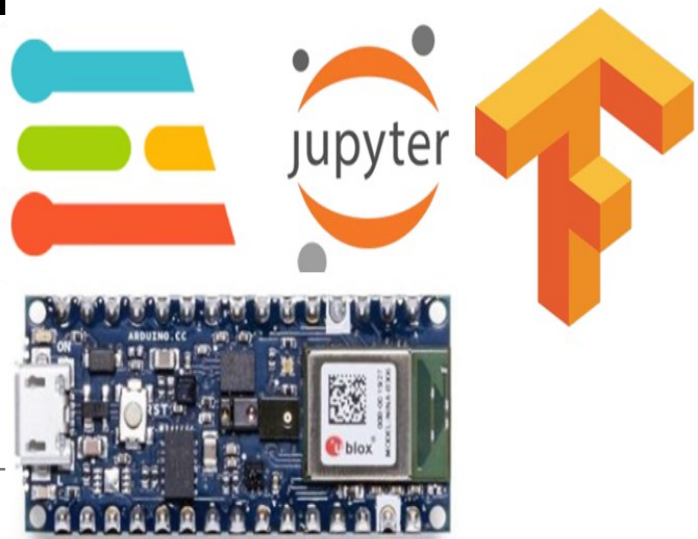
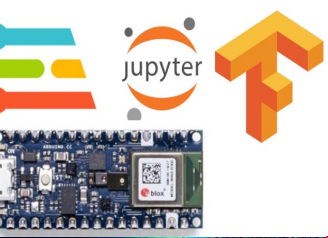
AI

CLASSIFICATION

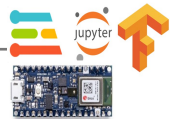
Dennis A. N. Gookyi





CONTENTS

- Classification



CLASSIFICATION

- Classification

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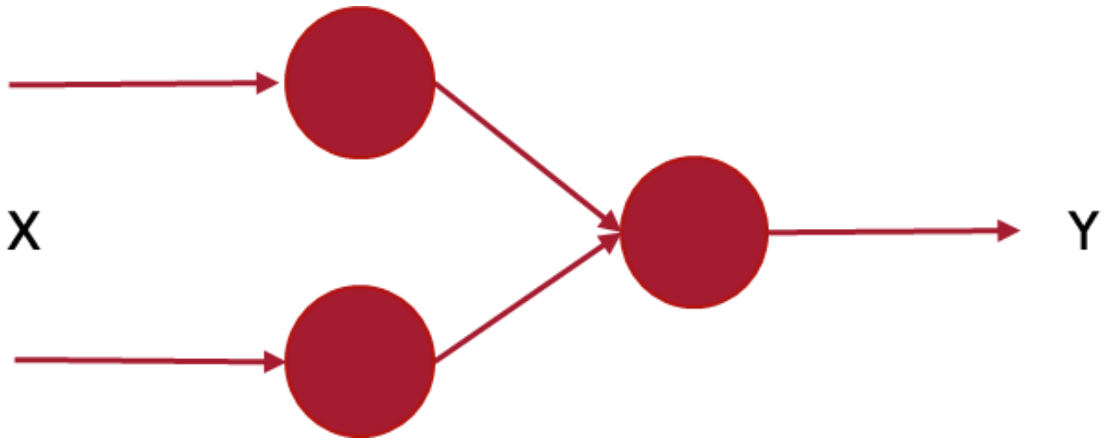

