Edge Computing Laboratory
Lab Assignment 5

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Title

The “Hello World” of Edge Impulse Platform and Gesture Recognition(up-down, left-right, idle, circular)

Introduction

Edge Impulse is a development platform for machine learning on edge devices, targeted at developers who want to create intelligent device solutions. The "Hello World" 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.

Objective

TinyML: Building and Training a Model

Materials Required

Raspberry Pi 4 / 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:

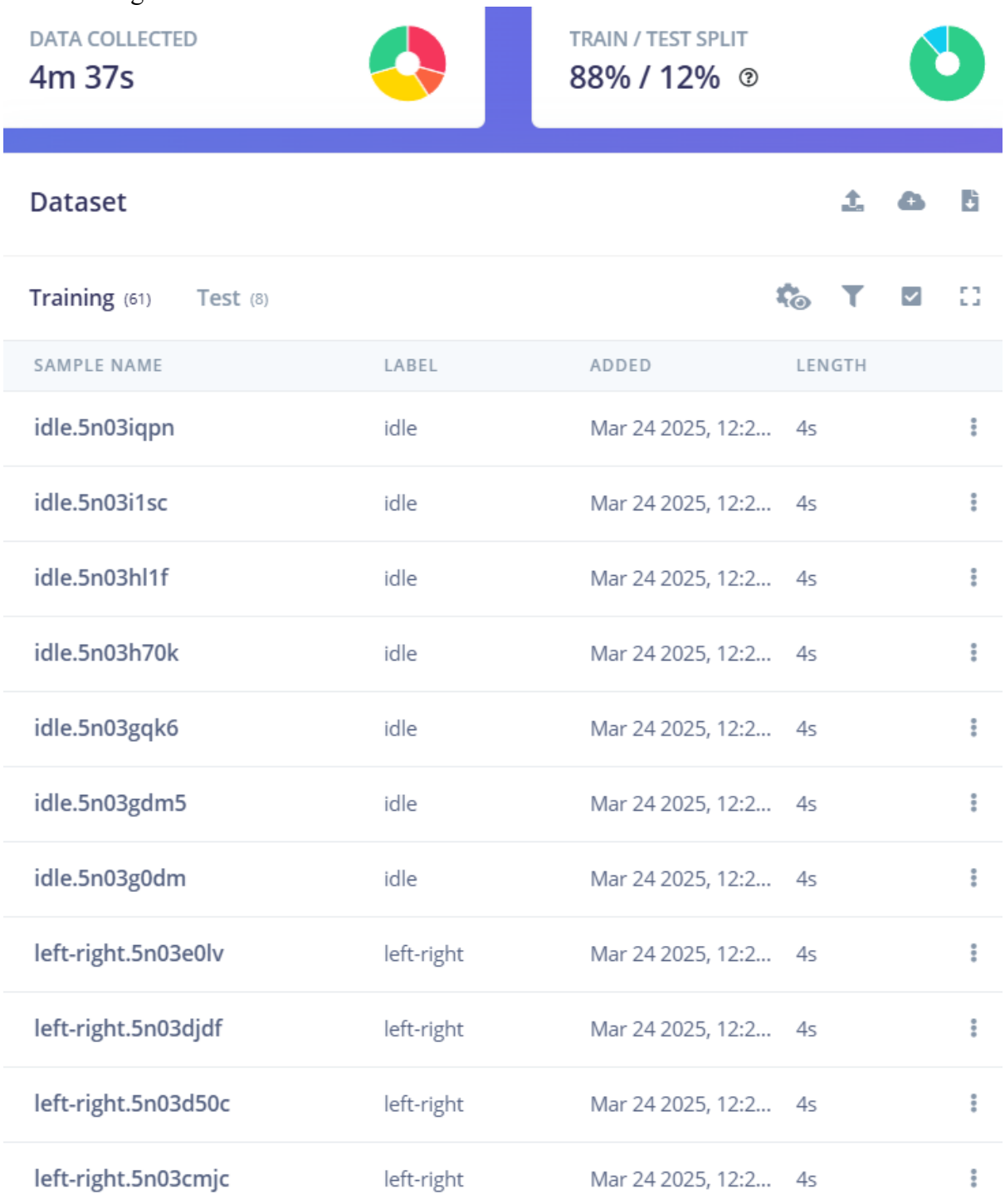
1. Create an Account and New Project:
    - Sign up for an Edge Impulse account.
    - Create a new project from the dashboard.
2. Connect a Device:
    - You can use a supported development board or your smartphone as a sensor device.
    - Follow the instructions to connect your device to your Edge 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.

