GARBAGE CLASSIFICATION

Transfer learning model for Garbage classification based on deep features extracted by CNN

Students : Ananthakrishnan K M
Arjun S
Sanora Teressa Raju
Vishnu V

ITD334 MINIPROJECT

Dr. Vijayanand K .S
Department of Information Technology
Government Engineering College, Barton Hill, Thiruvananthapuram

CONTENTS

- PROJECT OVERVIEW
- OBJECTIVE
- ARCHITECTURE
- IMPLEMENTATION
- RESULT
- MODEL EVALUATION
- REFERENCES

PROJECT OVERVIEW

- The accumulation of non- recyclable waste around the world and the time it takes to biodegrade can affect in our lifestyle .
- There are mainly three reasons why waste accumulation is becoming an increasingly severe problem during the last 50 years.

PROJECT OVERVIEW (cont)

- overpopulation .
- The absence of recyclable items available on the market.
- The lack of use modern technologies in the recycling .

PROJECT OVERVIEW (cont)

ROLE OF MACHINE LEARNING IN THIS SCENARIO!!!

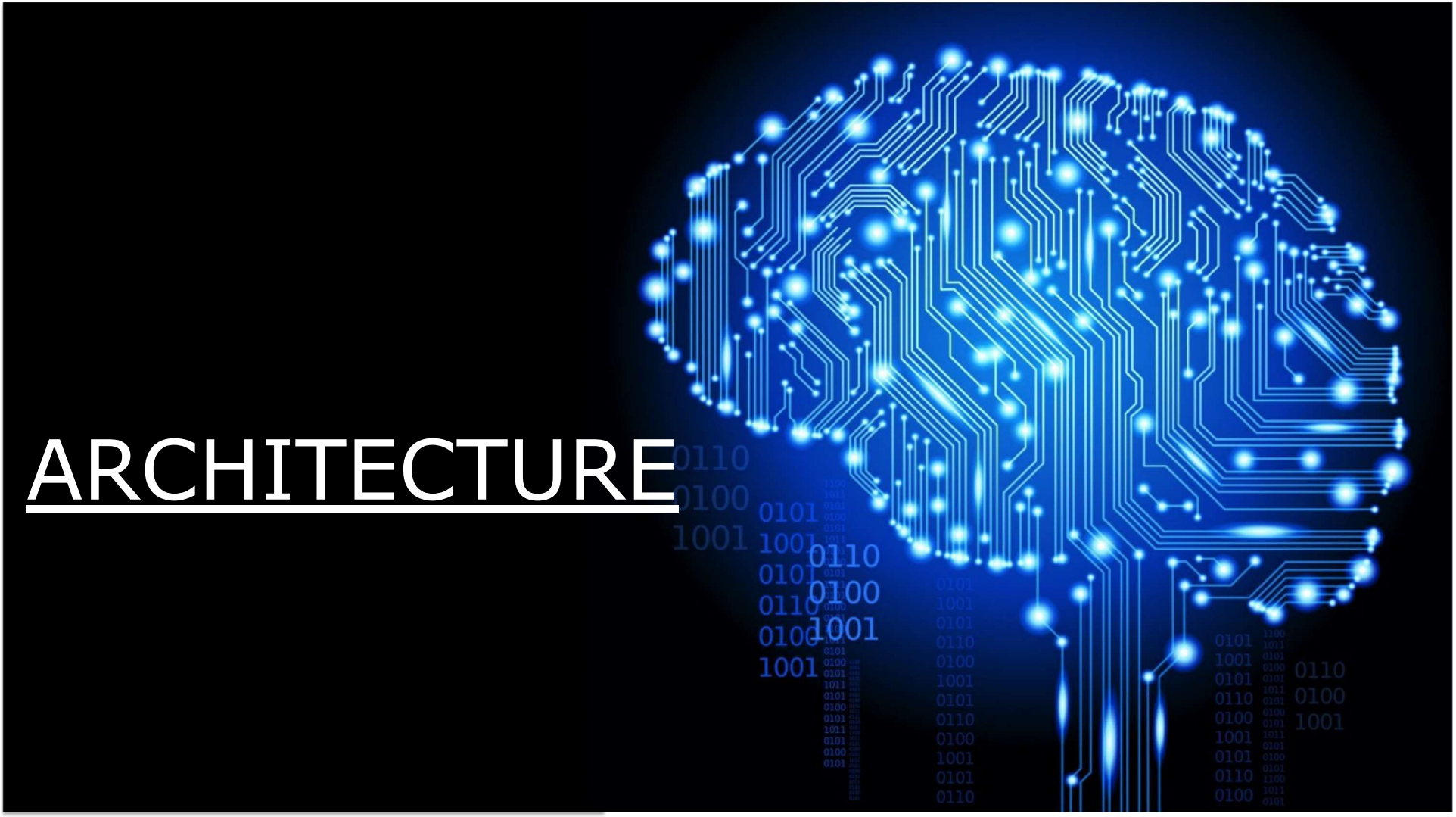
OBJECTIVE

- The goal of this project is to develop an application based on deep learning techniques focused on solving environmental issues like waste accumulation,pollution

- It is done by creating a model capable of sorting between two different types of waste depending on the fabrication materials, thus its recyclability.

- The classification of the waste are based on PLASTIC, E-WASTE .

ARCHITECTURE



ARCHITECTURE

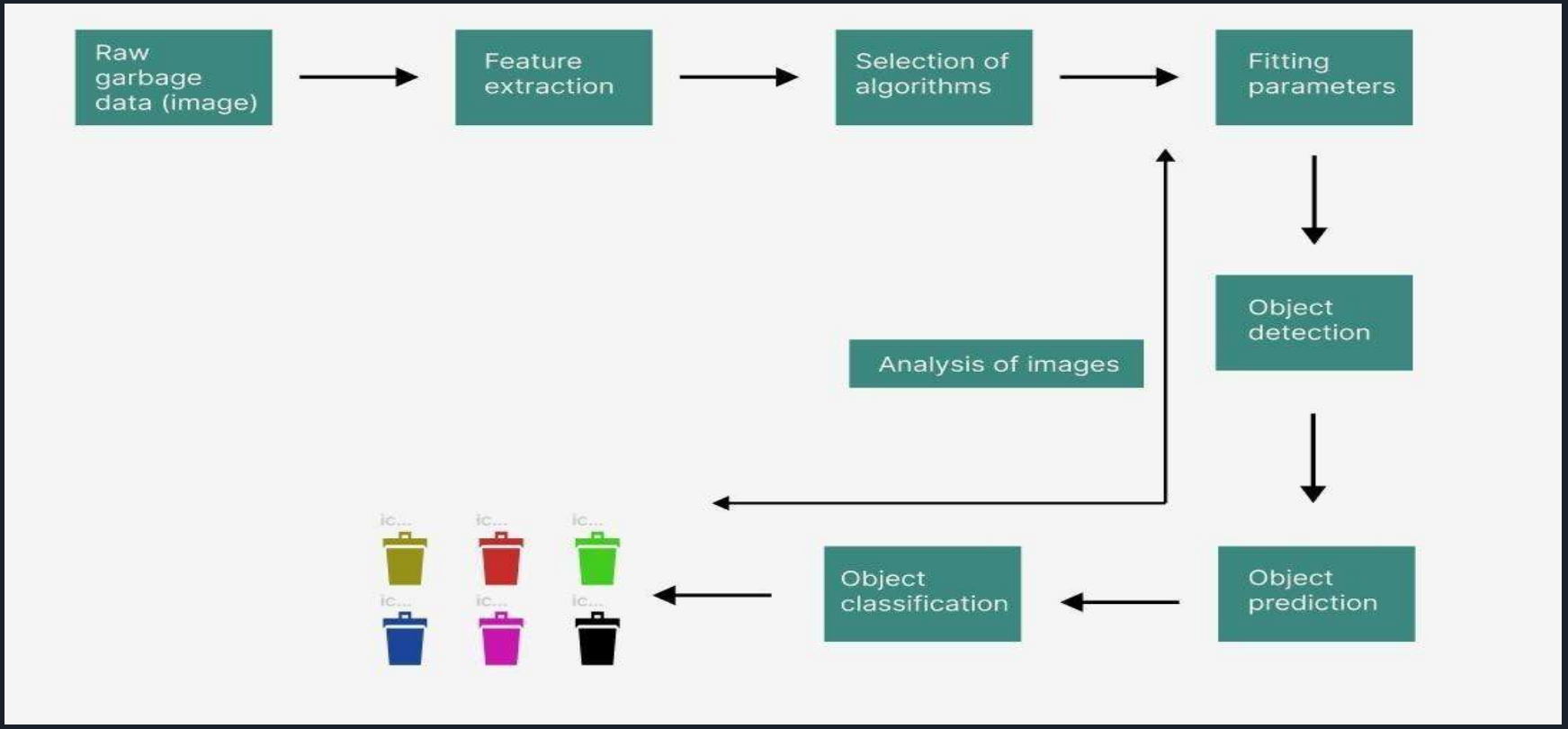


Fig. 1 Block diagram

IMPLEMENTATION

IMPLEMENTATION

For this work, we are using a trash image dataset which was created by Gary Thung and Mindy Yang.

