

# Velvet Buzzsaw

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# Problem description

1. There are a lot of museums or exhibitions of paintings that don't gain much attention due to many reasons.
2. One of the most important reasons is a low amount of fun visitors could gain on an event => low demand.
3. We found a way to make an improvement, thus exhibitions will be better supported and flourish - Velvet Buzzsaw.

# Velvet Buzzsaw in a nutshell

1. Detect a piece of art (painting) from a mobile shot
2. Cut and align a detected piece of art (remove frames if needed)
3. Apply chosen “style” to an aligned cut painting
4. Revert perspective transformation and draw a modified painting in the original place

# Dataset Description

Overall dataset : 15 images

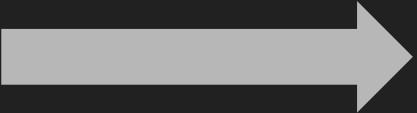
Train set 5 images / Test Set 10 images

1. Painting should be covering 20% of image size at least
2. Painting should not be partially impaired by any other object
3. Painting has slight angle orientations



# Painting Detection & Projection

1. Detection using contours
2. Handling frames of paintings using contours hierarchy and area thresholding.

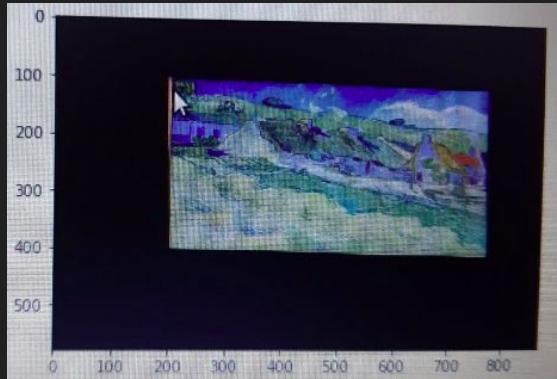


# Inverse transform approaches

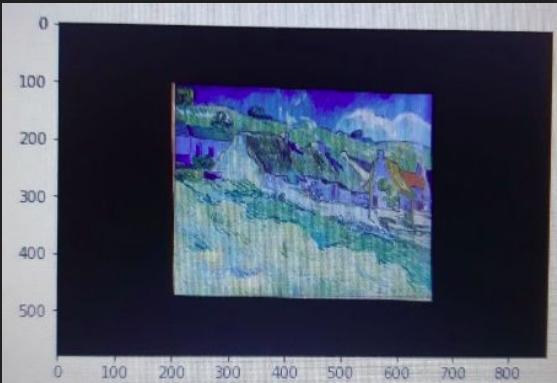
Original Image



Inverse of projection matrix



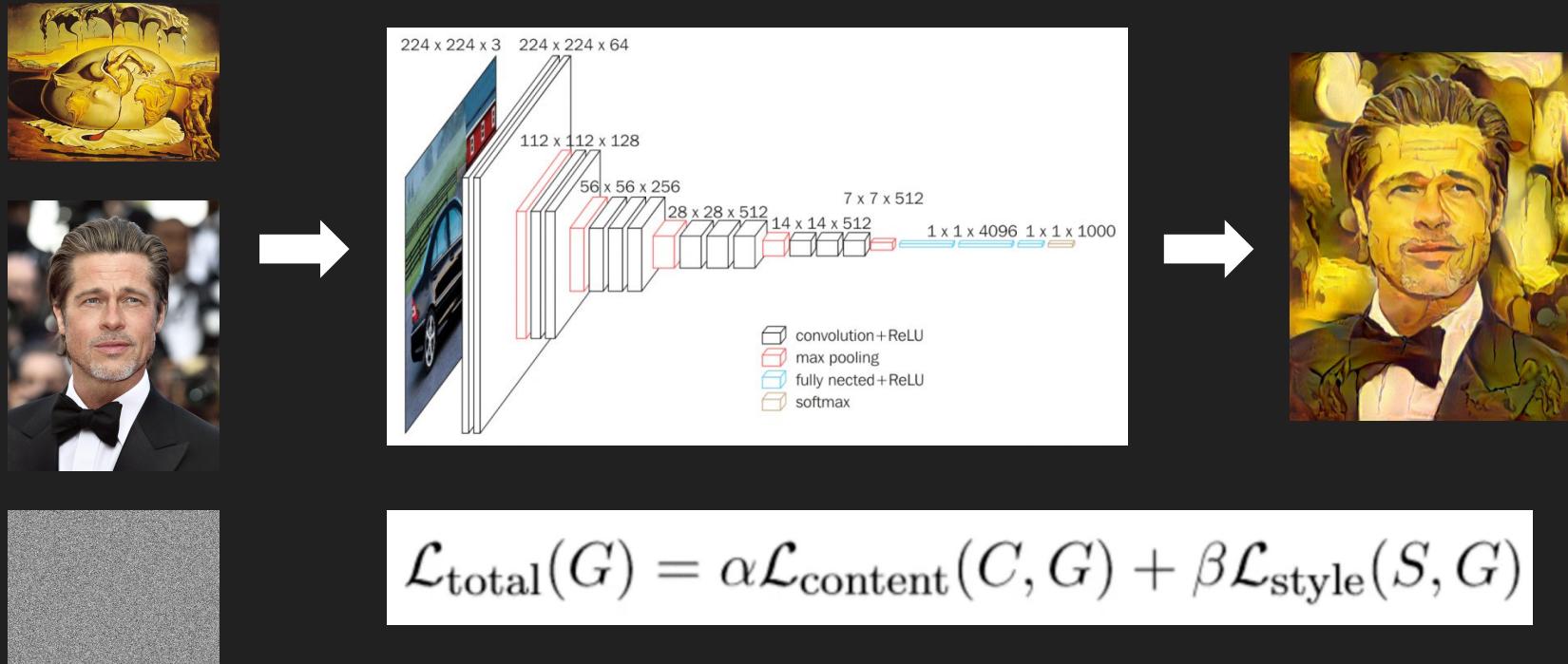
Reversing src and dst points



# What is “Style”?



# Style transfer



A neural algorithm of artistic style: <https://arxiv.org/abs/1508.06576>

# Examples



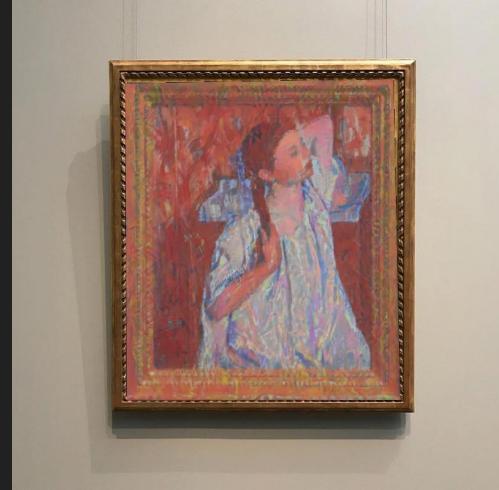
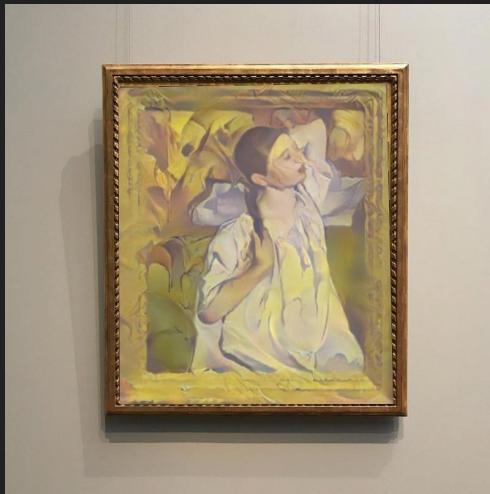
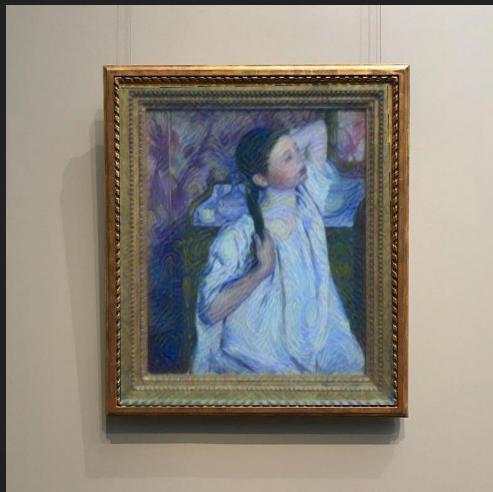
# Examples



