Edge Computing Lab

Class: TY-AIEC

School of Computing, MIT Art Design Technology University

Academic Year: 2024-25

Experiment No. 10

Introduction

Study of Transfer Learning (Images) on Edge Computing Devices

Objective: Build a project to apply Transfer Learning of MobileNetV1 & V2 architectures trained on an ImageNet dataset

Tasks:

- Understand Transfer learning
- Understanding of MobileNetV1 & V2 Architectures
- Configure Edge Impulse for Object Detection
- Apply a pre-trained network for you to fine-tune your specific application
- Building and Training a Model
- Deploy on Edge Computing Devices

Introduction

Edge Impulse is a development platform for machine learning on edge devices, targeted at developers who want to create intelligent device solutions. The " Camera "sensor reading equivalent in Edge Impulse would typically involve creating a simple machine learning model that can run on an edge device, like classifying sensor data or recognizing a basic pattern.

Materials Required

- Nano BLE Sense Board

Theory

GPIO (General Purpose Input/Output) pins on the Raspberry Pi are used for interfacing with other electronic components. BCM numbering refers to the pin numbers in the Broadcom SOC channel, which is a more consistent way to refer to the GPIO pins across different versions of the

Here's a high-level overview of steps you'd follow to create a "Hello World" project on Edge Impulse:

Steps to Configure the Edge Impulse:

1. Create an Account and New Project:

   - Sign up for an Edge Impulse account.

   - Create a new project from the dashboard.

2. Connect a Device:

- You can use a supported development board or your smartphone as a sensor device.
- Follow the instructions to connect your device to your Edge Impulse project.

3. Collect Data:

- Use the Edge Impulse mobile app or the Web interface to collect data from the onboard sensors.
- For a "Hello World" project, you could collect accelerometer data, for instance.

4. Create an Impulse:

- Go to the 'Create impulse' page.
- Add a processing block (e.g., time-series data) and a learning block (e.g., classification).
- Save the impulse, which defines the machine learning pipeline.

5. Design a Neural Network:

- Navigate to the 'NN Classifier' under the 'Learning blocks'.
- Design a simple neural network. Edge Impulse provides a default architecture that works well for most basic tasks.

6. Train the Model:

- Click on the 'Start training' button to train your machine learning model with the collected data.

7. Test the Model:

- Once the model is trained, you can test its performance with new data in the 'Model Testing' tab.

8. Deploy the Model:

- Go to the 'Deployment' tab.
- Select the deployment method that suits your edge device (e.g., Arduino library, WebAssembly, container, etc.).
- Follow the instructions to deploy the model to your device.
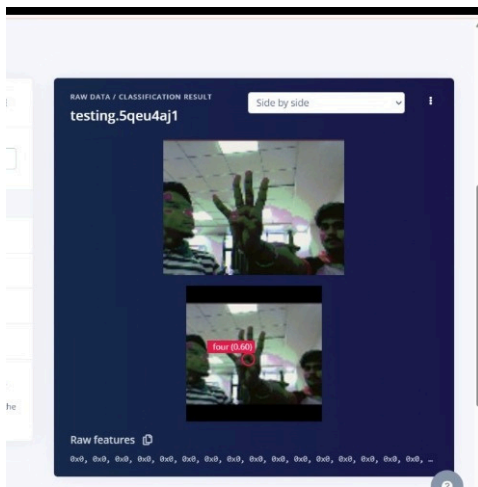
9. Run Inference:

