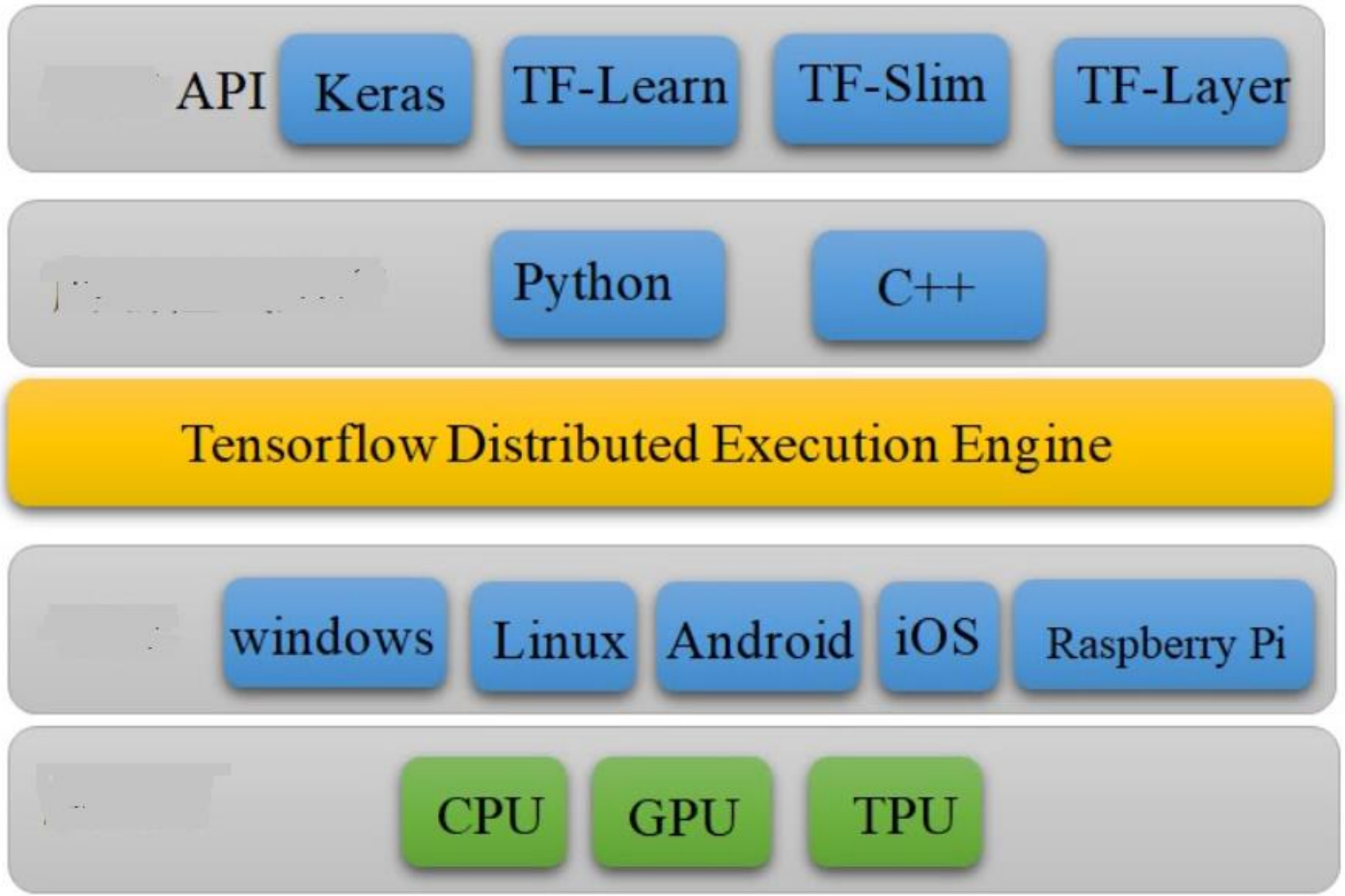
TensorFlow

A powerful Package for Deep learning & ML

- Developed by Google Brain, extensively used in Google Products—Google Speech Recognition, Google Image Recognition, Google Translation

