



Welcome to TensorFlow!

CS 20: TensorFlow for Deep Learning Research

Lecture 1

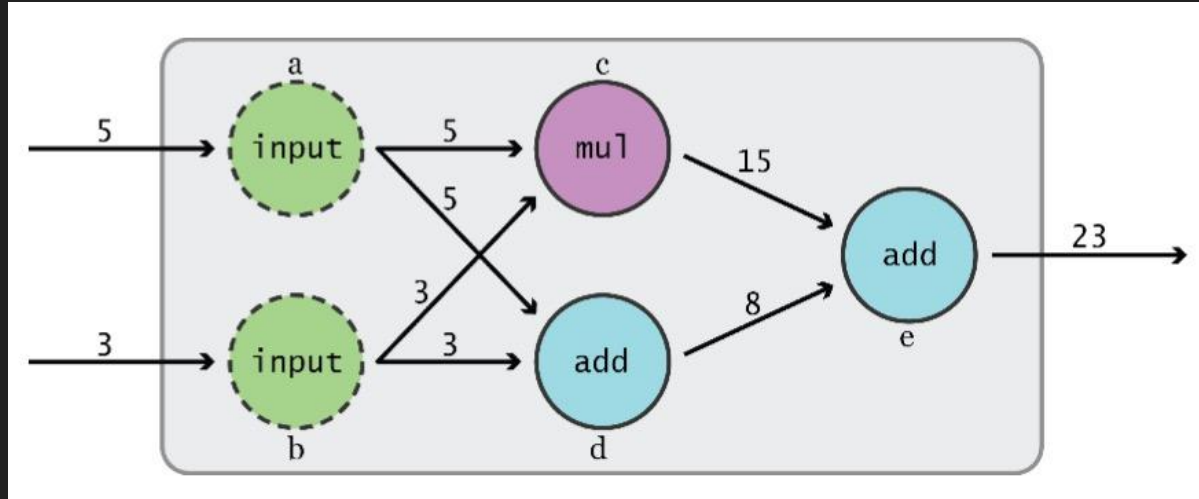
1/12/2018



Graphs and Sessions

Data Flow Graphs

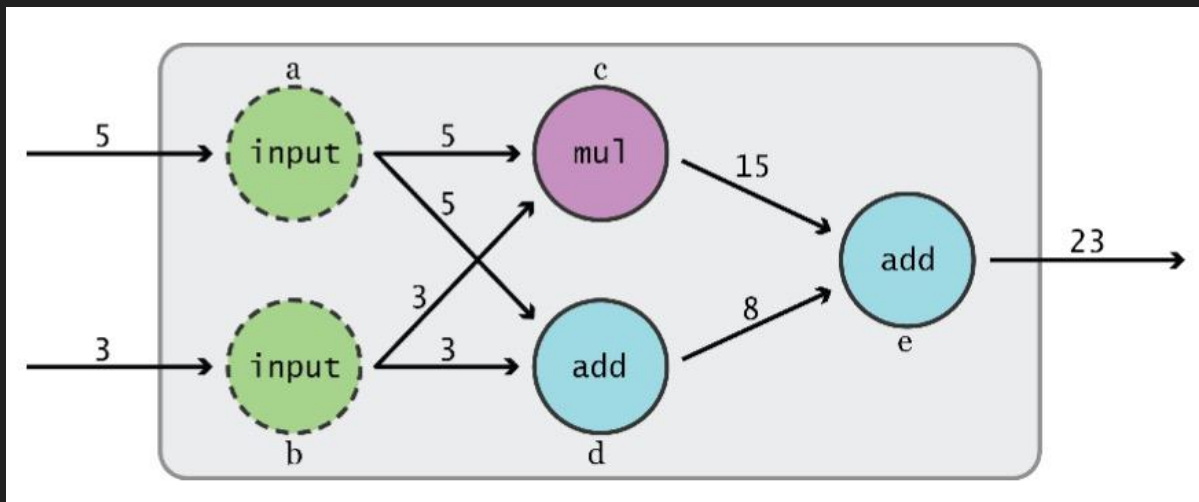
TensorFlow separates definition of computations from their execution



Data Flow Graphs

Phase 1: assemble a graph

Phase 2: use a session to execute operations in the graph.

