Crop identification with Edge Impulse

Lab Workbook

Objective

“Develop a ML system which can be deployed on Sony Spresense which can identify crops”

Table of Contents

About this Workbook

The contents of this workbook are created by Adiuvo Engineering & Training, Ltd.

If you have any questions about the contents, or need assistance, please contact Adam Taylor at adam@adiuvoengineering.com.

Pre-Lab

Workshop Pre-requisites

Required Hardware

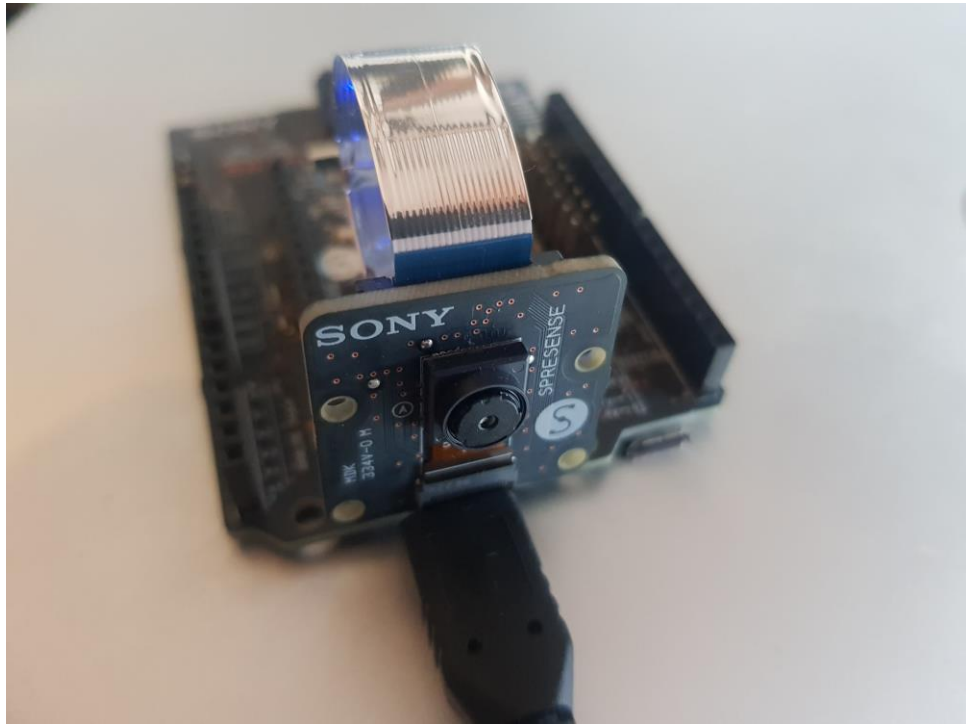
This lab requires a Sony Spresense development board with the Extension board and Camera module.

Boards can be purchased from the link below.

Development Board

Camera Module

Extension Board



Downloads and Installations

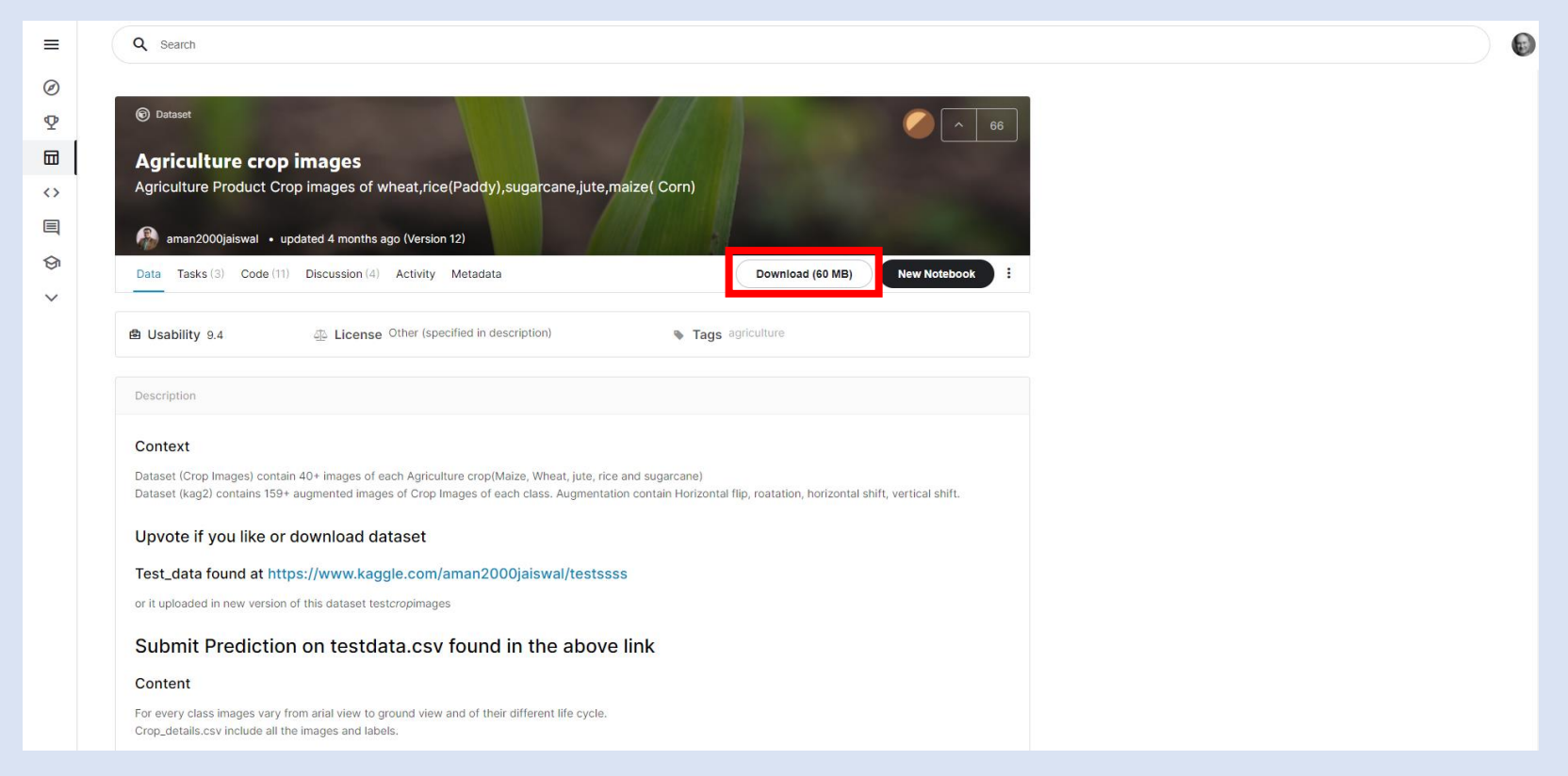
Step 1 – Download and install the following at least one day prior to the workshop. This may take a significant amount of time and drive space.

Edge Impulse Account	Register
Edge Impulse Daemon	Install
GNU Make	Download
GNU ARM Embedded Toolchain 8-2018-q4-major	Download
Git	Download
Text Editor e.g Notepad++ / Vs Code etc	

Lab
Get the Data Set

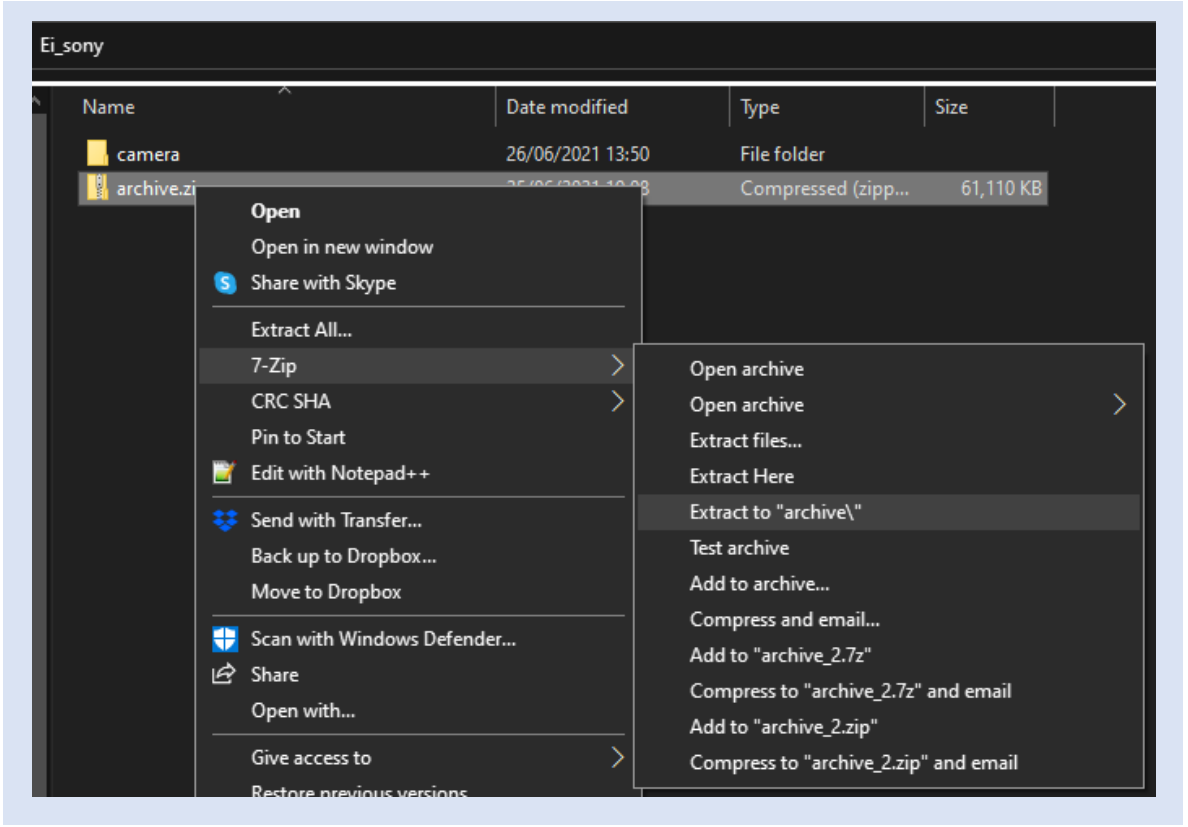
Edge Impulse: Get the Data Set

Step 1 – Log into Kaggle and download the data set to a location
https://www.kaggle.com/aman2000jaiswal/agriculture-crop-images



Edge Impulse: Get the Data Set

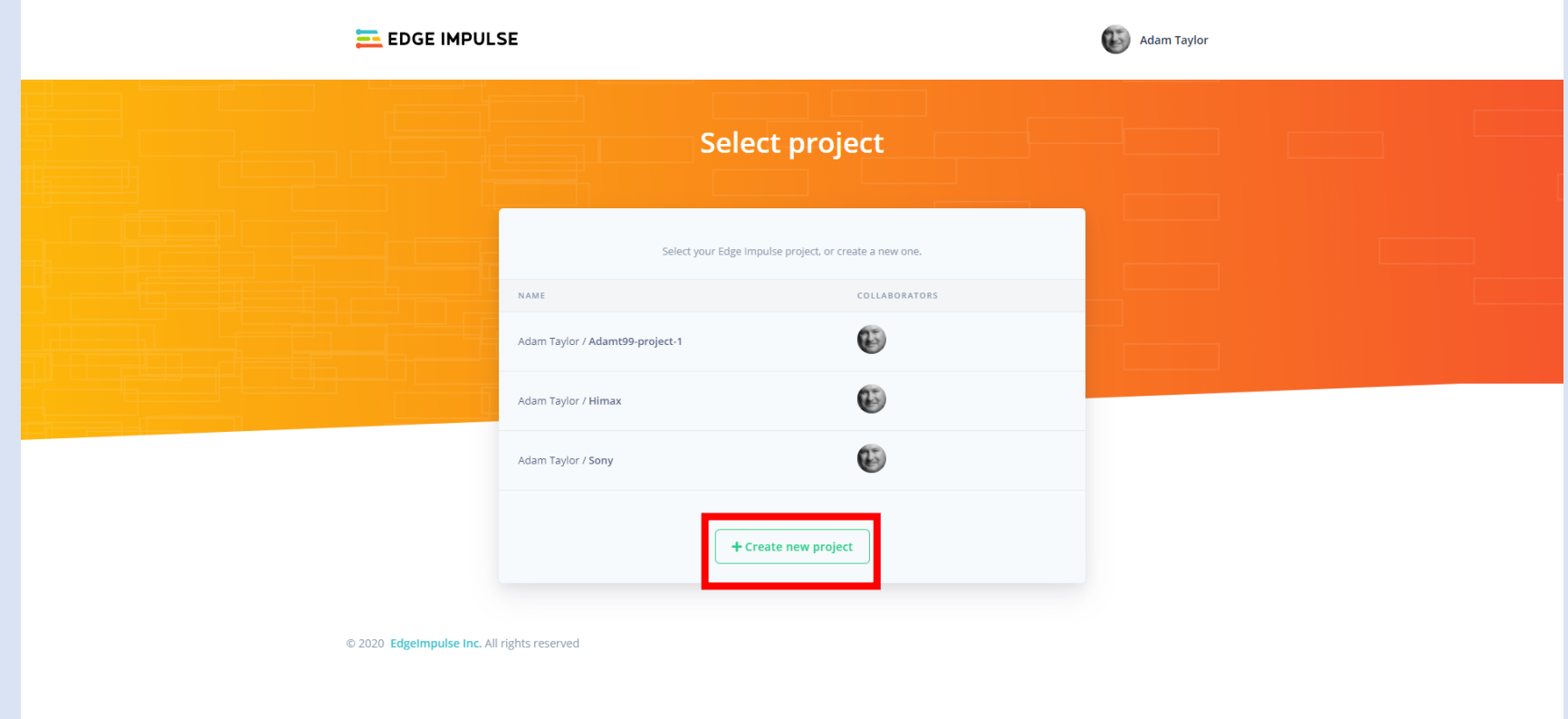
Step 2 – Extract the Compressed Zip file



Lab
Creating The Impulse

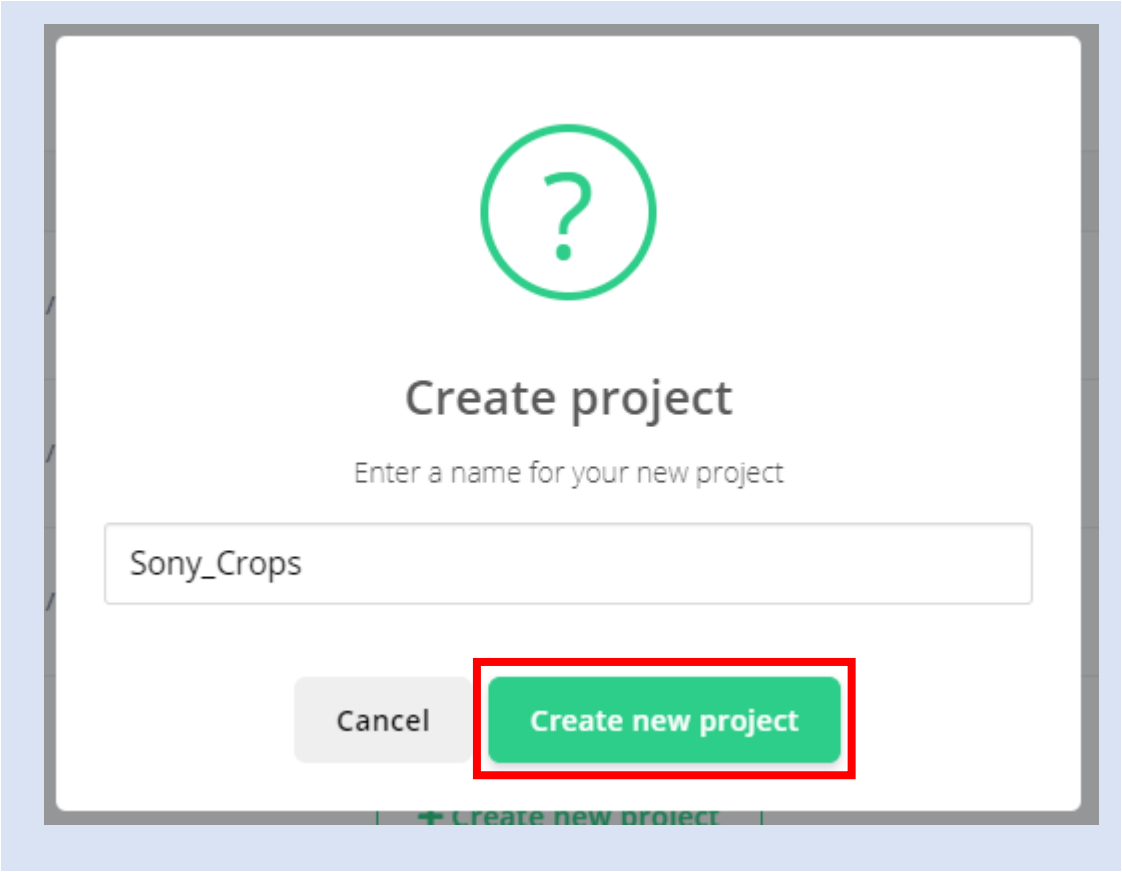
Edge Impulse: Creating the Impulse

Step 1 – Log Into Edge Impulse Studio via www.edgeimpulse.com
In edge impulse studio select create project



