

# **EDGE INTELLIGENCE LABORATORY 5**

**MACSE604**

**SHIBU P  
25MML0042**

## **EDGE IMPULSE**

### **1.Click Data Acquisition:**

Navigate to the Data Acquisition section, where all sensor and image data collection is managed.

### **2.Select Connect to device:**

Choose the option to connect a device for data collection, which allows real-time image capture.

### **3. Use mobile phone and scan the QR code:**

Select the mobile phone option and scan the displayed QR code using your phone's browser to establish a connection.

### **4.Connect the mobile phone as a camera:**

Once connected, the mobile phone camera acts as an input device for capturing images directly into Edge Impulse.

### **5.Capture sample images:**

Use the phone camera to capture images under different lighting and angles to improve model robustness.

### **6.Collect images for training and testing:**

Capture a sufficient number of images and split them into training and testing datasets for proper model evaluation.

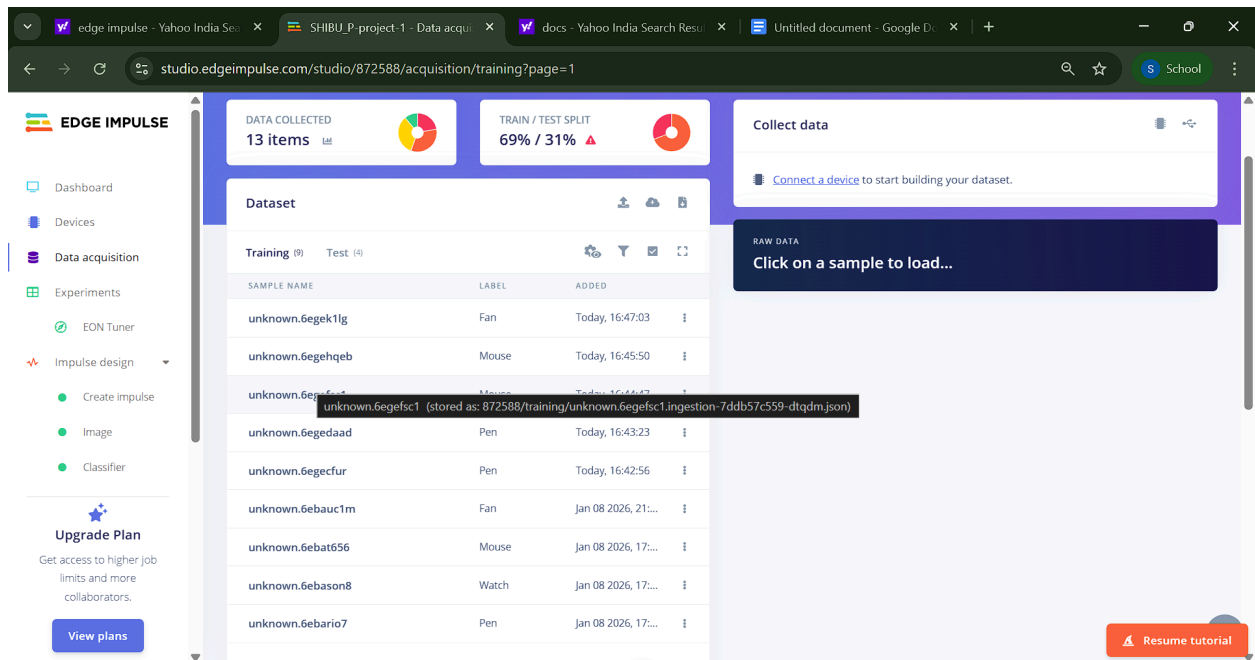
### **7.Rename images with meaningful names:**

Assign clear and descriptive filenames to images to help identify classes and improve dataset organization.

## 8.Label all images correctly:

Apply accurate labels to each image so the model can correctly learn and distinguish between different classes.

