# Edge Computing Lab

## Class: TY-AIEC

### School of Computing, MIT Art Design Technology University

#### Academic Year: 2024-25

**Experiment No. 8**

## Introduction

**The "magic wand" project that can recognize gestures using an accelerometer and an ML classification model on Edge Devices**

**Objective:** Build a project to detect the accelerometer values and convert them into gestures

**Tasks:**

* Generate the dataset for Accelerometer Motion (Up-Down, Left-Right)
* Configure BLE Sense / Mobile for Edge Impulse
* Building and Training a Model
* Deploy on Nano BLE Sense / Mobile Phone

## Introduction

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

1. 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.

1. 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.

1. 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.

1. 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.

1. Train the Model:

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

1. Test the Model:

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

1. 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.

1. Run Inference:

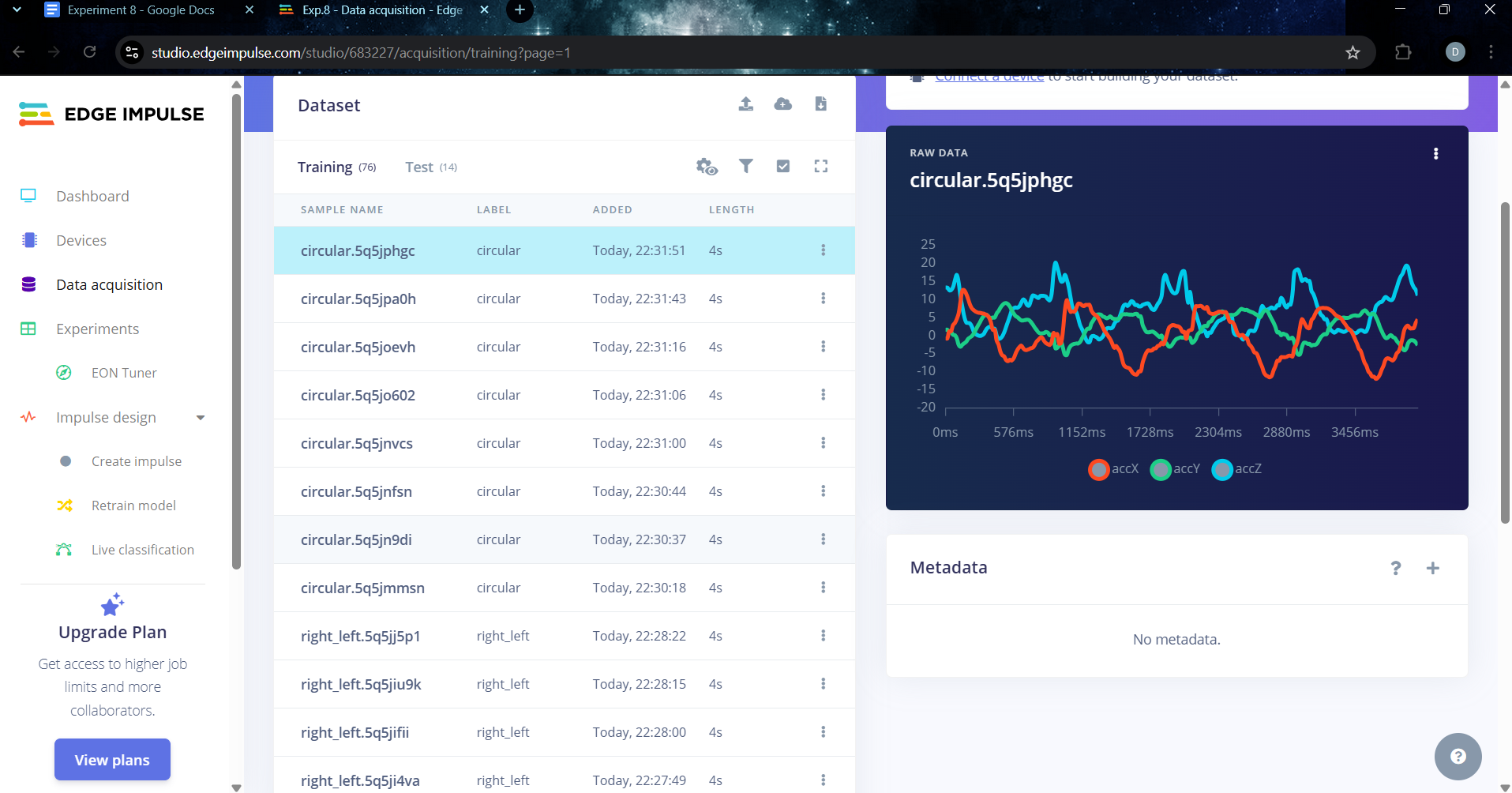
* With the model deployed, run inference on the edge device to see it classifying data in real-time.

