What is TensorFlow?

INTRODUCTION TO TENSORFLOW IN R

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Instructor

# A brief TensorFlow history

- created by the Google Brain team

- open source library that uses:
    - Python (and now R) as a front-end API

    - C++ for application execution

- particularly popular for:
    - digit classification

    - NLP

    - RNNs

Relax, don't be so tens(ors)

TensorFlow creates flow-through graphs which describe how data move through processing nodes.

Let's go through a dataflow graph for the following equation:

$$(A \times B) + C$$
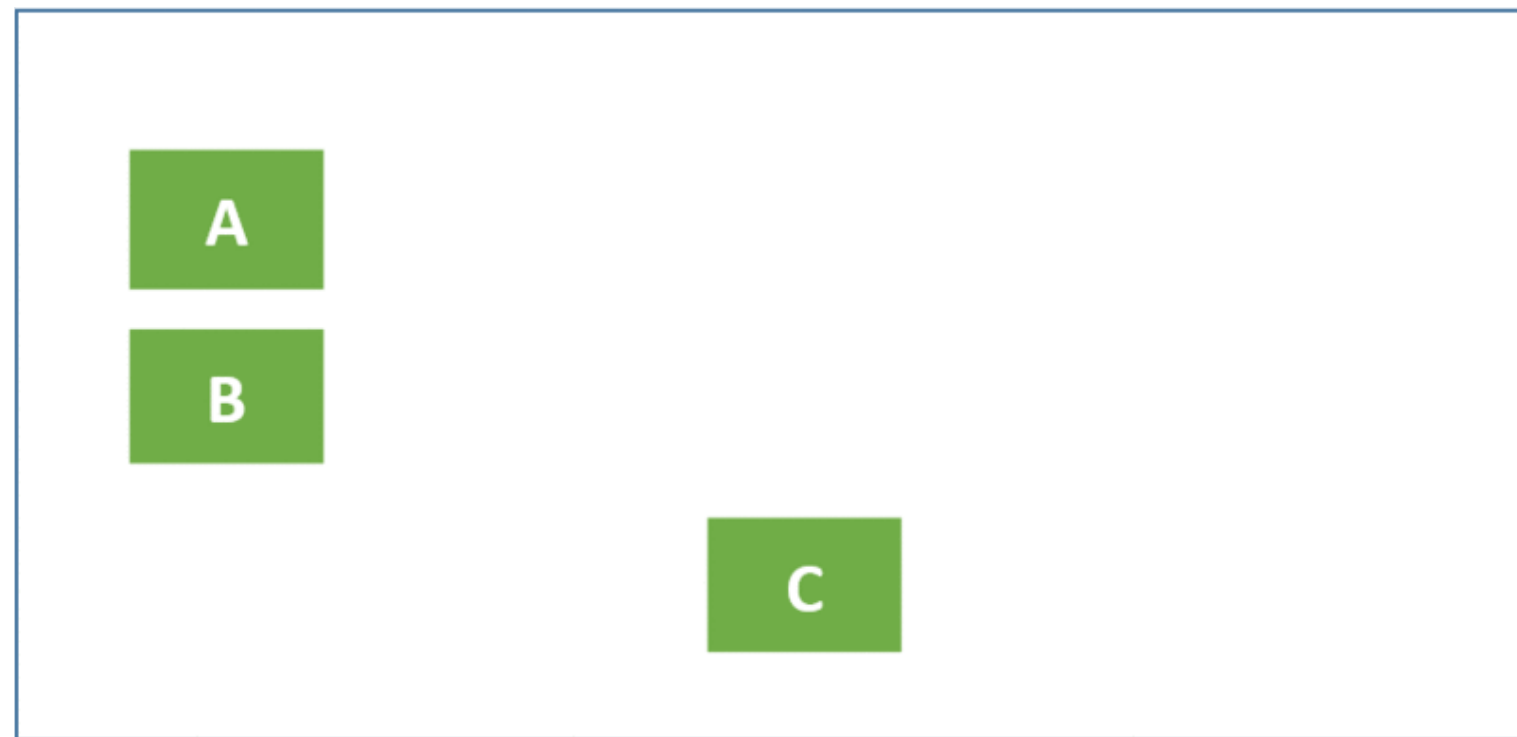
Getting Started in R

To start your TensorFlow journey, you'll first need to install TensorFlow on your machine.

Once that is complete, you can load TensorFlow using:

```
library(tensorflow)
```

To call up your configuration details, use:

```
tf_config()
```

TensorFlow Sessions

To create any computations in TensorFlow, you must first launch a session.

To start a session:

```
firstsession = tf$Session()
print(firstsession$run())
```

To complete a session:

```
firstsession$close()
```

Let's practice!

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TensorFlow syntax, variables, and placeholders

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TensorFlow constants

Constants are:

- well, constant

- create nodes whose values do not change

We can create constants using `tf$constant()` .

`tf$constant()` uses several basic parameters including:

- value

- dtype = `None`

- shape = `None`

TensorFlow constants

For example, in the last lesson we used:

```
HiThere <- tf$constant('Hi DataCamp Student!')
```

Another example:

```
a = tf$constant(2)
```

float32!

