

tf.keras.layers.Bidirectional

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Class **Bidirectional**

Inherits From: [Wrapper](#)

Defined in [tensorflow/python/keras/_impl/keras/layers/wrappers.py](#).

Bidirectional wrapper for RNNs.

Arguments:

- `layer`: [Recurrent](#) instance.
- `merge_mode`: Mode by which outputs of the forward and backward RNNs will be combined. One of {'sum', 'mul', 'concat', 'ave', None}. If None, the outputs will not be combined, they will be returned as a list.

Raises:

- [ValueError](#): In case of invalid `merge_mode` argument.

Examples:

```
model = Sequential()  
model.add(Bidirectional(LSTM(10, return_sequences=True), input_shape=(5,  
10)))  
model.add(Bidirectional(LSTM(10)))  
model.add(Dense(5))  
model.add(Activation('softmax'))  
model.compile(loss='categorical_crossentropy', optimizer='rmsprop')
```

Properties

activity_regularizer

constraints

dtype

graph

input

Retrieves the input tensor(s) of a layer.

Only applicable if the layer has exactly one input, i.e. if it is connected to one incoming layer.

Returns:

Input tensor or list of input tensors.

Raises:

- `AttributeError` : if the layer is connected to more than one incoming layers.

Raises:

- `RuntimeError` : If called in Eager mode.
- `AttributeError` : If no inbound nodes are found.

input_mask

Retrieves the input mask tensor(s) of a layer.

Only applicable if the layer has exactly one inbound node, i.e. if it is connected to one incoming layer.

Returns:

Input mask tensor (potentially None) or list of input mask tensors.

Raises:

- `AttributeError` : if the layer is connected to more than one incoming layers.

input_shape

Retrieves the input shape(s) of a layer.

Only applicable if the layer has exactly one input, i.e. if it is connected to one incoming layer, or if all inputs have the same shape.

Returns:

Input shape, as an integer shape tuple (or list of shape tuples, one tuple per input tensor).

Raises:

- `AttributeError` : if the layer has no defined input_shape.
- `RuntimeError` : if called in Eager mode.

losses

name

non_trainable_variables

non_trainable_weights

output

Retrieves the output tensor(s) of a layer.

Only applicable if the layer has exactly one output, i.e. if it is connected to one incoming layer.

Returns:

Output tensor or list of output tensors.

Raises:

- `AttributeError` : if the layer is connected to more than one incoming layers.
- `RuntimeError` : if called in Eager mode.

output_mask

Retrieves the output mask tensor(s) of a layer.

Only applicable if the layer has exactly one inbound node, i.e. if it is connected to one incoming layer.

Returns:

Output mask tensor (potentially None) or list of output mask tensors.

Raises:

- `AttributeError` : if the layer is connected to more than one incoming layers.

output_shape

Retrieves the output shape(s) of a layer.

Only applicable if the layer has one output, or if all outputs have the same shape.

Returns:

Output shape, as an integer shape tuple (or list of shape tuples, one tuple per output tensor).

Raises:

- `AttributeError` : if the layer has no defined output shape.
- `RuntimeError` : if called in Eager mode.

scope_name

trainable_variables

trainable_weights

updates

variables

Returns the list of all layer variables/weights.

Returns:

A list of variables.

weights

Returns the list of all layer variables/weights.

Returns:

A list of variables.

Methods

__init__

```
__init__(
    layer,
    merge_mode='concat',
    weights=None,
    **kwargs
)
```

__call__

```
__call__(
    inputs,
    **kwargs
)
```

Wrapper around self.call(), for handling internal references.

If a Keras tensor is passed: - We call self._add_inbound_node(). - If necessary, we **build** the layer to match the shape of the input(s). - We update the _keras_history of the output tensor(s) with the current layer. This is done as part of _add_inbound_node().

Arguments:

- **inputs** : Can be a tensor or list/tuple of tensors.
- ****kwargs** : Additional keyword arguments to be passed to **call()** .

Returns:

Output of the layer's `call` method.

Raises:

- `ValueError` : in case the layer is missing shape information for its `build` call.

`__deepcopy__`

```
__deepcopy__(memo)
```

`add_loss`

```
add_loss(  
    losses,  
    inputs=None  
)
```

Add loss tensor(s), potentially dependent on layer inputs.

Some losses (for instance, activity regularization losses) may be dependent on the inputs passed when calling a layer. Hence, when reusing a same layer on different inputs `a` and `b`, some entries in `layer.losses` may be dependent on `a` and some on `b`. This method automatically keeps track of dependencies.

The `get_losses_for` method allows to retrieve the losses relevant to a specific set of inputs.

Arguments:

- `losses` : Loss tensor, or list/tuple of tensors.
- `inputs` : Optional input tensor(s) that the loss(es) depend on. Must match the `inputs` argument passed to the `__call__` method at the time the losses are created. If `None` is passed, the losses are assumed to be unconditional, and will apply across all dataflows of the layer (e.g. weight regularization losses).

Raises:

- `RuntimeError` : If called in Eager mode.

`add_update`

```
add_update(  
    updates,  
    inputs=None  
)
```

Add update op(s), potentially dependent on layer inputs.

Weight updates (for instance, the updates of the moving mean and variance in a BatchNormalization layer) may be dependent on the inputs passed when calling a layer. Hence, when reusing a same layer on different inputs `a` and `b`, some entries in `layer.updates` may be dependent on `a` and some on `b`. This method automatically keeps track of dependencies.

