

DLC Tool Lecture

TensorFlow

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Deep Learning College

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TensorFlow 설치

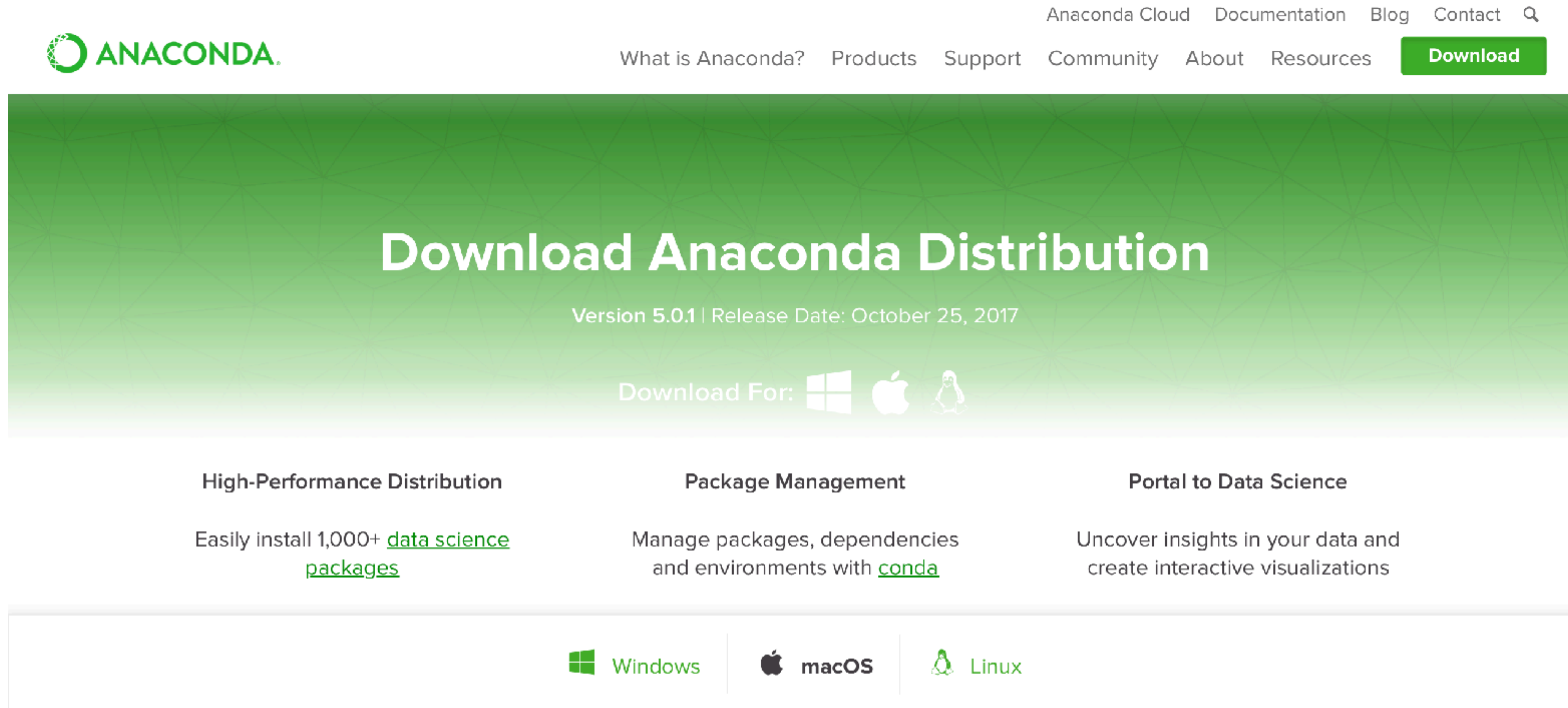
기본 환경 설정

- Ubuntu 16.04 / MacOS
- Python 3.6 이상 (아나콘다 설치 추천)
- GPU 셋팅
 - CUDA® Toolkit 8.0, cuDNN v6 이상 (`tf.__version__ < 1.5`)
 - CUDA® Toolkit 9.0, cuDNN v7 이상 (`tf.__version__ >= 1.5`)
- TensorFlow 설치



아나콘다 설치

<https://www.anaconda.com/download>



The screenshot shows the Anaconda website's download page. At the top, there is a navigation bar with links for 'Anaconda Cloud', 'Documentation', 'Blog', and 'Contact'. Below this, a secondary navigation bar includes 'What is Anaconda?', 'Products', 'Support', 'Community', 'About', 'Resources', and a prominent green 'Download' button. The main section features a large green banner with the text 'Download Anaconda Distribution' and 'Version 5.0.1 | Release Date: October 25, 2017'. Below the banner, it says 'Download For:' followed by icons for Windows, macOS, and Linux. The page is divided into three columns: 'High-Performance Distribution' (mentioning 1,000+ data science packages), 'Package Management' (mentioning conda), and 'Portal to Data Science' (mentioning interactive visualizations). At the bottom, there are three buttons for 'Windows', 'macOS', and 'Linux'.