- Open Source
- A tool to speed up matrix operations
- A tensor a is a matrix

Architecture



Tensor

0.3 Zero dimensional tensor

[0.1, 0.2, 0.3] One dimensional tensor, vector

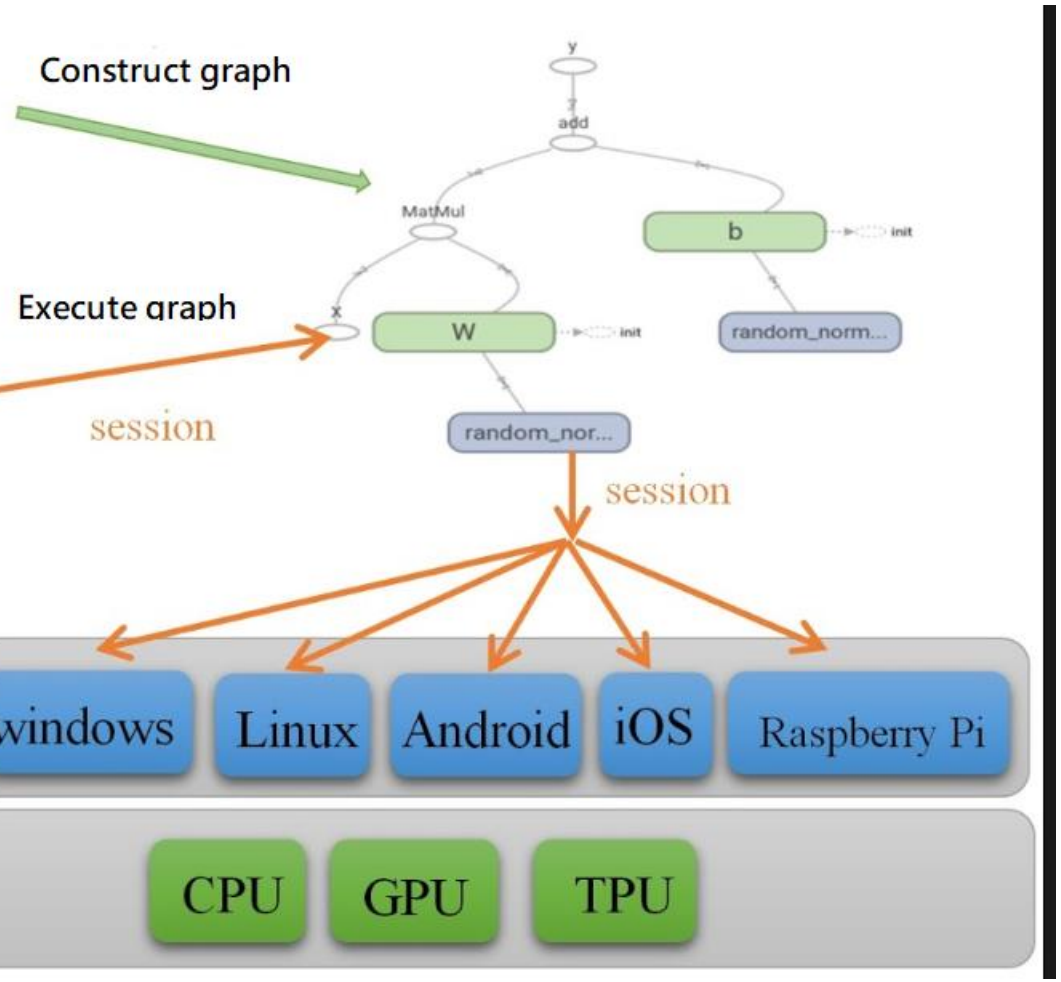
$$\begin{bmatrix} 0.1, 0.2, 0.3 \\ 0.1, 0.3, 0.5 \end{bmatrix}$$ Two dimensional tensor, 2-d array

- Tensorflow is a tool to construct and execute a computation graph
- Components of a Tensorflow graph:
  - Placeholder for accepting the input
  - Model variables—parameters to be optimized
  - A graph is a function which calculate the output based on the input and the model variables
  - A cost function to guide updating the model variables to optimize the model
  - An optimization method (or policy) for optimizing the model