- With the model deployed, run inference on the edge device to see it classifying data in real-time.
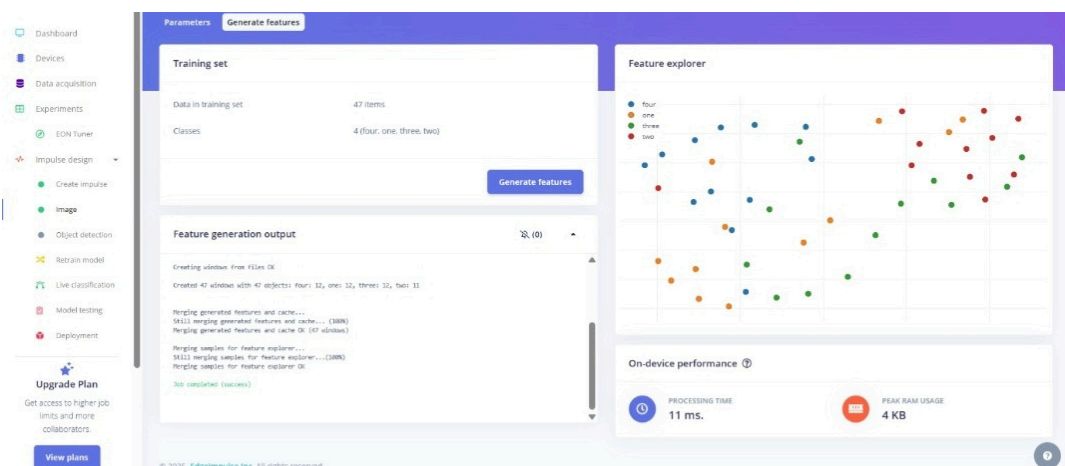
10. Monitor:

- You can monitor the performance of your device through the Edge Impulse studio.
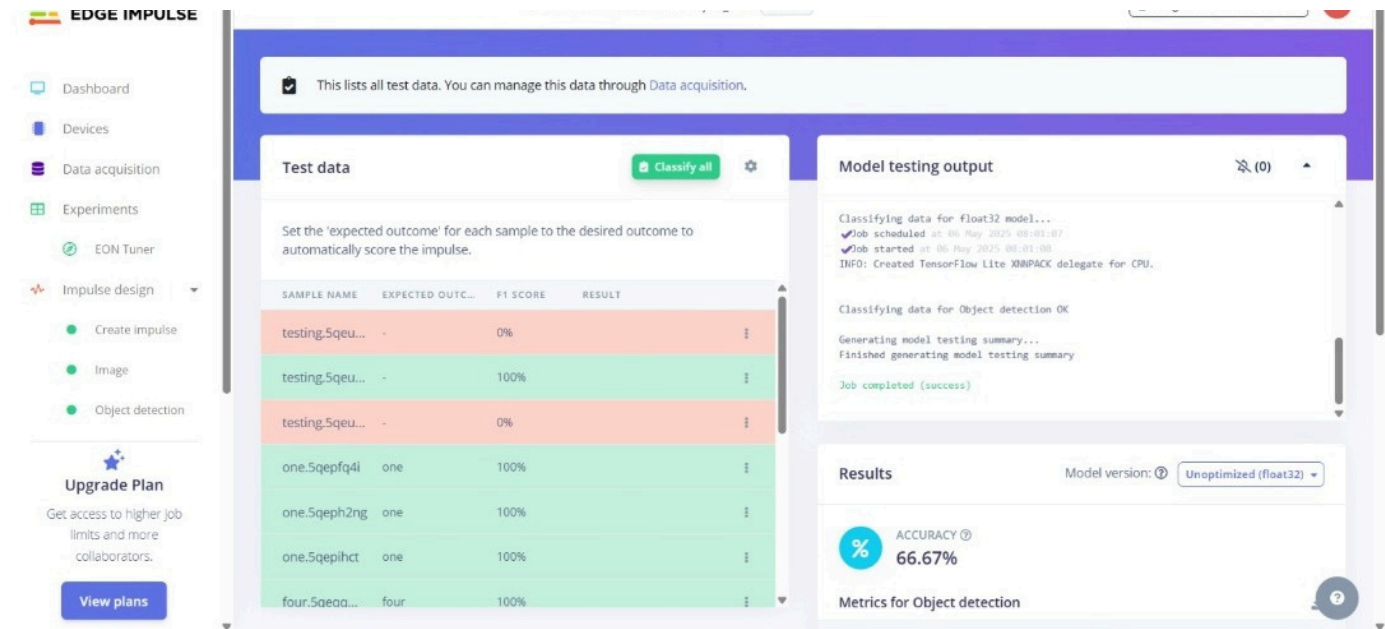
Paste your Edge Impulse project's Results:

1) Dataset Image

2) Feature extraction - Image

3) Accuracy / Loss - Confusion Matrix – image

4) Validation Result – Image