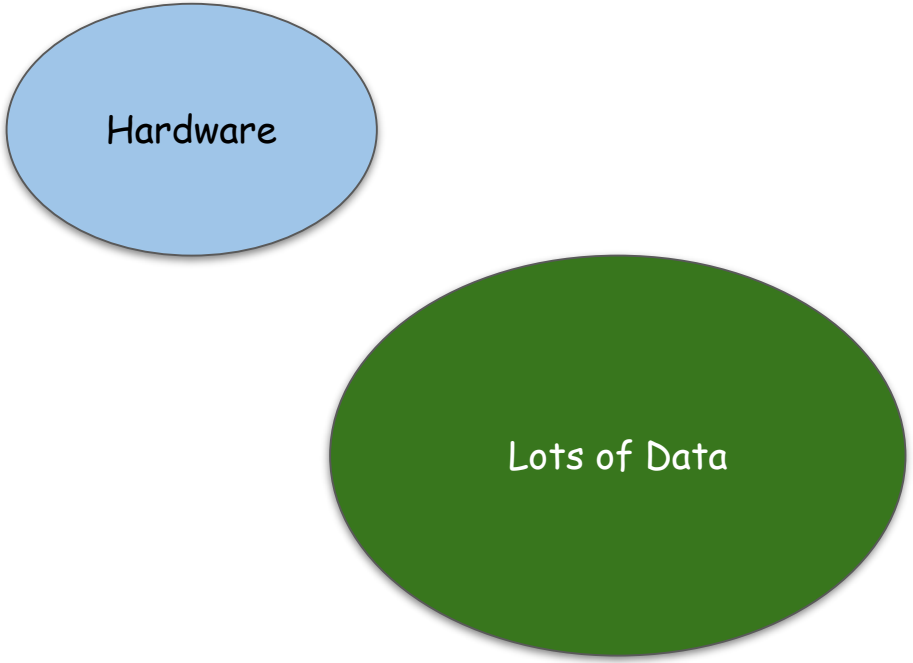
greatlearning
Learning for Life

What do we need for

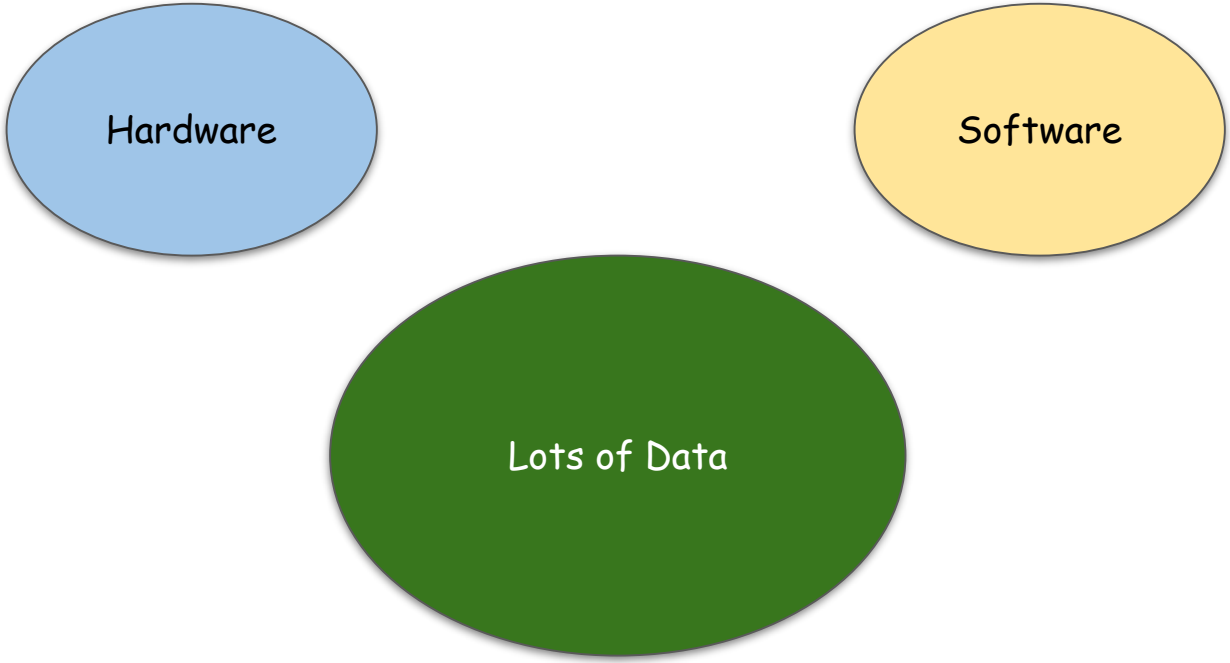
Machine Learning

Lots of Data

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

greatlearning
Learning for Life

TensorFlow

Open Source platform for Deep Learning

by Google

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

TensorFlow

- **Supported Platforms**
  - Linux / Ubuntu
  - Windows
  - Mac OS
  - Raspberry Pi