Computational graph

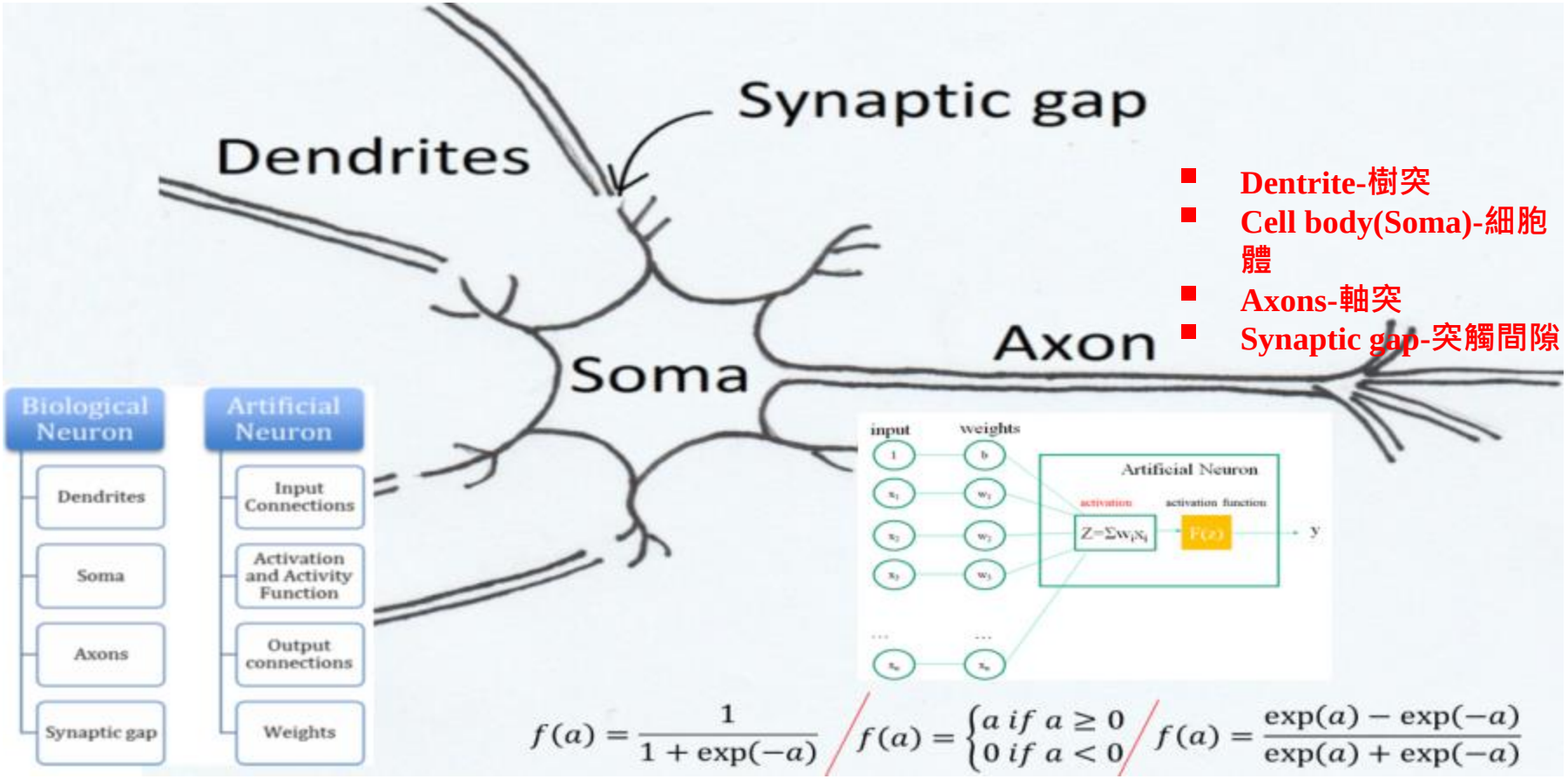
```
import tensorflow as tf
import numpy as np
W = tf.Variable(tf.random_normal([3, 2]),name='W')
b = tf.Variable(tf.random_normal([1, 2]),name='b')
X = tf.placeholder("float", [None,3],name='X')
y=tf.nn.sigmoid(tf.matmul(X,W)+b,'y')
```

```
with tf.Session() as sess:
    init = tf.global_variables_initializer()
    sess.run(init)
    X_array = np.array([[0.4,0.2 ,0.4],
                        [0.3,0.4 ,0.5],
                        [0.3,-0.4,0.5]])
    (_b,_W,_X,_y)=sess.run((b,W,X,y),
                           feed_dict={X:X_array})
```



