INTRODUCTION TO TENSORFLOW

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PEAK TIME LEARNERS

WHAT IS TENSORFLOW?

- TensorFlow is an open-source machine learning framework developed by Google.
- Used to build and train ML models.
- Uses computational graphs.
- Runs on CPU, GPU, or TPU.

WHY TENSORFLOW?

- Open-source and free
- Scalable to large datasets
- Runs on multiple platforms (mobile, web, cloud)
- TensorBoard for visualization
- Community support

WHAT IS A TENSOR?

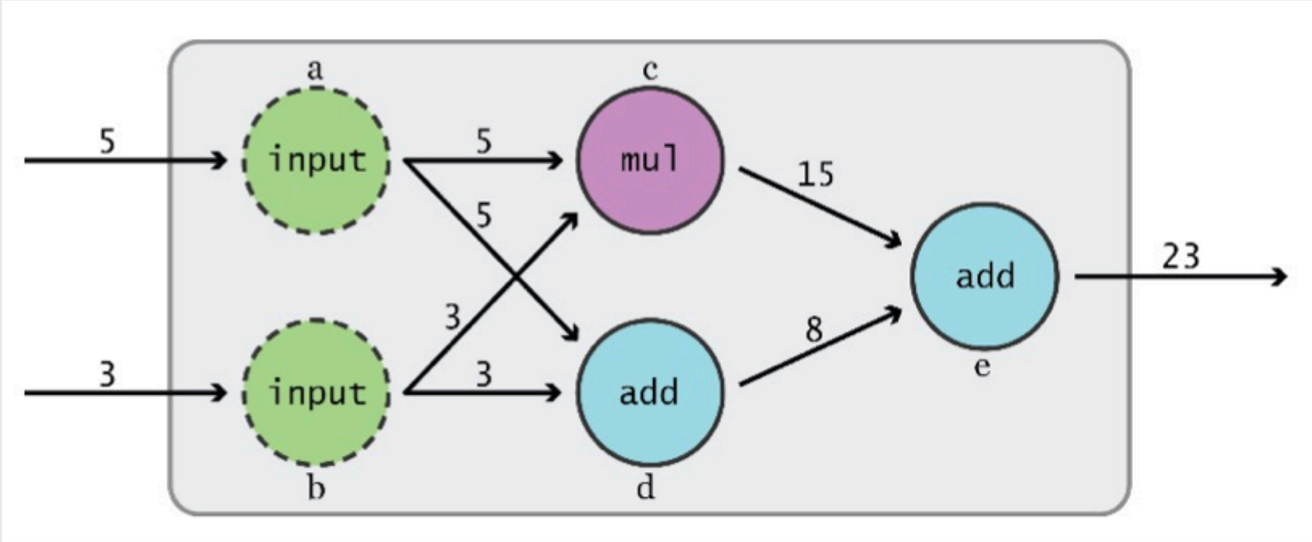
- Tensors are the building blocks in TensorFlow.
- They are multi-dimensional arrays (like scalars, vectors, matrices).

Examples:

- 0D: Scalar (e.g., 4)
- 1D: Vector (e.g., [1, 2, 3])
- 2D: Matrix (e.g., [[1, 2], [3, 4]])
- 3D: Tensor (e.g., [[[1,2], [3,4]], [[5,6], [7,8]]])

TENSORFLOW COMPUTATION GRAPH

- A computational graph is a series of TensorFlow operations arranged into a graph.
- Each node represents an operation.
- Each edge represents a tensor (data).



EXAMPLE

```
x = tf.constant(5)
y = tf.constant(3)
z = x + y
```

Here, x and y are tensors (edges), and + is a node (operation).