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

TensorFlow

- **Supported Languages**
  - Python
  - C++
  - C
  - Go
  - Java (Limited)
  - Swift (beta)

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

tensorflow.org/install

Installation Instructions

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

TensorFlow

Let’s start with… Hello World :)

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

```
import tensorflow as tf
hello = tf.constant('Hello World')
print (hello)
```

```
Tensor("Const:0", shape=(), dtype=string)
```

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

What is a tensor?

- ★ N-Dimensional Data Array
- ★ has Shape and Data Type
- ★ GPU support

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

```
Tensor("Const:0", shape=(), dtype=string)
```

Name

Shape

Data Type

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

```
import tensorflow as tf
hello = tf.constant("Hello World",name="my_tensor")
print (hello)
```

Giving tensor a name

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

Shape

```
import tensorflow as tf
hello = tf.constant("Hello",name="my_tensor",shape=[6,2])
print (hello)
```

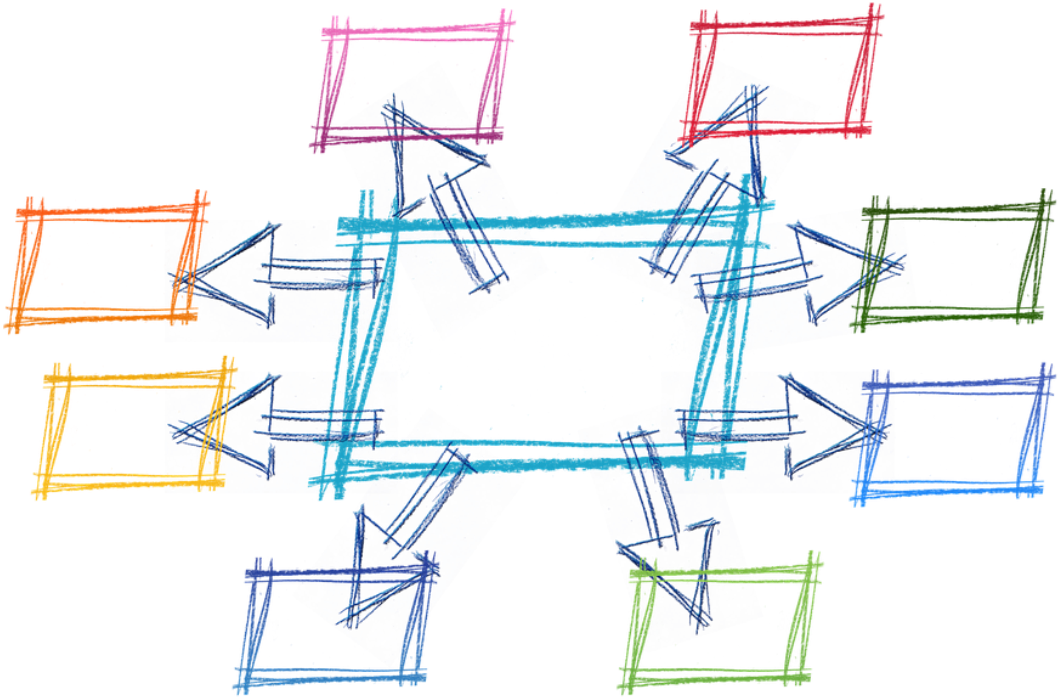
Tensor("my_tensor:0", **shape=(6,2)**, dtype=string)

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

greatlearning
Learning for Life

How do we print Hello World ?

