Video timeline:

First 30s, explain high level overview of IoT Device + communication protocol

Table

Description automatically generated

Show how each stage has been accomplished

1. Collecting user input

* Input collected via real-time, via a push button to simulate the door bell, and by a camera to capture an image of the visitor.

1. Inference and display of result

* Model inference is offloaded onto the Cloud.
* Inference result is displayed on screen, after Edge Device (Raspberry Pi) receives the processed image from the Cloud.

1. Program runs on physical IoT device (Raspberry Pi 4, Model B+), with peripherals such as a NOIR Camera, a pushbutton as well as a self-built circuit
2. Cloud Inference

* Server program is deployed on personal computer (Separate machine)

1. Communication between IoT device and Cloud.

* As the user presses the pushbutton, this simulates him ringing a doorbell at someone’s front door. It triggers the IoT edge device to take a snapshot of the visitor, and send the picture from the Edge Device to the Cloud for facial recognition.
* The Cloud will then process the received picture and send back the processed image to the Edge Device, by isolating and indicating the facial features of the visitor with a red rectangular box.

1. Facial Recognition model design adapted from <https://pyimagesearch.com/2018/02/26/face-detection-with-opencv-and-deep-learning/>

Utilizing OpenCV’s DNN module, with the included Face\_Detector modules.

1. Supports multiple concurrent users.

* Multiple simulated doorbell button presses can be done, with multiple images being sent to the Cloud for inference, before being sent back to Edge Device.
* (Demonstrate on camera, changing face angles constantly)

Total marks: 100

LOCAL INFERENCE (50)

1. USER INPUT

* Collect real-time input by touch screen, mic or camera (15) (To be done by taking photo of handwritten text and sending it as a photo)
* Load input from storage (8)

1. LOCAL INFERENCE AND RESULT DISPLAY (20) (Cloud inference: Sending the picture via MQTT to Cloud Machine where the inference happens.)

* Focus on uploading inference to Cloud to gain marks for this automatically
* Using AI model, NOT heuristic (15)
* Displaying Inference result by screen (5)

1. Running on Pi (15)

CLOUD INFERENCE (30)

1. Run inference in cloud machine

* Deploy server program on cloud virtual machine/Own computer (10)

1. Communiation between IOT and Cloud (This happens via MQTT)

* Send user input from mobile app to cloud (10)
* Send inference result from cloud to Pi (10)

Model selection

Downloaded pre trained model (8)

Support multiple users (Demonstrate multiple iot devices being able to use cloud service simultaneously) (10) (MQTT supports this, just have different clients)

Online model updating (Retraining of model) (10)