1. Monitor:

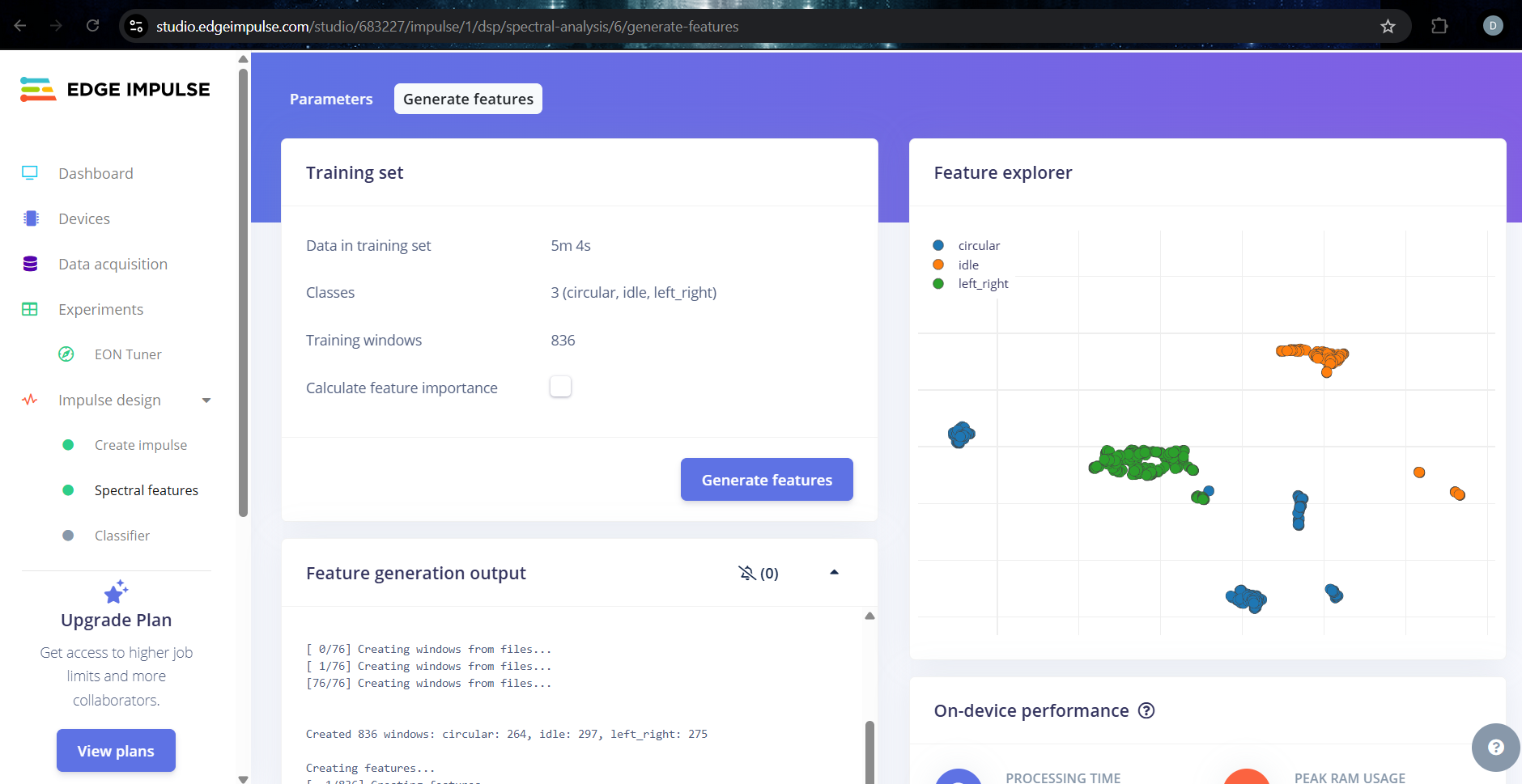
* You can monitor the performance of your device through the Edge Impulse studio.