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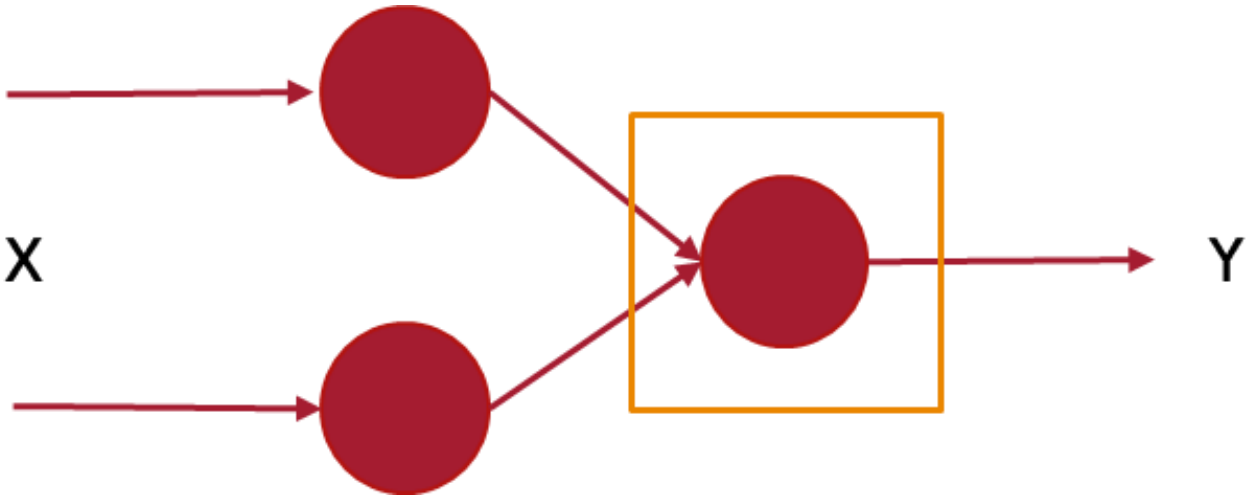

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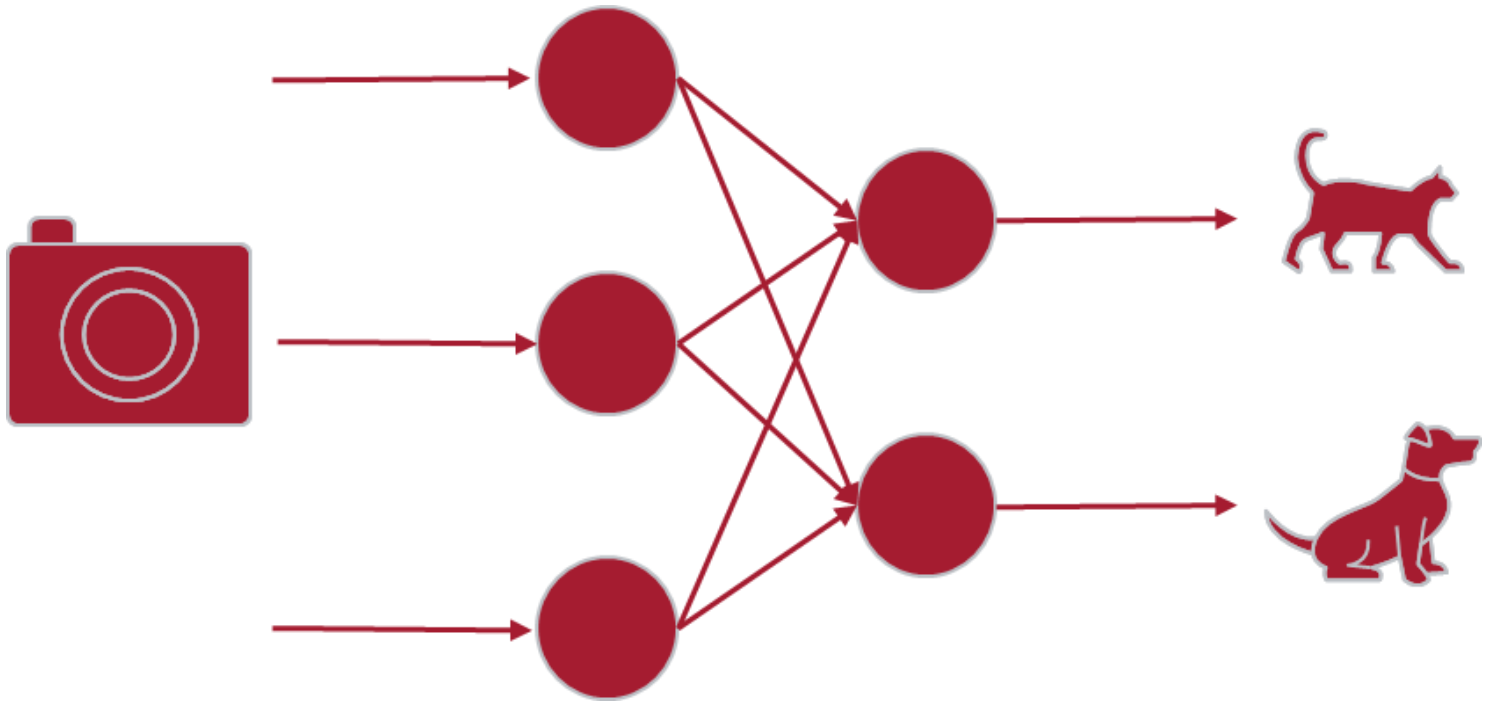

