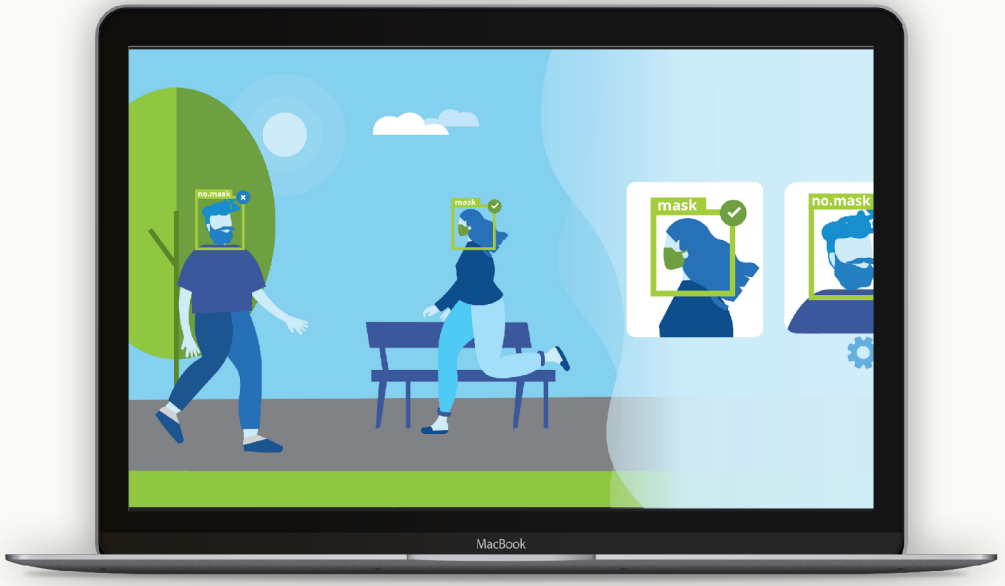
Face Mask Detection



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Task : Binary Classification of Images

Problem Statement : Classify Images belonging to two categories -> "With Mask" & "Without Mask"