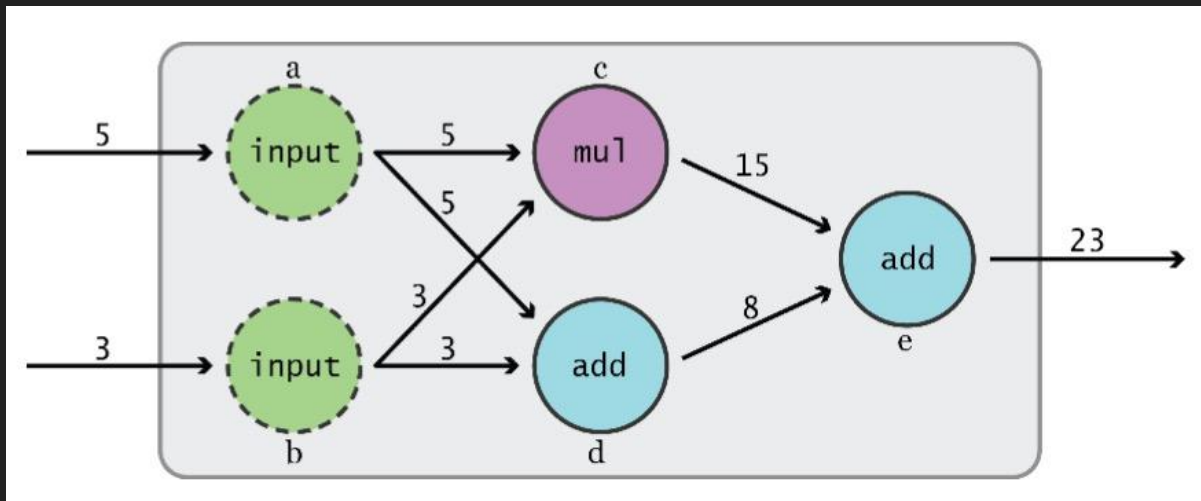


Data Flow Graphs

Phase 1: assemble a graph

This might change in the future with eager mode!!

Phase 2: use a session to execute operations in the graph.



What's a tensor?

What's a tensor?

An n-dimensional array

0-d tensor: scalar (number)