CLASSIFICATION

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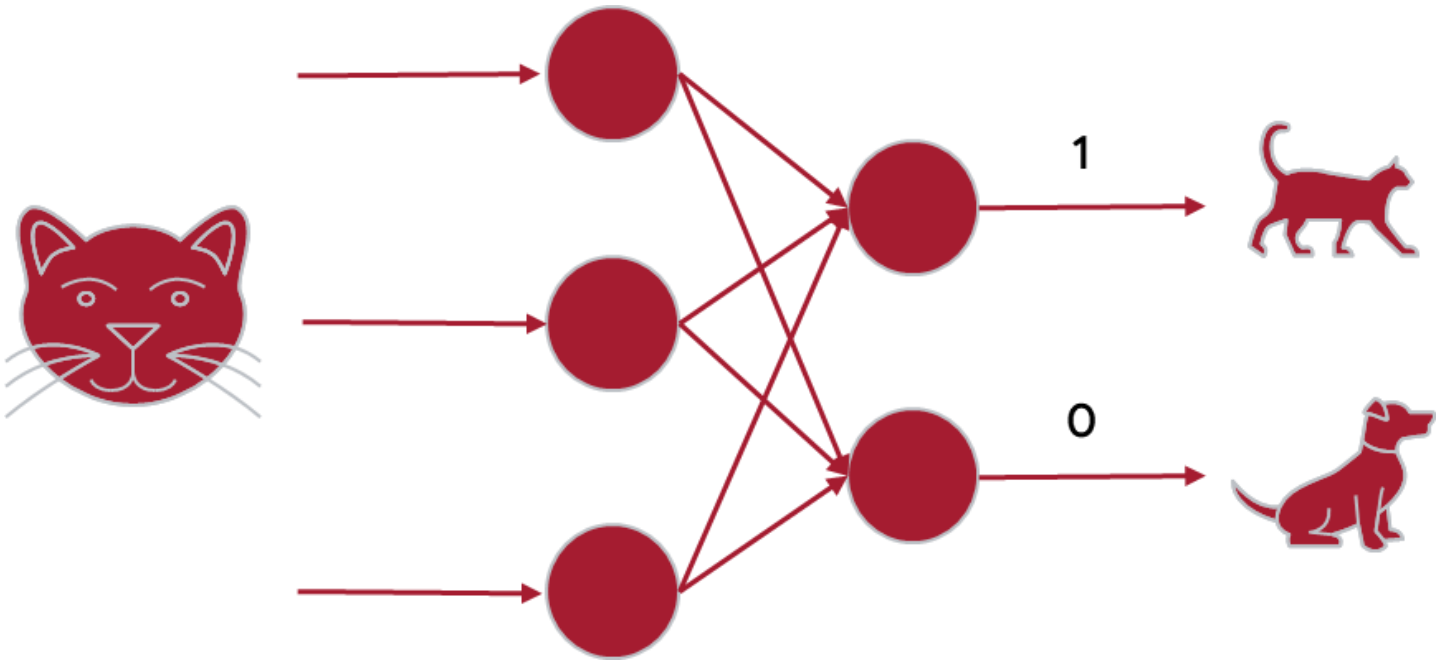
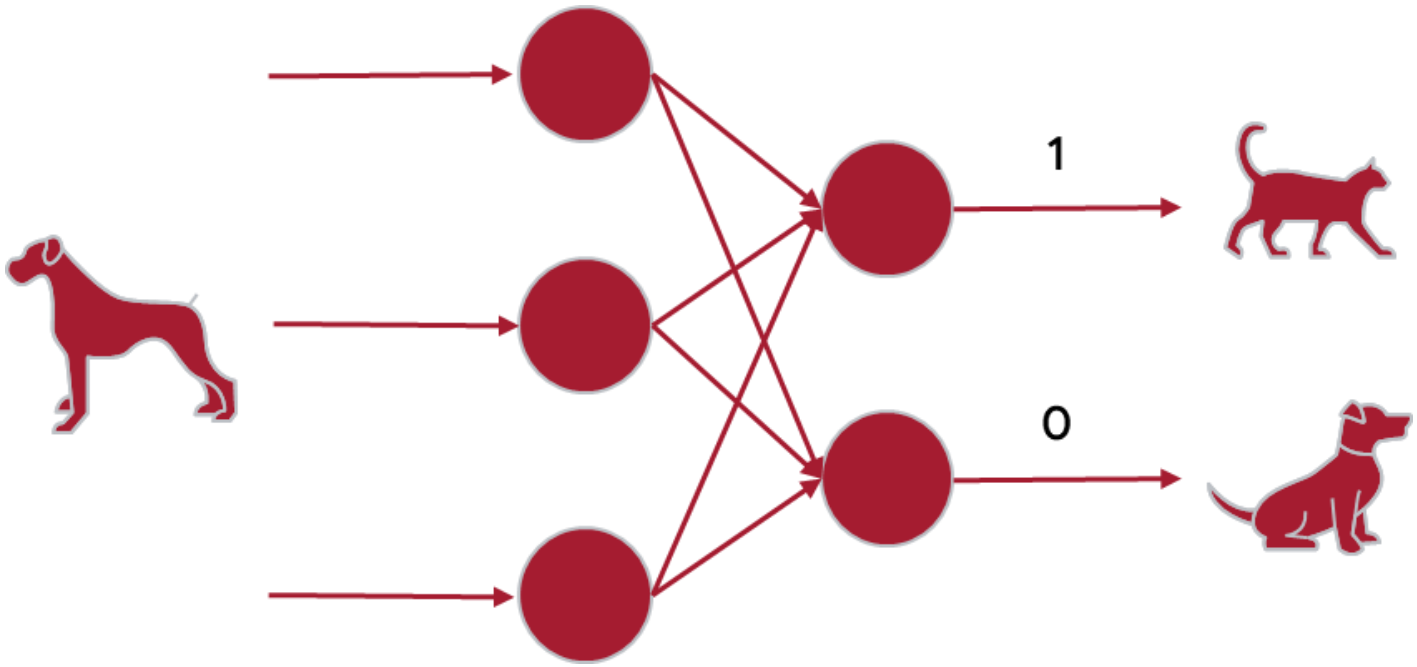


