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Multimodal Style Transfer via Graph Cuts

Citation

This presentation is based on the work of :

Yulun Zhang, Chen Fang, Yilin Wang, Zhaowen
Wang, Zhe Lin, Yun Fu, Jimei Yang

From :

Northeastern University, Adobe Research and
ByteDance AI Lab



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PLAN

1. The MST approach : a quick overview
2. 1st experiment : Number of clusters
3. 2nd experiment : Spatial invariance
4. 3rd experiment : Robustness against noise
5. 4th experiment : Does size matter ?
6. Conclusion

1 - The MST approach : a quick overview



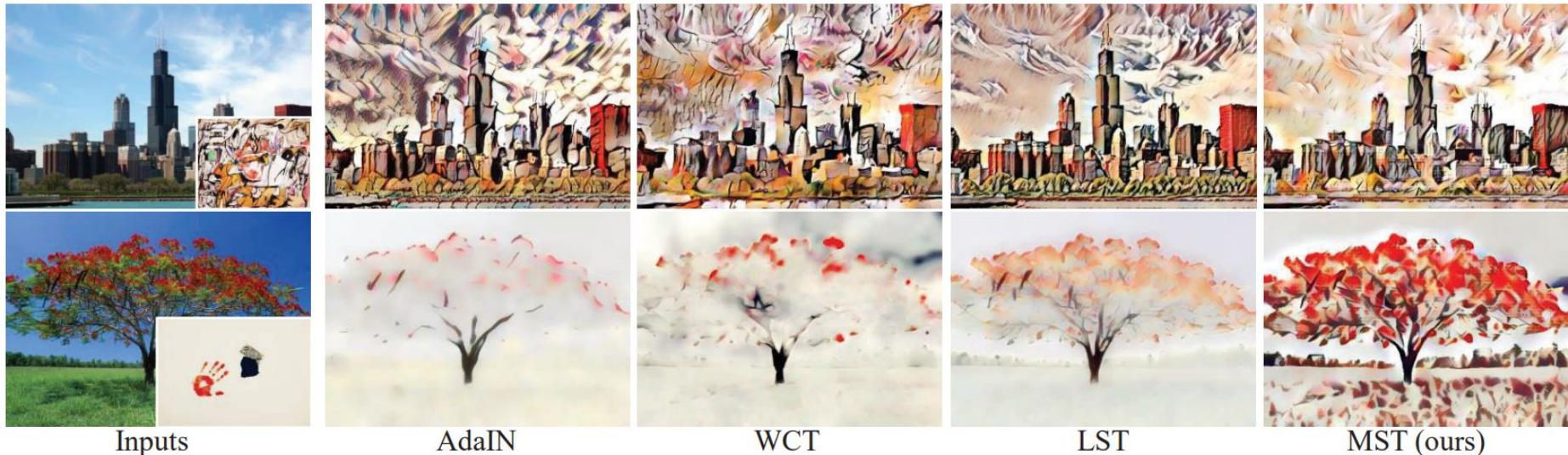
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1 : The MST approach : a quick overview

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1.1 What is image style transfer ?

“Image style transfer (IST) is the process of rendering a content image with characteristics of a style image”



1 : The MST approach : a quick overview

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1.2 Style - content approach