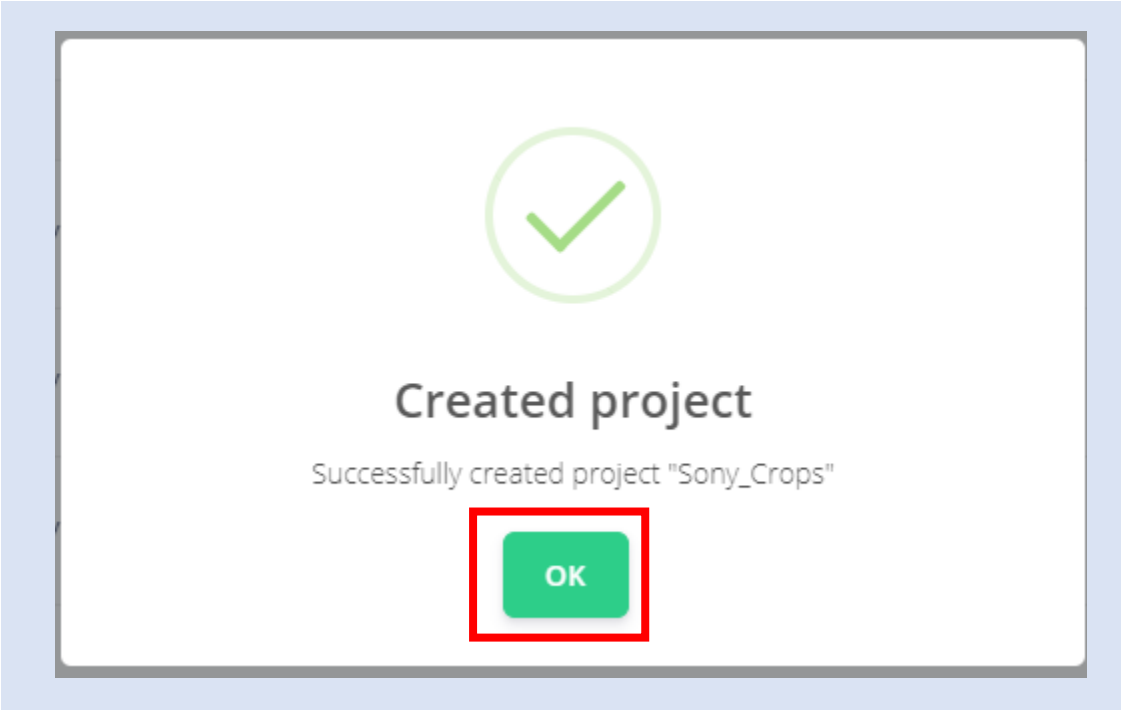
Edge Impulse: Creating the Impulse

Step 2 – Name the Project Sony_Crops – Click on Create New Project



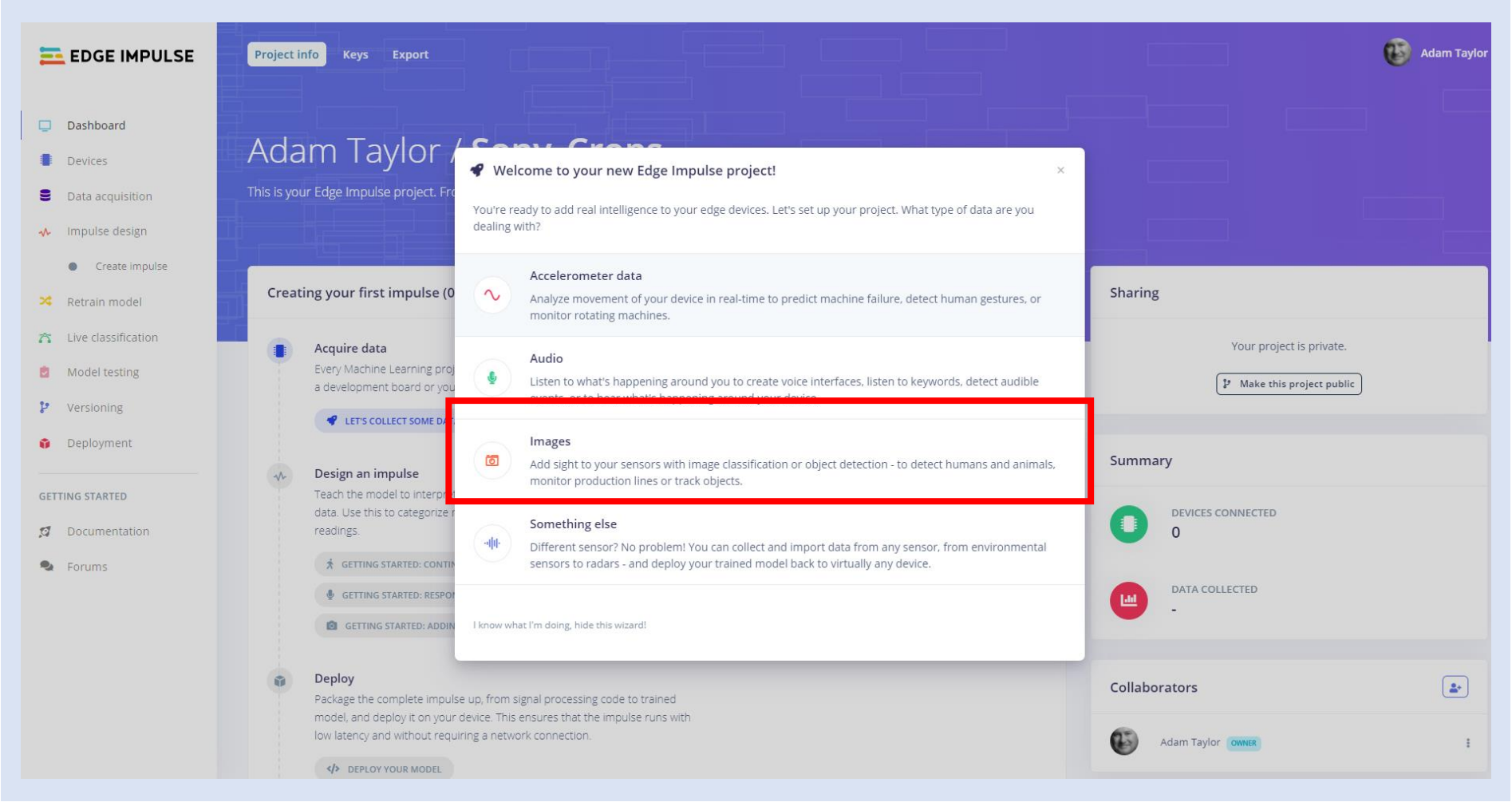
Edge Impulse: Creating the Impulse

Step 3 – Click OK



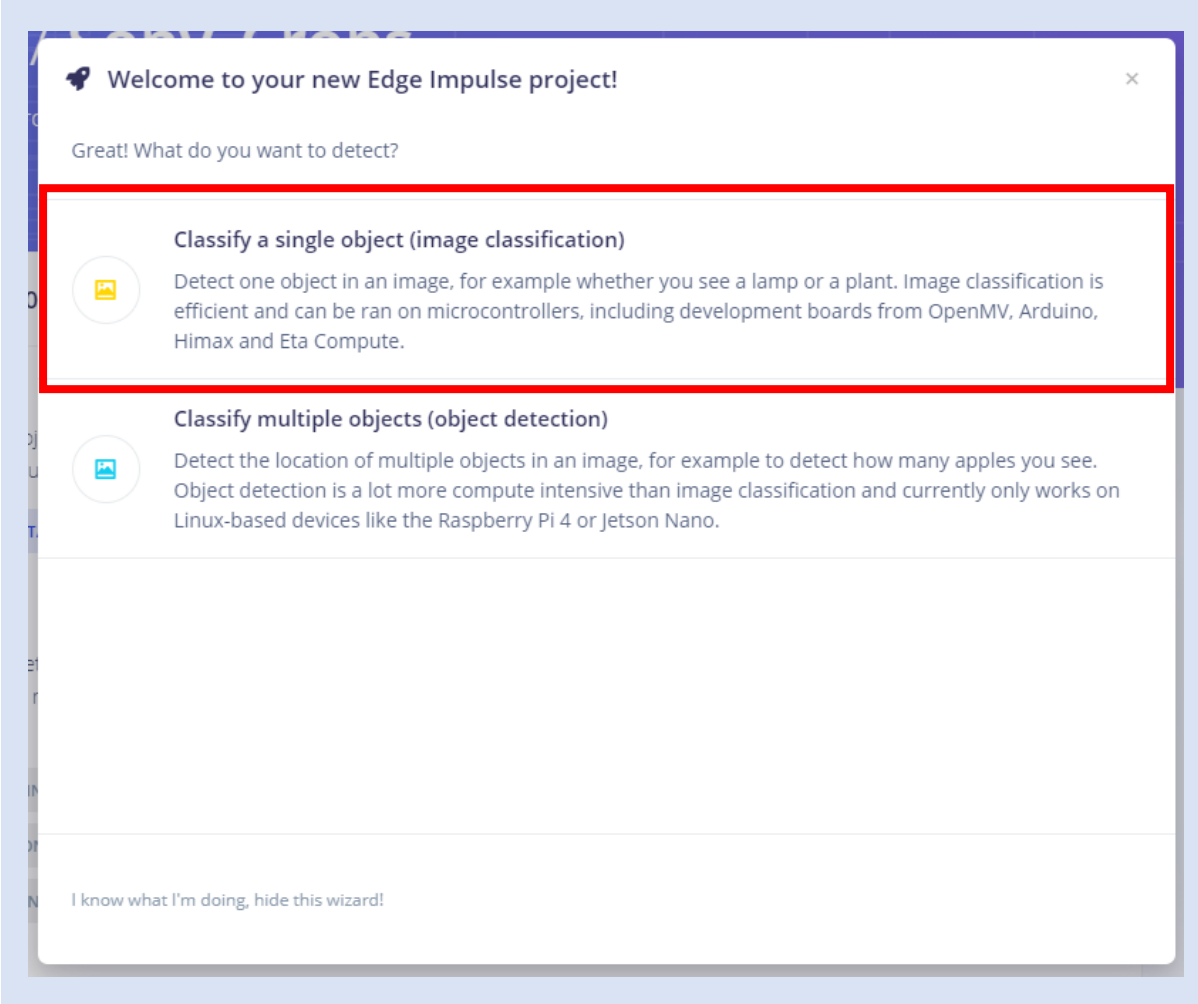
Edge Impulse: Creating the Impulse

Step 4 – Select the Images Option in the new project



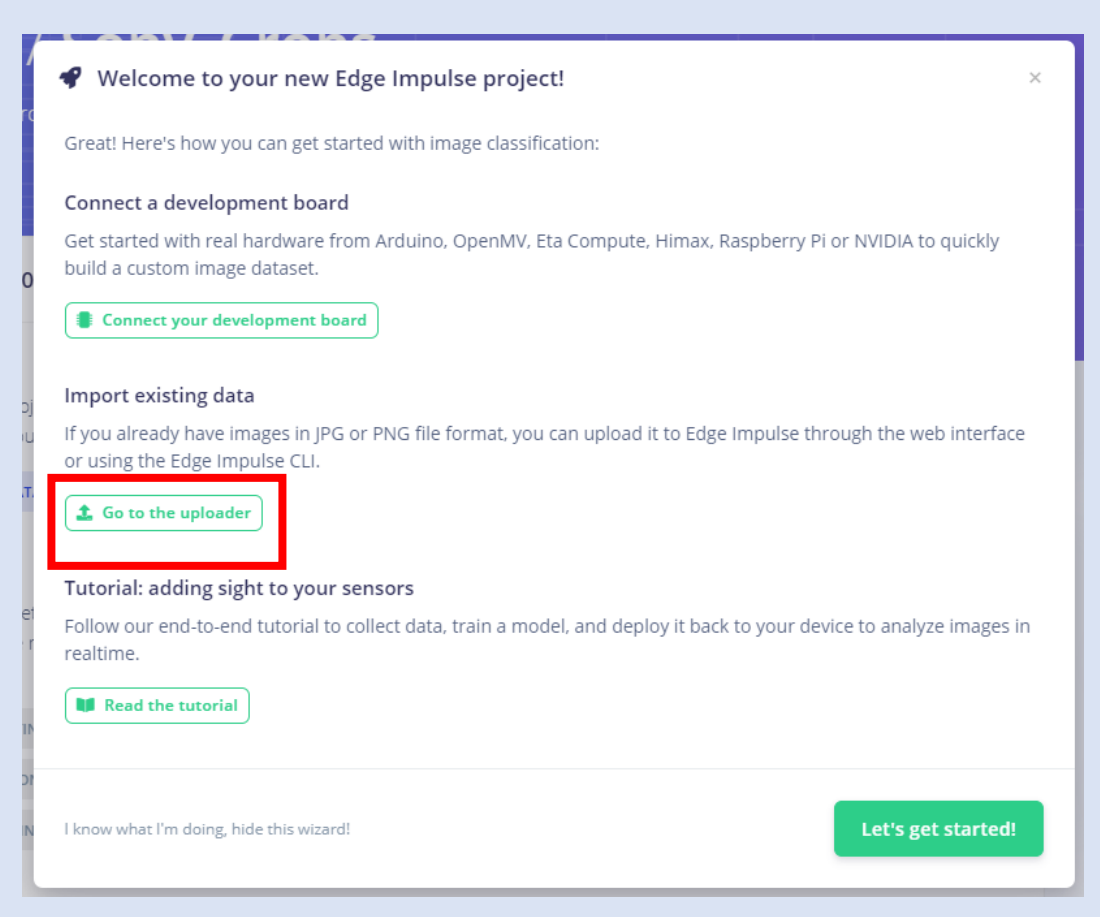
Edge Impulse: Creating the Impulse

Step 5 – Select Classify a single object (image classification)



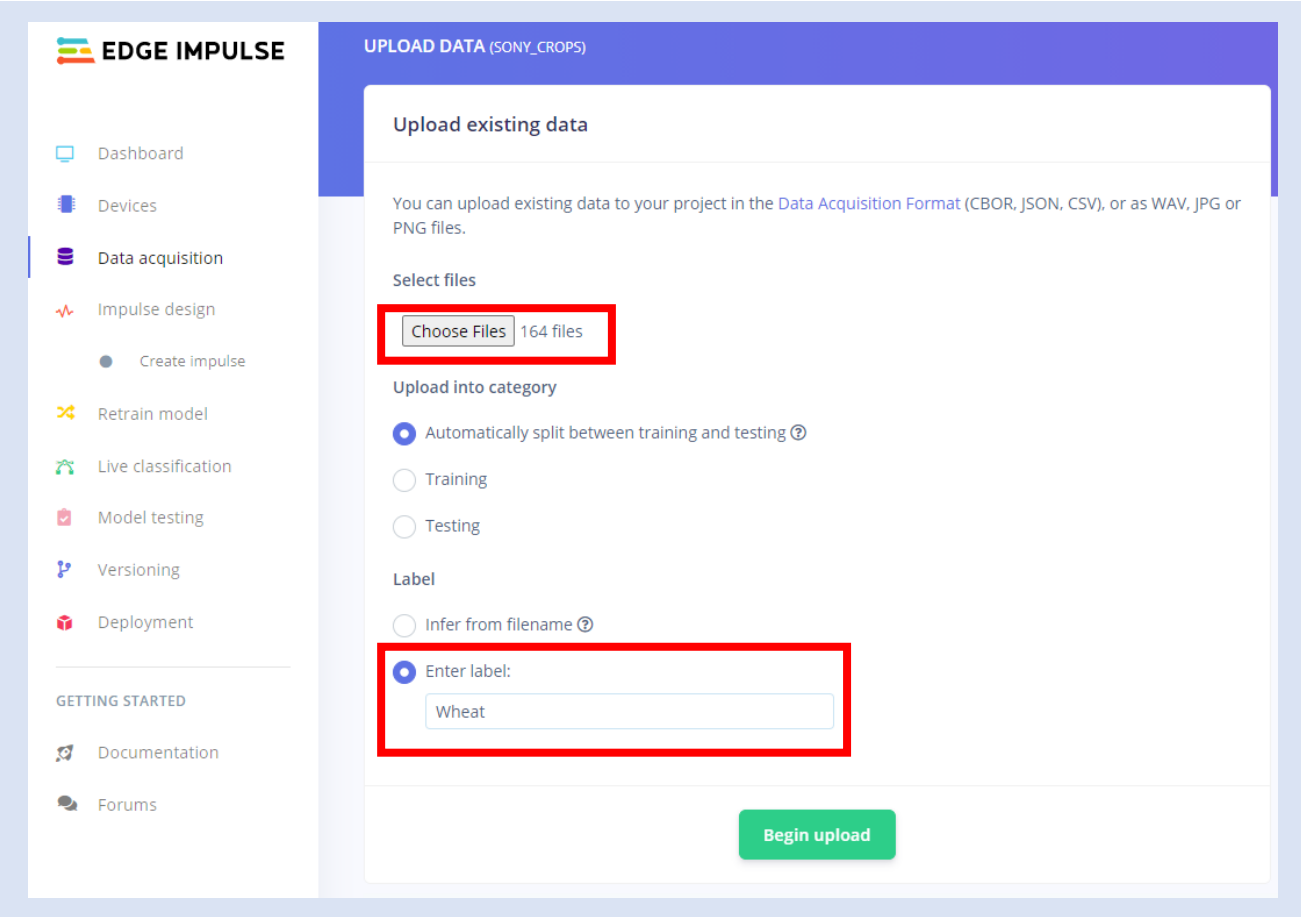
Edge Impulse: Creating the Impulse

Step 6 – Select Go to the Uploader



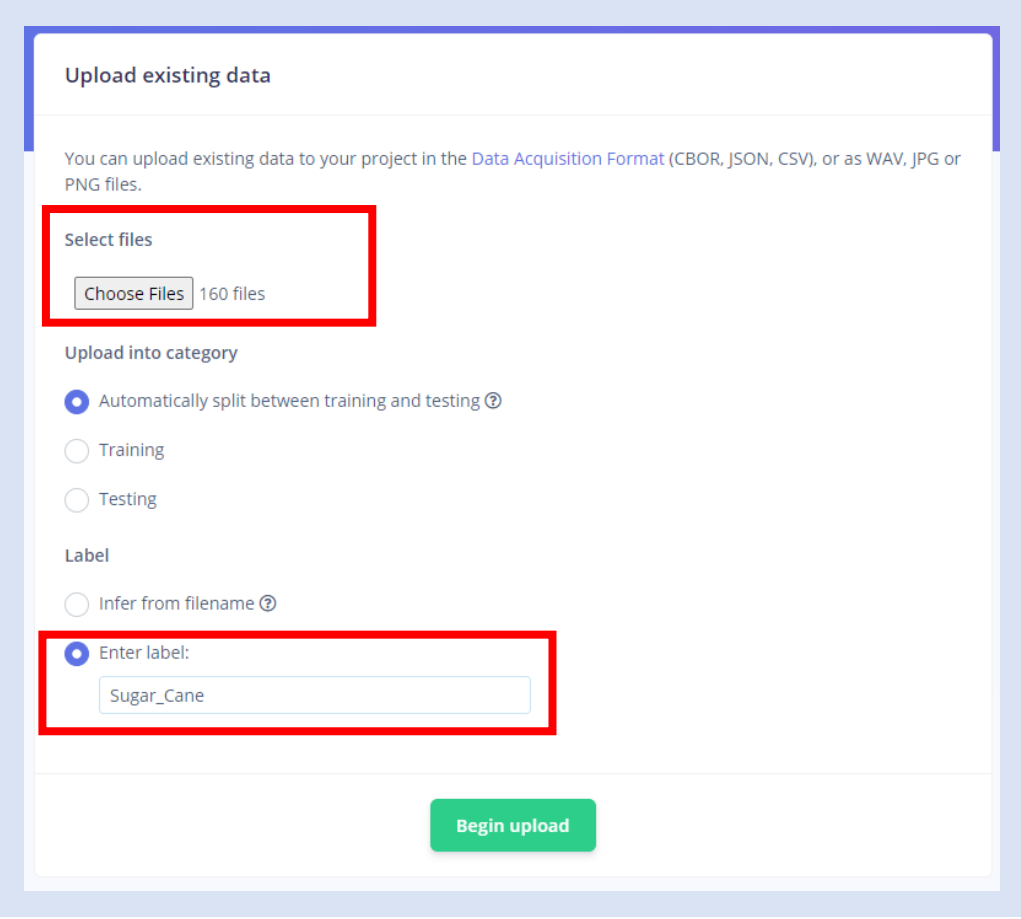
Edge Impulse: Creating the Impulse

Step 7 – In the uploader, choose the all the wheat pictures from directory archive\kag2\wheat from the Kaggle data set. Leave the upload category to split between training and testing, enter the label wheat.



