

EDGE INTELLIGENCE

LAB-4

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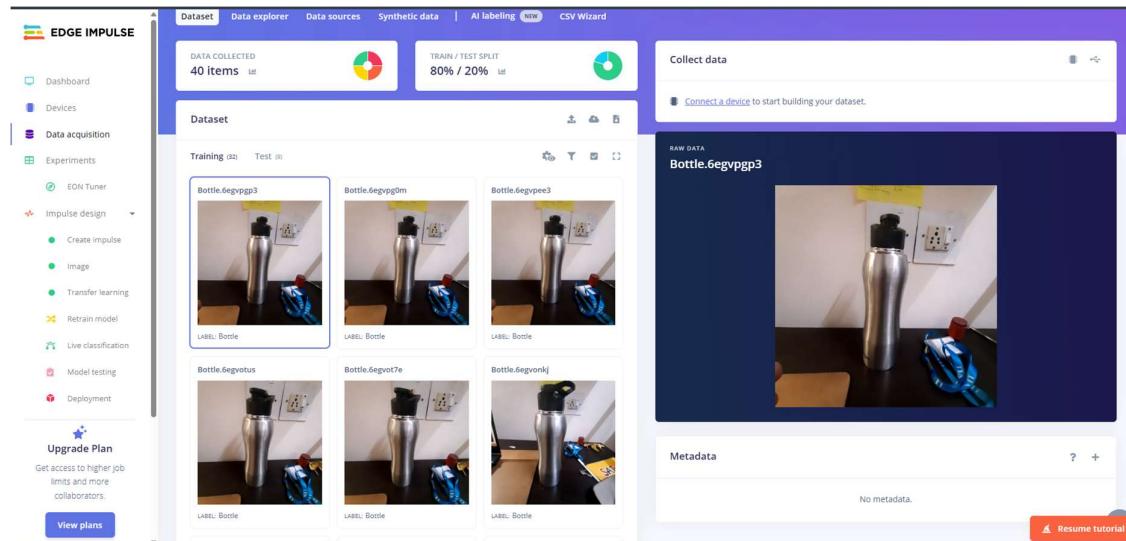
Roll no: 25MML0051

Embedded Vision ML Pipeline in Edge Impulse

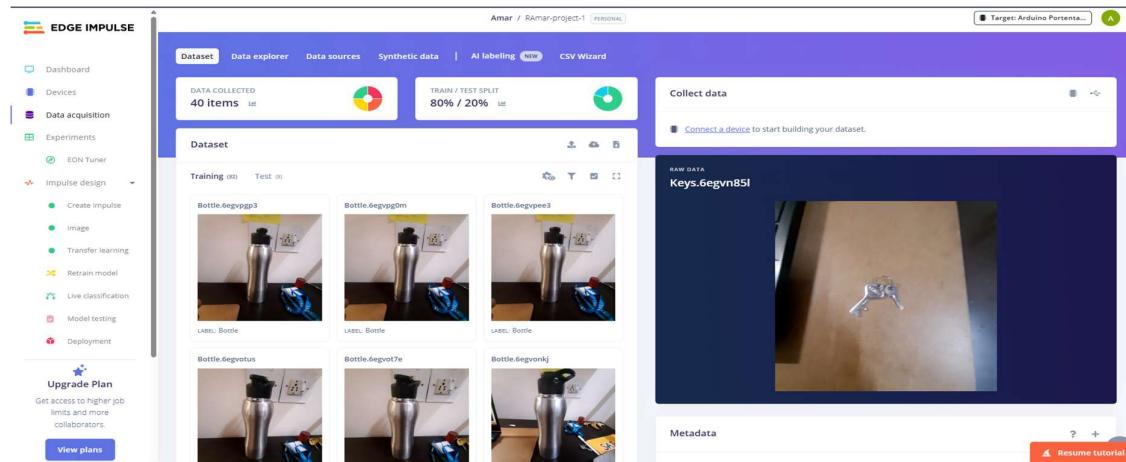
Step 1: Data Acquisition

Collect and label image data using the Data Acquisition section in Edge Impulse.

Bottle



Keys



Pen

The screenshot shows the Edge Impulse Studio interface. On the left, a sidebar contains navigation links: Dashboard, Devices, Data acquisition (selected), Experiments, EON Tuner, Impulse design (selected), Create impulse, Image, Transfer learning, Retrain model, Live classification, Model testing, Deployment, and Upgrade Plan. The main area displays a dataset titled "Dataset" with 40 items. It shows a "DATA COLLECTED" section with 40 items and a "TRAIN / TEST SPLIT" of 80% / 20%. Below this is a "Dataset" section with "Training" and "Test" tabs, displaying six images of a pen labeled "Keys". To the right is a "Collect data" section with a "RAW DATA" section titled "Pen.6egvkcmd" showing a video feed of a pen on a table, and a "Metadata" section.

