

# Across the Spider-Verse Style Transfer

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## Introduction

### Project Objective

- Explore and enhance image style transfer using convolutional neural networks (CNNs)
- Apply artistic style from one image to another, creating unique, stylized images
- Focus on applying this technique to the movie Across the Spider-Verse

### Background and Inspiration

- Seminal works by Gatys et al. and Dumoulin et al. sparked our interest
- Gatys et al. introduced the neural algorithm of artistic style transfer
- Dumoulin et al. proposed methods for more versatile style applications

### Project Scope and Focus

- Re-implement and extend foundational approaches in style transfer
- Blend of art and technology presents a fascinating challenge
- Optimize style transfer for speed and accuracy.
- Involves elements of structured prediction and unsupervised learning
- Does not require labeled data in the traditional sense; leverages intrinsic image properties



## Data Collection

### Data Collection & Preprocessing

1. Clips were taken from each universe in the movie
2. Frames were captured for each clip
3. Images were resized to a standard size of (224, 224) to work with the VGG

### Data Augmentation

- Used to address large disparities in the number of images for each class
- Techniques included:
  - Random cropping, Rotation, Flipping
- Increases dataset diversity
- Helps the model train on the style of the images

## Methodology

### Transfer Learning

We began with collecting our data from the movie. Then we used this dataset to train the different layers of VGG to improve performance on the style transfer. This resulted in a better model we could use in our style transfer model.

### Style Transfer

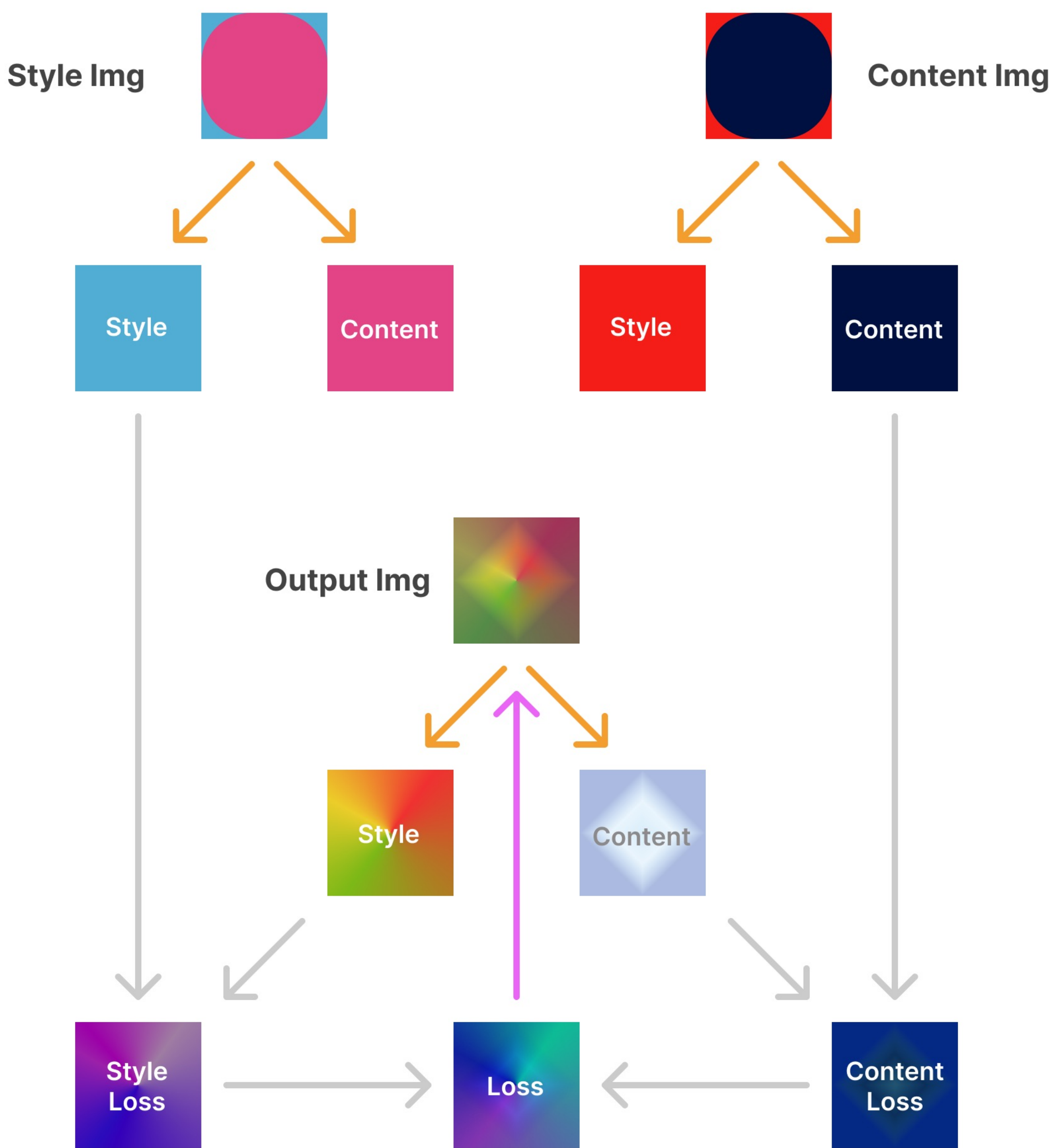
Our style transfer model took the improved VGG model and used it to separate style and content from our input images and compare it with our output image, running gradient descent until our output image matched the style from the style image and the content of the content image.

## Discussion

We noticed that training our VGG models on our dataset before training the style transfer model resulted in noticeable improvements.

We ran search tests to find optimal hyperparameters and layers to sample from VGG. We observed that increasing our weighting of total variation loss bettered our images, but adjusting weighting of style and content loss beyond the conventional values had little effect.

## Model Workflow



## Result

