Edge Computing Laboratory
Lab Assignment 10

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Title

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:

40. Create an Account and New Project:
    - Sign up for an Edge Impulse account.
    - Create a new project from the dashboard.
41. 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.

42. 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.

43. 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.

44. 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.

45. Train the Model:

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

46. Test the Model:

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

47. 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.

48. Run Inference:

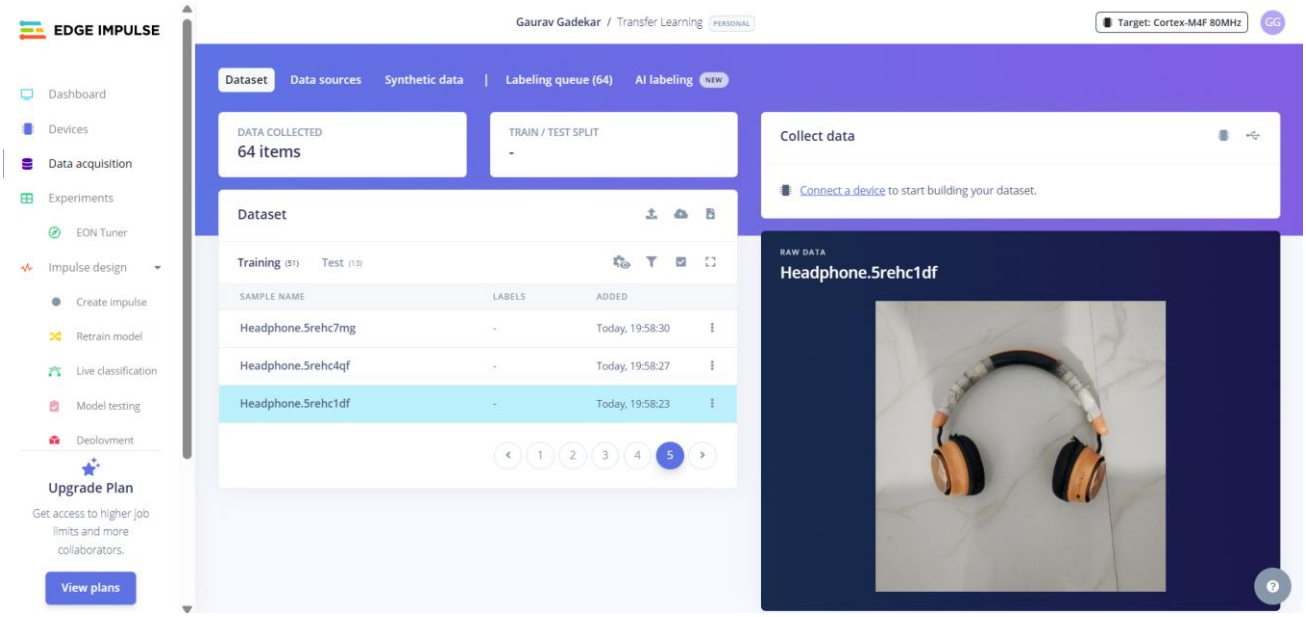
    - With the model deployed, run inference on the edge device to see it classifying data in real-time.

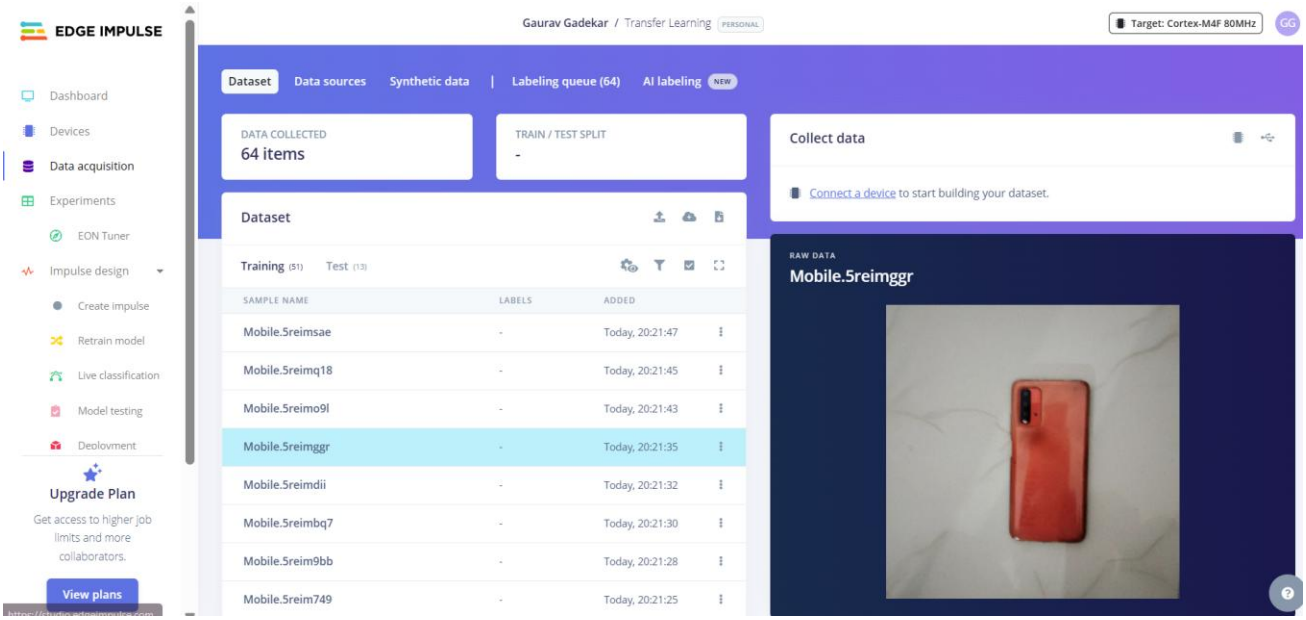
49. Monitor:

    - You can monitor the performance of your device through the Edge Impulse studio.

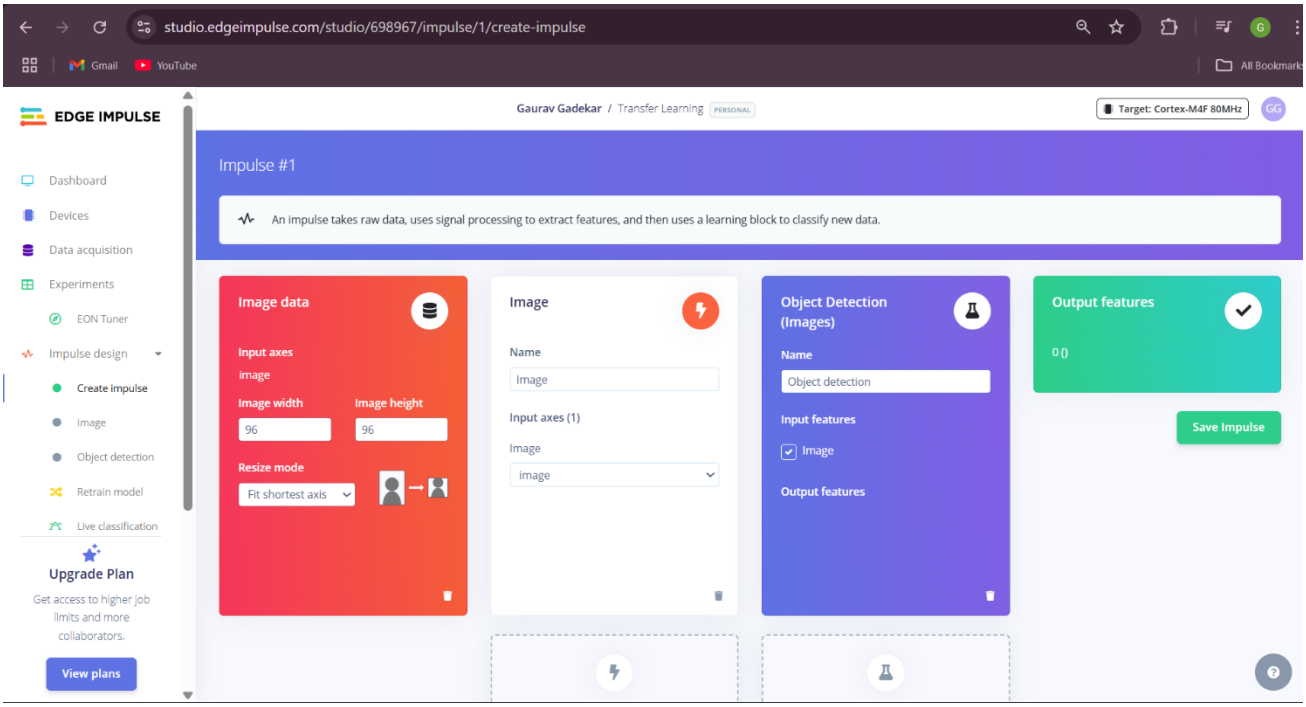
Screenshots:

