CASA0018 Deep Learning

Design and build of a handwriting to digital text AI-powered stylus

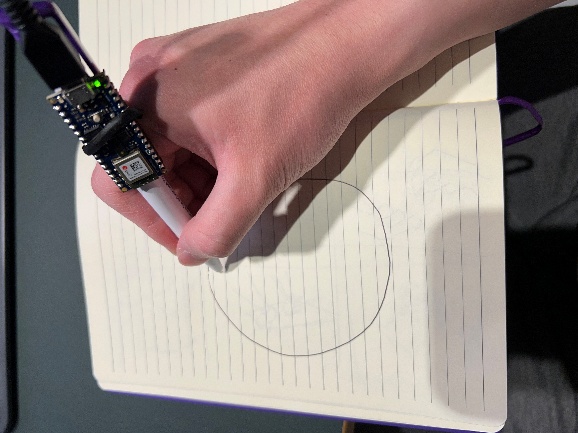
Ethan Low

INTRODUCTION

RELATED WORK

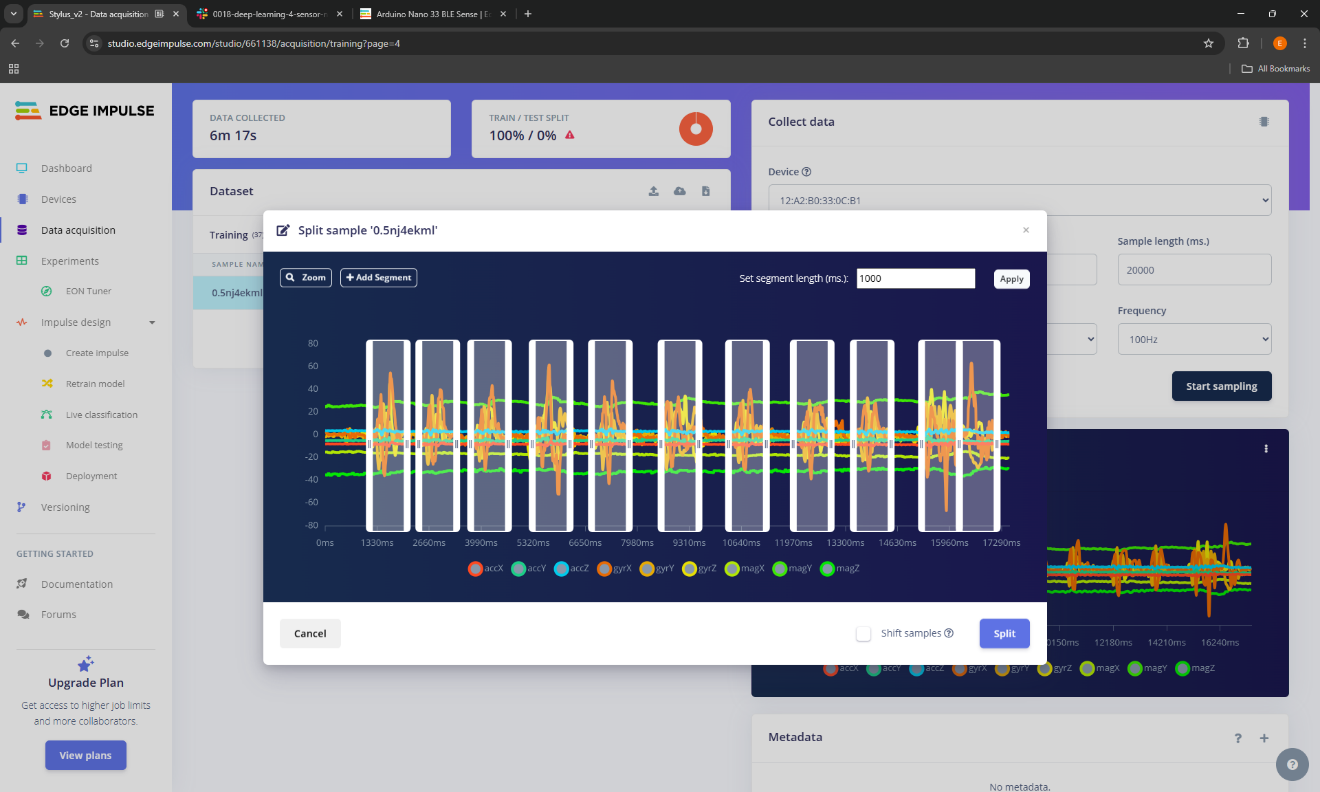
