Analog to Digital Convertor

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Objective:

Analog to Digital Convertor.

In electronics, an **analog-to-digital converter** (**ADC**, **A/D**, or **A-to-D**) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an input analog voltage or current to a digital number representing the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities.

Methodology:

The analog values are taken to be in between 0 and 64 with minimum interval as 0.05.

The digital values are assumed to be of 6 bit length ranging from 0 to 63.

The corresponding digital values are generated as:

If the float value is between 0 and 1, the output shall be 0,

If the float value is between 1 and 2, the output shall be 1 and so on.

The dataset shall be as follows:

Analog values	Digital values
0.0	0
0.05	0
0.1	0
. . .	0
0.95	0
1.0	1
1.05	1
. . .	1

1.95	1
2.00	2
. . . . .	
63.85	63
63.9	63
63.95	63

Data Generation:

Y values are generated using a for loop in range (0,64).

X values are floating values also generated using a for loop in range (0,64) with increment of 0.05.

The code for data generation is as follows:

```
X= [[[0+j] for j in np.arange(i-1,i,0.05)] for i in np.arange(1,65)]
print(*X, sep="\n")


Y= [(0+i) for i in range(0,64)]
print (Y)
```

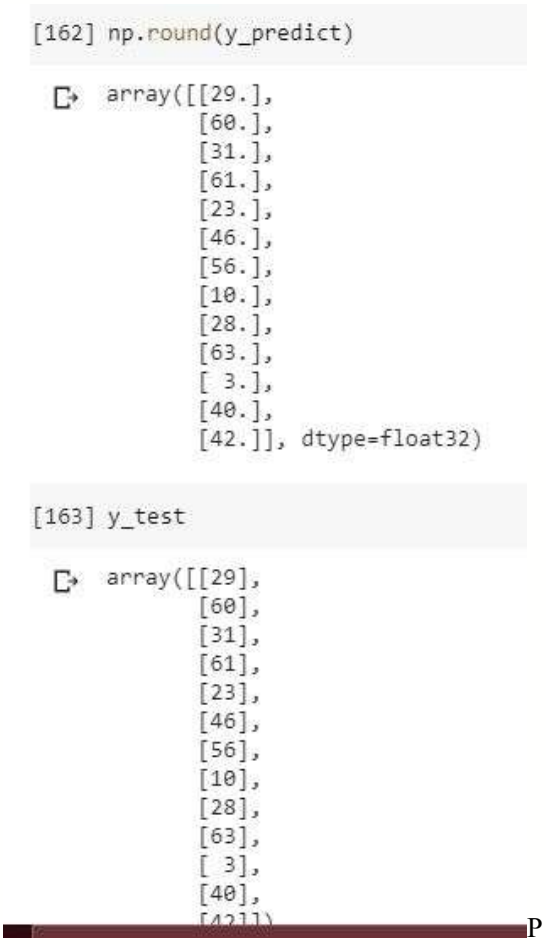
Network Layers:

The layers used are
1.LSTM layer with 100 neurons with input shape(20,1) and with return sequence ‘true’ with ‘relu’ as activation function.
2.LSTM layer with 50 neurons and with return sequence ‘false’ with ‘relu’ as activation function.
3.Dense layer with 20 neurons and activation function as ‘relu’.
4.Dense layer with 1 neuron and activation function as ‘relu’ is the output layer.

LSTM Layer:
Long short-term memory (LSTM) is an artificial recurrent neural network (RNN) architecture used in the field of deep learning. Unlike standard feedforward neural networks, LSTM has feedback connections. It can not only process single data points (such as images), but also entire sequences of data.

Dense Layer:
A dense layer is just a regular layer of neurons in a neural network. Each neuron recieves input from all the neurons in the previous layer, thus densely connected. The layer has a weight matrix W, a bias vector b, and the activations of previous layer a.

Output:



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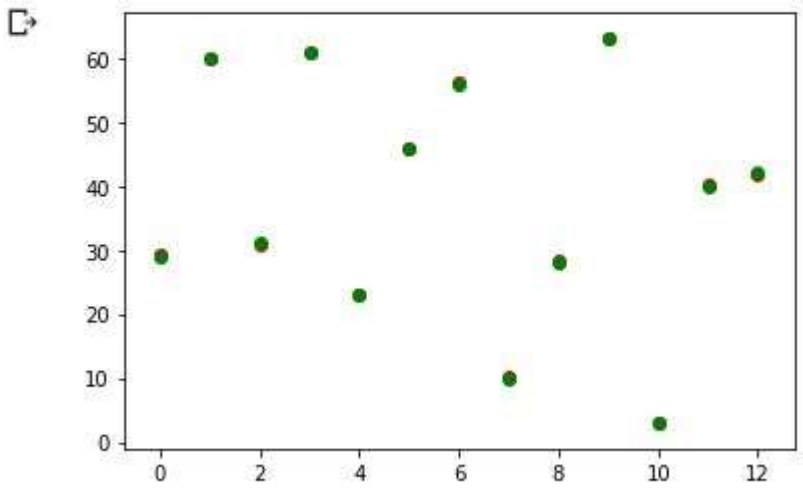
Comparision between the test data and predicted date

```
[165] plt.scatter(range(13),y_predict,c = 'r')
      plt.scatter(range(13),y_test ,c='g')
      plt.show()
```



Graph between the predicted values and test values