CLASSIFICATION

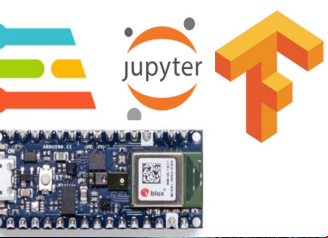
- Classification



CLASSIFICATION

- Classification

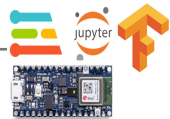
Data	Label
	[1, 0]
	[0, 1]

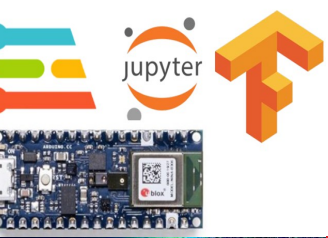


CLASSIFICATION

- Classification

0	[1, 0, 0, 0, 0, 0, 0, 0, 0, 0]
1	[0, 1, 0, 0, 0, 0, 0, 0, 0, 0]
2	[0, 0, 1, 0, 0, 0, 0, 0, 0, 0]
3	[0, 0, 0, 1, 0, 0, 0, 0, 0, 0]
4	[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
5	[0, 0, 0, 0, 0, 1, 0, 0, 0, 0]
6	[0, 0, 0, 0, 0, 0, 1, 0, 0, 0]
7	[0, 0, 0, 0, 0, 0, 0, 1, 0, 0]
8	[0, 0, 0, 0, 0, 0, 0, 0, 1, 0]
9	[0, 0, 0, 0, 0, 0, 0, 0, 0, 1]