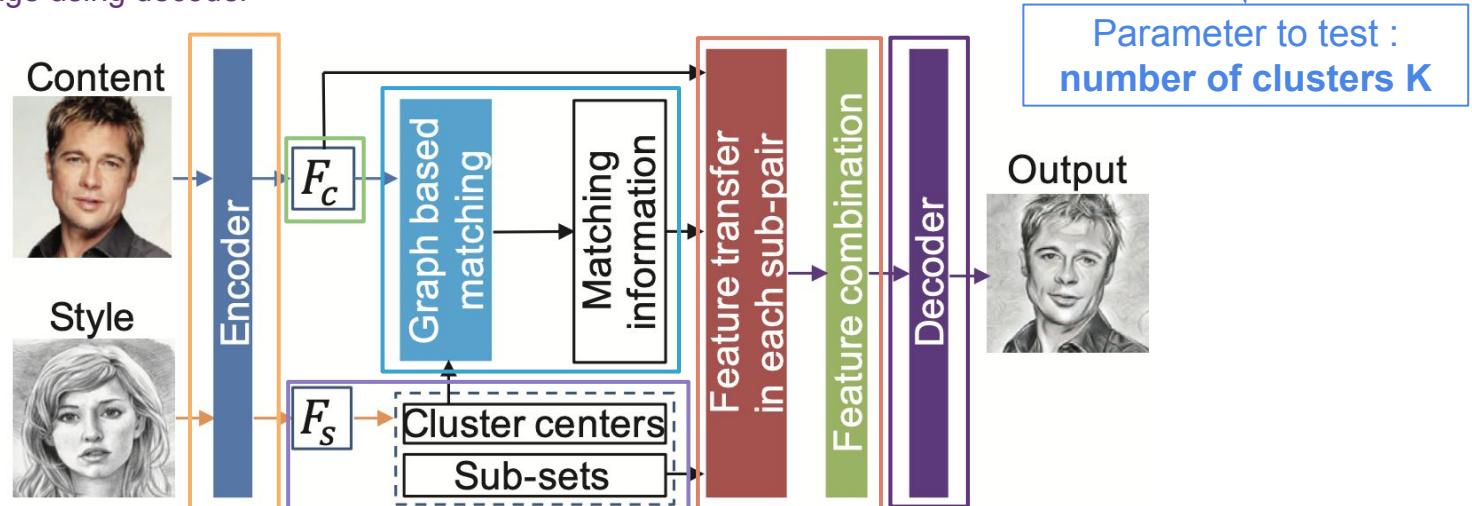


Figure: Patch-swap based methods (CNNMRF [6], DFR [7], and AvatarNet [8]) may copy some less desired style patterns (labeled with red arrows) compared to MST.

1 : The MST approach : a quick overview

1.3 : architecture principle

- How to extract style from an image ?
 - style image → encoder (VGG 19) + K-means on the feature vectors → cluster centroids = style features
 - IDEA : “multimodal style approach” = find principal modes (patterns) in this high dimension (512) feature space
- How to transfer style to an image ?
 - content image → encoder (VGG 19) → content features
 - match content features to style features ? graph approach : graph cut method
 - Feature combination & transfer (WCT for combination, ponderate mean for transfer)
 - rebuild image using decoder



CHAPITRE 1 : CONTEXT

Multimodal style methods

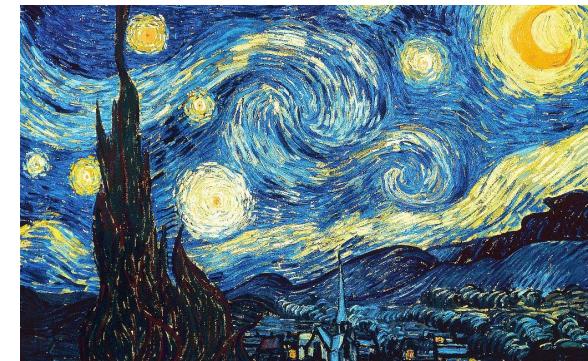
Chosen images



CHAPITRE 1 : CONTEXT

Multimodal style methods

Chosen style image



EXPERIMENT 1

NUMBER OF CLUSTER



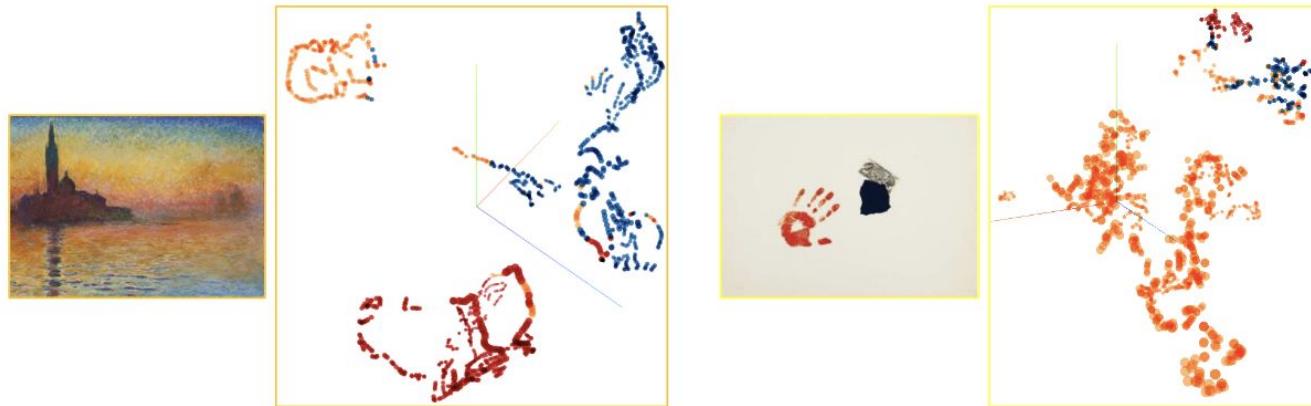
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EXPERIMENT 1 : Number of clusters

