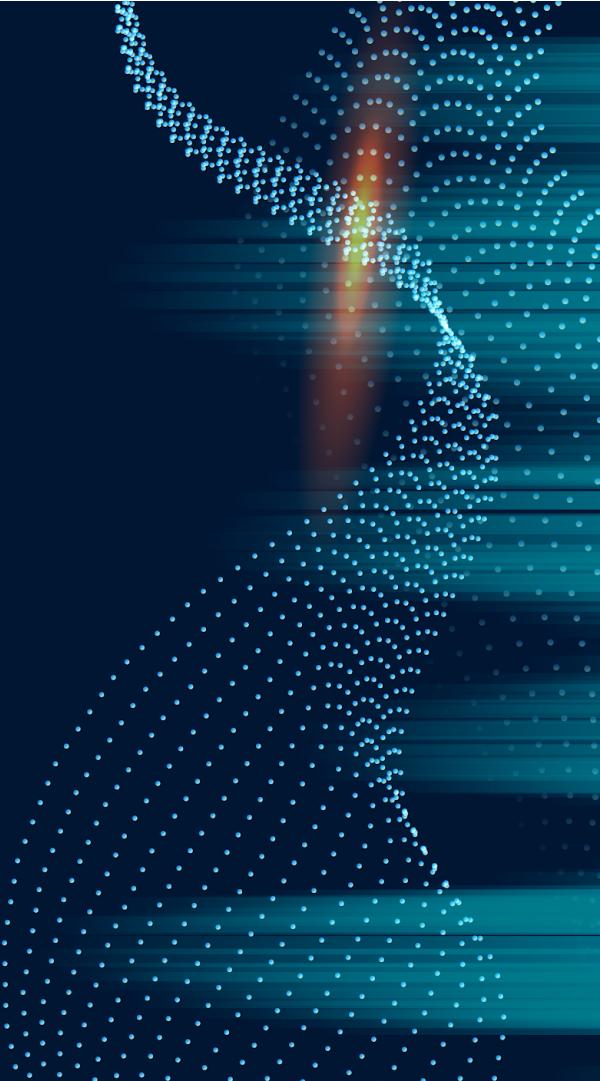
Word Recognition Module

Petru Micu - ACES

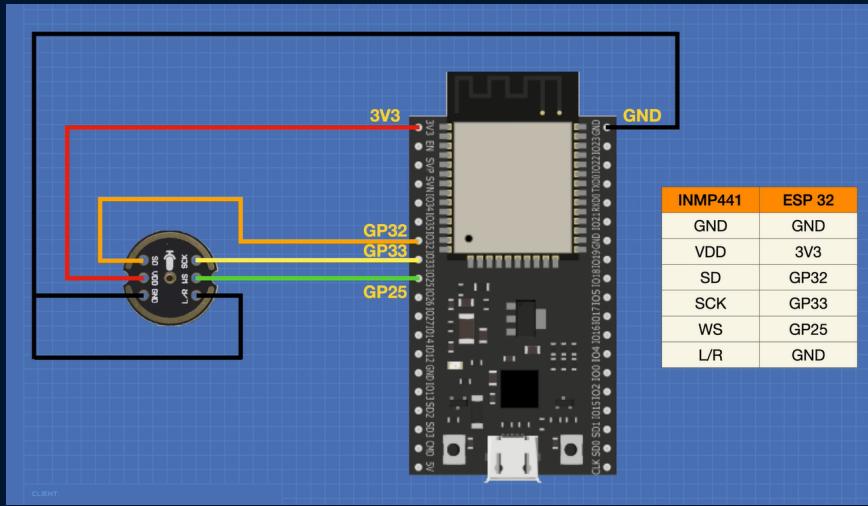
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Scope of the project

