Neural Network- 19B16CS311

Assignment Sheet

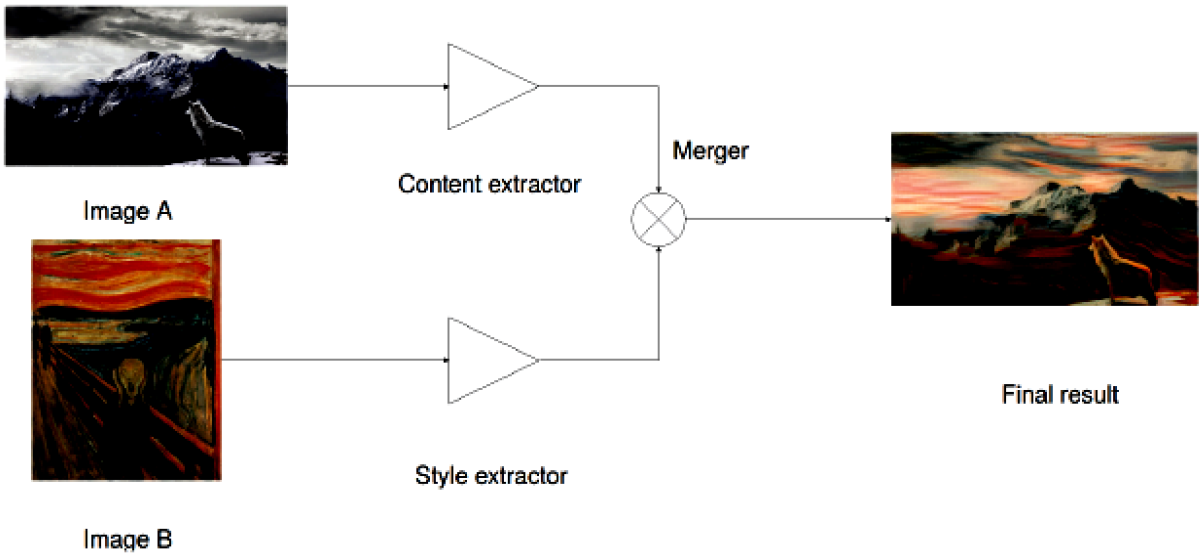
Assignment-12(a) and Assignment 12(b)

Topic: Neural Style Transfer

Evaluative Assignment 2: 20 Marks

Ques:1 Design a system that will input a content image and a style image. The output of system will be a styled image which will transfer style of style image on content image in such a manner that output image style will be close to style image and content will be close to content image.

Neural style transfer means transferring the style of an image to a content image. **(References: read the attached paper of Gatys et al., 2016)**



Landscape (content) + Scream (style)

Steps of your work will be as follows:

1. **Data Collection:** select content image as well as find most used and researched styles so produce a comparative results.

2. **Extract the best features** using VGG-16 architecture to feed into network.

3. **Optimizer tuning:** To create different models by varying hyper parameters and for following two optimizers.

Stochastic Gradient Descent optimiser (SGD): Strength of SGDs is that they are simple to implement and also fast for problems that have many training examples. However, SGD methods have many disadvantages. One key disadvantage of SGDs is that they require much manual tuning of optimization parameters such as learning rates and convergence criteria. If one does not know the task at hand well, it is very difficult to find a good learning rate or a good convergence criterion.

Adam Optimiser: The Adam optimization algorithm is an extension to stochastic gradient descent that has recently seen broader adoption for deep learning applications in computer vision and natural language processing. Instead of adapting the parameter learning rates based on the average first moment (the mean) as in RMSProp, Adam also makes use of the average of the second moments of the gradients (the uncentered variance).Specifically, the algorithm calculates an exponential moving average of the gradient and the squared gradient, and the parameters beta1 and beta2 control the decay rates of these moving averages.

4. **Layer Tuning:** To create different models by creating different neural networks based on **max pooling vs average pooling** and study the variance in the performance.

5. **Style Reconstruction**

1. Show at least 2-3 reconstructed image
2. Plot Content and Style loss of the reconstructed image.
3. Plot content and style loss variation result for max pooling and average pooling.
4. Plot varying Optimizer tuning results.