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Download Anaconda Distribution

Version 5.0.1 | Release Date: October 25, 2017

Download For:   

High-Performance Distribution


Easily install 1,000+ [data science packages](#)


Package Management


Manage packages, dependencies and environments with [conda](#)

Portal to Data Science

Uncover insights in your data and create interactive visualizations

 Windows

 macOS

 Linux



아나콘다 설치

- 파일을 다운 받은 후 아래의 명령어를 실행한다

```
$ bash ~/Downloads/Anaconda3-5.0.1-Linux-x86_64.sh
```



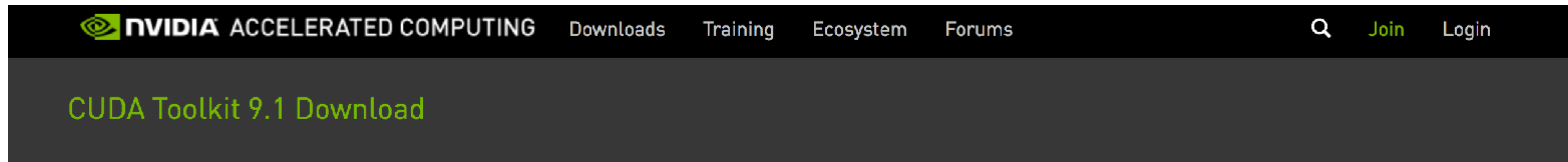
GPU 셋팅

- TensorFlow를 GPU에서 계산하고 싶으면
 - CUDA® Toolkit과 cuDNN library를 깔아야 한다
- if tf.__version__ < 1.5
 - CUDA® Toolkit 8.0 and cuDNN v6 library
- else
 - CUDA® Toolkit 9.1 and cuDNN v7 library



CUDA® Toolkit 9.1

<https://developer.nvidia.com/cuda-downloads>



[Home](#) > [ComputeWorks](#) > [CUDA Toolkit](#) > [CUDA Toolkit 9.1 Download](#)

Select Target Platform ⓘ

Click on the green buttons that describe your target platform. Only supported platforms will be shown.

Operating System

[Windows](#)[Linux](#)[Mac OSX](#)

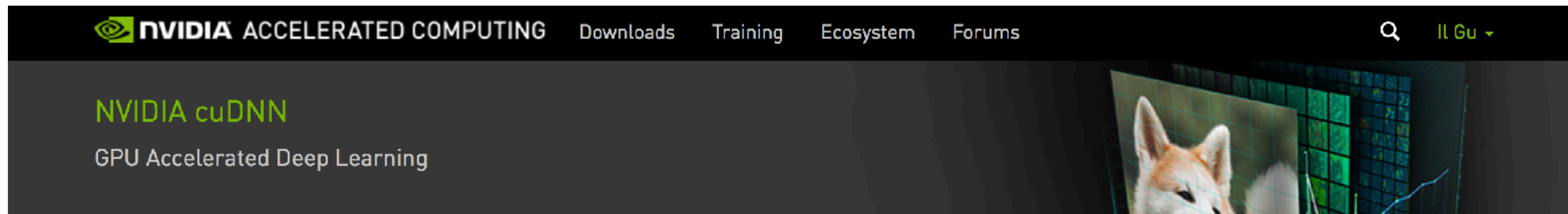
Before installing the CUDA Toolkit on Linux, please ensure that you have the latest NVIDIA driver R390 installed. The latest NVIDIA R390 driver is available at: www.nvidia.com/drivers

[Documentation >](#)[Release Notes >](#)[Code Samples >](#)[Legacy Releases >](#)

cuDNN 7

회원가입 및 로그인 필요

<https://developer.nvidia.com/cudnn>



[Home](#) > [ComputeWorks](#) > [Deep Learning](#) > [Software](#) > [NVIDIA cuDNN](#)

The NVIDIA CUDA® Deep Neural Network library (cuDNN) is a GPU-accelerated library of primitives for **deep neural networks**. cuDNN provides highly tuned implementations for standard routines such as forward and backward convolution, pooling, normalization, and activation layers. cuDNN is part of the **NVIDIA Deep Learning SDK**.

Deep learning researchers and framework developers worldwide rely on cuDNN for high-performance GPU acceleration. It allows them to focus on training neural networks and developing software applications rather than spending time on low-level GPU performance tuning. cuDNN accelerates widely used deep learning frameworks, including **Caffe2**, **MATLAB**, **Microsoft Cognitive Toolkit**, **TensorFlow**, **Theano**, and **PyTorch**. See [supported frameworks](#) for more details. cuDNN is freely available to members of the **NVIDIA Developer Program**

What's New in cuDNN 7?

QUICKLINKS

[Accelerated Computing - Training](#)

[CUDA GPUs](#)

[Tools & Ecosystem](#)

[OpenACC: More Science Less Programming](#)

[CUDA FAQ](#)



CUDA® Toolkit 9.1 설치

- 파일을 다운 받은 후 아래의 명령어를 실행한다
- Ctrl + Alt + F1을 눌러 콘솔 모드로 전환한다.
- 로그인 후 다음 명령어를 실행한다.

```
$ sudo service lightdm stop  
$ chmod +x ./cuda_9.1.85_387.26_linux.run  
$ sudo ./cuda_9.1.85_387.26_linux.run  
$ sudo reboot
```



CUDA Configure

- \$HOME 폴더에 있는 .bashrc 파일을 직접 수정한다.

```
$ vi .bashrc
```

- 맨 아래 부분에 다음과 같이 입력 후 저장하고 나온다.

```
# set CUDA_PATH  
export CUDA_HOME=/usr/local/cuda-9.0  
export PATH=$CUDA_HOME/bin:$PATH  
export LD_LIBRARY_PATH=$CUDA_HOME/lib64:$LD_LIBRARY_PATH
```



cuDNN 설치

- 파일을 다운로드 받은 후 압축을 푼다.

```
$ tar xvzf cudnn-9.1-linux-x64-v7
```

- 라이브러리 파일들을 /usr/local/cuda 에 복사한다.

```
$ sudo chmod a+r cuda/include/cudnn.h
```

```
$ sudo chmod a+r cuda/lib64/libcudnn*
```

```
$ sudo cp cuda/include/cudnn.h /usr/local/cuda-9.1/include/
```

```
$ sudo cp cuda/lib64/libcudnn* /usr/local/cuda-9.1/lib64/
```



대망의 TensorFlow 설치

```
$ pip install tensorflow-gpu
```

또는

```
$ pip install tensorflow
```



TensorFlow

What is TensorFlow?