## Training Data with size if Nine (9):

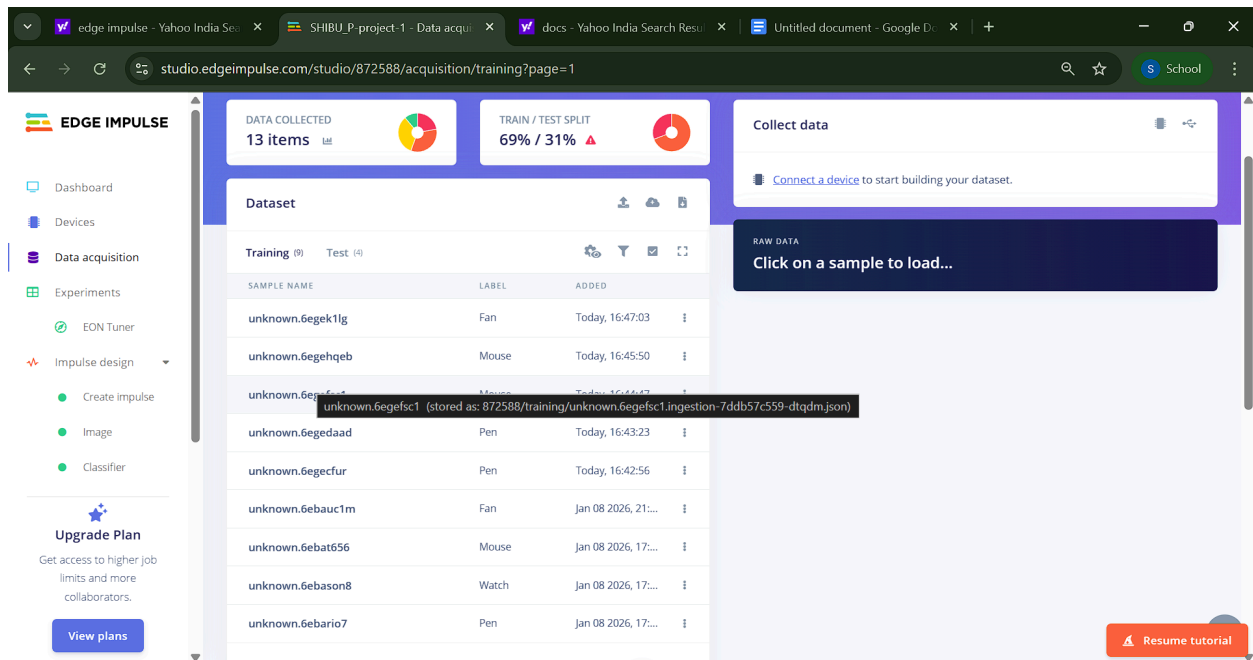


The screenshot displays the Edge Impulse Studio interface for a project named "SHIBU\_P-project-1". The main view shows a dataset with 13 items, split into Training (9) and Test (4). The dataset is labeled "unknown.6egefsc1" and is stored as "872588/training/unknown.6egefsc1.ingestion-7ddb57c559-dtqdm.json". The table lists the following samples:

| SAMPLE NAME      | LABEL | ADDED               |
|------------------|-------|---------------------|
| unknown.6egek1lg | Fan   | Today, 16:47:03     |
| unknown.6egehqeb | Mouse | Today, 16:45:50     |
| unknown.6egefsc1 | Mouse | Today, 16:44:44     |
| unknown.6egedaad | Pen   | Today, 16:43:23     |
| unknown.6egecfur | Pen   | Today, 16:42:56     |
| unknown.6ebauc1m | Fan   | Jan 08 2026, 21:... |
| unknown.6ebat656 | Mouse | Jan 08 2026, 17:... |
| unknown.6ebason8 | Watch | Jan 08 2026, 17:... |
| unknown.6ebario7 | Pen   | Jan 08 2026, 17:... |

The interface also shows a "Collect data" section with a "Connect a device" button and a "RAW DATA" section with a "Click on a sample to load..." button. A "Resume tutorial" button is visible in the bottom right corner.

## Testing Data with size of Four:



### 1. Open Impulse Design and click Create Impulse.

Go to the Impulse Design section and click “Create Impulse” to define the data flow for model training.

### 2. Add a Processing Block as Image.

Select the Image processing block to convert raw image data into features suitable for learning.

### 3. Add a Learning Block as Image Classification.

Choose the Image Classification learning block to enable the system to classify images into predefined categories.

### 4. Click Save Impulse.

Save the impulse configuration so the processing and learning blocks

are applied to the dataset.

**5.In Impulse Design, click on Image.**

Open the Image processing page to configure parameters such as image size and color depth.

**6.Click Generate Features to extract image features.**

Generate features from the uploaded images, transforming visual information into numerical representations.

**7.After feature generation is complete, go to Image Classification (Classifier).**

Navigate to the classifier section to prepare the model for training using the extracted features.

**8.Click Start Training.**

Start the training process, where the model learns patterns from the labeled image data.

