

ART AND MACHINE LEARNING
CMU 2019 SPRING
PROJECT 1

A Quantum Evening



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Concept:

After attending the panel discussion on Paradox: Frames and Biases, one of the key points that stood out to us was pervasiveness of new technologies into our societies. We believe that in the future, our communities and culture will increasingly come to rely on technology for all things, essentially making it a part of the background to our daily lives. In an effort visualize and represent this, we thought that it would be interesting to take photos of normal, everyday life and utilize style transfer to impose a circuit board design on over the images. Our goal was to create a more technological or futuristic image of what our cities or culture may look like.

Technique:

To accomplish our goal, we utilized the style transfer notebook provided in the GitHub repo for this course. Our base image and style image are both preprocessed using the VGG19 default preprocess module. Additionally, a blank image is also created. These three images are then bundled together and passed to the VGG19 network as inputs. Three loss functions are then calculated by extracting the values at various layers in the model during the forward pass. The content loss is calculated by taking the difference in features of the result image and the original content image in the final layer. Similarly, the style loss is calculated the same way, but over multiple other layers. Finally, the variation loss is calculated by looking differences between nearby pixels. The content loss is used to preserve the features of the background image, while the style loss helps limit the effect of the style. The variation loss is used to prevent large differences between nearby regions in the final result image, thereby keeping it more coherent.

Process:

The base images used are depicted in Figure-1 while the style images are shown in Figure-2.



Figure-1: Original base Images



Figure-2: Style images

We performed a number of experiments to understand how the different parameters affect the final style transfer image. Figure-3 demonstrates how the final image would be affected by changing the content and style weight parameters in the style transfer network.



Figure-3: Final style-transferred images from the experiments

Table-1 summarizes the parameter settings for the experiments carried out.

Experiment #	Style weight	Content weight
1	1.0	0.025
2	1.0	0.05
3	0.25	0.25
4	0.25	0.50
5	0.025	1
6	0.25	0.50
7	0.025	1.0

In addition to altering the weights of the style and content losses, we also played around with altering the layers used when calculating the style loss. Specifically, we altered the feature layers from using block 1 in each layer to block 2. The results of this are shown in Figure-4. We found that the results from using block 2 were much more colorful and neon than when using the block 1 layers.

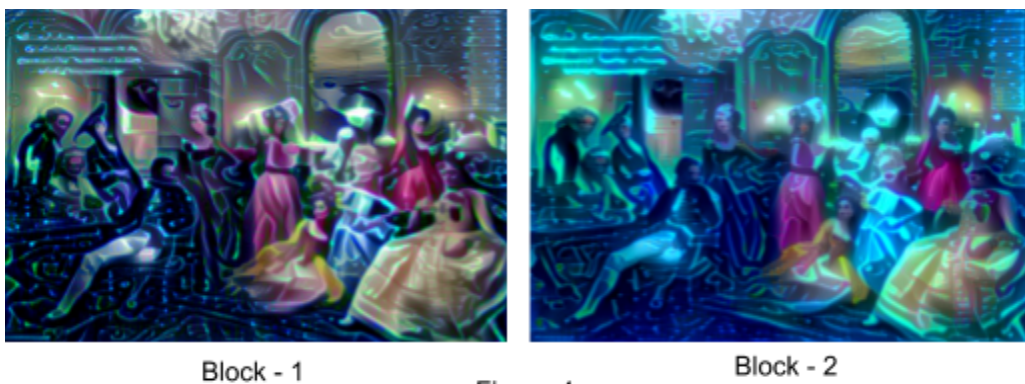


Figure-4

Result:

Our final results were chosen from the Victorian and City originals. In order to create interesting and appealing images, we had to alter the ideal parameters between them. For the Victorian base, we chose to use more of the block 2 layers to increase the neon outline of the shapes while also weighing the style loss more heavily than the content loss (style weight at 1, content weight at 0.025). This worked well as the individual elements were clearly defined, and were less prone to being drowned out by the circuits. On the other hand, the city image had a lot of detail in the background that was easily overpowered by the circuits. Therefore, we chose to use a style weight of 0.1 and a content weight of 1, while only using block 1 layers to preserve as much detail from the original image as possible. As a result, it is still quite easy to distinguish between individuals on the street while still applying interesting and unique textures to the buildings and signs around them. In addition, we found that for both images, the blue circuit boards provided a much more gentle note to the final result than the green ones, making them much more inviting.



Victorian Circuitry



The Progressive City

Reflection:

Although we had run many experiments and generated numerous composite images, we felt that these few blended our two core concepts the best. In both of these images, we can clearly distinguish the elements of the content image, but the circuits and resistors have still been melded into these elements. Despite the fact that one of the content images is a Victorian era painting, after the style transfer, we believe that both of the results are very futuristic and interesting representations for how prevalent technology will be in our communities. Even though the results are quite artificial, there is still a visually appealing factor in how the circuits are integrated into the backgrounds and onto the figures in the images without creating an overpowering presence, hopefully representing the coexistence of humans and technology.

Contributions:

Each of the members ran several experiments on their own, before all three of us met up to discuss our findings. Prajwal experimented with altering the style and content weights, Sunil focused on the effect of different layers, and Yash focused on finding interesting and compelling images to apply these techniques on. All members worked together to write the report.

CODE: <https://github.com/prajwalppv/ArtML>