Current State-of-the-Art : Convolutional Neural Network Architectures

Networks of choice : Inception-v3 Network, MobileNet-v2 Network

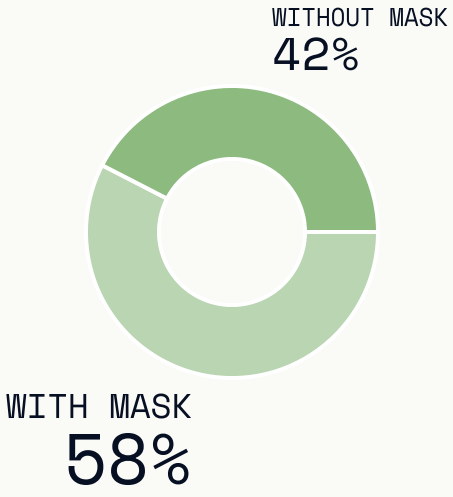
With Mask

Without Mask

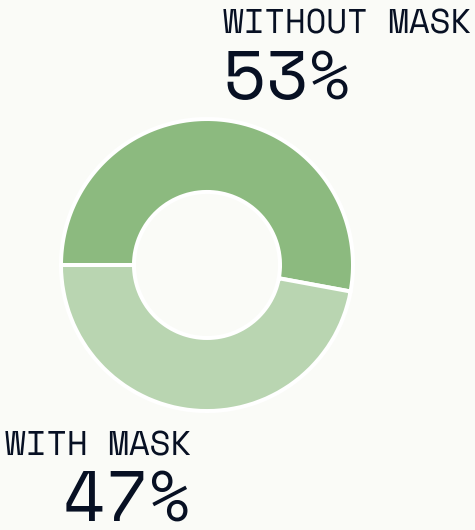