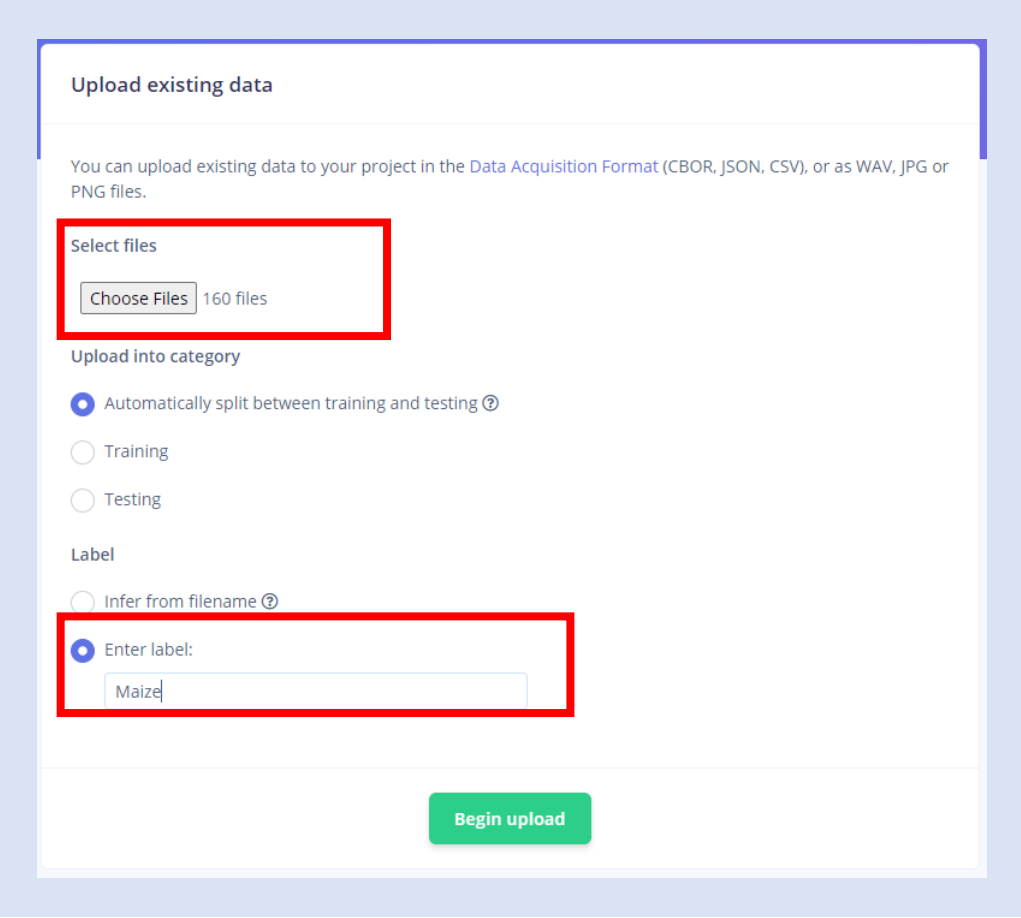
Edge Impulse: Creating the Impulse

Step 8 – Upload the Sugar Cane images from directory archive\kag2\sugarcane from the Kaggle data set. Leave the upload category to split between training and testing, enter the label wheat.



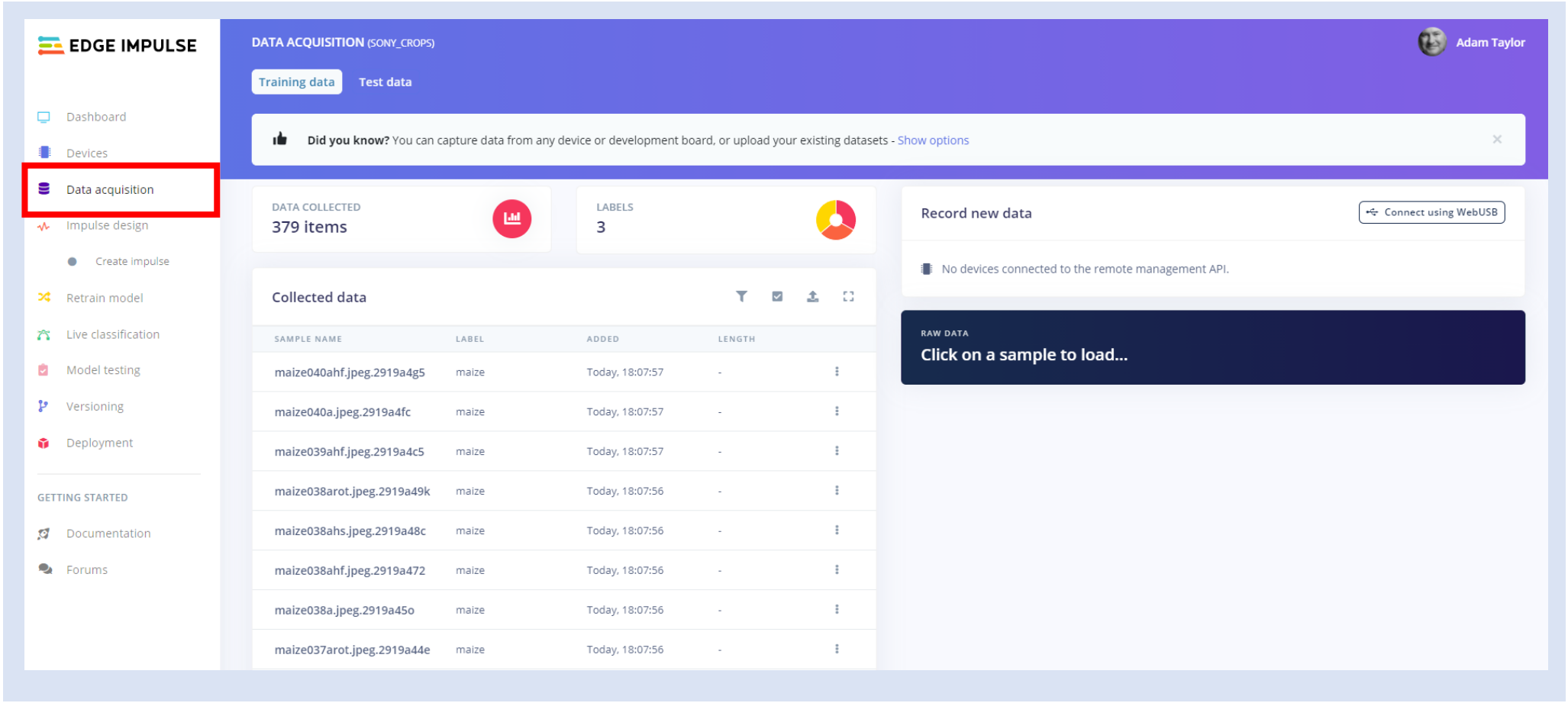
Edge Impulse: Creating the Impulse

Step 9 – Upload the Sugar Cane images from directory archive\kag2\maize from the Kaggle data set. Leave the upload category to split between training and testing, enter the label wheat.



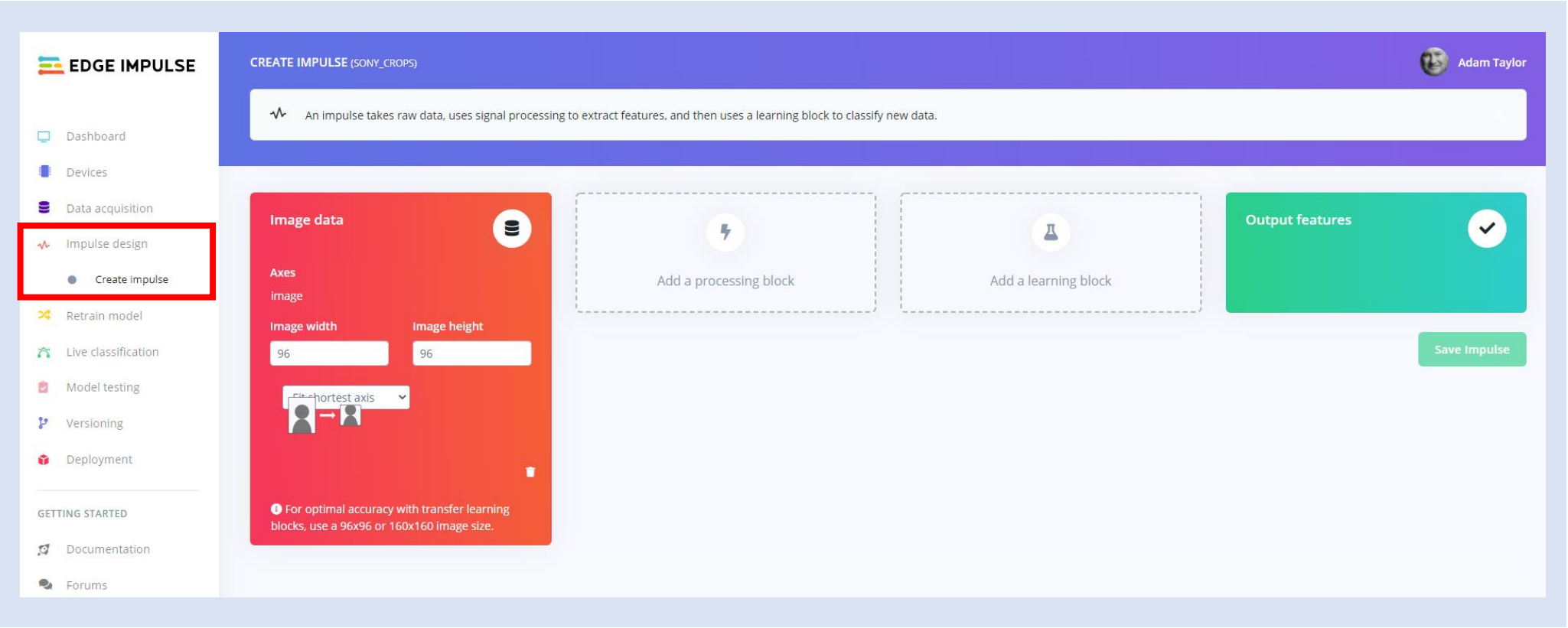
Edge Impulse: Creating the Impulse

Step 10 – Click on Data acquisition and note the number of data elements, you should have three labels and there should be images under both training and test data



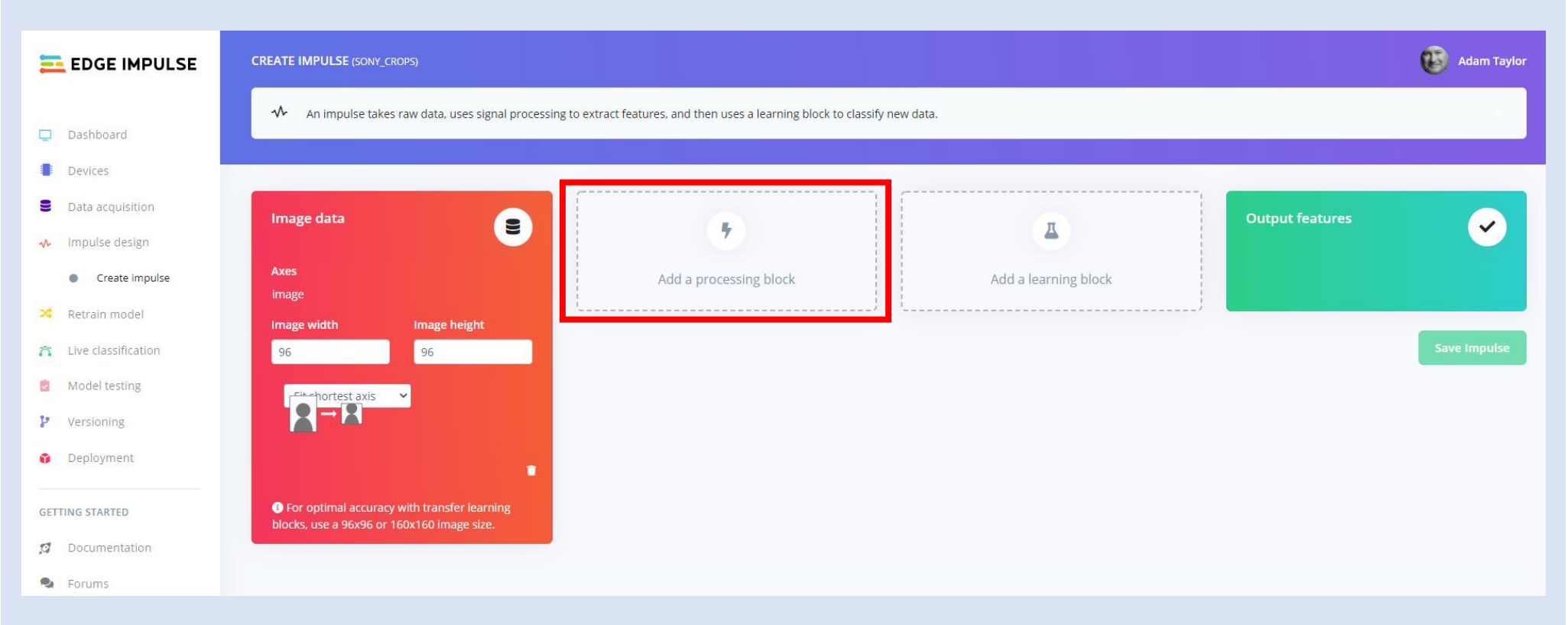
Edge Impulse: Creating the Impulse

Step 11 – Click on Impulse Design – Notice the Image data processing is already added into the



