TensorFlow

高阶OP

主讲：龙良曲

Outline

- where
- scatter_nd
- meshgrid

Where(tensor)

True	False	False
False	**True**	False
False	False	**True**

where

```
In [3]: a=tf.random.normal([3,3])
<tf.Tensor: id=11, shape=(3, 3), dtype=float32, numpy=
array([[ 1.6420907 ,  0.43938753, -0.31872085],
       [ 1.144599  , -0.02425919, -0.9576591 ],
       [ 1.5931814 ,  0.1182256 , -0.39948994]], dtype=float32)>

In [5]: mask=a>0
<tf.Tensor: id=14, shape=(3, 3), dtype=bool, numpy=
array([[ True,  True, False],
       [ True, False, False],
       [ True,  True, False]])>

In [7]: tf.boolean_mask(a,mask)
<tf.Tensor: id=42, shape=(5,), dtype=float32, numpy=
array([1.6420907 , 0.43938753, 1.144599  , 1.5931814 , 0.1182256 ],
      dtype=float32)>

In [8]: indices=tf.where(mask)
<tf.Tensor: id=44, shape=(5, 2), dtype=int64, numpy=
array([[0, 0],
       [0, 1],
       [1, 0],
       [2, 0],
       [2, 1]])>

In [10]: tf.gather_nd(a,indices)
<tf.Tensor: id=46, shape=(5,), dtype=float32, numpy=
array([1.6420907 , 0.43938753, 1.144599  , 1.5931814 , 0.1182256 ],
      dtype=float32)>
```

where

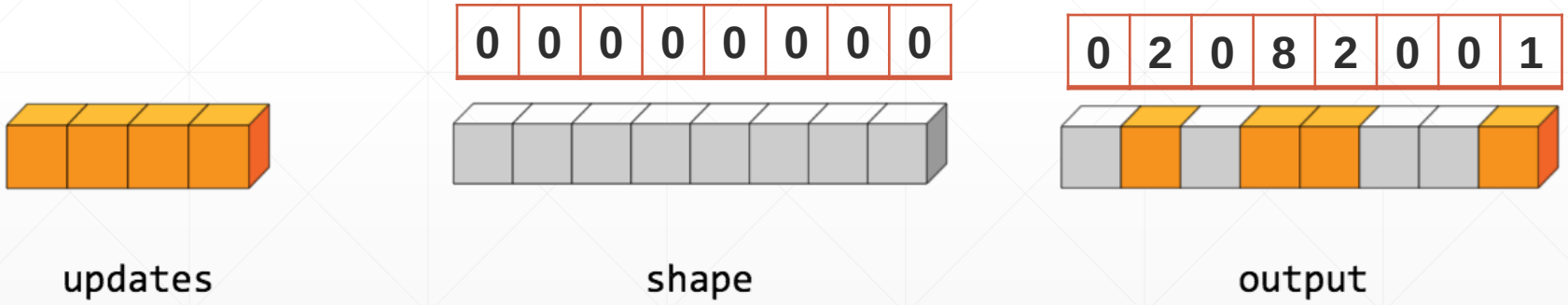
- where(cond, A, B)

```
In [11]: mask
<tf.Tensor: id=14, shape=(3, 3), dtype=bool, numpy=
array([[ True,  True, False],
       [ True, False, False],
       [ True,  True, False]])>

In [12]: A=tf.ones([3,3])

In [13]: B=tf.zeros([3,3])

In [14]: tf.where(mask, A, B)
<tf.Tensor: id=55, shape=(3, 3), dtype=float32, numpy=
array([[1., 1., 0.],
       [1., 0., 0.],
       [1., 1., 0.]], dtype=float32)>
```

