AI智慧監控攝影機
Oscar, Always care

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Team Name: OSCAR
Team Members: 陳冠瑋 / 袁鈺彬 / 謝元碩 / 林聖諺 / 陳博謙

Outline

- Introduction
- Difficulties & Innovation
- Design & Implementation
- Result & Demo

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- **Introduction**
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Introduction - Motivation

Fall Detection

Smart Security

Helmet Detection

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Introduction – Our Project

NXP i.MX RT1060

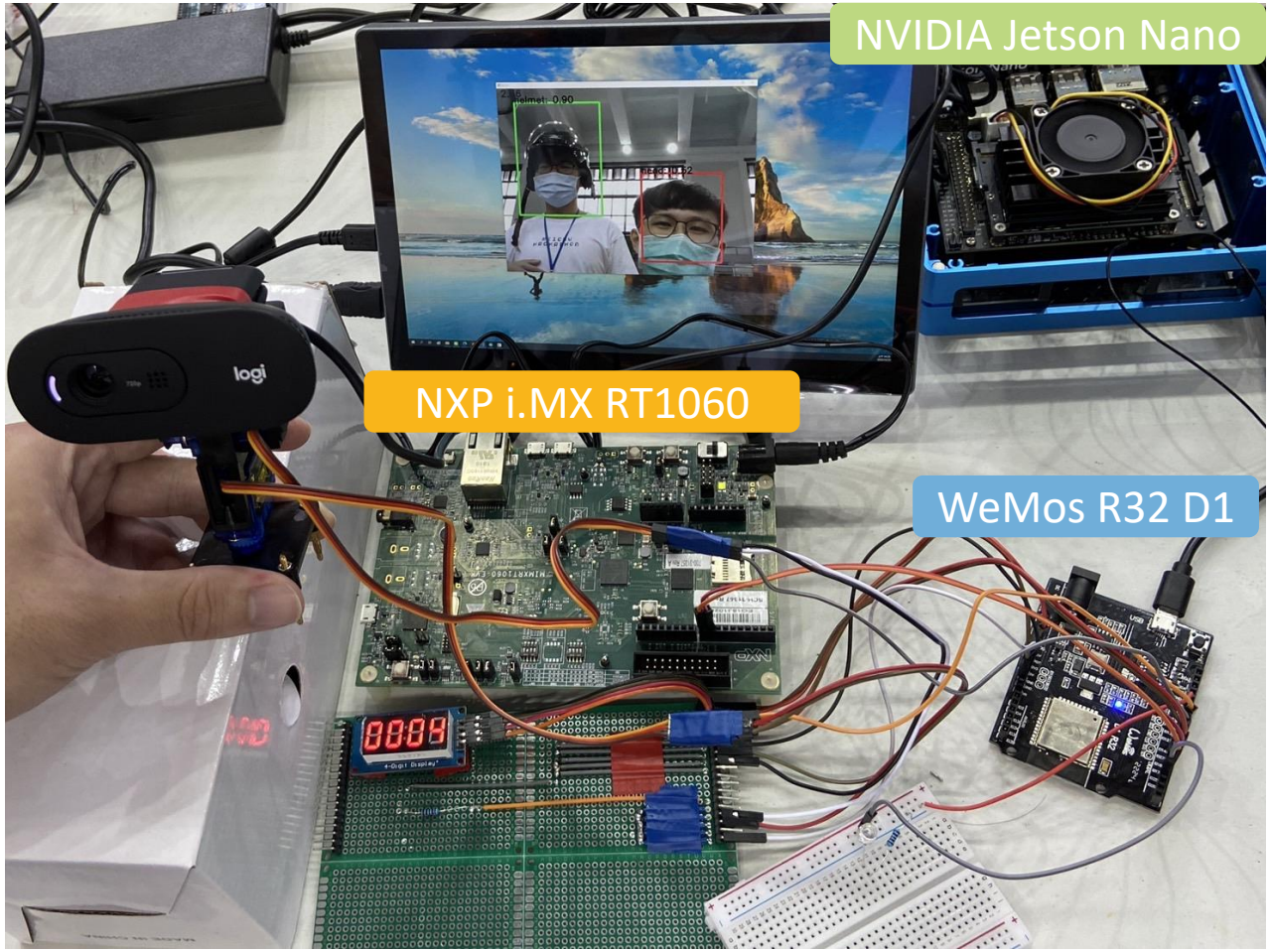
- Keyword Spotting (KWS)
- UART *2
  - LPUART0
  - LPUART6