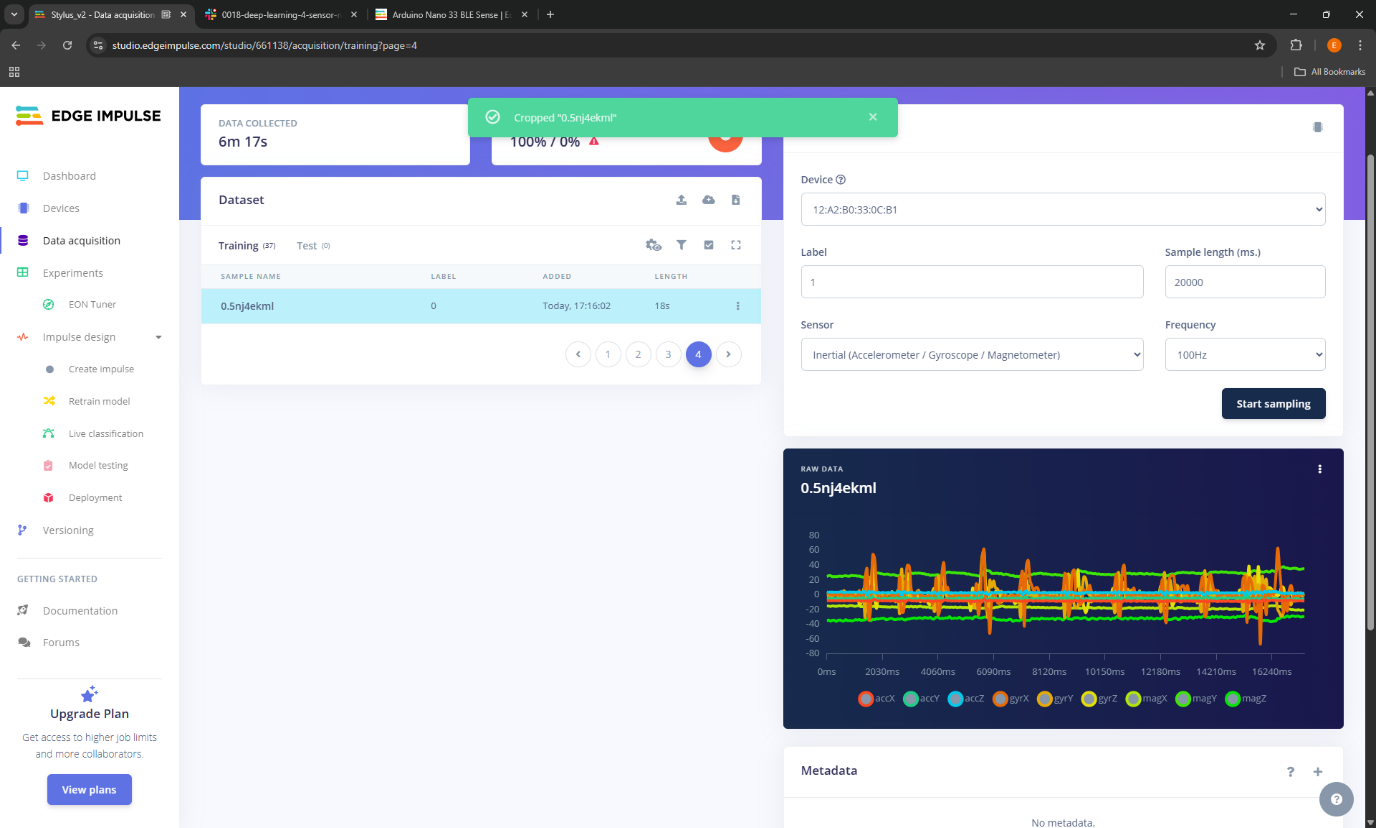
INITIAL TESTING

Data collection methodology

 A hand holding a pen and writing on a notebook

AI-generated content may be incorrect.

