

Neural Color Transfer between Images

Supplemental Material

Contents

1	User Study	2
2	Comparison of Portrait Style Transfer	7
3	Comparison of Single-Reference Color Transfer	9
4	Multi-Reference Color Transfer	11
5	Colorization	12
6	Limitation	13

1 User Study



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	1.6154(±0.6837)	2.6154(±1.0030)	3.7308(±0.4436)	2.3462(±0.8294)
Faithful to style score	2.0385(±0.9398)	2.1154(±0.9334)	3.5769(±0.7428)	2.3462(±0.8745)

Figure 1: Case 1.



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	3.1538(±0.7692)	1.1154(±0.3195)	1.6538(±0.4757)	3.6923(±0.5385)
Faithful to style score	2.4231(±0.9271)	1.5769(±0.6891)	1.8462(±0.7692)	3.6154(±0.6249)

Figure 2: Case 2.



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	3.5769(±0.6891)	1.3077(±0.5385)	2.1538(±0.5329)	3.2692(±0.5921)
Faithful to style score	3.1538(±0.7692)	1.6154(±0.8356)	2.3462(±0.8745)	3.1923(±0.6805)

Figure 3: Case 3.



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	3.1154(±0.8913)	1.8462(±0.9484)	1.6538(±0.6166)	3.3462(±0.7308)
Faithful to style score	2.4231(±1.0066)	2.0000(±0.7338)	1.9615(±0.8077)	3.5000(±0.5718)

Figure 4: Case 4.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	1.9615(± 0.6493)	2.3846(± 0.9231)	3.8462(± 0.3608)	3.2692(± 0.7102)
Faithful to style score	2.2692(± 0.9429)	1.9615(± 0.8077)	3.4231(± 0.7929)	3.2692(± 0.5921)

Figure 5: Case 5.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.2692(± 0.7625)	1.8462(± 0.9881)	3.3462(± 0.6761)	2.8846(± 0.6976)
Faithful to style score	2.1923(± 0.8329)	2.2692(± 1.0940)	3.0000(± 1.0000)	3.0385(± 0.8077)

Figure 6: Case 6.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.0385(± 0.8540)	1.2692(± 0.4436)	2.4615(± 0.8427)	3.2692(± 0.6538)
Faithful to style score	2.0385(± 0.8077)	1.4615(± 0.7458)	2.4231(± 0.7929)	3.1538(± 0.8177)

Figure 7: Case 7.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.8462(± 0.8177)	2.3462(± 1.1748)	2.6154(± 0.9231)	2.7692(± 0.8904)
Faithful to style score	2.2308(± 0.9326)	2.5385(± 1.0824)	2.6538(± 0.8294)	3.0385(± 0.8540)

Figure 8: Case 8.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.0769(± 0.9577)	2.0769(± 0.7298)	2.2308(± 0.8904)	3.3077(± 0.9102)
Faithful to style score	1.8846(± 0.9738)	2.1923(± 0.8779)	2.2692(± 0.8113)	3.1538(± 0.9881)

Figure 9: Case 9.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.7692(± 0.7994)	1.1538(± 0.3608)	1.6923(± 0.5385)	3.3462(± 0.8294)
Faithful to style score	2.8077(± 0.8779)	1.2692(± 0.5231)	2.0000(± 0.7845)	3.2308(± 0.8904)

Figure 10: Case 10.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.4231(± 1.1154)	2.0769(± 0.8285)	2.6154(± 0.7882)	3.3462(± 0.6166)
Faithful to style score	1.3462(± 0.6761)	2.3077(± 0.8669)	2.9231(± 0.8737)	3.1923(± 0.6214)

Figure 11: Case 11.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.5385(± 0.9700)	1.3462(± 0.7816)	1.6538(± 0.7816)	2.8462(± 0.7692)
Faithful to style score	2.6538(± 1.0356)	1.6154(± 0.9231)	1.8846(± 0.8470)	2.6154(± 0.8804)

Figure 12: Case 12.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.3077(± 0.9515)	2.0385(± 1.0554)	3.1154(± 0.8003)	2.3077(± 0.7731)
Faithful to style score	2.5000(± 0.7966)	3.2308(± 0.8462)	1.7692(± 1.0118)	2.4615(± 0.5705)

Figure 13: Case 13.



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.6923(± 0.9515)	3.0000(± 0.7845)	2.6154(± 1.1461)	2.2692(± 0.8113)
Faithful to style score	2.3077(± 1.0292)	3.1923(± 0.8329)	2.4231(± 0.8400)	2.4615(± 0.7957)

Figure 14: Case 14.



