

تم تحميل هذا الملف من موقع المناهج الإماراتية



الملف الخطة الأسبوعية للأسبوع الخامس الحلقة الثانية في مدرسة أبو أيوب الأنصاري

موقع المناهج ← المناهج الإماراتية ← ملفات مدرسية ← المدارس ← الفصل الأول

روابط مواقع التواصل الاجتماعي بحسب ملفات مدرسية



روابط مواد ملفات مدرسية على تلغرام

[الرياضيات](#)

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[التربية الاسلامية](#)

المزيد من الملفات بحسب ملفات مدرسية والمادة المدارس في الفصل الأول

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[امتحانات منتصف الفصل الأول للصفين الحادي عشر والثاني عشر في مدرسة الشعلة الخاصة](#)

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# Section 1: Understanding neural networks

## Aim

This section will introduce you to artificial neural networks. Before you examine artificial neurons, you will have a quick look at biological neurons. You will learn how the architecture of biological neural networks is very similar to that of artificial neural networks. You will learn the components of neural networks. You will also learn about the different types of neural networks and their applications in various fields.

## Learning outcomes

- Illustrate a multi-layer perceptron neural network.
- Examine different types of neural networks.
- Examine real-life applications of neural networks..

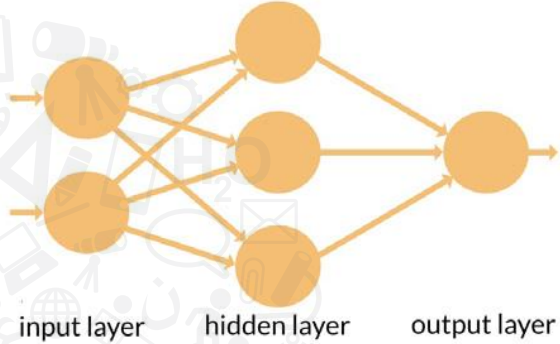
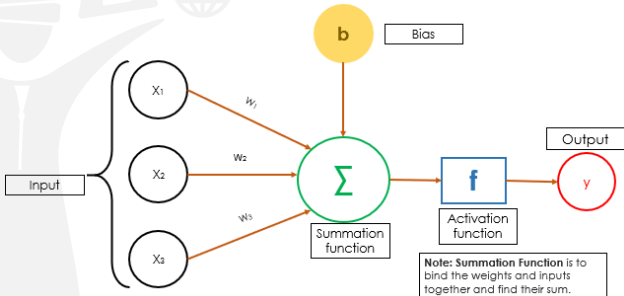
## Prior knowledge

- ML algorithms
- Basics of neural networks

## My STREAM focus

- Science
- Technology
- Engineering
- Mathematics

## Key vocabulary

Word	Meaning	Picture
artificial neural network (ANN)	computational model inspired by the structure and functions of the biological neural network	 <p>input layer      hidden layer      output layer</p>
layers	collection of 'neurons' operating together at a specific depth within a neural network	
neuron	basic unit of computation within a neural network	
weight	control the strength of the connections between the neurons	
bias	constant which helps the model in a way that it can fit best for the given data	
activation function	defines the output of a neuron on a given input or set of inputs	 <p>Note: Summation Function is to bind the weights and inputs together and find their sum.</p>

### Activity 5.1.1

Conduct research on the real-life application of neural networks. Record your answers in the space given below.

Answers may vary.

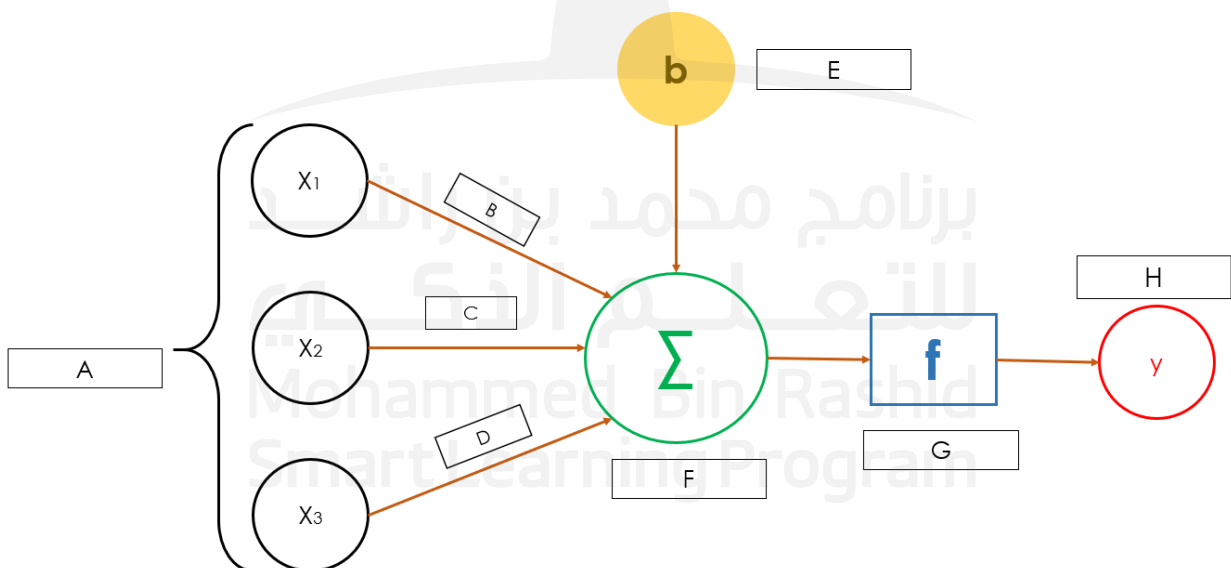
### Activity 5.1.2

Match the components of a biological neural network in Column A with their artificial neural network counterparts in Column B...

