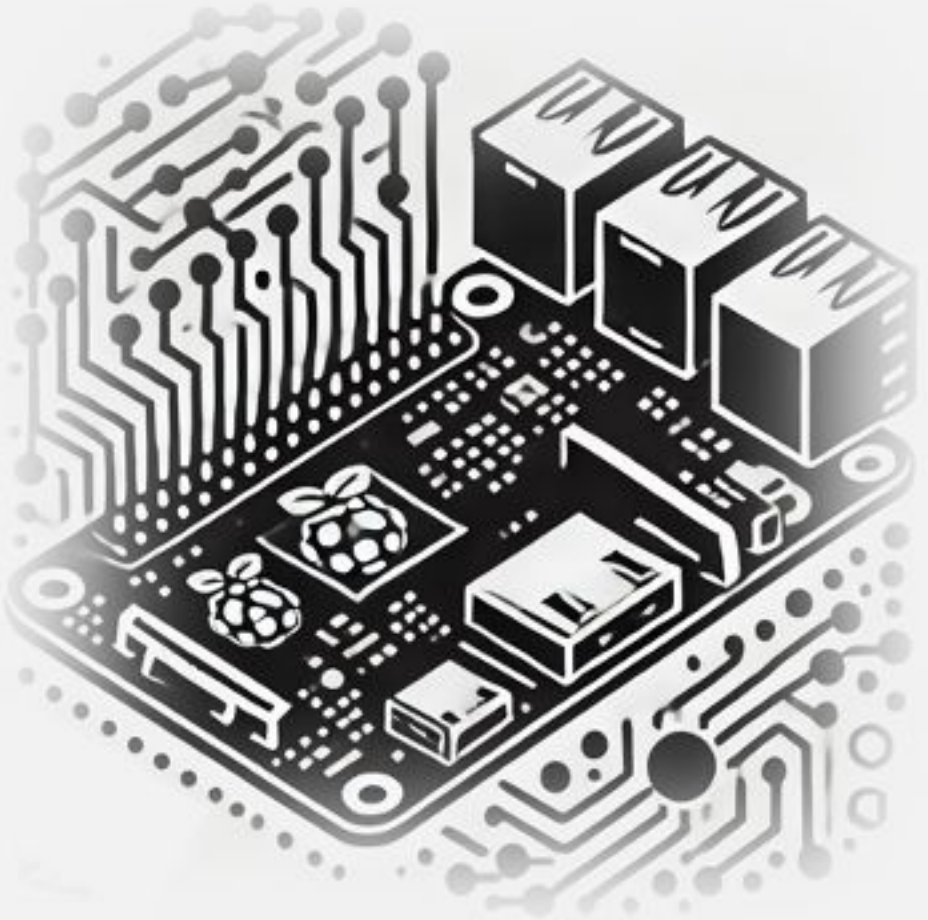
IESTI05 – Edge AI

Machine Learning System Engineering



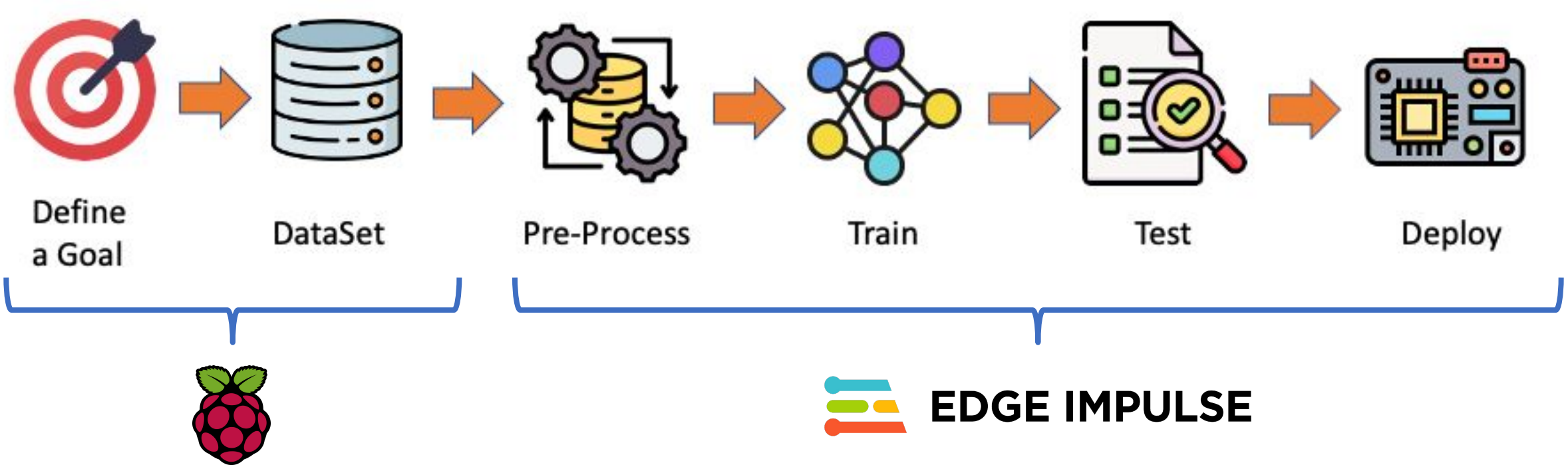
7. Image Classification Project: Training, Test & Deploy at EI

