IMAGE DIMENSIONALITY REDUCTION

Dimensionality Reduction

This is a process of extraction of the important features of the particular input image, such that the complexity of the processing function decreases. Image dimensionality reduction is majorly used for reducing overfitting of the model, such that the complexity of the model decreases, and the performance of the model increases. Dimensionality Reduction is simply known to reduce high dimensional features to low dimensional features. These Dimensionally reduced features are the key features that are mainly used for further processing of the input image. There are two different methods to perform Dimensionality Reduction. They are:

i. Feature Extraction
   This Feature Extraction is a method for extracting the highly important features from the original image features. This method is widely used to perform dimensionality Reduction for image or video files. There are various types of functions used for performing Feature Extraction, such as Auto encoders, principal component analysis and so on.

ii. Feature Selection
   This Feature Selection is a method of selecting the highly important features, such that retaining the most important features and removing all the other less important features. To perform Feature Selection, there are various function used, such as, supervised and unsupervised algorithms and so on.

Dimensionality Reduction using Auto Encoders

Auto Encoders are the special type of function, that helps in transforming the input to another form and again gets transforms to the original input. This Auto Encoders have 3 layers in it, namely: Input layer, Hidden Layer, Output Layer.

This Auto Encoder has two parts of Functions namely, Encoder function, Decoder Function.

- Encoder function perform transformation of the input to a hidden representation.
- This Hidden Representation of the input is stored in the input layer.
- The Decoder function performs the retransformation of the hidden representation back to the original input.

Auto Encoders are used to perform Feature Extraction in Dimensionality Reduction. The Encoder function in Auto Encoders are used to perform the Reduction of Dimensions. Since Auto encoders transform the input to a hidden representation and again retransform the hidden representation to the original representation, the number of neurons in the input layer, hidden layer and output layers must be equal. Such that the Auto Encoders have a better performance.

There are many other types of Auto Encoders such as,

1. Sparse Auto Encoders
2. Undercomplete Auto Encoders
3. Variational Autoencoders.