[CVPR 2021] ArtFlow: Unbiased Image Style Transfer via Reversible Neural Flows

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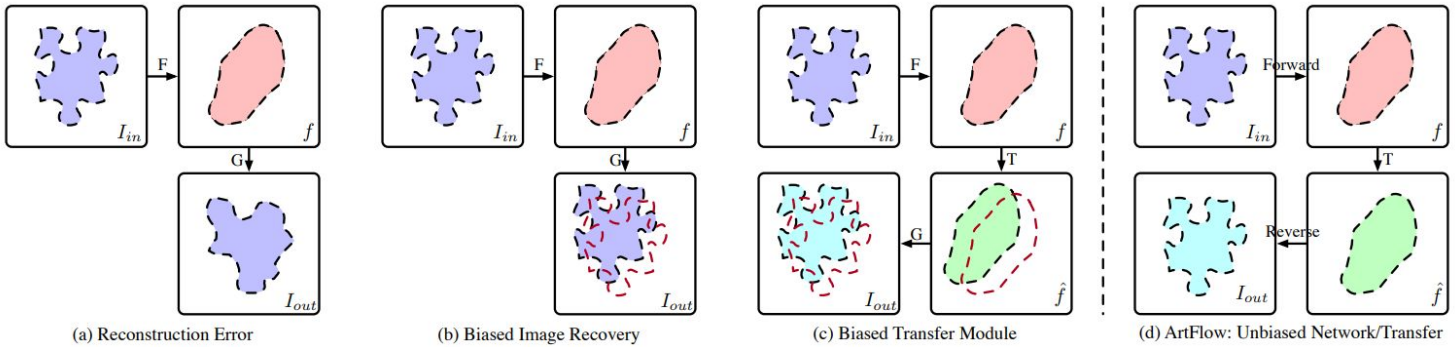
https://github.com/pkuanjie/ArtFlow

Outline

- Problems
- Datasets
- Experiments
- Tasks
- Conclusion

Problems

- Content Leak
  - Reconstruction error: decoder cannot reconstruct input content image lossless.
  - Biased decoder training: the autoencoder of AdaIN will memorize image styles in training and bias towards the training styles in inference.
  - Biased style transfer module: in Avatar-Net, the style transfer module is irreversible.



Flickr-Faces-HQ Dataset (FFHQ)

- 70000 high resolution (1024x1024) human face images.

https://github.com/NVlabs/ffhq-dataset

MetFaces Dataset

- 1336 high-quality PNG images at 1024×1024 resolution

https://github.com/NVlabs/metfaces-dataset

Moeimouto Dataset

- The website is defunct now.
- Contains 14397 anime face images.





https://www.kaggle.com/datasets/mylesoneill/tagged-anime-illustrations

Amateur Oil Paintings from Reddit

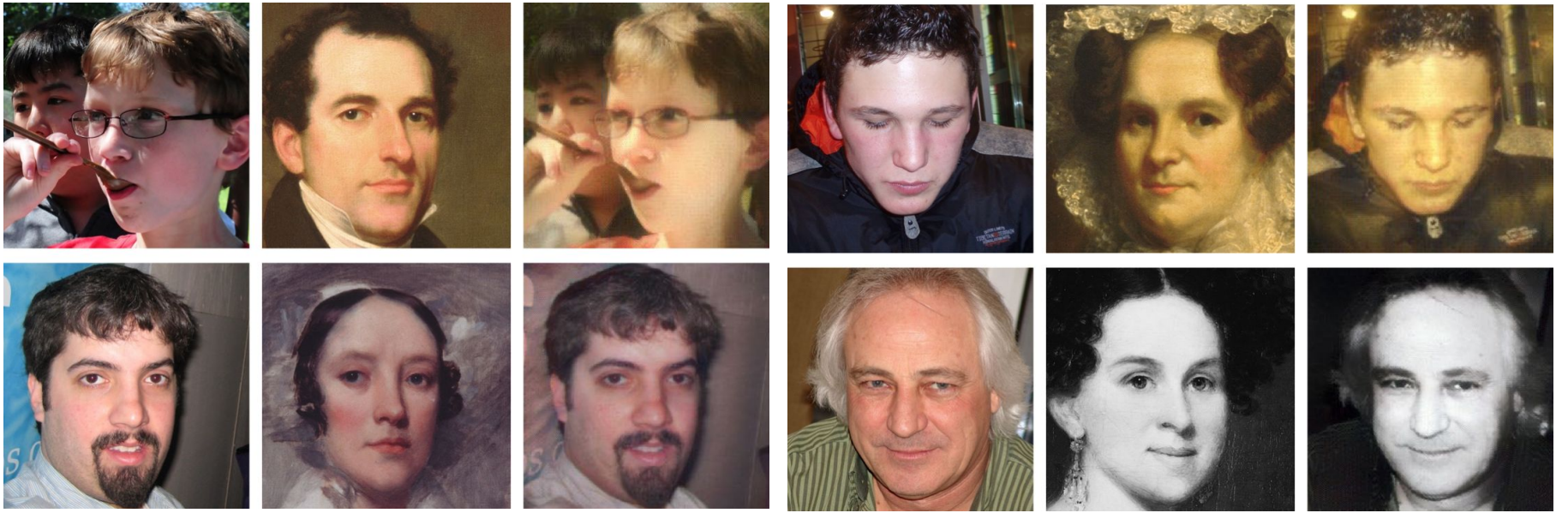
- 1855 oil painting images with size 256x256.
- The paintings are not focus on human faces.




https://www.kaggle.com/datasets/herbulaneum/oil-painting-images

ArtFlow: FFHQ + MetFace

- ArtFlow provides a model to convert a portrait photo into an artwork.
- The dataset being used is FFHQ and MetFaces.