Data processing & augmentation



A screenshot of a computer

AI-generated content may be incorrect.

Initial model architecture

A relatively limited amount of data, compared to real-world deep learning training workflows, was collected due to the time constraints of this project. Intuitively, it was therefore decided to add a dropout layer after each dense layer to combat overfitting. According to the literature, a dropout rate of 0.5 is recommended for these layers, for the simple classifier architecture ().

FULL TESTING & REFINEMENT

With the promising results from the initial testing, it was decided to proceed with full testing by collecting data for all the proposed classes.

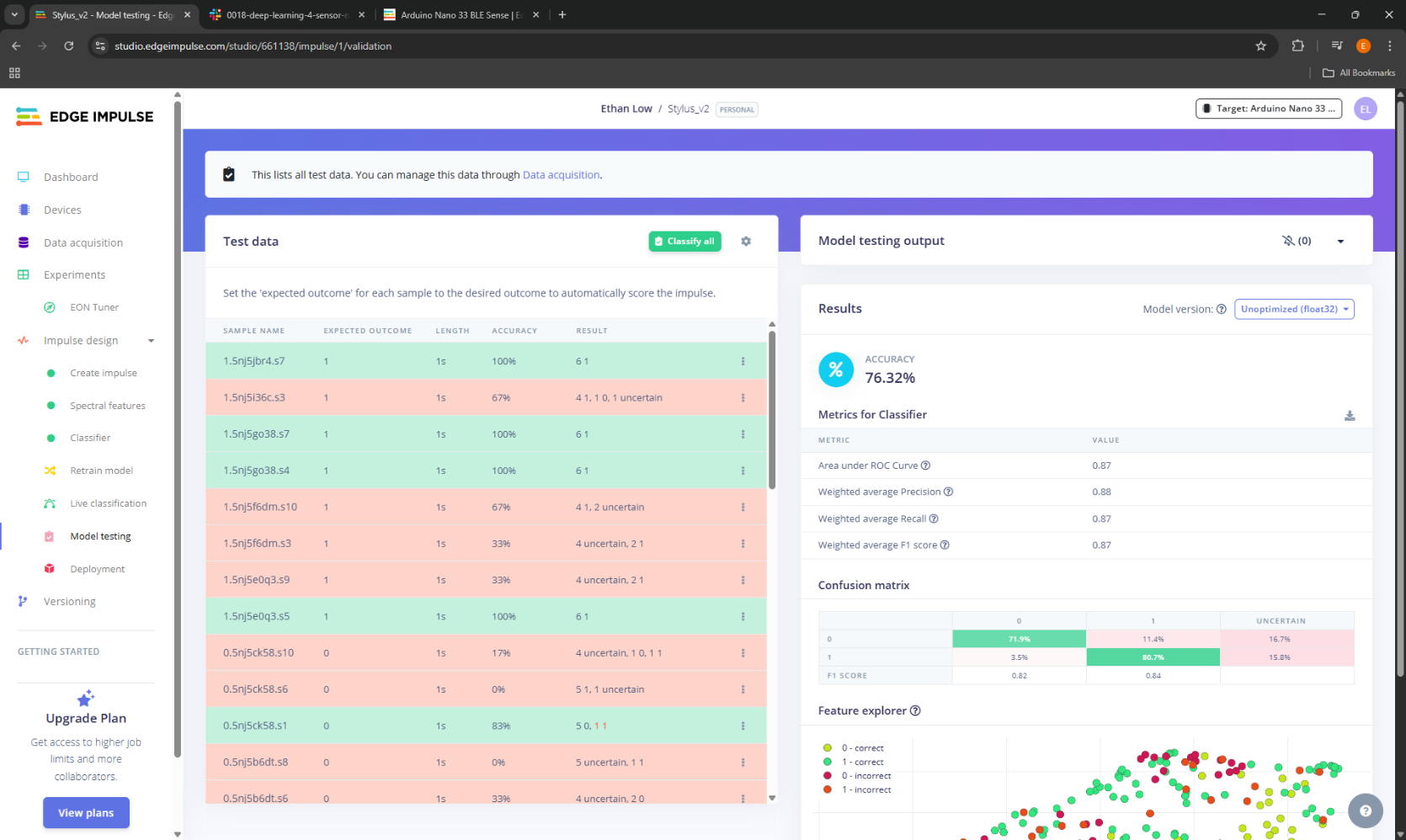
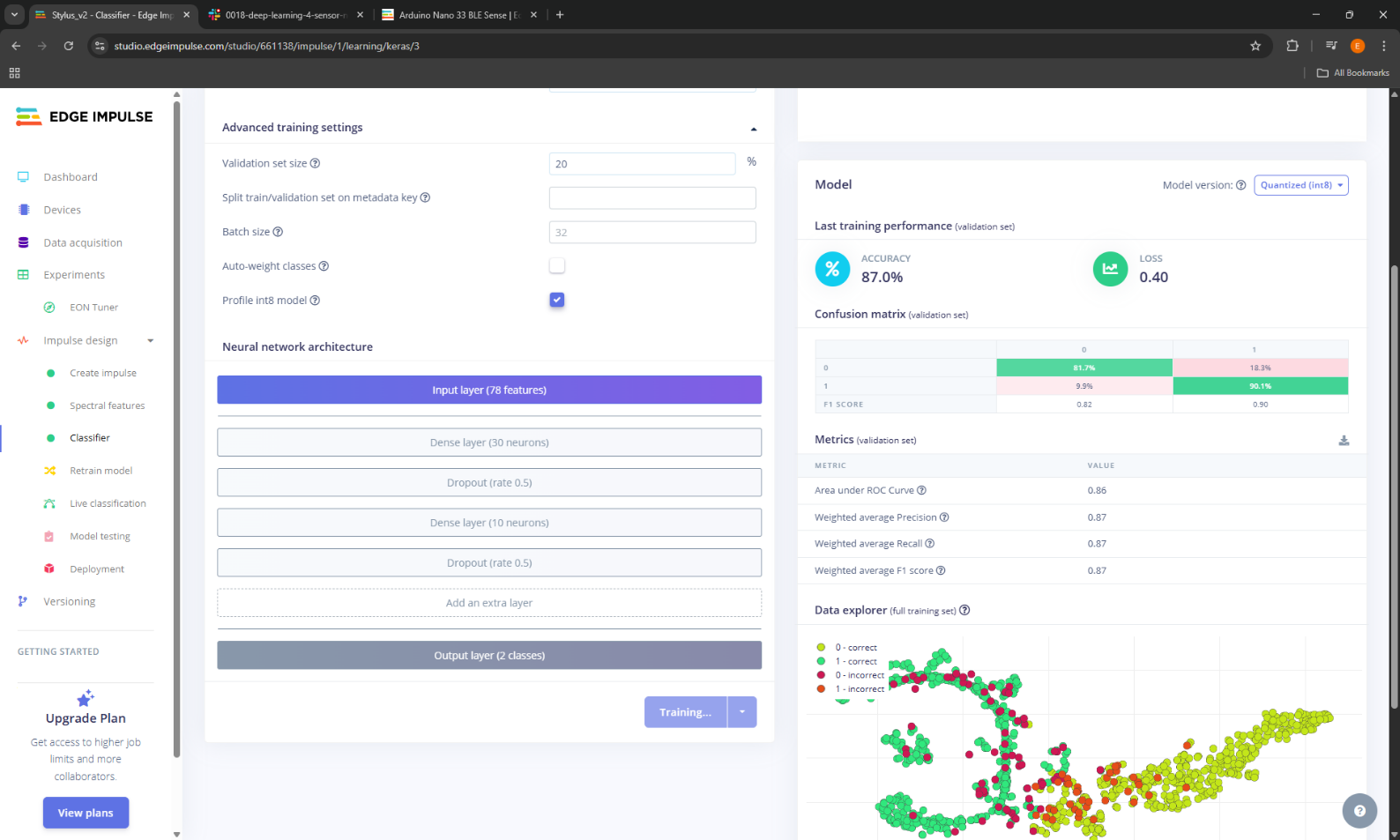
Enclosure build

To prevent excessive vibration from being transferred to the accelerometer, a simple enclosure was designed in Fusion360 and used to securely attach the Arduino Nano to a pen.