True从A中选，False从B中选

scatter_nd

- tf.scatter_nd(
- indices,
- updates,
- shape



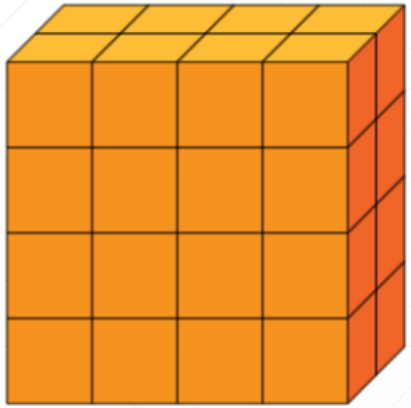
https://www.tensorflow.org/versions/r2.0/api_docs/python/tf/scatter_nd

scatter_nd

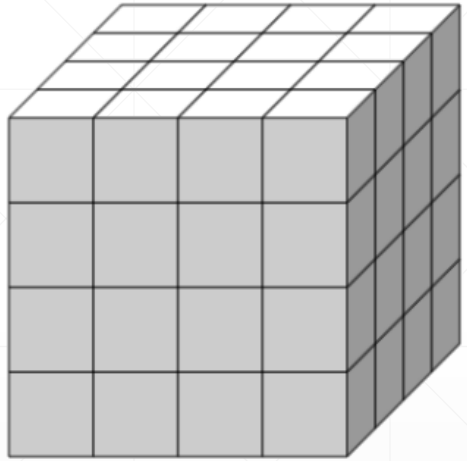
更新张量特定位置上的数据(更新模板的元素全0)

```
In [17]: indices = tf.constant([[4], [3], [1], [7]])
In [18]: updates = tf.constant([9, 10, 11, 12])
In [19]: shape = tf.constant([8])

In [20]: tf.scatter_nd(indices, updates, shape)
Out[20]: <tf.Tensor: id=60, shape=(8,), dtype=int32, numpy=array([ 0, 11,  0, 10,
 9,  0,  0, 12], dtype=int32)>
```