This is a small dataset and consist of 2031 images, which is divided into two different classes plastic and e-waste, all the pictures of the images have been resized down to 224 x 224. Few samples of the images are shown in Fig. 2

IMPLEMENTATION (cont)

Fig 2.(a) Plastic

IMPLEMENTATION (cont)

Fig 2.(b) E-waste

SOURCE CODE

```
from tensorflow.keras.applications.vgg19 import VGG19


base_model = VGG19(input_shape = (224, 224, 3), # Shape of our images
include_top = False, # Leave out the last fully connected layer
weights = 'imagenet')
```

Fig.3 Instantiates the VGG19 architecture.

SOURCE CODE (cont)

```
from tensorflow.keras import layers
#from keras.models import load_model
#from keras.layers import Lambda
import tensorflow as tf

# Flatten the output layer to 1 dimension
x = layers.Flatten()(base_model.output)
# Add a fully connected layer with 224 hidden units and ReLU activation

y = layers.Dense(224, activation='relu')(x)
# x to be equal to the pretrained models outputs (after applying an additional dense layer).

# Add a dropout rate of 0.5
x = layers.Dropout(0.5)(x)

# Add a final sigmoid layer for classification
x = layers.Dense(1, activation='sigmoid')(x)

model = tf.keras.models.Model(base_model.input, x)

model.compile(optimizer = tf.keras.optimizers.RMSprop(lr=0.0001), loss = 'binary_crossentropy',metrics = ['acc'])
model.summary()
for layer in base_model.layers:
    layer.trainable = False
```

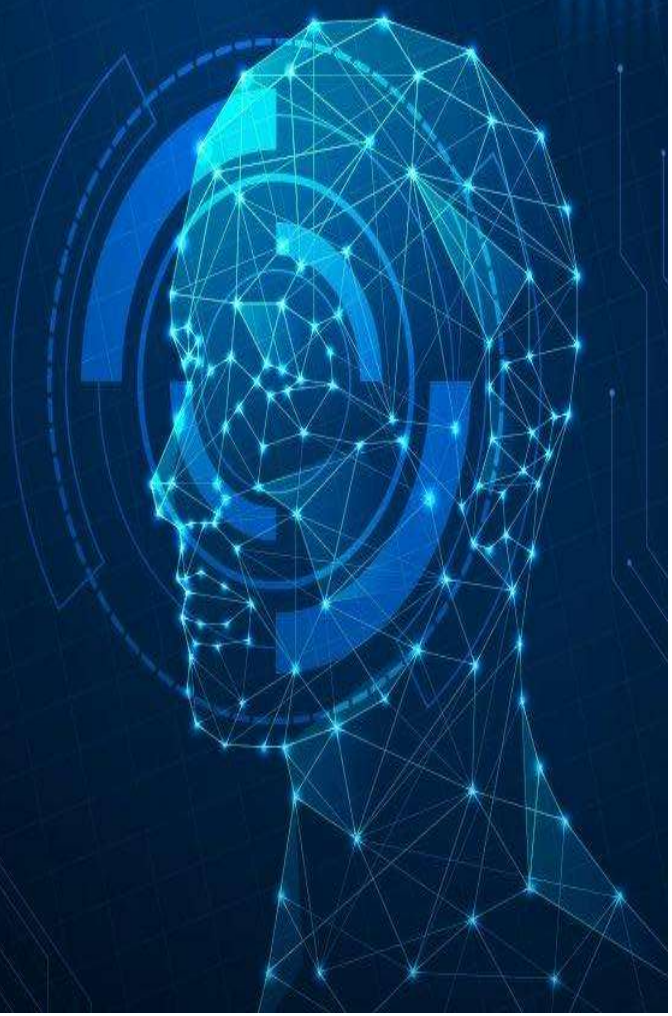
Fig.4 Configures the model for training

SOURCE CODE (cont)

```
vgghist = model.fit(train_generator, validation_data = test_generator,
                    epochs = epochs, callbacks=[custom_early_stopping])
```