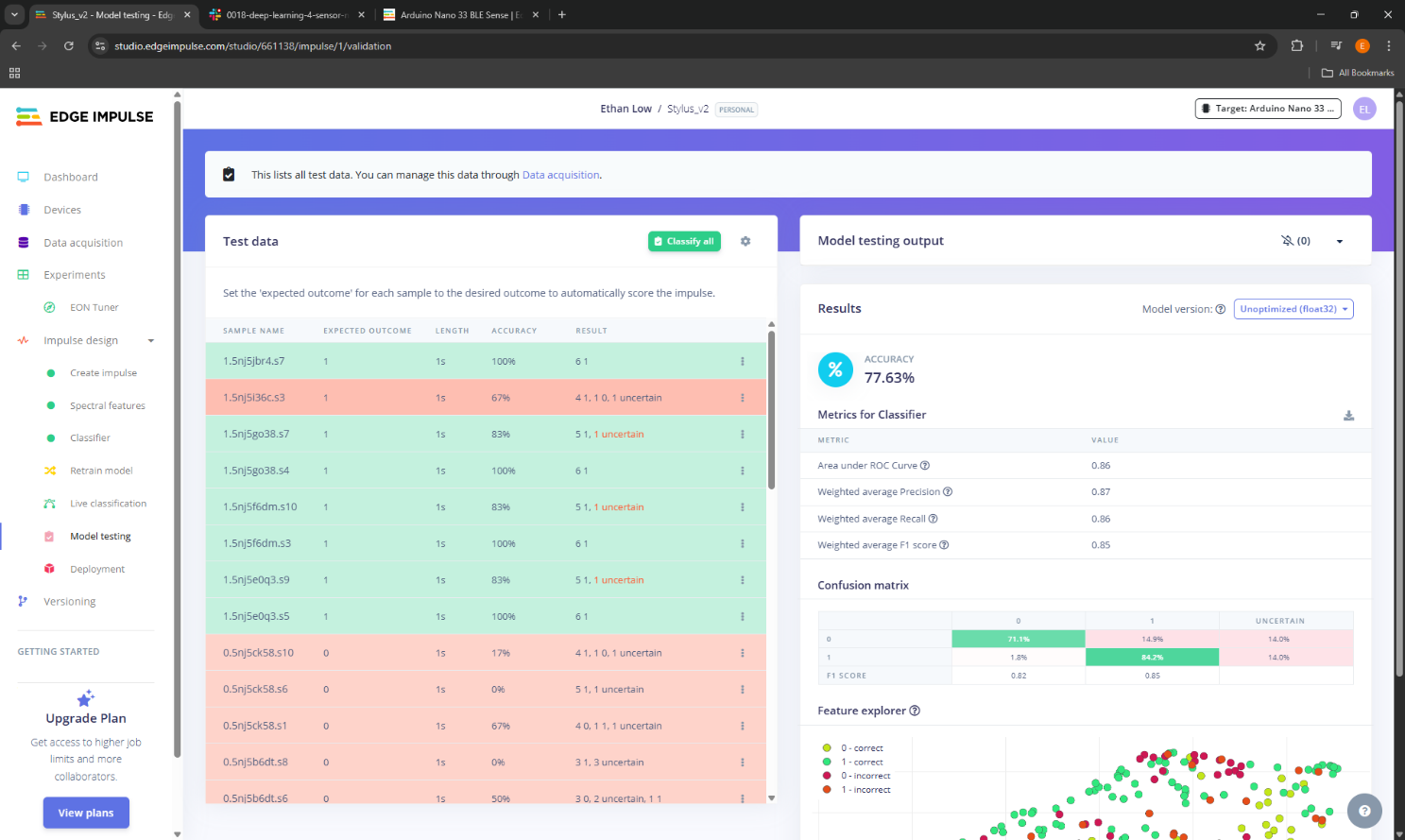