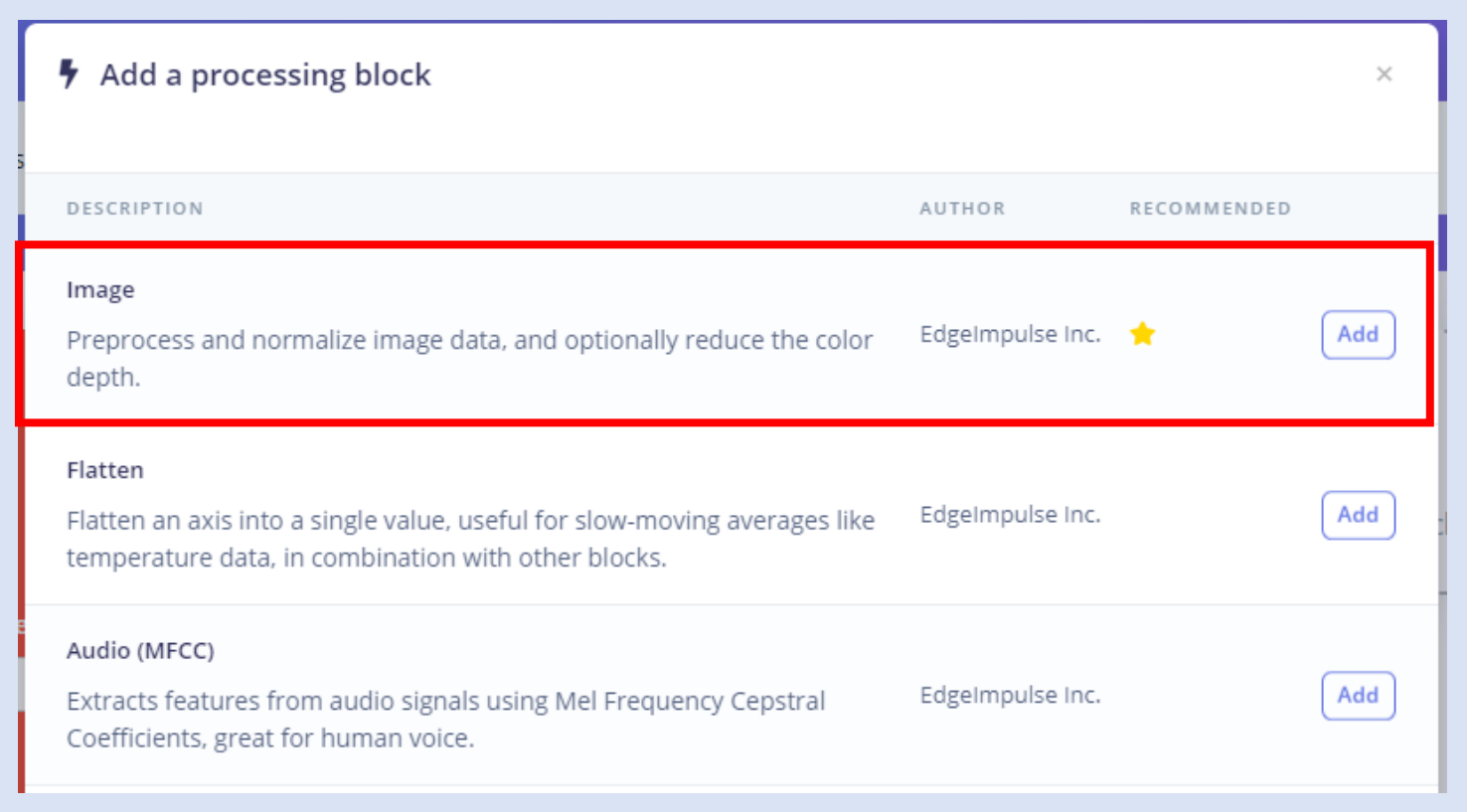
Edge Impulse: Creating the Impulse

Step 12 – Click on Add a processing block



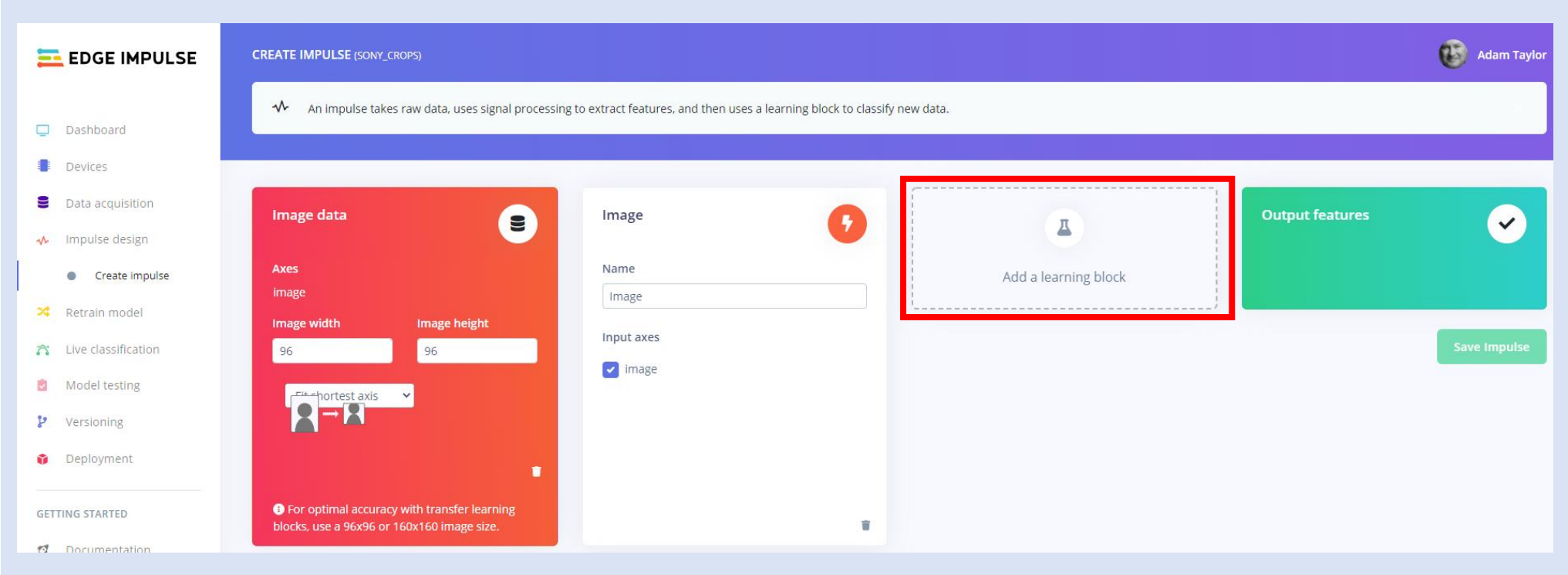
Edge Impulse: Creating the Impulse

Step 13 – Select Image as the processing block



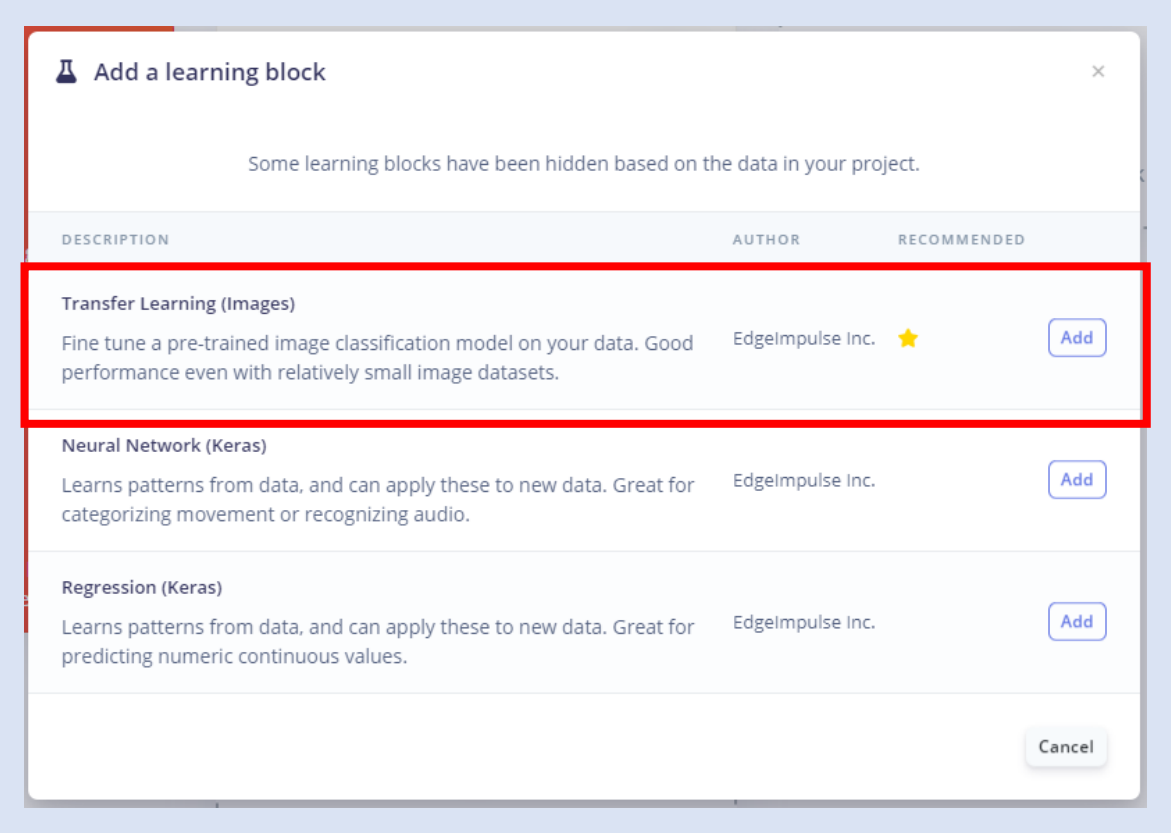
Edge Impulse: Creating the Impulse

Step 14 – Click on Add a learning block



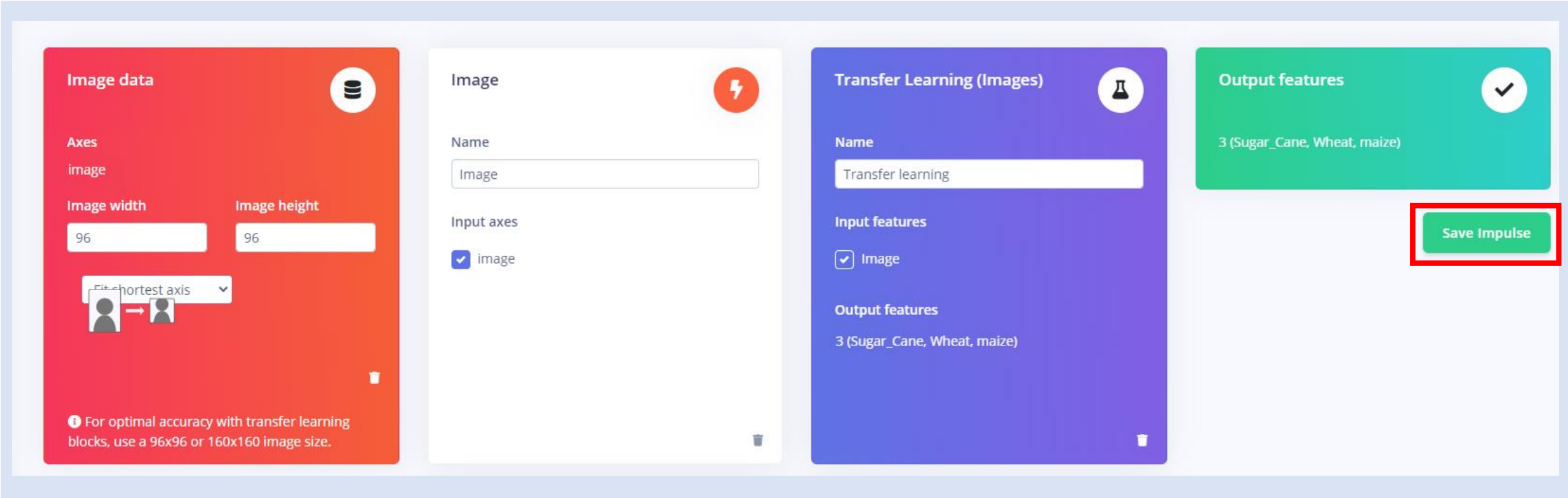
Edge Impulse: Creating the Impulse

Step 15 – Select Transfer Learning (Images)



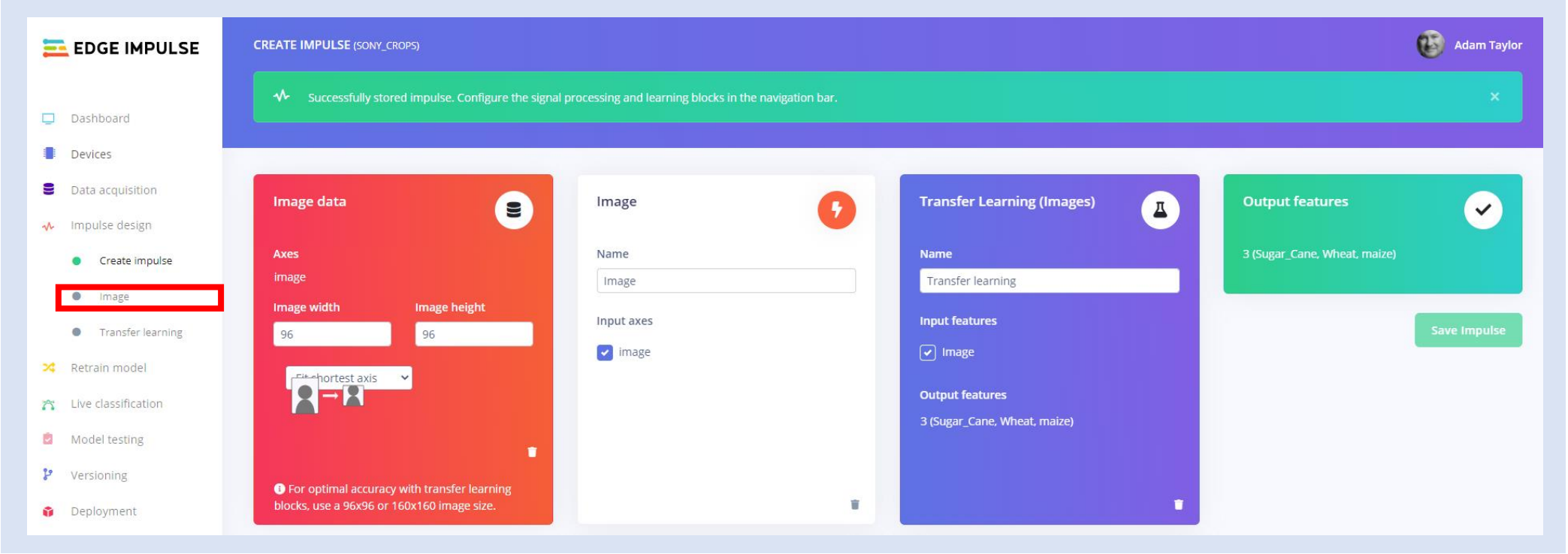
Edge Impulse: Creating the Impulse

Step 16 – Click on Save Impulse



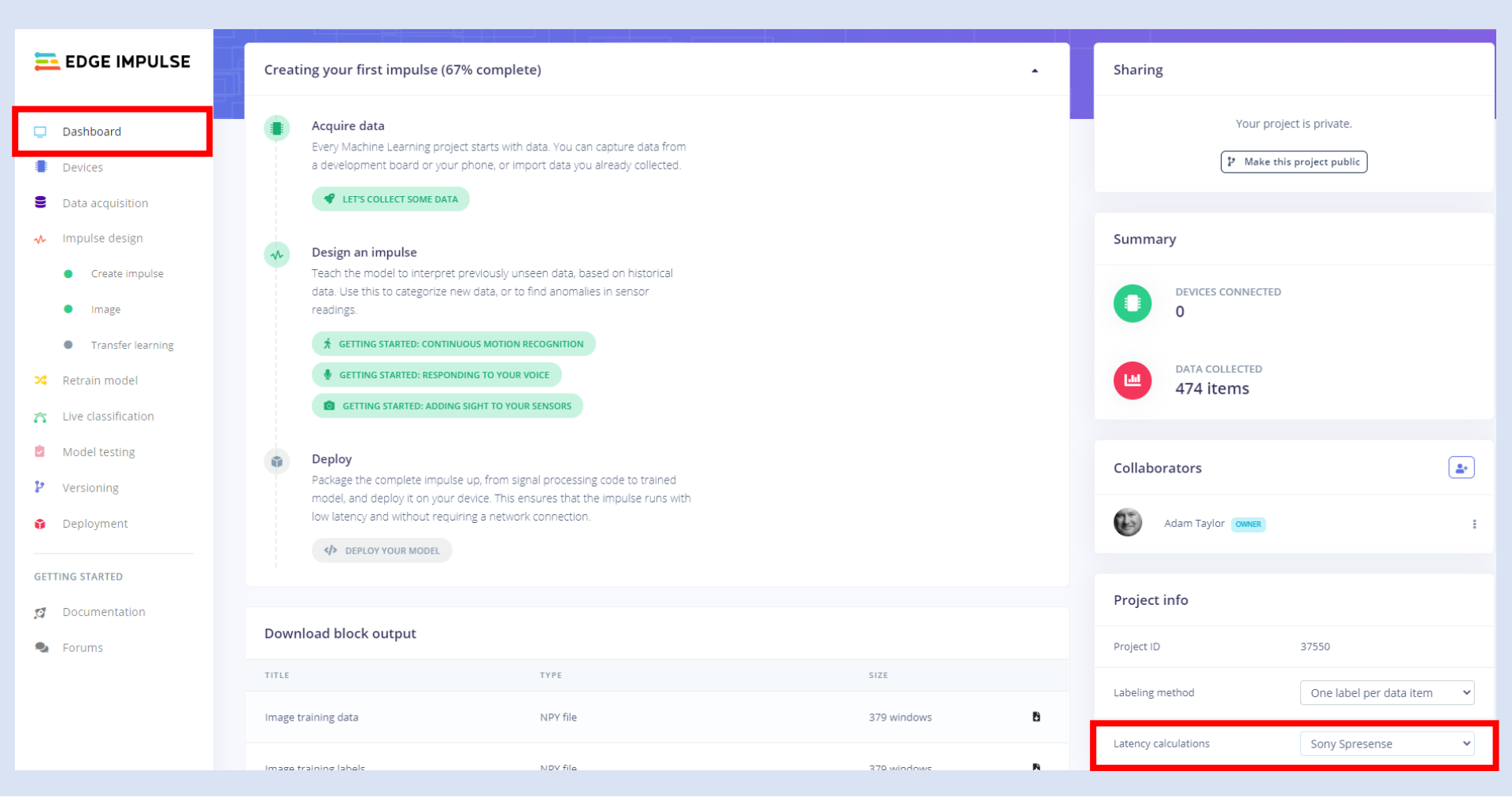
Edge Impulse: Creating the Impulse

Step 17 – Click on Save Impulse



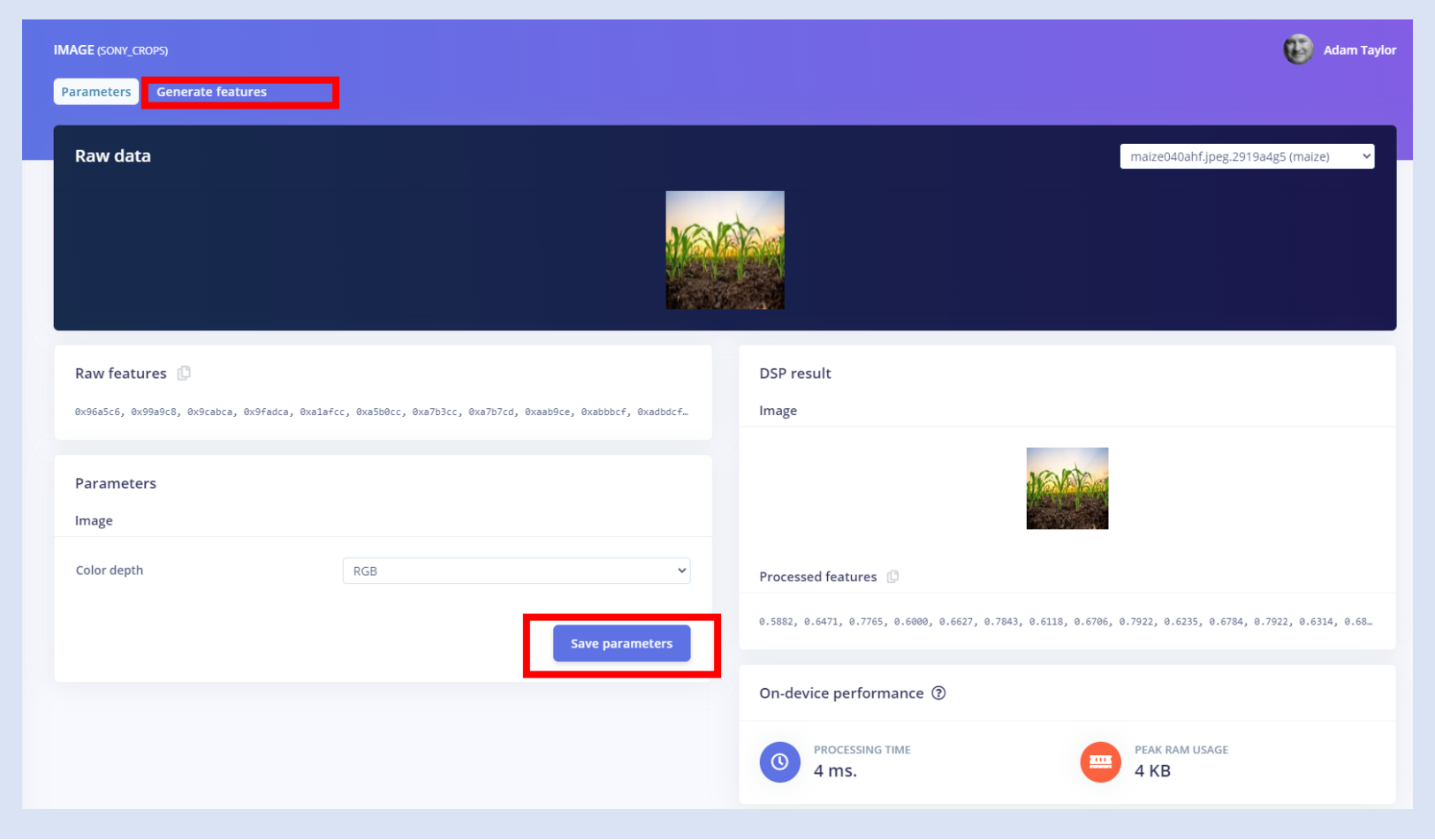
Edge Impulse: Creating the Impulse

Step 18 – Select Dashboard and then change the latency calculation to Sony Spresense