WeMos R32 D1

- Gimbal platform control
  - Servo1
  - Servo2
- 7-Segment Display
- UART

NVIDIA Jetson Nano

- AI model inference
- LCD display



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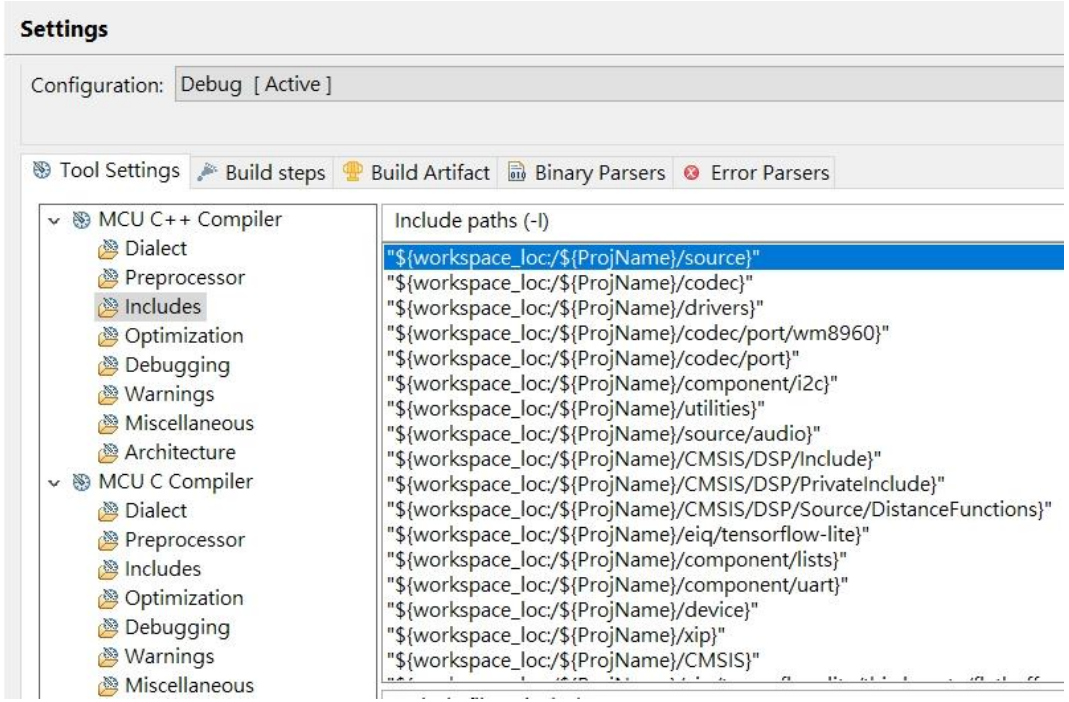
Difficulties

Libraries Merging

- Path setting
- Add related files
  - *.cpp, *.h, …



Communication Protocol

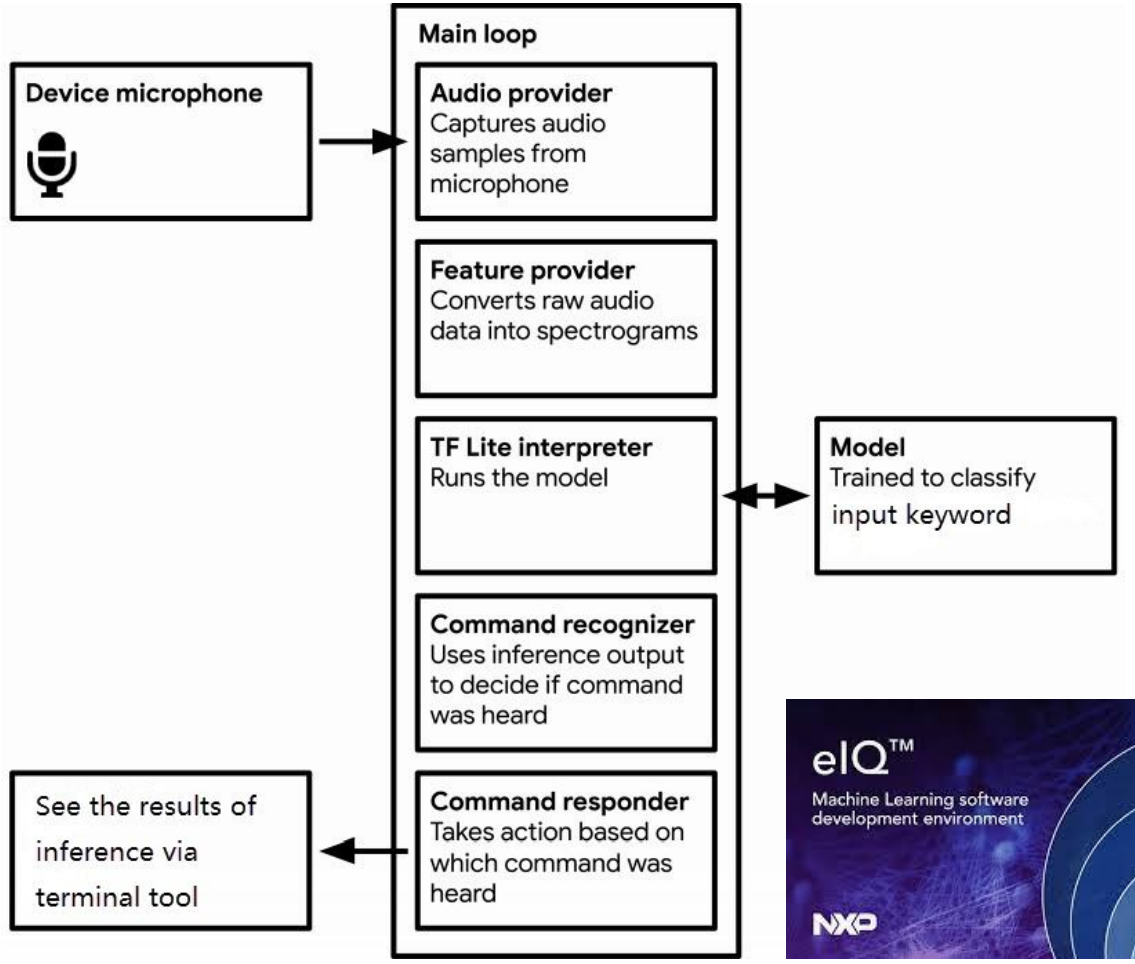
- Create 2 UARTs on i.MX RT1060
- Merge different examples
  - UART, eIQ™ AI inference, …