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.6538(± 0.7816)	2.9231(± 0.7807)	1.6538(± 0.7816)	3.6538(± 0.4757)
Faithful to style score	2.1154(± 0.8470)	2.8077(± 0.6805)	2.1154(± 1.0125)	3.3462(± 0.8745)

Figure 15: Case 15.



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	1.1538(± 0.3608)	1.9231(± 0.9166)	2.2692(± 0.7625)	3.4231(± 0.6308)
Faithful to style score	1.2692(± 0.5231)	2.1154(± 0.8003)	1.7308(± 0.7102)	3.5769(± 0.4940)

Figure 16: Case 16.



Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	1.3462(± 0.6166)	2.0769(± 0.8285)	1.7692(± 0.6390)	3.5385(± 0.6343)
Faithful to style score	1.0769(± 0.3846)	2.3846(± 0.6837)	1.8462(± 0.4551)	3.5000(± 0.6934)

Figure 17: Case 17.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	1.9615(± 0.8979)	2.3077(± 0.7731)	3.3846(± 0.6249)	3.5000(± 0.5718)
Faithful to style score	1.8846(± 0.7507)	1.9615(± 0.6493)	3.1923(± 0.6214)	3.5769(± 0.5666)

Figure 18: Case 18.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	1.8077(± 1.0007)	2.5385(± 0.8427)	2.3462(± 0.7308)	3.2692(± 0.7102)
Faithful to style score	1.5000(± 0.7468)	3.0385(± 0.7061)	2.1923(± 0.6214)	3.3462(± 0.6761)

Figure 19: Case 19.

Source & Ref	Pitié et al. [3]	Luan et al. [2]	Liao et al. [1]	Ours
Photorealistic	2.0000(± 0.7845)	1.6538(± 0.7308)	2.6538(± 0.8745)	3.3846(± 0.6837)
Faithful to style score	2.0769(± 0.8285)	1.8846(± 0.8913)	2.5385(± 0.6923)	3.1154(± 0.9738)

Figure 20: Case 20.

2 Comparison of Portrait Style Transfer



Figure 21: Portrait style transfer case 1.



Figure 22: Portrait style transfer case 2.

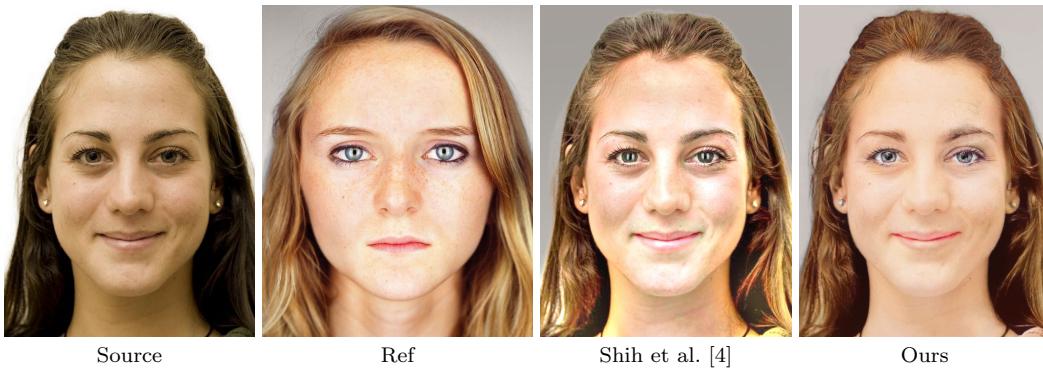


Figure 23: Portrait style transfer case 3.

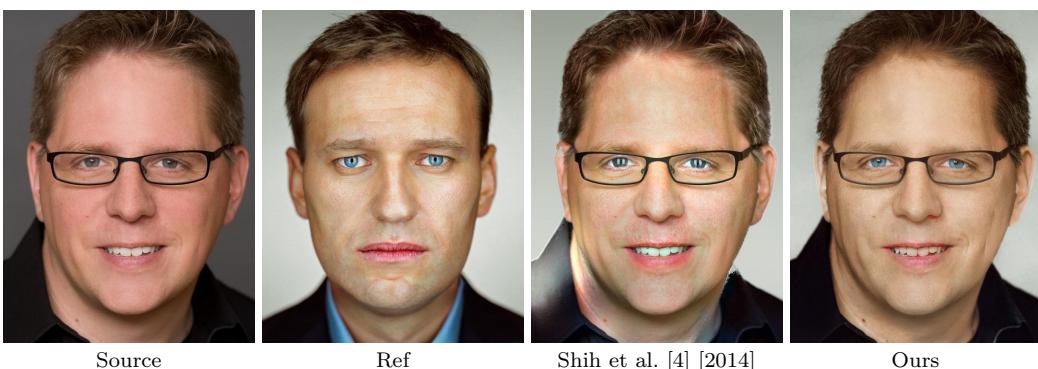


Figure 24: Portrait style transfer case 4.