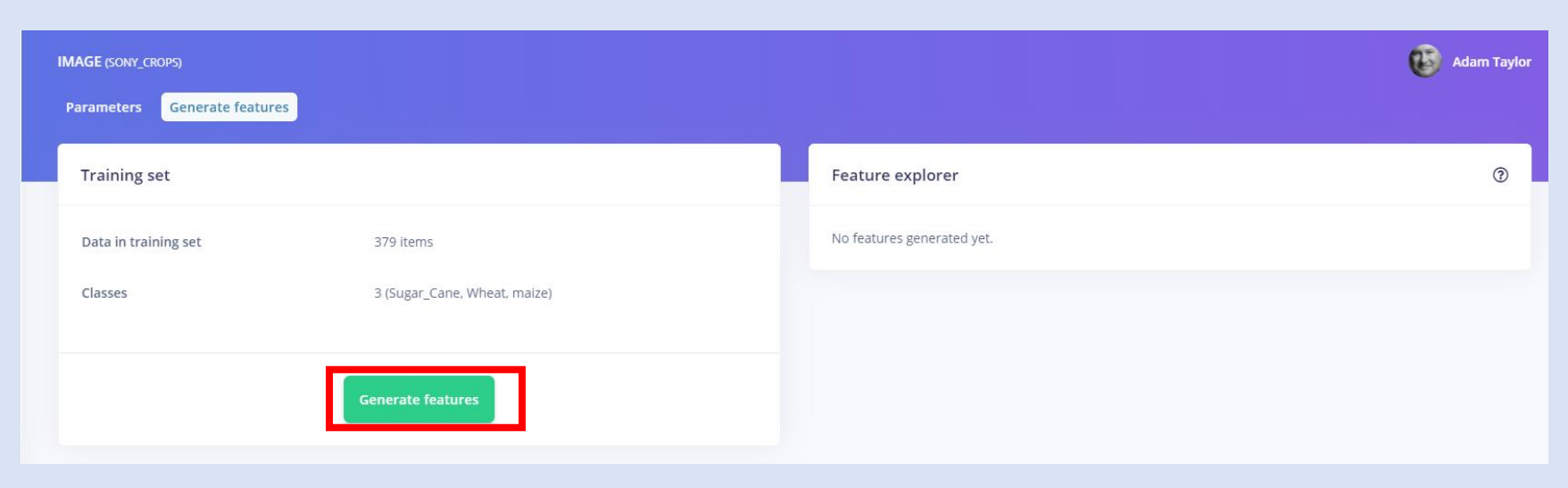
Edge Impulse: Creating the Impulse

Step 19 – Click save parameters and then select Generate features



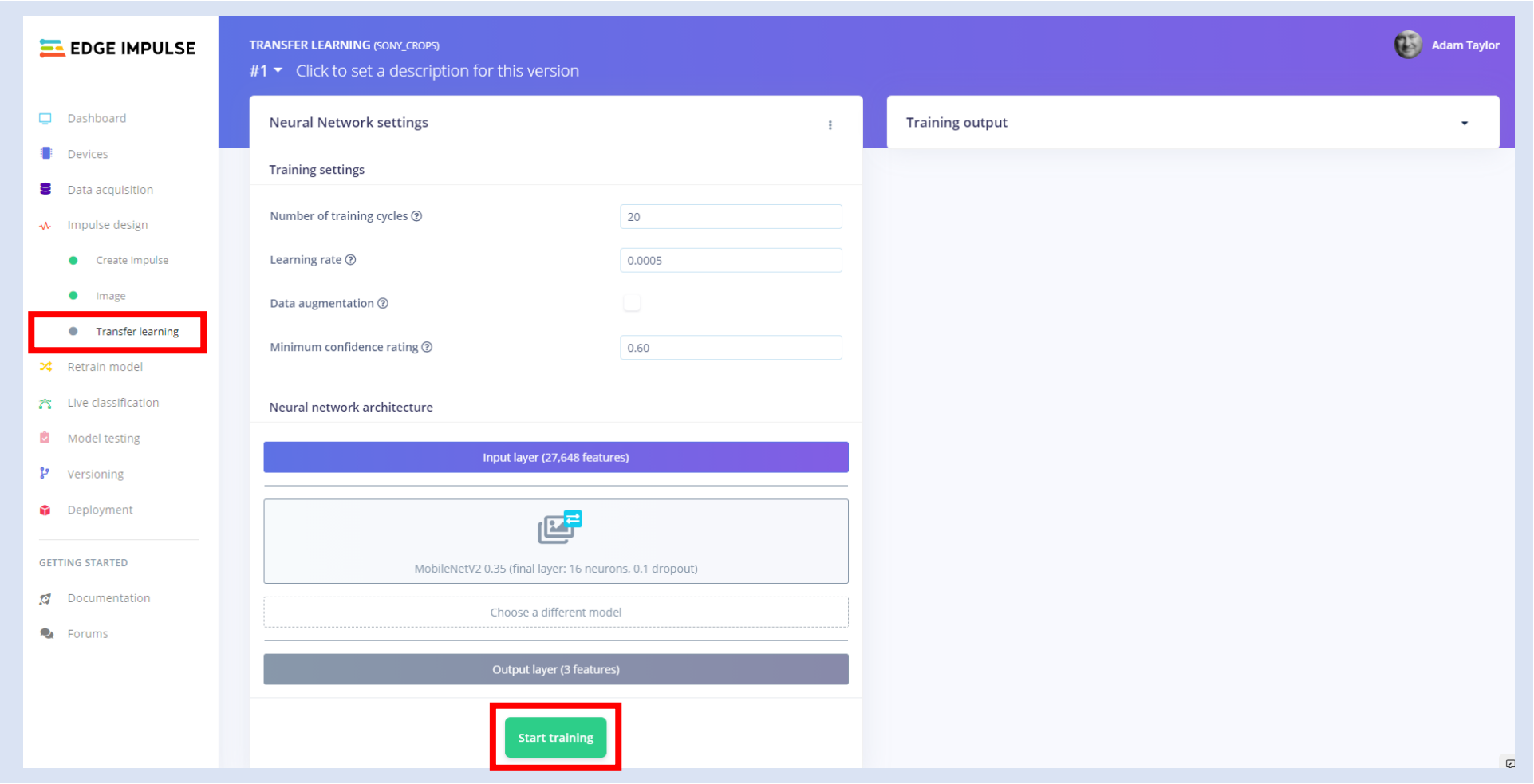
Edge Impulse: Creating the Impulse

Step 20 – Click Generate features



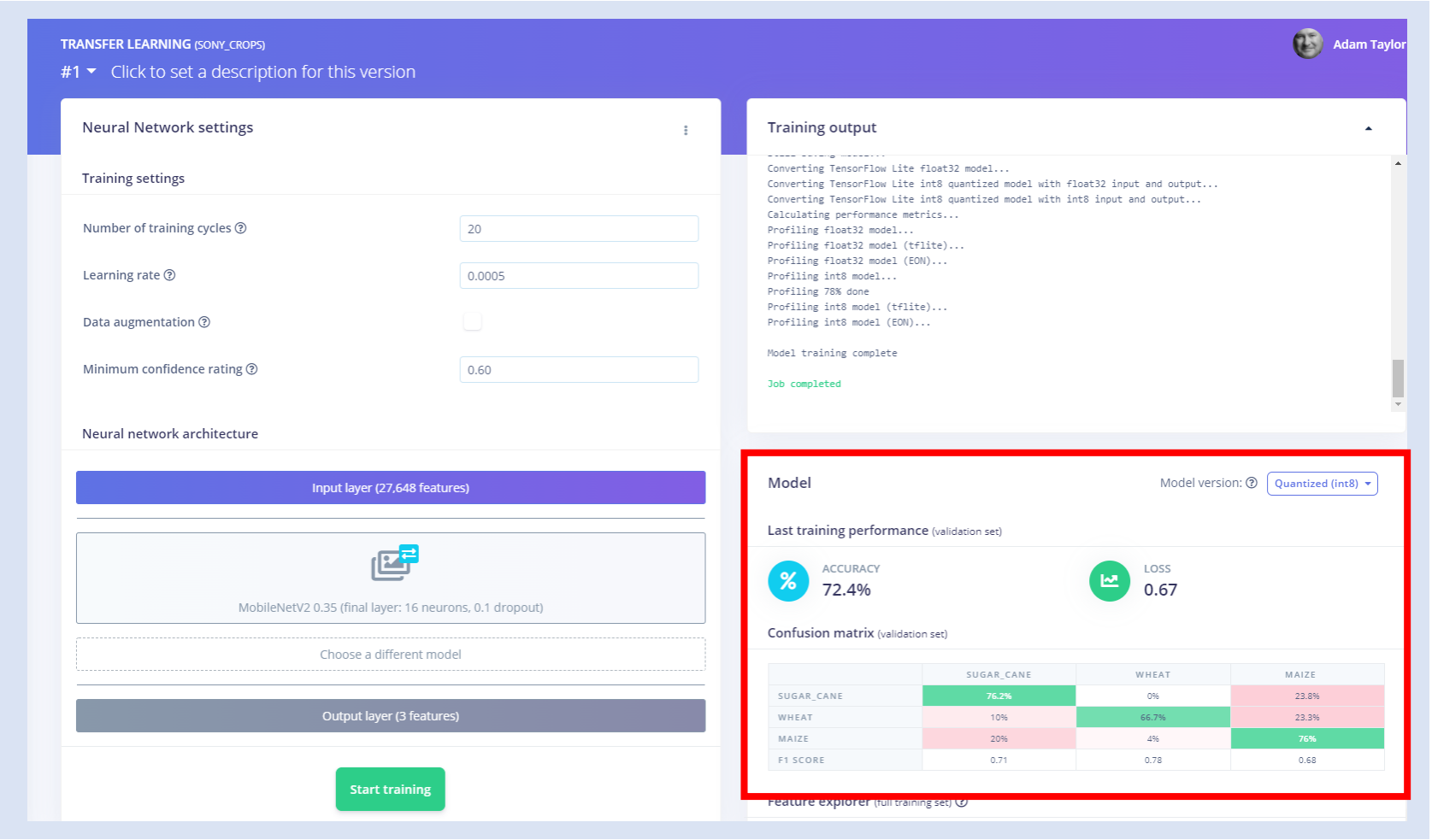
Edge Impulse: Creating the Impulse

Step 21 – Click on Transfer learning and then Start training



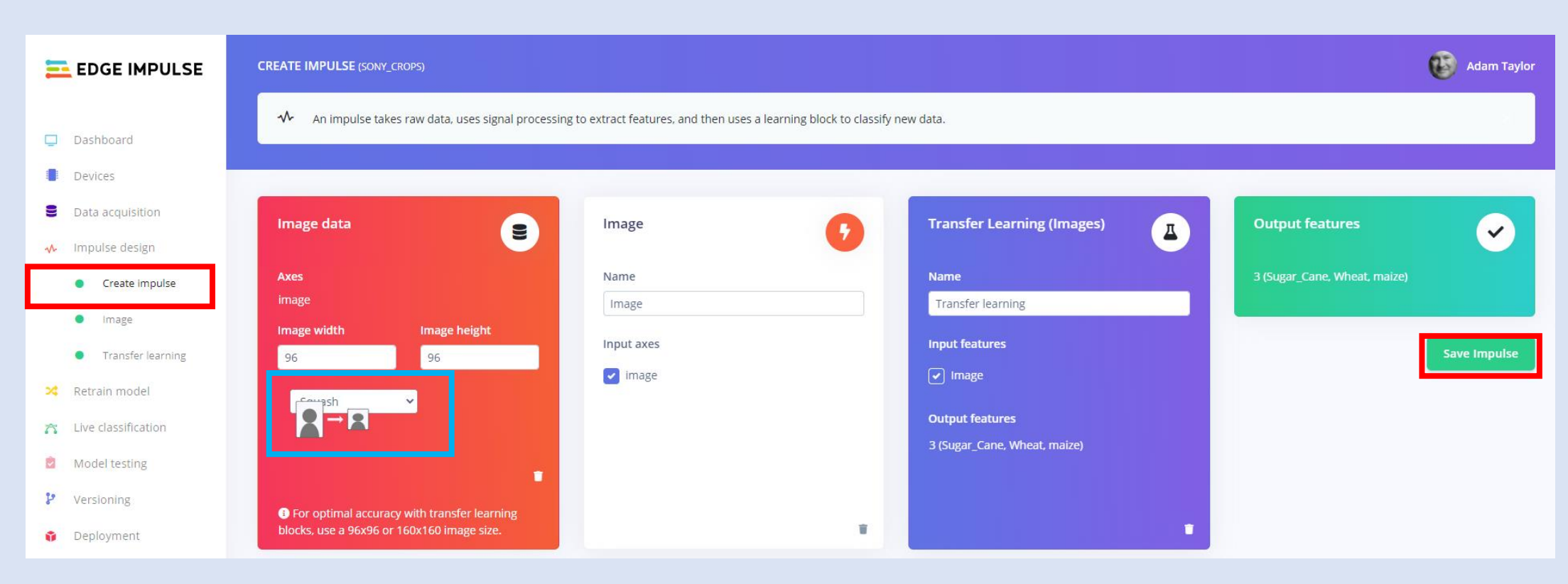
Edge Impulse: Creating the Impulse

Step 22 – Note the 72% accuracy – This is not acceptable so now we will need to optimize the solution



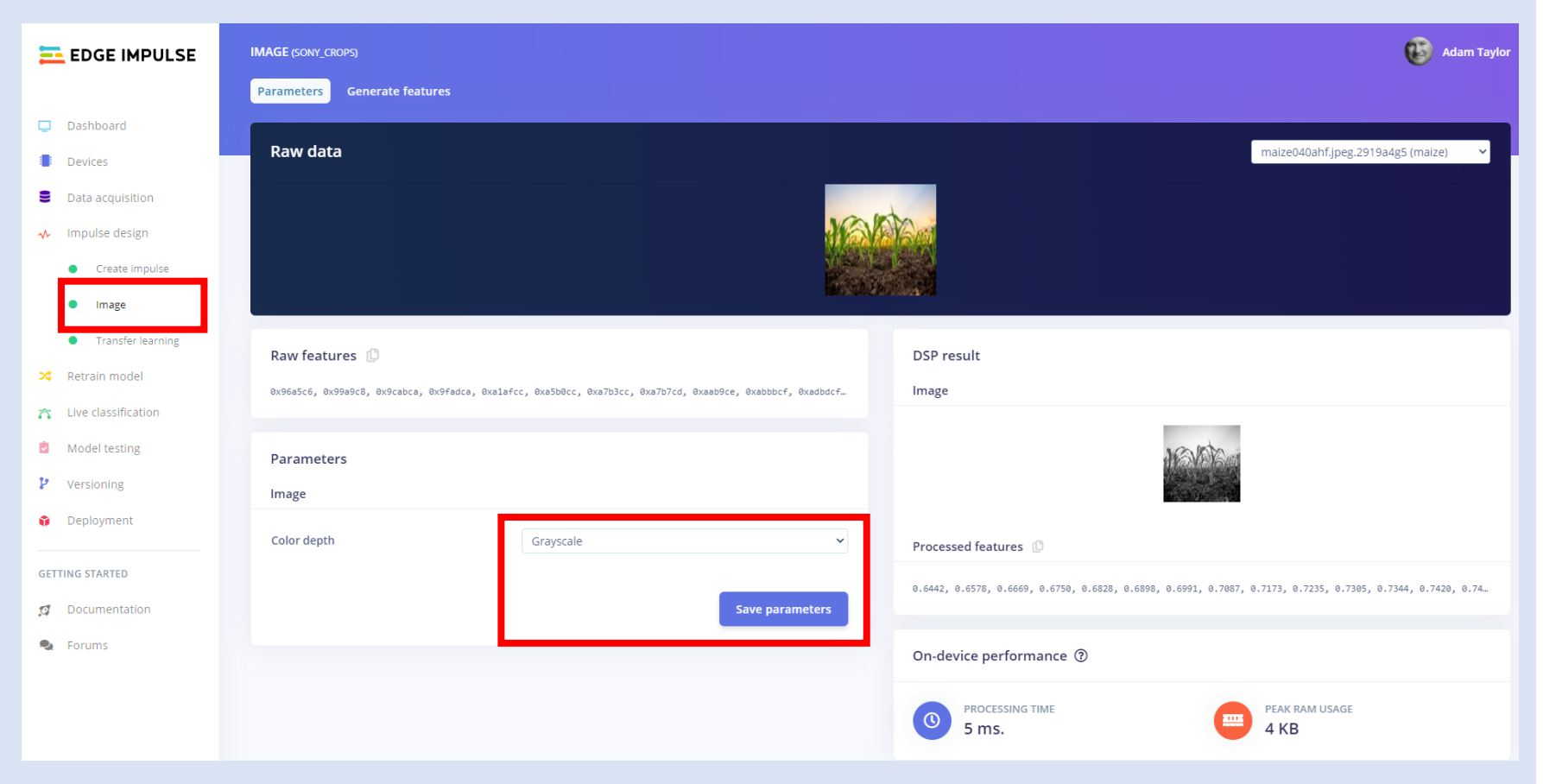
Edge Impulse: Creating the Impulse

Step 23 – Click on Create impulse and then change the image data from fit shortest axis to squash, save the impulse



