TensorFlow Basics

Deep Learning

- This section will expand on what we’ve learned and explore the TensorFlow’s Framework approach to Neural Networks
- You’ll see lots of parallels with our own simple implementation!

Deep Learning

- TensorFlow Basics
  - TF Basic Syntax
  - TF Graphs
  - TF Variables
  - TF Placeholders
- TensorFlow Neural Network

Deep Learning

- TensorFlow Regression Code Along
- TensorFlow Classification Code Along
- Regression Exercise
  - Solution
- Classification Exercise
  - Solution

Let’s get started!

TensorFlow Basic Syntax

TensorFlow Graphs

Deep Learning

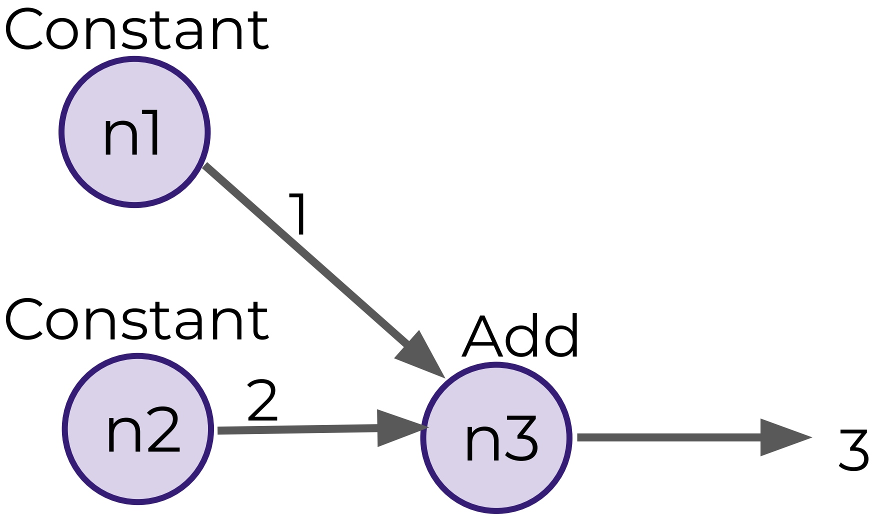
- Graphs are sets of connected nodes (vertices).
- The connections are referred to as edges.
- In TensorFlow each node is an operation with possible inputs that can supply some output.

Deep Learning

- In general, with TensorFlow we will construct a graph and then execute it.
- Let’s start showing some simple examples in Python!
- We’ll also discuss how TensorFlow uses a default graph.

Deep Learning

- We’ll start by building out this graph:



Variables and Placeholders

Deep Learning

- There are two main types of tensor objects in a Graph:
  - Variables
  - Placeholders

Deep Learning

- During the optimization process TensorFlow tunes the parameters of the model.
- Variables can hold the values of weights and biases throughout the session.
- Variables need to be initialized.

Deep Learning

- Placeholders are initially empty and are used to feed in the actual training examples.
- However they do need a declared expected data type (tf.float32) with an optional shape argument.

Deep Learning

- Let’s see some examples of each.
- Once we understand how they work we’ll be ready to build our first model with TensorFlow!

