Computer Vision Project

Photorealistic Style Transfer

Project Information

- Github Repository: Link
- Reference Paper: Deep Photo Style Transfer (link here)
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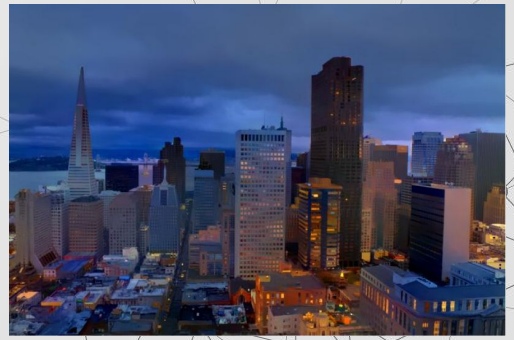
Introduction

- Photographic style transfer refers to a computer vision problem that attempts to solve the issue of transferring the style of a reference photo onto another photo.
- This would mean being able to change the illumination, weather, hue etc. of the input photo.
- The existing methods to achieve this style transfer are found to be limited in various aspects, and either deviate more than is ideal from the initial style or can only transfer a very limited subset of styles.

Input Figure

Reference Image



Output Image

Objective

- To use a deep learning approach to solve issue of photographic style transfer, to transfer the style of a reference image to another input image.
- We have two major contributions in this paper that make it stand out from previously implemented algorithms.
    - To prevent painting-like distortions from appearing in our and ensuring that the photorealistic properties of the input images are preserved when attempting to transfer the style from the reference image.
    - To ensure that the style transfer respects the semantics of the scene, and does not attempt to match incompatible parts of the reference and the input image.

Challenges

The existing State-Of-The-Art model have the following problems which the current approach aims to resolve:

- There can be difference in the content between the input and the reference image which can result in unequal and improper style transfer.
- Achieving local drastic effects without causing any distortions in the input image.
- The resultant image in the SOTA model almost always looks like a painting and not a photorealistic picture.
- The existing techniques are either limited in the diversity of scenes or transfers that they can handle or in the faithfulness of the stylistic match they achieve. There is no global approach as per our knowledge.

Method Overview

- The algorithm takes in two images, an input image and a reference image, from which the style is to be extracted and applied to the input image.
- The proposed approach improves upon an a pre-existing Neural style algorithm has been augmented by introducing 2 core ideas:
    - In order to reduce distortions, a photorealism regularization term is introduced in the objective function, enabling the output image to be represented by locally affine color transformations of the input.
    - Introduction of an optimal guidance to the style transfer process, to prevent problems related to content-mismatch and to improve the photorealism of the results.

Input Image and Style

Output Images varying the weight of the photorealism regularization (Increasing photorealism)

Goals

- Writing prerequisite MATLAB functions mentioned in the paper in python.
- Implementing the base State of the Art Neural Style Algorithm.
- Data preparation
- Augmenting the algorithm and introduce the photorealistic regularization term.
- Augmenting the algorithm by adding optimal guidance to reduce content mismatch and improve the model

Timeline (Tentative)

- Matting Laplacian Implementation: Mid Evaluation
- Base Model Implementation: Final Evaluation
- Data preparation: Mid Evaluation
- 1st Model Improvement: Final Evaluation
- 2nd Model Improvement: Final Evaluation

THANK YOU