CLASSIFICATION

- Classification

```
import tensorflow as tf

data = tf.keras.datasets.mnist
(training_images, training_labels), (val_images, val_labels) = data.load_data()

training_images  = training_images / 255.0
val_images = val_images / 255.0

model = tf.keras.models.Sequential(
    [tf.keras.layers.Flatten(input_shape=(28,28)),
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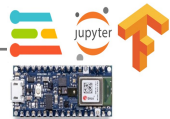

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```

Collect Data

CLASSIFICATION

- Classification

60,000 Labelled Training Examples
10.000 Labelled Validation Examples

CLASSIFICATION

- Classification

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Preprocess Data

CLASSIFICATION

- Classification

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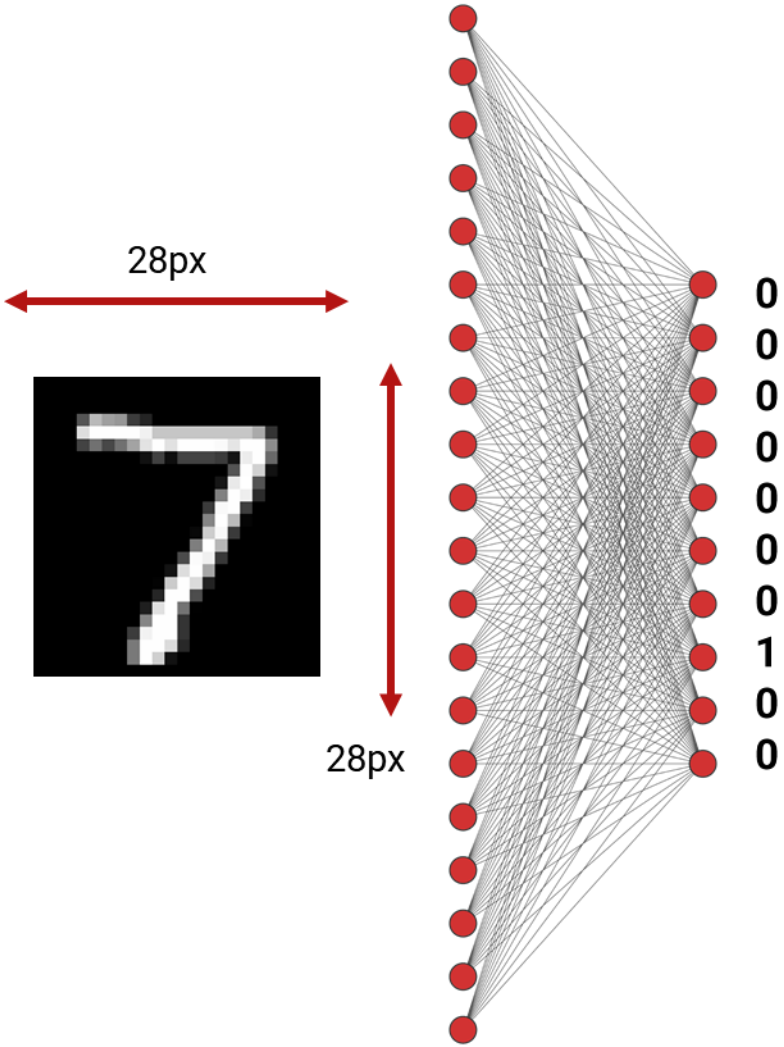
Design a Model

CLASSIFICATION

- Classification



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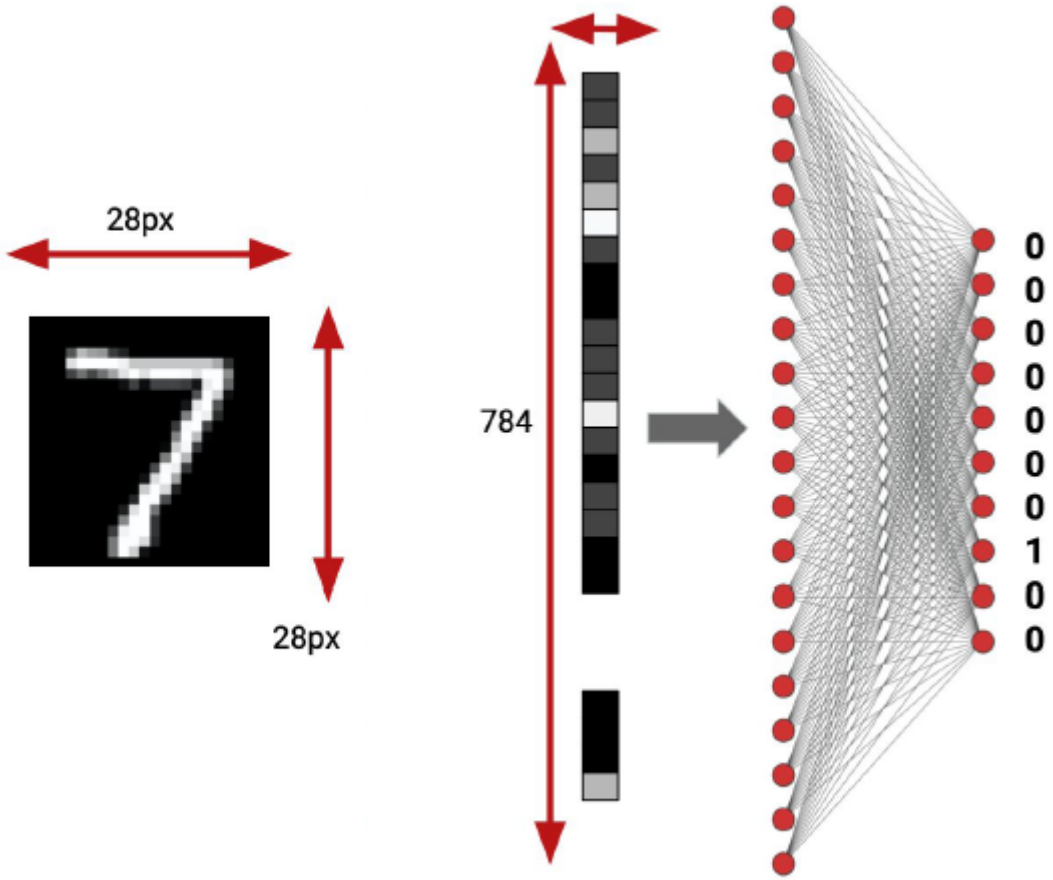

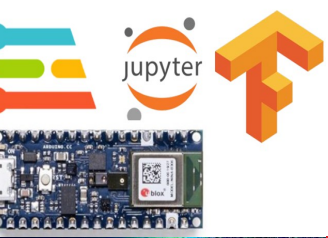

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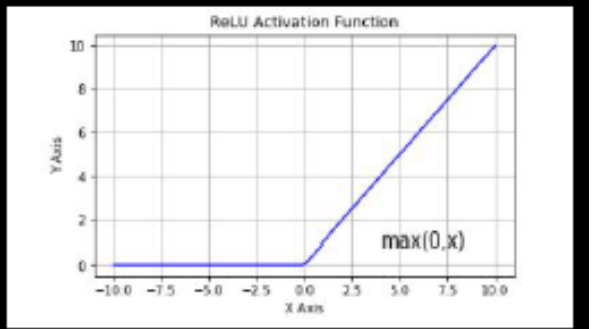

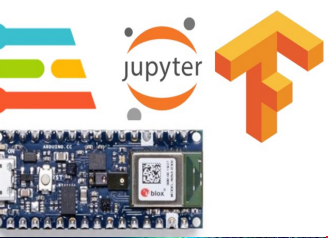

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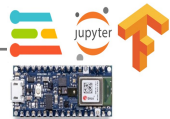

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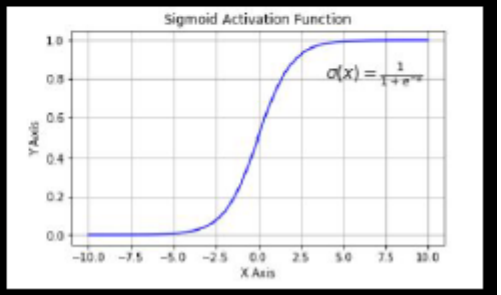

CLASSIFICATION

- Classification