- 구글 브레인팀이 만든 딥러닝(머신러닝) framework
- Open source software library
- Data flow 그래프를 이용하여 numerical 계산을 수행
- 다른 분야에도 폭넓게 적용할 수 있을 만큼 굉장히 일반적임

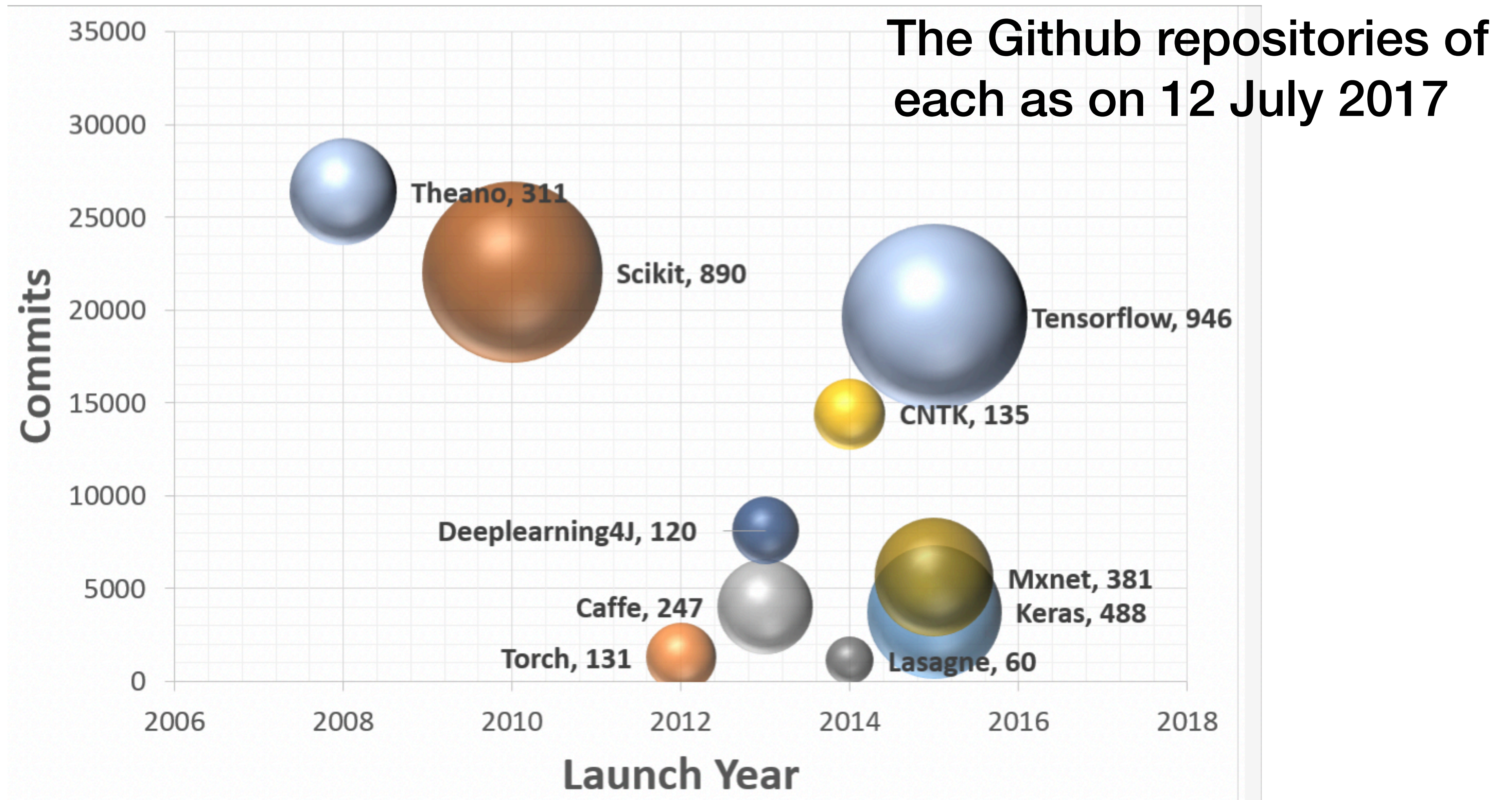


Why TensorFlow?

- Python!! (C++, Java, R, Go)
- Multiple platform: one or more CPUs or GPUs in a desktop, server, or mobile device with a single API
- Flexibility: from Raspberry Pi, Android, Windows, iOS, Linux to server farms
- Visualization (TensorBoard)
- Auto-differentiation autodiff
- Large community and awesome projects already using TensorFlow
- Software that includes TensorFlow, TensorBoard, and TensorServing



