

Tensor Indexing

Use tensor indexing to retrieve the model's final word prediction.

Chapter Goals:

- Extract the word predictions for the final time step of each sequence

A. Gather functions

When generating word predictions for a batch of sequences, we only want to retrieve the word IDs for each sequence's final time step. If this were regular Python (or NumPy), we could do this through simple list indexing or slicing. However, in TensorFlow we need to use *gather* functions to retrieve data at specific locations in the tensor.

There are two main gather functions: `tf.gather` and `tf.gather_nd`. Both take in the same two required arguments:

- **params:** The tensor that we wish to retrieve data from.
- **indices:** The locations in the tensor that we will index into.

The `tf.gather` function can be used to retrieve specific slices from a tensor, based on what the `axis` keyword argument is set to (default is `0`).

Below are example usages of `tf.gather`. Note that the values in the `indices` argument must be valid indices for the specified `axis`.

```

1 import tensorflow as tf
2 t1 = tf.constant([1, 2, 3])
3 with tf.Session() as sess:
4     print(repr(sess.run(tf.gather(t1, 0))))
5     print(repr(sess.run(tf.gather(t1, 2))))
6
7 print('\n')
8 t2 = tf.constant([[1, 2, 3], [4, 5, 6]])
9 with tf.Session() as sess:
10    print(repr(sess.run(tf.gather(t2, 0))))
11    print(repr(sess.run(tf.gather(t2, 1, axis=1))))
12    print(repr(sess.run(tf.gather(t2, [0, 2], axis=1))))
13
14 print('\n')
15 t3 = tf.constant([
16     [[1, 2, 3], [4, 5, 6]],
17     [[5, 6, 7], [7, 8, 9]]
18 ])
19 with tf.Session() as sess:
20    print(repr(sess.run(tf.gather(t3, 0))))
21    print(repr(sess.run(tf.gather(t3, 1, axis=1))))
22    print(repr(sess.run(tf.gather(t3, [0, 2], axis=2))))

```

RUN

SAVE

RESET



While `tf.gather` retrieves slices from the input tensor, we can use `tf.gather_nd` for specific tensor indexing. Since `tf.gather_nd` is used for specific indexing rather than slicing, there's no `axis` keyword argument.

The code below shows example usages of `tf.gather_nd`. Note that the tensors `t2` and `t3` come from the previous example.

```

1 with tf.Session() as sess:
2     print(repr(sess.run(tf.gather_nd(t2, [0, 1]))))
3     print(repr(sess.run(tf.gather_nd(t2, [[0, 1], [1, 1]]))))
4
5 print('\n')
6 with tf.Session() as sess:
7     print(repr(sess.run(tf.gather_nd(t3, [0, 1]))))
8     print(repr(sess.run(tf.gather_nd(t3, [[0, 0], [1, 1]]))))
9     print(repr(sess.run(tf.gather_nd(t3, [0, 1, 2]))))

```

When using `tf.gather_nd`, the `params` argument must be a multi-dimensional tensor (cannot be 1-D), and the `indices` argument cannot be a single integer.