1-d tensor: vector

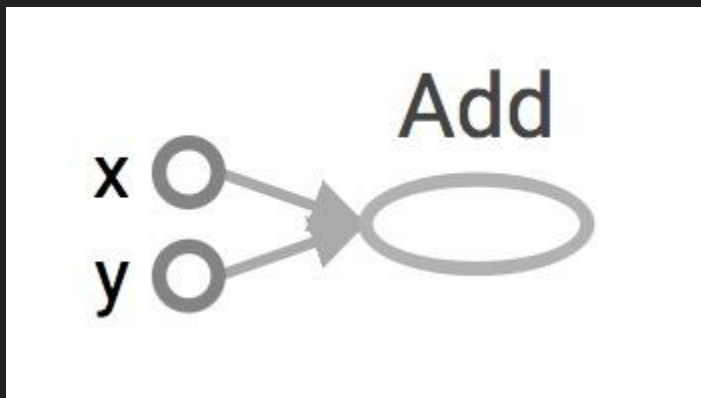
2-d tensor: matrix

and so on

Data Flow Graphs

```
import tensorflow as tf  
a = tf.add(3, 5)
```

Visualized by TensorBoard



Data Flow Graphs

```
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```

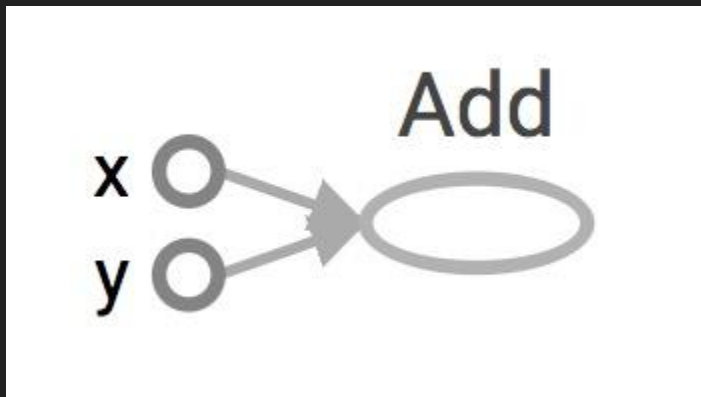
Why x, y?

TF automatically names the nodes when you don't explicitly name them.

x = 3

y = 5

Visualized by TensorBoard

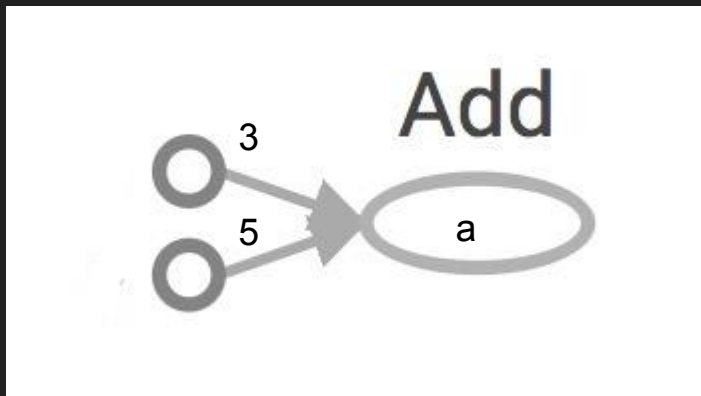


Data Flow Graphs

```
import tensorflow as tf  
a = tf.add(3, 5)
```

Nodes: operators, variables, and constants
Edges: tensors

Interpreted?



Data Flow Graphs

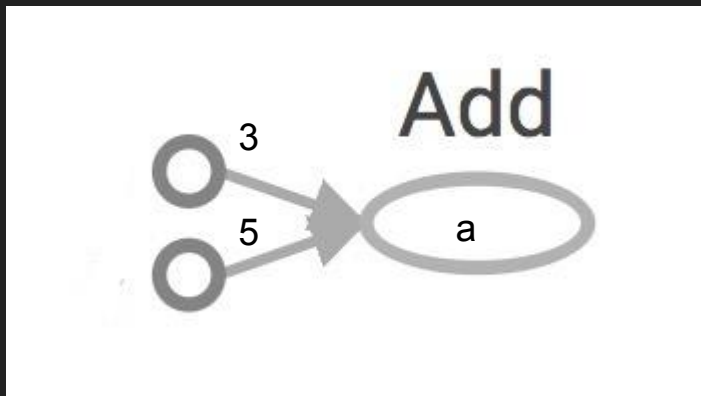
```
import tensorflow as tf  
a = tf.add(3, 5)
```

Nodes: operators, variables, and constants
Edges: tensors

Tensors are data.

TensorFlow = tensor + flow = data + flow
(I know, mind=blown)

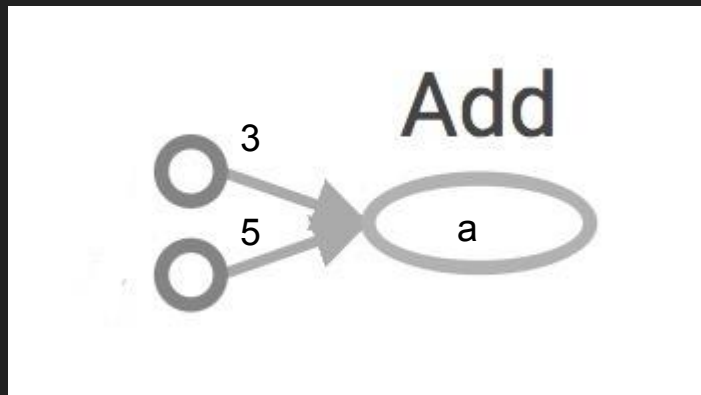
Interpreted?



Data Flow Graphs

