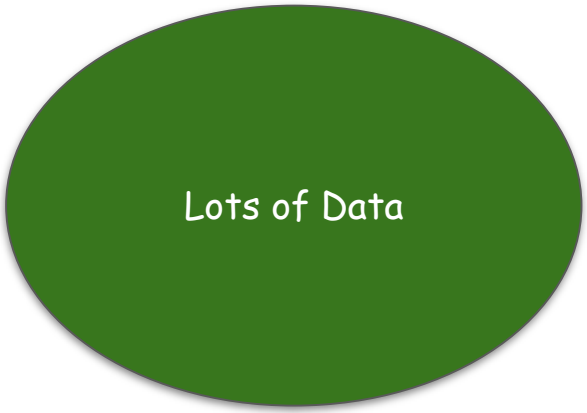
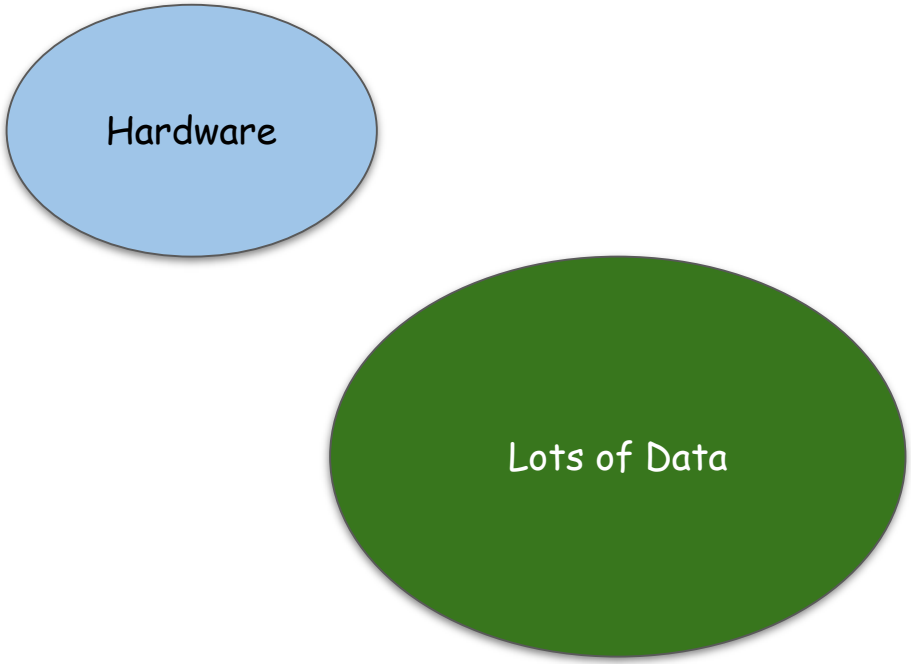
What do we need for