Column A		Column B
Five Senses		Neurons
Dendrites		Output
Nucleus		Weights
Synapses		Input / Source
Axon		Connections

### Activity 5.1.3

Consider the neural network shown below and answer the following question.



(a) Complete the table below by identifying the name of each of the components of the neural network given above.

Label	Name
A	Input Values
B	Weight ( $W_1$ )
C	Weights ( $W_2$ )
D	Weights ( $W_3$ )
E	Bias
F	Summation function
G	Activation function
H	Output

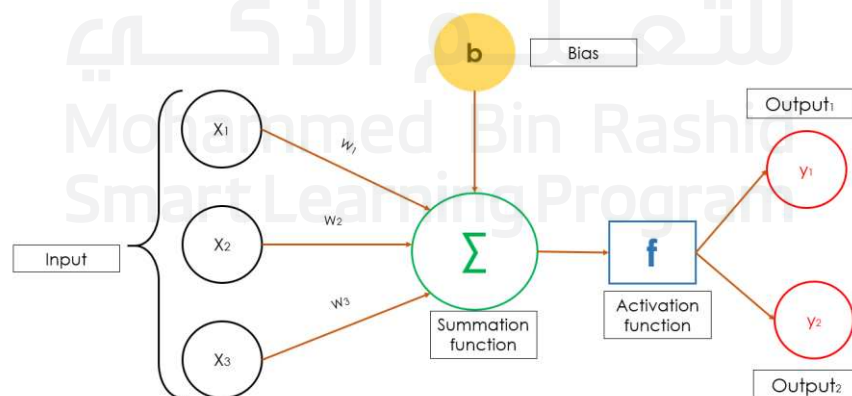
(b) Identify the type of the neural network shown above.

Single Layer Perceptron

(c) Why are parts B, C, D, and E important in the neural network above? If they were removed from the network, what would happen?

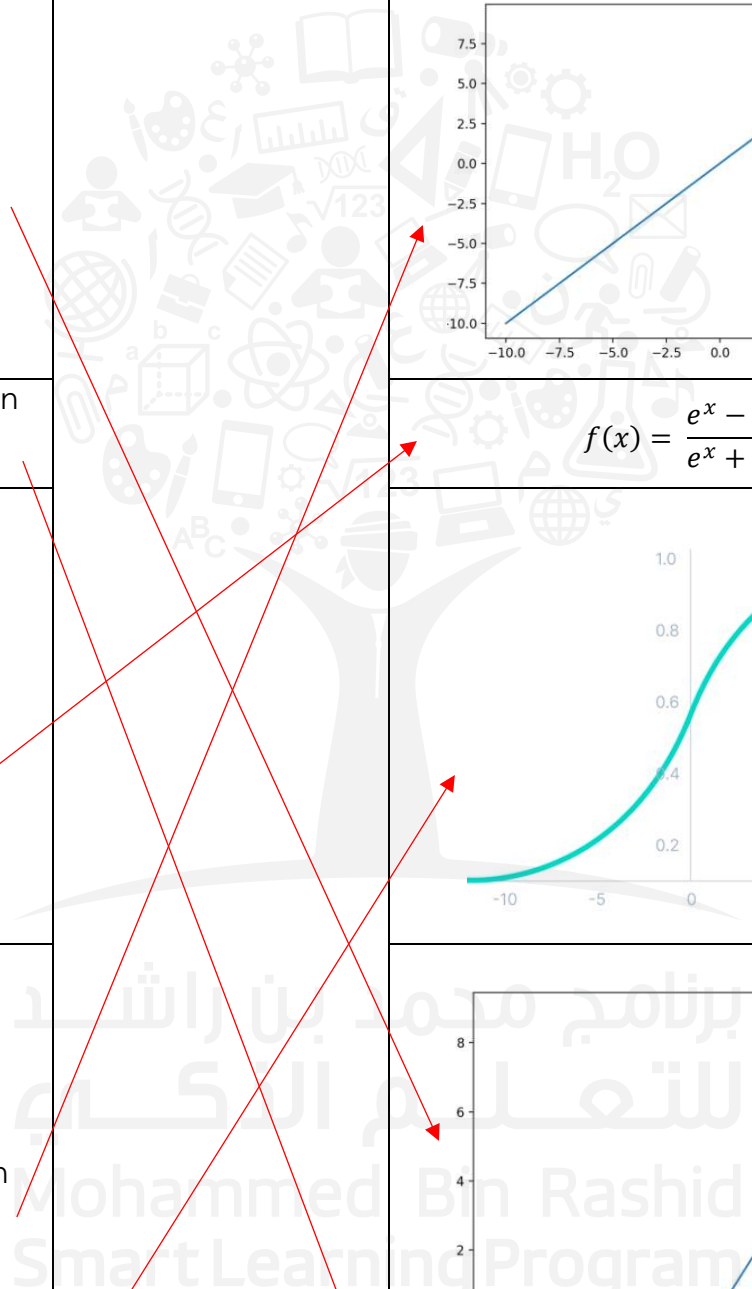
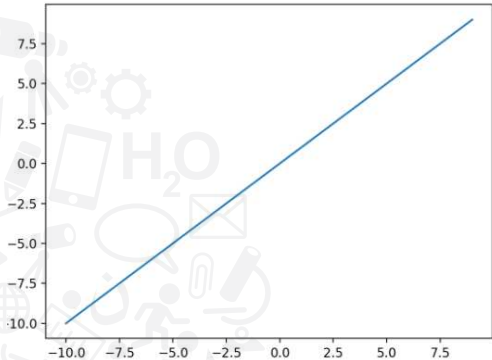
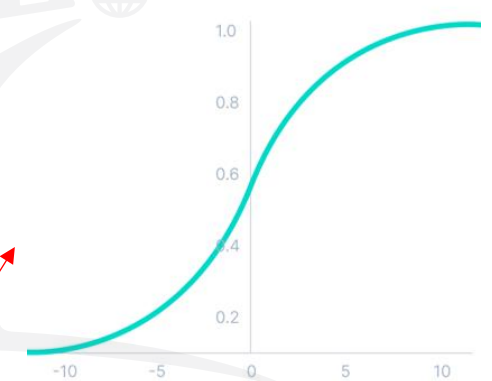
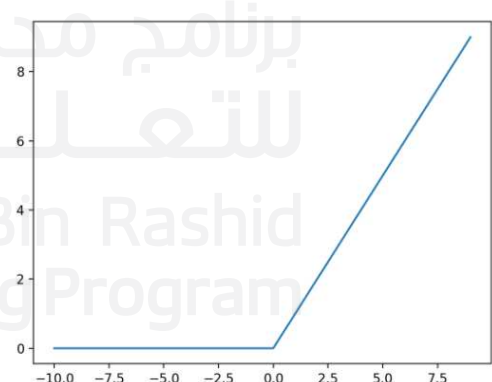
Parts B, C and D are the weight and part E is the bias of the neural network.  
 Weight - It plays an important role in changing the orientation or slope of the line that separates two or more classes of data points at the output stage. It also tells the importance of a feature in predicting the output value. It also tells the relationship between a feature and an output value.  
 Bias – This constant helps to fit the model better based on the given input data.