UNIFEI

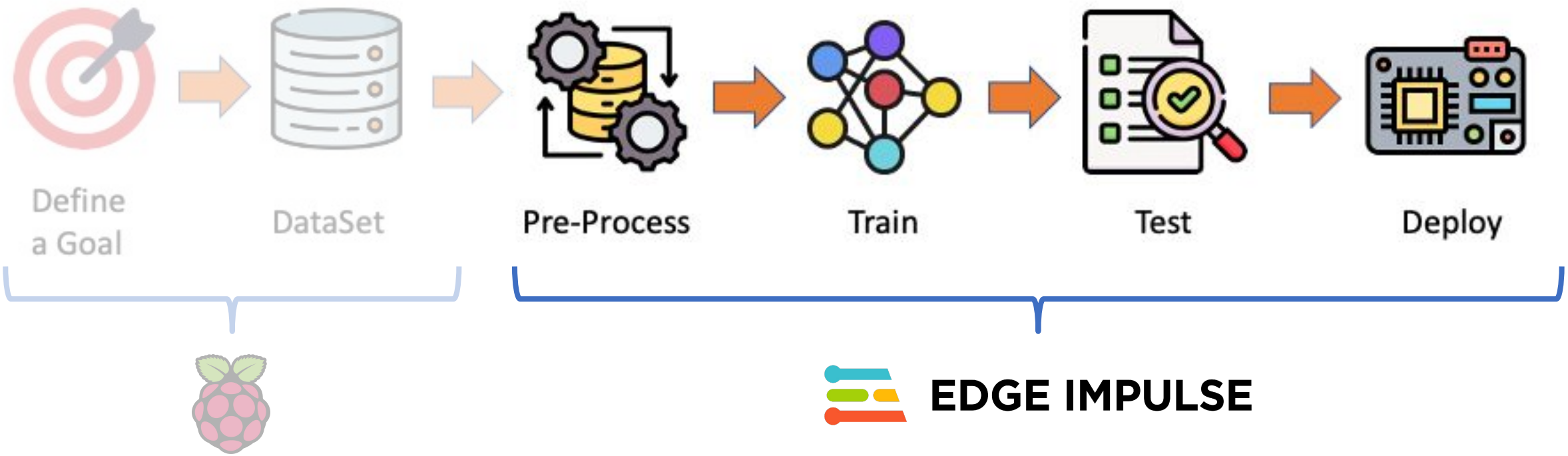
Marcelo Rovai

Professor Honoris Causa

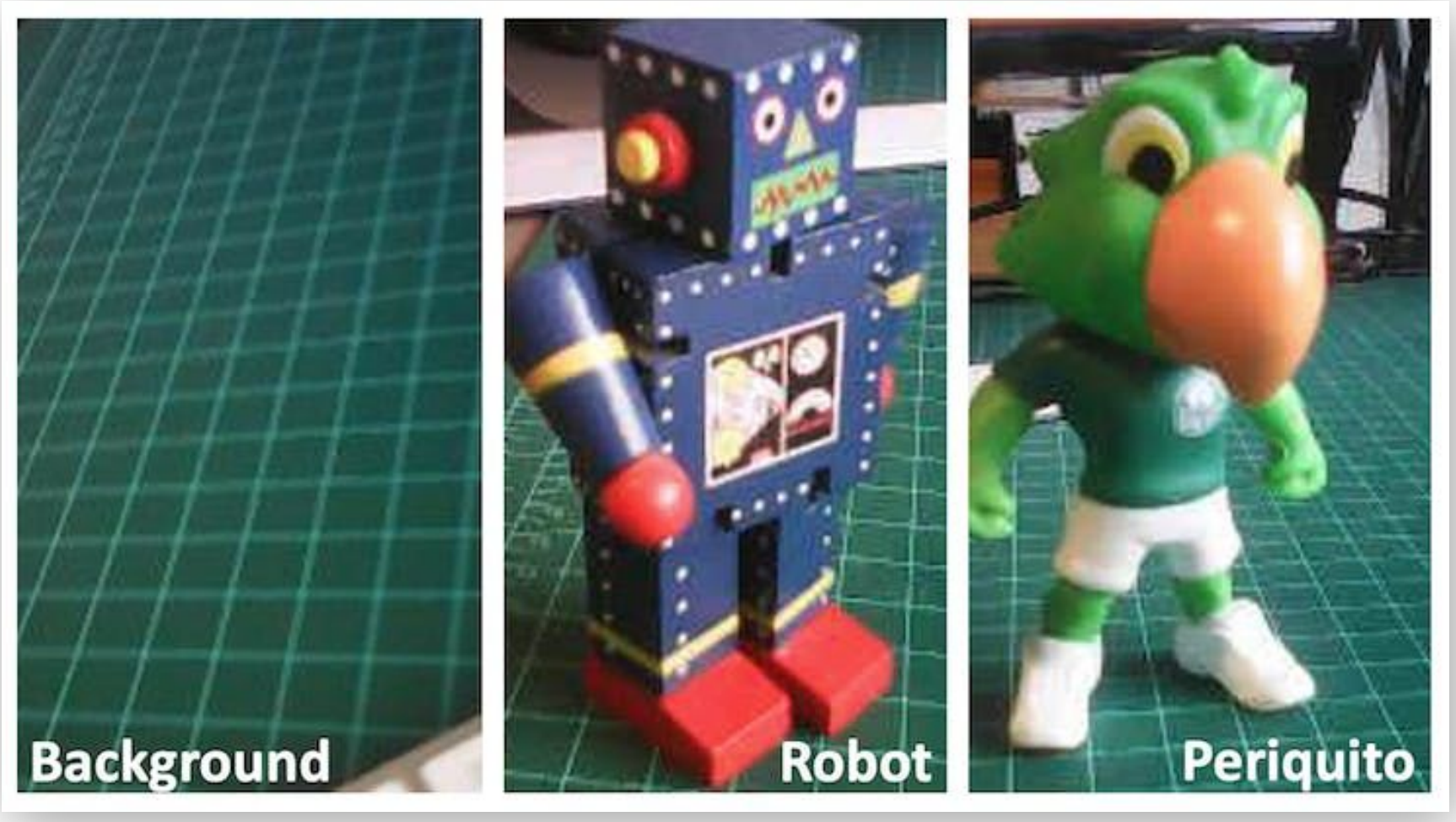
Machine Learning Workflow



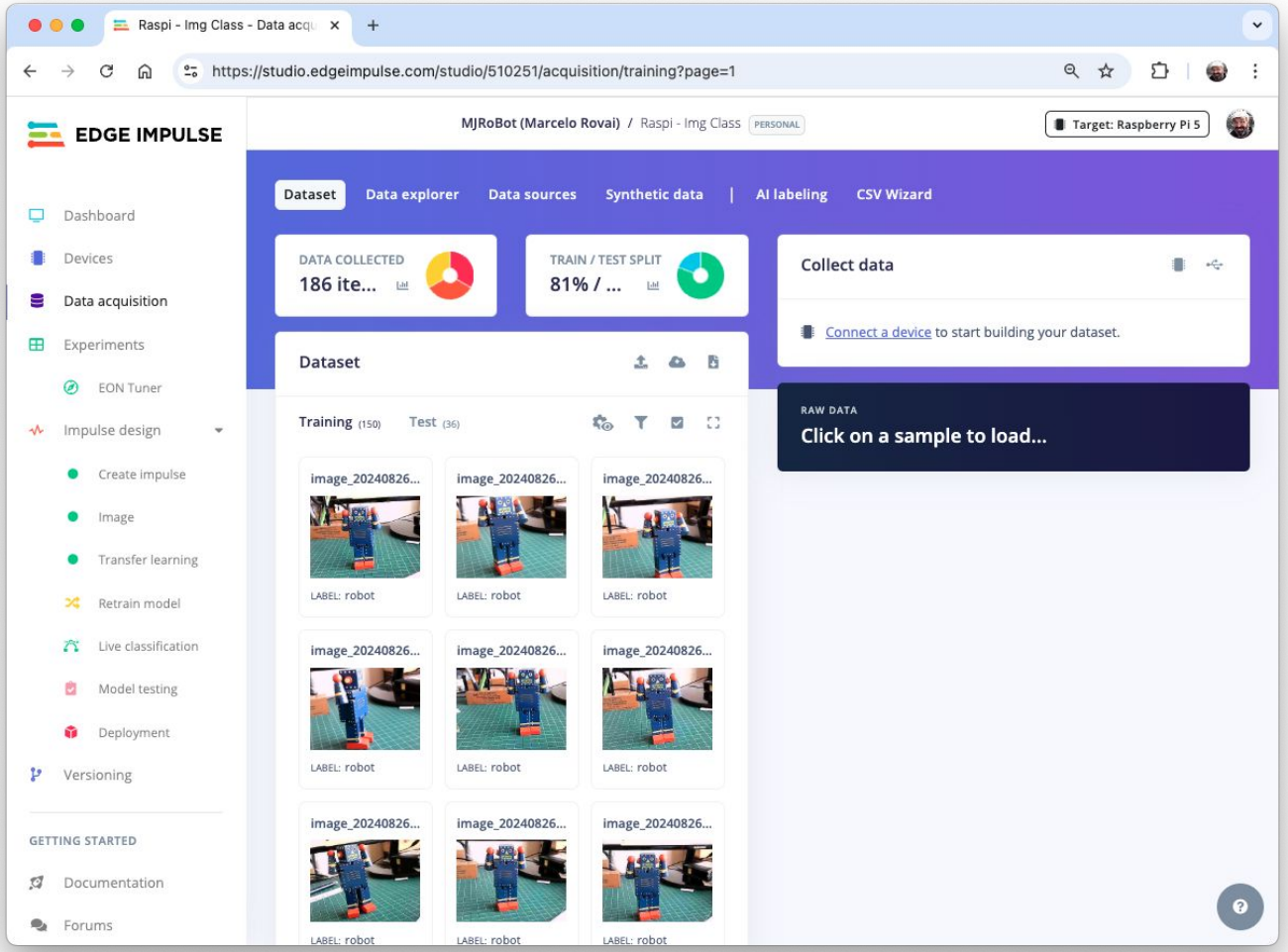