Dataset image

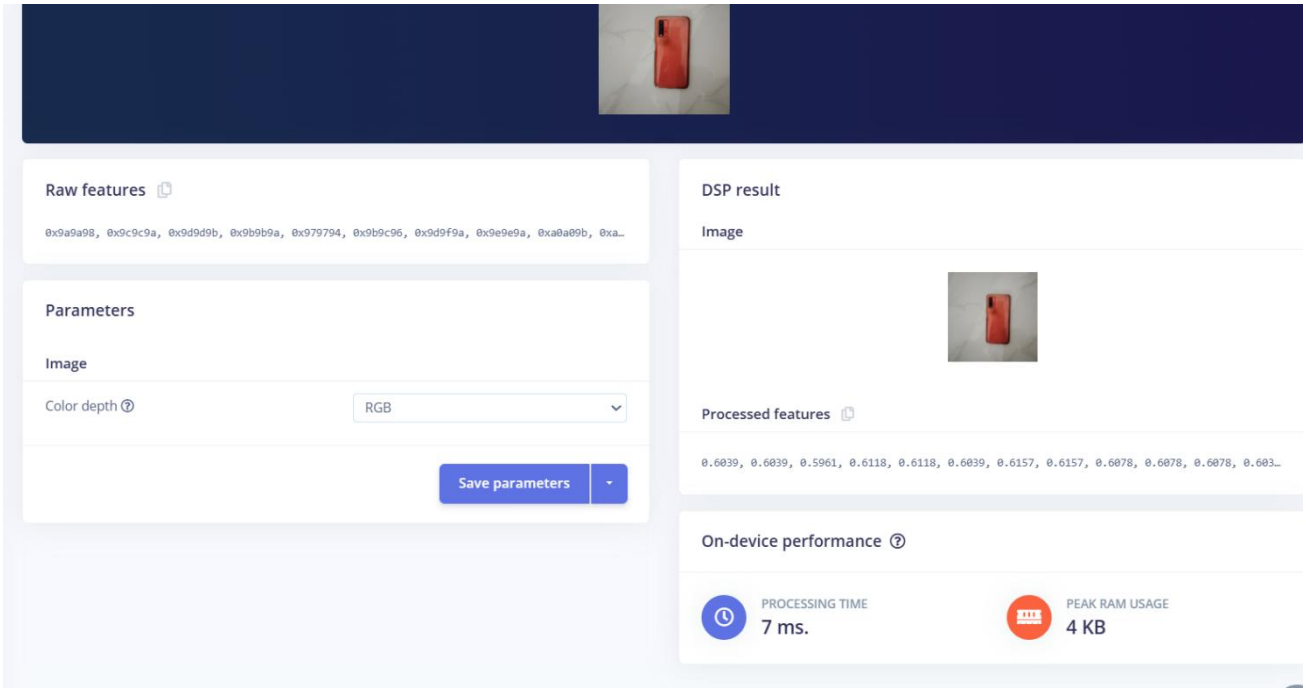




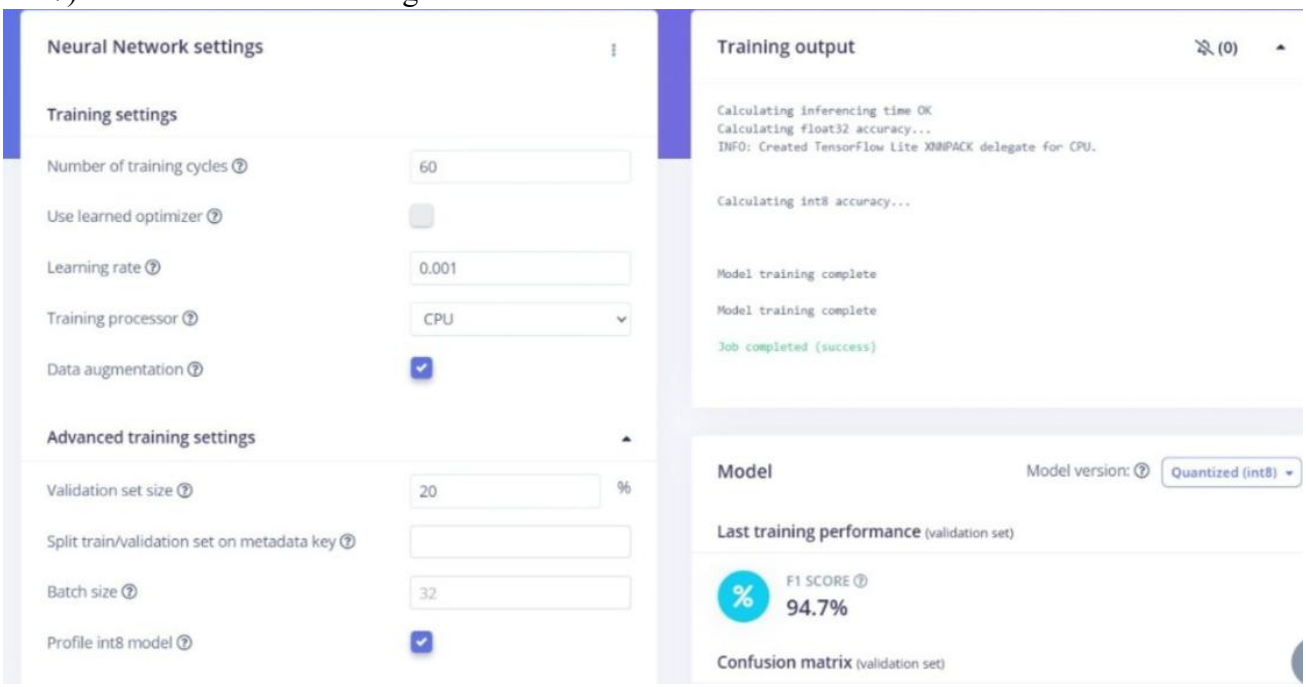
Feature extraction - Image



Accuracy / Loss image



7) Validation Result – Image



- **Conclusion:** Understood of MobileNetV1 & V2 Architectures and custom training on new dataset for edge devices.