Book

The screenshot shows the Edge Impulse Studio interface. The sidebar is identical to the previous screenshot. The main area displays a dataset titled "Dataset" with 40 items. It shows a "DATA COLLECTED" section with 40 items and a "TRAIN / TEST SPLIT" of 80% / 20%. Below this is a "Dataset" section with "Training" and "Test" tabs, displaying six images of books labeled "Book". To the right is a "Collect data" section with a "RAW DATA" section titled "Book.6egvd3pk" showing a video feed of a book, and a "Metadata" section.

Step 2: Create Impulse

Configure the impulse by selecting image input size, preprocessing block, and learning block.

The screenshot shows the Edge Impulse web interface for creating a machine learning model. The main window displays the configuration for 'Impulse #1'. On the left, a sidebar provides navigation through various project components like Dashboard, Devices, and Experiments. The central workspace is divided into several panels: 'Image data' (specifying input axes as 'image' with dimensions 96x96 and a resize mode of 'Fit shortest axis'), 'Image' (setting the name to 'Image' and specifying the input axis as 'image'), 'Transfer Learning (Images)' (configuring a transfer learning model with a name of 'Transfer learning', input features set to 'Image', and output features including 'Book', 'Bottle', 'Keys', and 'Pen'), and 'Output features' (listing the four output categories). A large button at the bottom right says 'Save impulse'. A 'Resume tutorial' button is also present.

Step 3: Image Preprocessing

Resize and preprocess images using the Image block.

This screenshot shows the 'Generate features' step in the Edge Impulse interface. The main workspace is titled 'Generate features'. It displays a 'Raw data' section with an image of a pen and a bottle, a 'Raw features' section showing a list of hex values, a 'Parameters' section where the 'Image' color depth is set to 'RGB', and a 'DSP result' section showing a processed image. Below these are sections for 'Processed features' (a list of numerical values) and 'On-device performance' (showing a processing time of 1 ms and a peak RAM usage of 4 KB). A 'Save parameters' button is located in the 'Parameters' section, and a 'Resume tutorial' button is at the bottom right.

Step 4: Feature Generation

Generate features from the pre-processed images

The screenshot shows the Edge Impulse web interface. On the left, a sidebar menu includes options like Dashboard, Devices, Data acquisition, Experiments, EON Tuner, Impulse design (Create impulse, Image, Transfer learning, Retrain model), Live classification, Model testing, Deployment, and an Upgrade Plan. The main area has tabs for Parameters and Generate features. Under Parameters, there's a 'Training set' section showing 32 items and 4 classes (Book, Bottle, Keys, Pen). A 'Generate features' button is present. Below it is a 'Feature generation output' section with a dropdown menu showing '(0)'. To the right is a 'Feature explorer' section with a loading message. At the bottom, there's an 'On-device performance' summary with a processing time of 1 ms and peak RAM usage of 4 KB. A 'Resume tutorial' button is at the bottom right.

Step 5: Transfer Learning & Model Testing

Train the model using transfer learning & evaluate the trained model using test data.

The screenshot shows the Edge Impulse web interface. The sidebar is identical to the previous screenshot. The main area has two main sections: 'Transfer learning settings' on the left and 'Training output' on the right. In 'Transfer learning settings', there are sections for 'Training settings' (Training processor: CPU, Number of training cycles: 30, Learning rate: 0.001, Model size: 80 - 4M params, 16 MB, Use pretrained weights checked, Freeze % of layers: 90, Last layers: dense: 32, dropout: 0.1, Data augmentation: flip, crop, brightness) and 'Advanced training settings'. In 'Training output', there's a 'Model' section showing 'Model version: Quantized (int8)'. It displays 'Last training performance (validation set)' with accuracy at 100.0% and loss at 0.00. A 'Confusion matrix (validation set)' table is shown:

| | BOOK | BOTTLE | KEYS | PEN |
|--------|------|--------|------|------|
| BOOK | 100% | 0% | 0% | 0% |
| BOTTLE | 0% | 100% | 0% | 0% |
| KEYS | 0% | 0% | 100% | 0% |
| PEN | 0% | 0% | 0% | 100% |

Below the confusion matrix are 'Metrics (validation set)' and a 'Data explorer (full training set)' section which is currently loading.