

DenseNet

DenseNet (Dense Convolutional Network) is a type of deep learning architecture for convolutional neural networks (CNNs) that improves efficiency and reduces the number of parameters compared to traditional networks like ResNets.

Key Features of DenseNet:

1. **Dense Connectivity:** Each layer in DenseNet is connected to every other layer in a feed-forward fashion. This means the output of one layer is passed as input to all subsequent layers.
2. **Feature Reuse:** Because of dense connections, earlier layer outputs are reused throughout the network, improving gradient flow and learning efficiency.
3. **Fewer Parameters:** Unlike traditional CNNs where each layer learns redundant features, DenseNet reduces the number of parameters by encouraging feature sharing.
4. **Improved Gradient Flow:** Since each layer receives gradients directly from the loss function and other layers, the vanishing gradient problem is mitigated.

DenseNet Architecture:

- **Dense Blocks:** A series of layers, where each layer gets inputs from all preceding layers.
- **Growth Rate:** Defines the number of feature maps added by each layer. If a layer has a growth rate of k , then its output contributes k new feature maps.
- **Transition Layers:** Used between dense blocks to downsample (reduce feature map size) using pooling layers.

Variants:

These models differ in the number of layers.

- **DenseNet-121**
- **DenseNet-169**
- **DenseNet-201**
- **DenseNet-264**