

Tensor Views

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\pytorch-master\docs\source\ (pytorch-master) (docs) (source) tensor_view.rst, line 1)

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```
.. currentmodule:: torch
```

PyTorch allows a tensor to be a `View` of an existing tensor. View tensor shares the same underlying data with its base tensor. Supporting `view` avoids explicit data copy, thus allows us to do fast and memory efficient reshaping, slicing and element-wise operations.

For example, to get a view of an existing tensor `t`, you can call `t.view(...)`.

```
>>> t = torch.rand(4, 4)
>>> b = t.view(2, 8)
>>> t.storage().data_ptr() == b.storage().data_ptr() # `t` and `b` share the same underlying data.
True
# Modifying view tensor changes base tensor as well.
>>> b[0][0] = 3.14
>>> t[0][0]
tensor(3.14)
```

Since views share underlying data with its base tensor, if you edit the data in the view, it will be reflected in the base tensor as well.

Typically a PyTorch op returns a new tensor as output, e.g. `meth:~torch.Tensor.add`. But in case of view ops, outputs are views of input tensors to avoid unnecessary data copy. No data movement occurs when creating a view, view tensor just changes the way it interprets the same data. Taking a view of contiguous tensor could potentially produce a non-contiguous tensor. Users should pay additional attention as contiguity might have implicit performance impact. `meth:~torch.Tensor.transpose` is a common example.

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```
>>> base = torch.tensor([[0, 1], [2, 3]])
>>> base.is_contiguous()
True
>>> t = base.transpose(0, 1) # `t` is a view of `base`. No data movement happened here.
# View tensors might be non-contiguous.
>>> t.is_contiguous()
False
# To get a contiguous tensor, call `.contiguous()` to enforce
# copying data when `t` is not contiguous.
>>> c = t.contiguous()
```

For reference, hereâ€™s a full list of view ops in PyTorch:

- Basic slicing and indexing op, e.g. `tensor[0, 2:, 1:7:2]` returns a view of base tensor, see note below.
- `meth:~torch.Tensor.adjoint`

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- `meth:~torch.Tensor.as_strided`

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- `.meth:~torch.Tensor.detach``

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- `.meth:~torch.Tensor.diagonal``

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- `.meth:~torch.Tensor.expand``

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- `.meth:~torch.Tensor.expand_as``

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- `.meth:~torch.Tensor.movedim``

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- `.meth:~torch.Tensor.narrow``

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- `.meth:~torch.Tensor.permute``

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- `.meth:~torch.Tensor.select``

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- `.meth:~torch.Tensor.squeeze``

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- `.meth:~torch.Tensor.transpose``

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- `.meth:~torch.Tensor.t``

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- `.attr:~torch.Tensor.T``

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- `.attr:~torch.Tensor.H``

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- `.attr:~torch.Tensor.mT``

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- `.attr:~torch.Tensor.mH``

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- `.attr:~torch.Tensor.real``

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- `.attr:~torch.Tensor.imag``

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- `.meth:~torch.Tensor.view_as_real``

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- `.meth:~torch.Tensor.unflatten``

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- `.meth:~torch.Tensor.unfold``

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- `.meth:~torch.Tensor.unsqueeze``

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- `.meth:~torch.Tensor.view``

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- `.meth:~torch.Tensor.view_as``

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- `.meth:~torch.Tensor.unbind``

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- `.meth:~torch.Tensor.split``

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line 77); [backlink](#)

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- `.meth:~torch.Tensor.hsplit``

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- `.meth:~torch.Tensor.vsplit``

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- `.meth:~torch.Tensor.tensor_split``

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- `.meth:~torch.Tensor.split_with_sizes``

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- `.meth:~torch.Tensor.swapaxes``

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- `.meth:~torch.Tensor.swapdims``

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- `.meth:~torch.Tensor.chunk``

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- `.meth:~torch.Tensor.indices` (sparse tensor only)`

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- `meth:~torch.Tensor.values`` (sparse tensor only)

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Note

When accessing the contents of a tensor via indexing, PyTorch follows Numpy behaviors that basic indexing returns views, while advanced indexing returns a copy. Assignment via either basic or advanced indexing is in-place. See more examples in [Numpy indexing documentation](#).

It's also worth mentioning a few ops with special behaviors:

- `meth:~torch.Tensor.reshape``, `meth:~torch.Tensor.reshape_as`` and `meth:~torch.Tensor.flatten`` can return either a view or new tensor, user code shouldn't rely on whether it's view or not.

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- `meth:~torch.Tensor.contiguous`` returns **itself** if input tensor is already contiguous, otherwise it returns a new contiguous tensor by copying data.

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For a more detailed walk-through of PyTorch internal implementation, please refer to [ezyang's blogpost about PyTorch Internals](#).