Machine Learning Workflow

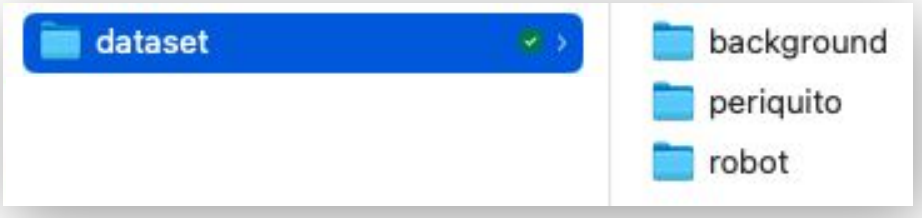


The Goal

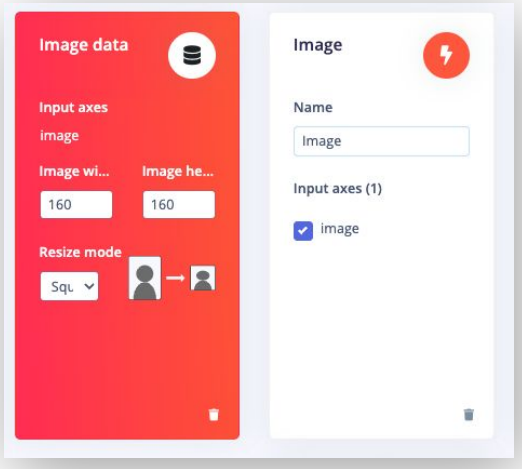


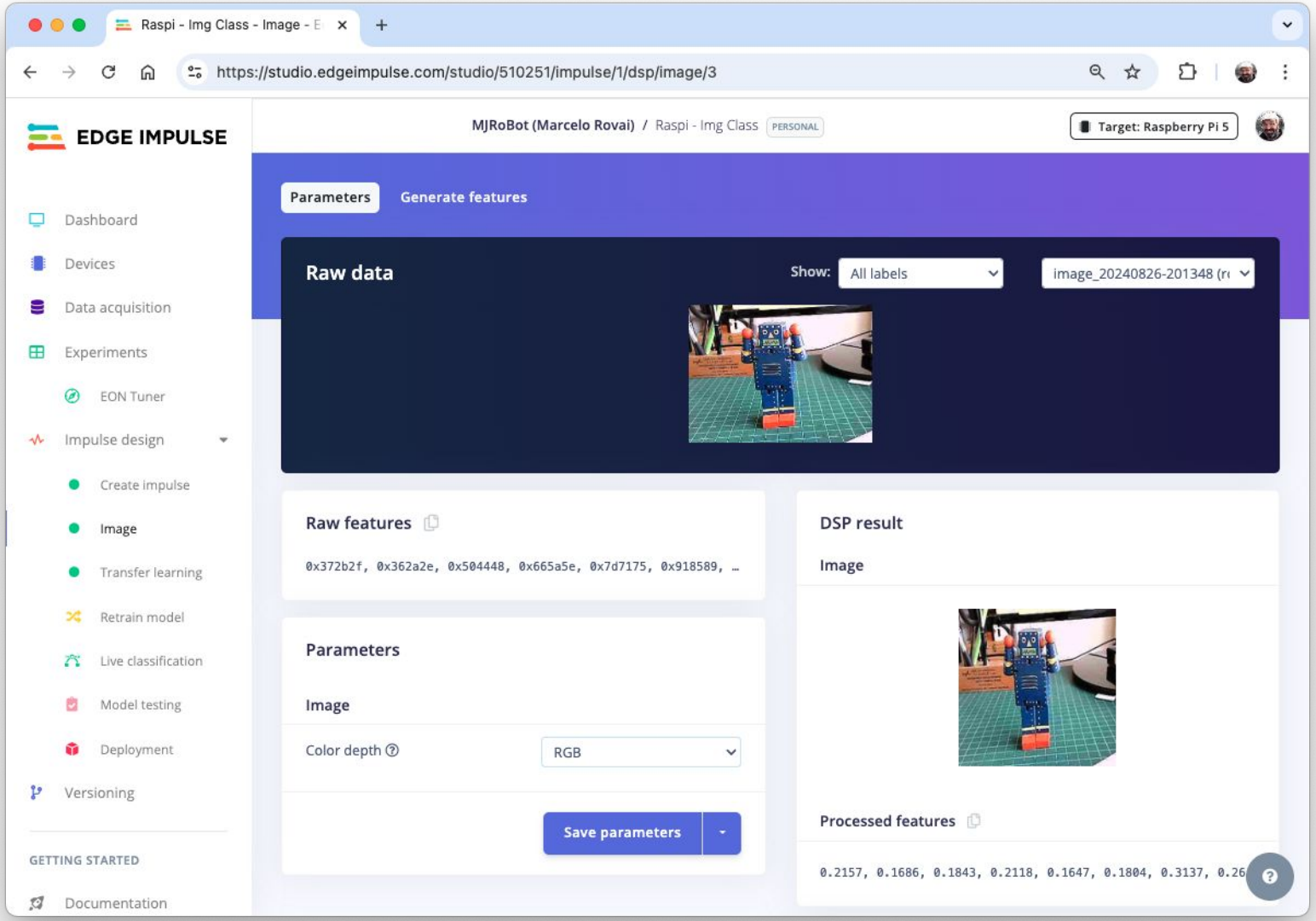
Data Aquisition