Screenshots:

1. Dataset Image



Dataset

Training (61) Test (8)

SAMPLE NAME	LABEL	ADDED	LENGTH
left-right.5n03bqg0	left-right	Mar 24 2025, 12:2...	4s
left-right.5n03bdl2	left-right	Mar 24 2025, 12:2...	4s
left-right.5n03aj67	left-right	Mar 24 2025, 12:2...	4s
left-right.5n02fts2	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02fgm8	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02f3pt	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02ellp	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02e8p8	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02dr6b	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02def4	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02d192	left-right	Mar 24 2025, 12:0...	4s
left-right.5n02cklu	left-right	Mar 24 2025, 12:0...	4s

Dataset

Training (61) Test (8)

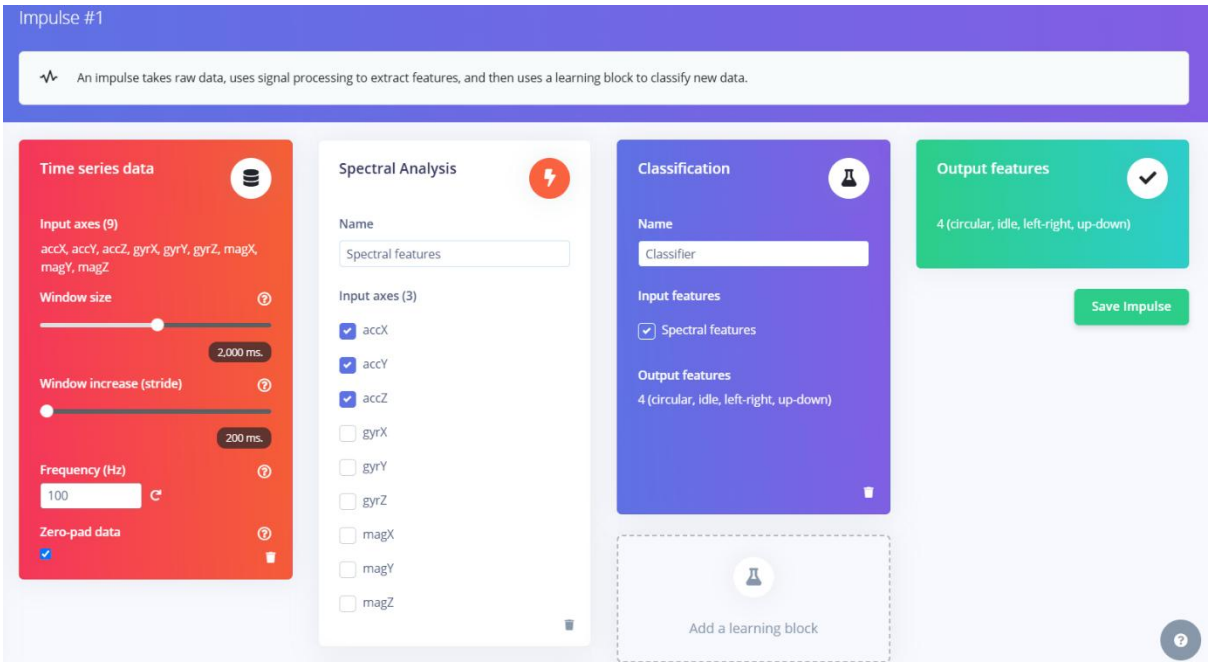
SAMPLE NAME	LABEL	ADDED	LENGTH
left-right.5n02c83d	left-right	Mar 24 2025, 12:0...	4s
circular.5n02942l	circular	Mar 24 2025, 12:0...	4s
circular.5n028m4i	circular	Mar 24 2025, 12:0...	4s
circular.5n0288t6	circular	Mar 24 2025, 12:0...	4s
circular.5n0278rk	circular	Mar 24 2025, 12:0...	4s
circular.5n026q2n	circular	Mar 24 2025, 12:0...	4s
circular.5n026b8u	circular	Mar 24 2025, 12:0...	4s
circular.5n025t3s	circular	Mar 24 2025, 12:0...	4s
circular.5n025ft3	circular	Mar 24 2025, 12:0...	4s
circular.5n0252il	circular	Mar 24 2025, 12:0...	4s
circular.5n024lc4	circular	Mar 24 2025, 12:0...	4s
circular.5n0241s8	circular	Mar 24 2025, 11:5...	4s