Fig.5 Training the model

RESULT



RESULT

```
1  waste_prediction("/content/drive/MyDrive/garbage_classifcation/ewaste.jpg")
```

```
[[0.00042492]]
False
<class 'numpy.bool_'>
The waste material is e-waste
```

Fig.6

RESULT (cont)

```
1  waste_prediction("/content/drive/MyDrive/garbage_classifcation/plastic2.jpg")
```

```
[[0.9808491]]
True
<class 'numpy.bool_'>
The waste material is plastic
```

Fig.7

MODEL EVALUATION

ACCURACY GRAPH

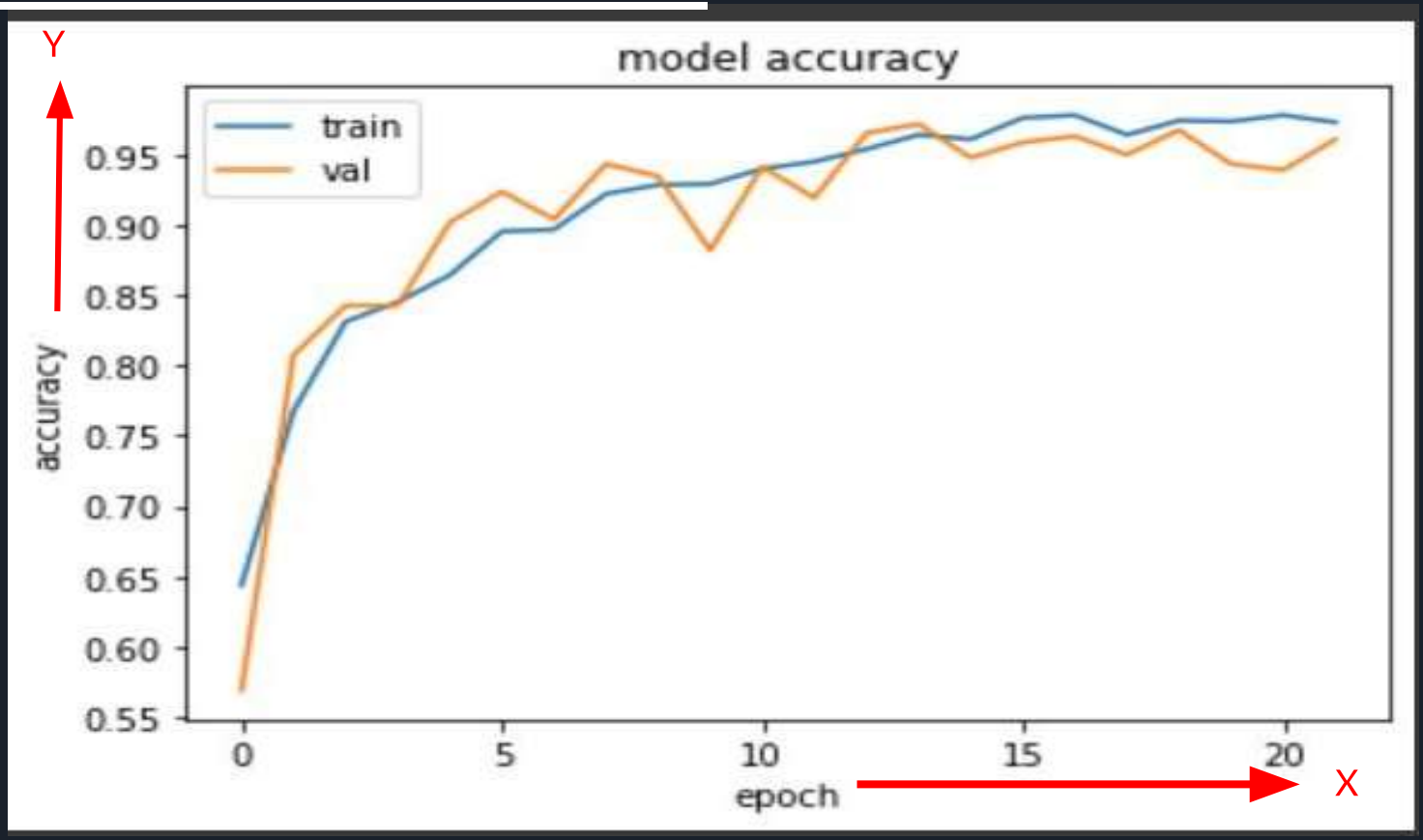