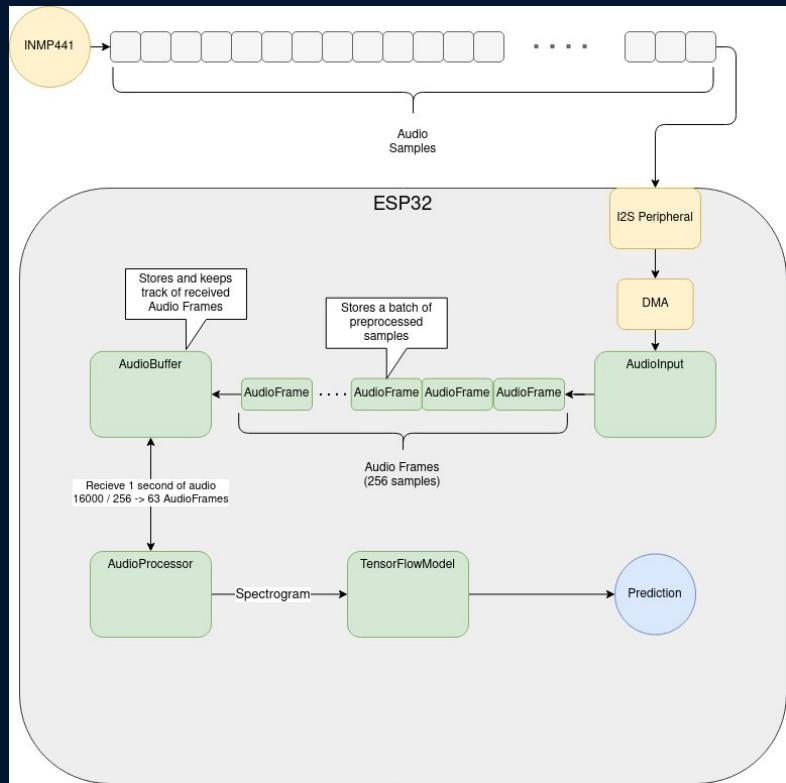


Hardware



- **Esp32 DevKit V1 microcontroller**
 - 160MHz
 - 520KB RAM
 - 4MB flash
- **INMP441 MEMS microphone**
 - I2S
 - 24bit mono
 - Philips data format