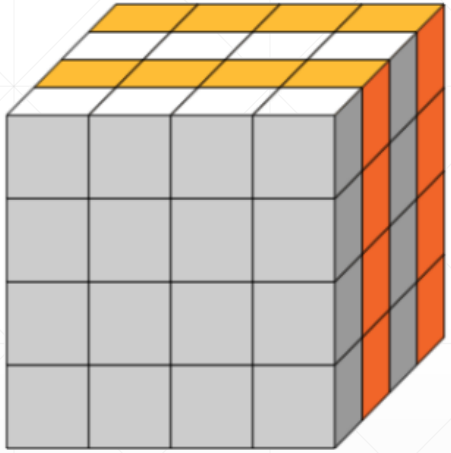
scatter_nd



updates

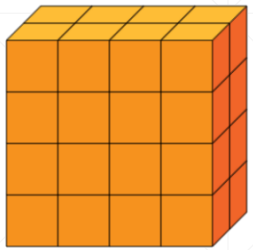


shape

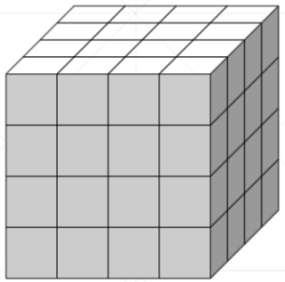


output

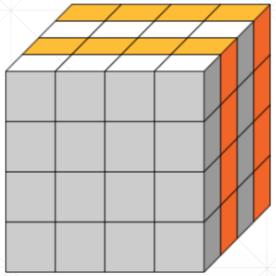
scatter_nd



updates



shape



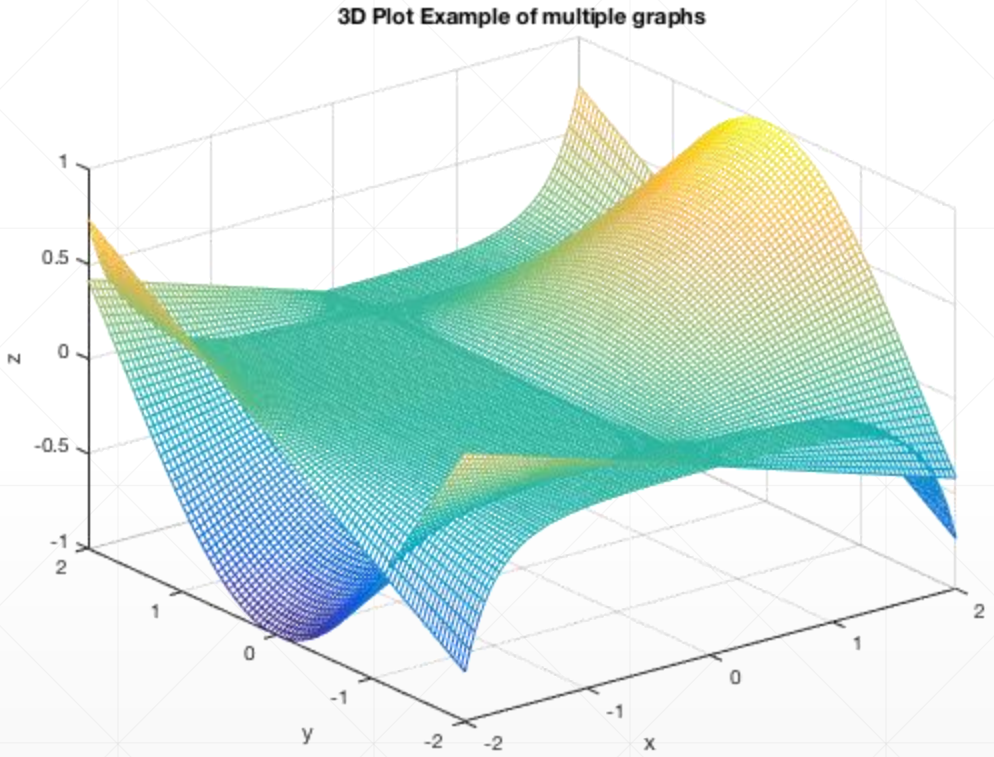
output

```
In [21]: indices = tf.constant([[0], [2]])

In [22]: updates = tf.constant([   [[5, 5, 5, 5], [6, 6, 6, 6],
    ...:                            [7, 7, 7, 7], [8, 8, 8, 8]],
    ...:
    ...:                           [[5, 5, 5, 5], [6, 6, 6, 6],
    ...:                            [7, 7, 7, 7], [8, 8, 8, 8]]])
    ...:
In [24]: updates.shape
Out[24]: TensorShape([2, 4, 4])

In [23]: shape = tf.constant([4, 4, 4])

In [25]: tf.scatter_nd(indices, updates, shape)
<tf.Tensor: id=65, shape=(4, 4, 4), dtype=int32, numpy=
array([[[5, 5, 5, 5],
        [6, 6, 6, 6],
        [7, 7, 7, 7],
        [8, 8, 8, 8]],

       [[0, 0, 0, 0],
        [0, 0, 0, 0],
        [0, 0, 0, 0],
        [0, 0, 0, 0]],

       [[5, 5, 5, 5],
        [6, 6, 6, 6],
        [7, 7, 7, 7],
        [8, 8, 8, 8]],

       [[0, 0, 0, 0],
        [0, 0, 0, 0],
        [0, 0, 0, 0],
        [0, 0, 0, 0]]], dtype=int32)>
```

meshgrid

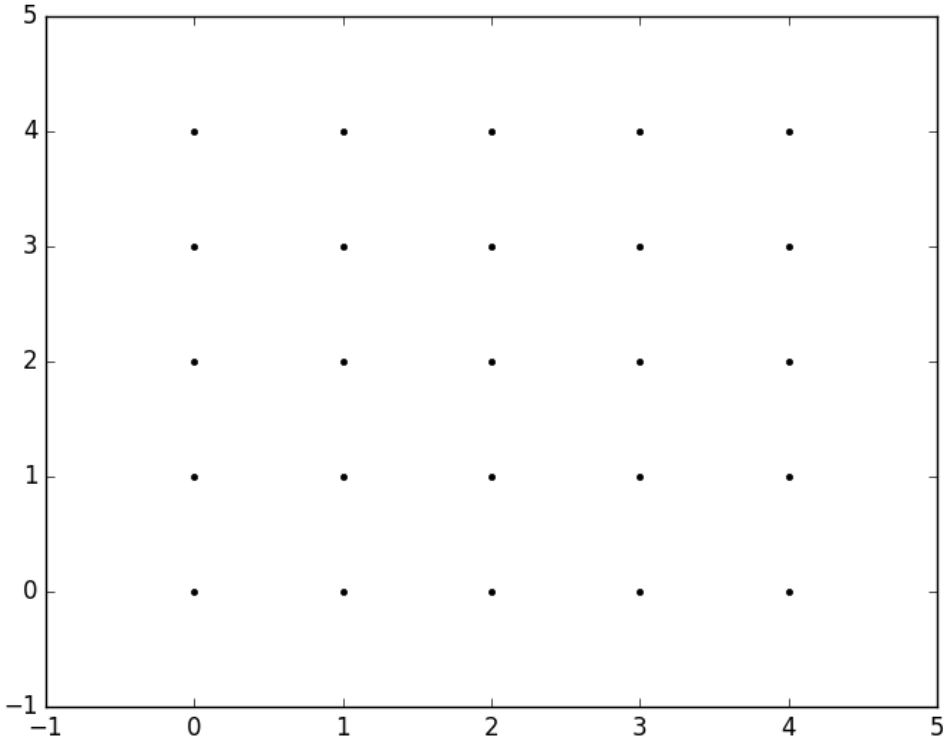
- [-2, -2]
- [-1, -2]
- [0, -2]
- [-2,-1]
- [-1,-1]
- …