Experiment 1 - Different Dataset

- We trained ArtFlow network with different dataset to figure out the effect of different training set of style.
- We test two kind of dataset combination:
  - Content: FFHQ, Style: Moeimouto.
  - Content: FFHQ, Style: Oil paintings.
- We train the models in 10,000 iterations, where ArtFlow trains in 160,000 iterations.

Results - Moeimouto v.s. Oil Painting


Content

+


Style

- ArtFlow + AdaIN.
- The Moeimouto one is more smooth and high contrast.
- The oil painting one is more colorful.


Moeimouto dataset


Oil painting dataset

Result - Original AdaIN v.s. ArtFlow + AdaIN

- The result of ArtFlow is closer to original image than the original one.

Content

+

Style

Original AdaIN

ArtFlow + AdaIN

Experiment 2: Content Leak

- We produce style transfer image continuously to figure out the effect of content leak.
- We use default style dataset and our style image
- We iterate the dataset 20 rounds.

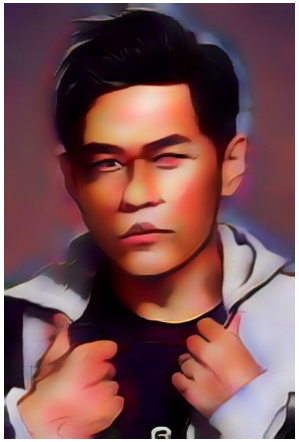
Compare 1: AdaIN vs ArtFlow+AdaIN

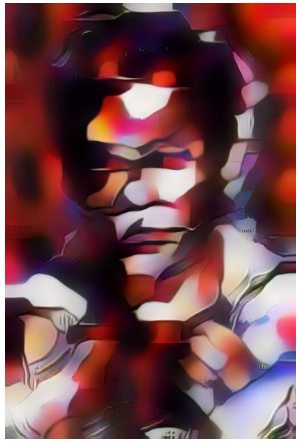

content

+

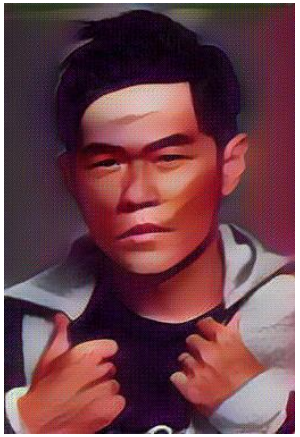

style

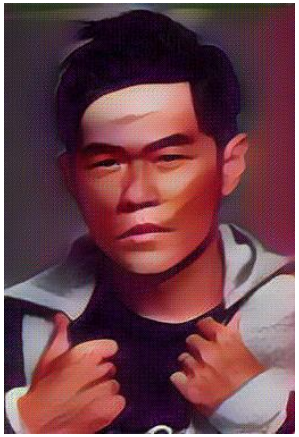
AdaIN


1 round


20 round

ArtFlow+AdaIN


1 round


20 round

Compare 2: AdaIN vs ArtFlow+AdaIN


+


content style

AdaIN


1 round 20 round

ArtFlow+AdaIN


1 round 20 round

Tasks

- Task 1: Images

Content

Style

Result

Tasks

Tasks

- Task 1: Images

Content

Style

Result

Tasks

Tasks

- Task 2: Videos

Content

Style

Result

Tasks






Tasks

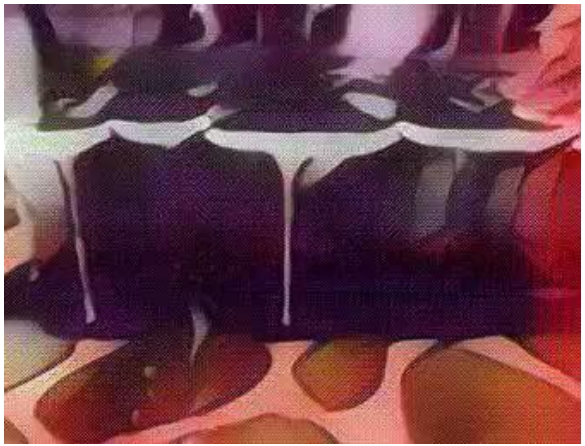
- Task 2: Videos

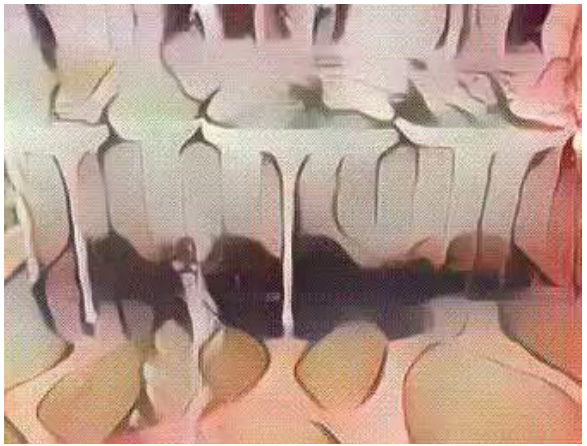
Content

Style

Result

Tasks





Conclusion

- ArtFlow couldn’t prevent from the “biased decoder training”.
- ArtFlow can prevent Content Leak while AdaIN cannot.
- ArtFlow is more similar to original picture, AdaIN is more similar to style picture.
- ArtFlow has better performance in portraits than in landscapes.

Thanks!