Dataset Description

LABEL	TRAIN	TEST
WITH MASK	594	154
WITHOUT MASK	438	173
TOTAL	1,032	397

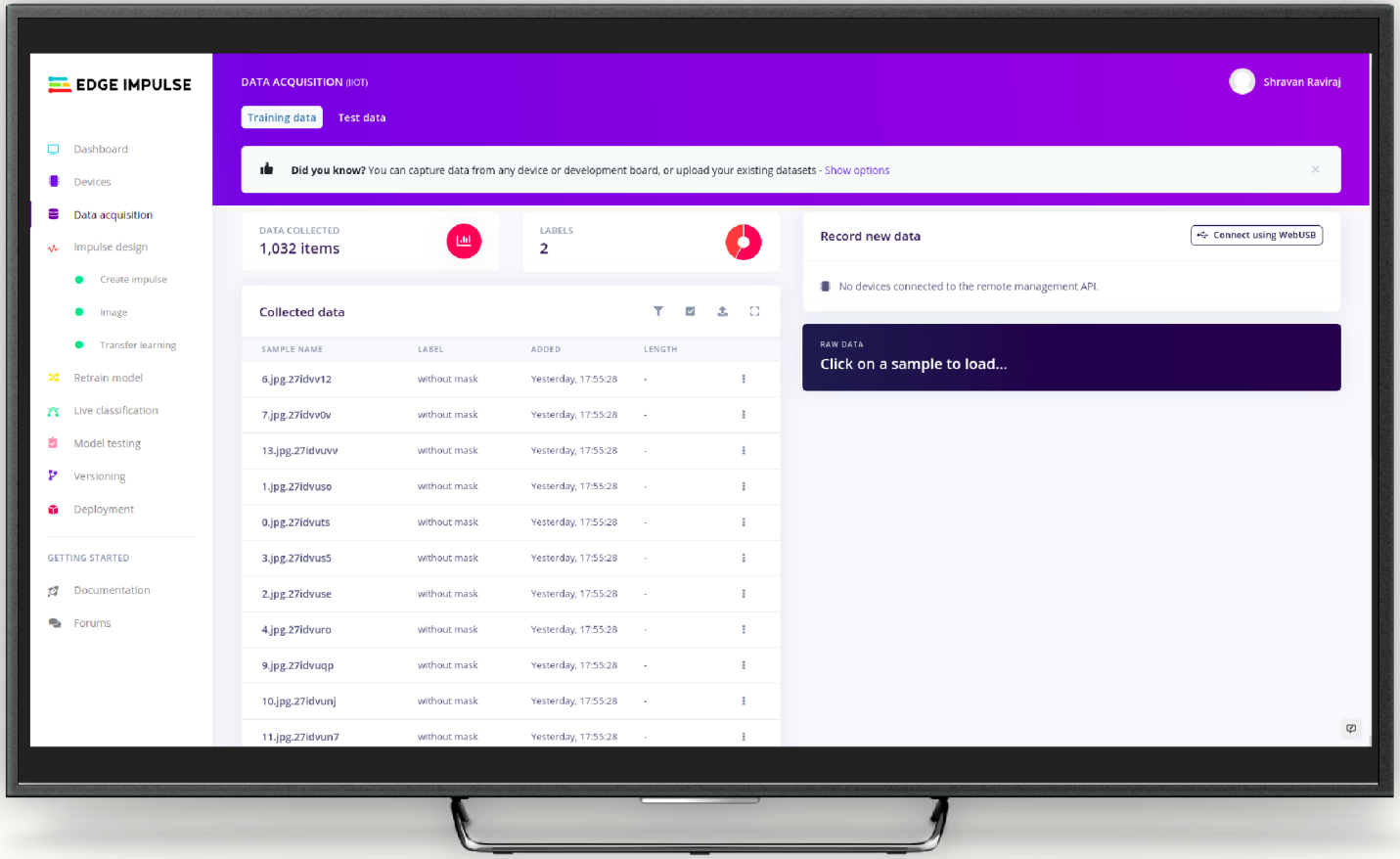
TRAINING DATA



TESTING DATA

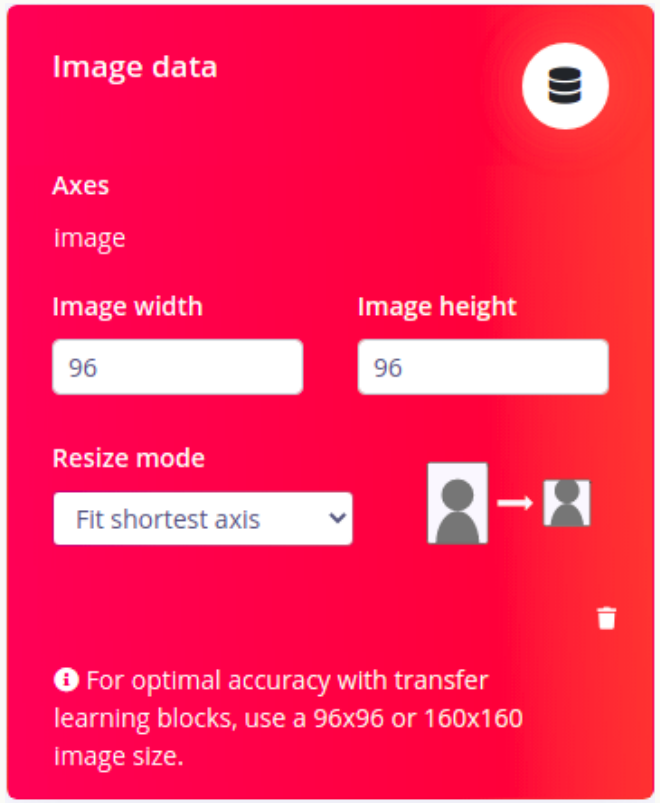


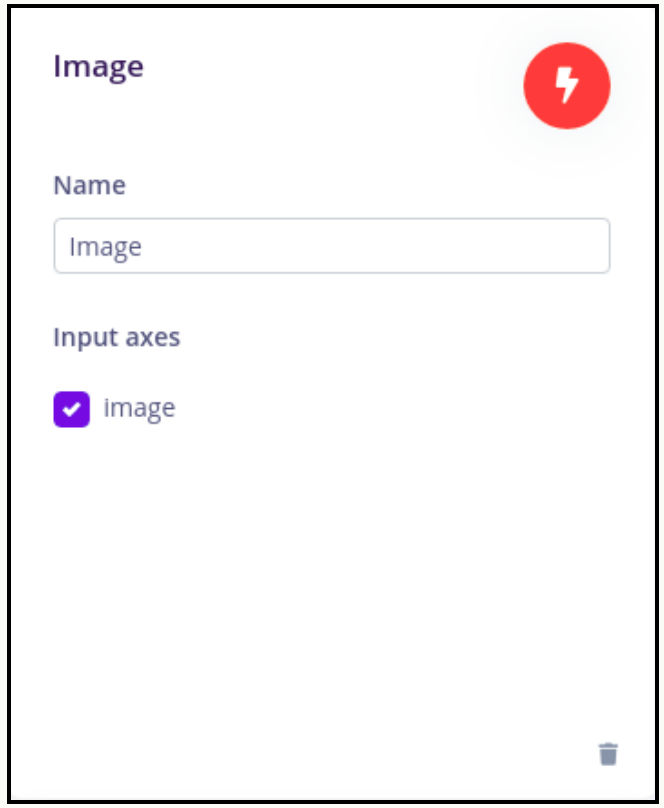