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Understanding

'Computational Graph'

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

Computational Graph

Step 1

Build a graph

↓

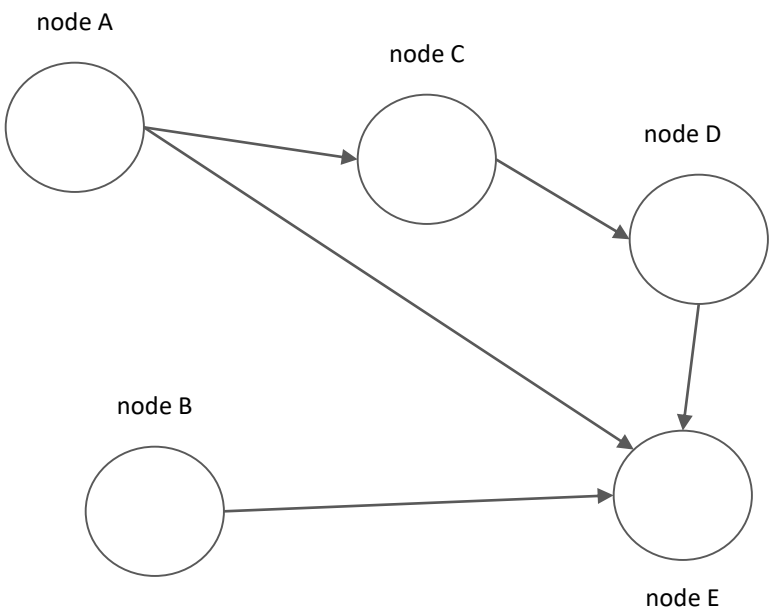
Step 2

Execute the graph

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

What is a Graph?

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Connected nodes

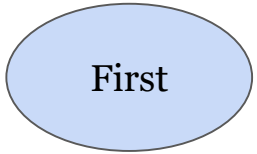
Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

Building Graph

$$c = a + b$$

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

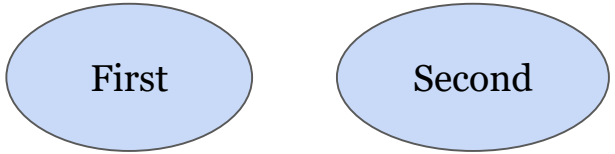
```
import tensorflow as tf
a = tf.constant([1.2],name='First',dtype= tf.float32)
```



Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

```
import tensorflow as tf
a = tf.constant([1.2],name='First',dtype= tf.float32)
```

```
b = tf.constant([3.4],name='Second',dtype=tf.float32)
```

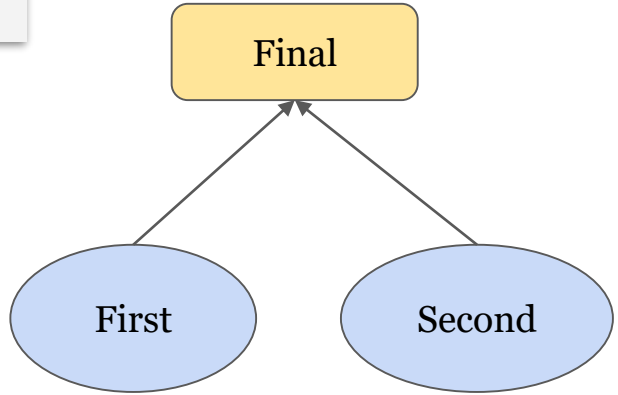


Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

```
import tensorflow as tf
a = tf.constant([1.2],name='First',dtype= tf.float32)
```

```
b = tf.constant([3.4],name='Second',dtype=tf.float32)
```

```
C = tf.add(a,b,name='Final')
```



Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

Executing Graph

$$c = a + b$$

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

```
With tf.Session() as sess:

        print(sess.run(c))
```

4.6

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

tensorFlow is changing .. Eager Execution

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

What is a Eager Execution?

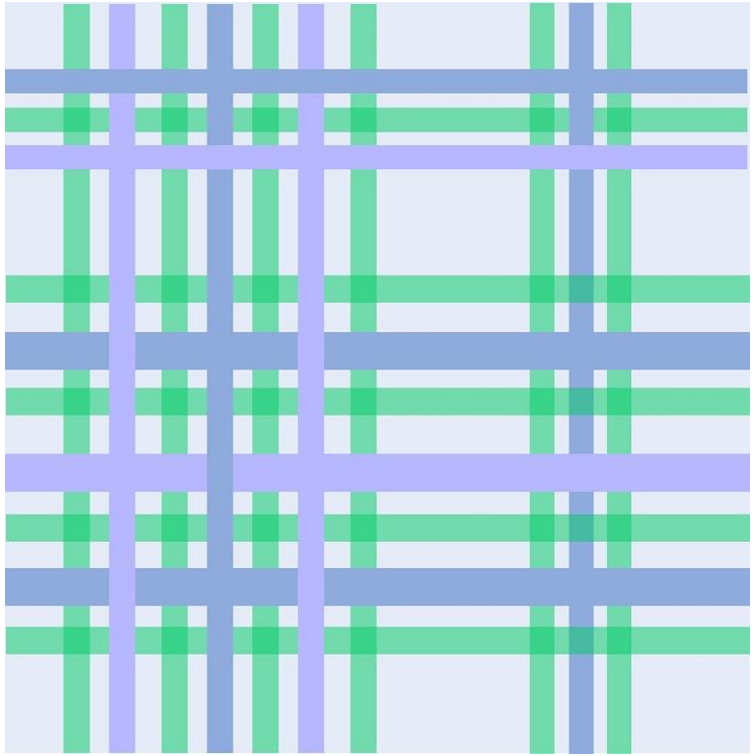
- ★ Execute operations as you call them just like other Python code
- ★ Default approach with tensorFlow 2.0
- ★ No need to use tf.Session()