- To see the graph
- Tensorboard –logdir=c:\pythonwork\tensorflow\log

Neural network



- Dentrite-樹突
- Cell body(Soma)-細胞體
- Axons-軸突
- Synaptic gap-突觸間隙

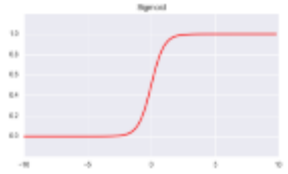
perceptron

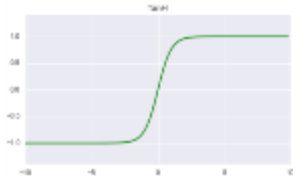
Sigmod

ReLU

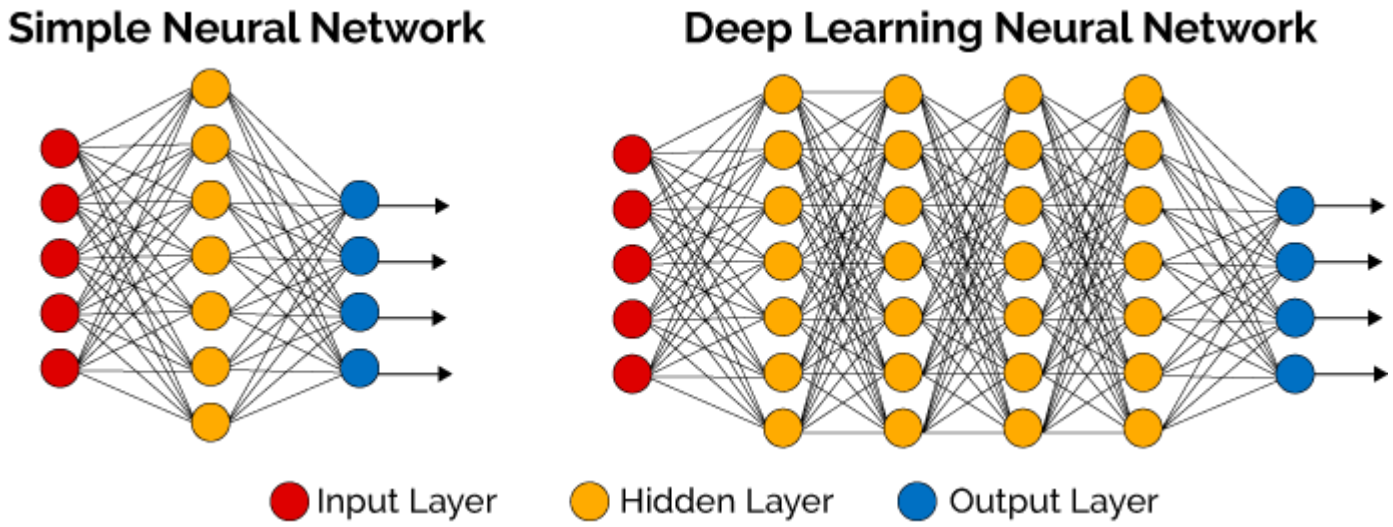
(Rectifier, or Rectified Linear Unit)

Hyperbolic tangent

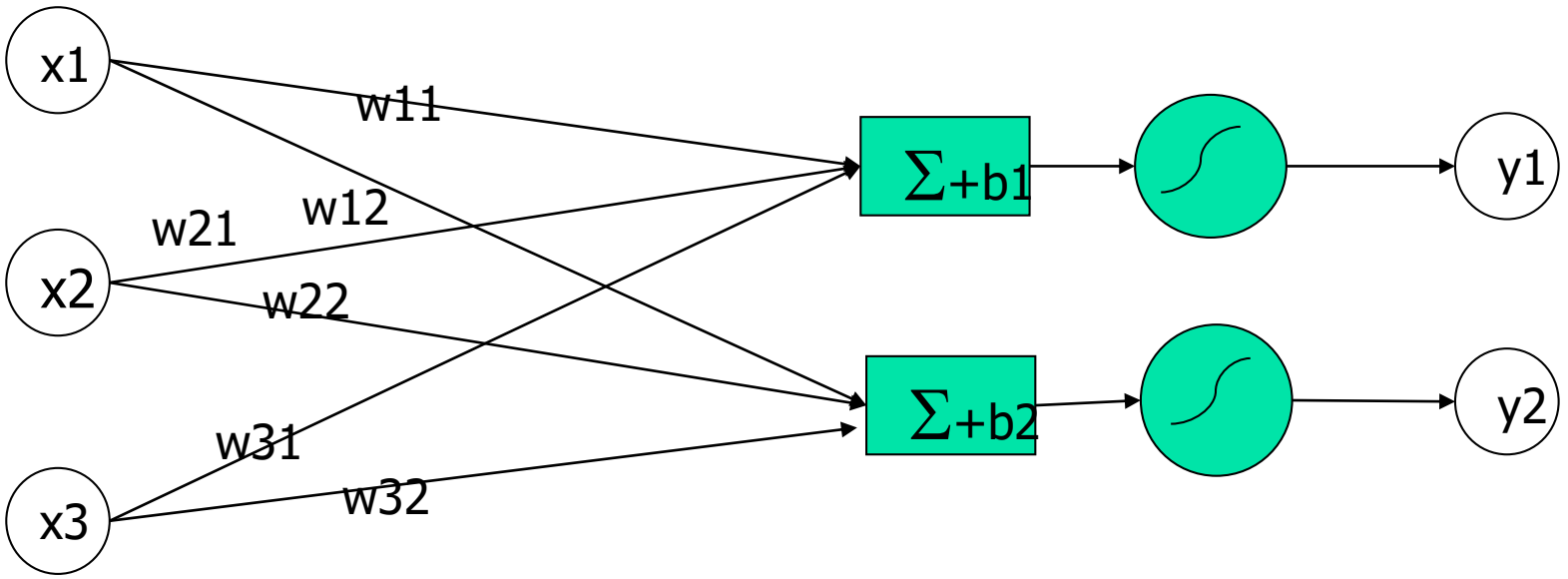




Multilayer Perceptron (MLP)



An MLP example



$$Y=\text{Sigmod}(X\times W+b)$$