

tf.nn.batch_normalization

```
batch_normalization(  
    x,  
    mean,  
    variance,  
    offset,  
    scale,  
    variance_epsilon,  
    name=None  
)
```

Defined in [tensorflow/python/ops/nn_impl.py](#).

See the guide: [Neural Network > Normalization](#)

Batch normalization.

As described in <http://arxiv.org/abs/1502.03167>. Normalizes a tensor by **mean** and **variance**, and applies (optionally) a **scale** γ to it, as well as an **offset** β :

$$\frac{\gamma(x-\mu)}{\sigma} + \beta$$

mean, **variance**, **offset** and **scale** are all expected to be of one of two shapes:

- In all generality, they can have the same number of dimensions as the input **x**, with identical sizes as **x** for the dimensions that are not normalized over (the 'depth' dimension(s)), and dimension 1 for the others which are being normalized over. **mean** and **variance** in this case would typically be the outputs of `tf.nn.moments(..., keep_dims=True)` during training, or running averages thereof during inference.
- In the common case where the 'depth' dimension is the last dimension in the input tensor **x**, they may be one dimensional tensors of the same size as the 'depth' dimension. This is the case for example for the common **[batch, depth]** layout of fully-connected layers, and **[batch, height, width, depth]** for convolutions. **mean** and **variance** in this case would typically be the outputs of `tf.nn.moments(..., keep_dims=False)` during training, or running averages thereof during inference.

Args:

- **x**: Input **Tensor** of arbitrary dimensionality.
- **mean**: A mean **Tensor**.
- **variance**: A variance **Tensor**.
- **offset**: An offset **Tensor**, often denoted β in equations, or None. If present, will be added to the normalized tensor.
- **scale**: A scale **Tensor**, often denoted γ in equations, or **None**. If present, the scale is applied to the normalized tensor.
- **variance_epsilon**: A small float number to avoid dividing by 0.
- **name**: A name for this operation (optional).

Returns:

the normalized, scaled, offset tensor.

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