eIQ Toolkit™ for i.MX RT1170
Data Import

Revision 5
August 2023

Contents

1 Lab Overview

This document will cover how to quickly import datasets and create eIQ Portal project files (.eiqp) that can be opened with eIQ Portal to then train and export custom models.

2 Hardware Requirements

This lab is written for the i.MX RT1170 evaluation board. This lab can also be used with the following evaluation boards that support DeepViewRT in the SDK by downloading their respective SDK packages:

- i.MX RT1050
- i.MX RT1060
- i.MX RT1064
- i.MX RT1160
- i.MX RT1170

3 Software Requirements

The following pieces of software for this lab will be required:

- eIQ Toolkit

4 Import Data based on Directory Structure

There are four methods for importing data into an **eiqp** project file

- Using the eIQ Portal GUI directly
- Import datasets in the VOC format
- **Import images based on directory structure**
- Import pre-created datasets from TensorFlow

This section will cover the 3rd option.

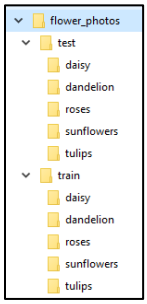
4.1 Setup the image directory structure

eIQ requires that the image directory structure is in the following format:

image_folder_name
->test
-->label_1
-->label_2
-->label_3
--> …
->train
-->label_1
-->label_2
-->label_3
--> …

This categorizes and labels the images in each subfolder according to their type (train/test) and label (label_1/label_2/label_3/etc).

1. For this lab we'll use a set of Creative Commons licensed flowers images that have already been categorized into 5 different classes.
2. Download the following file containing all the images into a directory on your PC: http://download.tensorflow.org/example_images/flower_photos.tgz
3. Unzip the images into a folder named **flower_photos** (should do it automatically)
4. Create new folders named **train** and **test** underneath the **flower_photos** folder.
5. Create subfolders for each type of flower underneath: **daisy, dandelion, roses, sunflowers, tulips**
6. It should look like the following when done:

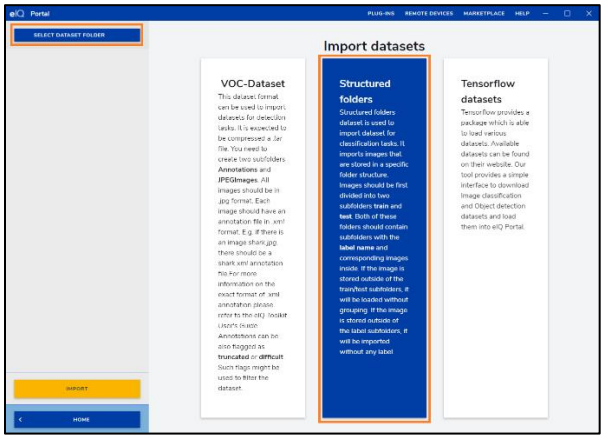


7. Copy and paste most of the images (~75%) under the "train" folder in their associated folder names, and then put the rest of the photos in the "test" folders in their associated folder names. The exact number is not important.