Machine Learning


Lots of Data

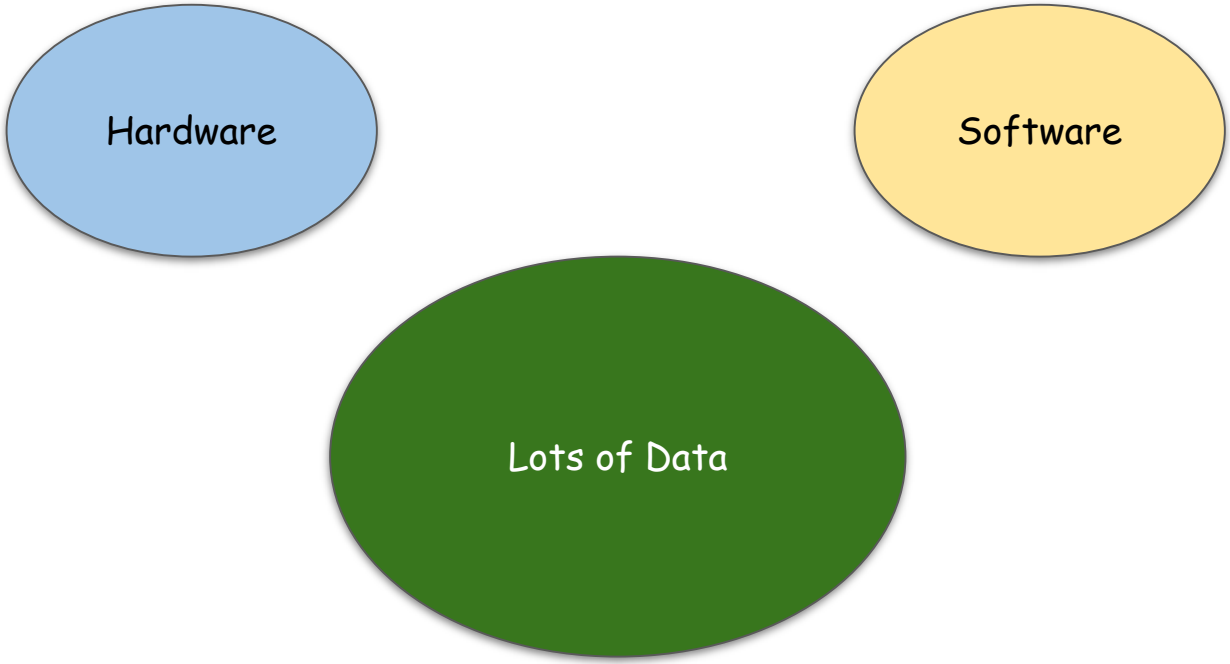

Hardware
Lots of Data

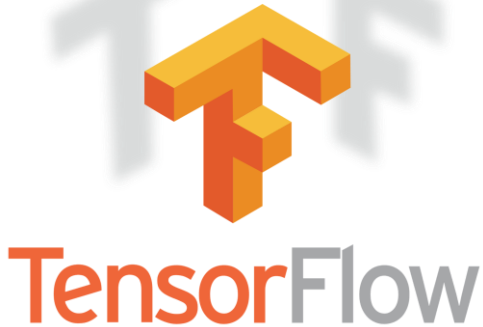
https://colab.research.google.com

Google Coab

1. Virtual machine in Google Cloud
2. Available to developers at no cost
3. Provides machines with GPU

We will use Google Colab for learning ML.


Hardware
Software
Lots of Data



Open Source platform for Deep Learning

by Google

TensorFlow

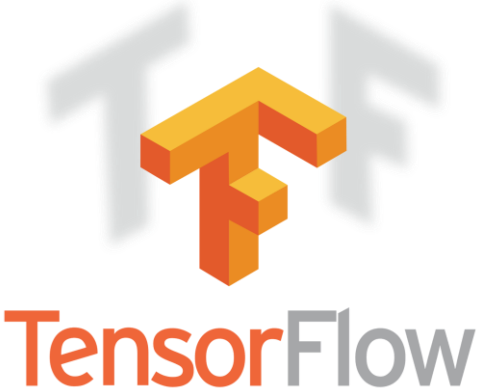
- **Supported Platforms**
  - Linux / Ubuntu
  - Windows
  - Mac OS
  - Raspberry Pi

TensorFlow

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

tensorflow.org/install

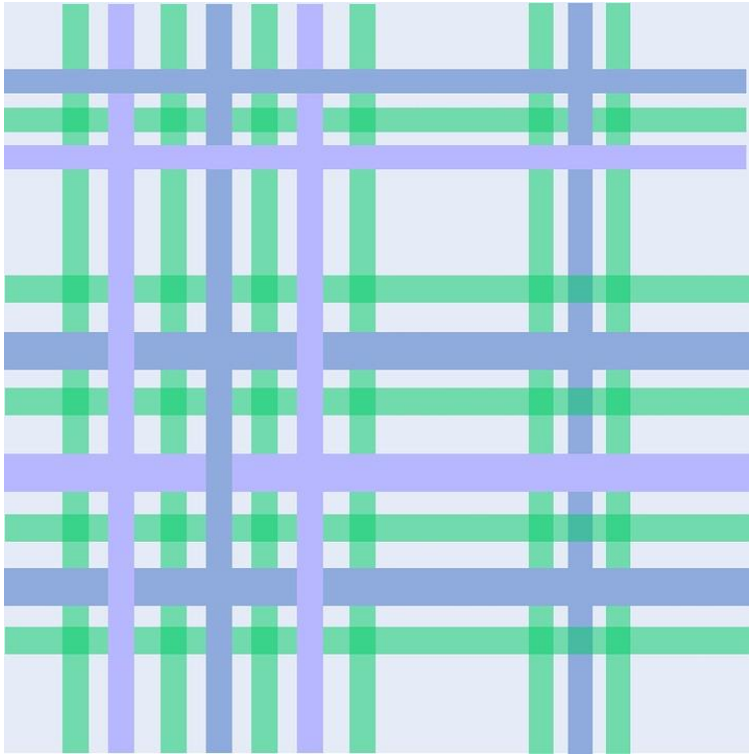
Installation Instructions



Let’s start with… Hello World :)

What is a tensor?