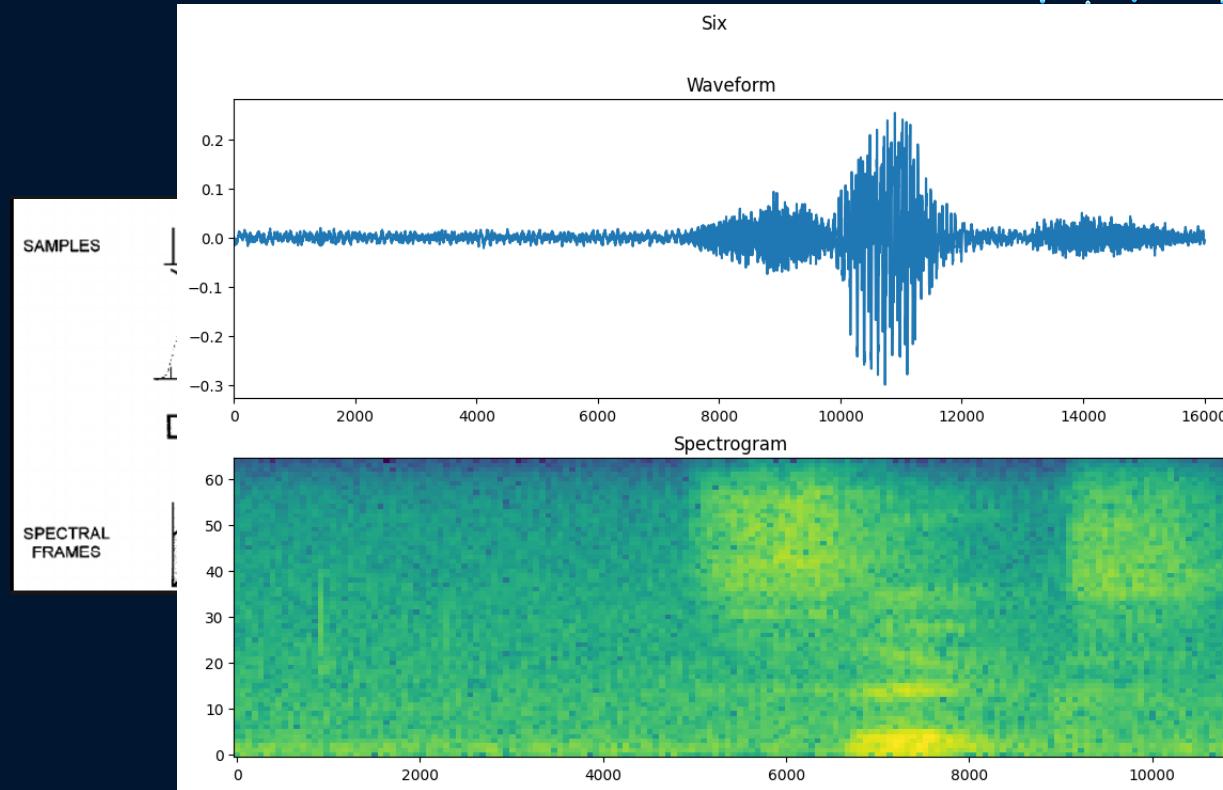
Software



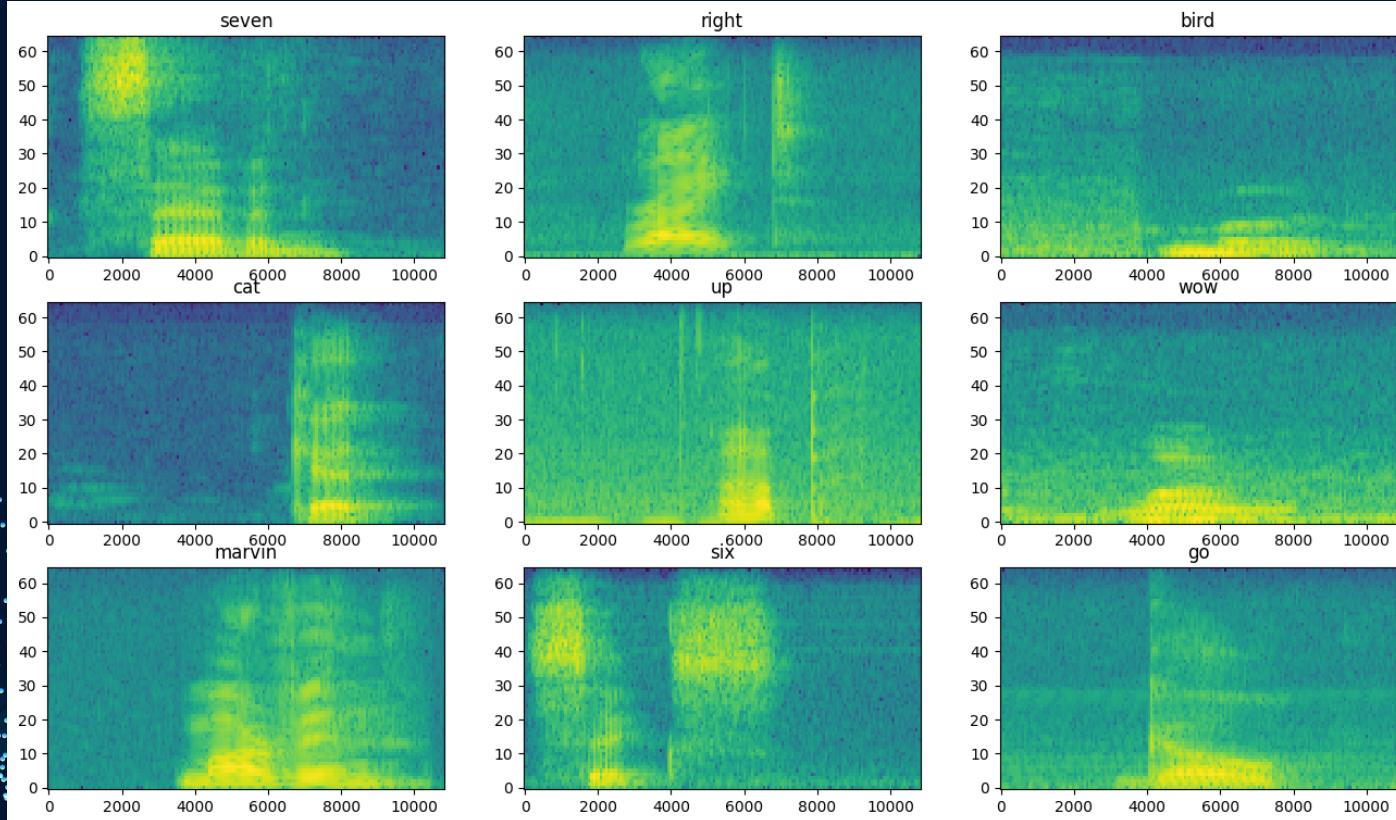
Libraries used

- ESP-IDF v5.1.2
 - ESP-DSP v1.4.10
 - ESP-NN v1.0.2
 - TensorFlow Lite Micro v1.2.0