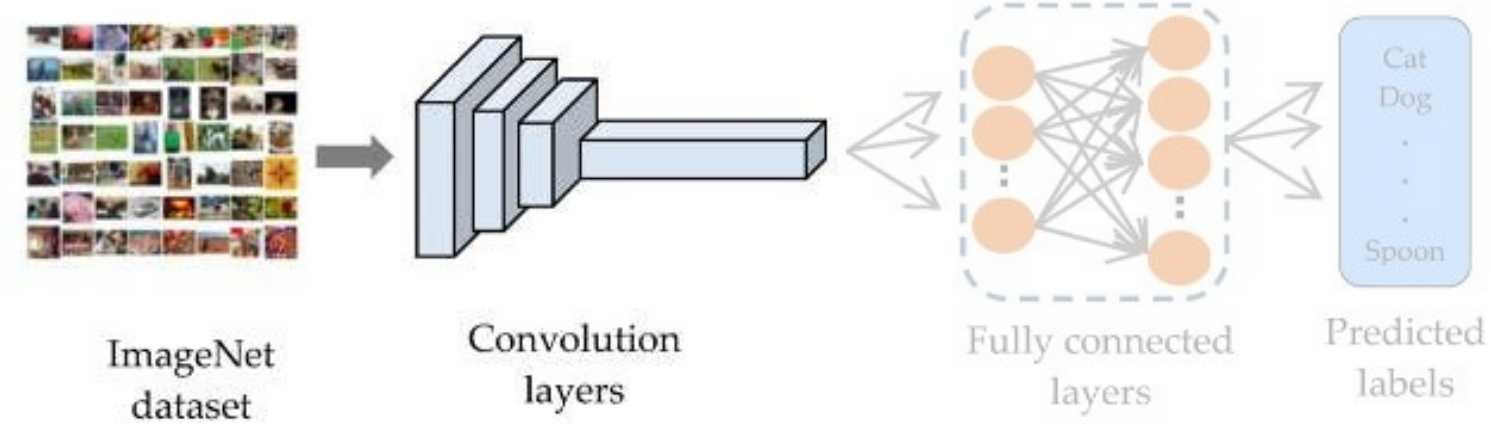


Pre-Processing

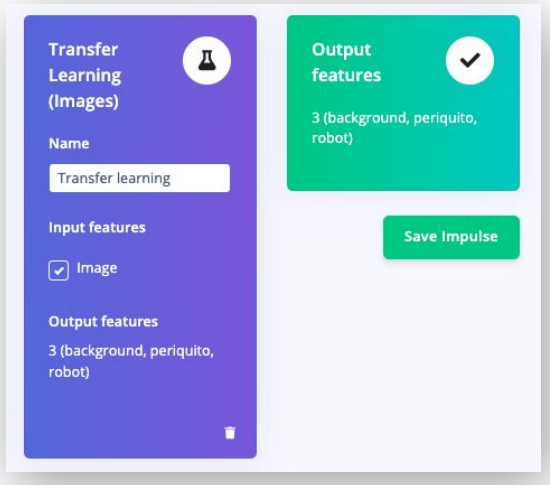


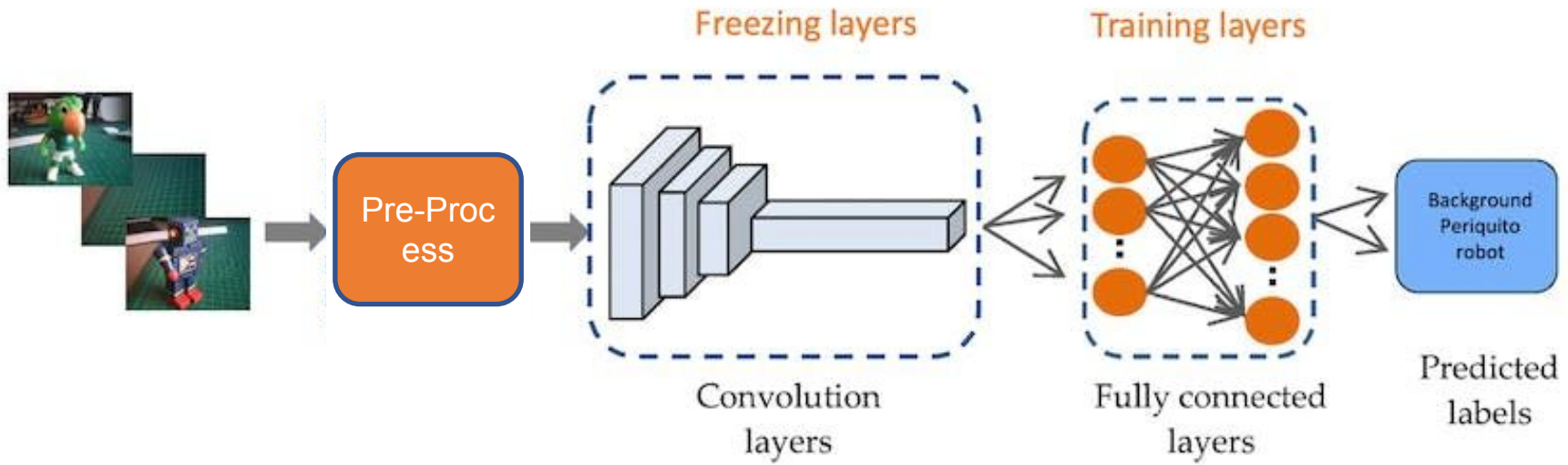


Model

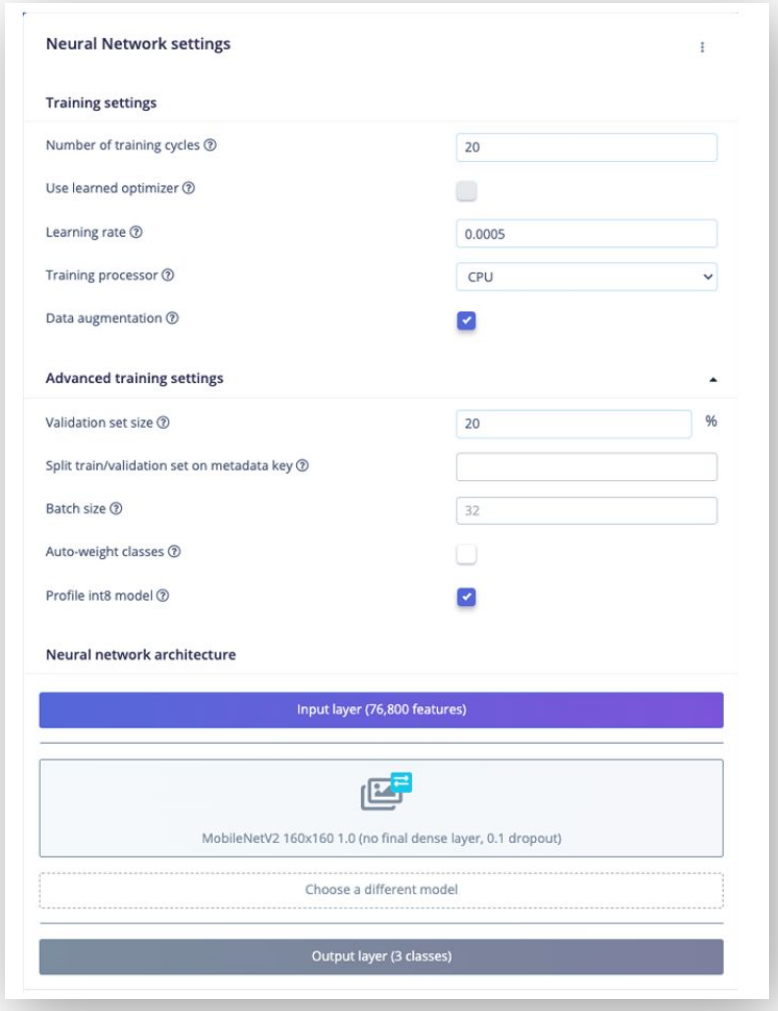


