

## tf.contrib.rnn.CoupledInputForgetGateLSTMCell

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Class `CoupledInputForgetGateLSTMCell`

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## Class `CoupledInputForgetGateLSTMCell`

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Inherits From: [RNNCell](#)

Defined in [tensorflow/contrib/rnn/python/ops/rnn\\_cell.py](#).

See the guide: [RNN and Cells \(contrib\) > Core RNN Cell wrappers \(RNNCells that wrap other RNNCells\)](#)

Long short-term memory unit (LSTM) recurrent network cell.

The default non-peephole implementation is based on:

<http://www.bioinf.jku.at/publications/older/2604.pdf>

S. Hochreiter and J. Schmidhuber. "Long Short-Term Memory". *Neural Computation*, 9(8):1735-1780, 1997.

The peephole implementation is based on:

<https://research.google.com/pubs/archive/43905.pdf>

Hasim Sak, Andrew Senior, and Francoise Beaufays. "Long short-term memory recurrent neural network architectures for large scale acoustic modeling." *INTERSPEECH*, 2014.

The coupling of input and forget gate is based on:

<http://arxiv.org/pdf/1503.04069.pdf>

Greff et al. "LSTM: A Search Space Odyssey"

The class uses optional peep-hole connections, and an optional projection layer.

## Properties

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### `activity_regularizer`

Optional regularizer function for the output of this layer.

### `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\_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\_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.

## **output\_size**

## **scope\_name**

## **state\_size**

## **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__(
    num_units,
    use_peepholes=False,
    initializer=None,
    num_proj=None,
    proj_clip=None,
    num_unit_shards=1,
    num_proj_shards=1,
    forget_bias=1.0,
    state_is_tuple=True,
    activation=tf.tanh,
    reuse=None
)
```

Initialize the parameters for an LSTM cell.

Args:

- `num_units` : int, The number of units in the LSTM cell
- `use_peepholes` : bool, set True to enable diagonal/peephole connections.
- `initializer` : (optional) The initializer to use for the weight and projection matrices.
- `num_proj` : (optional) int, The output dimensionality for the projection matrices. If None, no projection is performed.
- `proj_clip` : (optional) A float value. If `num_proj > 0` and `proj_clip` is provided, then the projected values are clipped elementwise to within `[-proj_clip, proj_clip]`.
- `num_unit_shards` : How to split the weight matrix. If >1, the weight matrix is stored across `num_unit_shards`.
- `num_proj_shards` : How to split the projection matrix. If >1, the projection matrix is stored across `num_proj_shards`.
- `forget_bias` : Biases of the forget gate are initialized by default to 1 in order to reduce the scale of forgetting at the beginning of the training.
- `state_is_tuple` : If True, accepted and returned states are 2-tuples of the `c_state` and `m_state`. By default (False), they are concatenated along the column axis. This default behavior will soon be deprecated.
- `activation` : Activation function of the inner states.
- `reuse` : (optional) Python boolean describing whether to reuse variables in an existing scope. If not `True`, and the existing scope already has the given variables, an error is raised.

## `__call__`

```
__call__(
    inputs,
    state,
    scope=None
)
```

Run this RNN cell on inputs, starting from the given state.

Args:

- `inputs` : 2-D tensor with shape `[batch_size x input_size]`.
- `state` : if `self.state_size` is an integer, this should be a 2-D Tensor with shape `[batch_size x self.state_size]`. Otherwise, if `self.state_size` is a tuple of integers, this should be a tuple with shapes `[batch_size x s]` for `s` in `self.state_size`.

- `scope` : VariableScope for the created subgraph; defaults to class name.

Returns:

A pair containing:

- Output: A 2-D tensor with shape `[batch_size x self.output_size]` .
- New state: Either a single 2-D tensor, or a tuple of tensors matching the arity and shapes of `state` .

## `__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.

## 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(_)
```

## call

```
call(  
    inputs,  
    state  
)
```

Run one step of LSTM.

Args:

- `inputs`: input Tensor, 2D, batch x num\_units.
- `state`: if `state_is_tuple` is False, this must be a state Tensor, 2-D, batch x state\_size. If `state_is_tuple` is True, this must be a tuple of state Tensors, both 2-D, with column sizes `c_state` and `m_state`.

Returns:

A tuple containing: - A 2-D, [batch x output\_dim], Tensor representing the output of the LSTM after reading `inputs` when previous state was `state`. Here output\_dim is: num\_proj if num\_proj was set, num\_units otherwise. - Tensor(s) representing the new state of LSTM after reading `inputs` when the previous state was `state`. Same type and shape(s) as `state`.

Raises:

- `ValueError`: If input size cannot be inferred from inputs via static shape inference.

## 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).

## **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\_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)
```



Retrieves losses relevant to a specific set of inputs.

#### Arguments:

- `inputs`: Input tensor or list/tuple of input tensors. Must match the `inputs` argument passed to the `__call__` method at the time the losses were created. If you pass `inputs=None`, unconditional losses are returned, such as weight regularization losses.

#### Returns:

List of loss tensors of the layer that depend on `inputs`.

#### Raises:

- `RuntimeError`: If called in Eager mode.

### **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\_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)
```

Retrieves updates relevant to a specific set of inputs.

Arguments:

- `inputs` : Input tensor or list/tuple of input tensors. Must match the `inputs` argument passed to the `__call__` method at the time the updates were created. If you pass `inputs=None` , unconditional updates are returned.

Returns:

List of update ops of the layer that depend on `inputs` .

Raises:

- `RuntimeError` : If called in Eager mode.

## **zero\_state**

```
zero_state(  
    batch_size,  
    dtype  
)
```

Return zero-filled state tensor(s).

Args:

- `batch_size` : int, float, or unit Tensor representing the batch size.
- `dtype` : the data type to use for the state.

Returns:

If `state_size` is an int or `TensorShape`, then the return value is a **N-D** tensor of shape `[batch_size x state_size]` filled with zeros.

If `state_size` is a nested list or tuple, then the return value is a nested list or tuple (of the same structure) of **2-D** tensors with the shapes `[batch_size x s]` for each s in `state_size` .

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