



IMT Atlantique

Bretagne-Pays de la Loire

École Mines-Télécom

Texture synthesis

From Pseudo Optimizer (PO) to Optimal Transport (OT)

Group 1 - Topic 4:

DI MARIA, Franco Martin

PISTONE WATHELET, Sofia

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1. Fast Texture Synthesis via Pseudo Optimizer (PO)

Wu Shi, Yu Qiao

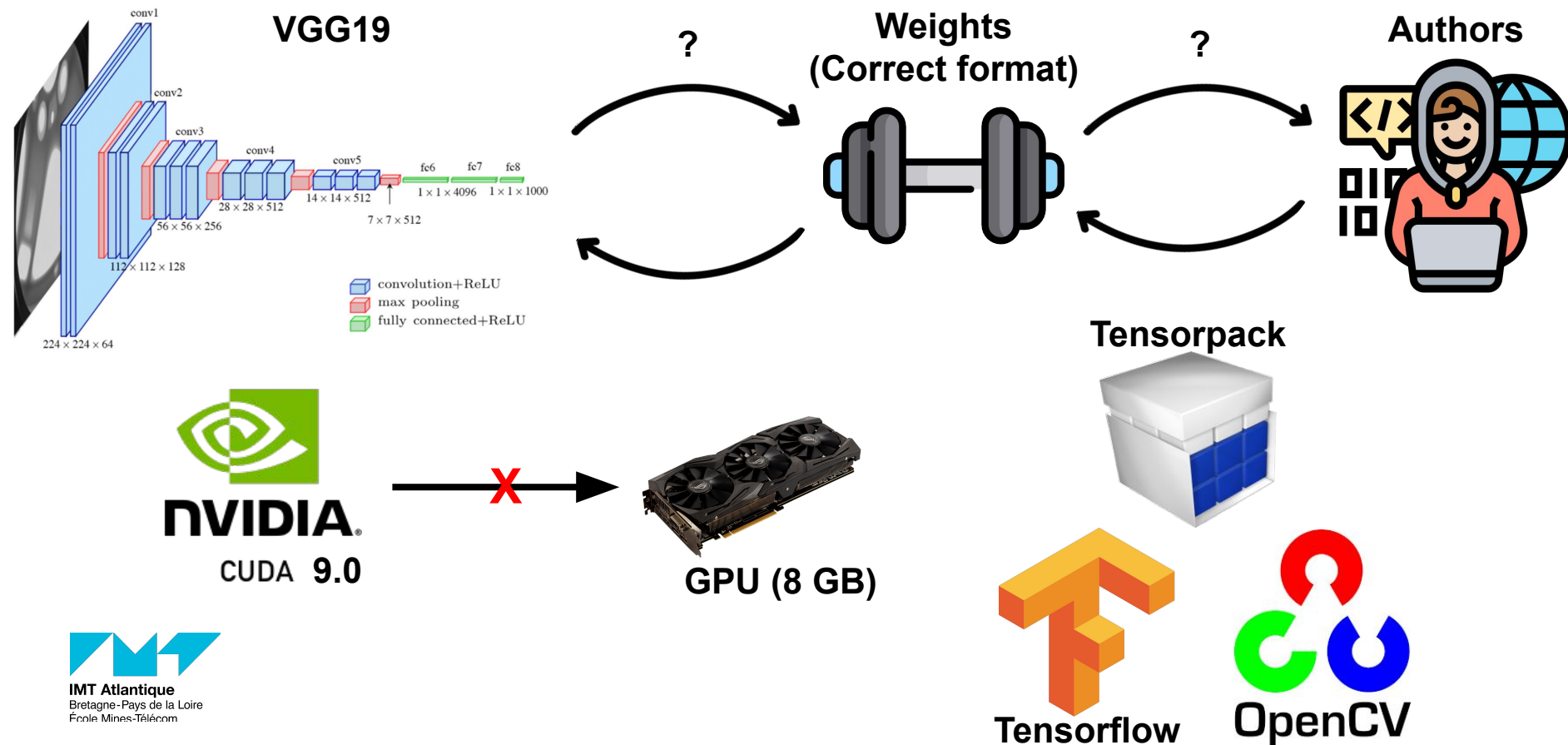
Proceedings of the IEEE/CVF Conference on
Computer Vision and Pattern Recognition (CVPR),
2020, pp. 5498-5507



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1. Pseudo Optimizer (PO)

