**Assignment – week 01**

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| **Classification Algorithms** | **Pros** | **Cons** | **Structure of the Algorithm** |
| **1.** **RESNET​** | * Deep architectures allow for the construction of very deep neural networks. * Improved gradient flow. * Transfer learning capability allows for faster convergence and improved performance on smaller datasets. * Can be adapted and applied to different computer vision tasks. | * Increased memory consumption. (Require more memory to store the activations and gradients during training) * More complex. * Takes more computational cost. | * The key components of RESNET are residual blocks, which consist of a sequence of convolutional layers followed by element-wise addition with the input (or a transformed version of it) to form the residual connection. * Typically includes multiple stages, each containing several residual blocks. * First stage usually consists of a single convolutional layer, while subsequent stages employ multiple residual blocks with increasing numbers of filters. |
| **2. DensNet** | * Feature reuse and connectivity- allows for extensive feature reuse throughout the network. * Strong gradient flow (during backpropagation) * Improved accuracy (high accuracy compared to RESNET and VGG) * Feature extraction at multiple scales. | * Increased memory consumption. * Limited parallelism. * Difficulty in interpretation | * Characterized by dense connectivity and dense blocks. * Between the dense blocks, transition layers are inserted to control the spatial dimensions and the number of channels. * Typically starts with a single convolutional layer followed by a dense block. * Final part of the network usually includes global pooling, followed by fully connected layers for classification or regression tasks. |
| **3.VGG** | * VGG follows a simple and uniform architecture. * Shown strong performance in image classification tasks. * Transfer learning. * Stability during training. (Along with the use of batch normalization and dropout) | * Need more computational and memory requirements during training and inference. * Lack of spatial efficiency. * Limited parallelism. | * Characterized by stacking multiple layers of small-sized convolutional filters followed by pooling layers. * Typically starts with a series of convolutional layers with small filter sizes. * The high-level structure of VGG follows a repetitive pattern of stacking convolutional and pooling layers. |
| **4. Inception​** | * Allow for the extraction of features at multiple scales. * Computational efficiency. * Reduction of spatial dimensions. * Effective information flow. | * Has a complex architecture. * Require more memory to store activations and gradients. * Limited parallelism. | * Based on the concept of inception modules. * Each inception module is composed of parallel convolutional branches with different filter sizes, followed by concatenation of their outputs. * Addition to the inception blocks, Inception networks often include auxiliary classifiers. |