LayerNorm

CLASS torch.nn.LayerNorm(*normalized_shape, eps=1e-05, elementwise_affine=True, bias=True, device=None, dtype=None*) [SOURCE]

Applies Layer Normalization over a mini-batch of inputs.

This layer implements the operation as described in the paper Layer Normalization

$$y = \frac{x - \mathrm{E}[x]}{\sqrt{\mathrm{Var}[x] + \epsilon}} * \gamma + \beta$$

The mean and standard-deviation are calculated over the last *D* dimensions, where *D* is the dimension of `normalized_shape`. For example, if `normalized_shape` is `(3, 5)` (a 2-dimensional shape), the mean and standard-deviation are computed over the last 2 dimensions of the input (i.e. `input.mean((-2, -1))`). γ and β are learnable affine transform parameters of `normalized_shape` if `elementwise_affine` is `True`. The variance is calculated via the biased estimator, equivalent to *torch.var(input, unbiased=False)*.

• NOTE

Unlike Batch Normalization and Instance Normalization, which applies scalar scale and bias for each entire channel/plane with the `affine` option, Layer Normalization applies per-element scale and bias with `elementwise_affine`.

This layer uses statistics computed from input data in both training and evaluation modes.

Parameters

- **normalized_shape** (*int* or *list* or *torch.Size*) –
  input shape from an expected input of size
  $$[* \times \text{normalized\_shape}[0] \times \text{normalized\_shape}[1] \times \ldots \times \text{normalized\_shape}[-1]]$$
  If a single integer is used, it is treated as a singleton list, and this module will normalize over the last dimension which is expected to be of that specific size.
- **eps** (*float*) – a value added to the denominator for numerical stability. Default: 1e-5
- **elementwise_affine** (*bool*) – a boolean value that when set to `True`, this module has learnable per-element affine parameters initialized to ones (for weights) and zeros (for biases). Default: `True`.
- **bias** (*bool*) – If set to `False`, the layer will not learn an additive bias (only relevant if `elementwise_affine` is `True`). Default: `True`.

Variables

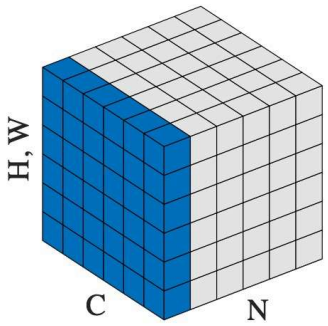
- **weight** – the learnable weights of the module of shape normalized_shape when `elementwise_affine` is set to `True`. The values are initialized to 1.
- **bias** – the learnable bias of the module of shape normalized_shape when `elementwise_affine` is set to `True`. The values are initialized to 0.

Shape:

- Input: $(N, *)$
- Output: $(N, *)$ (same shape as input)

Examples:

```
>>> # NLP Example
>>> batch, sentence_length, embedding_dim = 20, 5, 10
>>> embedding = torch.randn(batch, sentence_length, embedding_dim)
>>> layer_norm = nn.LayerNorm(embedding_dim)
>>> # Activate module
>>> layer_norm(embedding)
>>>
>>> # Image Example
>>> N, C, H, W = 20, 5, 10, 10
>>> input = torch.randn(N, C, H, W)
>>> # Normalize over the last three dimensions (i.e. the channel and spatial dimensions)
>>> # as shown in the image below
>>> layer_norm = nn.LayerNorm([C, H, W])
>>> output = layer_norm(input)
```



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