VISUAL WAKE WORD DETECTION

Daksh Baweja - 2022UCA1810
Archit Jain - 2022UCA1865
Aditya Bhandari - 2022UCA1819

NSUT | CSAI

PROBLEM STATEMENT

- **Inaccessibility of Smart Home Devices:** Individuals with vocal impairments cannot use voice-controlled smart home devices.
- **Lack of Intuitive Interfaces:** Existing solutions often require verbal communication, excluding non-verbal users.
- **Need for Inclusion:** A gap in technology that fails to cater to the needs of people with physical limitations.

SOLUTION

- **Gesture-Based System:** A non-verbal interface using finger gestures to control electronic devices.
- **Deep Learning on Edge Devices:** Utilizes lightweight deep learning models (e.g., MobileNet) optimized for edge deployment.
- **Objective:** To create an inclusive, real-time, and portable assistive system for smart home automation.

APPLICATIONS

- **Smart Home Automation:** Control lights, fans, and other appliances using finger gestures.
- **Healthcare:** Can be extended to assist patients with limited mobility in hospitals.
- **Industrial Use:** Hands-free control of machinery in environments where verbal communication is challenging.

LITERATURE REVIEW

1. Detecting Gesture Language for Deaf and Mute People Usingon Ultra-Low-Power TinyML Model
2. Edge Computing and Deep Learning Based Real-time Hand Gesture Recognition Using Wearable Sensor
3. Real-Time Numerical 0-5 Counting Based on Hand-Finger Gestures Recognition
4. A TinyDL Model for Gesture-Based Air Handwriting Arabic Numbers and Simple Arabic Letters Recognition

METHODOLOGY

STEP 1

Gesture Data Collection and Preprocessing

STEP 2

Model Selection and Training (ResNet50 → MobileNet)

STEP 3

Model Conversion and Optimization (TensorFlow Lite + Quantization)

STEP 4

Edge Device Integration (Deployment on Edge Impulse)

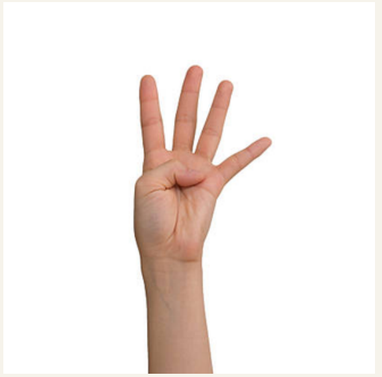
OUTPUT

1

2

3

4



5

6

RESULT

TRAIN

```
Epoch 46/50
34/34 [==============================] - 0s 7ms/step - loss: 0.0111 - accuracy: 0.9991
Epoch 47/50
34/34 [==============================] - 0s 7ms/step - loss: 0.0140 - accuracy: 0.9972
Epoch 48/50
34/34 [==============================] - 0s 7ms/step - loss: 0.0106 - accuracy: 0.9981
Epoch 49/50
34/34 [==============================] - 0s 7ms/step - loss: 0.0091 - accuracy: 1.0000
Epoch 50/50
34/34 [==============================] - 0s 7ms/step - loss: 0.0094 - accuracy: 1.0000
```

TEST

```
Loss = 0.1743667870759964
Test Accuracy = 0.9416666626930237
```

THANK YOU