2.1. Installation problems

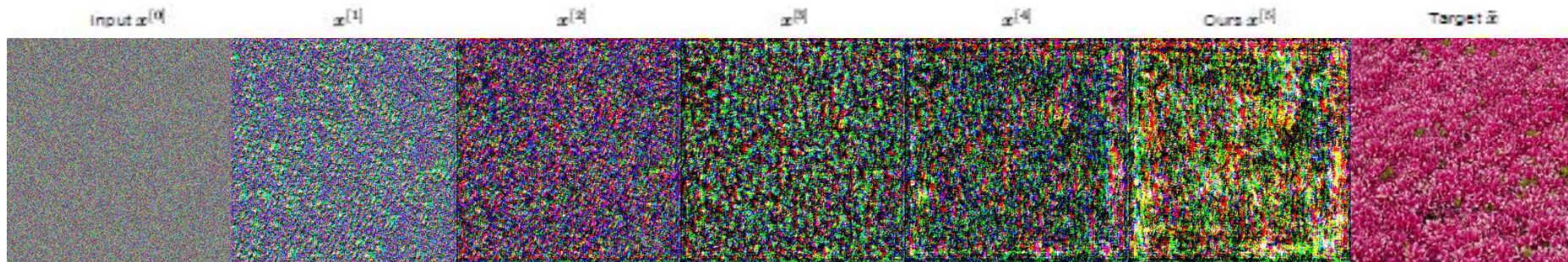
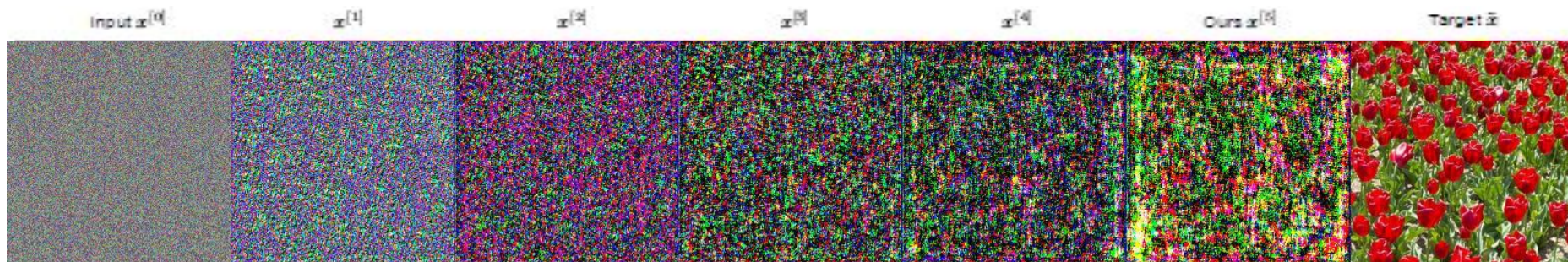


