# Deep Learning


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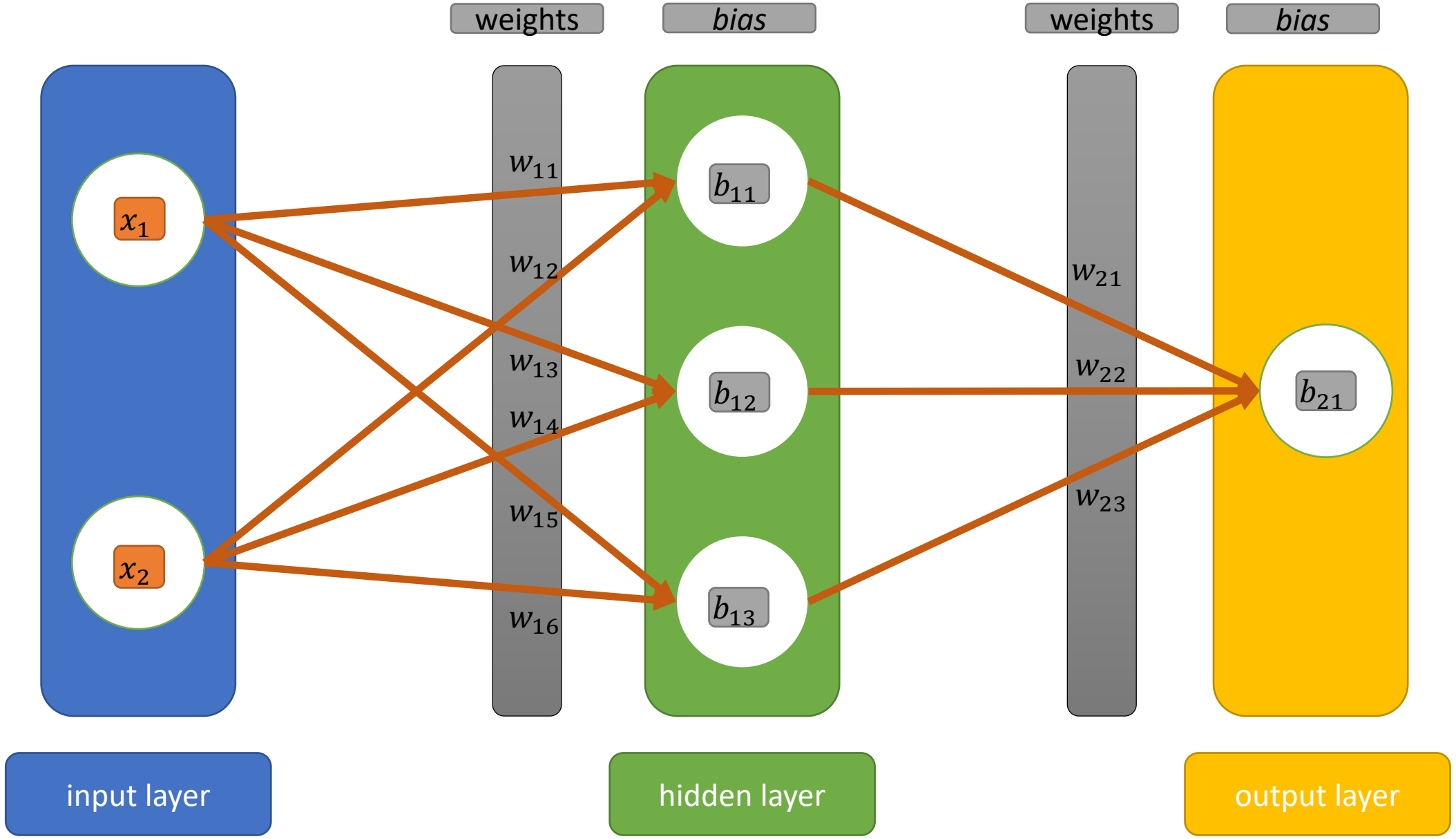