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Explanation

The recommended number of cluster for the style features is 3

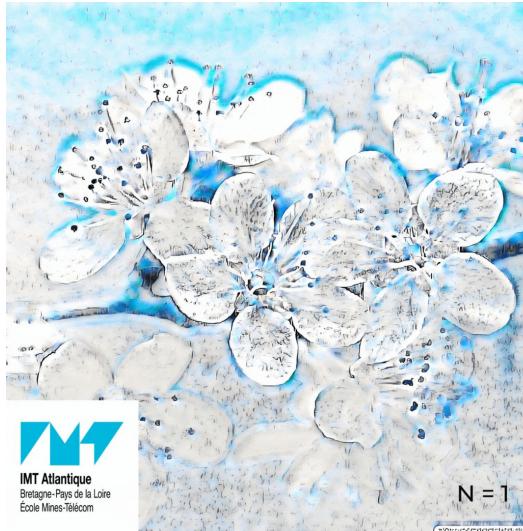


EXPERIMENT 1 : Number of clusters

12

Results

Testing from K=1 to K=5



EXPERIMENT 1 : Number of clusters

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Results



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EXPERIMENT 2

SPATIAL INVARIANCE



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EXPERIMENT 2 : Spatial invariance

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Explanation

The goal of the encoder is to extract a style
Is this extractor space dependents ?



EXPERIMENT 2 : Number of clusters

Results

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EXPERIMENT 2 : Number of clusters

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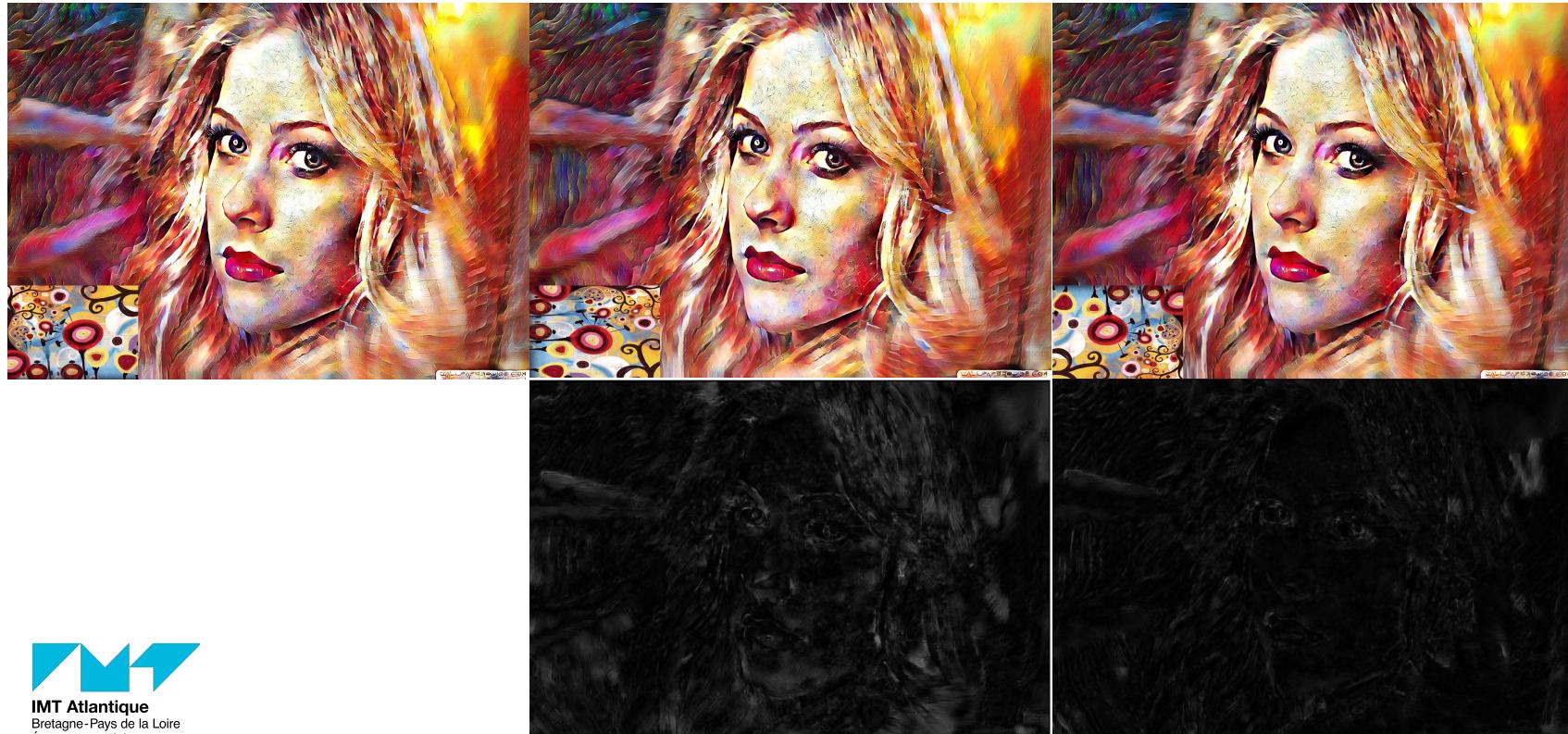
Results



