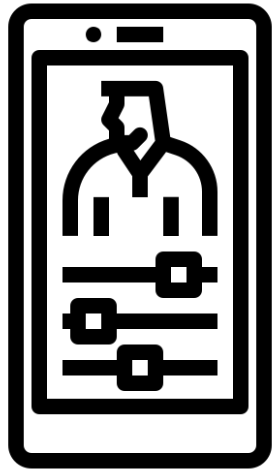
Neural Style Transfer of Paintings to Portraits and Selfies

CS 464 – Final Presentation
Group 7

MOTIVATION

- Selfie editing applications are quite popular.
- Latest applications utilize AI-based technologies.



PARTICULAR FOCUS

- NST of classical paintings to portraits and selfies

NEURAL STYLE TRANSFER

- Blending the style and content of two images

Figure 1: Content Image
(Hayley Williams)

Figure 2: Style Image
(Angle of Love)

Figure 3: Target Image
with 1500 iterations

Figure 4: Target Image
with 2200 iterations

BACKGROUND RESEARCH

- The optimizer optimizes the weighted sum of style and content losses.

$$L_{total}(i,j,k) = \alpha L_{content}(i,k) + \beta L_{style}(j,k)$$

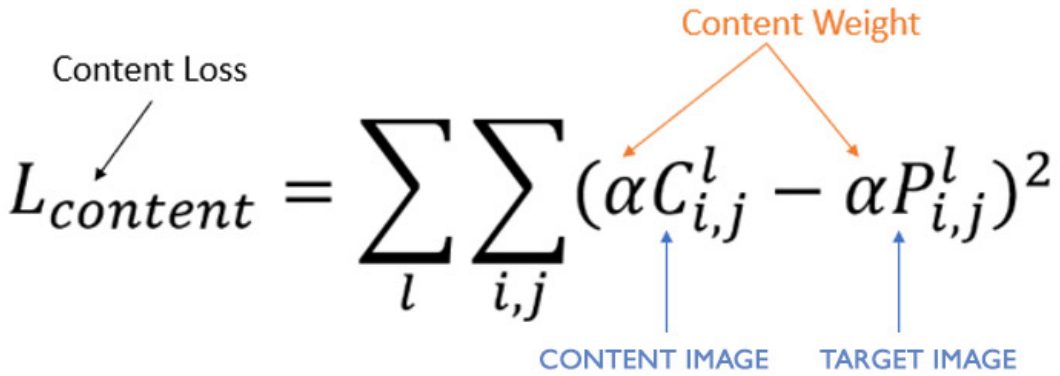
Content Weight

Style Weight

Hyperparameters

BACKGROUND RESEARCH

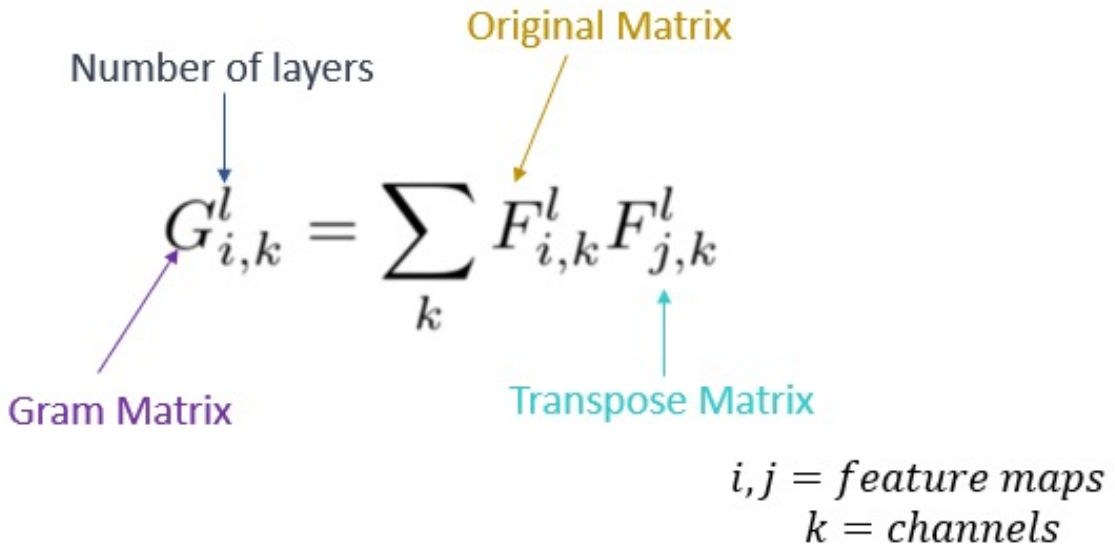
- The content loss function is defined as the squared difference of the content and target images.