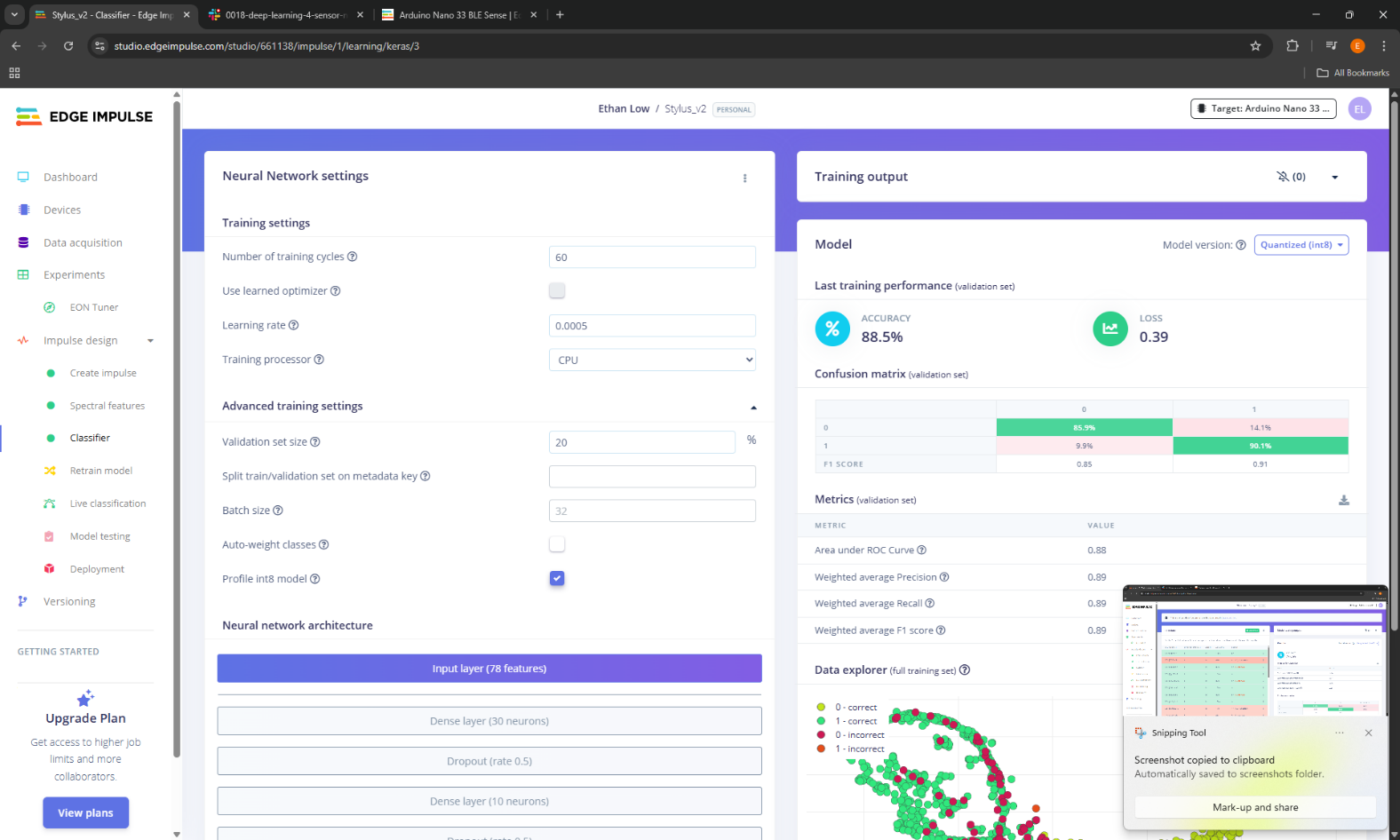
Circuit