EDGE IMPULSE - Data Acquistion

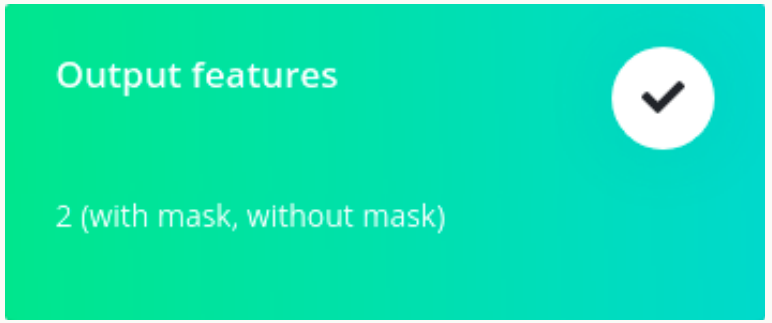


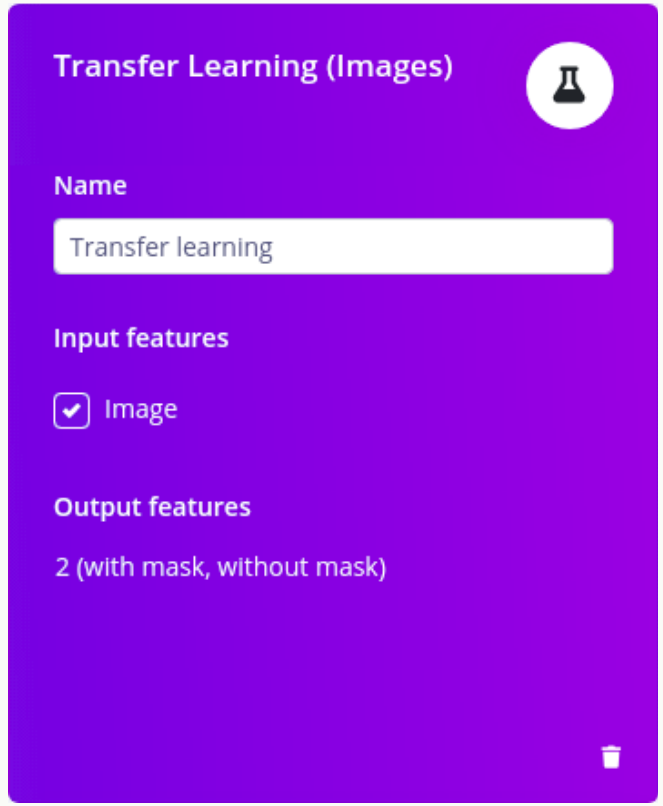
Dataset was prepared by collecting images from various online sources and was uploaded onto Edge Impulse

