

## Graphical Abstract

### **Advancements and Challenges in Neural Image Style Transfer: A Comprehensive Review**

Xiaotong Zhou, Yuhui Zheng

## Highlights

### **Advancements and Challenges in Neural Image Style Transfer: A Comprehensive Review**

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- Introducing some achievements in style transfer in the chronological order and providing a subdivision method for neural style transfer.
- Comparing some representative achievements in the field of style transfer.
- Providing a comprehensive summary and analysis of objective evaluation metrics in the field of style transfer. There is considerable debate over the choice of objective metrics in style transfer, with different studies employing a wide variety of metrics that vary significantly. To the best of our knowledge, this is the first work to systematically summarize and analyze the objective evaluation metrics used in the majority of recent style transfer studies.
- Discussing the existing issues in the field of style transfer.

# Advancements and Challenges in Neural Image Style Transfer: A Comprehensive Review

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## Abstract

Image style transfer is a technique that combines the content of a real photograph with the artistic style of another image to create a new and stylized image. This paper provides a comprehensive review of the field of image style transfer, tracing its development from traditional methods rooted in mathematical models for texture simulation to modern approaches that leverage deep learning and neural networks. The study divides the evolution of style transfer into two main stages: traditional style transfer, which relies on techniques such as texture synthesis and histogram matching, and neural style transfer, which utilizes convolutional neural networks to capture and apply complex artistic styles. The paper also explores the various evaluation parameters used in the field, compares representative achievements, and discusses the practical applications of style transfer in areas such as environmental rendering, font generation, and virtual reality. Finally, the paper highlights unresolved issues and potential directions for future research in the field of style transfer.

*Keywords:* Neural Style Transfer, Convolutional Neural Networks (CNNs), Generative Adversarial Networks (GANs)

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## 1. Example Section

Section text. See Subsection 1.1.

### 1.1. Example Subsection

Subsection text.

1	2	3
4	5	6
7	8	9

Table 1: Table Caption

### 1.1.1. Mathematics

This is an example for the symbol  $\alpha$  tagged as inline mathematics.

$$f(x) = (x + a)(x + b) \tag{1}$$

$$f(x) = (x + a)(x + b)$$

$$f(x) = (x + a)(x + b) \tag{2}$$

$$= x^2 + (a + b)x + ab \tag{3}$$

$$\begin{aligned} f(x) &= (x + a)(x + b) \\ &= x^2 + (a + b)x + ab \end{aligned} \tag{4}$$

$$\begin{aligned} f(x) &= (x + a)(x + b) \\ &= x^2 + (a + b)x + ab \end{aligned}$$

$$\begin{aligned} f(x) &= (x + a)(x + b) \\ &= x^2 + (a + b)x + ab \end{aligned}$$

## Appendix A. Example Appendix Section

Appendix text.

Example citation, See Lamport (1994).

## References

Leslie Lamport, *LaTeX: a document preparation system*, Addison Wesley, Massachusetts, 2nd edition, 1994.

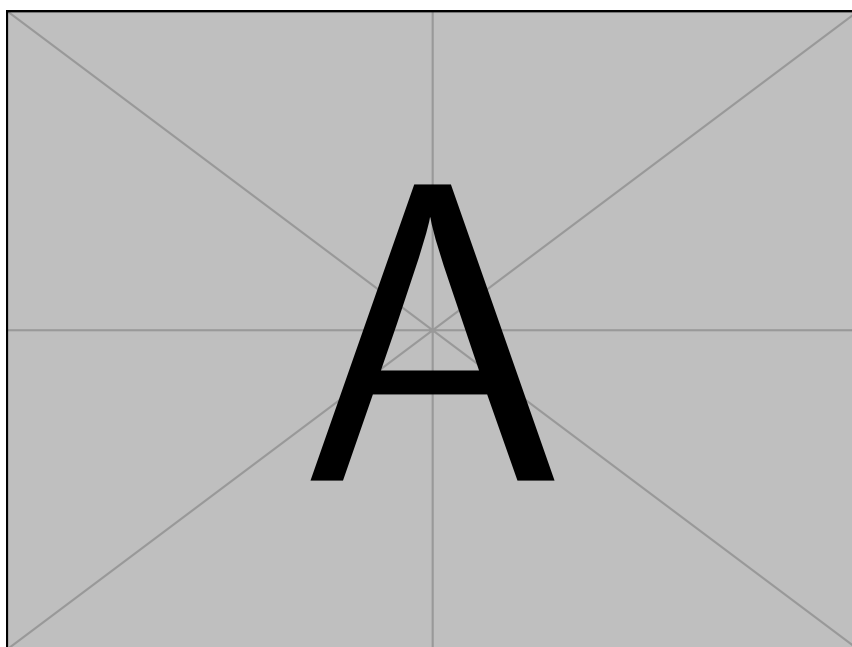


Figure 1: Figure Caption