- [2,2]



Points

- [y, x, 2]
  - [5, 5, 2]
- [N, 2]



Numpy

```
points = []

for y in np.linspace(-2,2,5):
  for x in np.linspace(-2,2,5):
    points.append([x,y])

return np.array(points)
```

GPU acceleration

- x: [-2~2]
- y: [-2~2]

- Points: [N, 2]

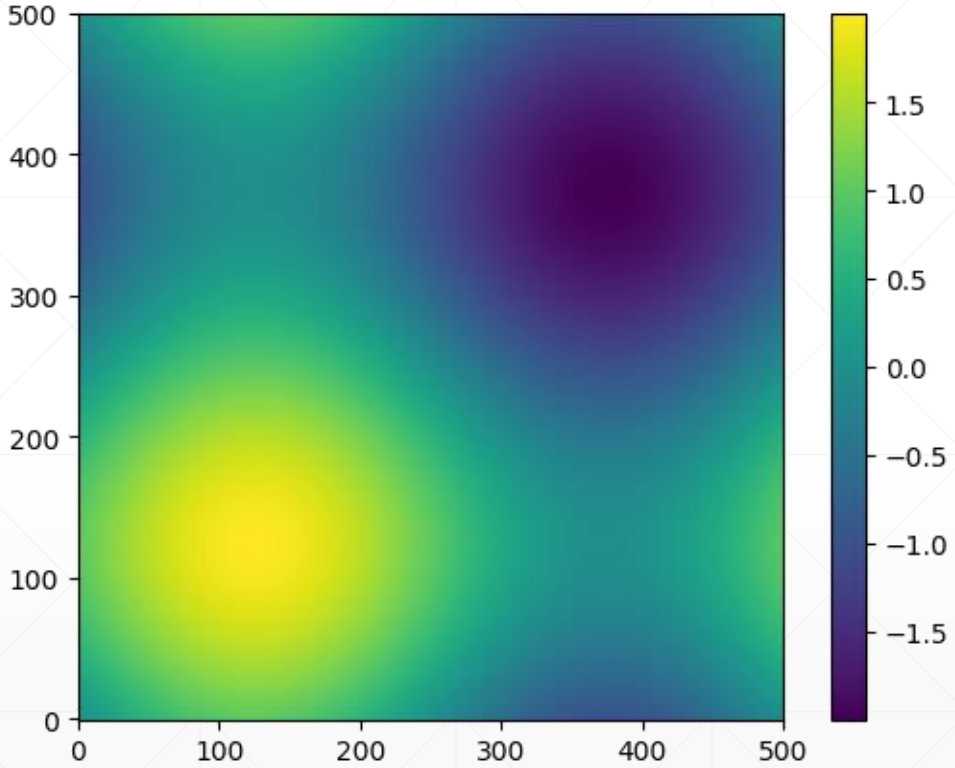
```
In [39]: y=tf.linspace(-2.,2,5)
In [40]: y
Out[40]: <tf.Tensor: id=136, shape=(5,), dtype=float32, numpy=array([-2., -1.,
 0.,  1.,  2.], dtype=float32)>

In [41]: x=tf.linspace(-2.,2,5)

In [42]: points_x, points_y=tf.meshgrid(x,y)

In [43]: points_x.shape
Out[43]: TensorShape([5, 5])
```