First TF Neural Network

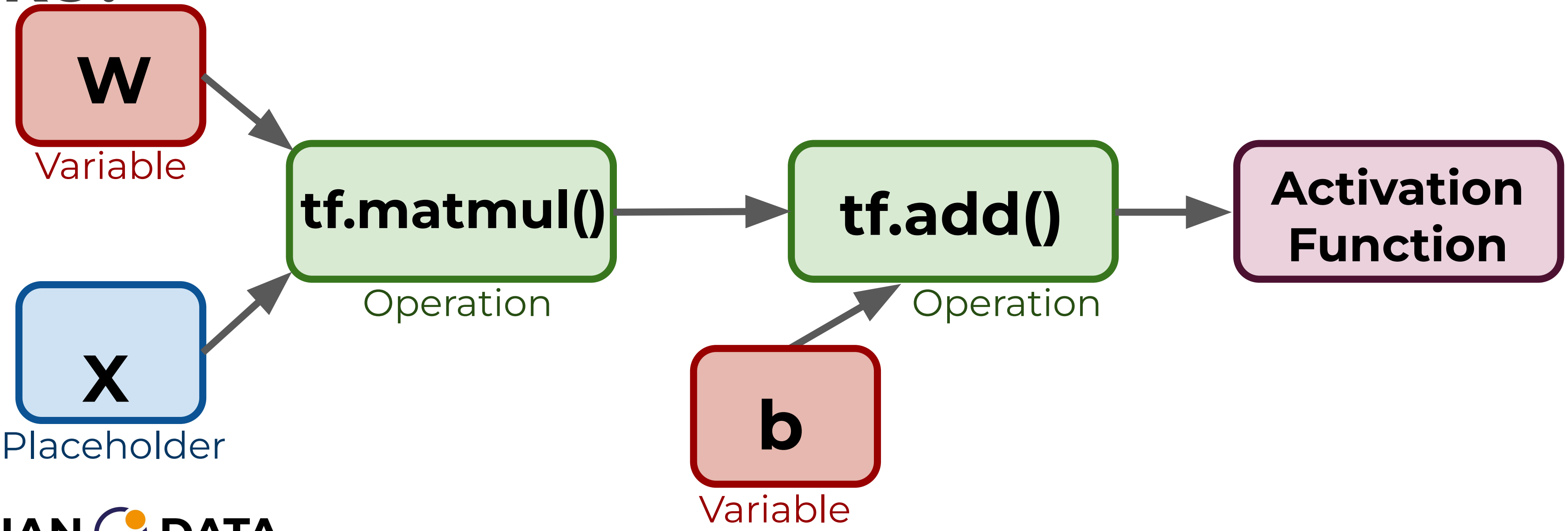
Deep Learning

- We’ve learned about Sessions, Graphs, Variables, and Placeholders.
- With these building blocks we can create our first neuron!
- We’ll create a neuron that performs a very simple linear fit to some 2-D data.

Deep Learning

- Our steps are:
  - Build a Graph
  - Initiate the Session
  - Feed Data In and get Output
- We’ll use the basics we’ve learned so far to accomplish this task!

What does the graph of wx+b=z look like?



Deep Learning

- Afterwards you can add in the cost function in order to train your network to optimize the parameters!
- Let’s go build this neural network!

TensorFlow Regression

Deep Learning

- Let’s code along with a more realistic regression example and introduce tf.estimator!

TensorFlow Estimator API

Deep Learning

- Let’s now explore the Estimator API from TensorFlow!
- There are lots of other higher level APIs (Keras, Layers, etc), we cover those later on in the Miscellaneous Section.

Deep Learning

- The tf.estimator API has several model types to choose from.
- Let’s quickly show you the options!

Deep Learning

- Here are the Estimator Types
    - tf.estimator.LinearClassifier: Constructs a linear classification model.
    - tf.estimator.LinearRegressor: Constructs a linear regression model.

Deep Learning

- Here are the Estimator Types
    - tf.estimator.DNNClassifier: Construct a neural network classification model.
    - tf.estimator.DNNRegressor: Construct a neural network regression model.

- Here are the Estimator Types
    - Tf.estimator. DNNLinearCombinedClassifier: Construct a neural network and linear combined classification model.

Deep Learning

- Here are the Estimator Types
    - Tf.estimator. DNNLinearCombinedRegressor: Construct a neural network and linear combined regression model.

Deep Learning

- In general, to use the Estimator API we do the following:
  - ○ Define a list of feature columns
  - ○ Create the Estimator Model
  - ○ Create a Data Input Function
  - ○ Call train,evaluate, and predict methods on the estimator object.

Deep Learning

- Let’s go ahead and show a simple example of using this Estimator API.

TensorFlow Classification

Deep Learning

- Pima Indians Diabetes Dataset
- Tf.estimator API
- Categorical and Continuous Features
- LinearClassifier and DNNClassifier
- Let’s get started!

TF Regression Exercise

Deep Learning

- Time to test your new skills!
- You will create a model to predict housing prices using the tf.estimator API.
- Let’s review the exercise notebook.
- Optional - skip to the solutions and treat the exercise as a code-along lecture.

TF Regression Exercise Solution

TF Classification Exercise

TF Classification Exercise Solution