(d) How will you redesign the above neural network for multiclass classification?



### Activity 5.1.4

Match the activation function in Column A with its correct description in Column B.

Column A		Column B
ReLU function		
Logistic function		$f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$
Tanh function		
Linear function		
Softmax function		$f(x) = \frac{1}{1 + e^{-x}}$

### Activity 5.1.5 (T,E)

Choose the correct answer for the following question:

1. The most suitable activation function for the hidden layer is

- a) Sigmoid
- b) ReLU
- c) Softmax
- d) Tanh

2. What does a neuron compute?

- a) A neuron computes an activation function followed by a linear function ( $z = Wx + b$ )
- b) A neuron computes a linear function ( $z = Wx + b$ ) followed by an activation function
- c) A neuron computes a function  $g$  that scales the input  $x$  linearly ( $Wx + b$ )
- d) A neuron computes the mean of all features before applying the output to an activation function

3. What is an activation function?

- a) A way to determine how well the machine learning model has performed given the different values of each parameter
- b) An optimisation algorithm used to find the values of parameters (coefficients) of a function ( $f$ ) that minimises a cost function (cost)
- c) Function that describes how computationally expensive is a neural network
- d) Function used to enable the neural network to solve non-linear problems

4. The most suitable activation function for the output layer

- a) Sigmoid
- b) ReLU
- c) Softmax
- d) Tanh

### Activity 5.1.6 (T,R,E)

You have learned about different activation functions. Research the purpose of using the different activation functions in real-life examples.

Answers may vary.

### Activity 5.1.7 (T,E)

Innovation@UAE magazine and Khaleej Times newspaper feature a variety of topics addressed to different audiences. Build a machine learning model that differentiates headlines between the two publications. The neural network model needs to be trained to predict the likelihood of a new headline appearing in a particular publication.

Add the screenshots of the labels used and predictions made by the model.

#### Notes:

- You can use Example 5.1.1 as a reference to complete this activity.
- You have to collect the headlines yourself from both publications.
- You have to make two labels – the first label to collect headlines from the Innovation@UAE magazine, and the second label to collect headlines from the Khaleej Times newspaper.
- Remember that the higher the number of samples gathered for each label, the better the model's prediction you have built.

#### Labels:

Recognising **text** as **Innovation\_Magazine or Khaleej\_Times**

< Back to project + Add new label

#### Innovation\_Magazine

- ADU STUDENTS WIN EMIRATES GLOBAL ALUMINIUM AI ROBOT COMPETITION
- AUS STUDENT TEAM WINS BEST PAPER AWARD AT IEEE CONFERENCE
- KU'S DHABISAT REACHES THE INTERNATIONAL SPACE STATION
- KU RESEARCHERS INTEGRATE DEEP LEARNING WITH SMARTPHONES TO DETECT PARKI...
- MBRU PROFESSOR UNVEILS BREAKTHROUGH STUDY INTO MOLECULAR MOTOR PROTEIN
- NYUAD TEAM SHEDS NEW LIGHT ON BIOLUMINESCENCE
- RIT DUBAI STUDENTS WIN SOFTWARE AG FUTURE DISRUPTORS AWARD
- UAU PROJECT REVEALS THE IMPACT OF DIESEL EXHAUST ON GASTRIC STEM CELLS
- UOS STUDENT PROJECTS WIN TOP PRIZES AT SHARJAH CHAMBER'S AWARD FOR INNOV...
- ZAYED UNIVERSITY ALUMNA START-UP WINS ENTREPRENEUR MIDDLE EAST AWARD