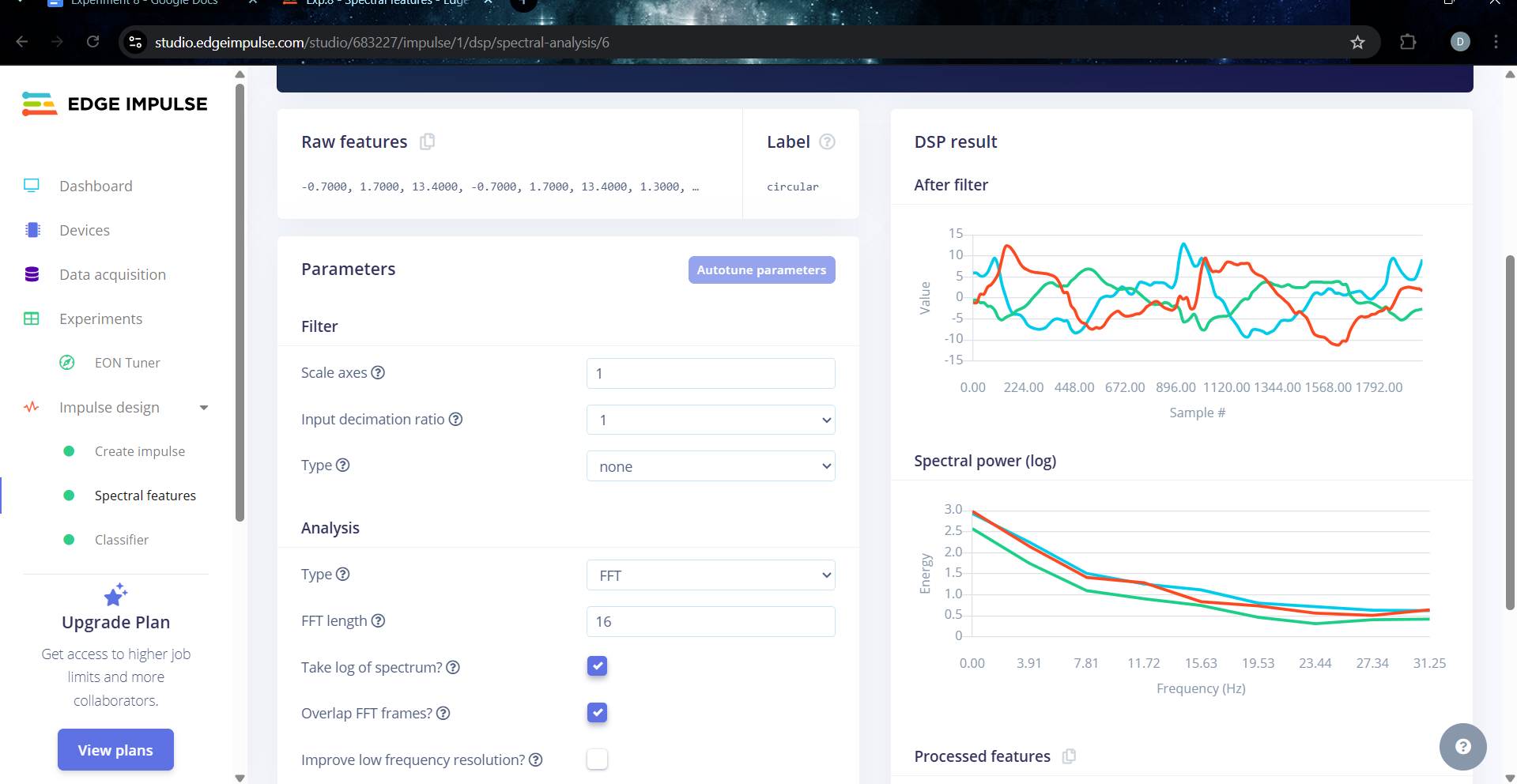
Paste your Edge Impulse project’s Results:

1. Dataset Image

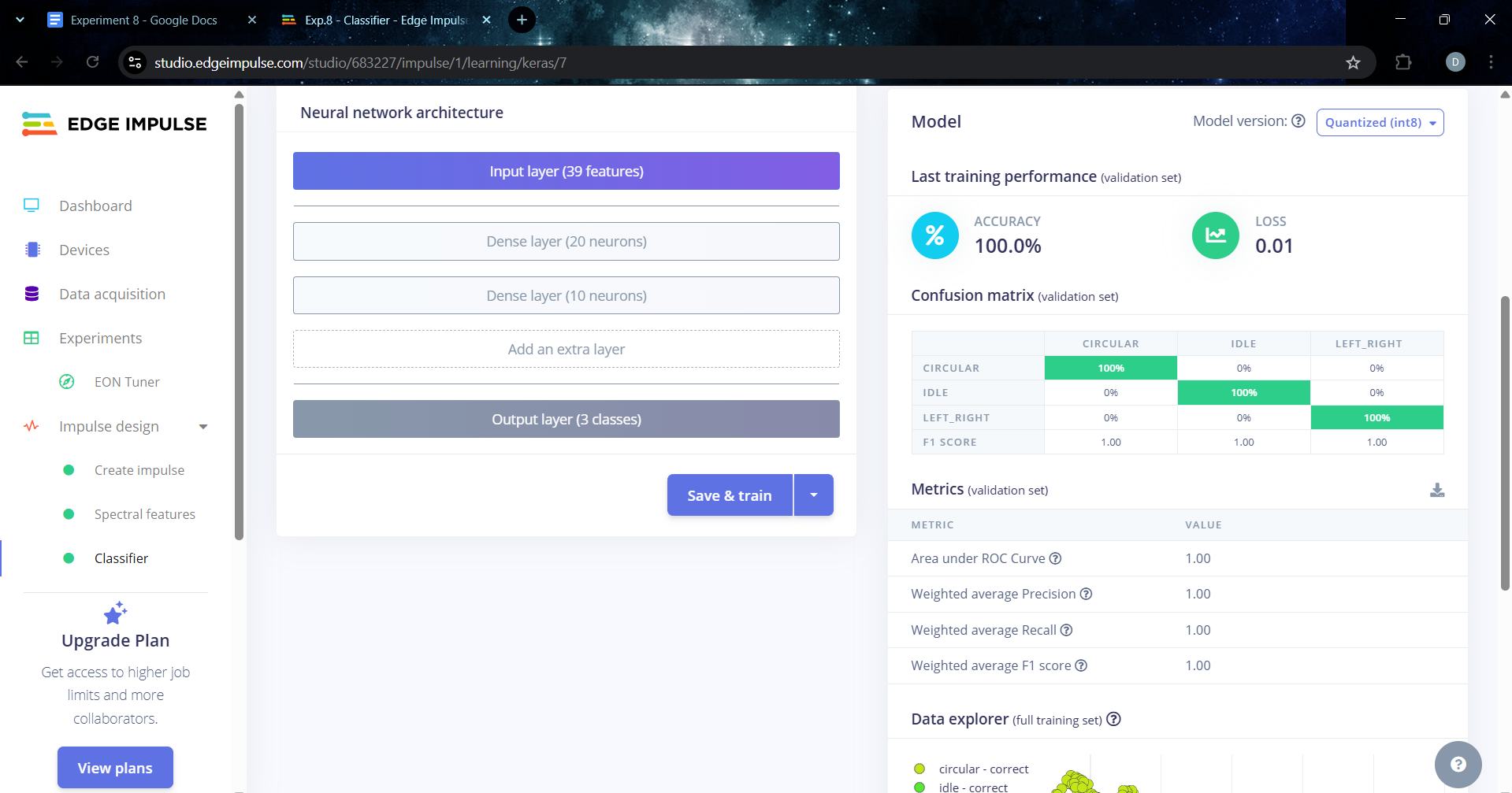


1. Feature extraction - Image