TensorFlow variables

- may change over the course of your session

- `tf$Variable('inital value', 'optional name')`

For example:

```
EmptyMatrix <- tf$Variable(tf$zeros(shape(4,3)))
```

where: `tf$zeros()` fills in the matrix with 4 rows and 3 columns of zeros.

TensorFlow placeholders

- similar to variables, but will assign data at a later date

- used when we know the shape of the tensor, but will use data from a previous pipeline execution (or an external source)

```
tf$placeholder(dtype, shape = None, name = None)
```

For example:

To create a float32 placeholder, `SinglePlaceholder` :

```
SinglePlaceholder <- tf$placeholder(tf$float32)
```

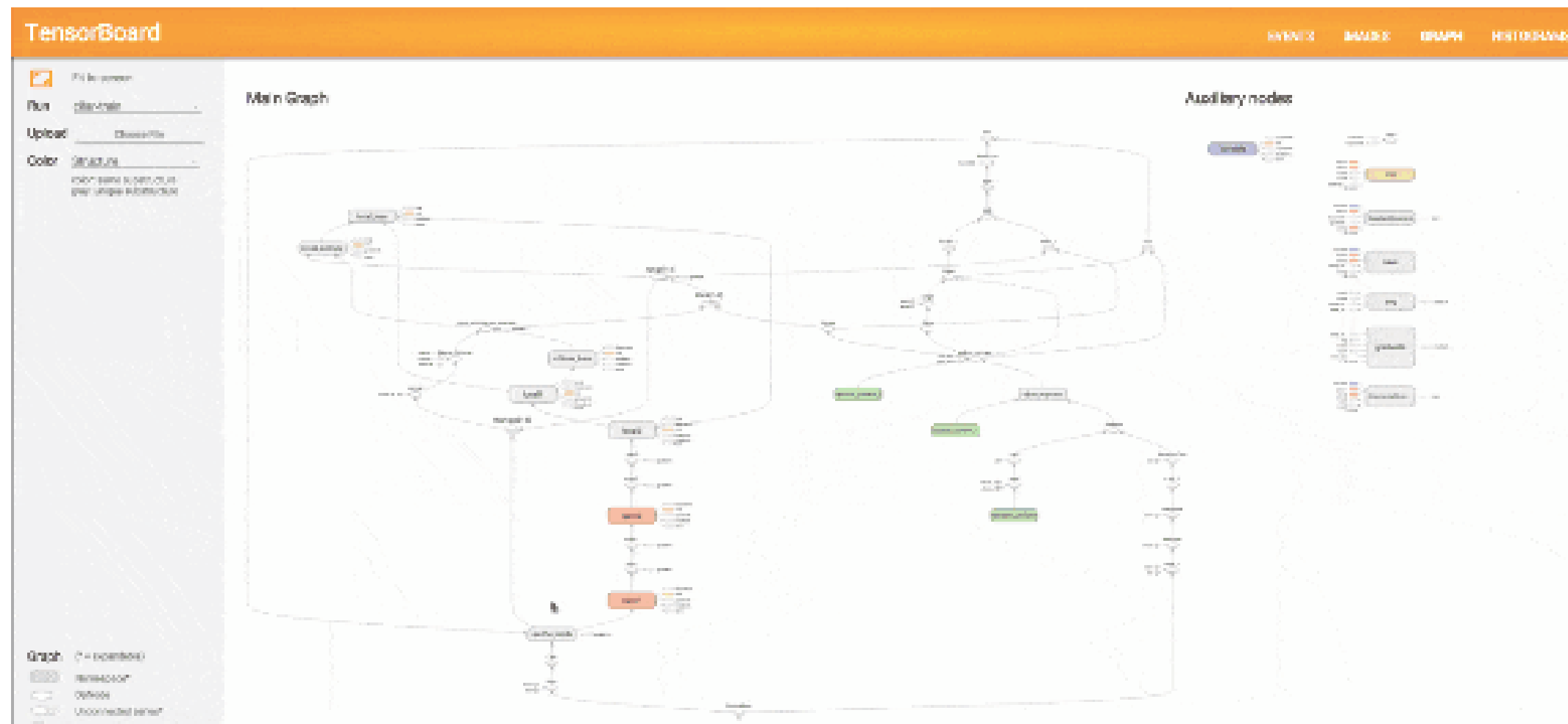# Let's practice!

TensorBoard: visualizing TensorFlow models

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Visualizing models

- Problem: TensorFlow computations can become complicated quickly and can be difficult to debug
  - Solution: TensorBoard!

[1] GIF source: TensorFlow RStudio

Preparing your session for TensorBoard

1. Start your session

```
session <- tf$Session()
```

2. Record your variables/constants/placeholders and operations

```
a <- tf$constant(5, name = "NumAdults")
b <- tf$constant(6, name = "NumChildren")
c <- tf$add(a,b)
print(session$run(c))
```

Opening your session in TensorBoard

3. Write your session to a location on your machine

```
writemygraph <- tf$summary$FileWriter('./graphs', session$graph)
```

4. Open TensorBoard to view the computational graph

```
tensorboard(log_dir = './graphs')
```

Visualizing your graph

Let's practice!