MobileNetV2 160x160 1.0



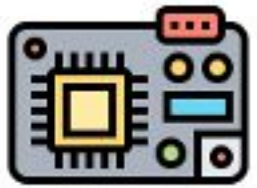


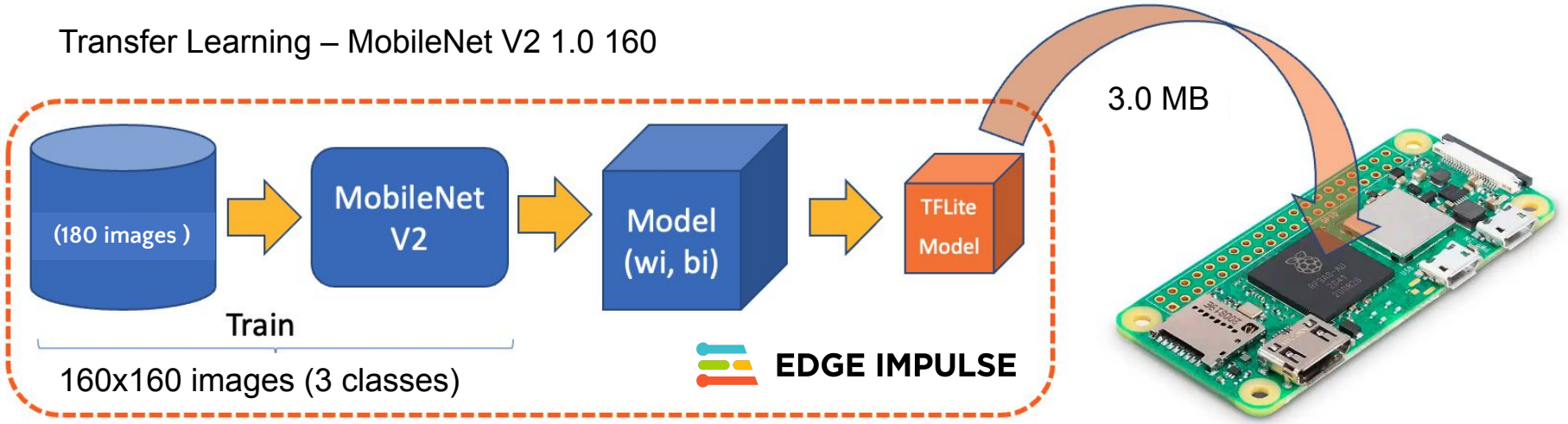
Train & Test


Neural Network settings
Training settings
Number of training cycles
20
Use learned optimizer
Learning rate
0.0005
Training processor
CPU
Data augmentation
Advanced training settings
Validation set size
20
%
Split train/validation set on metadata key
Batch size
32
Auto-weight classes
Profile int8 model
Neural network architecture
Input layer (76,800 features)
MobileNetV2 160x160 1.0 (no final dense layer, 0.1 dropout)
Choose a different model
Output layer (3 classes)