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

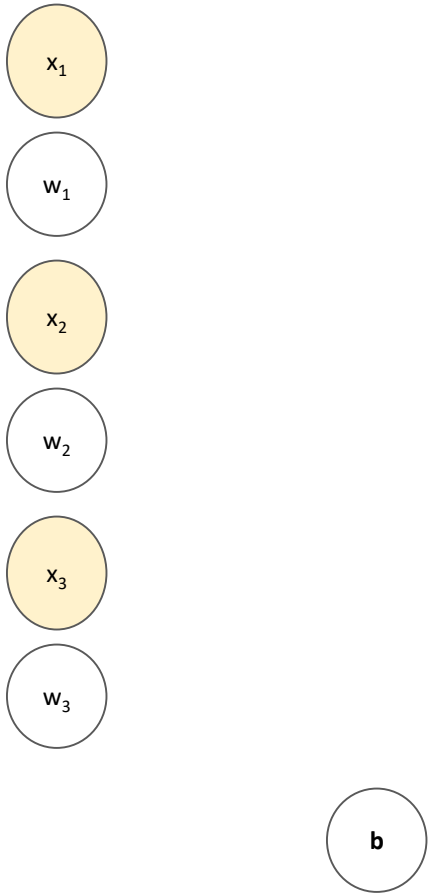


Rivisting
Linear Regression

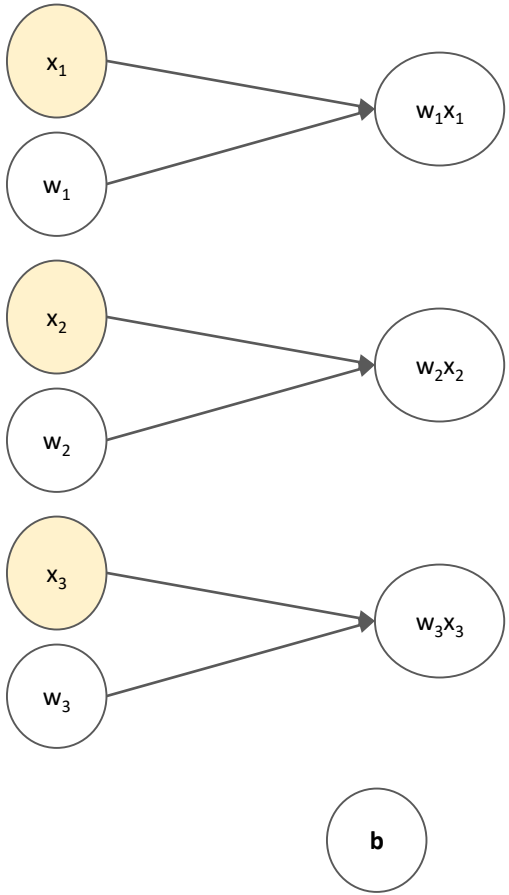
$$y = w_1 x_1 + w_2 x_2 + w_3 x_3 + b$$