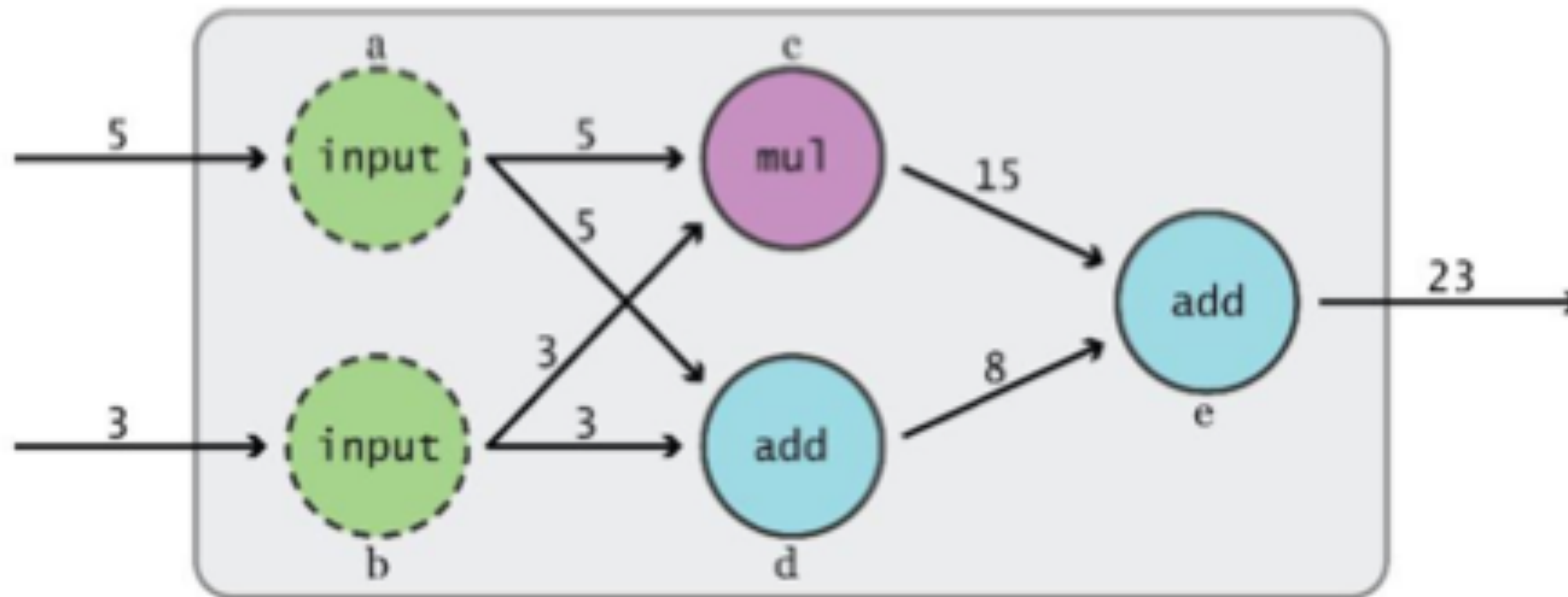
Compare Others



Graphs and Sessions

Data Flow Graphs

- Phase 1: 그래프를 구성한다 (정적 그래프 방식)
- Phase 2: session을 이용하여 그래프의 각 연산을 수행한다



What is a Tensor?

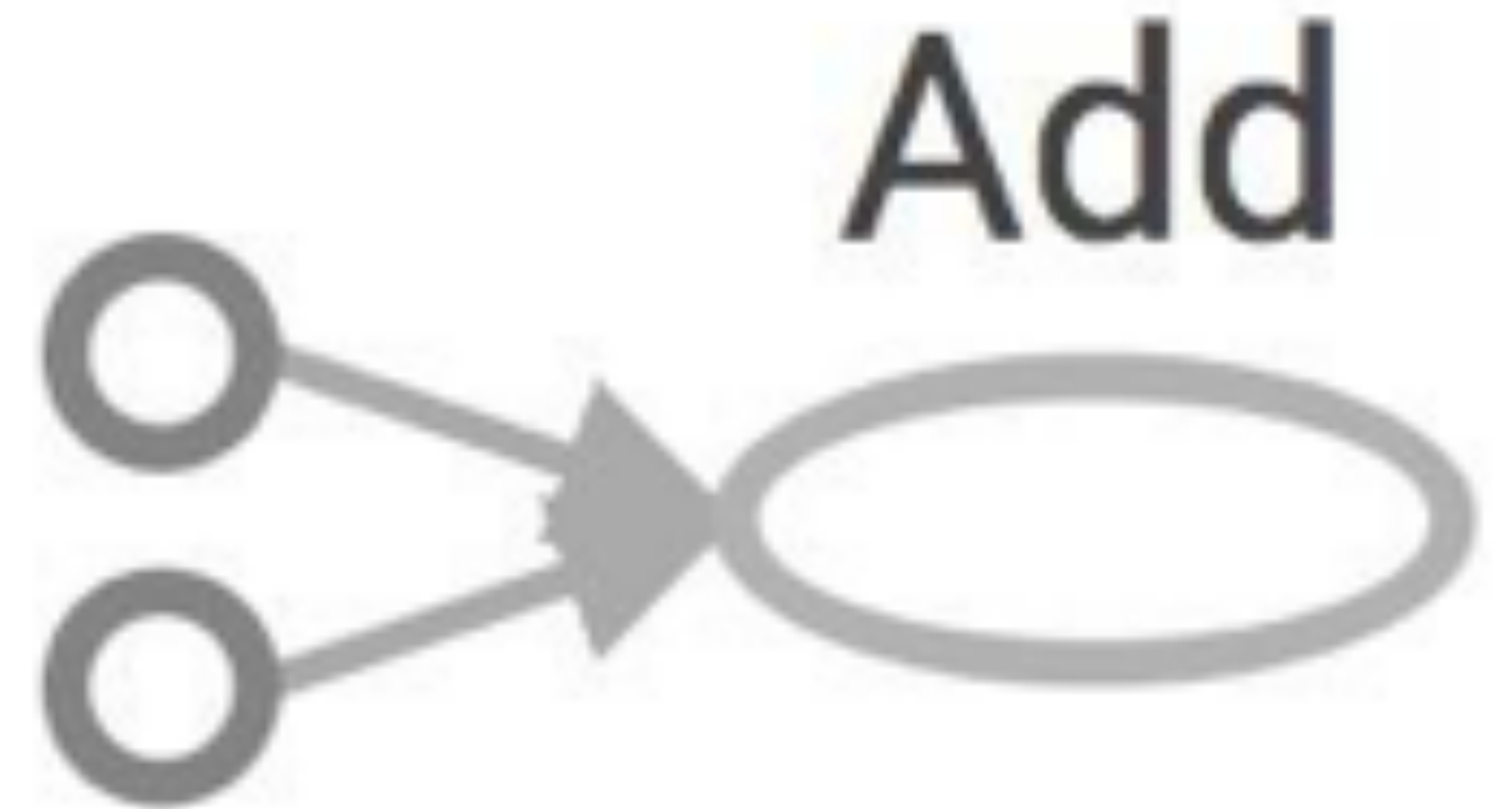
- An n-dimensional array
 - rank 0: scalar
 - rank 1: vector
 - rank 2: matrix
 - rank 3: 3-tensor (cube 모양)
 - rank n: n-tensor