ACCURACY
100.00%
Metrics for Transfer learning
METRIC
VALUE
Area under ROC Curve
1.00
Weighted average Precision
1.00
Weighted average Recall
1.00
Weighted average F1 score
1.00
Confusion matrix
BACKGROUND
PERIQUITO
ROBOT
UNCERTAIN
BACKGROUND
100%
0%
0%
0%
PERIQUITO
0%
100%
0%
0%
ROBOT
0%
0%
100%
0%
F1 SCORE
1.00
1.00
1.00
Feature explorer
background - correct
periquito - correct
robot - correct

Deploy





Download block output

TITLE	TYPE	SIZE
Image training data	NPY file	150 windows
Image training labels	NPY file	150 windows
Image testing data	NPY file	36 windows
Image testing labels	NPY file	36 windows
Transfer learning model	TensorFlow Lite (float32)	9 MB
Transfer learning model	TensorFlow Lite (int8 quantized)	3 MB
Transfer learning model	Model evaluation metrics (JSON file)	5 KB
Transfer learning model	TensorFlow SavedModel	8 MB
Transfer learning model	Keras h5 model	8 MB

Edge Impulse Project: Raspi - Img Class

Raspberry Pi Inference:

30_Image_Classification_edge_impulse.ipynb

Live Image Classification

img_class_live_infer.py

```
 * Running on http://192.168.4.210:5000
Press CTRL+C to quit
```

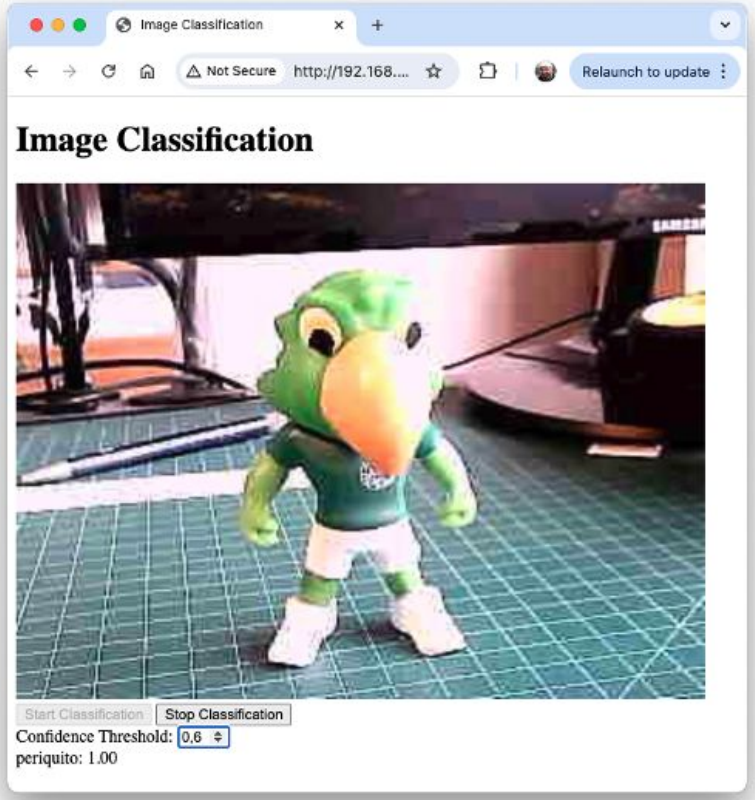
marcelo_rovai — mjrovai@raspi-zero: ~/Documents/TFLITE/IMG_CLASS — ssh mjrovai@192.168.4.210 — 80×21

```
  GNU nano 7.2                  img_class_live_infer.py
import time
import numpy as np
from PIL import Image
import tflite_runtime.interpreter as tflite
from queue import Queue

app = Flask(__name__)

# Global variables
picam2 = None
frame = None
frame_lock = threading.Lock()
is_classifying = False
confidence_threshold = 0.8
model_path = "./models/ei-raspi-img-class-int8-quantized-model.tflite"
labels = ['background', 'periquito', 'robot']
interpreter = None

^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute   ^C Location
^X Exit      ^R Read File ^\ Replace   ^U Paste     ^J Justify   ^/ Go To Line
```



Questions?

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rovai@unifei.edu.br

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