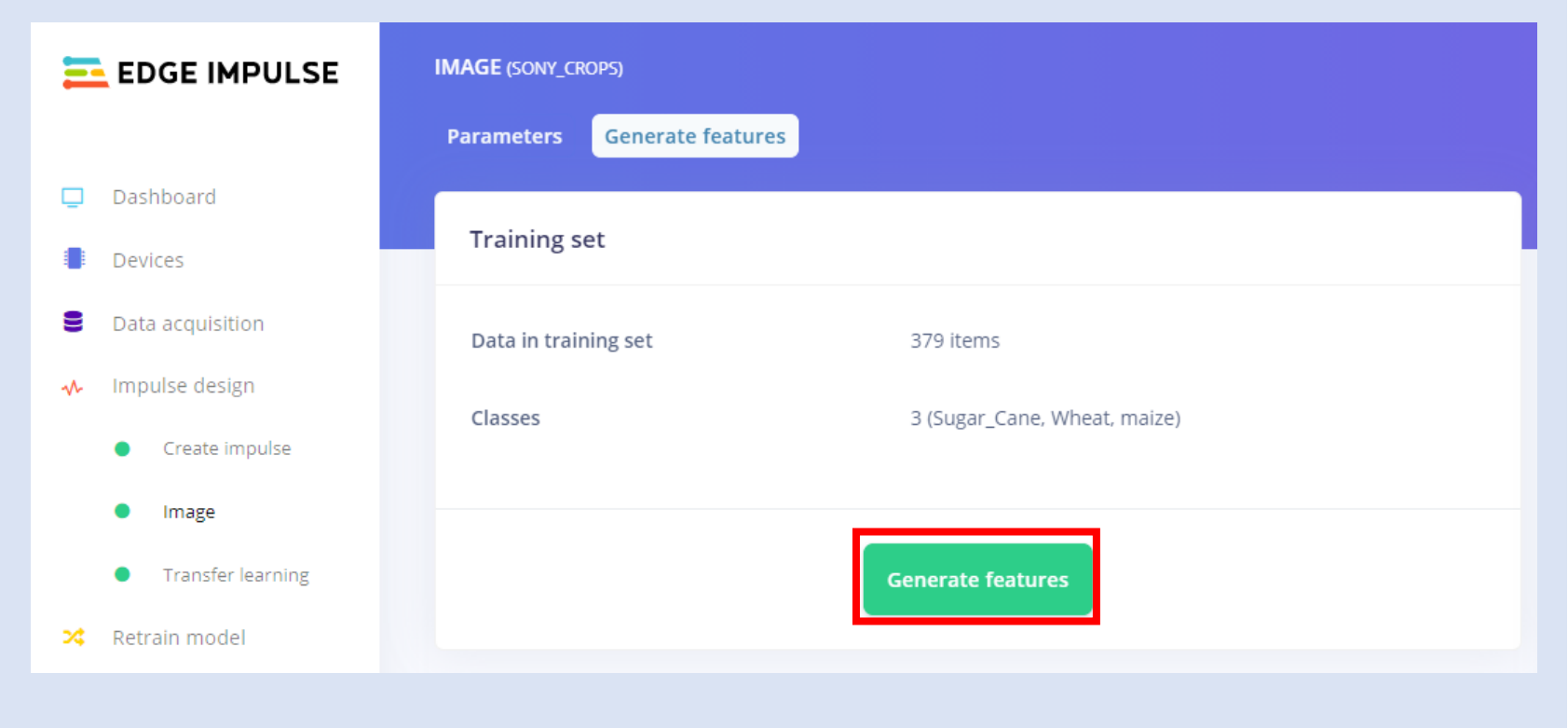
Edge Impulse: Creating the Impulse

Step 24 – Click on Image and change the color depth from RGB to GreyScale, save parameters



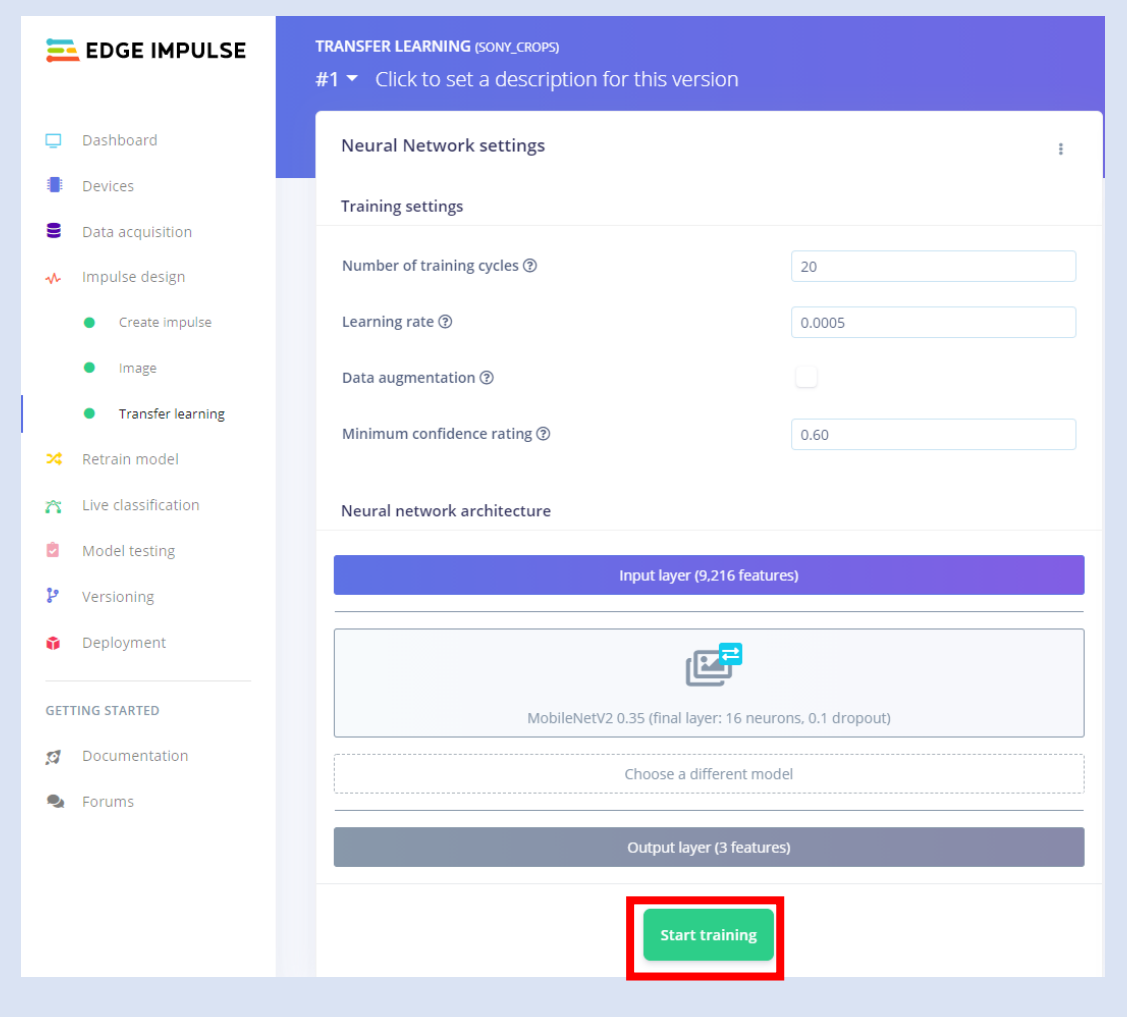
Edge Impulse: Creating the Impulse

Step 25 – Click on Generate features



Edge Impulse: Creating the Impulse

Step 26 – Rerun the training of the Transfer Learning, click on Start training



Edge Impulse: Creating the Impulse

Step 27 – Rerun the training of the Transfer Learning, click on Start training

Last training performance (validation set)

ACCURACY
96.1%

LOSS
0.15

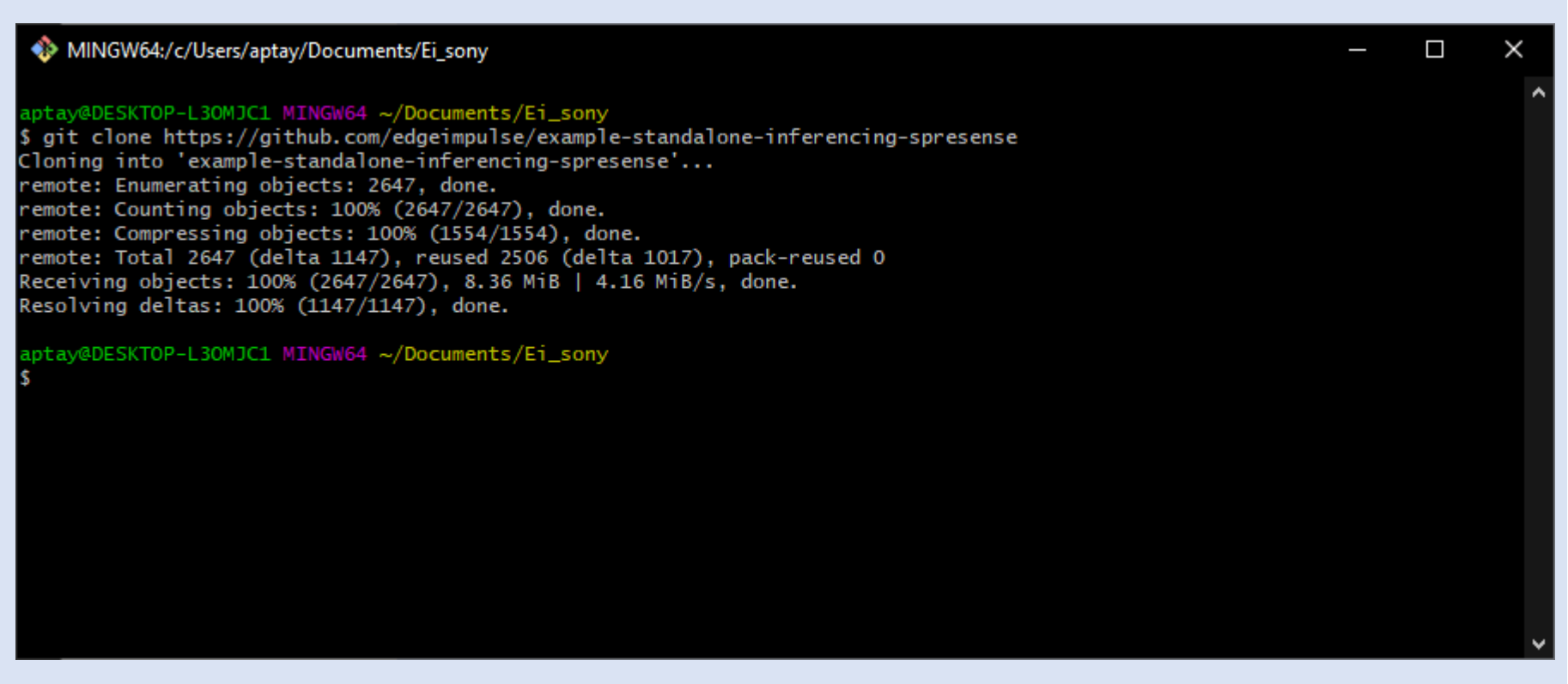
Confusion matrix (validation set)

	MAIZE	SUGAR_CANE	WHEAT
MAIZE	90%	10%	0%
SUGAR_CANE	0%	100%	0%
WHEAT	0%	3.1%	96.9%
F1 SCORE	0.95	0.94	0.98

Lab
Testing on the board

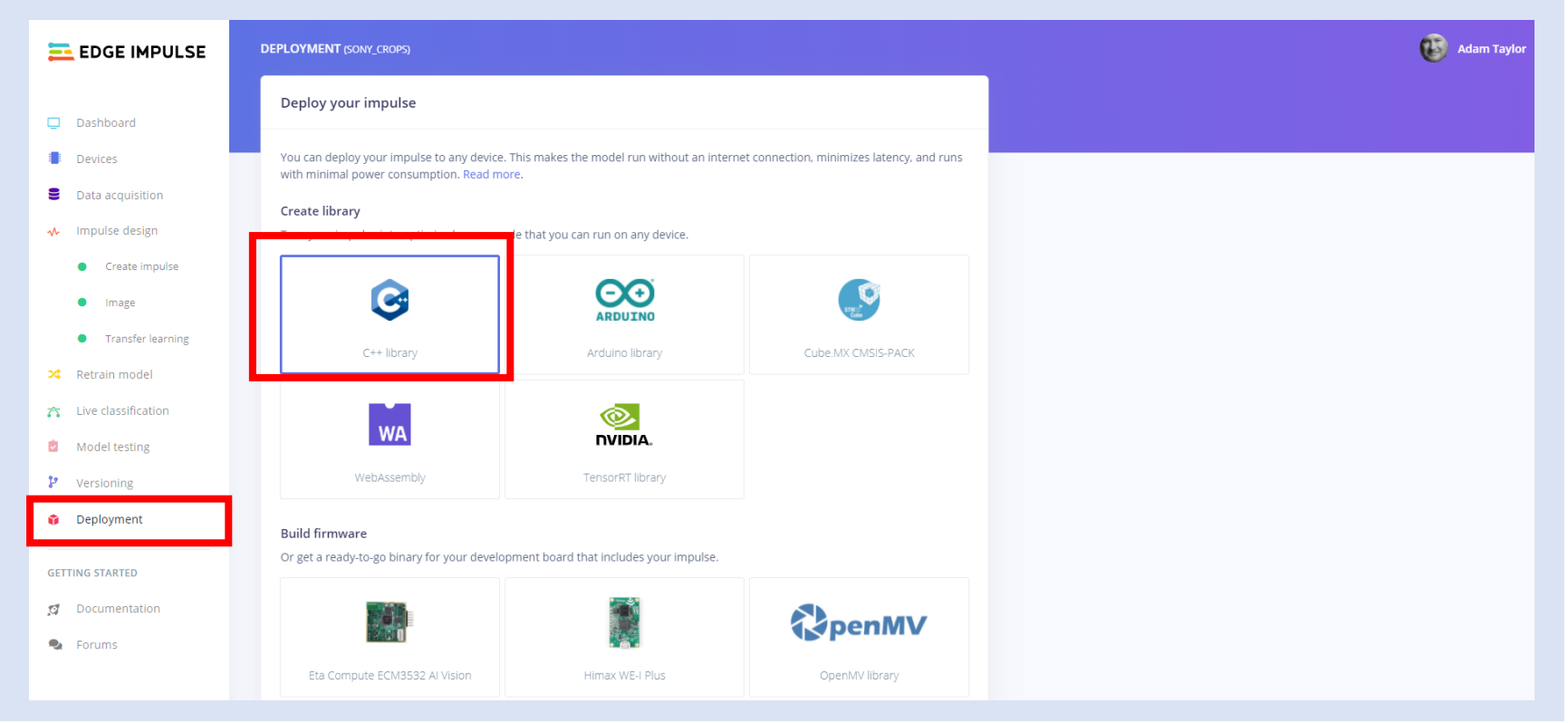
Edge Impulse: Creating the Impulse

Step 1 – Clone the repository at
https://github.com/edgeimpulse/example-standalone-inferencing-spresense