EXPERIMENT 2 : Spatial invariance

Results

18



EXPERIMENT 2 : Number of clusters

Results



ssim = 0.35



EXPERIMENT 2 : Number of clusters

20

Results



ssim = 0.38



EXPERIMENT 3

ROBUSTNESS AGAINST NOISE



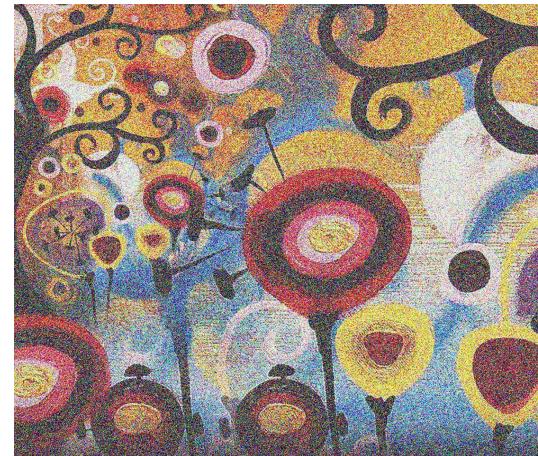
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EXPERIMENT 2 : Robustness against noise

Explanation

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How react the style transfert with a noisy image ?



EXPERIMENT 2 : Robustness against noise

Explanation

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EXPERIMENT 2 : Robustness against noise

Explanation

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EXPERIMENT 2 : Robustness against noise

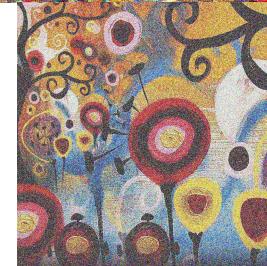
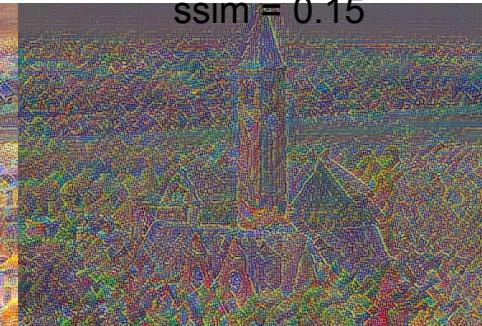
25

Explanation

ssim = 0.55

ssim = 0.25

ssim = 0.15



ssim = 0.51

ssim = 0.13

ssim = 0

EXPERIMENT 4

INFLUENCE OF THE IMAGE SIZE



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EXPERIMENT 2 : Influence of image size

Explanation

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Influence of the content image size on the running time

Method	Gatys	AdaIN	WCT	DFR	AvatarNet
Time (s)	116.46	0.09	0.92	54.32	0.33
Method	MST-1	MST-2	MST-3	MST-4	MST-5
Time (s)	0.20	1.10	1.40	1.97	2.27

On GPU



On CPU

Size (px)	729x512	1680x1050	2048x2048
Time (s)	11.184	22.820	45.570

CONCLUSION



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Code source

Pytorch version :

https://github.com/irasin/Pytorch_MST

Tensorflow version :

<https://github.com/Rakshit-Shetty/Multimodal-Style-Transfer-via-Graph-Cuts>

Paper :

https://openaccess.thecvf.com/content_ICCV_2019/papers/Zhang_Multimodal_Style_Transfer_via_Graph_Cuts_ICCV_2019_paper.pdf