1. Pseudo Optimizer (PO)

2.2. Preliminary results

Pseudo optimizer: **improved_model.py**

Train size = 38 (flower images) | Epochs = 10 | Iterations = 100



2. Optimal Textures: Fast and Robust Texture Synthesis and Style Transfer through Optimal Transport

Eric Risser

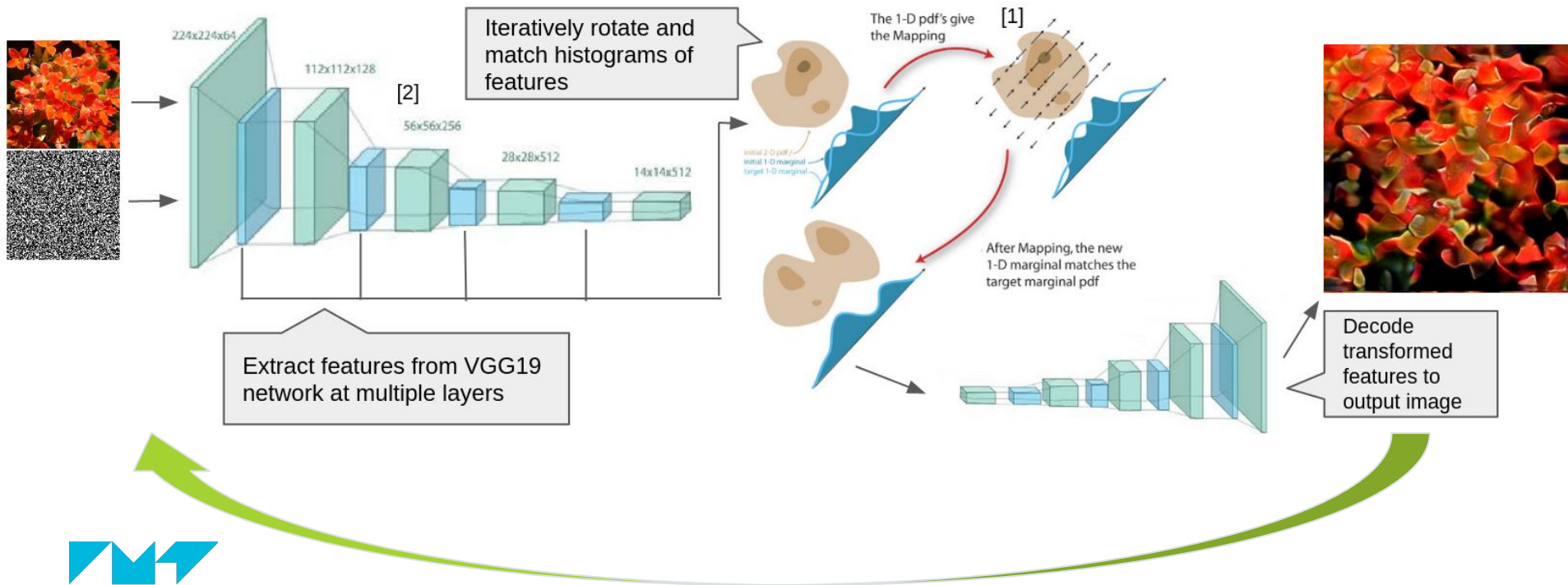
arXiv:2010.14702 [cs.GR]



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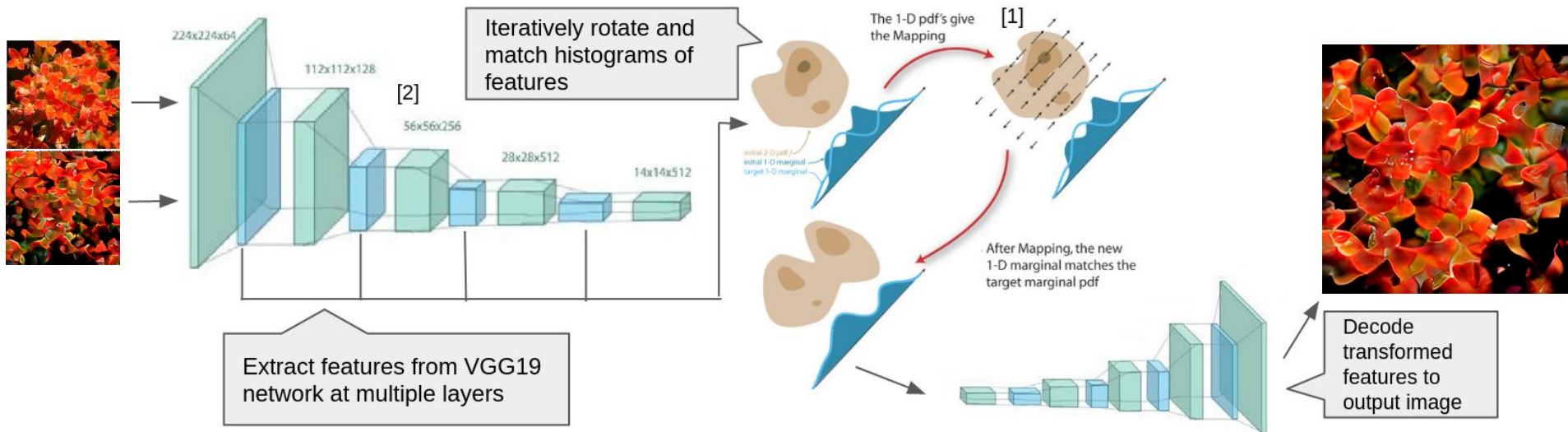
2. Optimal Transport (OT)