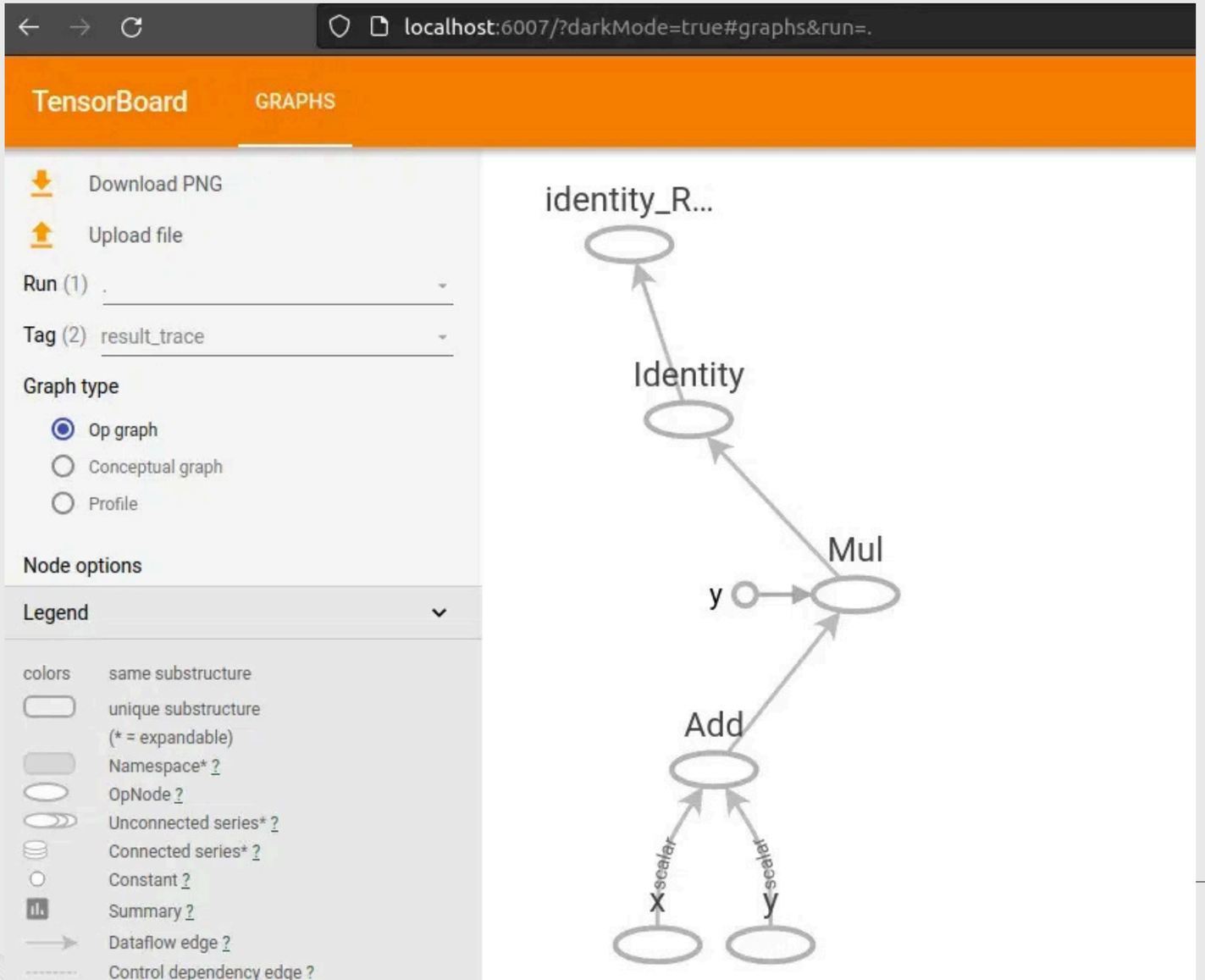
WHAT IS A NODE IN TENSORFLOW?

- Nodes are operations or functions (e.g., add, multiply).
- Can take inputs and produce outputs.
- Nodes perform computations on tensors.

EXAMPLE

```
x = tf.constant(2)
y = tf.constant(3)
add = tf.add(x, y)
mul = tf.multiply(add, 2)
```

EXAMPLE


localhost:6007/?darkMode=true#graphs&run=.
TensorBoard
GRAPHS
Download PNG
Upload file
Run (1) .
Tag (2) result_trace
Graph type
Op graph
Conceptual graph
Profile
Node options
Legend
colors same substructure
unique substructure
(* = expandable)
Namespace* ?
OpNode ?
Unconnected series* ?
Connected series* ?
Constant ?
Summary ?
Dataflow edge ?
Control dependency edge ?
identity_R...
Identity
Mul
y
Add
scalar
x
scalar
y

STATIC VS EAGER EXECUTION

Static Graph (TensorFlow 1.x):

- Build the graph first, then run it.

Eager Execution (TensorFlow 2.x):

- Operations run immediately.
- Easier for beginners.

EAGER EXECUTION

```
import tensorflow as tf

a = tf.constant(5)
b = tf.constant(3)
c = a + b

print("Result:", c.numpy())
```

STATIC EXECUTION

```
import tensorflow as tf
@tf.function
def compute():
    a = tf.constant(5)
    b = tf.constant(3)
    return a + b
result = compute()
print("Result:", result.numpy())
```

@tf.function tells TensorFlow: “Don’t run this code line-by-line. Instead, create a graph.”

The code is compiled into a graph first, then executed.

ADVANTAGES OF TENSORFLOW

- Open Source & Free
- Cross-Platform Support
- Support for Deep Learning & ML Algorithms
- Computational Graph Support
- Auto Differentiation
- TensorBoard Visualization
- Pre-trained Models & Transfer Learning

THANK YOU