+ Add example

10

#### Khaleej\_Times

- 'Running late' cited as main reason for road accidents
- UAE unifies public, private work systems: 7 labour rules to know
- New UAE workweek: Sharjah schools to get 3-day weekend
- UAE reports 92 Covid-19 cases, 71 recoveries, no deaths
- Expo 2020 Dubai records over 6.3 million visits by December 13
- Bollywood singer Neha Kakkar gears up for her concert at Expo 2020 Dubai on Dec 12
- Arab culture ministers set to get together for conference at Expo 2020 Dubai
- Dubai Shopping Festival: Frontman of Rammstein Till Lindemann to perform in city
- UAE: First female chef promotes Emirati culture through food
- How to create a sankalpa: Power of intentional goal-setting

+ Add example

10



## Predictions:

1. The text – “DEVELOPING A NEW FLEXIBLE BIOSENSOR FOR PRECISION HEALTHCARE” was given from the Innovation magazine to test the trained model. As per the image shown in the result below, the model has identified correctly that the input text was from Innovataion magazine.

Try putting in some text to see how it is recognised based on your training.

DEVELOPING A NEW FLEXIBLE BIOSENSOR FOR PRECISION HEALTHCARE

Describe your model!

Recognised as **Innovation\_Magazine**  
with 32% confidence

2. The text – “Elon Musk named Time's 'Person of the Year' for 2021” was given from the Khaleej Times newspaper to test the trained model. As per the image shown in the result below, the model has identified correctly that the input text was from Innovataion magazine.

Try putting in some text to see how it is recognised based on your training.

Elon Musk named Time's 'Person of the Year' for 2021

Describe your model!

Recognised as **Khaleej\_Times**  
with 25% confidence

### Activity 5.1.8 (T,R,E)

(a) Identify the type of propagation used in the neural network model built-in Activity 5.1.7.

**Backpropagation**

(b) Differentiate between the two types of propagations in a neural network.

**Students can try to answer this question using table 5.1.5 from student book.**

(c) Conduct research on several real-life examples that utilise the different propagation systems (as indicated in (b) above).

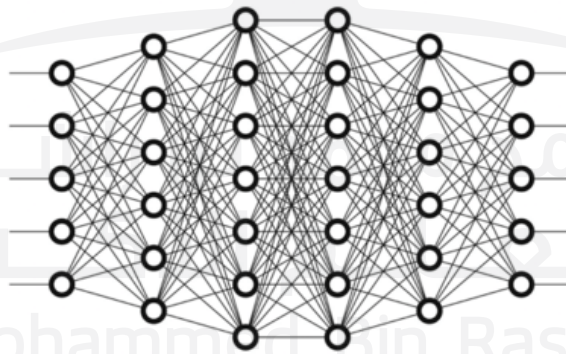
**Answers may vary (Students can use table 5.1.6 as a point of reference to answer this question)**

(d) Examine the real-life applications of neural networks described above and determine which type of propagation is suitable for each application.

**Answers may vary**

### Activity 5.1.9 (T,E)

1. Which of the following is correct for the following neural network?



- a) Input layers – 1, Output layer – 1, Hidden Layer – 4
- b) Input layers – 2, Output layer – 1, Hidden Layer – 3
- c) Input layers – 3, Output layer – 1, Hidden Layer – 2
- d) Input layers – 5, Output layer – 1, Hidden Layer – 0

2. A single-layer neural network is to have six inputs and two outputs. The outputs are to be limited to and continuous over the range 0 to 1. What can you tell about the network architecture?

**Notes:**

You can answer the following questions:

- a. How many neurons are required?
- b. What are the dimensions of the weight matrix?
- c. What kind of transfer functions could be used?
- d. Is a bias required?

- Two neurons, one for each output, are required.
- The weight matrix has two rows corresponding to the two neurons and six columns corresponding to the six inputs.
- The suitable transfer function can be – logistic function as it is given that the output will range between 0 to 1.
- Bias is required to be added so that the trained model can fit to the given data.

Activity 5.1.10 (T,R,E)

Examine the various applications of neural networks. Explain why a particular type of neural network was used for a particular application.

Answers may vary

## Student reflection

List three things you have learned and two things you have enjoyed.

Three things I have learned:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Two things I have enjoyed:

1. \_\_\_\_\_

2. \_\_\_\_\_

Learning outcomes	Key Skills (Please tick the box to show your understanding of the skills below.)	I do not understand.	I understand.	I am an expert.
Illustrate a multilayer perceptron neural network.	I can recap on the building blocks of neural networks including neurons, weights and activation functions.			
	I can explore how the building blocks are used in layers to create networks.			
Examine different types of neural networks.	I can differentiate between the common types of neural networks including Feed Forward, Multi-layer perceptron, Deep Feed Forward, and Recurrent Neural Network.			
Develop a simple neural network algorithm to solve a problem.	I can develop a neural network algorithm to make a prediction.			
Examine real-life applications of neural networks.	I can explore the real-world applications of Artificial Neural Networks including computer vision, speech recognition, and autonomous vehicles.			
<b>Teacher's comment:</b>				

## Section 2: Neural networks using Python

### Aim

In this section, you will learn how to implement a neural network in Python to solve a classification problem. To truly understand how machine learning works, you must also understand the data by which it operates. Therefore, you will learn the types of data needed for machine learning to be effective and understand their roles in the system.