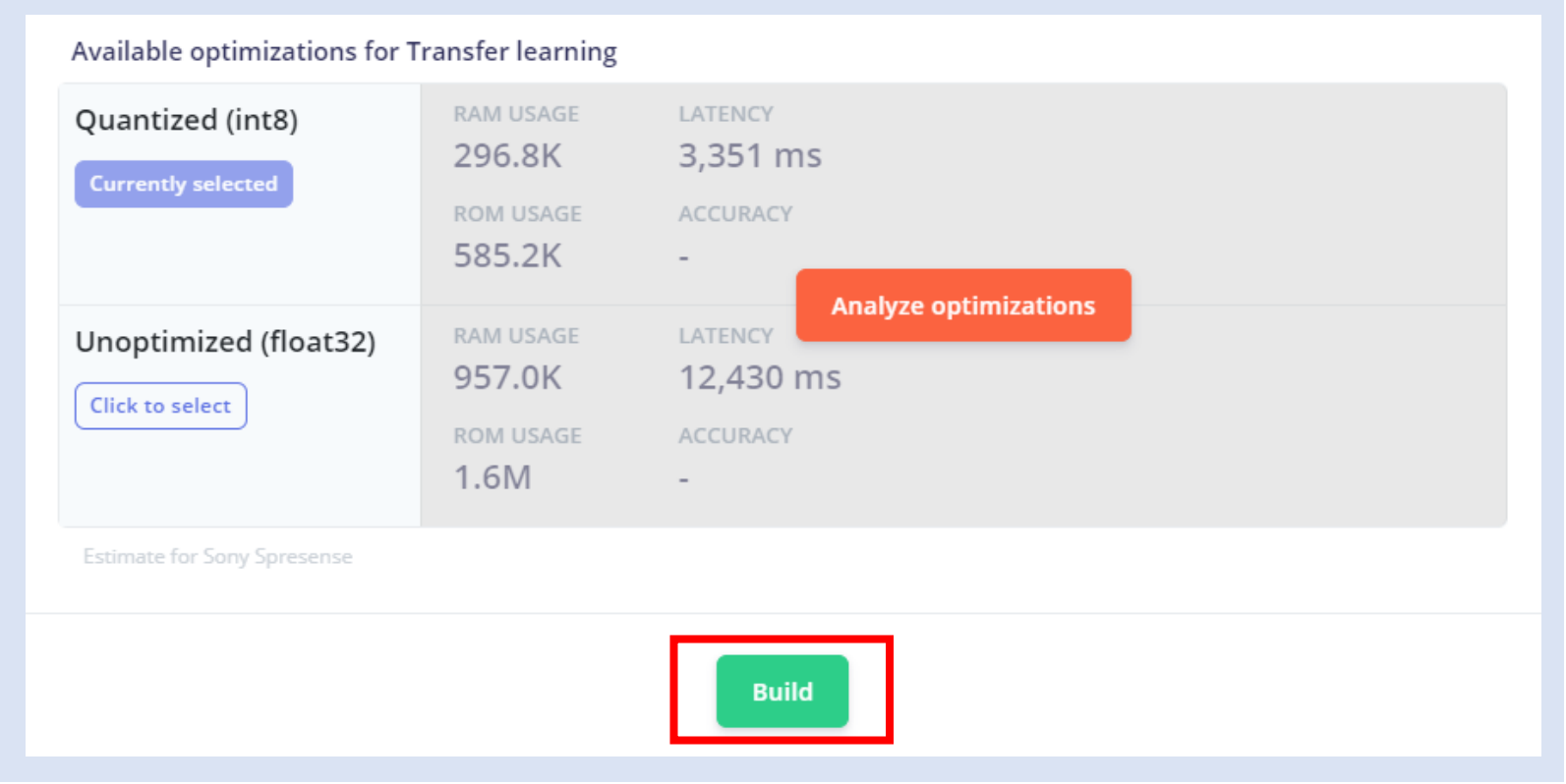
Edge Impulse: Creating the Impulse

Step 2 – Click on the Deployment menu and select C++ library



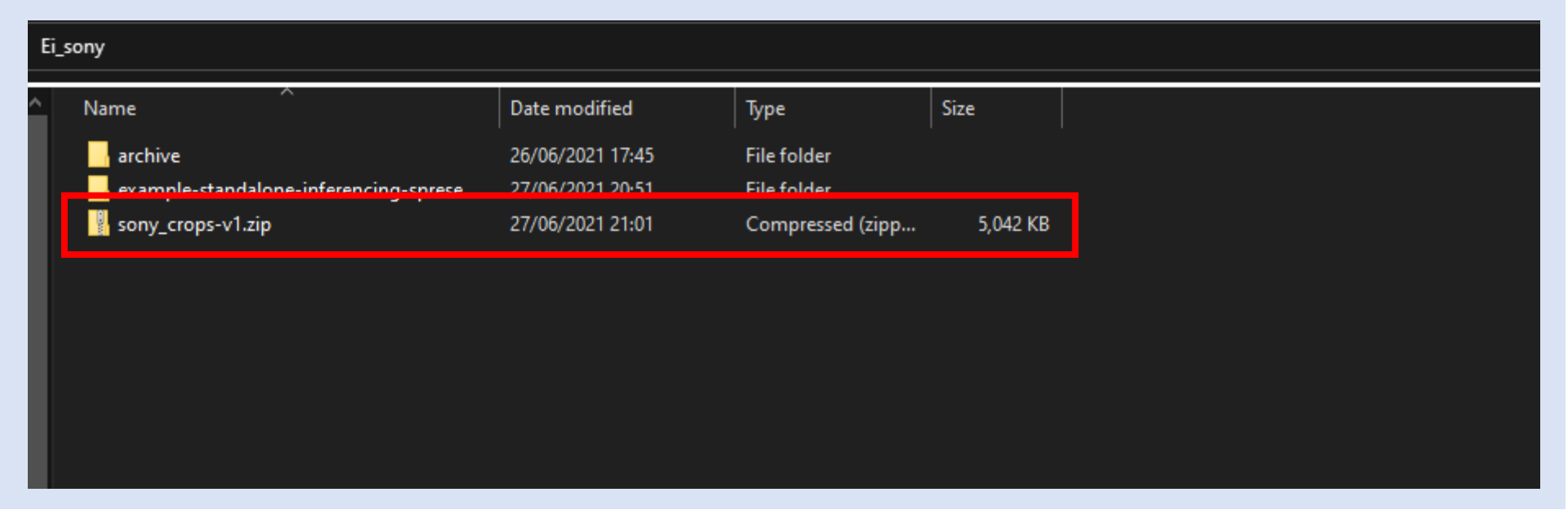
Edge Impulse: Creating the Impulse

Step 3 – Click on build and save the zip file in the same directory as the recently cloned repository



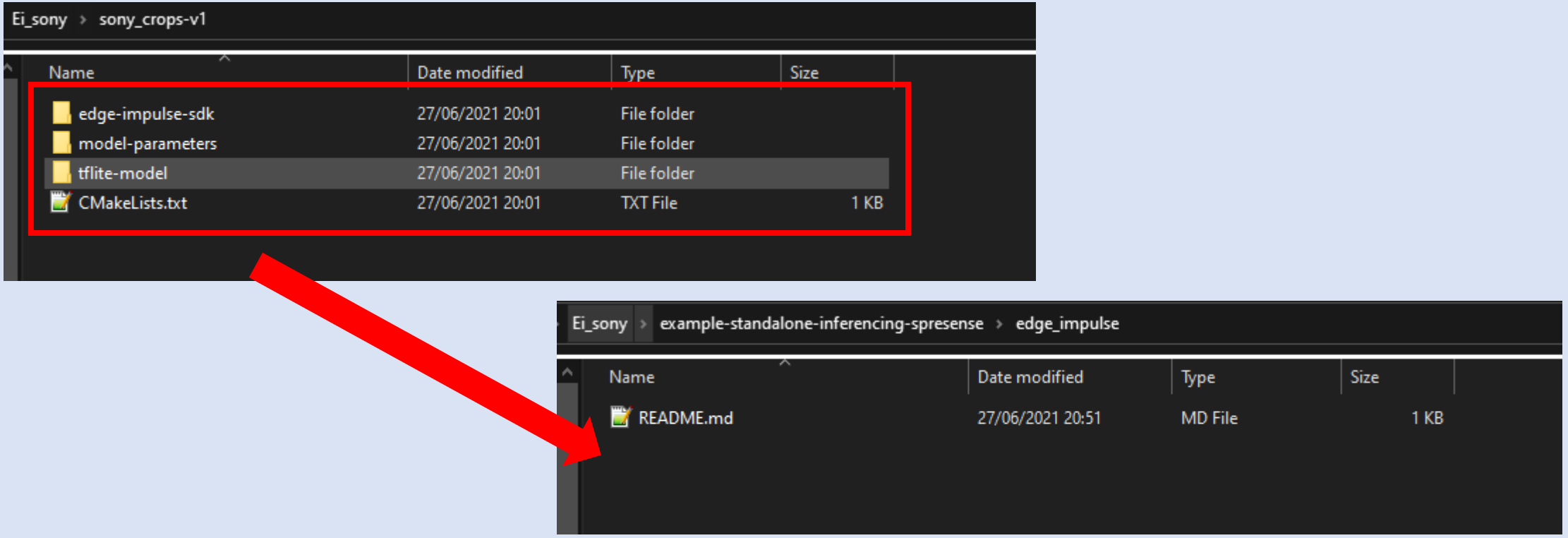
Edge Impulse: Creating the Impulse

Step 4 – Unzip the compressed file just downloaded



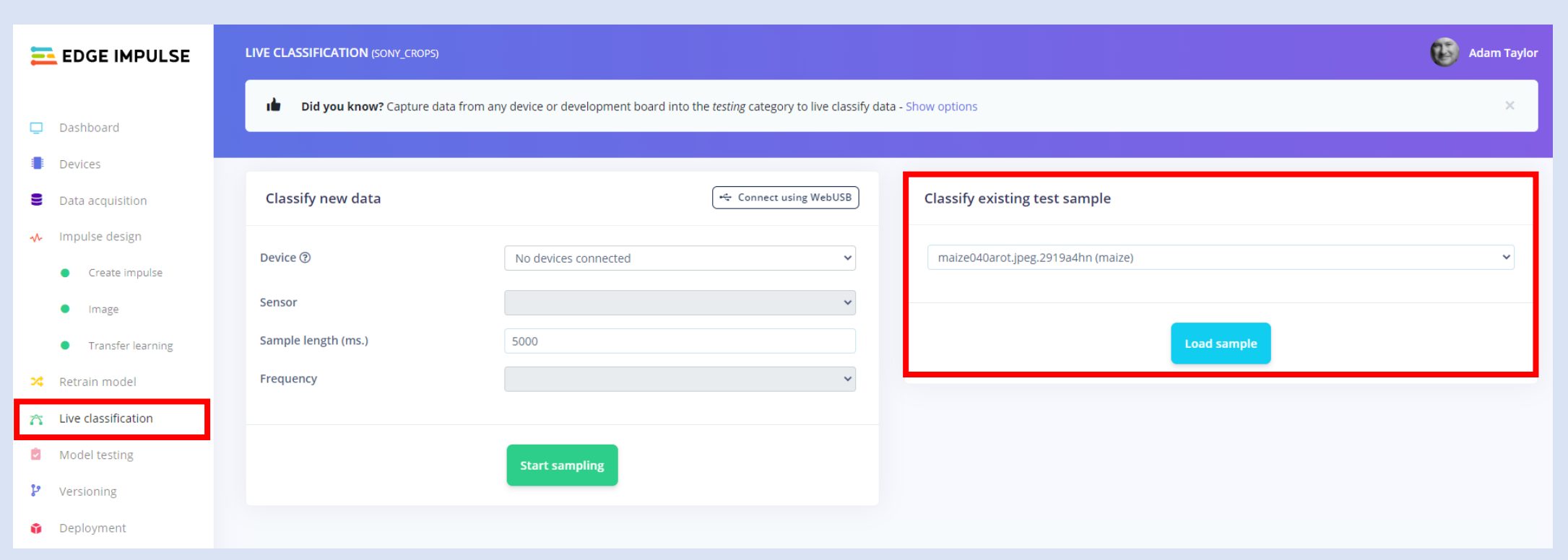
Edge Impulse: Creating the Impulse

Step 5 – Copy the extracted files from sony_crops-v1 to example-standalone-inferencing-spresense\edge_impulse



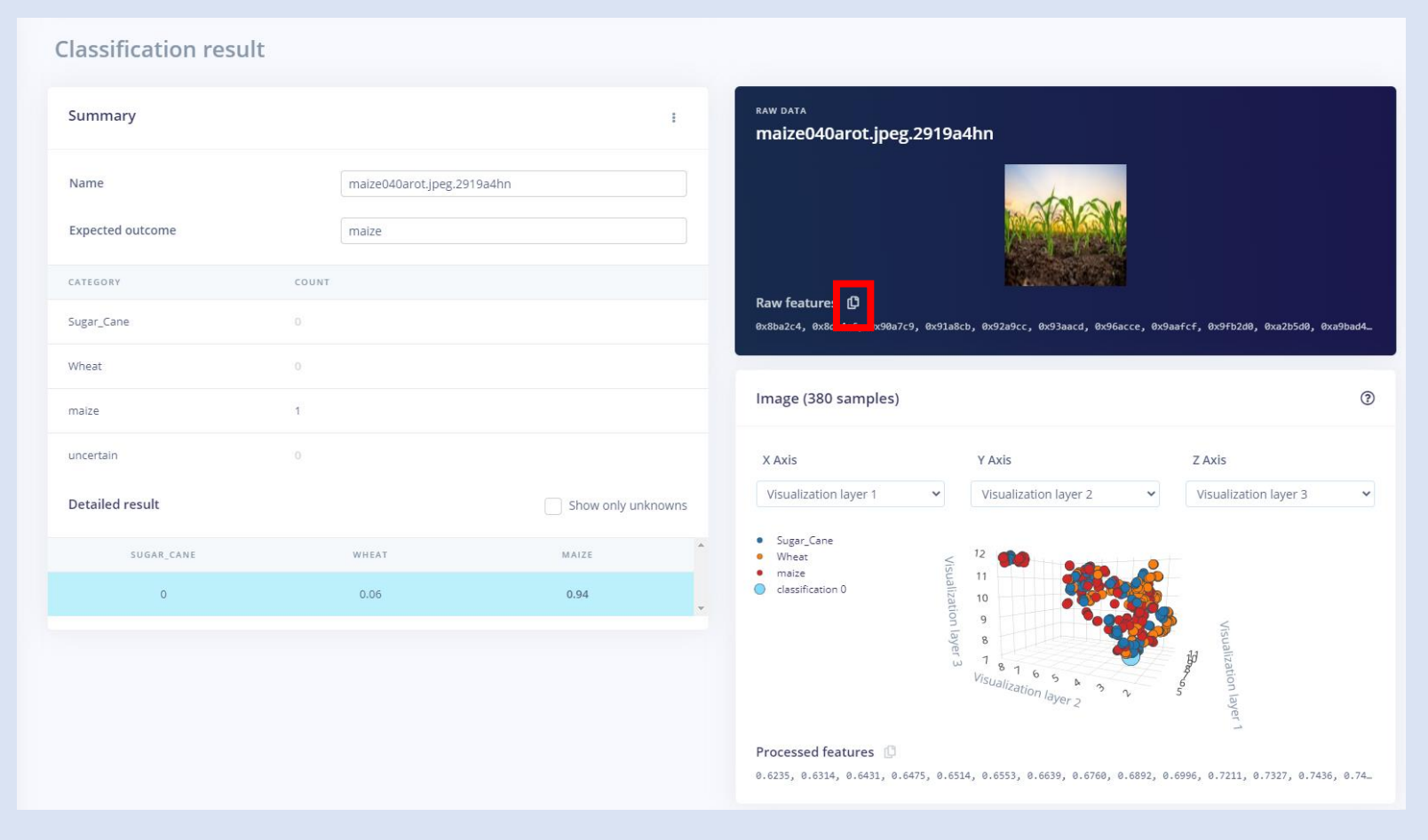
Edge Impulse: Creating the Impulse

Step 6 – Click on live classification and select the sample you wish to classify – select load sample