```
import tensorflow as tf  
a = tf.add(3, 5)  
print(a)
```

```
>> Tensor("Add:0", shape=(), dtype=int32)  
(Not 8)
```



How to get the value of a?

Create a **session**, assign it to variable sess so we can call it later

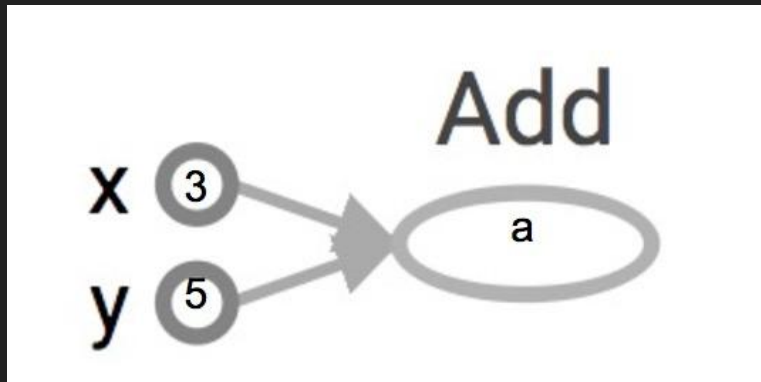
Within the session, evaluate the graph to fetch the value of a

How to get the value of a?

Create a **session**, assign it to variable sess so we can call it later

Within the session, evaluate the graph to fetch the value of a

```
import tensorflow as tf
a = tf.add(3, 5)
sess = tf.Session()
print(sess.run(a))
sess.close()
```



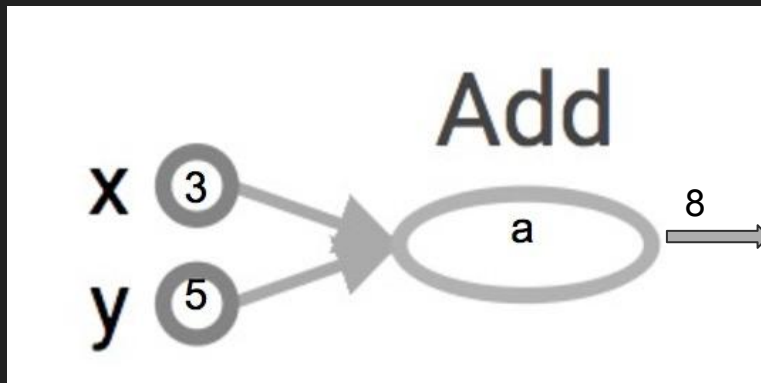
The session will look at the graph, trying to think: hmm, how can I get the value of a, then it computes all the nodes that leads to a.

How to get the value of a?

Create a **session**, assign it to variable `sess` so we can call it later

Within the session, evaluate the graph to fetch the value of `a`

```
import tensorflow as tf
a = tf.add(3, 5)
sess = tf.Session()
print(sess.run(a))    >> 8
sess.close()
```



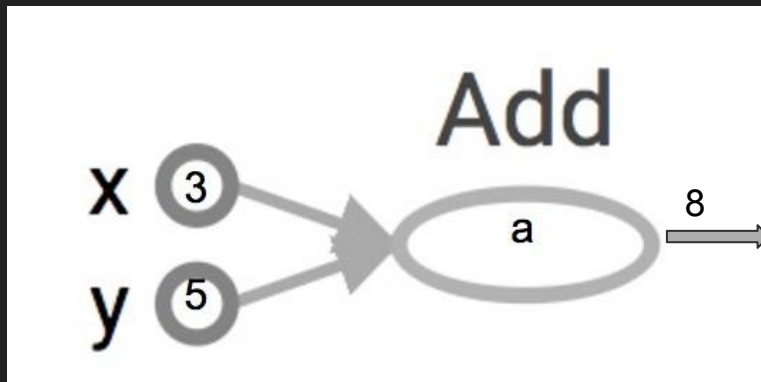
The session will look at the graph, trying to think: hmm, how can I get the value of `a`, then it computes all the nodes that leads to `a`.

How to get the value of a?

Create a **session**, assign it to variable `sess` so we can call it later

Within the session, evaluate the graph to fetch the value of `a`

```
import tensorflow as tf
a = tf.add(3, 5)
sess = tf.Session()
with tf.Session() as sess:
    print(sess.run(a))
sess.close()
```



tf.Session()

A Session object encapsulates the environment in which Operation objects are executed, and Tensor objects are evaluated.

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Session will also allocate memory to store the current values of variables.

**You can
but you don't need more than one graph
The session runs the default graph**