2.1. Algorithm



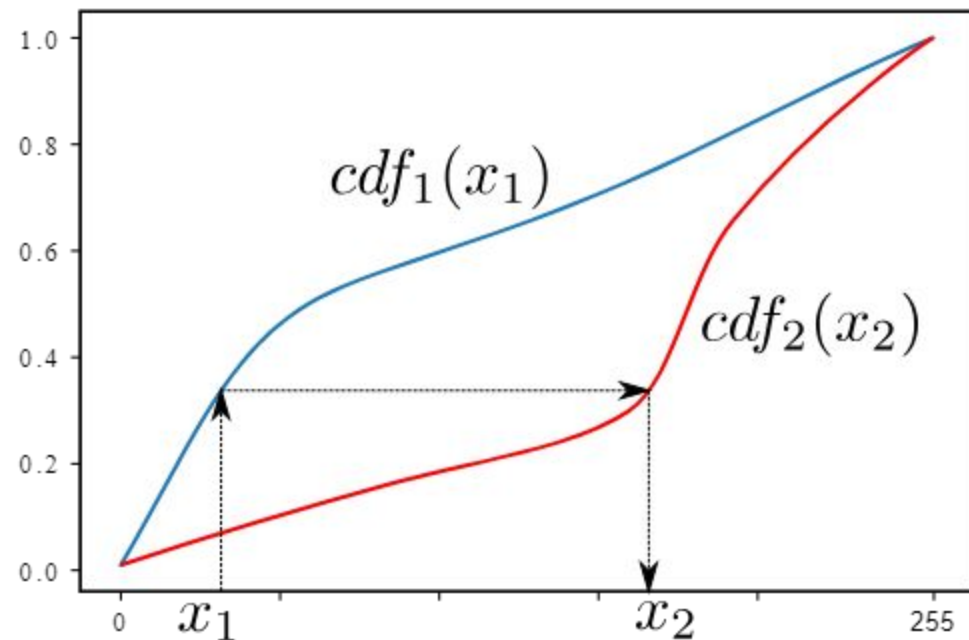
2. Optimal Transport (OT)

2.1. Algorithm



2. Optimal Transport (OT)

2.2 Histogram matching



Accelerate this process by applying

- **PCA,**
- **Cholesky decomposition,**
- **or Symmetric eigenvalues**

on the covariance matrix of the histogram

3. Experiments



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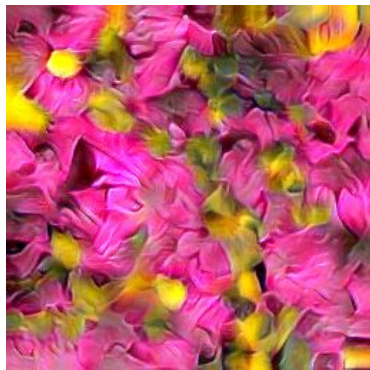
3. Experiments

passes
parameter

3.1. Optimal Transport (OT)

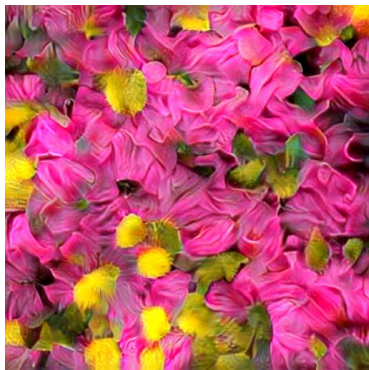
Number of times to loop over each of the 5 layers in VGG-19

