**Project 4 – Xiang Li – Proposal**

*Convolutional Neural Network and Style Transfer*

*Stable Diffusion Web Application*

*Image Interpolation with Stable Diffusion*

**Project Outlook:**

This project, Neutral Style Transfer (NST) model will take a real-life photo or a piece of artistic work, as the original image. It will take another piece of artwork as the style image. The output of this NST model will be a generated image that has the mix of features from the original image and the style image.

**Theoretic approach:**

The total loss function we need to calculate, which is the sum of content loss and style loss:

The content loss function is a comparison between the original image and the generated image:

The style loss function is the generated image gram matrix minus the style image gram matrix, and the gram matrix is the dot product of a conv layer output with its transpose:

The challenge here is to create these functions in python to fully implement NST.

**Tools & libraries:**

* Python
* Pytorch/Tensorflow and associated libraries
* Pandas
* Databases – PostgreSQL/MongoDB
* Pre-trained CNN model VGG19/Xception/EfficientNet/ResNet
* Third party NST pre-trained models for result comparison
* HTML/CSS/Javascript/Python flask for a web project (to be decided)
* Others (to be added)

**Implementation Steps Brief:**

* Inspect the features of a pre-trained CNN model.
* Chose the intermediete layers from the CNN model and record the weights from those layers in a data frame.
* Build the customized NST model.
* Create functions to process total loss, content loss, and style loss.
* Optimize the model.
* Train the model and test.
* Design a web application to allow users run this model and get the output image from the web. (to be decided)
* Design a CNN model from scratch using Pytorch/Tensorflow and try pass the CIFAR 10 test. (side quest)