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

Exercise

Using Eager Execution in tensorFlow

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Rivisting Linear Regression

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

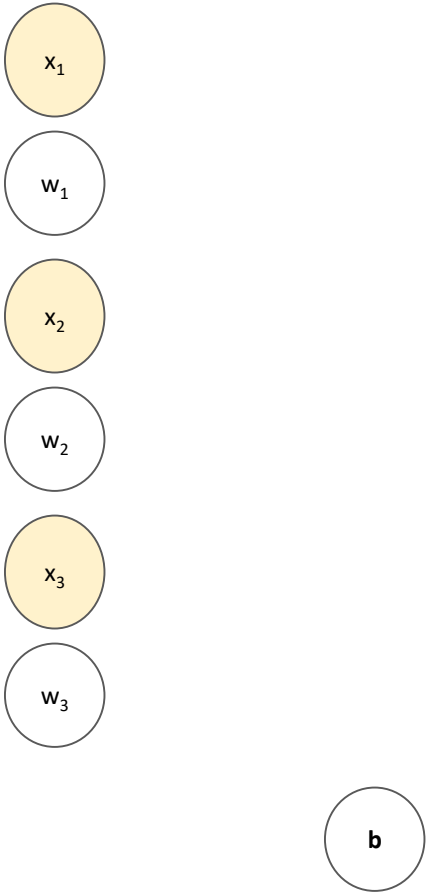
$$y = w_1x_1 + w_2x_2 + w_3x_3 + b$$

Linear Regression

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

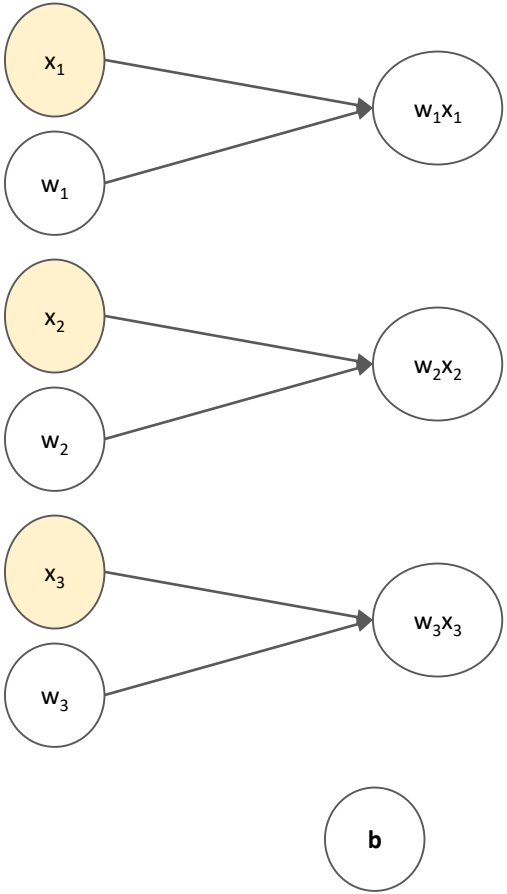
Linear Regression as a Graph

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



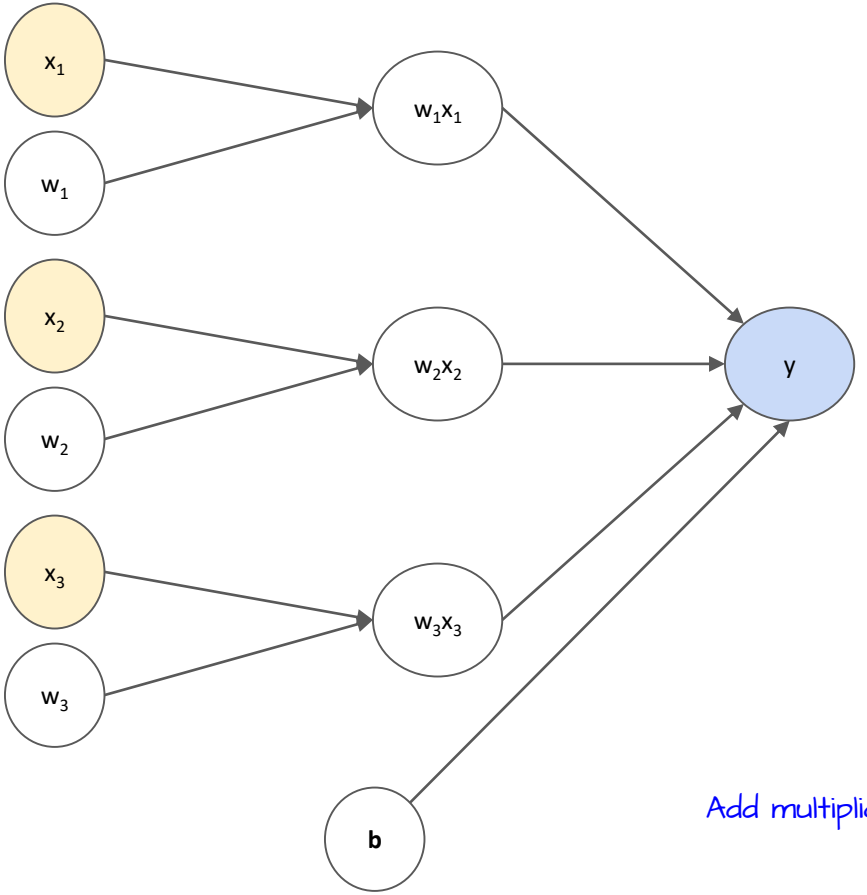
Start with Input features (x), Weights (w) and Bias (b)