目的: 计算出每一层的权重 $w$ 以及 偏置$b$

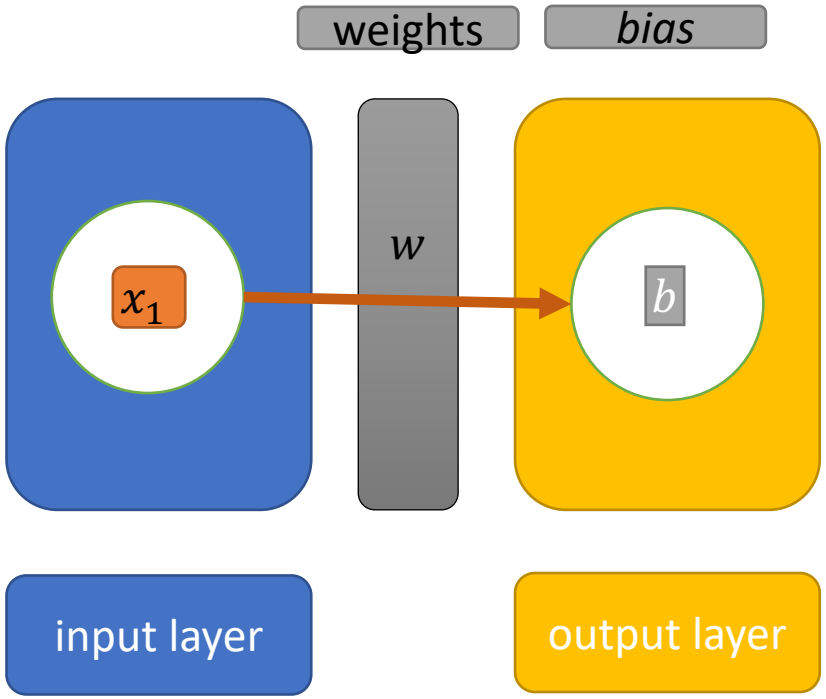
# Preparation

Python

Numpy

TensorFlow

Keras

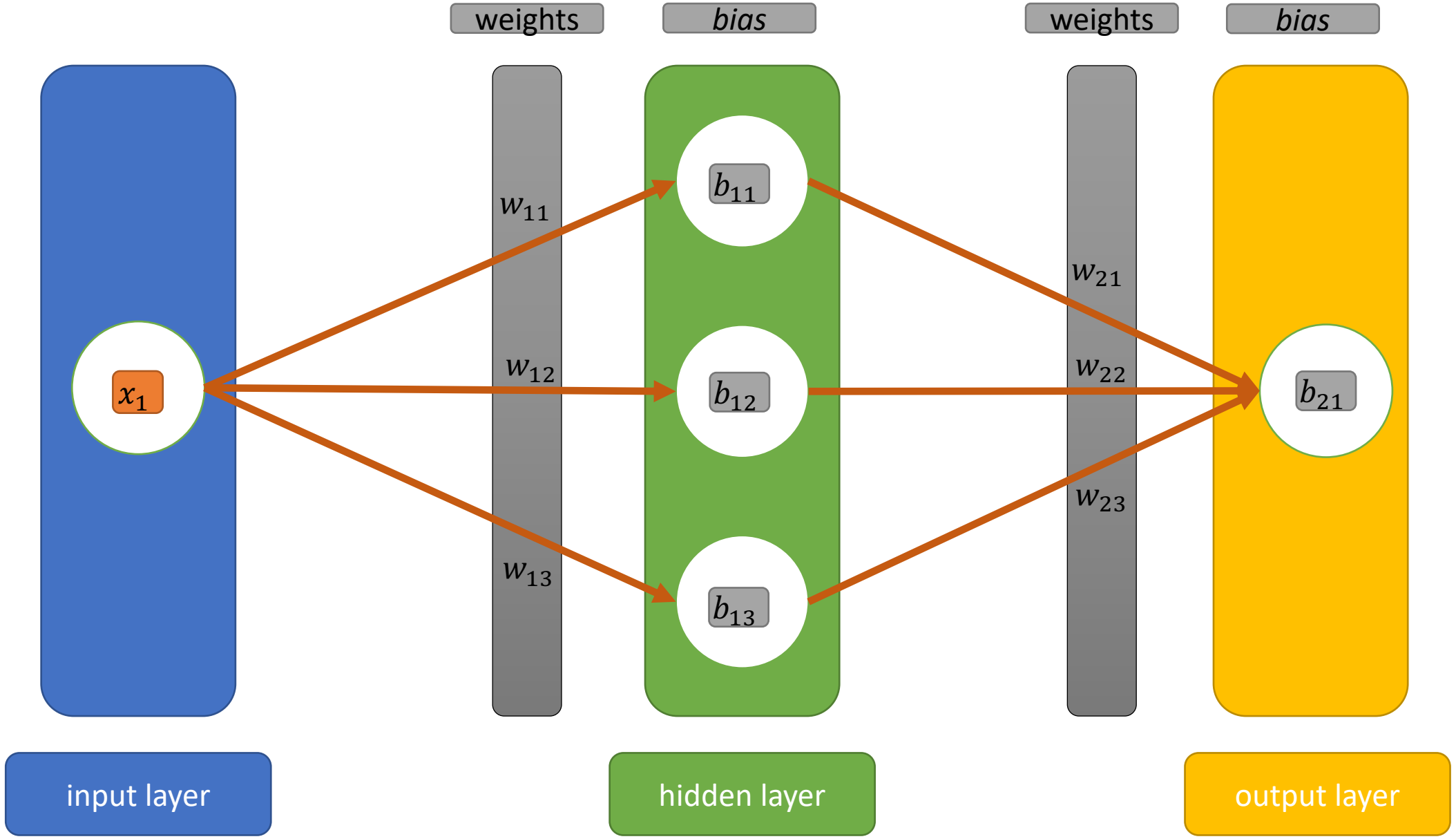



$$f(x) = 2x + 1$$

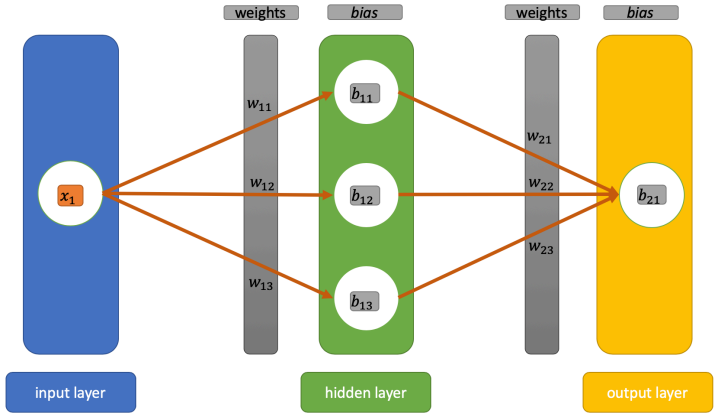
```python
import tensorflow as tf
import numpy as np

X = np.arange(-10, 11)
#[-10,-9,-8,-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10]

y = 2*X+1
#[-19,-17,-15,-13,-11,-9,-7,-5,-3,-1,1,3,5,7,9,11,13,15,17,19,21]

l1 = tf.keras.layers.Dense(units=1, input_shape=[1])

model = tf.keras.Sequential([l1])

model.compile(loss='mean_squared_error',optimizer=tf.keras.optimizers.Adam(0.1))

history = model.fit(X, y, epochs=30, verbose=False) # epochs=30, 100 or 300

l1_weight = l1.get_weights()

w = l1_weight[0]
print("w = ", w)

b = l1_weight[1]
print("b = ", b)

result = model.predict([-2]) # f(-2)=?
print("f(-2) = ", result)
```

$f$

class03/nn_1.py


weights
bias
weights
bias
$w_{11}$
$w_{12}$
$w_{13}$
$w_{21}$
$w_{22}$
$w_{23}$
$x_1$
$b_{11}$