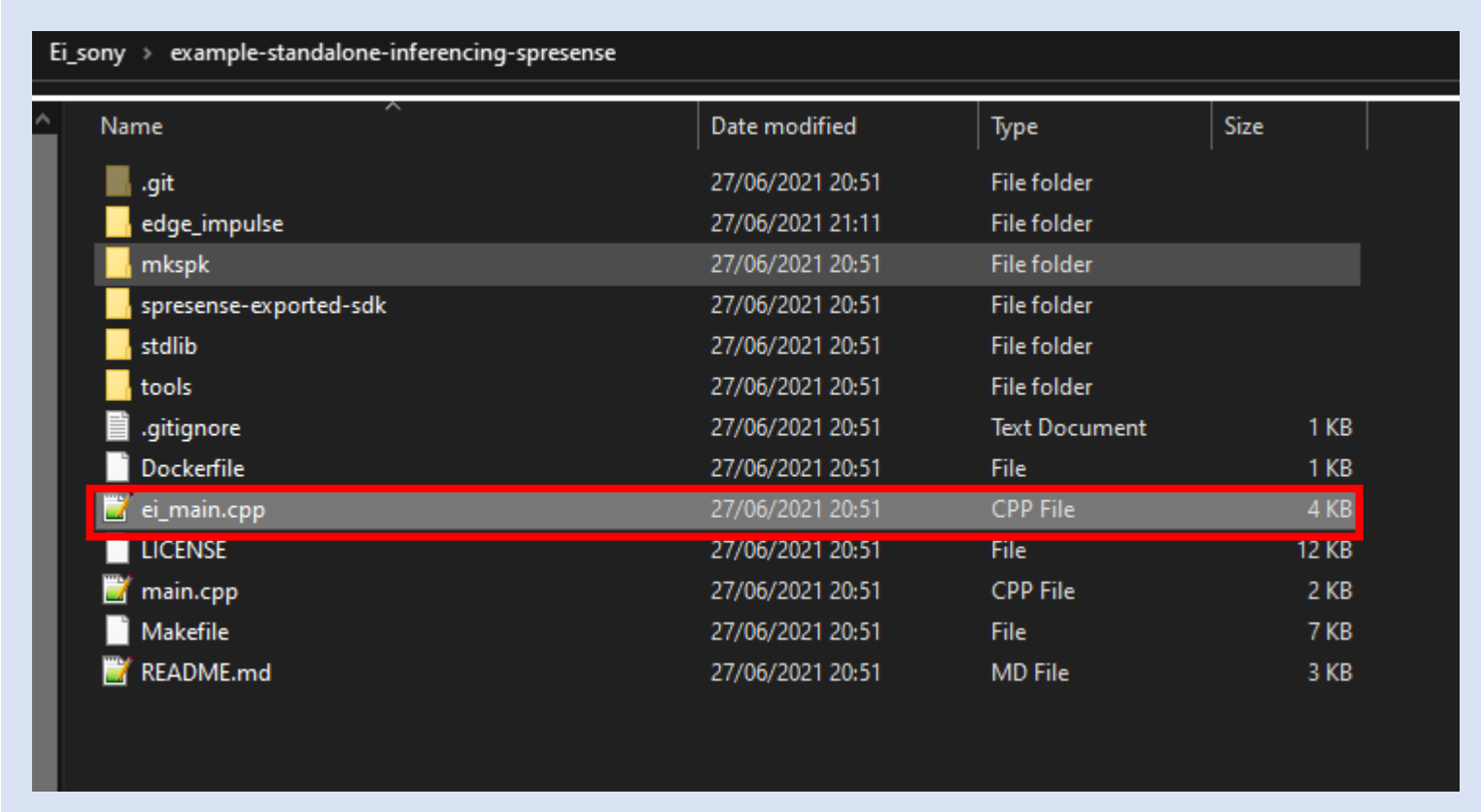
Edge Impulse: Creating the Impulse

Step 7 – Click to copy the raw features to the clipboard



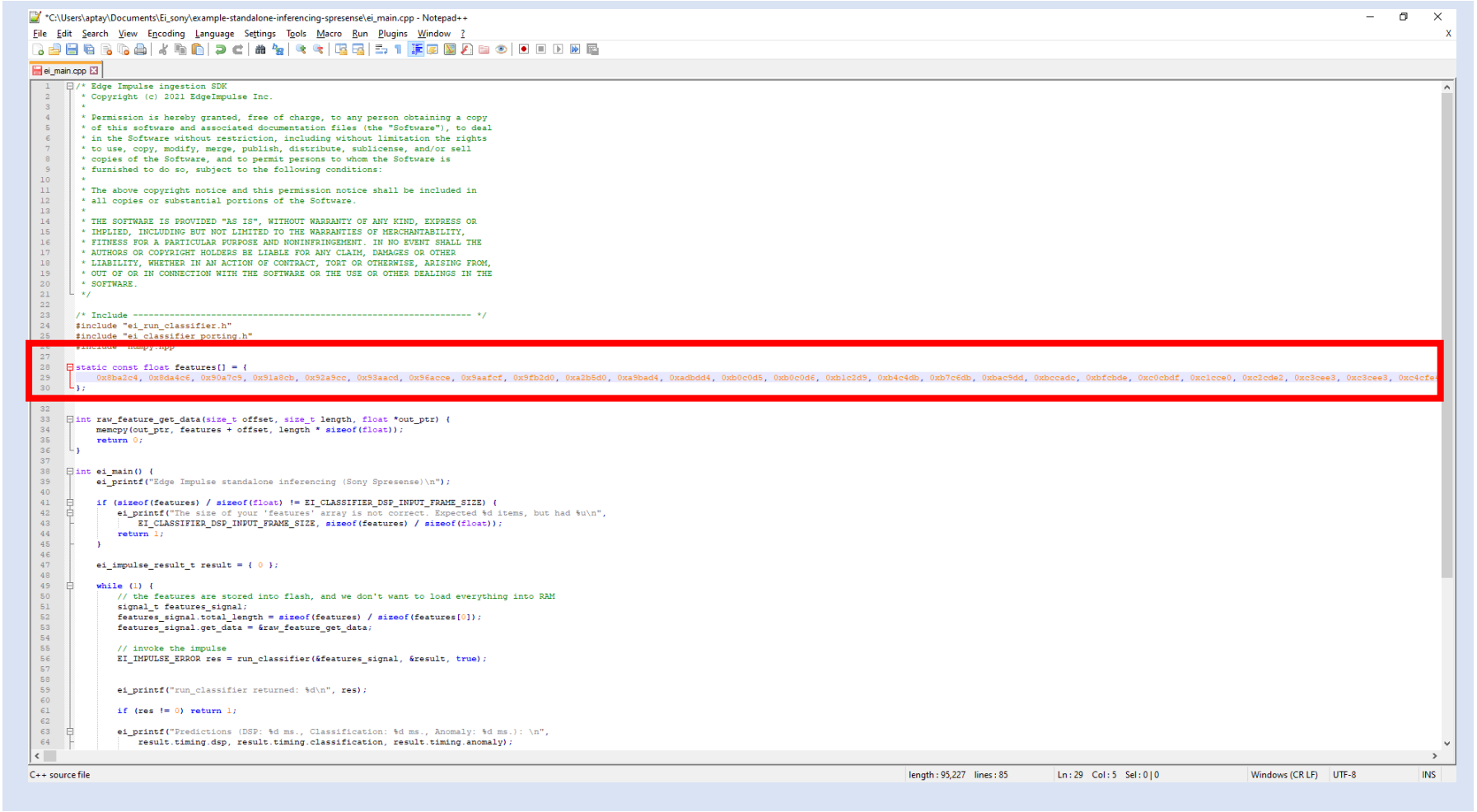
Edge Impulse: Creating the Impulse

Step 8 – Open the file ei_main.cpp which is in the top level of the cloned repository



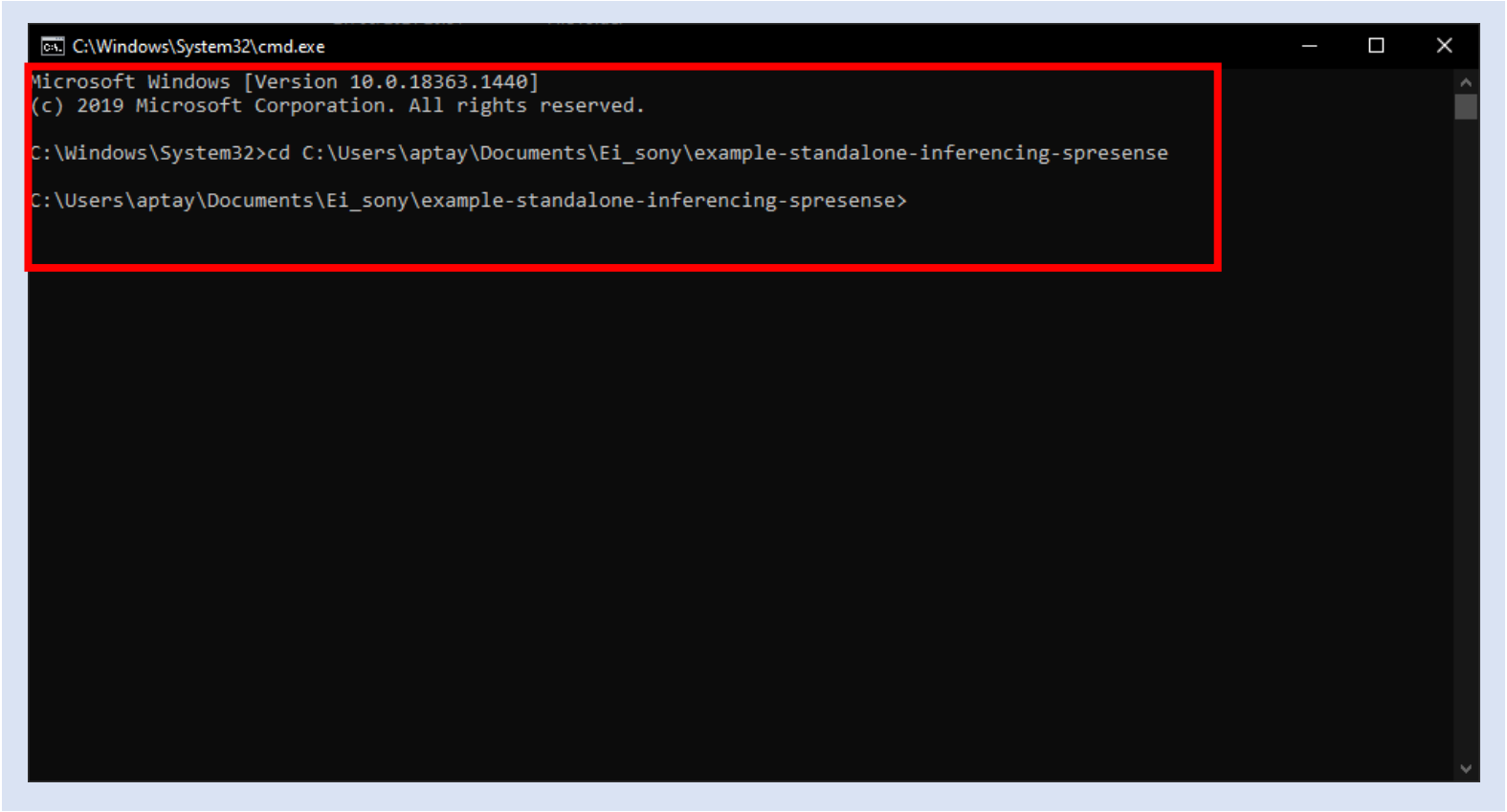
Edge Impulse: Creating the Impulse

Step 9 – Copy the data in on line 21 and click save, and close the file



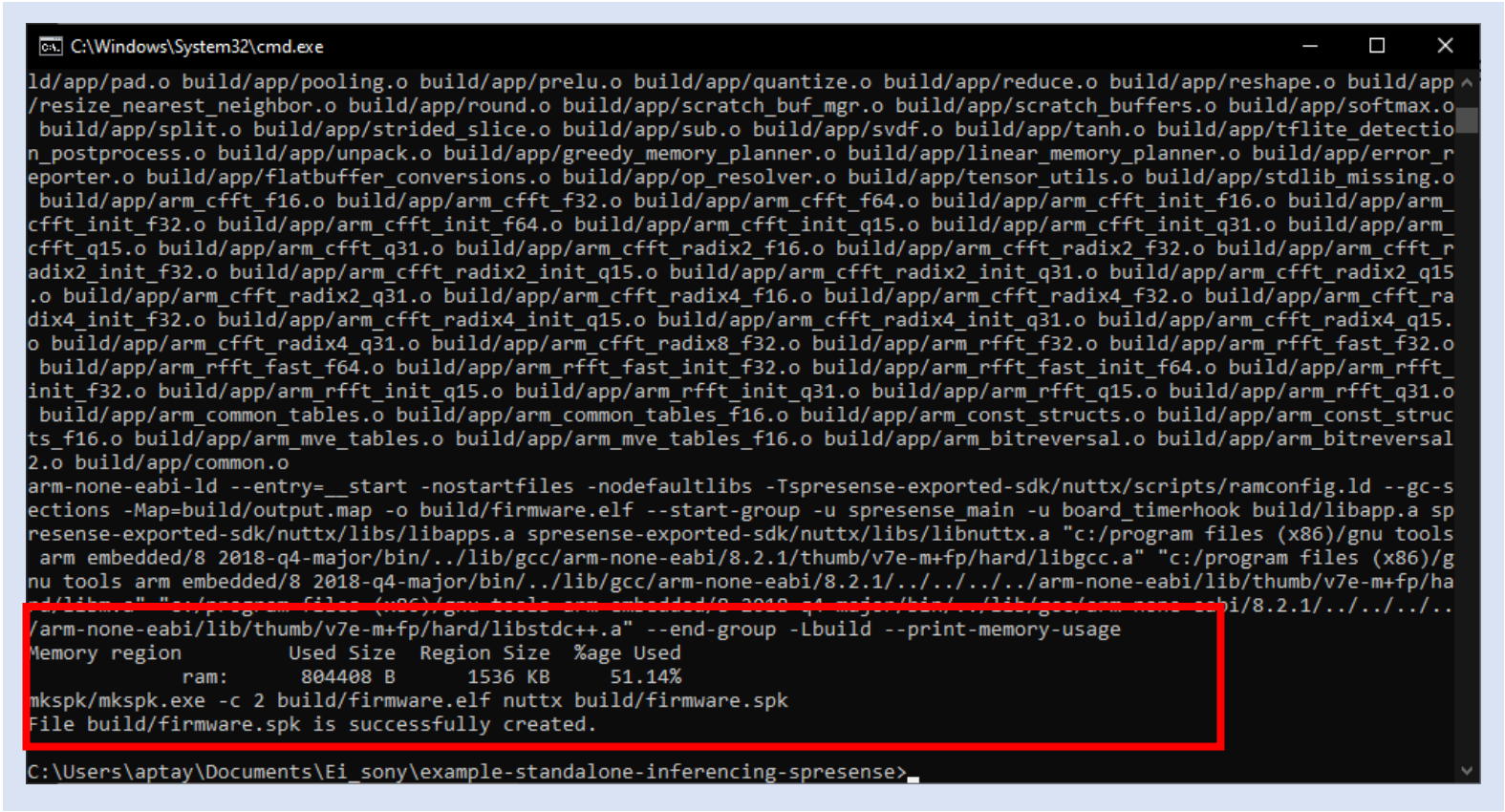
Edge Impulse: Creating the Impulse

Step 10 – Open a command window and change directory into the top level of the cloned repository



Edge Impulse: Creating the Impulse

Step 11 – Enter the command make –j if you so not see the output below run the command again



Edge Impulse: Creating the Impulse

Step 12 – Connect the Sony Spresense to your development machine

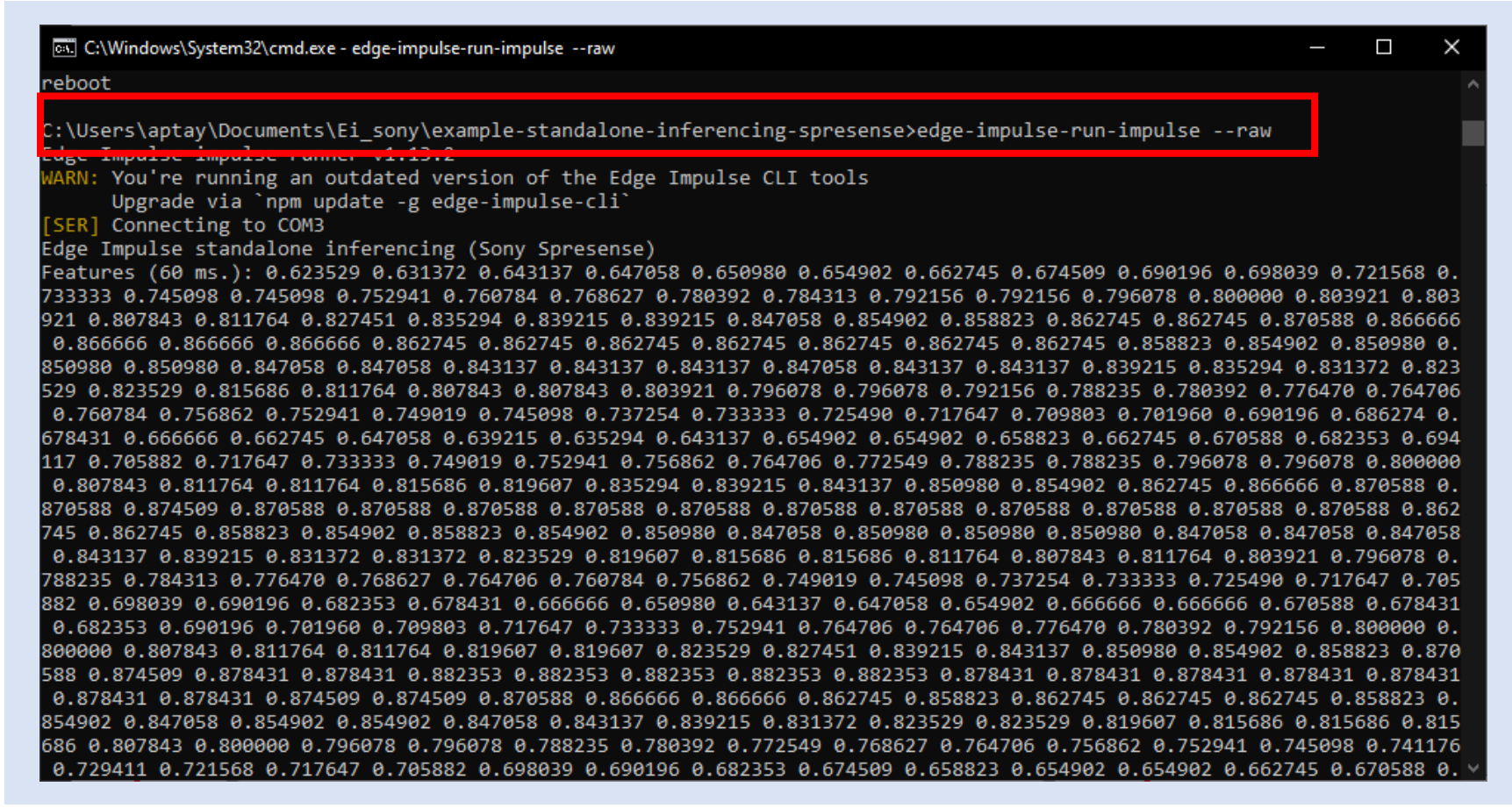
Edge Impulse: Creating the Impulse

Step 13 – Enter the command make flash this will flash the application to the Spresense

```
C:\Users\aptay\Documents\Ei_sony\example-standalone-inferencing-spresense>make flash
tools/flash_writer.py -s -d -b 115200 -n build/firmware.spk
[7[119;1H[J[8
[A[K[(B[m[[33m?[(B[m](B[m Select your device: COM3 - Silicon Labs CP210x USB to UART Bridge (COM3)
 [34m> COM3 - Silicon Labs CP210x USB to UART Bridge (COM3)[(B[m[K

Using device COM3
>>> Install files ...
install -b 115200
Install build/firmware.spk
|0%----------50%----------100%|
##################################################################

776368 bytes loaded.
Package validation is OK.
Saving package to "nuttx"
updater# sync
updater# Restarting the board ...
reboot

C:\Users\aptay\Documents\Ei_sony\example-standalone-inferencing-spresense>
```

Edge Impulse: Creating the Impulse

Step 14 – In the command window enter the command edge-impulse-run-impulse --raw



Edge Impulse: Creating the Impulse

Step 15 – Scroll down the processing results and you will see the classification, press cntrl-c to stop the application – compare this with the predicted accuracy of the model