Dataset

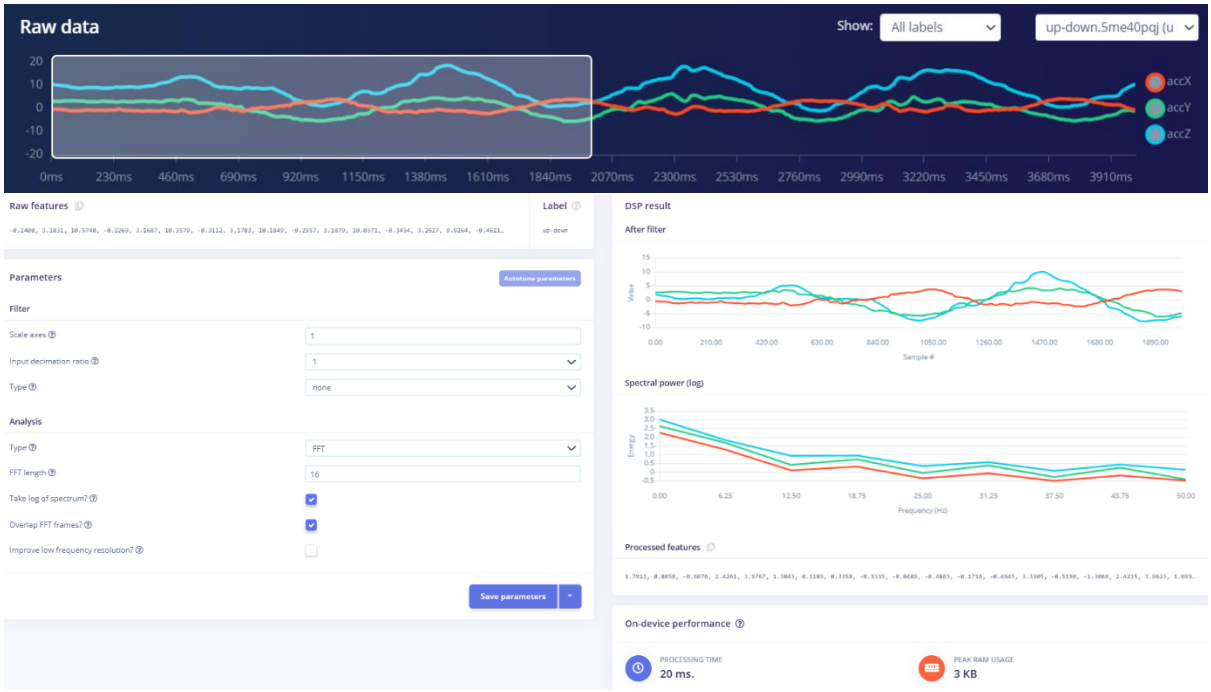
Training (61) Test (8)

SAMPLE NAME	LABEL	ADDED	LENGTH
up-down.5me418e0	up-down	Mar 17 2025, 12:4...	4s
up-down.5me40pqj	up-down	Mar 17 2025, 12:4...	4s
up-down.5me40c86	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3vt7e	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3vg8q	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3v30p	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3ul9u	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3u8i2	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3topj	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3t526	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3sljc	up-down	Mar 17 2025, 12:4...	4s
up-down.5me3s7i9	up-down	Mar 17 2025, 12:4...	4s

2. Feature extraction - Image



3. Accuracy / Loss - Confusion Matrix – image



4. Validation Result – Image
5. Copy the code of Arduino Sketch
6. Screen shot of Arduino Terminal - Result

Conclusion:- Created and deployed ML model with sound based data on edge device