### Learning outcomes

- Solve a classification problem using NNs.
- Use training and testing datasets to build a model.
- Use learning curves to diagnose the performance of a machine learning model.

### Prior knowledge

- ML algorithms
- Basics of neural networks
- Basics of Python programming

### My STREAM focus

- Science
- Technology
- Engineering
- Mathematics

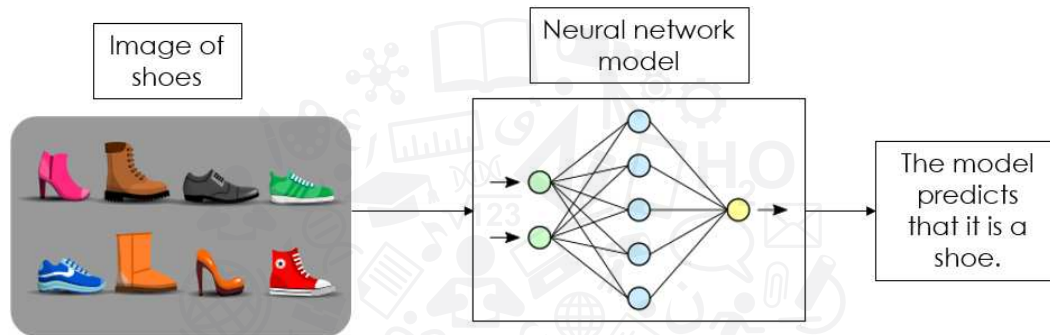
برنامج محمد بن راشد  
للتعلم الذكي  
Mohammed Bin Rashid  
Smart Learning Program

## Key vocabulary

Word	Meaning	Picture																		
dense layer	layer that is deeply connected to the layer before it	<p>The diagram illustrates a neural network with four layers: an Input-Layer (3 blue squares), a Dense Layer (3 blue circles), another Dense Layer (2 blue circles), and a Final Layer (4 blue circles) labeled 'Final Layer (not dense)'. Arrows indicate the flow of information from left to right between nodes in adjacent layers.</p>																		
flatten	converting the data into a 1-dimensional array for inputting it to the next layer	<p>The diagram shows a 3x3 grid labeled 'Pooled Feature Map' with values:         <table border="1" style="display: inline-table; margin-right: 20px;"> <tr><td>1</td><td>1</td><td>0</td></tr> <tr><td>4</td><td>2</td><td>1</td></tr> <tr><td>0</td><td>2</td><td>1</td></tr> </table>         An arrow labeled 'Flattening' points to a vertical 1x9 array of values:         <table border="1" style="display: inline-table;"> <tr><td>1</td></tr> <tr><td>1</td></tr> <tr><td>0</td></tr> <tr><td>4</td></tr> <tr><td>2</td></tr> <tr><td>1</td></tr> <tr><td>0</td></tr> <tr><td>2</td></tr> <tr><td>1</td></tr> </table> </p>	1	1	0	4	2	1	0	2	1	1	1	0	4	2	1	0	2	1
1	1	0																		
4	2	1																		
0	2	1																		
1																				
1																				
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4																				
2																				
1																				
0																				
2																				
1																				
training dataset	sample of data used to fit the model	<p>A horizontal bar labeled 'Single Dataset' is divided into three colored segments: orange for 'Training', blue for 'Validation', and green for 'Test'.</p>																		
validation dataset	sample of data on which to evaluate the loss and any model metrics at the end of each epoch																			
test dataset	sample of data used to provide an unbiased evaluation of a final model fit on the training dataset																			
underfit model	model that can neither model the training data nor generalise to new data	<p>A scatter plot with blue data points and a straight blue regression line. The points are scattered around the line, indicating a poor fit.</p>																		
overfit model	model that models the training data too well	<p>A scatter plot with blue data points and a highly complex, wiggly blue regression line that passes through every single data point.</p>																		
well- trained model	model that can produce good accuracies on both testing and validation data	<p>A scatter plot with blue data points and a smooth, parabolic blue regression line that captures the underlying trend of the data.</p>																		

## Activity 5.2.1

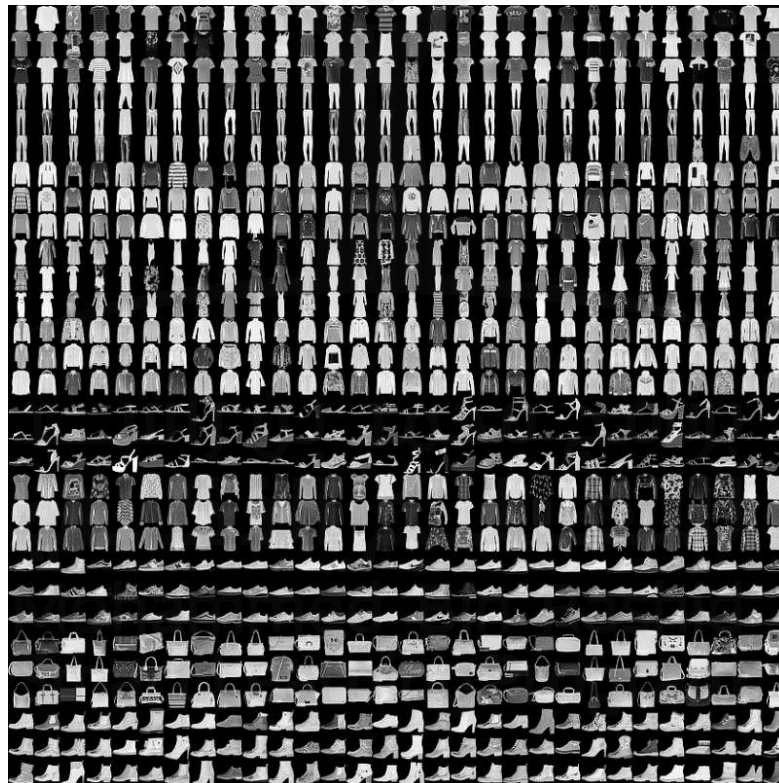
Create and train an ANN model using Python and images from Fashion-MNIST dataset to predict the class of a test image, as shown in the image below.