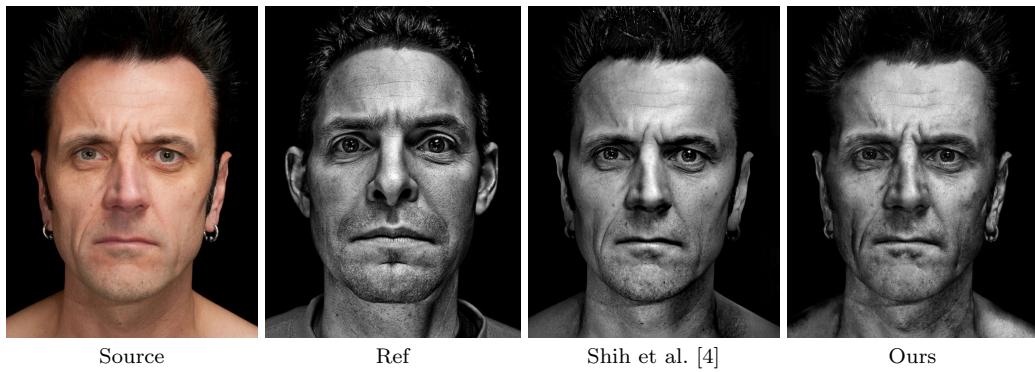


Figure 25: Portrait style transfer case 5.



Figure 26: Portrait style transfer case 6.

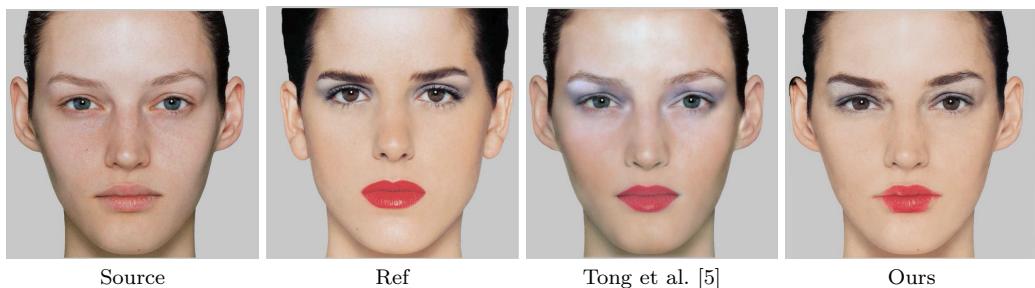


Figure 27: Cosmetic transfer case 1.



Figure 28: Cosmetic transfer case 2.

3 Comparison of Single-Reference Color Transfer



Figure 29: Case 1.

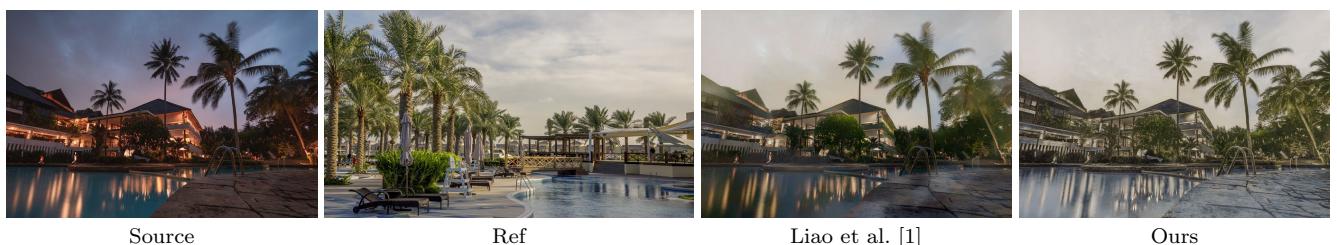


Figure 30: Case 2.



Figure 31: Case 3.



Figure 32: Case 4.



Figure 33: Case 5.



Figure 34: Case 6.