IMPULSE DESIGN





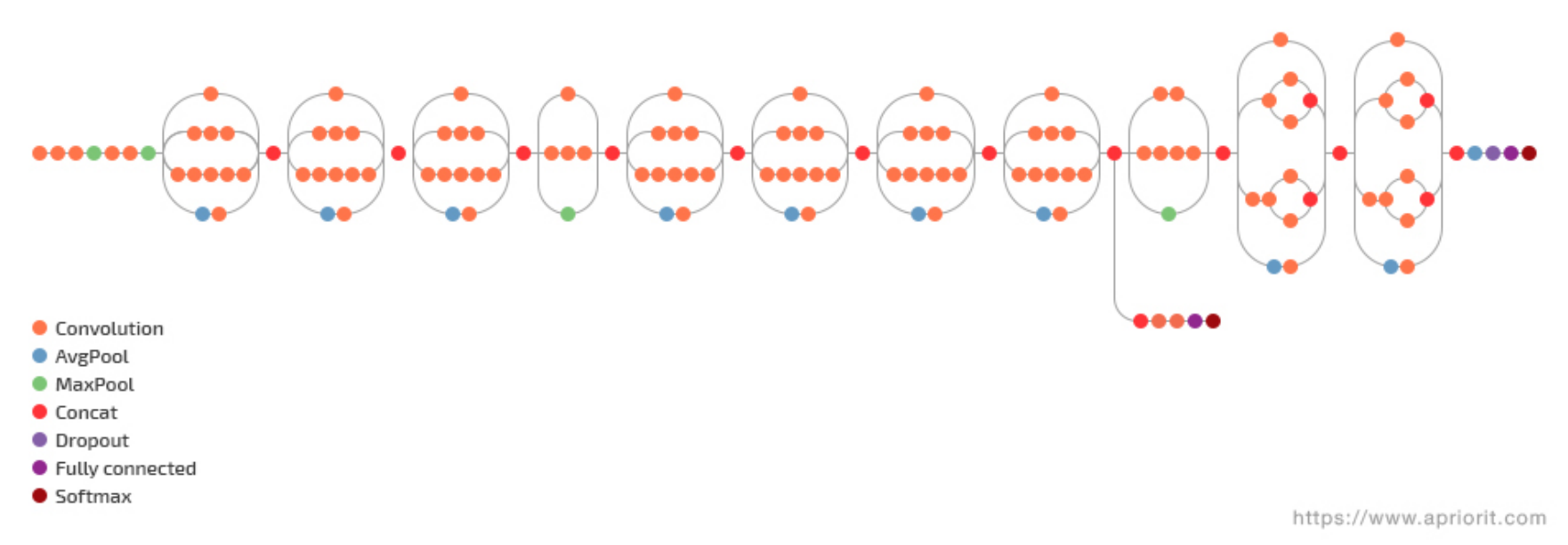




Transfer Learning - Architecture

Inception-v3

Inception is created to serve the purpose of reducing the computational burden of deep neural nets while obtaining state-of-art performance. As the network goes deeper, the computational efficiency will also decrease, therefore the authors of Inception were interested in finding a solution to scale up neural nets without increasing computational cost.



Training Results

Inception-v3

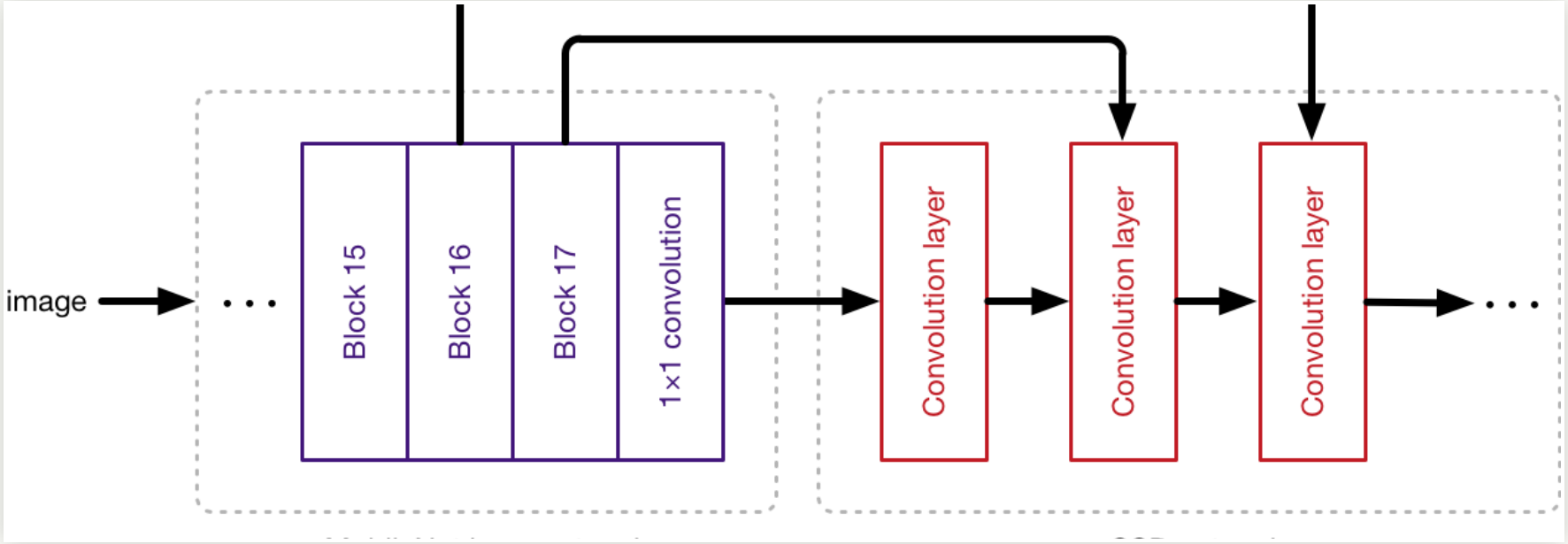
```
Epoch 1/6
51/51 [==============================] - 107s 2s/step - loss: 0.7256 - accuracy: 0.8227
Epoch 2/6
51/51 [==============================] - 103s 2s/step - loss: 0.2156 - accuracy: 0.9241
Epoch 3/6
51/51 [==============================] - 98s 2s/step - loss: 0.1802 - accuracy: 0.9429
Epoch 4/6
51/51 [==============================] - 98s 2s/step - loss: 0.1781 - accuracy: 0.9527
Epoch 5/6
51/51 [==============================] - 98s 2s/step - loss: 0.1152 - accuracy: 0.9576
Epoch 6/6
51/51 [==============================] - 106s 2s/step - loss: 0.1188 - accuracy: 0.9616
```