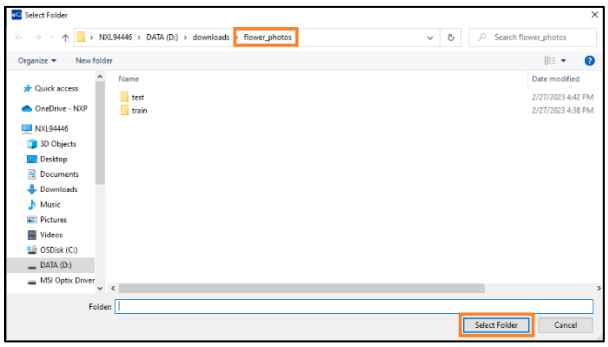
4.2 Import the Images

1. Start eIQ Portal
2. On the Welcome screen, the option arrow next to **Create Project** and select **Import dataset**

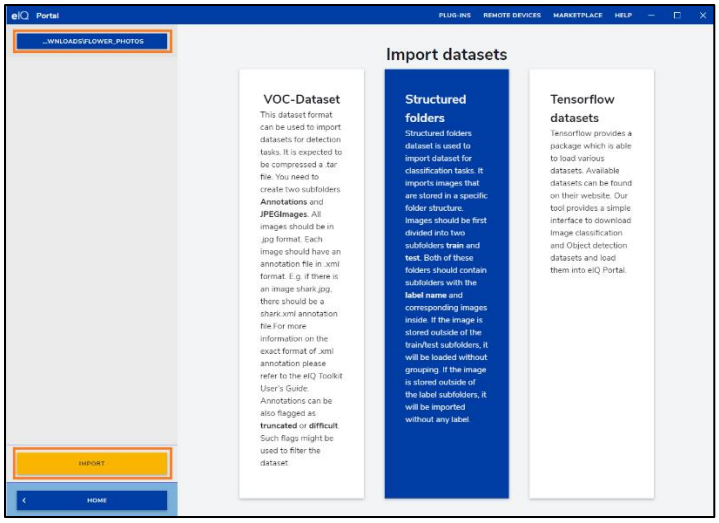
8. On the next screen, click on the Structured Folders option and then in the upper left corner click on Select Dataset Folder



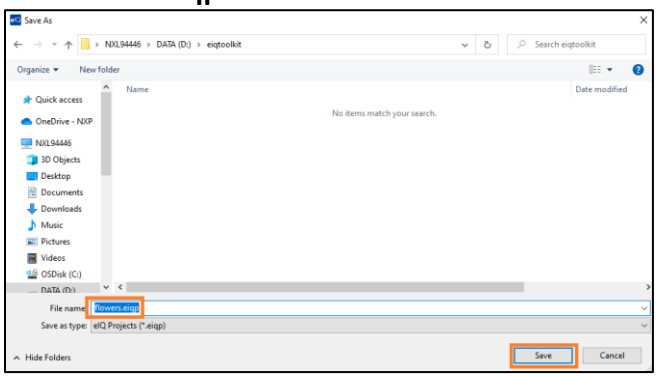
9. In the dialog box that comes up, navigate to the **flower_photos** folder on your PC and click on **Select Folder**



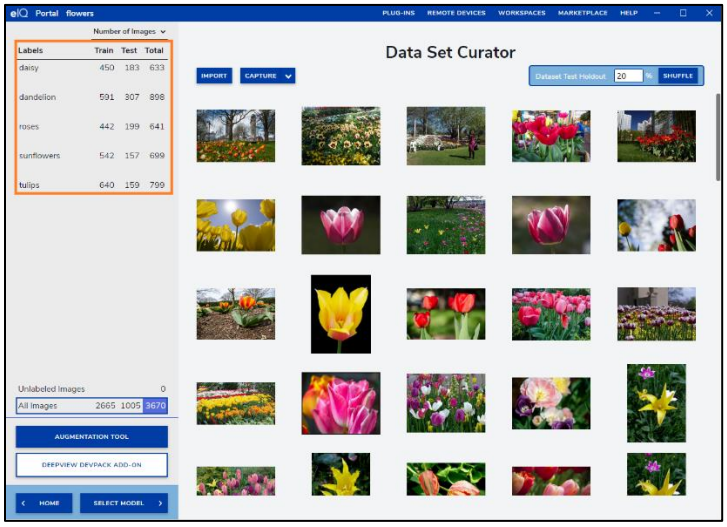
10. You'll then see the name of that folder in eIQ Portal. Click on the **IMPORT** button in the lower left corner to import the photos.



11. You'll then be asked where you want to save the .eqip project file that will be generated by importing these images, so select somewhere on your hard drive and give the project a name like **flowers.eiqp**.



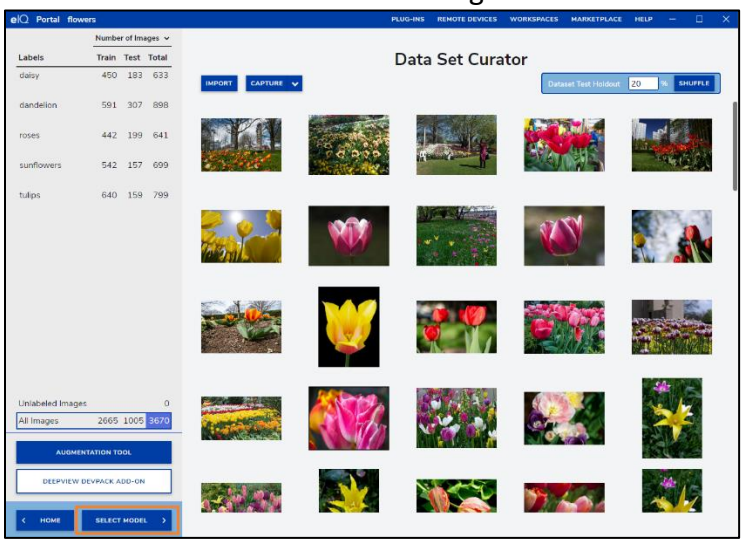
12. When the images have finished importing you should see a screen like below, with the 5 flower categories and images allocated to both Train and Test categories



