Project 2: Style Transfer

Task1

Calculate the $d \times d$ gram matrix corresponding to a $1 \times d \times h \times w$ tensor

Task 2

Complete the Training Function

Task 3

Complete the mapping from VGG layer numbers to layer names

Task 4

Styler Transfer using the VGG network
Experiment with different weights for style (1.0e3, 1.0e6, 1.0e9, 1.0e12), different numbers of steps (e.g. 500, 1000, 2000) and different learning rates (e.g. 0.1, 0.01, 0.001) to find a set of parameters with which you can create a stylized image that looks similar to the provided reference solution as fast / efficient as possible. Plot the learning curves and record the training times.

First Example

Style weight	1.0e3
Steps	2000
Learning rate	0.1

Training complete in **686s**
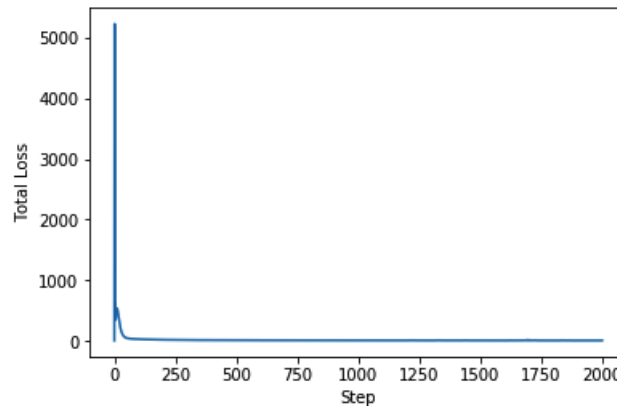
Second Example

Project 2: Style Transfer

Style weight	1.0e3
Steps	2000
Learning rate	0.01

Training complete in **572s**
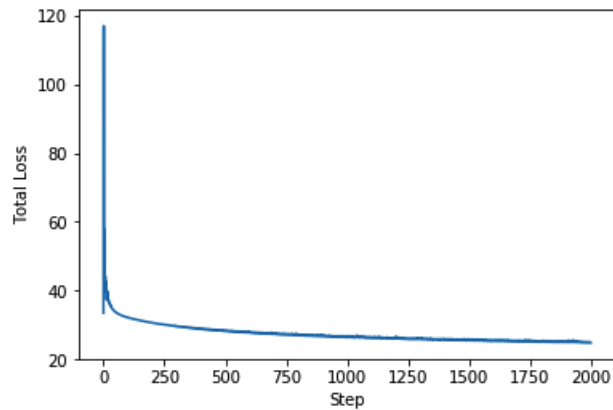
Third Example

Style weight	1.0e12
Steps	2000
Learning rate	0.001

Training complete in **519s**
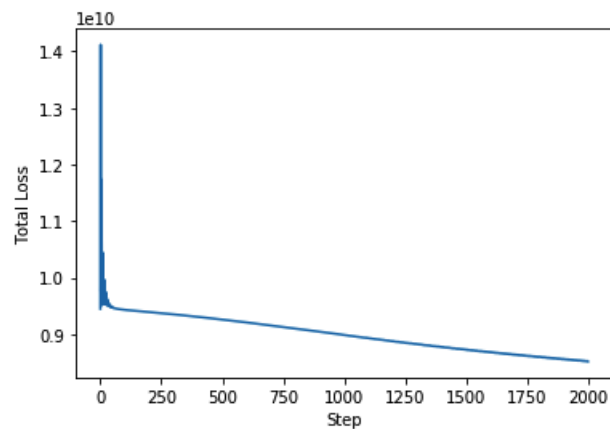
Fourth Example

Style weight	1.0e12
Steps	2000
Learning rate	0.1

Training complete in **568s**

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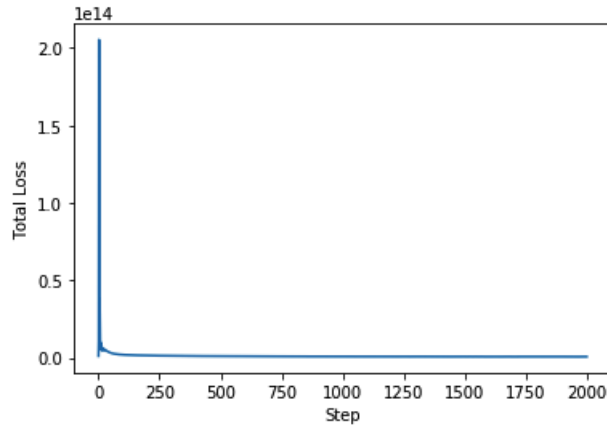
Task 5

Apply changes to ResNet-18

Task 6

Style Transfer using ResNet-18
Experiment with different weights for style (1.0e3, 1.0e6, 1.0e9, 1.0e12), different numbers of steps (e.g. 2000, 5000, 10000) and different learning rates (e.g. 0.1, 0.01, 0.001) to find a set of parameters with which you can create a stylized image that looks similar (or preferably better) to the provided reference solution.

Example	Style weight	Steps	Learning rate
1	1.0e12	2000	0.01
2	1.0e9	5000	0.01
3	1.0e12	5000	0.01
4	1.0e12	2000	0.01

What is the difference between the style transfer results when using VGG or ResNet?

The effect of content representations of these two different CNNs are most same, whereas VGG19 has much better style representation than ResNet's.

Task 7

VGG Layer Replacement

Project 2: Style Transfer

Task 8

Implement the computation of the deep correlation matrices $R^{l,n}_{i,j}$ for a given tensor representing layer l

Task 9

Implement the computation of the smoothness loss E^l_{smooth} for a given tensor representing layer l
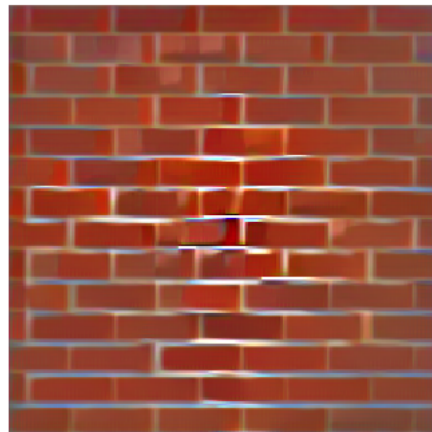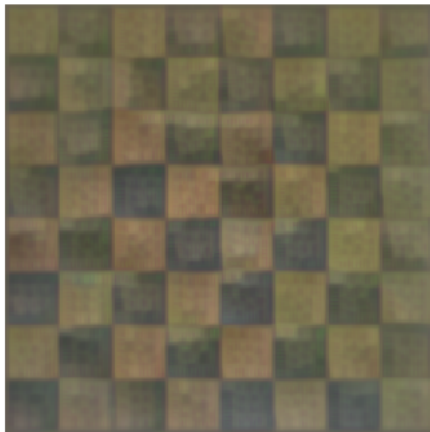
Task 10

Texture Synthesis Function

Task 11

Texture Synthesis
Test you implementation for texture synthesis on four examples. Report the total time for synthesis together with the results.

Texture	Total time (s)
0	75.12
1	75.04
2	75.03
3	74.83

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