Then evaluate your model and make predictions using any image of clothing accessory downloaded from the internet.

Record all the outputs for your model.

The details for the MNIST dataset are given below.





Fashion-MNIST is a dataset consisting of a training set of 60,000 examples and a test set of 10,000 examples. Each example is a 28x28 grayscale image associated with a label from 10 classes.

Each image is 28 pixels in height and 28 pixels in width, for a total of 784 pixels in total. Each pixel has a single pixel-value associated with it, indicating the lightness or darkness of that pixel, with higher numbers meaning darker. This pixel-value is an integer between 0 and 255. The training and test data sets have 785 columns. The first column consists of the class labels (see above) and represents the article of clothing. The rest of the columns contain the pixel-values of the associated image.

Each training and test example is assigned to one of the following labels:

- 0 T-shirt/top
- 1 Trouser
- 2 Pullover
- 3 Dress
- 4 Coat
- 5 Sandal
- 6 Shirt
- 7 Sneaker
- 8 Bag
- 9 Ankle boot





```

#importing libraries
import tensorflow as tf
from tensorflow import keras
from keras.models import Sequential
from keras.layers import Dense, Flatten, Conv2D, MaxPooling2D, Dropout
from tensorflow.keras import layers
from tensorflow.keras.utils import to_categorical
import numpy as np
import matplotlib.pyplot as plt
from keras import datasets

#downloading the dataset
(x_train, y_train), (x_test, y_test) = datasets.fashion_mnist.load_data()

#Print the data type of x_train
print(type(x_train))
#Print the data type of y_train
print(type(y_train))
#Print the data type of x_test
print(type(x_test))
#Print the data type of y_test
print(type(y_test))

#Get the shape of x_train
print('x_train shape:', x_train.shape)
#Get the shape of y_train
print('y_train shape:', y_train.shape)
#Get the shape of x_test
print('x_test shape:', x_test.shape)
#Get the shape of y_test
print('y_test shape:', y_test.shape)

#changing the shapes of the label data
y_train = y_train.reshape(-1,)
y_test = y_test.reshape(-1,)

#normalising the training and testing images divided by 255 (Image)
x_train =x_train / 255
x_test = x_test / 255

#check images and label
classes = ['Top', 'Pant', 'Pullover', 'Dress', 'Coat', 'Sandals', 'Shirt', 'Sneakers', 'Bag', 'Boot']

```

```

def plot_sample(X, y, index):
    plt.figure(figsize = (4,4))
    plt.imshow(X[index], cmap='gray')
    plt.xlabel(classes[y[index]])
idx = 1000
plot_sample(x_train, y_train, idx)

#build the structure of ANN model
model = Sequential([
    layers.Flatten(input_shape=(28,28,1)),
    layers.Dense(2000, activation='relu'),
    layers.Dense(1500, activation='relu'),
    layers.Dense(500, activation='relu'),
    layers.Dense(10, activation='softmax')
])

#choose the parameters of the ANN model
model.compile(
    optimizer = 'sgd',
    loss='sparse_categorical_crossentropy',
    metrics=['accuracy']
)

#print the summary of ANN model
model.summary()

#Start the training and store the changes
print("Fit model on training data")
history = model.fit(x_train, y_train, batch_size = 15, epochs=5,
validation_split = 0.3)

# Evaluate the model on the test data using `evaluate`
print("Evaluate on test data")
results = model.evaluate(x_test, y_test)
print("test loss, test acc:", results)

#Visualize the models accuracy
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('Model accuracy')
plt.ylabel('Accuracy')
plt.xlabel('Epoch')
plt.legend(['Train', 'Val'], loc='upper left')
plt.show()

```

```

#Visualize the models loss
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('Model loss')
plt.ylabel('Loss')
plt.xlabel('Epoch')
plt.legend(['Train', 'Val'], loc='upper right')
plt.show()

#preparing the test image
idx =20
classes = ['Top', 'Pant', 'Pullover', 'Dress', 'Coat', 'Sandals', 'Shirt',
'Sneakers', 'Bag', 'Boot']
plt.imshow(x_test[idx], cmap='gray')
print('The actual label is: ', classes[y_test[idx]])
test_im = x_test[idx]
test_im.shape
test_im = np.reshape(test_im, (1,28,28))
test_im.shape

# making predictions using the ann model designed above
predictions = model.predict([test_im])
classes = ['Top', 'Pant', 'Pullover', 'Dress', 'Coat', 'Sandals', 'Shirt',
'Sneakers', 'Bag', 'Boot']
predictions = np.around(predictions,2)

#Find the the highest probability of the class
pred = np.amax(predictions)

#Find the index of the highest value
clas = list(np.where(predictions == pred))
print("The predicted class is:",clas[1],
      "\n\nProbability of other classes:",predictions,
      "\n\nThe highest probability is",pred)

idd = int(clas[1])
print("The predicted class is: ",classes[idd])

```

### Activity 5.2.3

1. What is the purpose of using training, validation and testing datasets when building an ANN model?

The training dataset is the actual dataset that you use to train the model. The model sees and learns from this data.