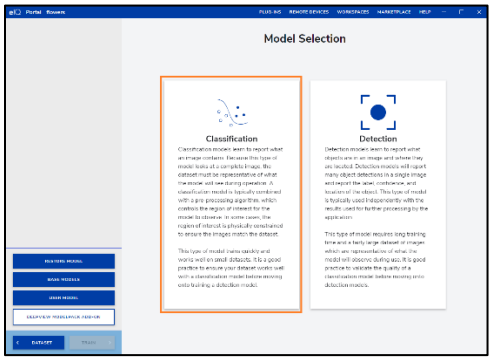
4.3 Train the model

Now with the images loaded into the eIQ Portal project, it's time to train a model that can recognize those images

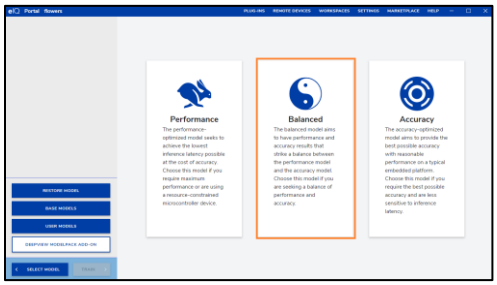
13. Click on Select Model in the lower right corner



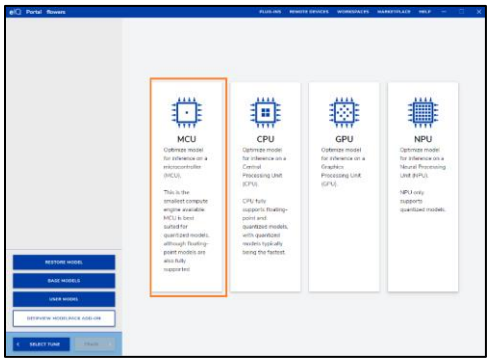
14. Select Classification model.



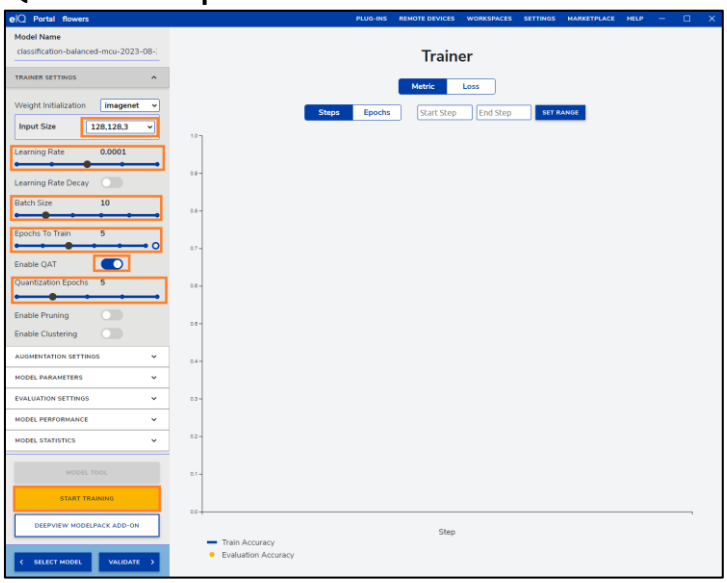
15. Select one of the options, for this lab use **Balanced**