Accuracy =
96.16%

Transfer Learning - Architecture

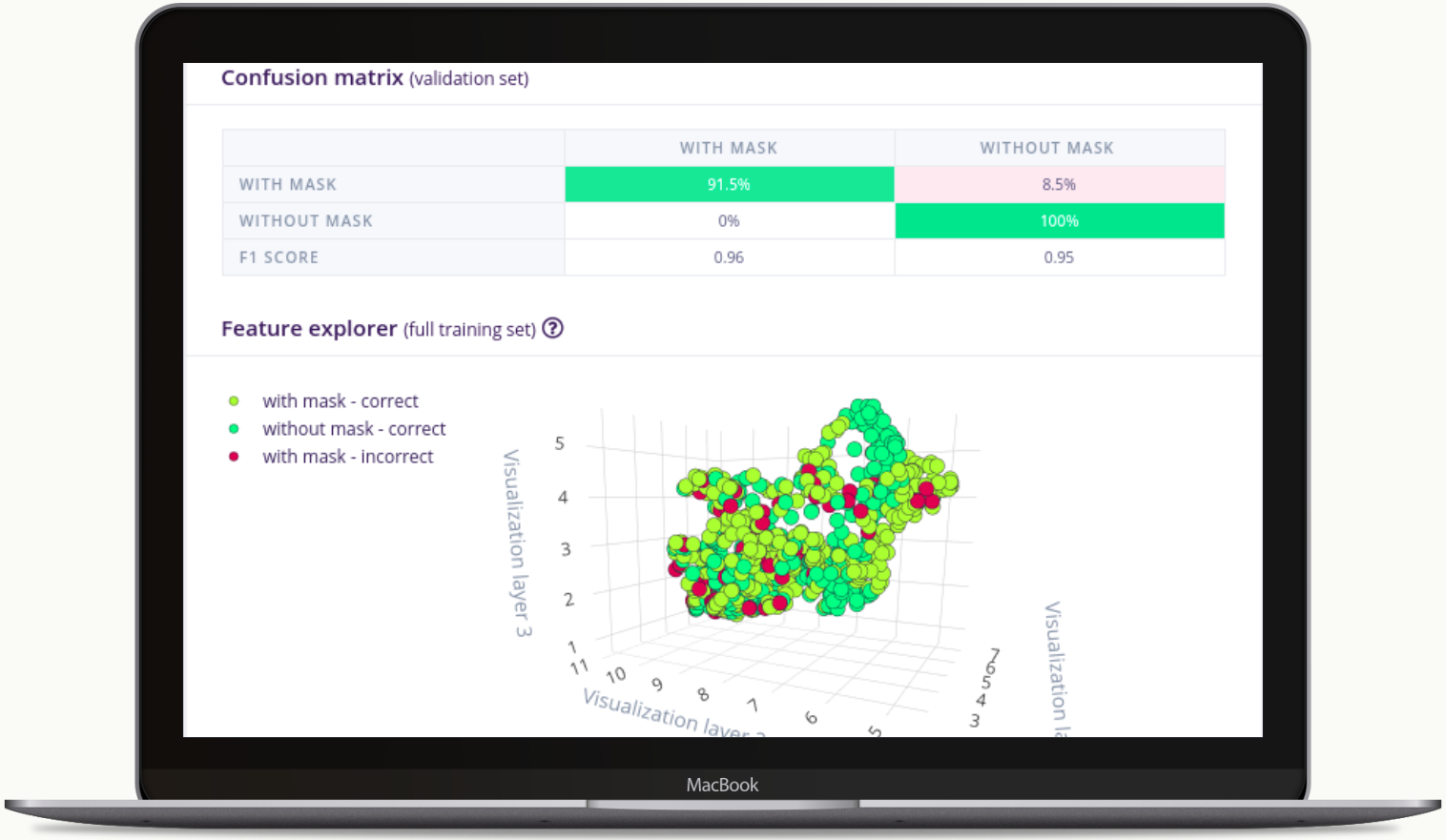
MobileNet-v2

MobileNetV2 is a convolutional neural network architecture that seeks to perform well on mobile devices. It is based on an inverted residual structure where the residual connections are between the bottleneck layers. The intermediate expansion layer uses lightweight depthwise convolutions to filter features as a source of non-linearity. As a whole, the architecture of MobileNetV2 contains the initial fully convolution layer with 32 filters, followed by 19 residual bottleneck layers.