Data Flow Graphs

```
In [2]: import tensorflow as tf
```

```
In [3]: a = tf.add(3, 5)
```



Data Flow Graphs

```
In [2]: import tensorflow as tf
```

```
In [3]: a = tf.add(3, 5)
```

```
In [4]: print(a)
```

```
Tensor("Add:0", shape=(), dtype=int32)
```



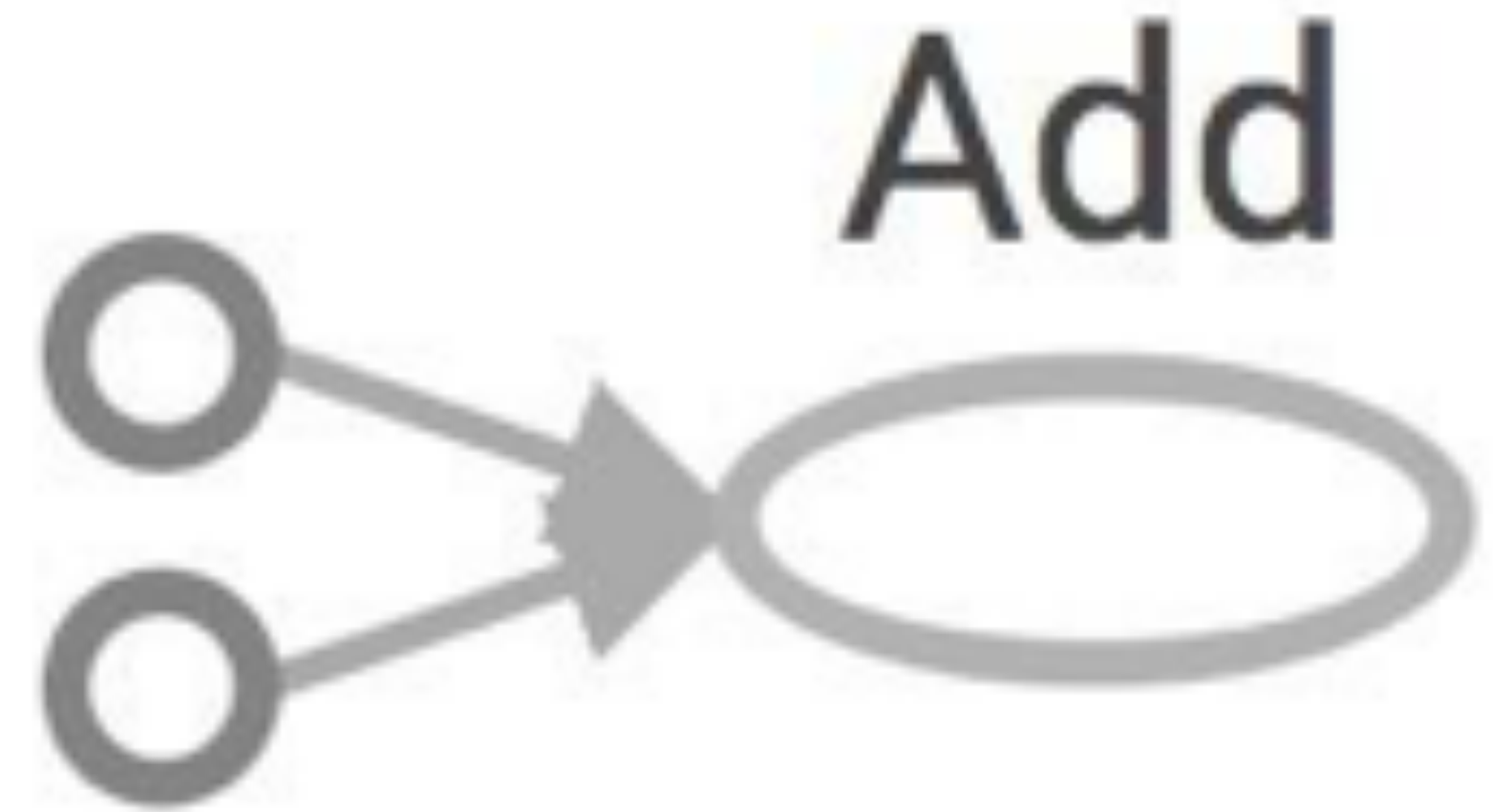
Data Flow Graphs

```
In [2]: import tensorflow as tf
```

```
In [3]: a = tf.add(3, 5)
```

```
In [4]: print(a)
```

```
Tensor("Add:0", shape=(), dtype=int32)
```



