

# Sequential Model

Learn how a neural network is built in Keras.

## Chapter Goals:

- Initialize an MLP model in Keras

### A. Building the MLP

In Keras, every neural network model is an instance of the `Sequential` (<https://keras.io/models/sequential/>) object. This acts as the container of the neural network, allowing us to build the model by stacking multiple layers inside the `Sequential` object.

The most commonly used Keras neural network layer is the `Dense` (<https://keras.io/layers/core/#dense>) layer. This represents a fully-connected layer in the neural network, and it is the most important building block of an MLP model.



When building a model, we start off by initializing a `Sequential` object. We can initialize an empty `Sequential` object and add layers onto the model using the `add` function, or we can directly initialize the `Sequential` object with a list of layers.

```
1 model = Sequential()
2 layer1 = Dense(5, input_dim=4)
3 model.add(layer1)
4 layer2 = Dense(3, activation='relu')
5 model.add(layer2)
```








 Succeeded


Adding two Dense layers to a Sequential model.



```
1 layer1 = Dense(5, input_dim=4)
2 layer2 = Dense(3, activation='relu')
3 model = Sequential([layer1, layer2])
```





 Code Execution In Progress...

Initializing a Sequential model with two Dense layers.

The `Dense` object takes in a single required argument, which is the number of neurons in the fully-connected layer. The `activation` keyword argument specifies the activation function for the layer (the default is no activation). In the code snippets above, we used no activation for `layer1` and ReLU activation for `layer2`.

The first layer of the `Sequential` model represents the input layer. Therefore, in the first layer we need to specify the feature dimension of the input data for the model, which we do with the `input_dim` keyword argument.


In the code snippets above, we set the input feature dimension to 4, meaning that the input data has shape `(batch_size, 4)` (where `batch_size` is the data's batch size, decided at runtime).


## Time to code!


The coding exercise for this chapter involves setting up a Keras `Sequential` model with a single `Dense` layer. We start off with an empty initialized `Sequential` object.


**Set `model` equal to `Sequential` initialized with no arguments.**


```
1 # CODE HERE
```



















Solution



```
1 model = Sequential()  
2  
3  
4
```


We'll build a three layer MLP model. The first layer will consist of 5 neurons and use ReLU activation. It will also act as the input layer for the model.


To create the input layer, we'll initialize a `Dense` object with the requisite number of neurons and activation. We'll also set the `input_dim` keyword argument to `2`, which represents the feature dimension of the input data for the model.


**Set `layer1` equal to a `Dense` with 5 as the required argument, `'relu'` for the activation keyword argument, and 2 for the `input_dim` keyword argument.**


**Then call `model.add` on `layer1`.**


1 # CODE HERE














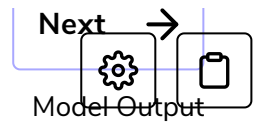
Solution



```
1 layer1 = Dense(5, activation='relu', input_dim=2)  
2 model.add(layer1)  
3  
4
```

 **Back**


Introduction




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