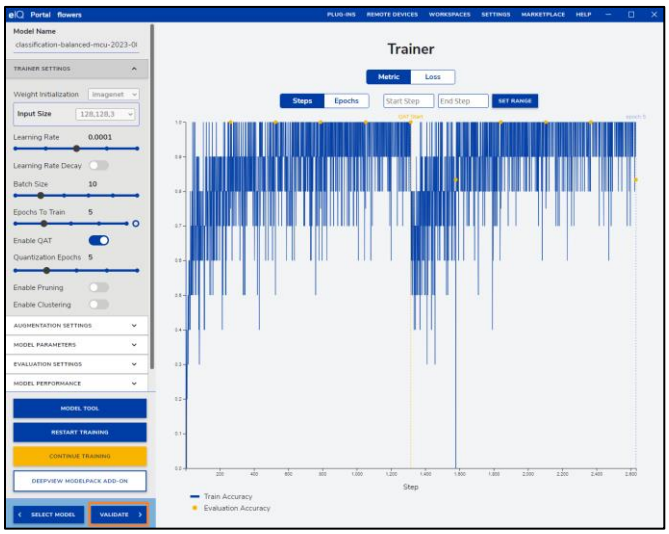
16. Select MCU



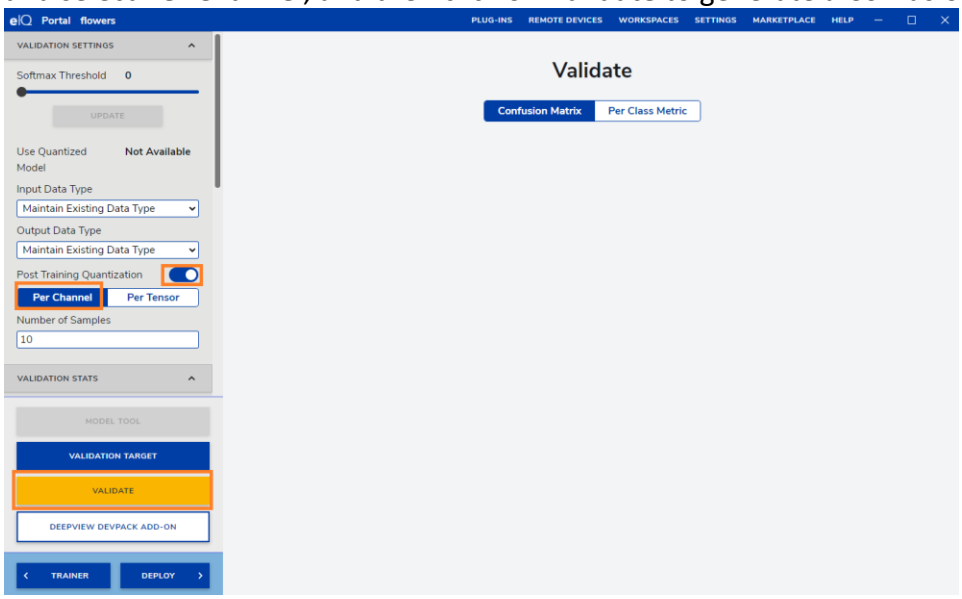
17. Now on the training page, change the following parameters for best results for this particular dataset and model. Other datasets and models may achieve higher accuracy or better performance with other settings, it will take experimentation to find the best combination for a given dataset and model. Also increasing Input Size will increase accuracy but also increase training and inference time. After making the adjustments click on **Start Training** to begin training the model.
    a) **Input Size: 128,128,3**
    b) **Learning Rate: 0.0001**
    c) **Batch Size: 10**
    d) **Epochs to Train: 5**
    e) **Enable Quantization Aware Training**
    f) **Quantization Epochs: 5**