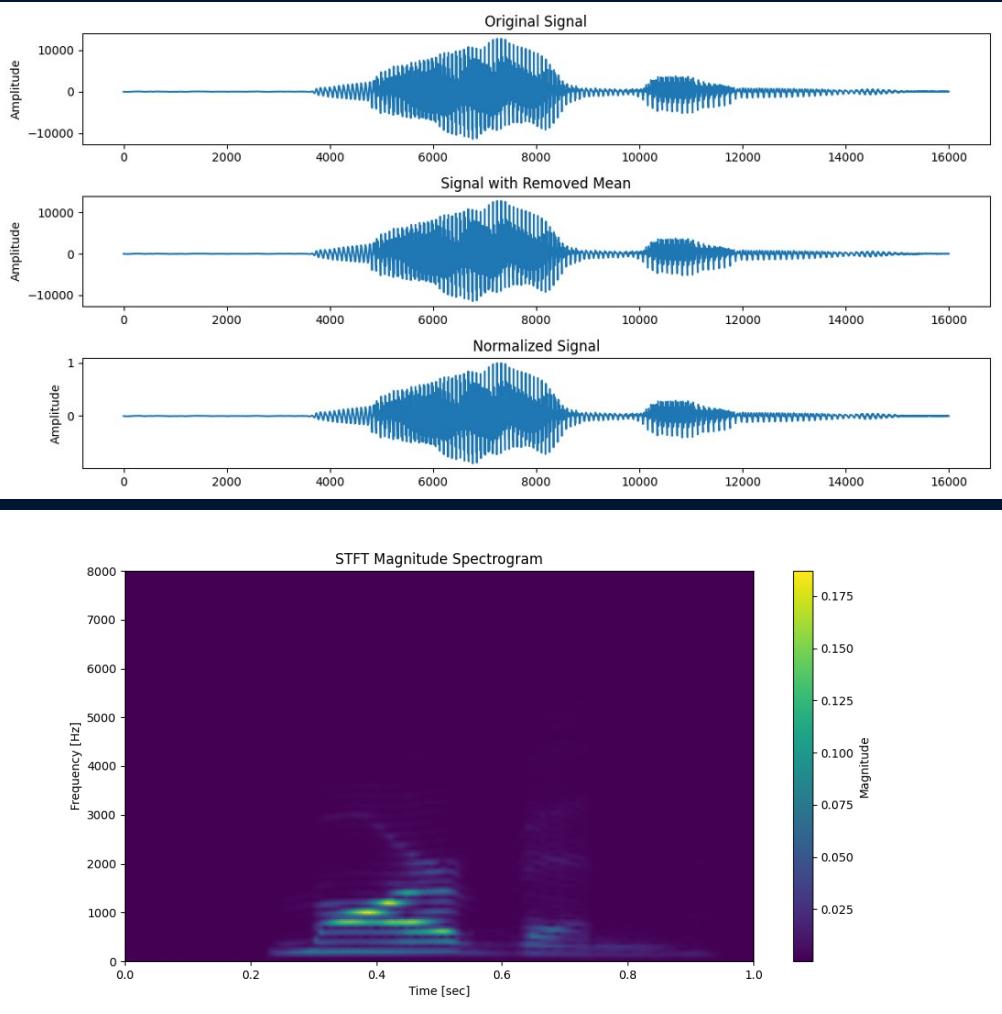
Short Time Fourier Transform



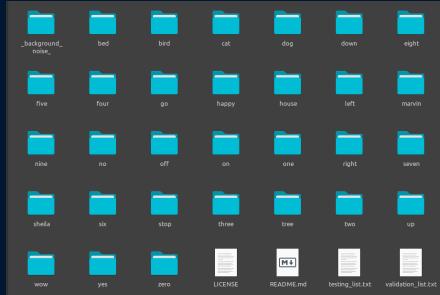
Processing steps



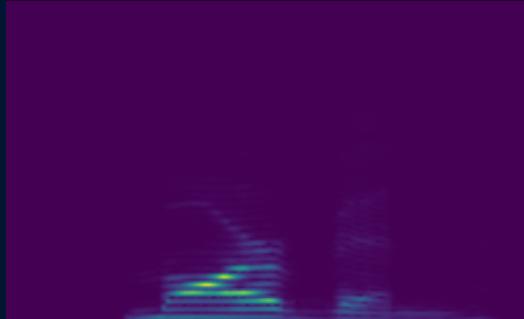
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Neural Network