Module Compatibility

- Lack of library resources

Innovation - Keyword Spotting (KWS) for Microcontrollers

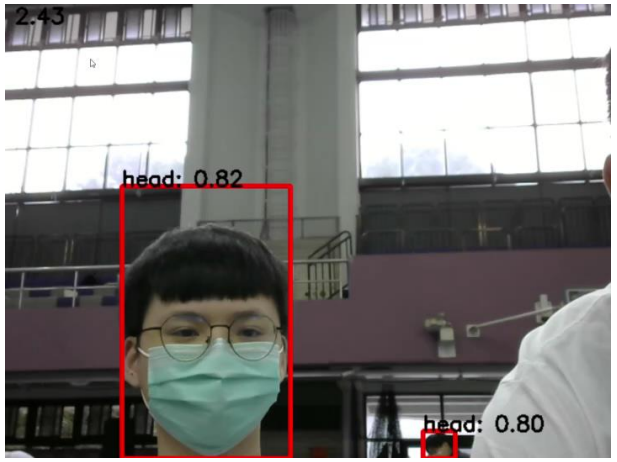
- **Hardware**
  - NXP i.MX RT1060
- **Detecting Specific Keywords**
  - “Go”, “Up”, “Stop” …
- **Dataset**
  - Google speech command dataset
- **NXP® eIQ™ ML Toolkit**
  - TensorFlow lite
  - MobileNet
  - 10 different keywords
  - Demo example – keyword spotting



Innovation – AI Application with Smart Camera

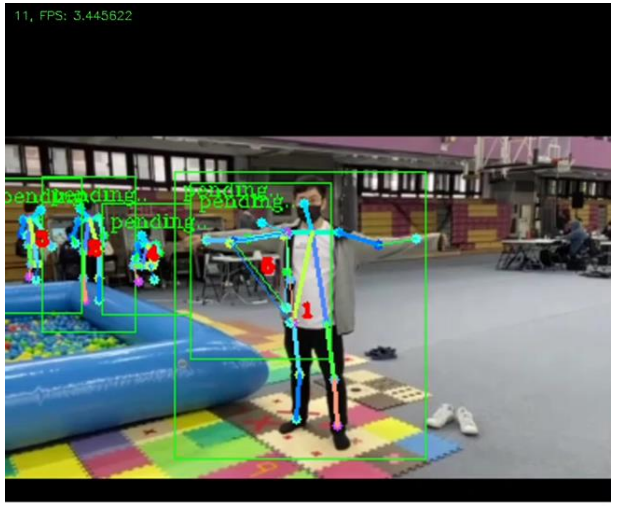
Helmet Detection

- TensorFlow + CUDA
- *YOLO v4*: Head & Helmet detection



Fall Detection

- PyTorch
- *Tiny-YOLO*: Human detection
- *AlphaPose*: 2D pose estimation
- *ST-GCN*: Action recognition



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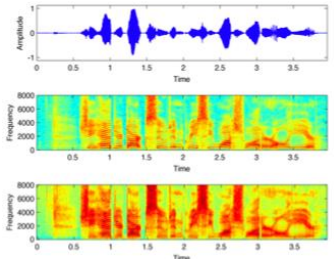
Design & Implementation - Concept

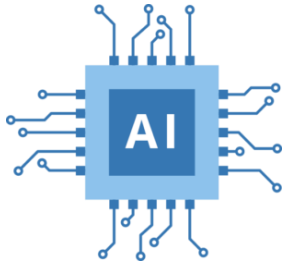
Go !

