5.0 PyTorch `nn.Module`

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The ***torch.nn*** module in PyTorch is a core library that provides a wide array of classes and functions designed to help developers build neural networks efficiently and effectively.

It abstracts the complexity of creating and training neural networks by offering pre-built layers, loss functions, activation functions, and other utilities, enabling you to focus on designing and experimenting with model architectures.

Key Components of *torch.nn*:

1. **Modules (Layers):**
   - ***nn.Module***: The base class for all neural network modules. Your custom models and layers should subclass this class.
   - **Common Layers:** Includes layers like ***nn.Linear*** (fully connected layer), ***nn.Conv2d***(convolutional layer), ***nn.LSTM*** (recurrent layer), and many others.

2. **Activation Functions:**
   - Functions like ***nn.ReLU***, ***nn.Sigmoid***, and ***nn.Tanh*** introduce non-linearities to the model, allowing it to learn complex patterns.

3. **Loss Functions:**
   - Provides loss functions such as ***nn.CrossEntropyLoss***, ***nn.MSELoss***, and ***nn.NLLLoss*** to quantify the difference between the model's predictions and the actual targets.

4. **Container Modules:**
   - ***nn.Sequential:*** A sequential container to stack layers in order.

5. **Regularization and Dropout:**

- Layers like ***nn.Dropout*** and ***nn.BatchNorm2d*** help prevent overfitting and improve the model's ability to generalize to new data