```
model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])
```

Design a Model

CLASSIFICATION

- Classification

```
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```

Mean Squared Error

$$MSE = \frac{1}{N}\sum(t_i - s_i)^2$$

Prediction

Ground Truth

Cross Entropy Loss

$$CE = -\sum_{i}^{C} t_i log(s_i)$$

Classes

Prediction

Ground Truth {0,1}

Design a Model

CLASSIFICATION

- Classification

```
model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
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model.fit(training_images, training_labels, epochs=20)
```

CLASSIFICATION

- Classification

```
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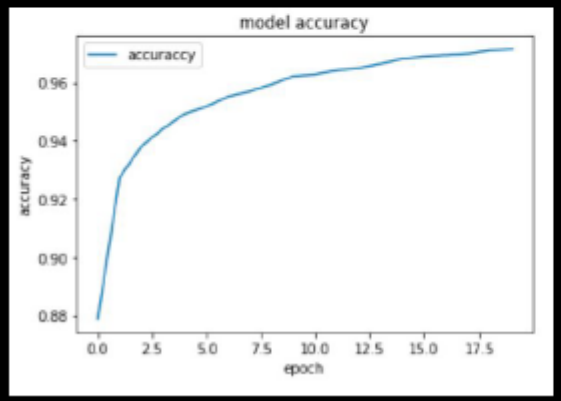
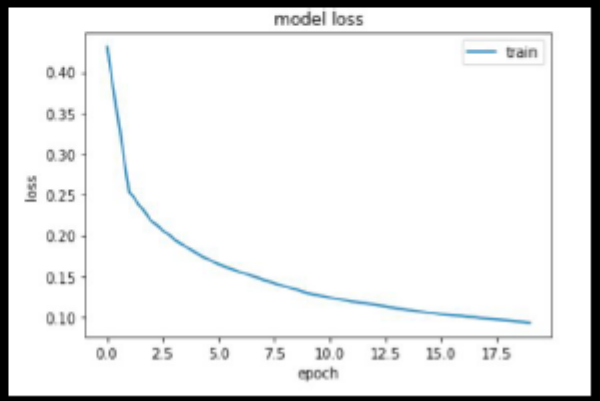
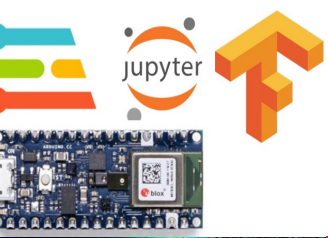




Evaluate
Optimize



CLASSIFICATION

- Classification

```
classifications = model.predict(val_images)

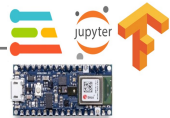
print(classifications[0])

print(test_labels[0])
```

```
[2.4921512e-09 1.3765138e-10 8.8281205e-08
1.0477231e-03 2.8455029e-12 4.0820678e-06
2.0070659e-16 9.9894780e-01 1.0296049e-07
2.9972372e-07]

7
```

Make Inferences



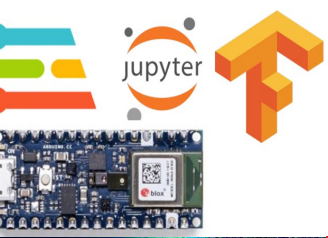
CLASSIFICATION

- Classification

Digits Classification using DNN with TF2

Code Time!

TF_MNIST_Classification.ipynb



CLASSIFICATION

- Going deeper with Deep learning
  - Initializing neural networks
    - https://www.deeplearning.ai/ai-notes/initialization/
  - Neural networks – PlayList - 3Blue1Brown
    - https://www.youtube.com/playlist?list=PLZHQObOWTQDNU6R1_67000Dx_ZCJB-3pi
  - An introductory lecture for MIT course 6.S094 by Prof. Lex Fridman
    - https://youtu.be/O5xeyoRL95U
  - A Complete Machine Learning Package by Jean de Dieu Nyandwi
    - https://github.com/Nyandwi/machine_learning_complete