BACKGROUND RESEARCH

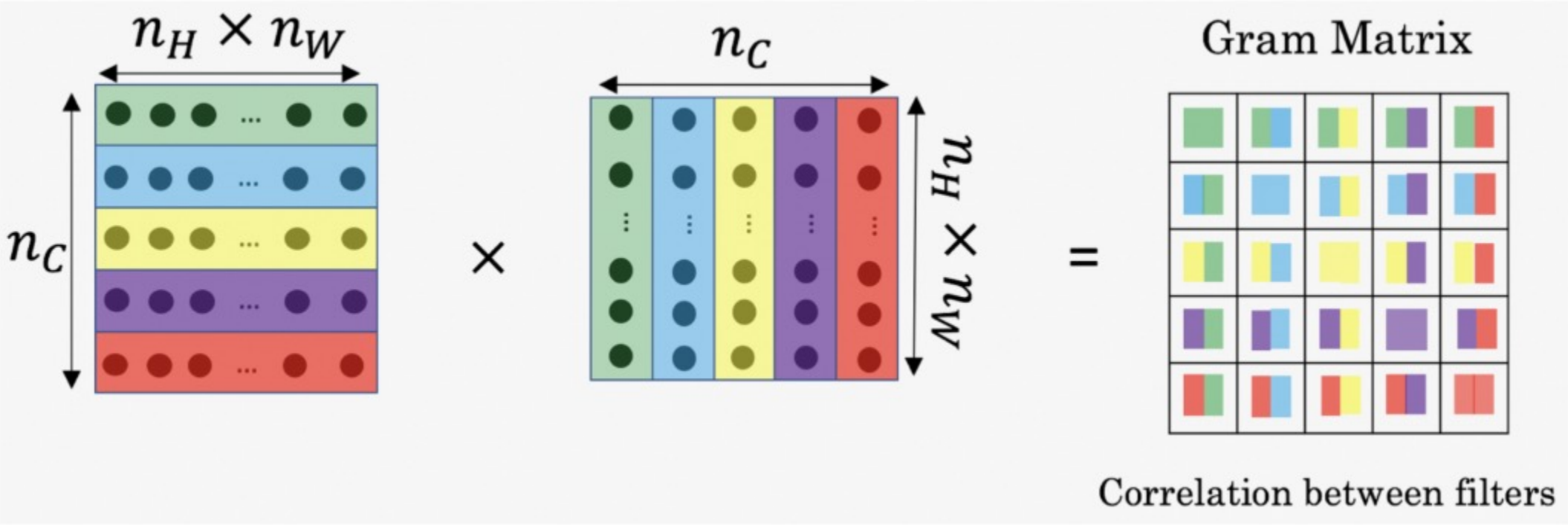
- The style loss function is the squared difference between the gram matrices of the style and target images.
- Gram matrices are computed multiplying style and target tensors by their transposes.

BACKGROUND RESEARCH

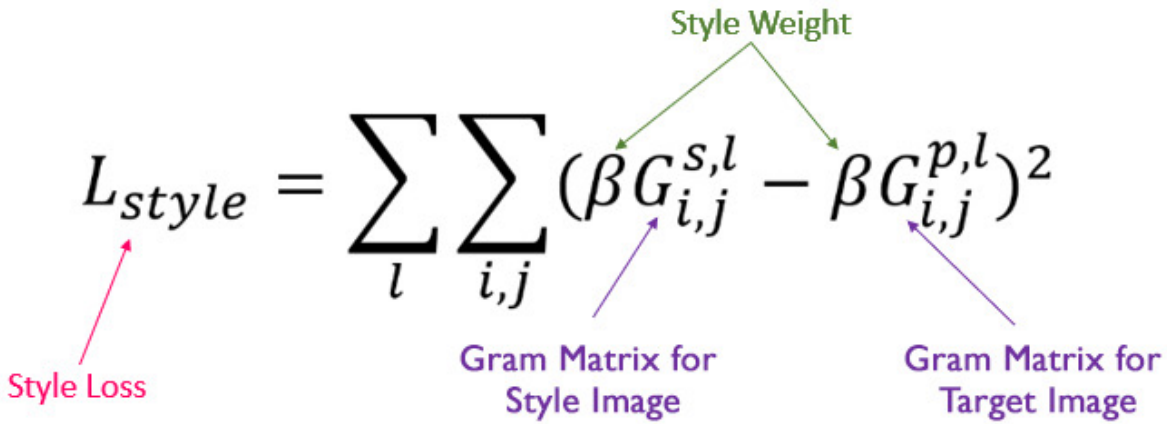


The computation of the Gram matrices

BACKGROUND RESEARCH



BACKGROUND RESEARCH



*Style loss function defined with the gram matrices: (**Style** – **Target**)²*

WHAT IS DONE

- VGG-19 pre-trained model was used.
- Gram matrices of the style and target were computed.
- Parameters of the target image were optimized with Adam.

WHAT IS RECENTLY DONE

- Several bugs in image and video rendering is fixed.
- The quality of the target image is enhanced by experimenting with the hyper-parameters.
- Users can now specify an artist instead of providing the style image.
- Style transitions can now be saved as a video.