**9.Once training is finished, the model accuracy will be displayed for the images you uploaded.**

The platform shows performance metrics such as accuracy, indicating how well the trained model classifies the images.

**10.Test with live classification:**

Try using sample test data

edge impulse - Yahoo India Se...Profile - Projects - Edge Impulse - docs - Yahoo India Search Resu...+studio.edgeimpulse.com/studio/profile/projects

EDGE IMPULSE

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ProjectsCustom ML blocks

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SHIBU\_P

DEVELOPER

Enable MFA

Multi-factor authentication is now available for all users. [Set up now.](#)

Organizations

Allow anyone on your team to collaborate on multiple datasets, automation, and models in a shared workspace.

Request Enterprise Trial

Projects

Sort + Create new project

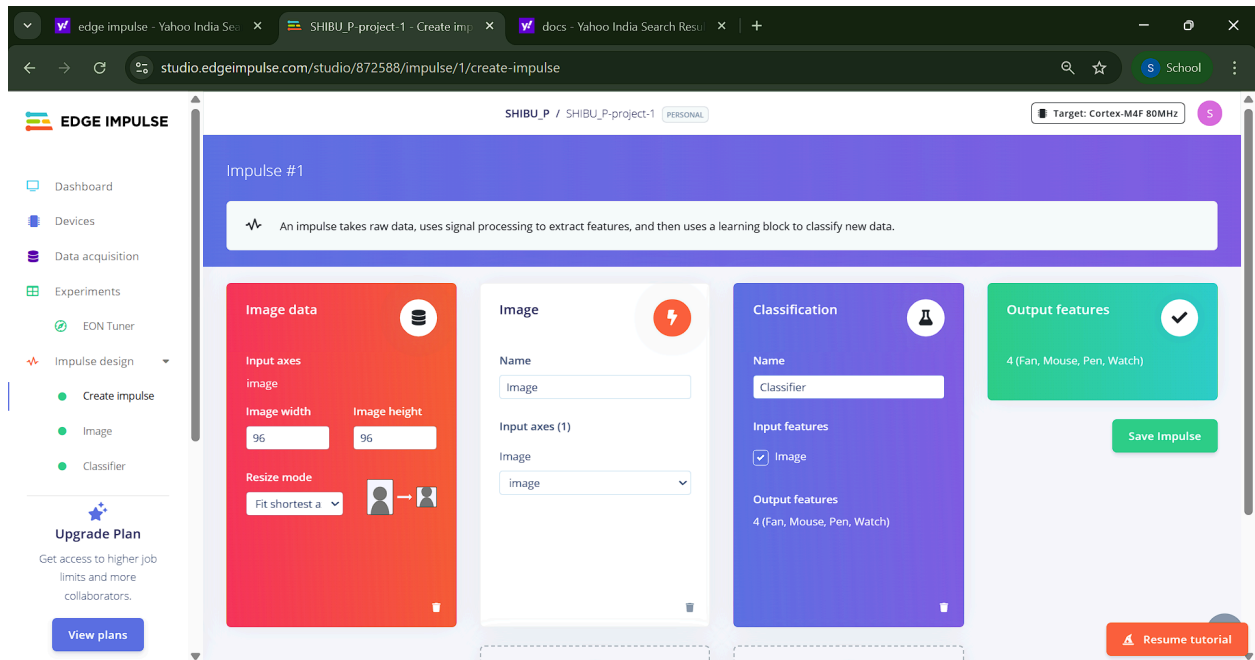
2 of 3 private projects remaining. Want access to more? [Request Enterprise Trial.](#)