파이프를 연결하여 길을 만드는 과정



Session

```
In [2]: import tensorflow as tf
```

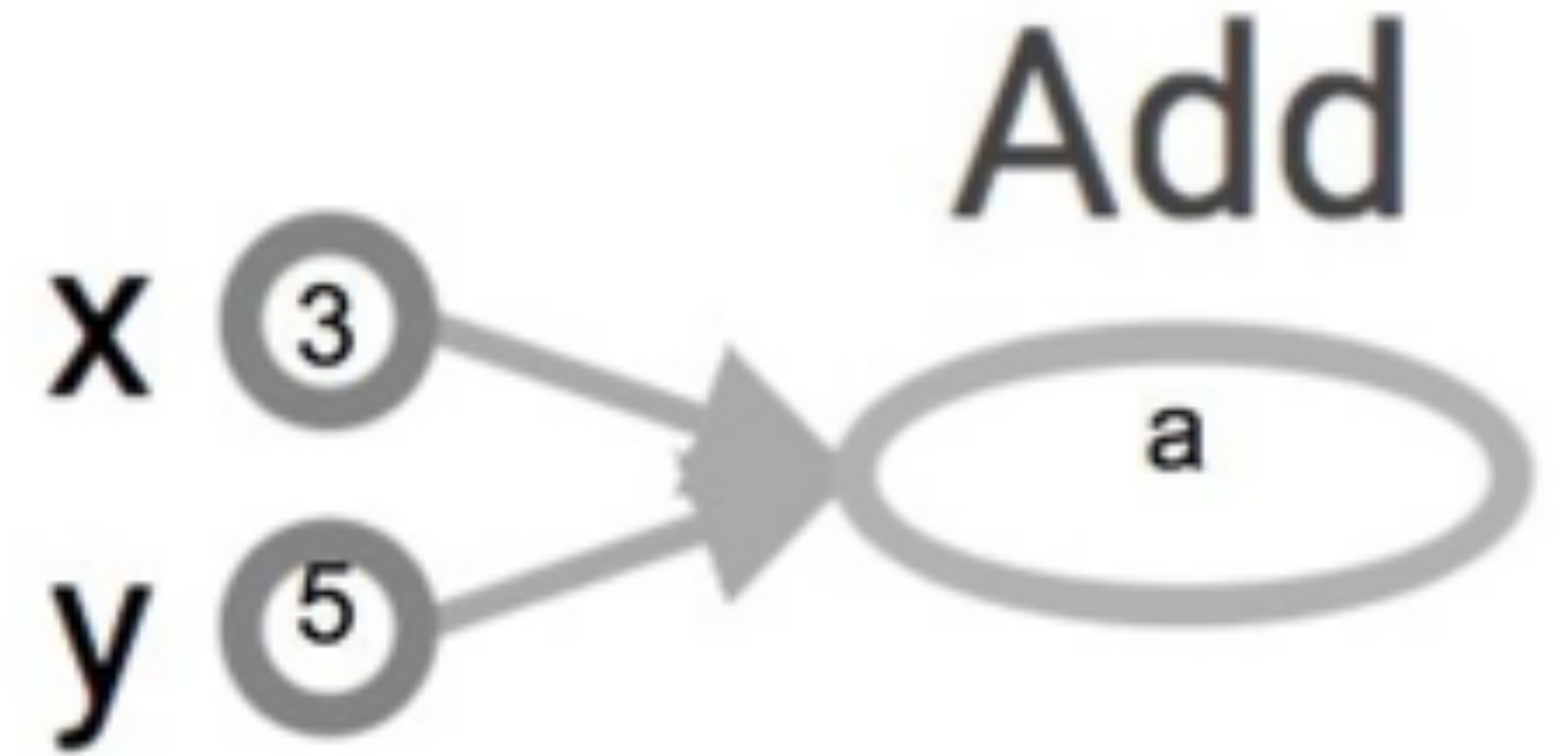
```
In [3]: a = tf.add(3, 5)
```

```
In [4]: print(a)
```

```
Tensor("Add:0", shape=(), dtype=int32)
```

```
In [5]: sess = tf.Session()  
print(sess.run(a))
```

```
8
```