18. Once training has completed, click on **Validate** in the lower left hand of the screen to go to the next screen



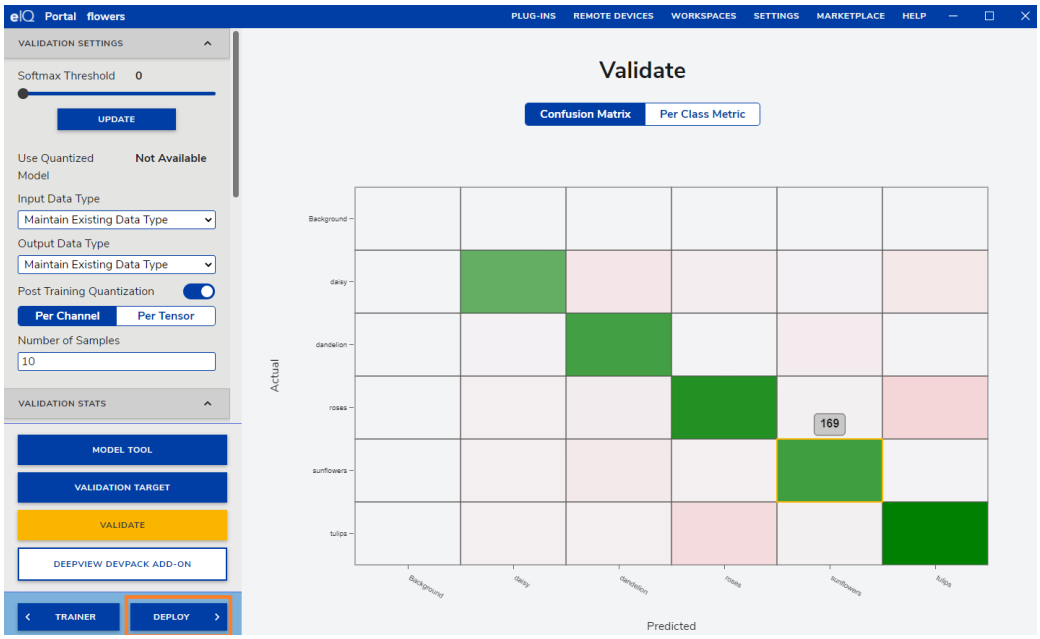
19. We want to validate the Quantized version of this model so enable **Post Training Quantization** and select **Per Channel**, and then click on **Validate** to generate a Confusion Matrix



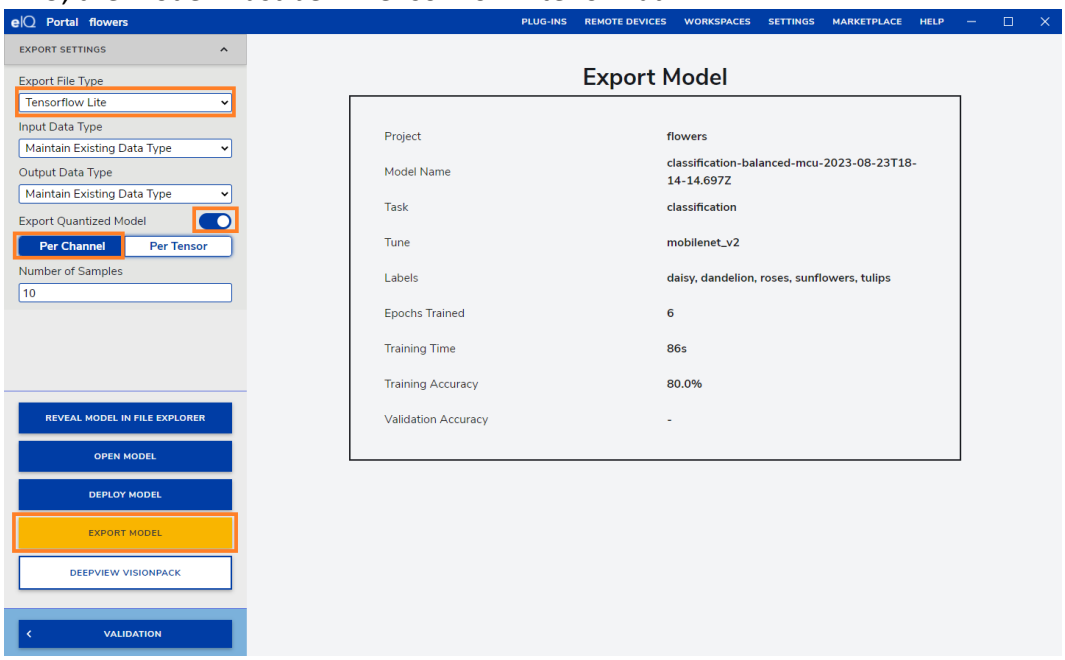
20. A confusion matrix will be generated. Verify the results. If they are not sufficient for your project, you can go back to the Training page and adjust the parameters.

    This screen is also where you could use Model Runner to run the model on a target system and get detailed profiling information. Those steps are covered in the DeepViewRT Model Runner lab.

    For this lab, click on **Deploy** in the lower left hand section to save the model to your hard drive.



21. From here you can quantize or export as a DeepViewRT or TensorFlow Lite file for use with the DeepViewRT, TensorFlow Lite, or Glow inference engines. Click on **Export Model** to save the exported model to your hard drive and then integrate it with one of the eIQ inference engines. Typically, a quantized model would be used to decrease inference time and reduce memory requirements and it would need to be Per Channel Quantized (PCQ). If using the eIQ Neutron NPU, the model must be in TensorFlow Lite format.