S

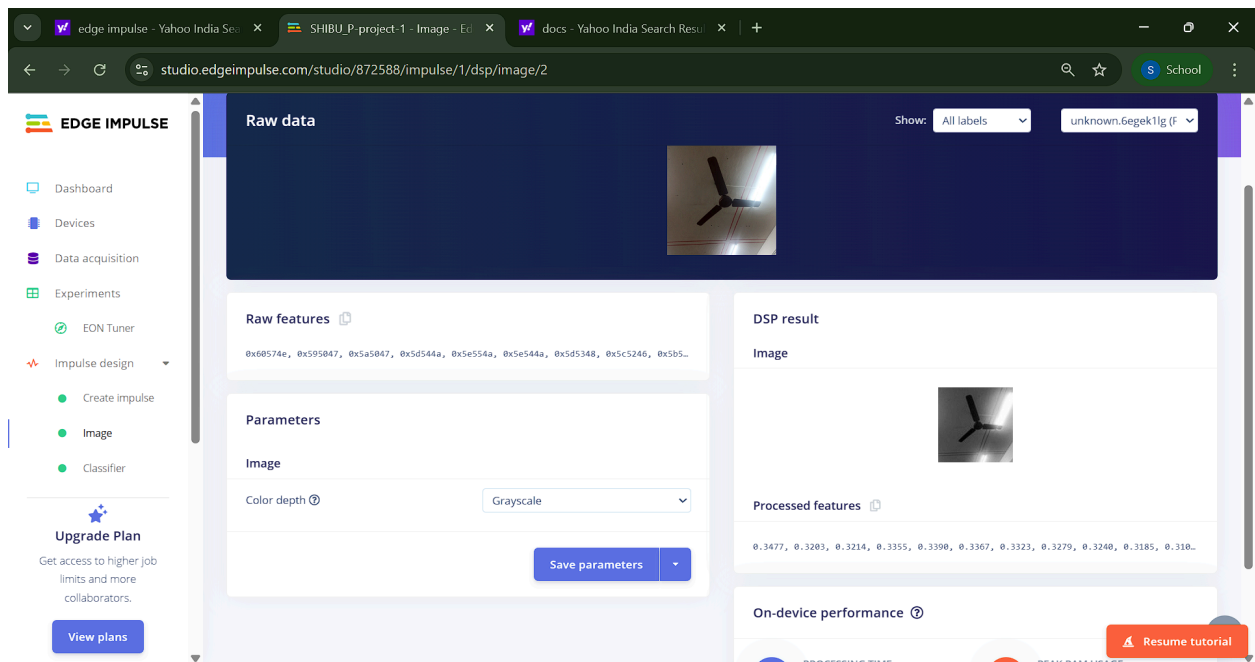
SHIBU\_P / SHIBU\_P-project-1

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## Creating Impulse:



## Changing into grayscale image:



# Generate features:

The screenshot shows the Edge Impulse Studio web interface at the URL `studio.edgeimpulse.com/studio/872588/impulse/1/dsp/image/2/generate-features`. The interface is divided into several sections:

- Left Sidebar:** Contains navigation links for Dashboard, Devices, Data acquisition, Experiments, EON Tuner, Impulse design, and an Upgrade Plan section.
- Top Bar:** Labeled 'Parameters' and 'Generate features'.
- Training set:** A table showing 'Data in training set' as '9 items' and 'Classes' as '4 (Fan, Mouse, Pen, Watch)'. A 'Generate features' button is located below this table.
- Feature explorer:** A scatter plot showing data points for four classes: Fan (blue), Mouse (orange), Pen (green), and Watch (red). The plot has a grid background.
- Feature generation output:** A section with a dropdown menu currently showing '(0)'.
- On-device performance:** A section at the bottom right with a 'Resume tutorial' button.



# Classifier with two Convolution and pooling layer with dropout and flatten layer and achieved an accuracy of 50 %:

The screenshot shows the Edge Impulse Studio interface for a project named "SHIBU\_P / SHIBU\_P-project-1". The "Neural Network settings" panel is active, displaying training parameters: Number of training cycles (10), Use learned optimizer (unchecked), Learning rate (0.0005), and Training processor (CPU). The "Neural network architecture" section shows a sequence of layers: Input layer (9,216 features), 2D conv / pool layer (16 filters, 3 kernel size, 1 layer), and 2D conv / pool layer (32 filters, 3 kernel size, 1 layer). The "Training output" panel shows the last training performance (validation set) with an accuracy of 50.0% and a loss of 1.40. A confusion matrix is displayed for the validation set, showing a 50% accuracy for the "MOUSE" class. The "Metrics" section shows a weighted average precision of 1.00 and a weighted average recall of 0.50.