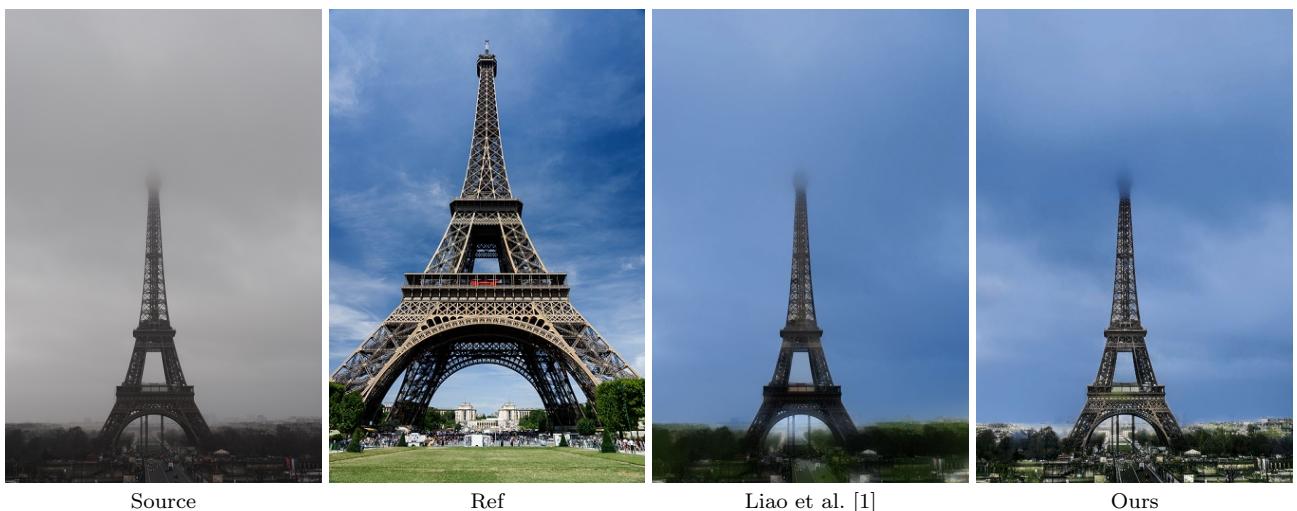


Figure 35: Case 7.



Figure 36: Case 8.

4 Multi-Reference Color Transfer



Figure 37: Case 1.



Figure 38: Case 2.



Figure 39: Case 3.

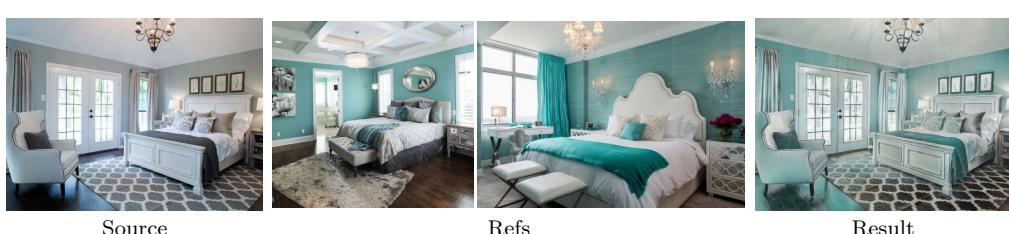


Figure 40: Case 4.

5 Colorization



Source

Refs

Result

Figure 41: Case 1.



Source

Ref

Result

Figure 42: Case 2.



Source

Refs

Result

Figure 43: Case 3.



Source

Refs

Result

Figure 44: Case 4.

6 Limitation



Figure 45: Failure cases of type 1. Our method fails to transfer correct colors for the objects which exist in the source but not the reference (like hat in the left example and jeans in the right example).



Figure 46: Failure cases of type 2. Our method may mix colors between instances of the same class (like clothes in the left example and cats in the right example).

References

- [1] Jing Liao, Yuan Yao, Lu Yuan, Gang Hua, and Sing Bing Kang. Visual attribute transfer through deep image analogy. *arXiv preprint arXiv:1705.01088*, 2017.
- [2] Fujun Luan, Sylvain Paris, Eli Shechtman, and Kavita Bala. Deep photo style transfer. *arXiv preprint arXiv:1703.07511*, 2017.
- [3] Francois Fleuret, Anil C Kokaram, and Rozenn Dahyot. N-dimensional probability density function transfer and its application to color transfer. In *Computer Vision, 2005. ICCV 2005. Tenth IEEE International Conference on*, volume 2, pages 1434–1439. IEEE, 2005.
- [4] YiChang Shih, Sylvain Paris, Connelly Barnes, William T. Freeman, and Frédéric Durand. Style transfer for headshot portraits. *ACM Transactions on Graphics (TOG)*, 33(4):148:1–148:14, 2014.
- [5] Wai-Shun Tong, Chi-Keung Tang, Michael S Brown, and Ying-Qing Xu. Example-based cosmetic transfer. In *Computer Graphics and Applications, 2007. PG’07. 15th Pacific Conference on*, pages 211–218. IEEE, 2007.