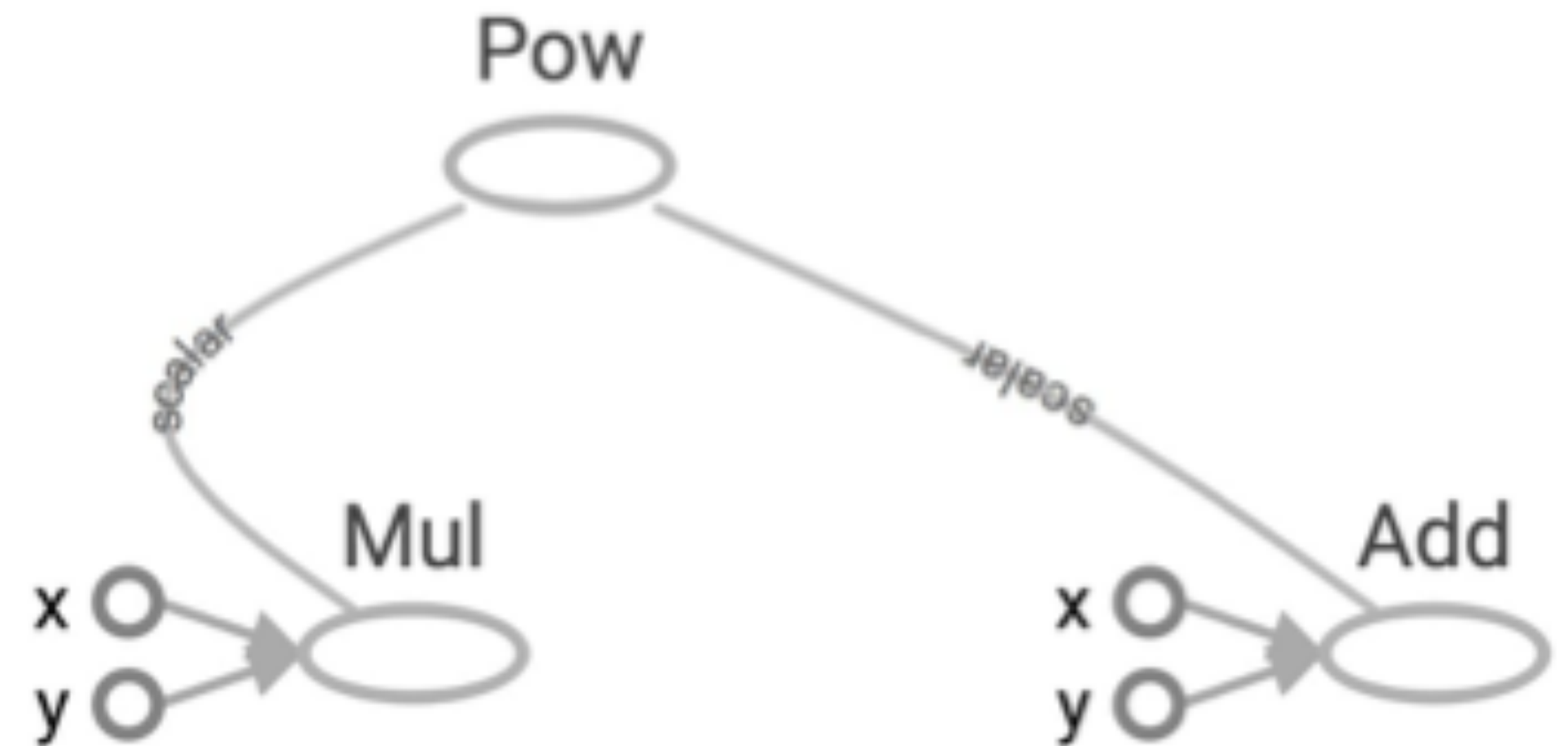
파이프에 물(데이터)을 흘려보내서 실제 계산을 수행



More Graphs

```
In [7]: x = 2  
        y = 3  
        w = tf.add(x, y)  
        z = tf.multiply(x, y)  
        p = tf.pow(z, w)  
        with tf.Session() as sess:  
            print(sess.run(p))
```

7776



Tensorboard

```
In [3]: a = tf.constant(2)
b = tf.constant(3)
x = tf.add(a, b)
with tf.Session() as sess:
    # add this line to use TensorBoard.
    writer = tf.summary.FileWriter("./graphs", sess.graph)
    print(sess.run(x))
writer.close() # close the writer when you're done using it
```

5




Tensorboard


\$ tensorboard --logdir graphs
브라우저 localhost:6006

TensorBoard

GRAPHS

INACTIVE

 Fit to screen

 Download PNG

Run (1)

Session runs (0)