$b_{12}$
$b_{13}$
$b_{21}$
input layer
hidden layer
output layer

$$f(x) = 2x + 1$$




$$f(x) = 2x + 1$$

class03/nn_2.py

$f$

```python
import tensorflow as tf
import numpy as np

X = np.arange(-10, 11)
#[-10,-9,-8,-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10]

y = 2*X+1
#[-19,-17,-15,-13,-11,-9,-7,-5,-3,-1,1,3,5,7,9,11,13,15,17,19,21]

l1 = tf.keras.layers.Dense(units=3, input_shape=[1])
l2 = tf.keras.layers.Dense(units=1)

model = tf.keras.Sequential([l1,l2])

model.compile(loss='mean_squared_error',optimizer=tf.keras.optimizers.Adam(0.1))

history = model.fit(X, y, epochs=30, verbose=False) # epochs=30, 100 or 300

l1_weight = l1.get_weights()
l2_weight = l2.get_weights()

w1 = l1_weight[0]
print("w1 = ", w1)

b1 = l1_weight[1]
print("b1 = ", b1)

w2 = l2_weight[0]
print("w2 = ", w2)

b2 = l2_weight[1]
print("b2 = ", b2)

result = model.predict([-2]) # f(-2)=?
print("f(-2) = ", result)

```

# END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