Fig. 7

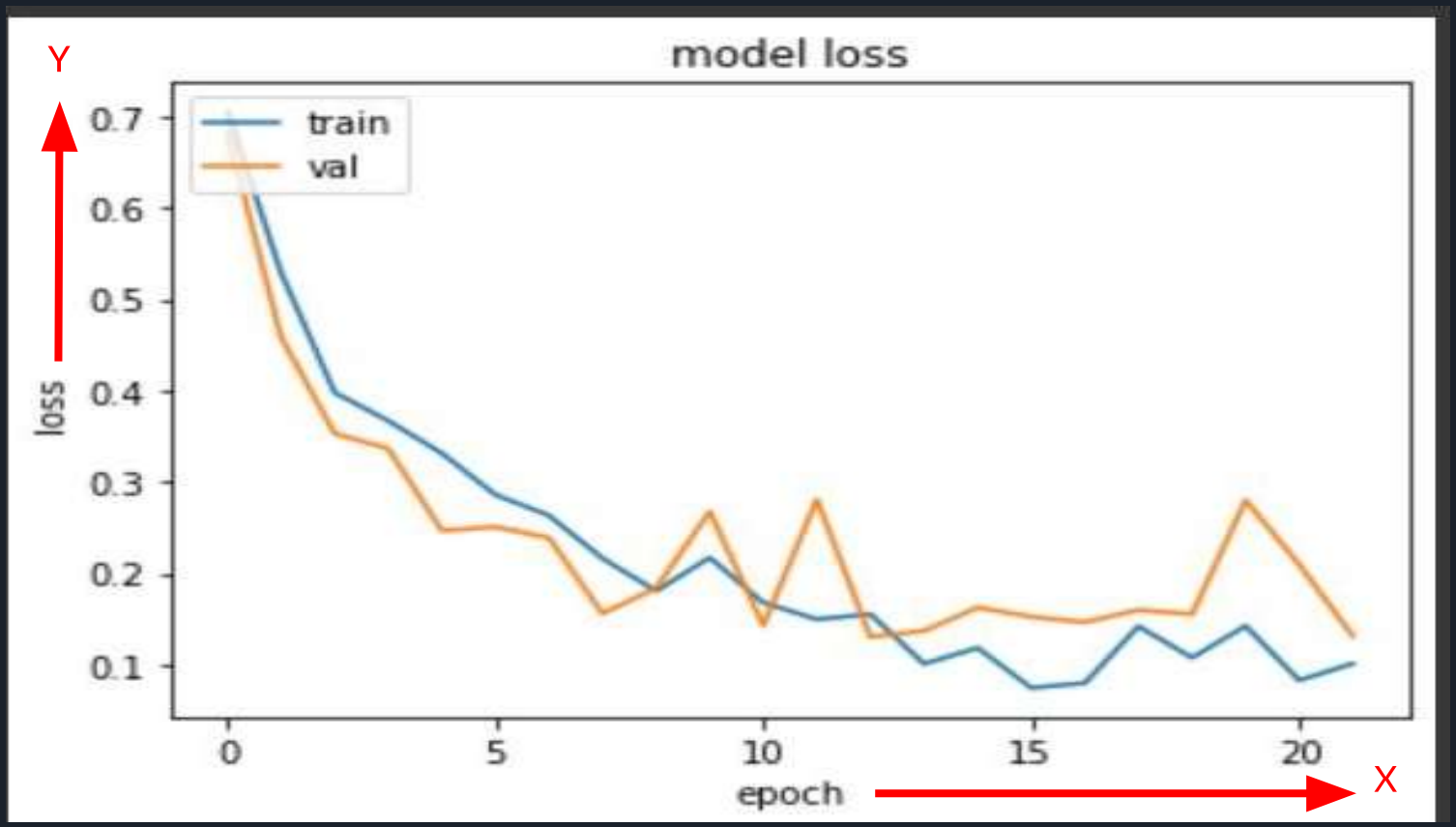

model loss
train
val
loss
epoch
Y
X
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
5
10
15
20

Fig. 8

REFERENCES

[1.] Olugboja Adedeji, Zenghui Wang "*Intelligent Waste Classification System Using Deep Learning Convolutional Neural Network*"

[2.] https://github.com/jaysoftic/awareness-of-waste-recycling (Dataset)

[3.] https://www.embitel.com/wp-content/uploads/AI-and-ML-banner-with-head.png (Images)


THANK YOU