Passes: 1



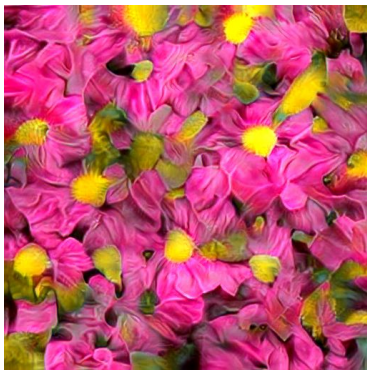
Time: 14.31 s

2



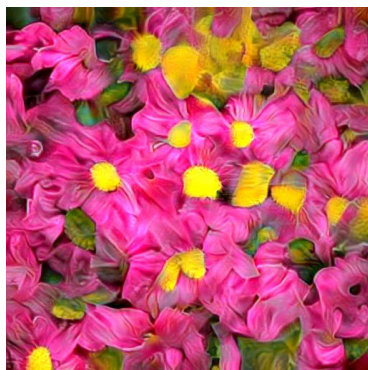
19.71 s

3



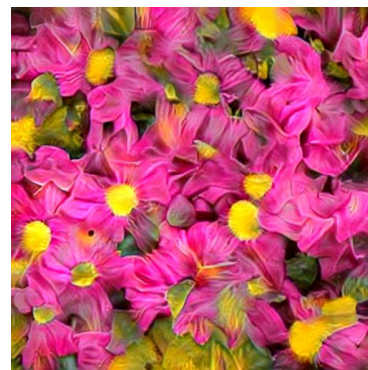
19.90 s

4



24.50 s

5



24.29 s

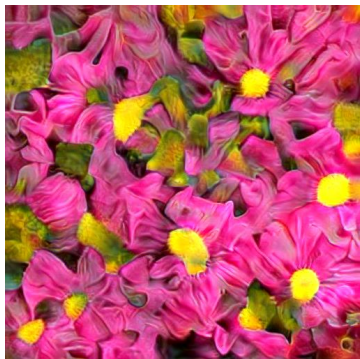
3. Experiments

3.1. Optimal Transport (OT)

Total number
of iterations

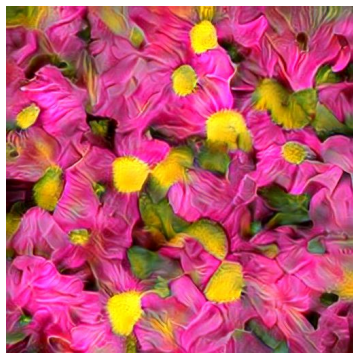
Total number of iterations to optimize.

100



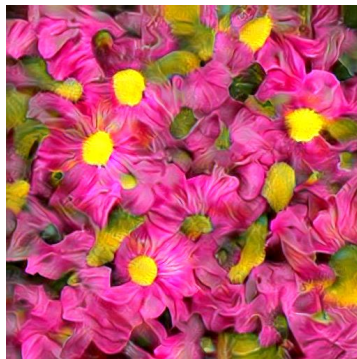
Time: 6.17 s

250



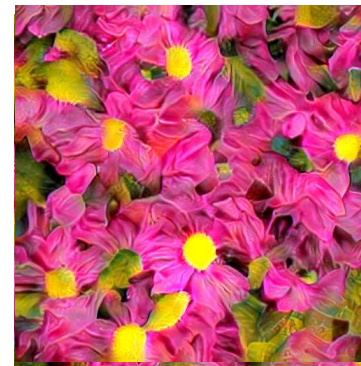
15.08 s

500



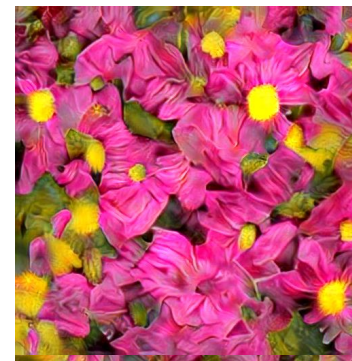
23.29 s

750



33.21 s

1000



47.08 s

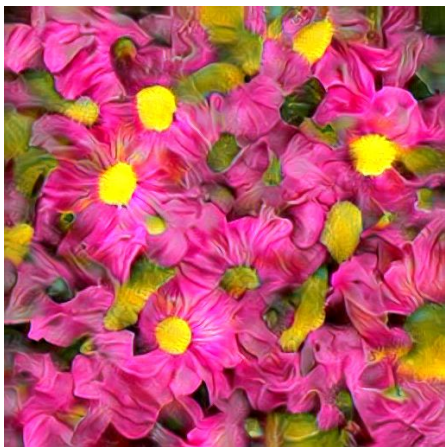
3. Experiments

3.1. Optimal Transport (OT)

Histogram
model

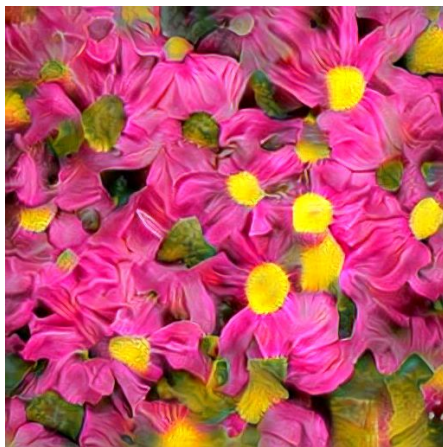
Histogram matching strategy.