Keyword Spotting



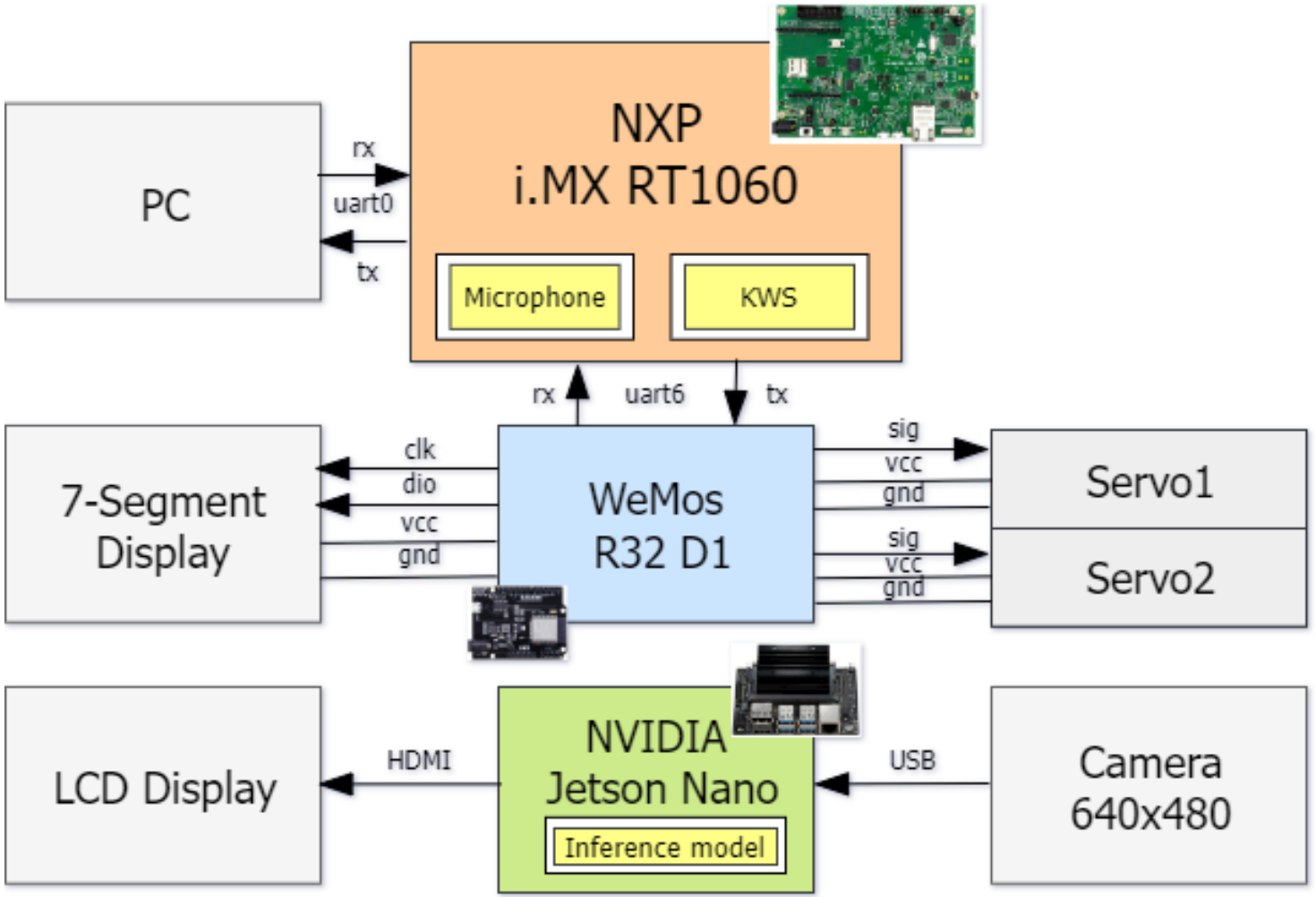
Control Gimbal Platform

AI Model Deployment



Scenario Applications

Design & Implementation - Architecture



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Result & Demo – Speech command

- **Speech command**
  - 0 down
  - 1 go
  - 2 left
  - 3 no
  - 4 off
  - 5 on
  - 6 right
  - 7 stop
  - 8 up
  - 9 yes

Result & Demo – Servo control with camera

- **Control**

0 down	turn down
1 go	360° scan
2 left	turn left
3 no	reset
4 off	light off
5 on	light on
6 right	turn right
7 stop	stop servos
8 up	turn up
9 yes	reserved

Result & Demo – Speech command control & helmet detection

Thank you