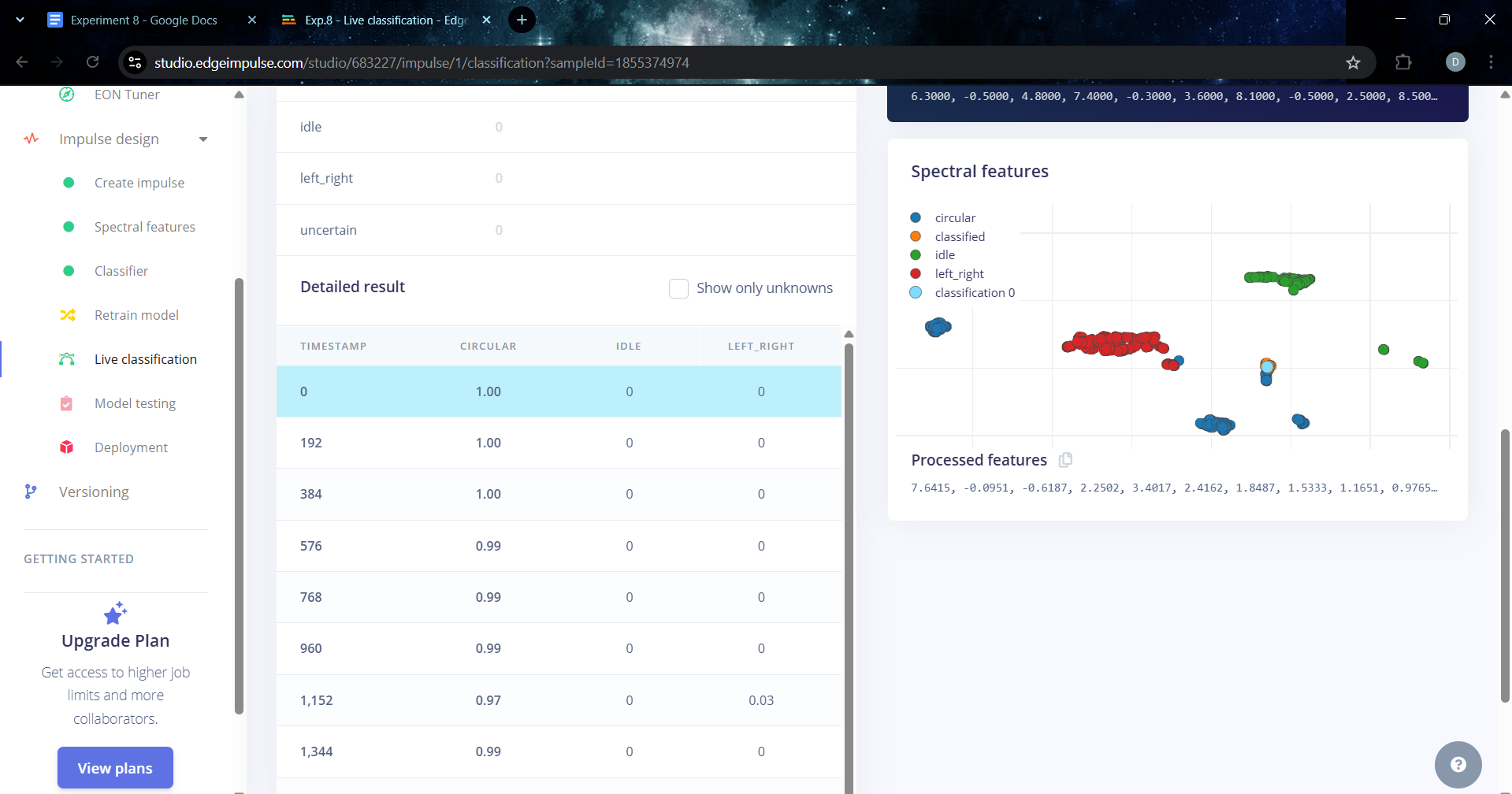


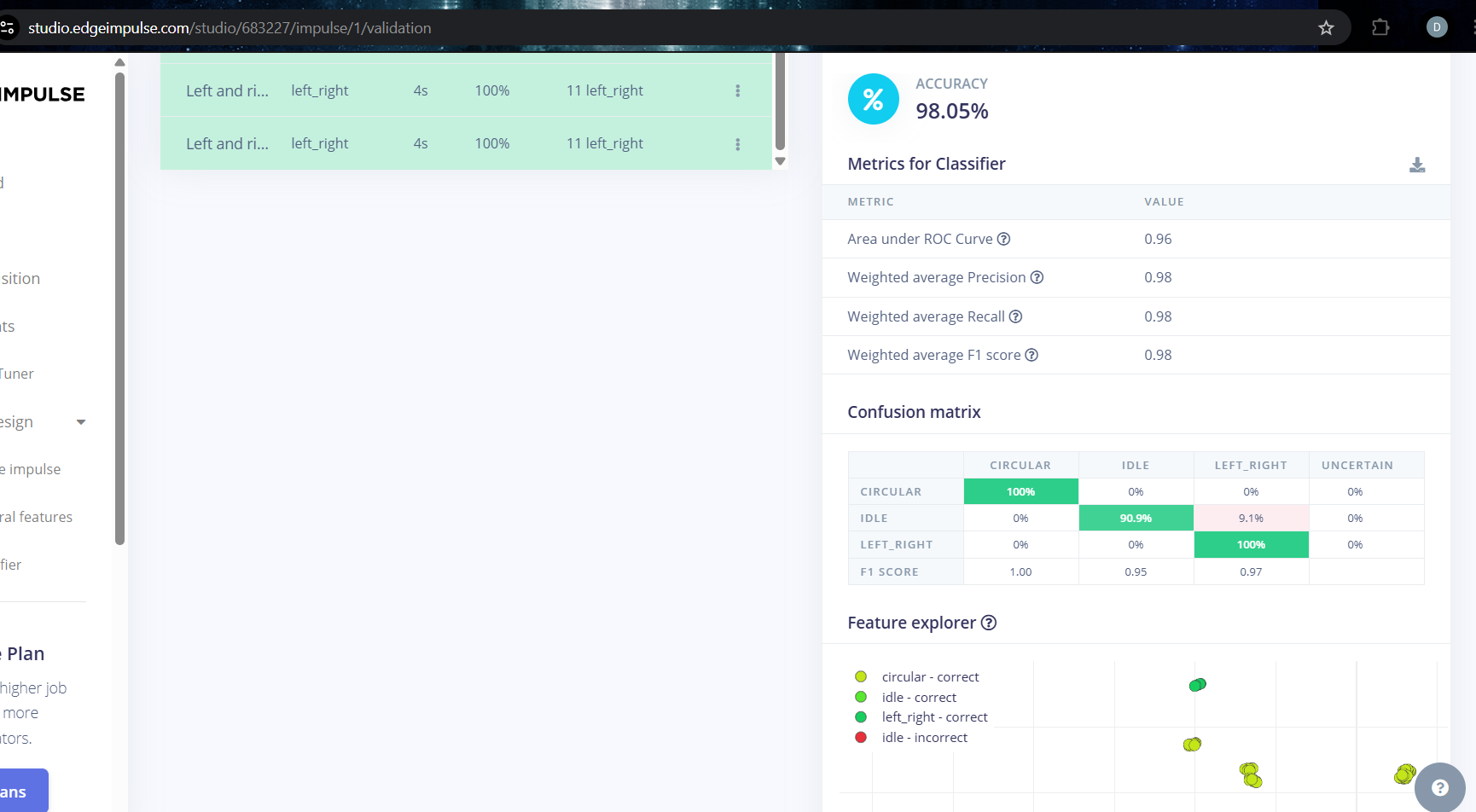


1. Accuracy / Loss - Confusion Matrix – image