Linear Regression

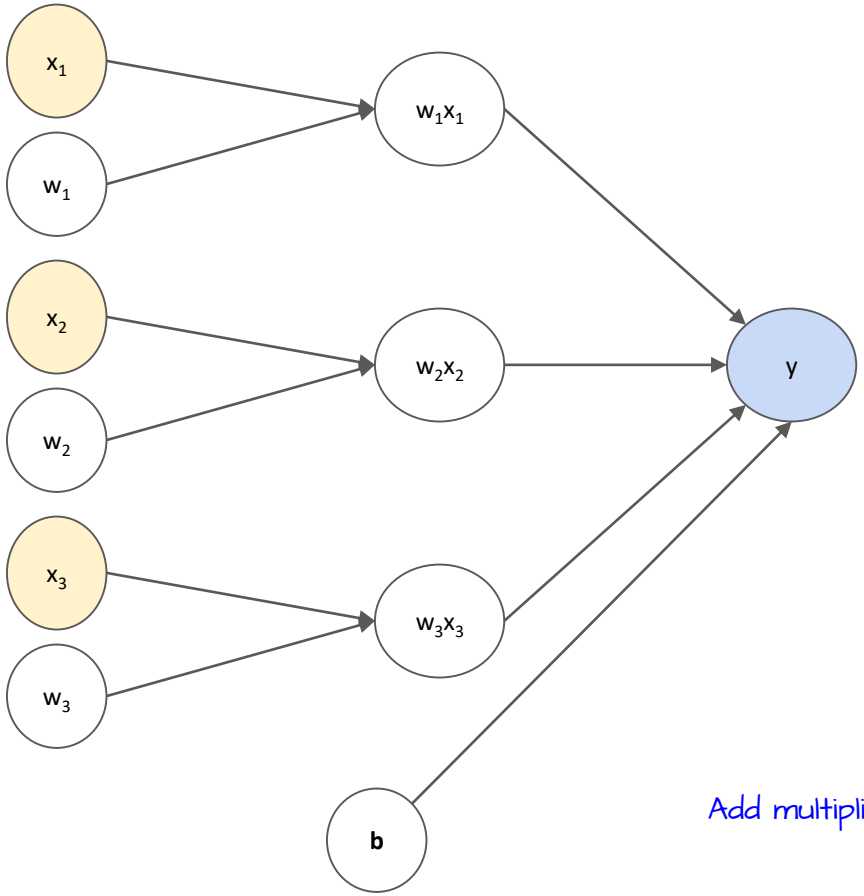
Linear Regression as a Graph



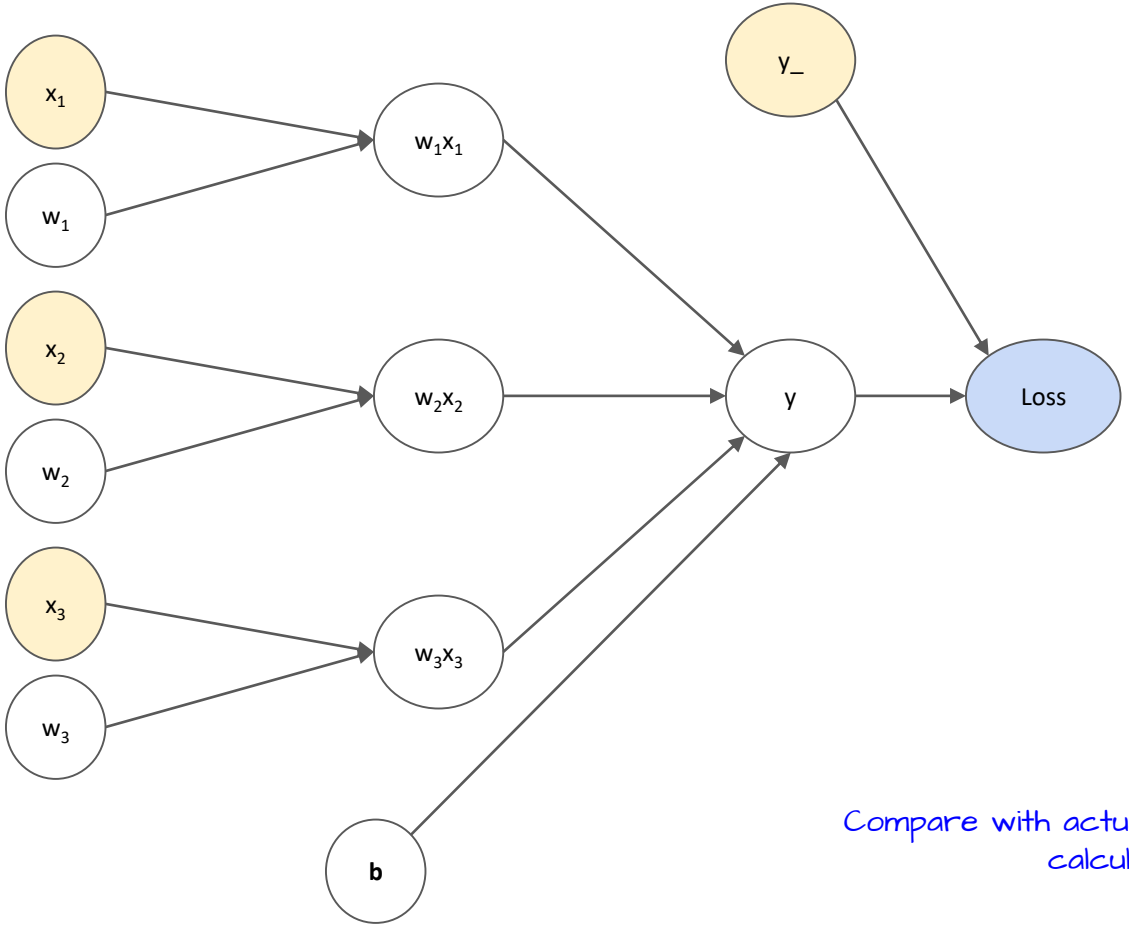
Start with Input features (x), Weights (w) and Bias (b)