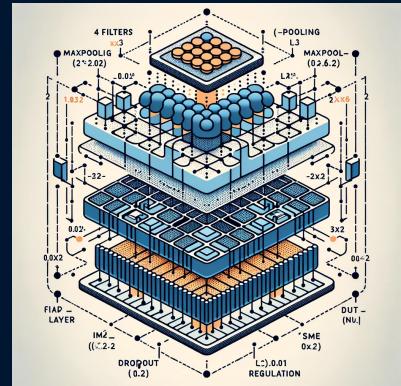


Spectrogram



- ~2GB worth of training sound
- 10 layers including input and output

Neural network

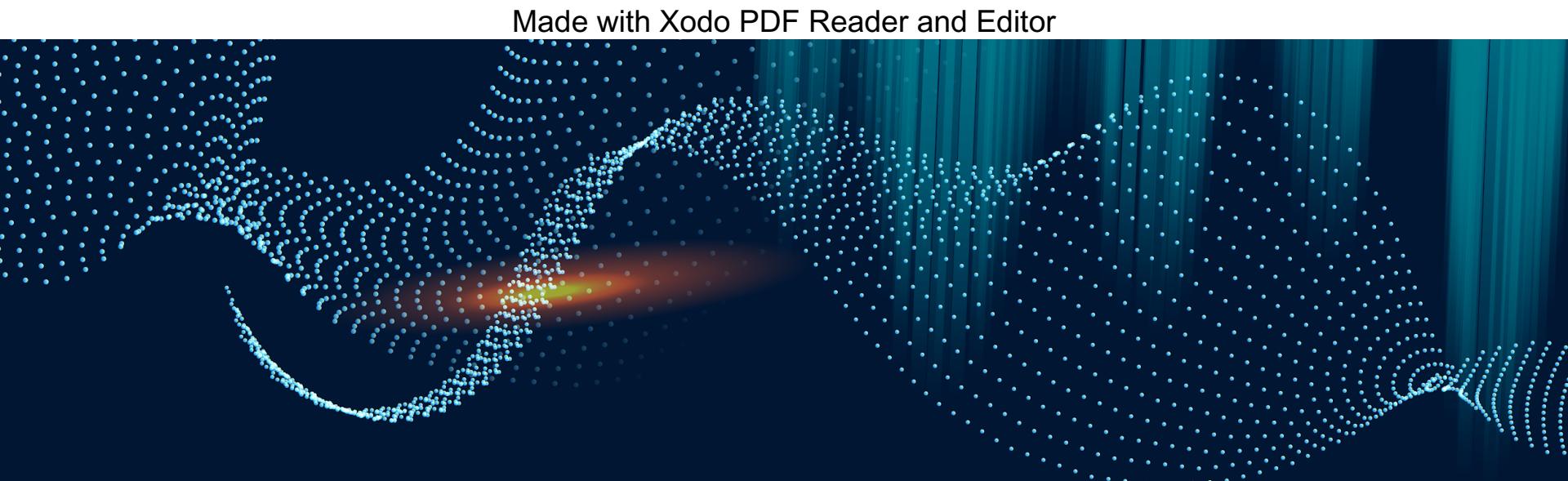


Prediction



Demonstration

```
petru@Petrus-Mint: ~/esp/esp32_work_assistant
Model prediction: 0.07
Model prediction: 0.00
Model prediction: 0.00
Model prediction: 0.01
Model prediction: 0.00
Model prediction: 0.00
Model prediction: 0.26
Model prediction: 0.00
Model prediction: 0.02
Model prediction: 0.02
Model prediction: 0.29
Model prediction: 1.00
Audio disable success
ESP32 WorkStation awake and listening
ESP32 WorkStation went to sleep
Audio enable success
Model prediction: 0.13
Model prediction: 0.01
Model prediction: 1.00
Audio disable success
ESP32 WorkStation awake and listening
ESP32 WorkStation went to sleep
Audio enable success
Model prediction: 0.08
Model prediction: 0.00
Model prediction: 0.96
Audio disable success
ESP32 WorkStation awake and listening
ESP32 WorkStation went to sleep
Audio enable success
Model prediction: 0.00
Model prediction: 0.20
Model prediction: 0.20
Model prediction: 0.00
Model prediction: 0.00
```



Thank you for your attention!

Q&A