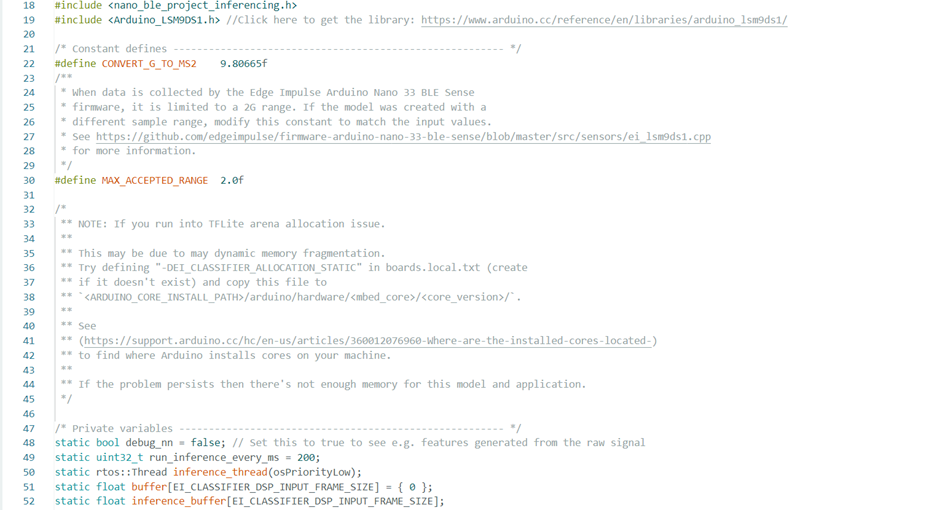


1. Validation Result – Image





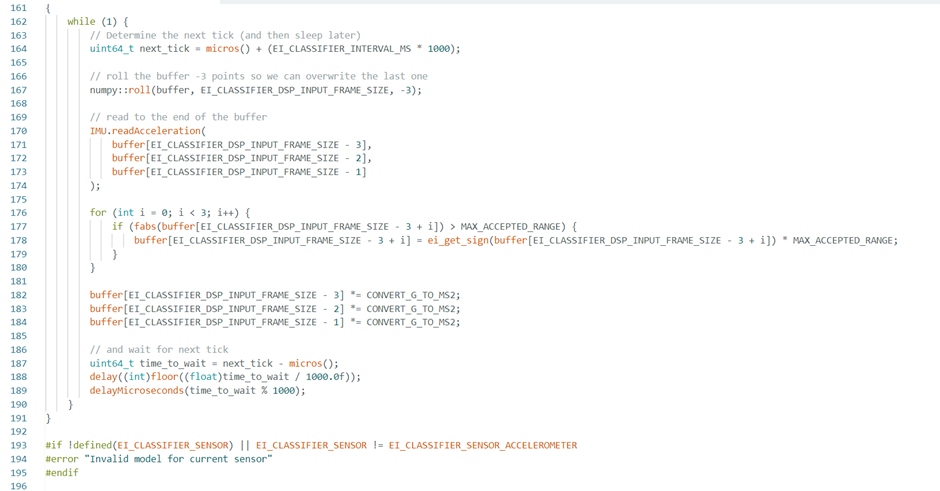
1. Copy the code of Arduino Sketch











1. Screen shot of Arduino Terminal - Result