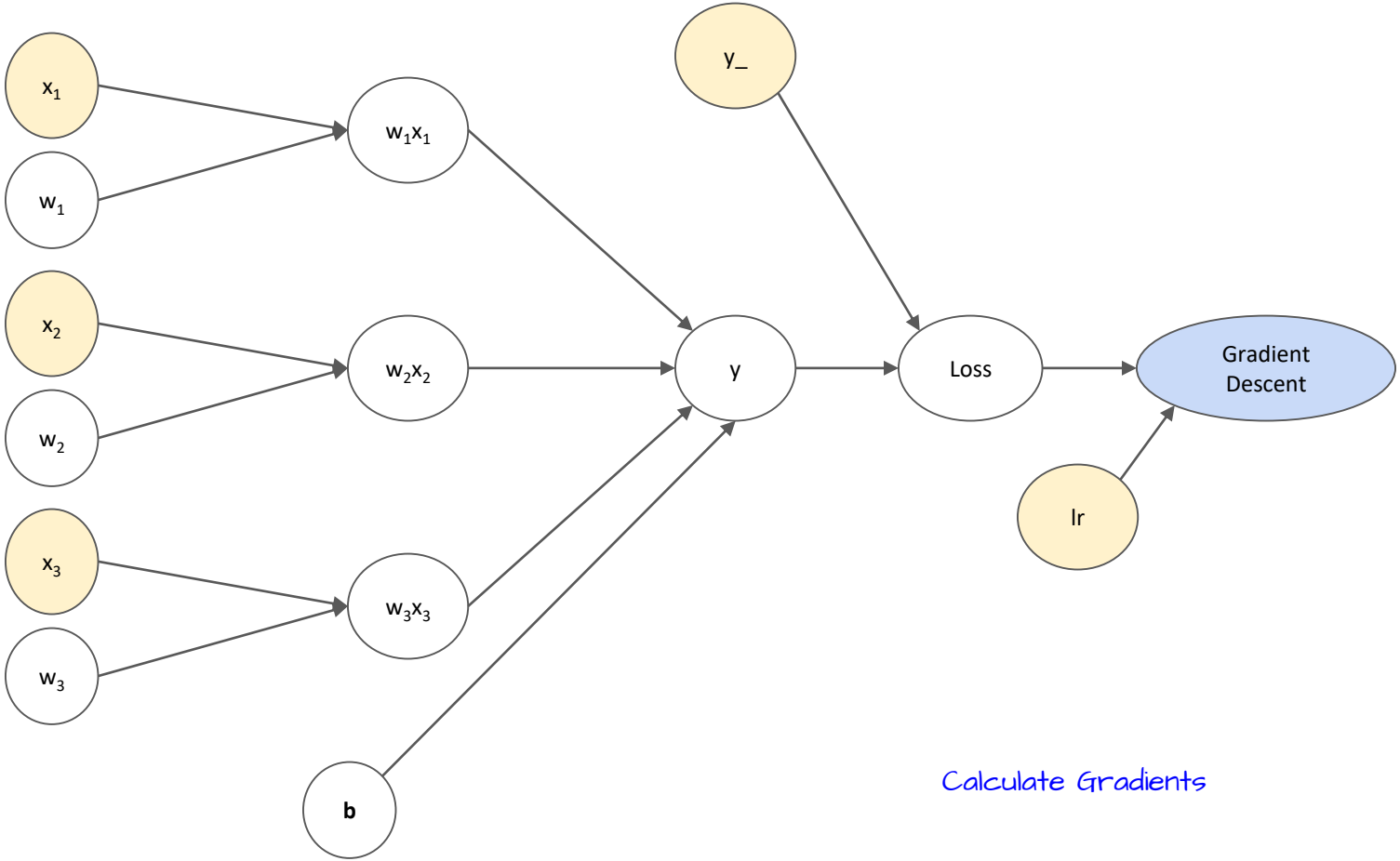
Multiply input features and weights

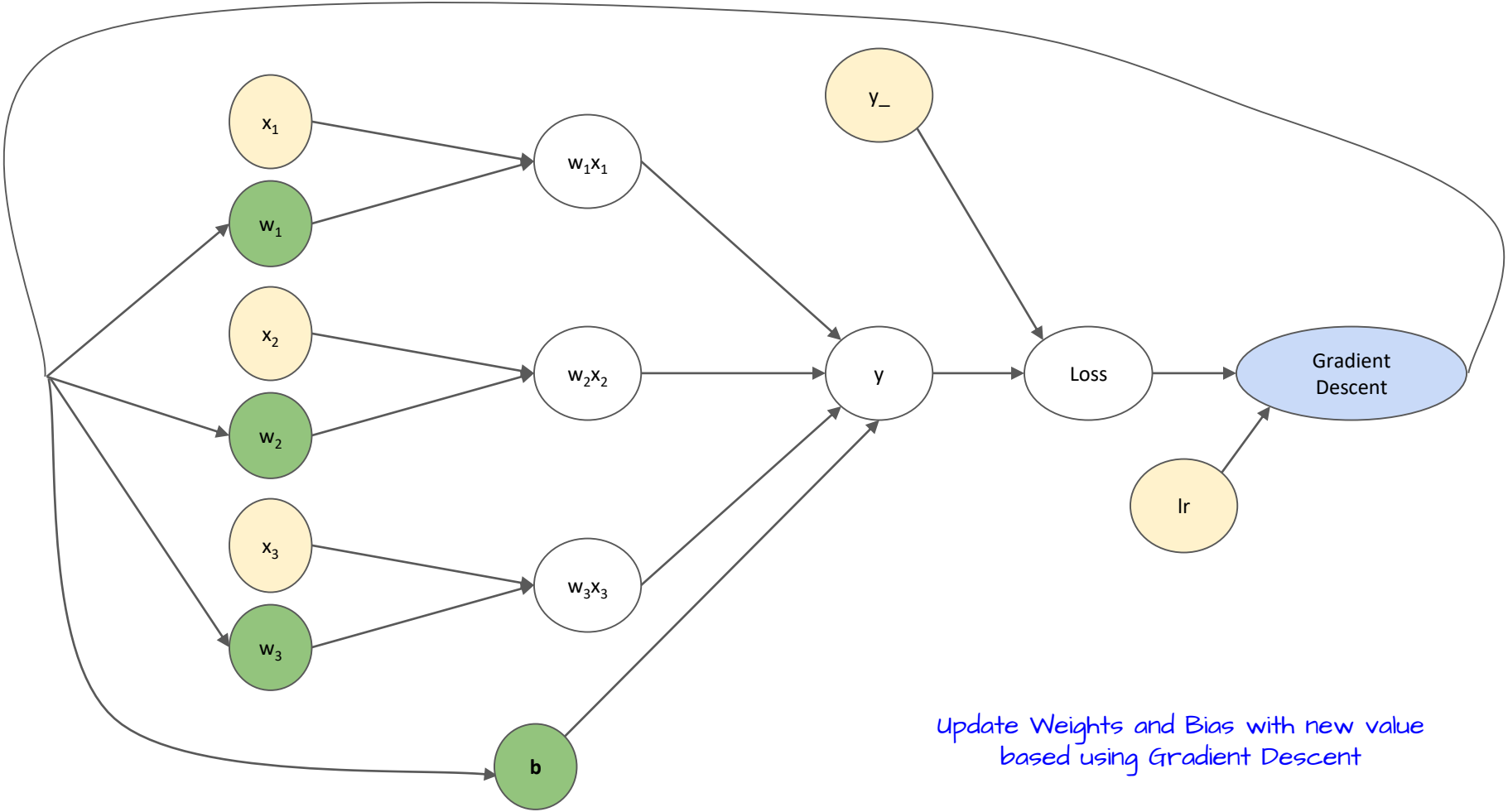


Add multiplication values and Bias



Compare with actual expected output and calculate Loss


x_1
w_1
x_2
w_2
x_3
w_3
b
w_1x_1
w_2x_2
w_3x_3
y_
y
Loss
Gradient Descent
lr
Calculate Gradients


x1
w1
x2
w2
x3
w3
b
w1x1
w2x2
w3x3
y_
y
Loss
Gradient Descent
lr
Update Weights and Bias with new value based using Gradient Descent

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

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

Exercise

Build Boston Housing Predictor in TensorFlow

Data Normalization