Symmetric strategy



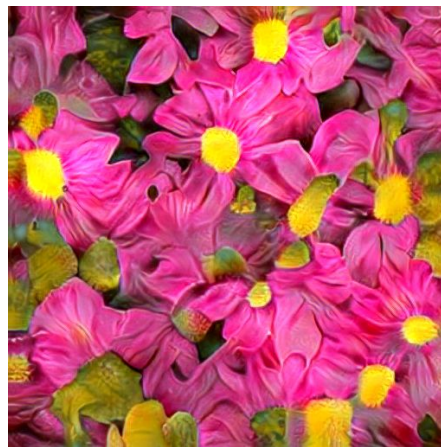
Time: 38.22 s

PCA strategy



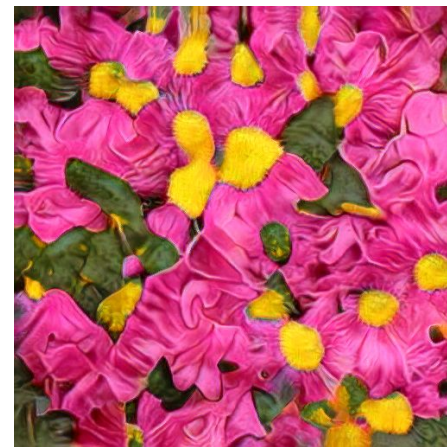
41.22 s

**Cholesky Decomposition
strategy**



23.50 s

**Cumulative Distribution
Function strategy**

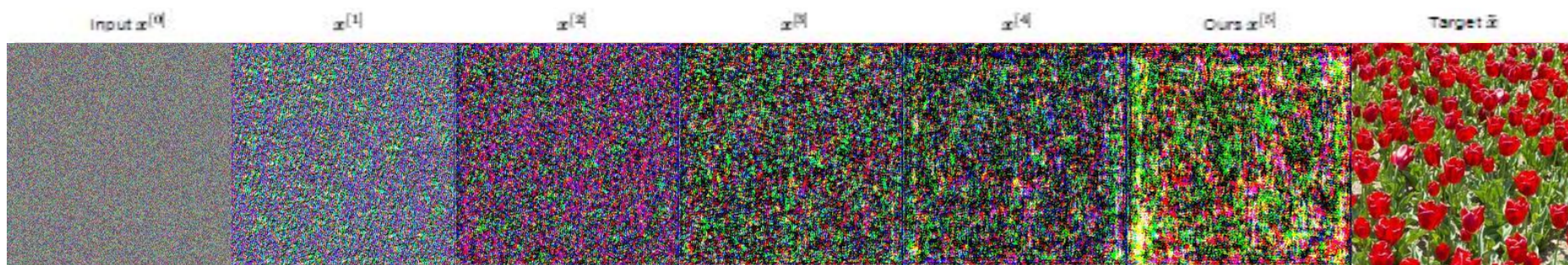


262.79 s

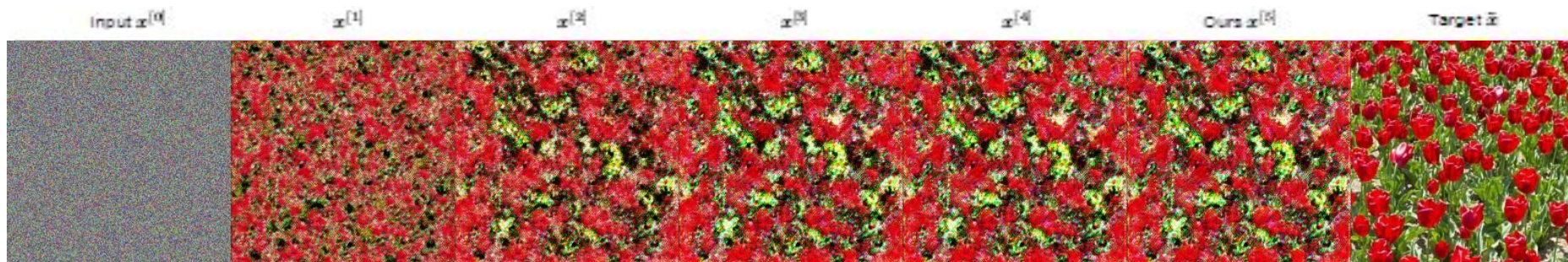
3. Experiments

3.2. Pseudo Optimizer (PO)

Before: Train size = 38 (flower images) | Epochs = 10 | Iterations = 100



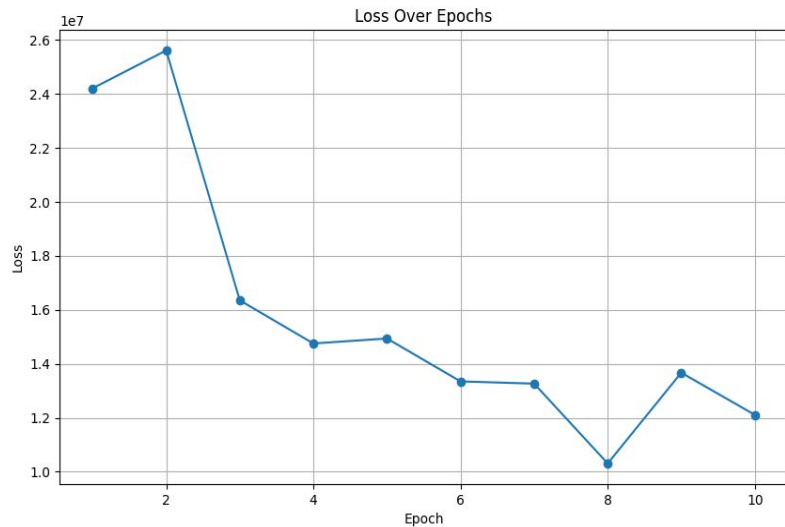
After: Train size = 38 (flower images) | Epochs = 100 | Iterations = 500