**Neural Network settings**

**Training settings**

- Number of training cycles: 10
- Use learned optimizer: ☐
- Learning rate: 0.0005
- Training processor: CPU

**Advanced training settings**

**Neural network architecture**

- Neural network
- Transfer learning

Input layer (9,216 features)

2D conv / pool layer (16 filters, 3 kernel size, 1 layer)

2D conv / pool layer (32 filters, 3 kernel size, 1 layer)

**Training output**

Model version: Quantized (int8)

**Last training performance (validation set)**

ACCURACY: 50.0% LOSS: 1.40

**Confusion matrix (validation set)**

|          | FAN | MOUSE | PEN  | WATCH |
|----------|-----|-------|------|-------|
| FAN      | -   | -     | -    | -     |
| MOUSE    | 0%  | 50%   | 50%  | 0%    |
| PEN      | -   | -     | -    | -     |
| WATCH    | -   | -     | -    | -     |
| F1 SCORE |     | 0.67  | 0.00 |       |

**Metrics (validation set)**

| METRIC                     | VALUE |
|----------------------------|-------|
| Weighted average Precision | 1.00  |
| Weighted average Recall    | 0.50  |

[Resume tutorial](#)

The screenshot shows the Edge Impulse Studio interface for the same project. The "Neural network architecture" section is expanded, showing the full sequence of layers: Input layer (9,216 features), 2D conv / pool layer (16 filters, 3 kernel size, 1 layer), 2D conv / pool layer (32 filters, 3 kernel size, 1 layer), Flatten layer, Dropout (rate 0.25), Add an extra layer, and Output layer (4 classes). The "Metrics" section shows the validation set performance: Weighted average Precision (1.00), Weighted average Recall (0.50), and Weighted average F1 score (0.67). The "Data explorer" section shows a scatter plot of the full training set, with points colored by class and correctness. The "On-device performance" section shows the inference time (587 ms), peak RAM usage (182.7K), and flash usage (106.1K).

**Neural network architecture**

- Neural network
- Transfer learning

Input layer (9,216 features)

2D conv / pool layer (16 filters, 3 kernel size, 1 layer)

2D conv / pool layer (32 filters, 3 kernel size, 1 layer)

Flatten layer

Dropout (rate 0.25)

Add an extra layer

Output layer (4 classes)

[Save & train](#)

**Metrics (validation set)**

| METRIC                     | VALUE |
|----------------------------|-------|
| Weighted average Precision | 1.00  |
| Weighted average Recall    | 0.50  |
| Weighted average F1 score  | 0.67  |

**Data explorer (full training set)**

● Fan - correct  
● Mouse - correct  
● Pen - correct  
● Watch - correct  
● Mouse - incorrect

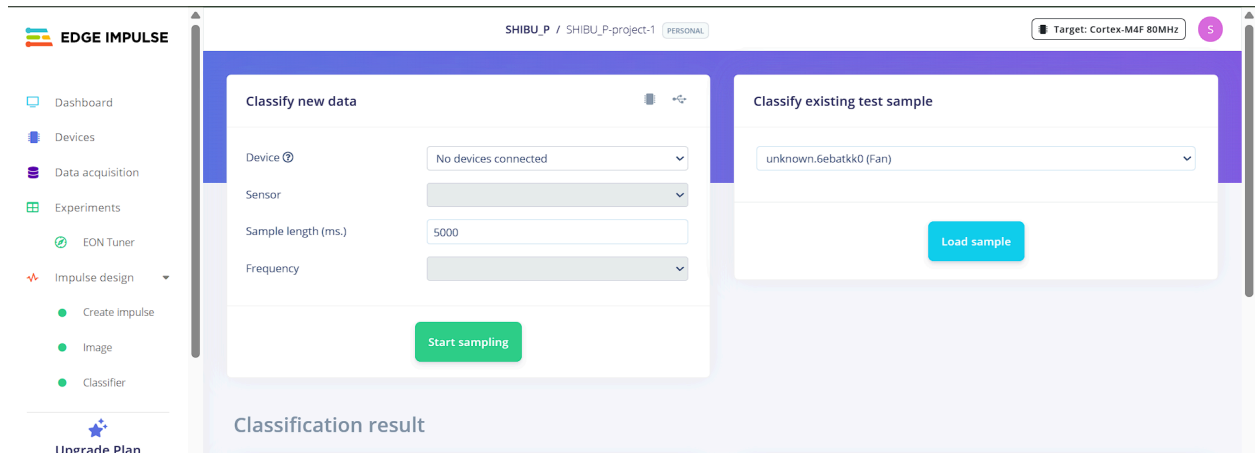
**On-device performance**

Engine: EON™ Compiler

- INFERENCE TIME: 587 ms.
- PEAK RAM USAGE: 182.7K
- FLASH USAGE: 106.1K

[Resume tutorial](#)

### Testing with (Fan) image:



**The model predicted an highest probability as Fan:**