Training Results

MobileNet-v2



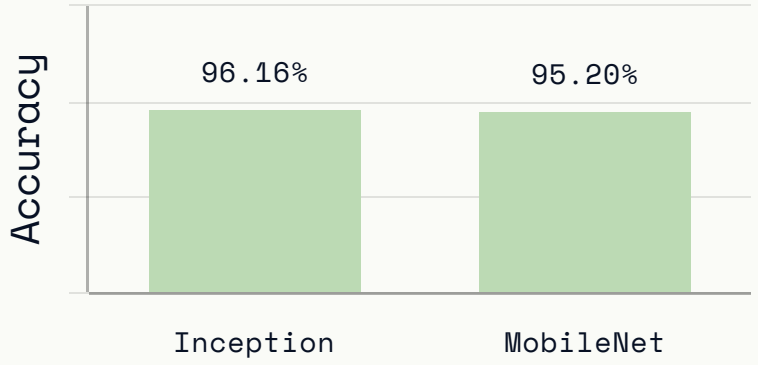
Accuracy = 95.2%

Transfer Learning - Architecture

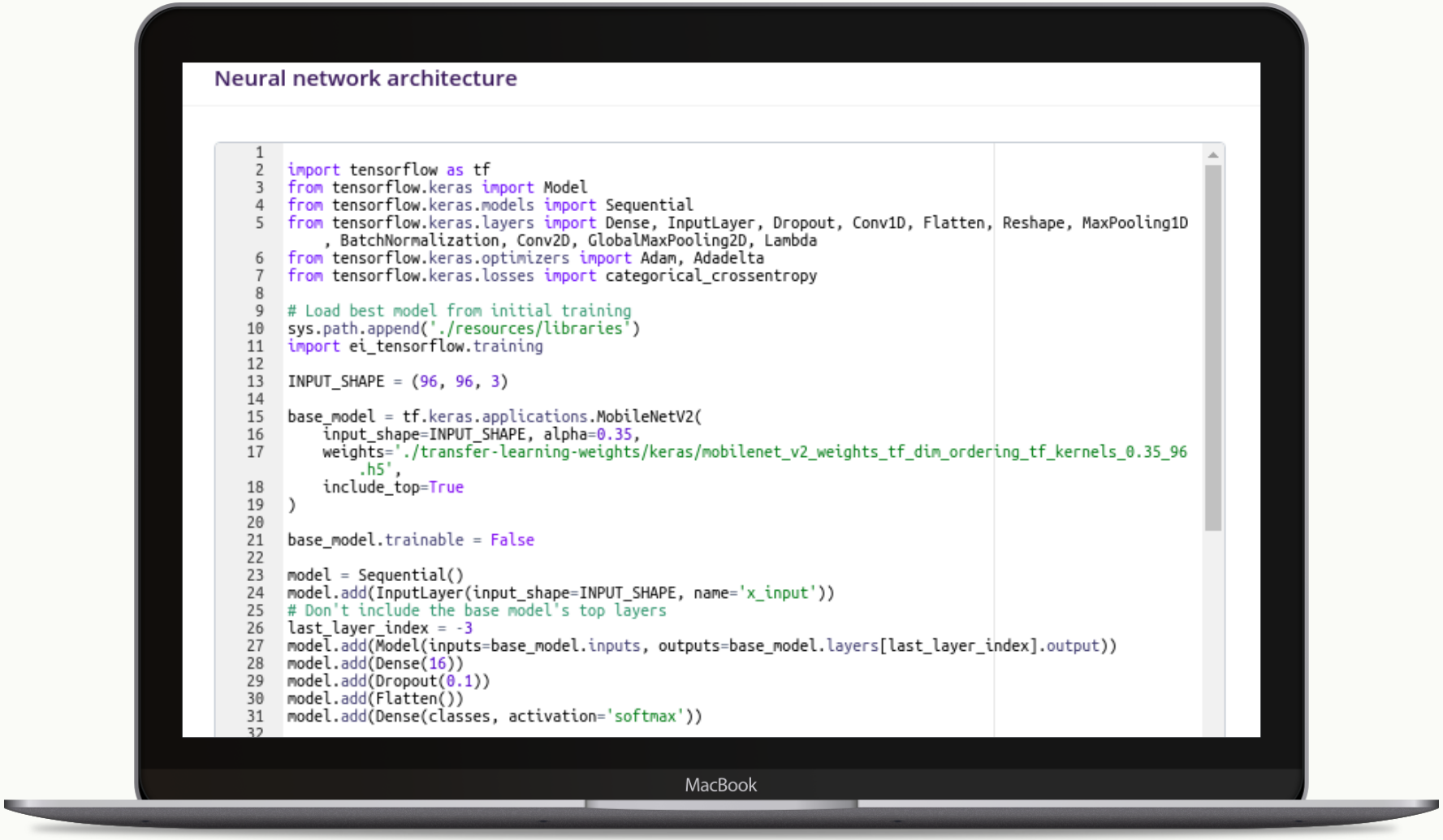
MobileNet-v2 vs Inception-v3

The major difference between InceptionV3 and Mobilenet is that Mobilenet uses Depthwise separable convolution while Inception V3 uses standard convolution. This results into lesser number of parameters in MobileNet compared to InceptionV3. However, this results in slight decrease in the performance as well.

The trend in the computer vision is to make deeper and more complicated network to achieve higher accuracy. However, deeper networks come with the tradeoff of size and speed. In real applications such as an autonomous vehicle or robotic visions, the object detection task must be able to be done on the computationally limited platform. MobileNet is developed to solve this problem, which is a network for embedded vision applications and mobile devices.



MobileNet-v2 was Implemented with the Keras Expert Mode on the Edge Impulse Platform



DEMONSTRATION

PLATFORM : EDGE IMPULSE
NEURAL NETWORK ARCHITECTURE : MobileNet-v2
DATA ACQUISITION DEVICE : Mobile Phone
Sensor : Camera