1.

a) CNNs are very effective in reducing the number of parameters without losing on the quality of models. Images have high dimensionality (as each pixel is considered as a feature) which suits the above described abilities of CNNs

b) In the case of deep neural networks each neuron in a given layer is fully connected to all the neurons in the previous layer. Because of these large number of connections the number of parameters to be learned increases. As the number of parameters increases the network becomes more complex. This more complexity of the network leads to overfitting.

To overcome these challenges, the **Convolution Neural Networks** were discovered. In this, the input image data will be subjected to a set of convolution operations such as filtration and max pooling. Then, the resultant data which will be of lesser dimension compared to the original image data will be subjected to Fully connected layers to predict output.

c) In a fully connected Deep Neural Network we do not perform pooling. However in CNN, after a convolution operation we usually perform *pooling* to reduce the dimensionality. This enables us to reduce the number of parameters, which both shortens the training time and combats overfitting. Pooling layers downsample each feature map independently, reducing the height and width, keeping the depth intact.

3. After a convolution operation we usually perform *pooling* to reduce the dimensionality. This enables us to reduce the number of parameters, which both shortens the training time and combats overfitting. Pooling layers downsample each feature map independently, reducing the height and width, keeping the depth intact.

2.