EXPERIMENTS

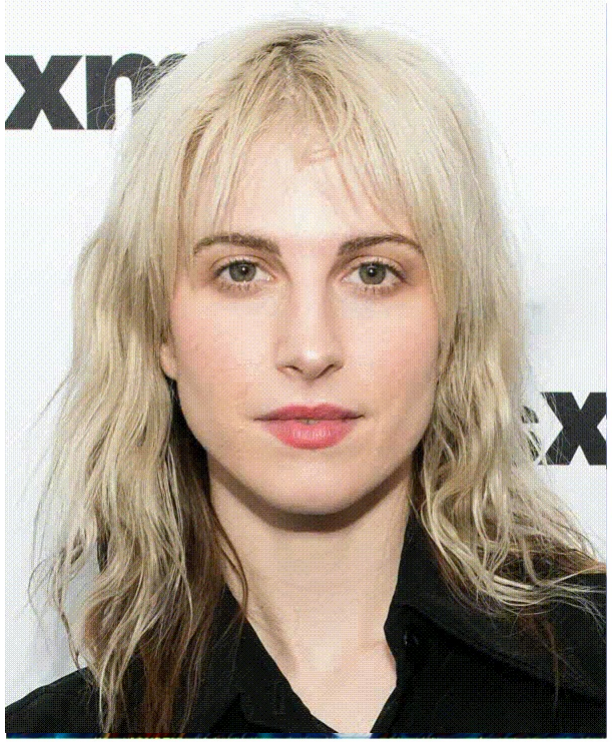
- Different weights are given to the content and style losses.
- The learning rate and number of layers are changed.
- Various pre-trained models are considered.

THE END PRODUCT

Content Image

Style Image

Target Image

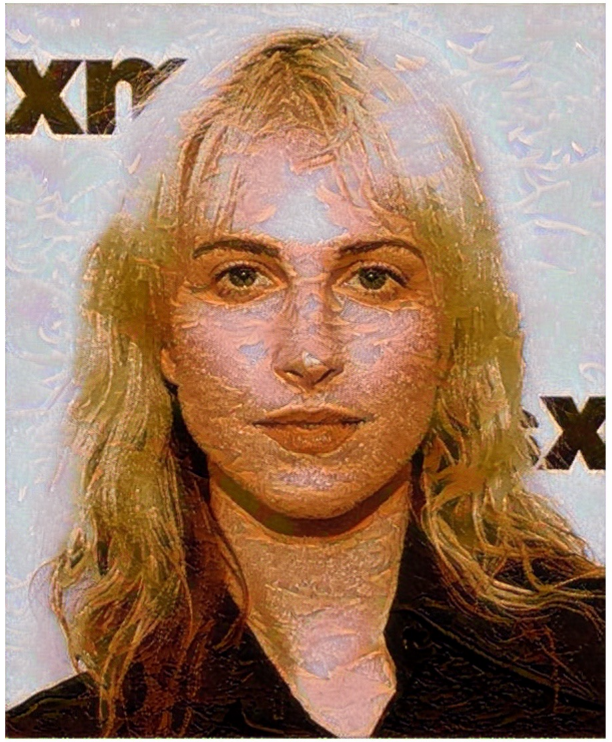


THE END PRODUCT

Content Image

Style Image

Target Image



THE END PRODUCT

Content Image

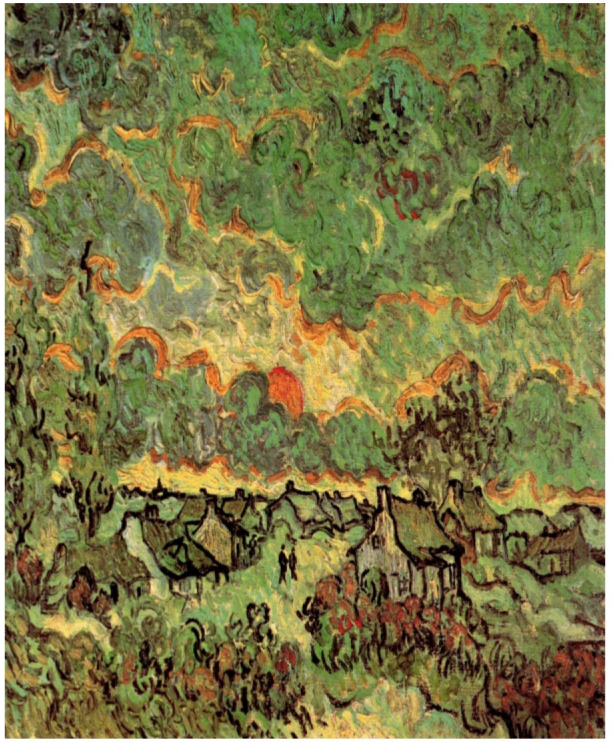
Style Image

Target Image

THE END PRODUCT

Content Image

Style Image



Target Image

ALPHA RATIO EXPERIMENT

Content Image

Style Image

Target with sw: 1e6

Target with sw: 1e4

Target with sw: 1e2

Target with sw: 1e1

LEARNING RATE EXPERIMENT

Will be stated in the final report.

CONCLUSION

- The algorithm we used is essentially an optimization algorithm.
- There is no training process; model parameters change for each content & style pair.
- Consequently, what we do is an image processing task.

DEMO AND VIDEO

THANK YOU