The validation set is used to evaluate a given model and fine-tune the learning rate of a model.

The Test dataset is used to evaluate the model. It is only used once a model is completely trained (using the train and validation sets).

2. What is the ratio of the different datasets you have used in Activity 5.2.1?

Training dataset = 60,000 samples = 85.71 % approx.

Testing dataset = 10,000 samples = 14.28 % approx.

Validation dataset = 30% of training dataset = 18,000 samples

3. What will happen if you change the ratios of the different datasets in Activity 5.2.1?

Test it and note your answer below.

Answers may vary as per the value changed by the student.

Hint: Students can change the value of `validation_split` while training the model.

### Activity 5.2.3

What can you conclude about the performance of the model you have designed in Activity 5.2.1?

For the above-mentioned code in Activity 5.2.1, the model is a well-fit model as the training and validation loss decreases to a point of stability with a minimal gap between the two final loss values.

## Student reflection

List three things you have learned and two things you have enjoyed.

Three things I have learned:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Two things I have enjoyed:

1. \_\_\_\_\_

2. \_\_\_\_\_

<b>Learning outcomes</b>	<b>Key Skills</b> (Please tick the box to show your understanding of the skills below.)	<b>I do not understand.</b>	<b>I understand.</b>	<b>I'm an expert.</b>
Develop a simple neural network algorithm to solve a problem.	I can develop a neural network algorithm to make a prediction.			
Solve a classification problem using NNs.	I can develop and train a classification model to solve a simple classification problem with Python.			
Use training and testing datasets to build a model.	I can differentiate between training, validation, and test sets.			
Use learning curves to diagnose the performance of a machine learning model.	I can use learning curves on the train and validation datasets to diagnose an underfit, overfit, or well-fit model.			
<b>Teacher's comment:</b>				

## Section 3: Computer vision and neural networks

### Aim

In this section, you will take a closer look at what the future holds for AI technology and its current adoption in the UAE. You will also learn the potential risks of implementing AI and whether the advancements in AI should worry us or not. In addition, you will learn about the key ethical issues AI systems should consider and how they can avoid moral biases.

### Learning outcomes

- Analyse the difference between human and computer vision systems.
- Demonstrate basic concepts and methods in the field of computer vision.


### Prior knowledge

- Computer science
- Robotics
- Engineering

### My STREAM focus

- Technology
- Reading
- Engineering

### Key vocabulary

Word	Meaning	Picture
computer vision	study and application of methods that allow computers to "understand" image content	

### Activity 5.3.1

Research the **similarities and differences** between computer vision and human vision. Provide examples to support your findings.

	Computer Vision	Human Vision
Differences	<ul style="list-style-type: none"> <li>• A type of artificial intelligence that allows computers to comprehend and interpret the information of digital images.</li> <li>• It requires an algorithm to include human vision.</li> <li>• Uses machine learning techniques and algorithms are used to detect, discriminate, and classify objects based on size or colour.</li> <li>• One of the most difficult processes in computer vision is object recognition.</li> </ul>	<ul style="list-style-type: none"> <li>• One of the most vital senses in a person's body that allows them to see.</li> <li>• It does not require an algorithm to see.</li> <li>• Uses human eyes to comprehend the environment as well as images and videos</li> <li>• Objects are easily recognized by humans.</li> </ul>
Similarities	Uses a sensing device such as the camera.	The human eye acts as the sensing device to capture images from the environment.

### Activity 5.3.2

You are planning to build an AI model that will help young children learn about the different animal species that live in Dubai Safari. You will use the computer vision technique to implement this idea.

Describe in detail the complete process that you will follow to implement your idea.

**\*\*Students have to describe here how the computer vision process will be used to build the model.**

The process described below can be used to build the AI model for the problem described above:

Step 1 – Image capturing:

The real-time images/videos of all the animals in the Safari have to be captured for further analysis and observation.

**Step 2 – Image Processing:**

In this step, model training is required. The training will help the model to get a database of features for each category of animal present in Safari. Usually, Deep learning models are used at this step.

**Step 3 – Understanding the image:**

Based on the features learned in Step 2, the model should be able to classify an image of an animal. When an animal is classified, it should display any important information about the animal.

**Activity 5.3.3**

You will be graduating from school next term. Your friends and you plan to take photos at different locations around your school to save memories. After you have taken the photos, you will need to process the image using the image processing techniques that you learned in this chapter.

Describe the different aspects of your photos that will be examined with computer vision and image processing techniques.

Students have to identify the possible steps from the image processing process mentioned in Table 5.3.1 from the student book. The steps they will choose to depend on how they want to save their graduation memories. Hence the answers may vary.

**Activity 5.3.4**

Research the different types of computer vision applications that have already been implemented in the UAE. Briefly describe each application you are investigating.

Road safety - Cameras use computer vision techniques to spot motorists who use phones while driving, before sending an SMS to warn them.

School buses are using the computer vision technique to monitor the bus drivers.

Computer vision technology is used to maintain security and flagging signals of bullying in educational institutions.



### Activity 5.3.5

You love animals. Using a live video feed, you are attempting to build a computer vision model that can detect and classify animals. This application will be developed using ANN.

Suggest an ANN model that can be used to build this application.

