

tf.keras.layers.Layer

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Class Layer

Inherits From: [Layer](#)

Defined in [tensorflow/python/keras/_impl/keras/engine/topology.py](#).

Abstract base layer class.

Properties

```
name: String, must be unique within a model.
input_spec: List of InputSpec class instances
    each entry describes one required input:
        - ndim
        - dtype
    A layer with `n` input tensors must have
    an `input_spec` of length `n`.
trainable: Boolean, whether the layer weights
    will be updated during training.
uses_learning_phase: Whether any operation
    of the layer uses `K.in_training_phase()`
    or `K.in_test_phase()`.
input_shape: Shape tuple. Provided for convenience,
    but note that there may be cases in which this
    attribute is ill-defined (e.g. a shared layer
    with multiple input shapes), in which case
    requesting `input_shape` will raise an Exception.
    Prefer using `layer.get_input_shape_for(input_shape)`,
    or `layer.get_input_shape_at(node_index)`.
output_shape: Shape tuple. See above.
inbound_nodes: List of nodes.
outbound_nodes: List of nodes.
input, output: Input/output tensor(s). Note that if the layer is used
    more than once (shared layer), this is ill-defined
    and will raise an exception. In such cases, use
    `layer.get_input_at(node_index)`.
input_mask, output_mask: Same as above, for masks.
trainable_weights: List of variables.
non_trainable_weights: List of variables.
weights: The concatenation of the lists trainable_weights and
    non_trainable_weights (in this order).
```

Methods

```
call(x, mask=None): Where the layer's logic lives.
__call__(x, mask=None): Wrapper around the layer logic (`call`).
    If x is a Keras tensor:
        - Connect current layer with last layer from tensor:
            `self._add_inbound_node(last_layer)`
        - Add layer to tensor history
    If layer is not built:
        - Build from inputs shape
get_weights()
set_weights(weights)
get_config()
count_params()
_compute_output_shape(input_shape)
compute_mask(x, mask)
get_input_at(node_index)
get_output_at(node_index)
get_input_shape_at(node_index)
get_output_shape_at(node_index)
get_input_mask_at(node_index)
get_output_mask_at(node_index)
```

Class Methods

```
from_config(config)
```

Internal methods:

```
build(input_shape)
_add_inbound_node(layer, index=0)
```

Properties

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_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__(**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(_)
```

Creates the variables of the layer.

call

```
call(  
    inputs,  
    **kwargs  
)
```

This is where the layer's logic lives.

Arguments:

- `inputs` : Input tensor, or list/tuple of input tensors.
- `**kwargs` : Additional keyword arguments.

Returns:

A tensor or list/tuple of tensors.

compute_mask

```
compute_mask(  
    inputs,  
    mask=None  
)
```

Computes an output mask tensor.

Arguments:

- `inputs`: Tensor or list of tensors.
- `mask`: Tensor or list of tensors.

Returns:

None or a tensor (or list of tensors, one per output tensor of the layer).

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

```
@classmethod  
from_config(  
    cls,  
    config  
)
```

Creates a layer from its config.

This method is the reverse of `get_config`, capable of instantiating the same layer from the config dictionary. It does not handle layer connectivity (handled by `Container`), nor weights (handled by `set_weights`).

Arguments:

- `config`: A Python dictionary, typically the output of `get_config`.

Returns:

A layer instance.

get_config

```
get_config()
```

Returns the config of the layer.

A layer config is a Python dictionary (serializable) containing the configuration of a layer. The same layer can be reinstantiated later (without its trained weights) from this configuration.

The config of a layer does not include connectivity information, nor the layer class name. These are handled by **Container** (one layer of abstraction above).

Returns:

Python dictionary.

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)
```

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_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)
```

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.

`get_weights`

```
get_weights()
```

Returns the current weights of the layer.

Returns:

Weights values as a list of numpy arrays.

`set_weights`

```
set_weights(weights)
```

Sets the weights of the layer, from Numpy arrays.

Arguments:

- `weights`: a list of Numpy arrays. The number of arrays and their shape must match number of the dimensions of the weights of the layer (i.e. it should match the output of `get_weights`).

Raises:

- `ValueError`: If the provided weights list does not match the layer's specifications.

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