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



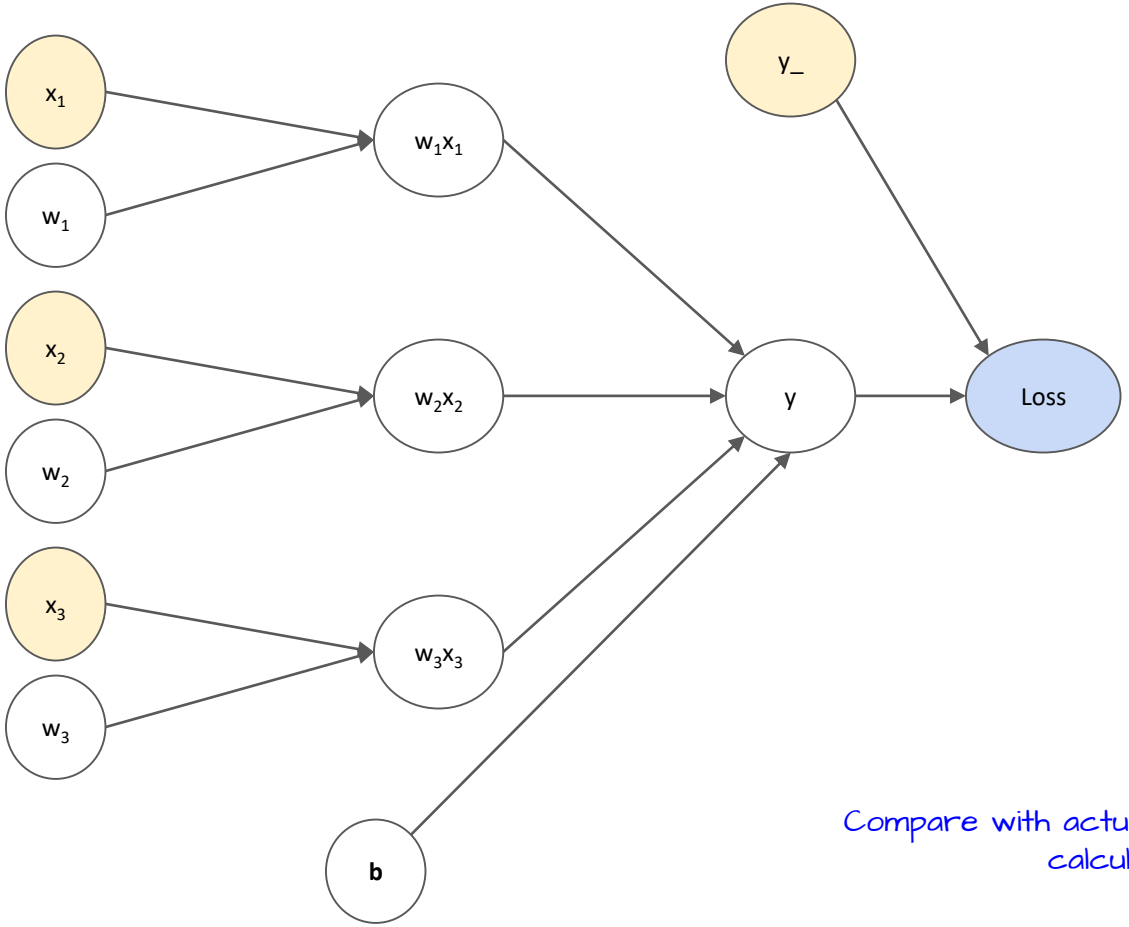
Multiply input features and weights

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



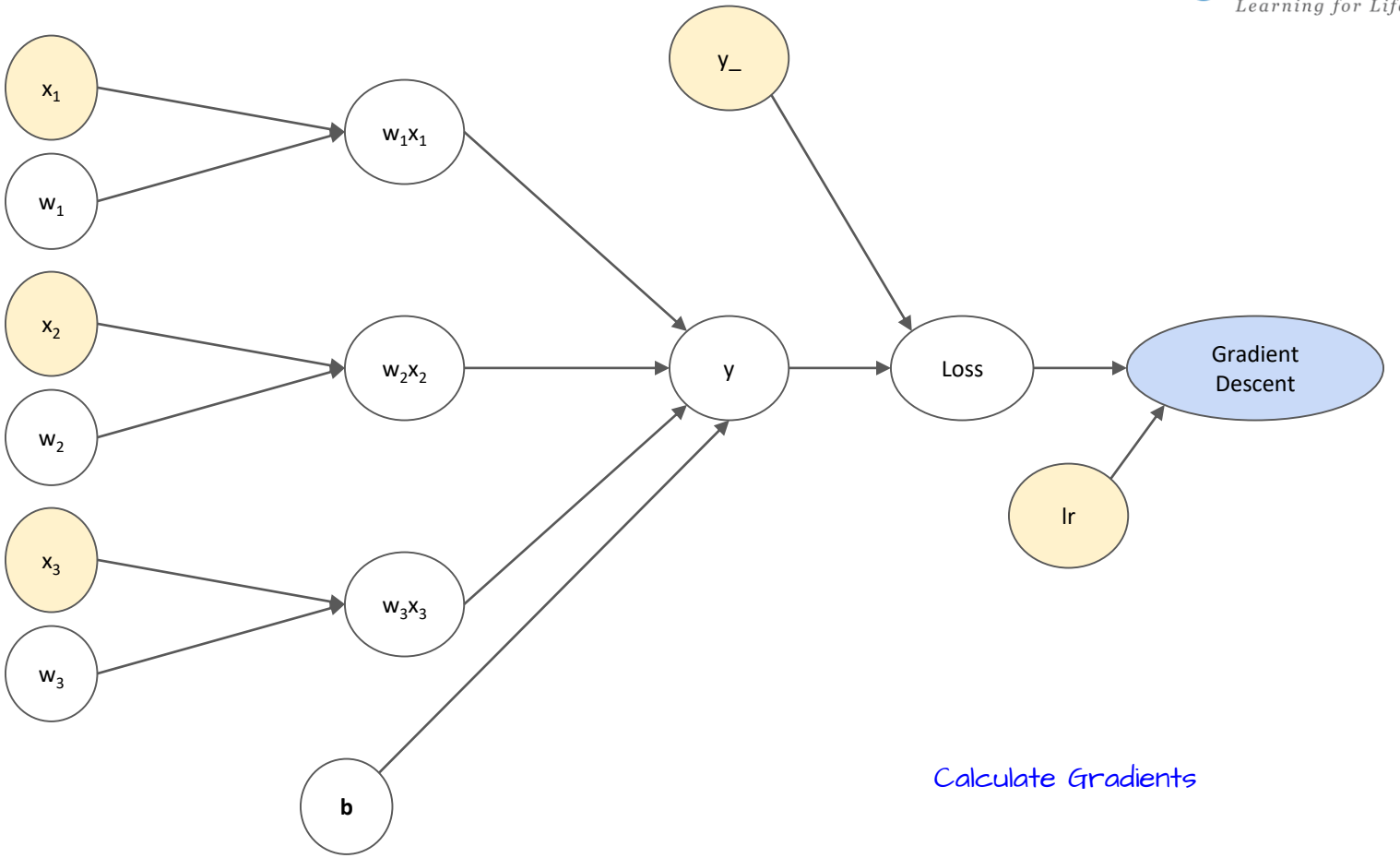
Add multiplication values and Bias

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



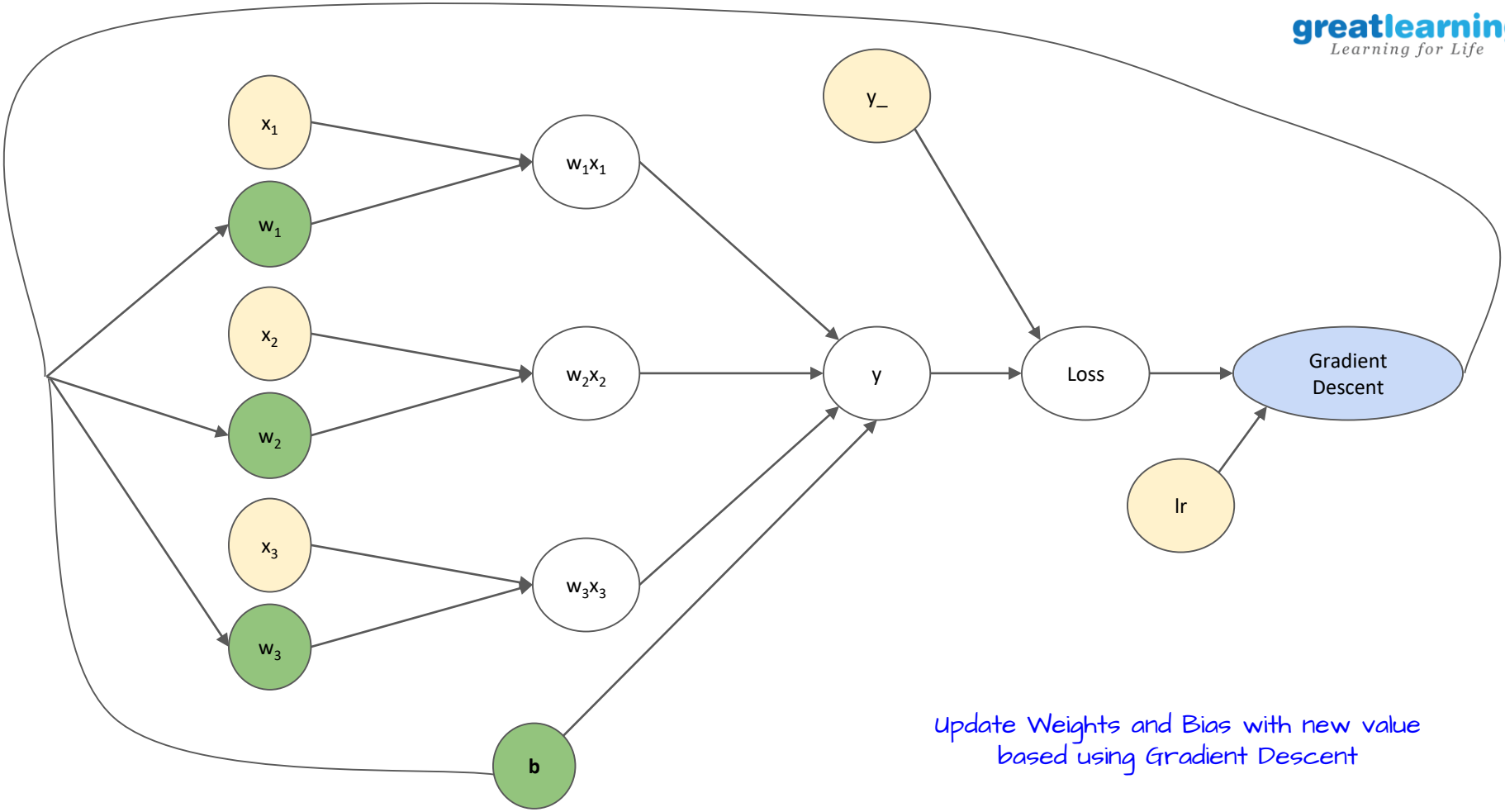
Compare with actual expected output and calculate Loss

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Calculate Gradients

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Update Weights and Bias with new value based using Gradient Descent

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

greatlearning
Learning for Life

Boston Housing Prices

Exercise

Exercise

- **What needs to be done?**
  - Build a Linear Regressor to predict Housing Prices for Boston
  - Use Tensorflow to build a Linear Regressor model

- **What is given?**
  - Housing Prices data (506 examples)
  - 13 features and Price

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

Data Set Information:

Concerns housing values in suburbs of Boston.