5 Import Data using TensorFlow Datasets

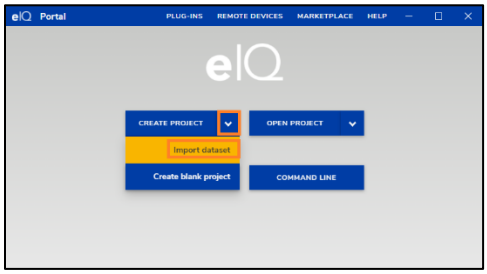
There are four methods for importing data into an **eiqp** project file

- Using the eIQ Portal GUI directly
- Import datasets in the VOC format
- Import images based on directory structure
- **Import pre-created datasets from TensorFlow**

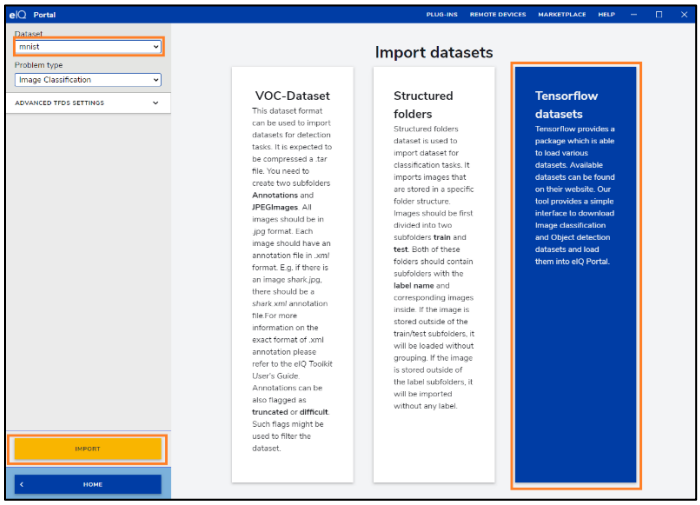
This section will cover the 4th option.

5.1 Import the Images

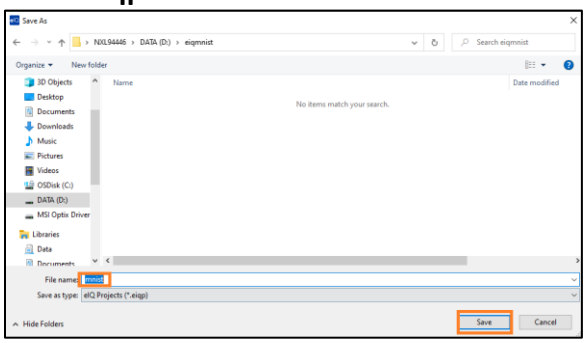
1. Start eIQ Portal
2. On the Welcome screen, the option arrow next to **Create Project** and select **Import dataset**



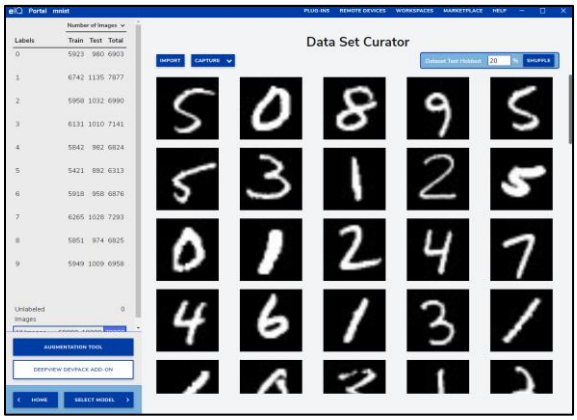
3. In the screen that comes up, click on **Tensorflow datasets** and then you'll then have the option to select some TensorFlow datasets. Let's go with **mnist**. Then click on IMPORT in the lower left corner.



4. You'll then be prompted to select a location to save the .eiqp project file. Give it a name like **mnist.eiqp** and click on **Save**



22. eIQ Portal will import the images



23. Train and export the model as usual to generate a .rtm or .tflite file as needed for the inference engine that will be used. Note that with these large datasets the training may take a very significant amount of time.

6 Conclusion

This lab demonstrated how to import different datasets into eiqp project files that can be opened with the eIQ Portal and used for model training. For information on how to import datasets in the Visual Object Class (VOC) format see the eIQ Toolkit User Guide that can be found in the **<eIQ Toolkit Install Dir>/doc** folder