Upload

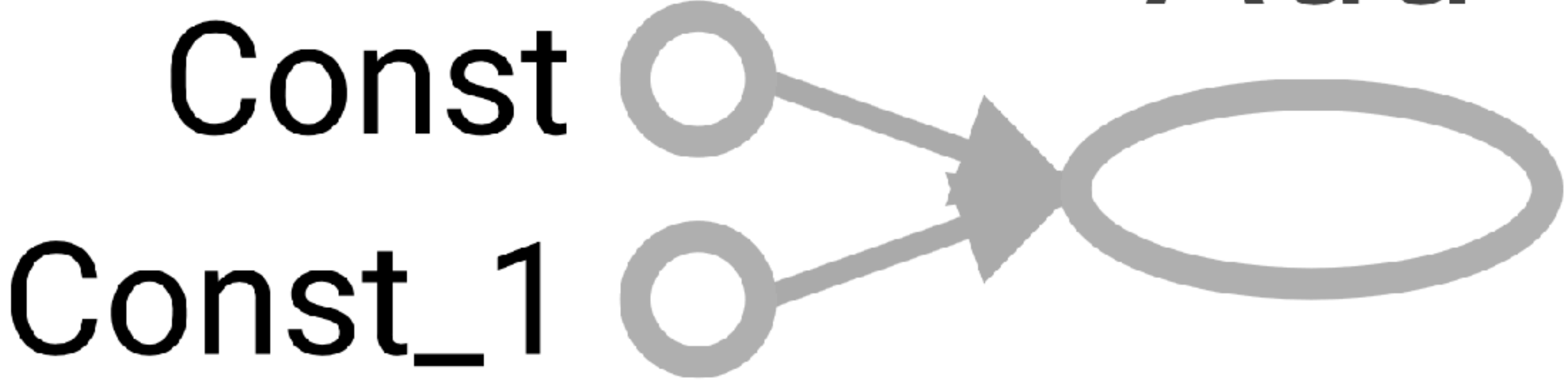
☐ Trace inputs

Color ☒ Structure ☐ Device

Const

Const_1

Add

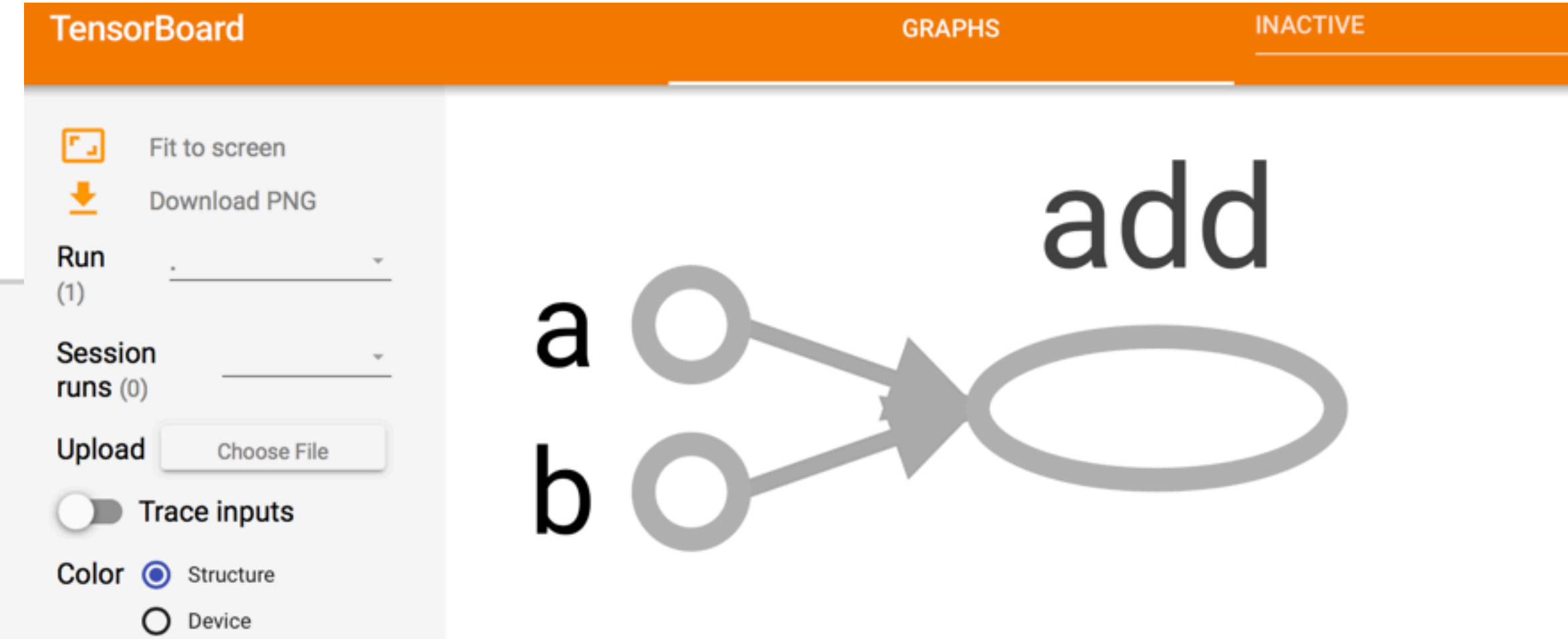




Explicitly Name

In [3]:

```
a = tf.constant(2, name='a')
b = tf.constant(3, name='b')
x = tf.add(a, b, name='add')
with tf.Session() as sess:
    # add this line to use TensorBoard.
    writer = tf.summary.FileWriter("./graphs", sess.graph)
    print(sess.run(x))
writer.close() # close the writer when you're done using it
```



TensorFlow Data Dimensions

`code03_TF_dimension.ipynb`



Three Types of Tensors

- `tf.constant`
- `tf.Variable`
- `tf.placeholder`



tf.Variable

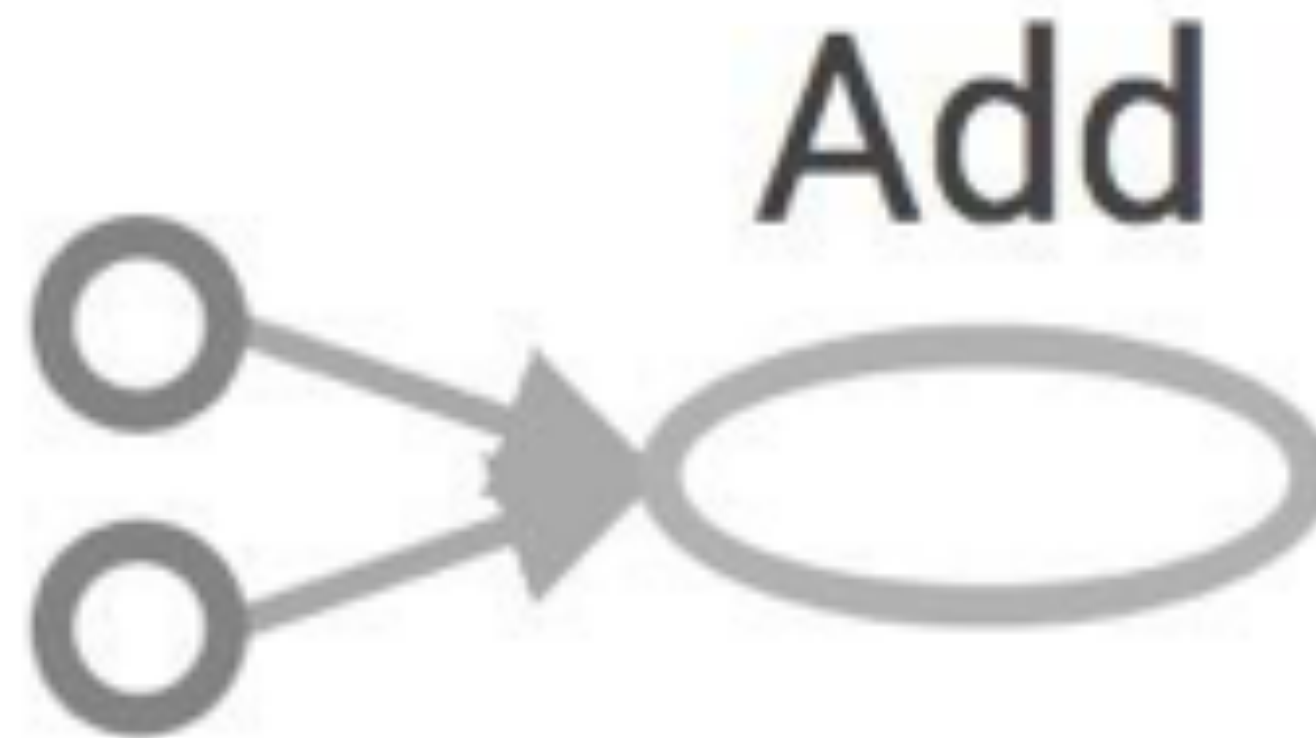
- 신경망에서 가중치와 같은 학습 가능한 parameter를 정의 할 때나 코드가 실행될 때 값이 변경 될 사항이 있을 때 유용함
- cf) `tf.constant`: session을 통해 실행될 때 값이 변하지 않음 (immutable)

`code04_tf.Variable.ipynb`



tf.placeholder

- `tf.Session()` 을 실행 할 때 외부에서 값을 넣어줌
- 학습데이터 또는 추론(inference) 할 때의 개별 데이터처럼 그래프 외부에서 값을 넣어 주는 형태로 만들 필요가 있을 때 유용함



`code05_tf.placeholder.ipynb`



tf.train.Saver

- Variable을 저장 또는 불러오기 위해 사용한다.
- 중요한건 tensorflow 변수 이름이다.

`code06_tf.train.Saver.ipynb`