A simple circuit was created, soldered on a proto-board and attached as a shield to the Arduino Nano. Its purpose was to provide support for a 8-strip Neopixel LED strip, which would indicate the inferred classes once the model was deployed.

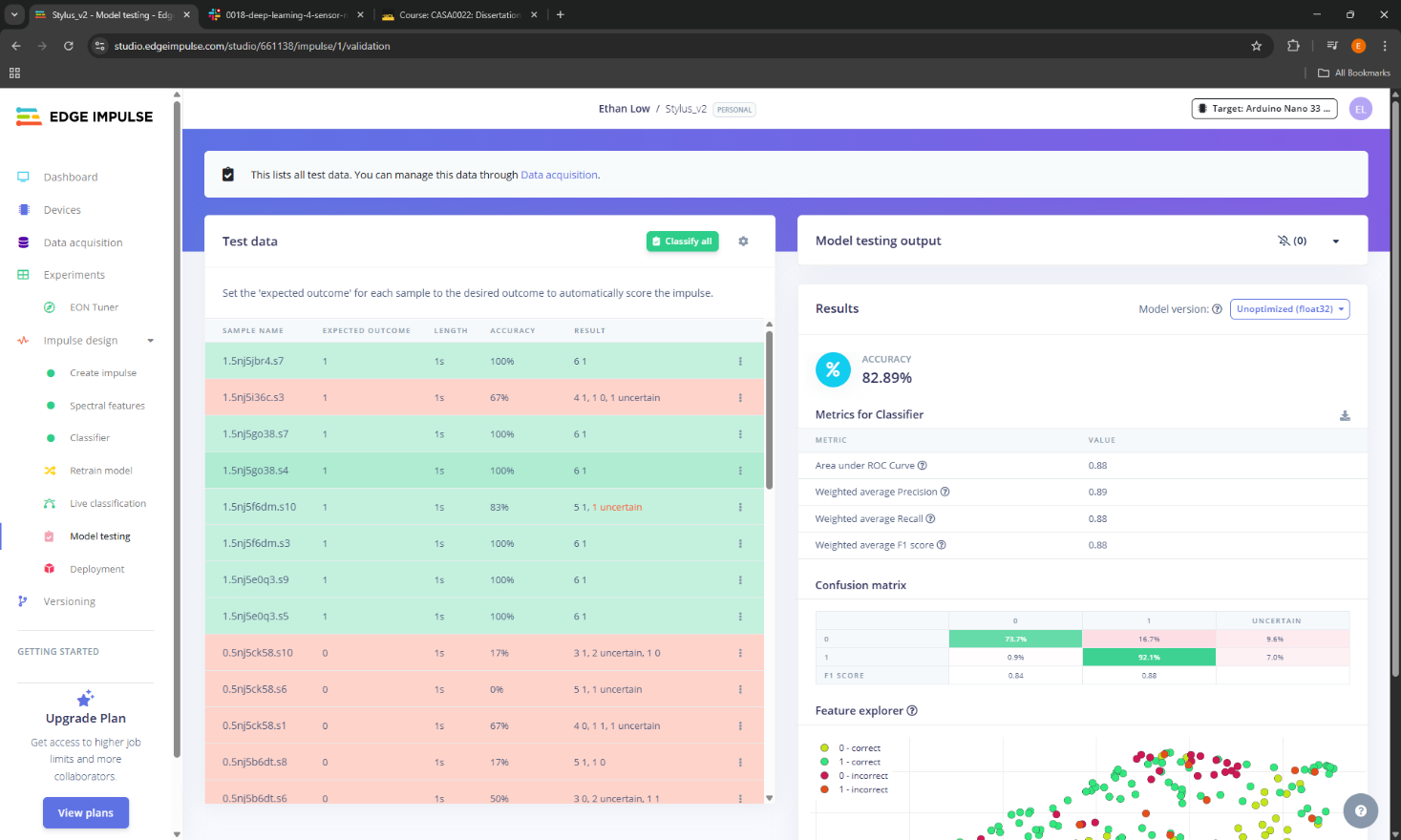
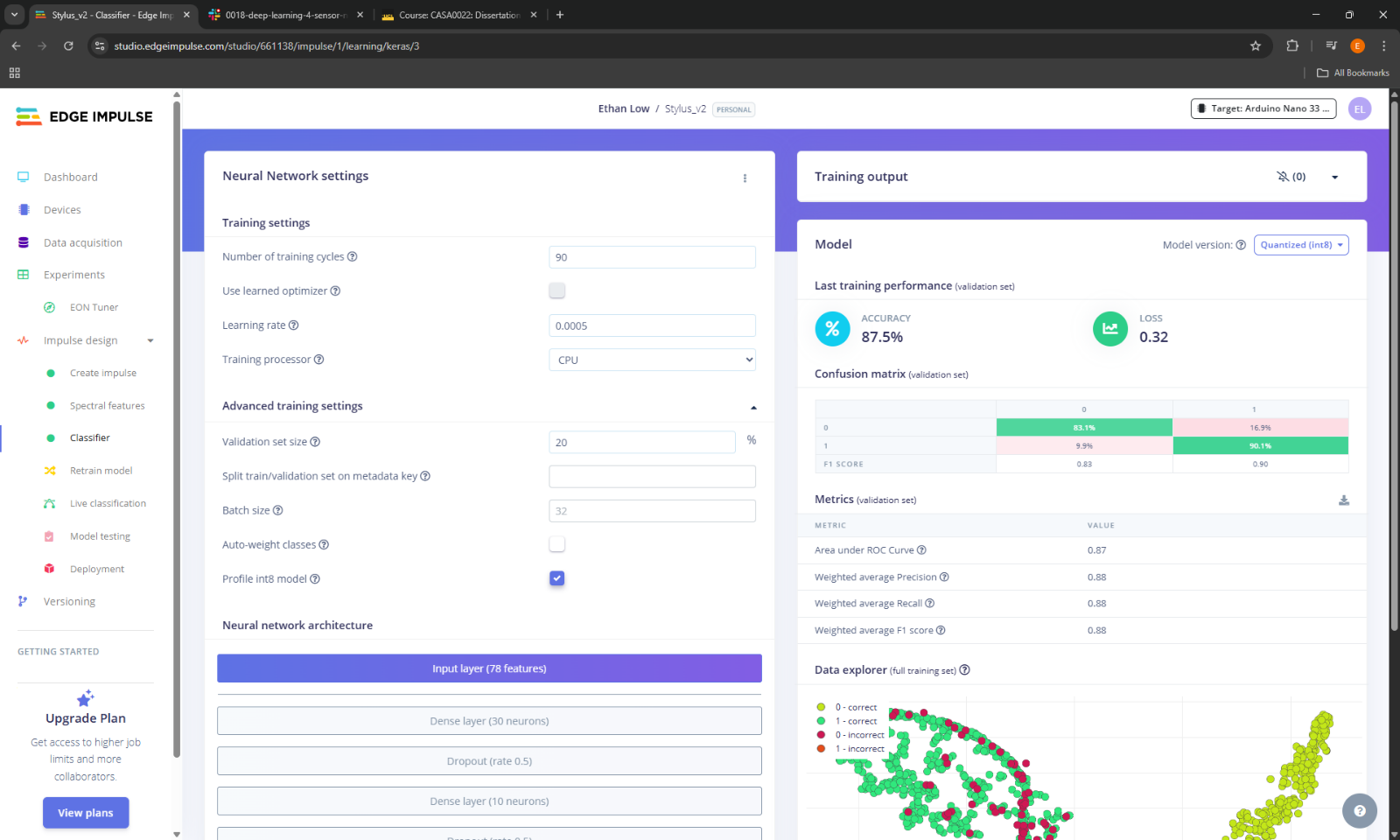
Model training and hyperparameter refinement



*Model performance at default 30 neurons 2nd layer and trained for 30 epochs*



*Model performance at default 30 neurons 2nd layer and trained for 60 epochs*



*Model performance at default 30 neurons 2nd layer and trained for 90 epochs*

CONCLUSION