The `get_updates_for` method allows to retrieve the updates relevant to a specific set of inputs.

This call is ignored in Eager mode.

Arguments:

- `updates` : Update op, or list/tuple of update ops.
- `inputs` : Optional input tensor(s) that the update(s) depend on. Must match the `inputs` argument passed to the `__call__` method at the time the updates are created. If `None` is passed, the updates are assumed to be unconditional, and will apply across all dataflows of the layer.

add_variable

```
add_variable(  
    name,  
    shape,  
    dtype=None,  
    initializer=None,  
    regularizer=None,  
    trainable=True,  
    constraint=None  
)
```

Adds a new variable to the layer, or gets an existing one; returns it.

Arguments:

- `name` : variable name.
- `shape` : variable shape.
- `dtype` : The type of the variable. Defaults to `self.dtype` or `float32`.
- `initializer` : initializer instance (callable).
- `regularizer` : regularizer instance (callable).
- `trainable` : whether the variable should be part of the layer's "trainable_variables" (e.g. variables, biases) or "non_trainable_variables" (e.g. BatchNorm mean, stddev).
- `constraint` : constraint instance (callable).

Returns:

The created variable.

Raises:

- `RuntimeError` : If called in Eager mode with regularizers.

add_weight

```
add_weight(  
    name,  
    shape,  
    dtype=None,  
    initializer=None,  
    regularizer=None,  
    trainable=True,  
    constraint=None  
)
```

Adds a weight variable to the layer.

Arguments:

- `name` : String, the name for the weight variable.
- `shape` : The shape tuple of the weight.
- `dtype` : The dtype of the weight.
- `initializer` : An Initializer instance (callable).
- `regularizer` : An optional Regularizer instance.
- `trainable` : A boolean, whether the weight should be trained via backprop or not (assuming that the layer itself is also trainable).
- `constraint` : An optional Constraint instance.

Returns:

The created weight variable.

apply

```
apply(  
    inputs,  
    *args,  
    **kwargs  
)
```

Apply the layer on a input.

This simply wraps `self.__call__`.

Arguments:

- `inputs` : Input tensor(s).
- `*args` : additional positional arguments to be passed to `self.call`.
- `**kwargs` : additional keyword arguments to be passed to `self.call`.

Returns:

Output tensor(s).

build

```
build(input_shape)
```

call

```
call(  
    inputs,  
    training=None,  
    mask=None  
)
```

compute_mask

```
compute_mask(  
    inputs,  
    mask  
)
```

count_params

```
count_params()
```

Count the total number of scalars composing the weights.

Returns:

An integer count.

Raises:

- `ValueError` : if the layer isn't yet built (in which case its weights aren't yet defined).

from_config

```
from_config(  
    cls,  
    config,  
    custom_objects=None  
)
```

get_config

```
get_config()
```

get_input_at

```
get_input_at(node_index)
```

Retrieves the input tensor(s) of a layer at a given node.

Arguments:

- `node_index` : Integer, index of the node from which to retrieve the attribute. E.g. `node_index=0` will correspond to the first time the layer was called.

Returns:

A tensor (or list of tensors if the layer has multiple inputs).

Raises:

- `RuntimeError` : If called in Eager mode.

get_input_mask_at

```
get_input_mask_at(node_index)
```

Retrieves the input mask tensor(s) of a layer at a given node.

Arguments:

- `node_index` : Integer, index of the node from which to retrieve the attribute. E.g. `node_index=0` will correspond to the first time the layer was called.

Returns:

A mask tensor (or list of tensors if the layer has multiple inputs).

get_input_shape_at

```
get_input_shape_at(node_index)
```

Retrieves the input shape(s) of a layer at a given node.

Arguments:

- `node_index` : Integer, index of the node from which to retrieve the attribute. E.g. `node_index=0` will correspond to the first time the layer was called.

Returns:

A shape tuple (or list of shape tuples if the layer has multiple inputs).

Raises:

- `RuntimeError` : If called in Eager mode.

get_losses_for

```
get_losses_for(inputs=None)
```

get_output_at

```
get_output_at(node_index)
```

Retrieves the output tensor(s) of a layer at a given node.

Arguments:

- `node_index` : Integer, index of the node from which to retrieve the attribute. E.g. `node_index=0` will correspond to the first time the layer was called.

Returns:

A tensor (or list of tensors if the layer has multiple outputs).

Raises:

- `RuntimeError` : If called in Eager mode.

get_output_mask_at

```
get_output_mask_at(node_index)
```

Retrieves the output mask tensor(s) of a layer at a given node.

Arguments:

- `node_index` : Integer, index of the node from which to retrieve the attribute. E.g. `node_index=0` will correspond to the first time the layer was called.

Returns:

A mask tensor (or list of tensors if the layer has multiple outputs).

get_output_shape_at

```
get_output_shape_at(node_index)
```

Retrieves the output shape(s) of a layer at a given node.

Arguments:

- `node_index` : Integer, index of the node from which to retrieve the attribute. E.g. `node_index=0` will correspond to the first time the layer was called.

Returns:

A shape tuple (or list of shape tuples if the layer has multiple outputs).

Raises:

- `RuntimeError` : If called in Eager mode.

get_updates_for

```
get_updates_for(inputs=None)
```

get_weights

```
get_weights()
```

reset_states

```
reset_states()
```

set_weights

```
set_weights(weights)
```

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