TensorFlow basics and TensorBoard Overview

TensorFlow basics

1. Define a model, layer definition

2. Define a loss, training function, optimizer, learning rate, etc

3. Train the model

- TensorFlow program - Build and run a computational graph
- TensorBoard - Understand, analyze, optimize and debug on your computational graph

Neural Nets can be a black box

TensorBoard is a flashlight

TensorFlow terms

- Tensors - central unit of data
    - [1,2,3] - vector with shape[3]
    - [[1,2,3],[4,5,6]] - matrix with shape[2, 3]
- Node - operation to take tensors as input and produces a tensor as output
    - tf.constant(3)
    - tf.variable([3], tf.float32)
    - tf.placeholder(tf.float32)
    - tf.add(node1, node2)
- Session - evaluate the node and run the computational graph

MNIST models

- MNIST - a dataset consists of handwritten images and corresponding labels

- Each image is 28 x 28 = 784 pixels

- Softmax regression - a very simple model

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \text{softmax}\left(\begin{bmatrix} W_{1,1} & W_{1,2} & W_{1,3} \\ W_{2,1} & W_{2,2} & W_{2,3} \\ W_{3,1} & W_{3,2} & W_{3,3} \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} \right)$$

Tensorboard features

- Scalars
- Images
- Graphs
- Distributions
- Histograms
- Projector

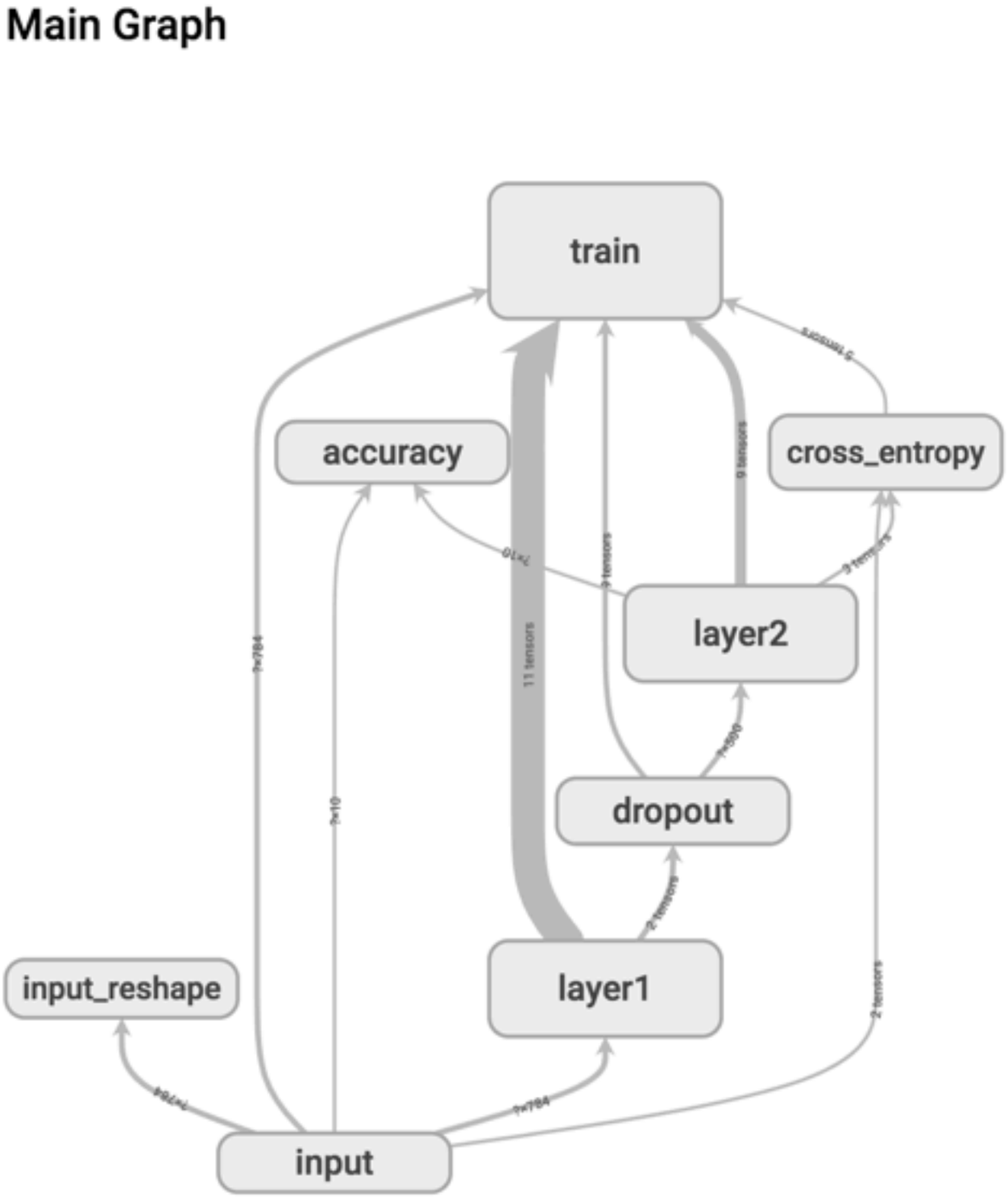
- Use summaries nodes such as tf.summary.scalar(), tf.summary.histogram() to annotate the data to be collected

- tf.summary.merge_all combine all summary ops into one and write to tf.summary.FileWriter()

- A serialized summary protobuf will be generated with all the summary data at given step and save in a directory

- tensorboard command will pull the protobuf from the log directory and run the web app in a local server localhost: 6006

- tf.summary.FileWriter(logdir, graph)
- the graph will show all operators and group certain operators in a block
- each block is able to expand to see entire structure by double clicking
- using name scope in code will group and label block accordingly



- tf.summary.scalar(label, data)
- plot a graph to keep track of certain metrics and performance overtime
- able to expand and mouse over to look at details
- plot multiple graphs with different parameters to compare