Describe your work in detail. Include information such as the type of animal you wish to detect and classify, the number of inputs/outputs, the number and function of hidden layers that will be included in the model, etc.

A Convolutional Neural network can be used to suggest a solution for the model.  
\*\* students can use the skills guide to describe the process in details,



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للتعلم الذكي  
Mohammed Bin Rashid  
Smart Learning Program

## Student reflection

List three things you have learned and two things you have enjoyed.

Three things I have learned:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Two things I have enjoyed:

1. \_\_\_\_\_

2. \_\_\_\_\_

Learning outcomes	Key Skills (Please tick the box to show your understanding of the skills below.)	I do not understand.	I understand.	I am an expert.
Analyse the difference between human and computer vision systems.	I can illustrate the link between computer vision and known principles of human visual system.			
	I can demonstrate basic knowledge in image processing.			
Demonstrate basic concepts and methods in the field of computer vision.	I can explain the application of neural networks in computer vision.			
Teacher's comment:				

## Section 4: Future of AI

### Aim

In this section, you will take a closer look at what the future holds for AI technology and its current adoption in the UAE. You will also learn the potential risks of implementing AI and whether the advancements in AI should worry us or not. In addition, you will learn about the key ethical issues AI systems should consider and how they can avoid moral biases.

### Learning outcomes

- Assess the shortcomings and risks of using AI.
- Identify the key ethical issues related to the implementation of AI technologies.
- Determine what the future holds for AI insight of the 4th industrial revolution.

### Prior knowledge


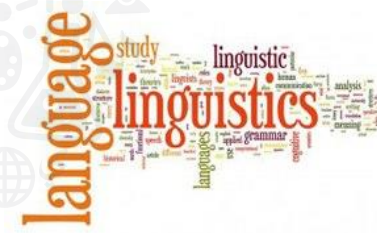
- Computer science
- Robotics
- Engineering

### My STREAM focus

- Technology
- Reading
- Engineering

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Mohammed Bin Rashid  
Smart Learning Program

## Key vocabulary

Word	Meaning	Picture
ethics	study of what is right or wrong in human conduct	
linguistics	scientific study of language	

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#### Activity 5.4.1

Can you give three examples of AI that are currently making the UAE's cities 'smarter'?

- Oyoon – During the first year of COVID, it was used to limit the movement of residents. This program monitors the permits of residents who leave their homes by using facial, voice, and license plate recognition.
- AI Hosn application – testing and tracking in COVID
- Smart screening vehicle - analyse number plates of vehicles travelling over 80 km/h with nearly 100% accuracy

#### Activity 5.4.2

You are asked to improve the design of a game where the robot runs towards its opponent instead of avoiding it. How would you modify the game's design or rules so that the robot avoids its opponent? Explain your design idea.

Answers may vary

#### Activity 5.4.3

Research three potential risks of using ML.

- The most primary threat is to target a ML model and trick it so that it makes false predictions by giving wrong inputs.
- ML algorithms use data for training and learning. Therefore, maintaining data privacy and confidentiality is a very difficult task. It becomes more even critical when it is built right into the machine learning model.
- ML systems are designed with an already trained machine learning model, which is further modified for any specialised purposes if required. During this process of modification, there are possibilities of a serious transfer learning attack. If you choose a popular model for your ML system, then it is possible that attackers will target your model so that your system fails to complete the task to be completed by your system.

(Note: Transfer learning is the process of gaining knowledge while creating new AI models which can be further used to a different problem as well. E.g., the knowledge gained while building a model to classify cars can be later on used to classify trucks as well.)

#### Activity 5.4.4

Research and describe in detail the application of NLP techniques in the education system.

Answers may vary

#### Activity 5.4.5 ( T, R, E)

Research and answer the following eight ethical questions about AI in your own words.

- (a) Is AI fair?
- (b) Who is responsible for AI?
- (c) How do we protect access to AI from bad actors?
- (d) Will AI make humans stop talking to one another?
- (e) Will the AI developments affect human employment?
- (f) Who benefits from AI?
- (g) Who decides how to deploy AI models?

Students should try to research these answers and try to put their opinions.  
This activity will help students with their research capabilities.

#### Activity 5.4.6 ( T, R, E)

Identify the views of the following organisations regarding AI.

- (a) Microsoft
- (b) Google
- (c) IBM

Record your answers below. Note any specific similarities or differences between the views of the three organisations.

Students should try to research these answers and try to put their opinions.  
This activity will help students with their research capabilities.

## Student reflection

List three things you have learned and two things you have enjoyed.

Three things I have learned:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Two things I have enjoyed:

1. \_\_\_\_\_

2. \_\_\_\_\_

<b>Learning outcomes</b>	<b>Key Skills</b> (Please tick the box to show your understanding of the skills below.)	<b>I do not understand.</b>	<b>I understand.</b>	<b>I am an expert.</b>
Assess the shortcomings and risks of using AI.	I can explore whether AI poses an existential threat to humanity.			
Identify the key ethical issues related to the implementation of AI technologies.	I can identify the ethical rules AI systems should use.			
	I can recognise potential moral harms caused by AI systems.			
	I can investigate the ways to prevent learning algorithms from acquiring morally objectionable biases.			
Determine what the future holds for AI insight of the 4th industrial revolution.	I can identify the UAE's strategies and plans for employing AI.			
	I can recognise the recent breakthroughs in AI.			
	I can explore the future of AI in Natural Language Processing (NLP).			
<b>Teacher's comment:</b>				