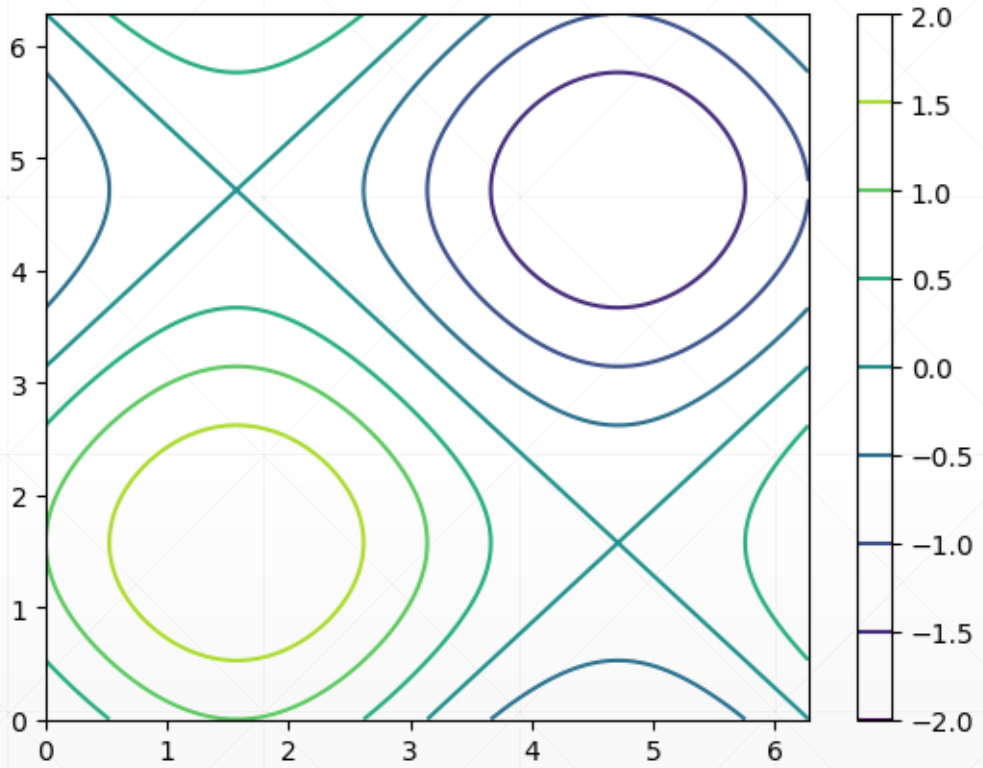
```
In [44]: points_x
<tf.Tensor: id=162, shape=(5, 5), dtype=float32, numpy=
array([[-2., -1.,  0.,  1.,  2.],
       [-2., -1.,  0.,  1.,  2.],
       [-2., -1.,  0.,  1.,  2.],
       [-2., -1.,  0.,  1.,  2.],
       [-2., -1.,  0.,  1.,  2.]], dtype=float32)>

In [45]: points_y
<tf.Tensor: id=163, shape=(5, 5), dtype=float32, numpy=
array([[-2., -2., -2., -2., -2.],
       [-1., -1., -1., -1., -1.],
       [ 0.,  0.,  0.,  0.,  0.],
       [ 1.,  1.,  1.,  1.,  1.],
       [ 2.,  2.,  2.,  2.,  2.]], dtype=float32)>
```

Points:[N, 2]

```
 [51]: points_x.shape
Out[51]: TensorShape([5, 5])

In [52]: points=tf.stack([points_x,points_y], axis=2)
<tf.Tensor: id=176, shape=(5, 5, 2), dtype=float32, numpy=
array([[[-2., -2.],
        [-1., -2.],
        [ 0., -2.],
        [ 1., -2.],
        [ 2., -2.]],

       [[-2., -1.],
        [-1., -1.],
        [ 0., -1.],
        [ 1., -1.],
        [ 2., -1.]],
```

$$z = sin(x) + sin(y)$$


500
400
300
200
100
0
0
100
200
300
400
500
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5


6
5
4
3
2
1
0
0
1
2
3
4
5
6
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0


JUST
DO
IT.

下一课时

数据加载

Thank You.