Attribute Information:

1. CRIM: per capita crime rate by town
2. ZN: proportion of residential land zoned for lots over 25,000 sq.ft.
3. INDUS: proportion of non-retail business acres per town
4. CHAS: Charles River dummy variable (= 1 if tract bounds river; 0 otherwise)
5. NOX: nitric oxides concentration (parts per 10 million)
6. RM: average number of rooms per dwelling
7. AGE: proportion of owner-occupied units built prior to 1940
8. DIS: weighted distances to five Boston employment centres
9. RAD: index of accessibility to radial highways
10. TAX: full-value property-tax rate per $10,000
11. PTRATIO: pupil-teacher ratio by town
12. B: 1000(Bk - 0.63)^2 where Bk is the proportion of blacks by town
13. LSTAT: % lower status of the population
14. MEDV: Median value of owner-occupied homes in $1000's

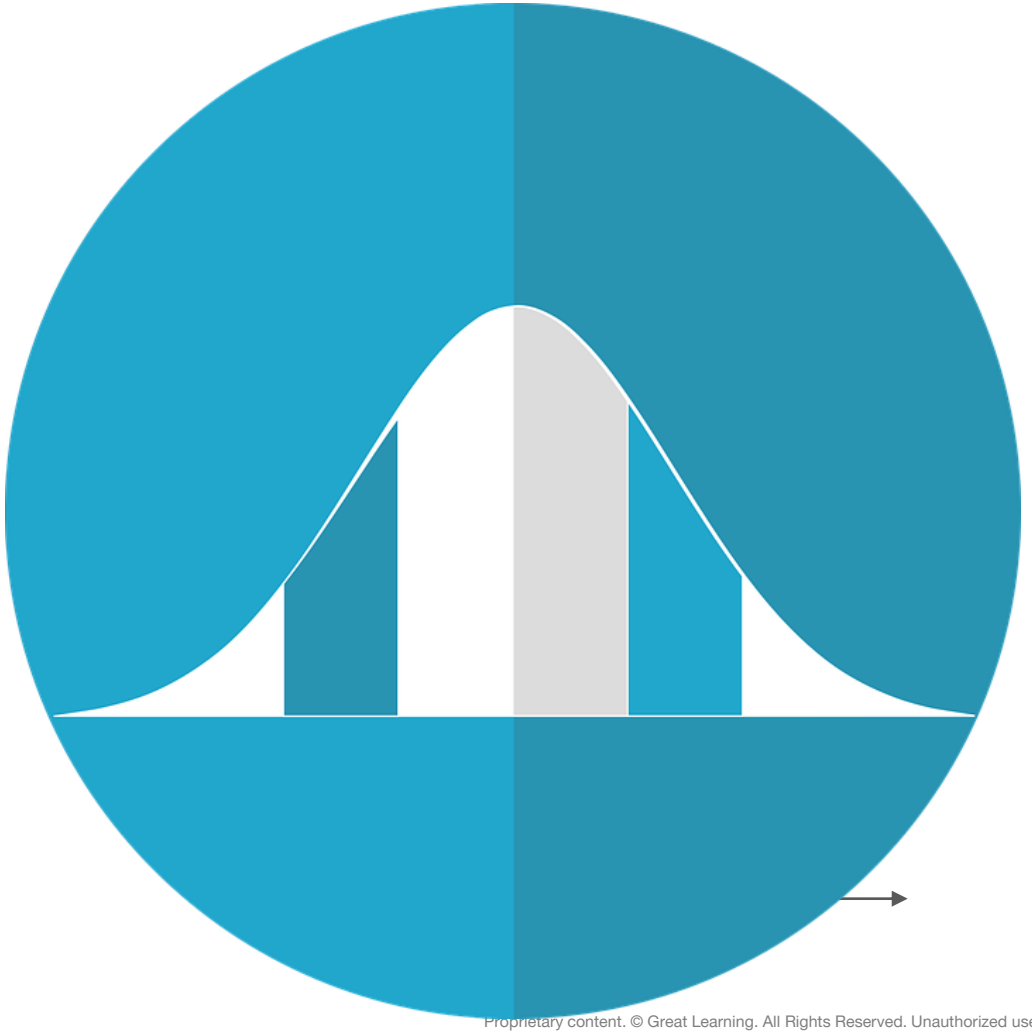
Prices

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

Exercise

Build Boston Housing Predictor in TensorFlow

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.



Data Normalization

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.

$$X_i = (X_i - \text{mean})/(\text{max} - \text{min})$$

Proprietary content. © Great Learning. All Rights Reserved. Unauthorized use or distribution prohibited.