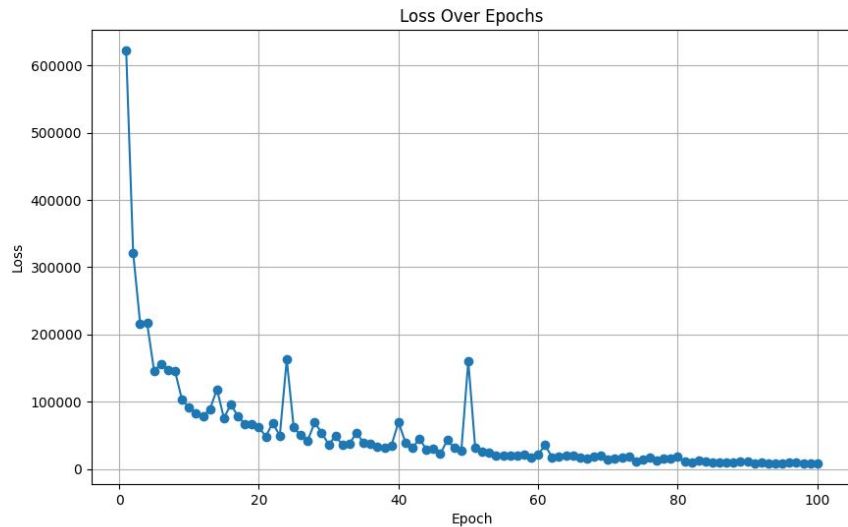
3. Experiments

3.2. Pseudo Optimizer (PO)

Before



After



3. Conclusions

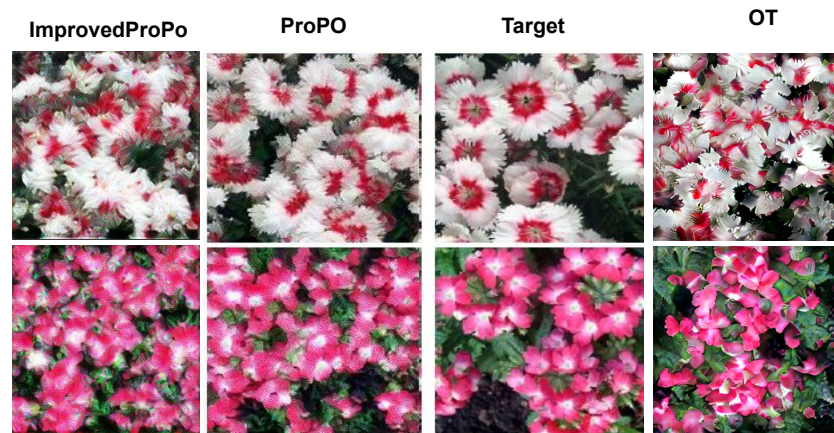


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4. Conclusions

PO vs OT

4.1. Comparison



4. Conclusion

PO vs OT

4.1. Comparison

For the images that were challenging for the PO:

ImprovedProPO



ProPO



Target



OT



Still not very good results.

Thanks for your attention!
Any questions?



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