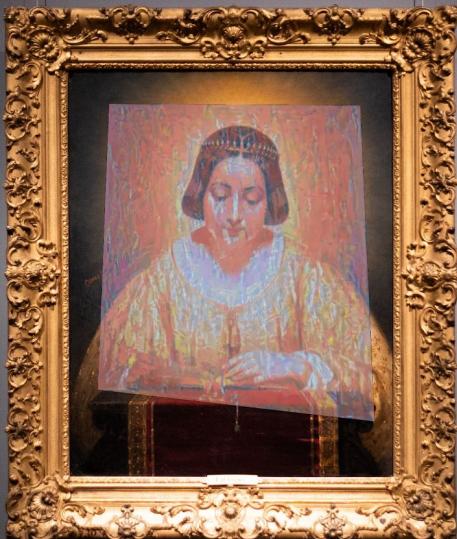
# Examples



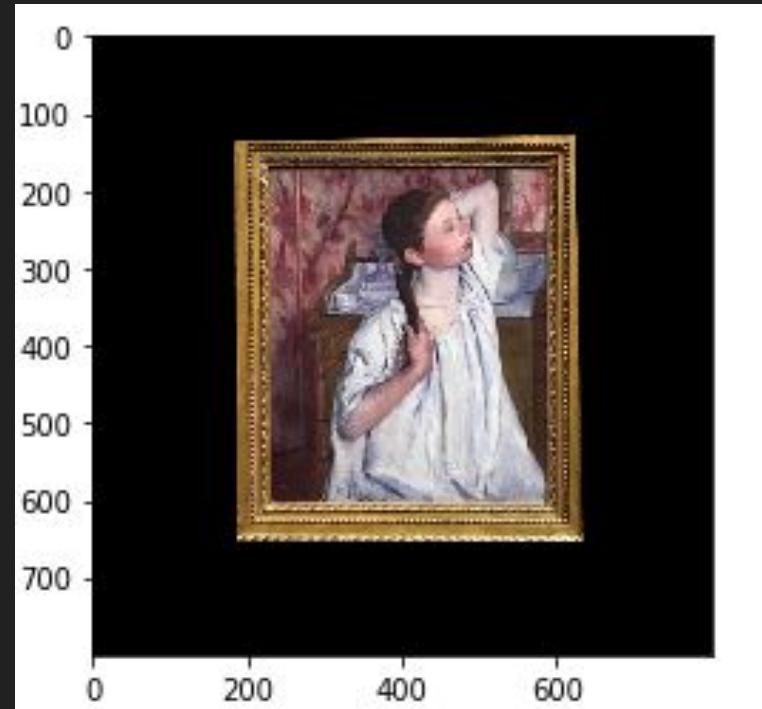
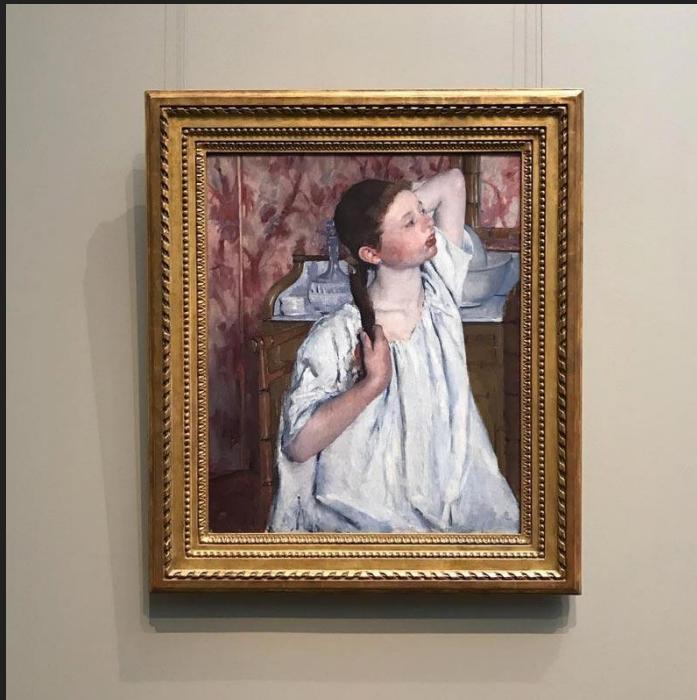
# Examples



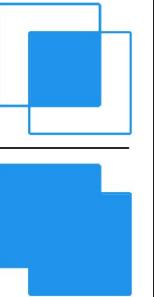
# Bad example



# Example of failure : (Detection)



# Evaluation

$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$


Ground truth Kernel



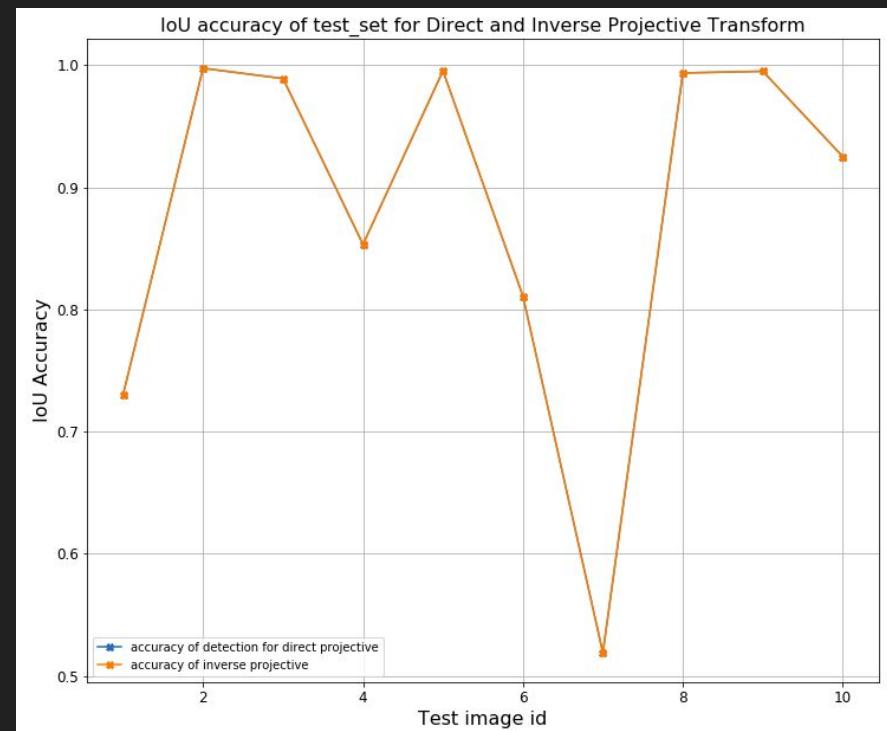
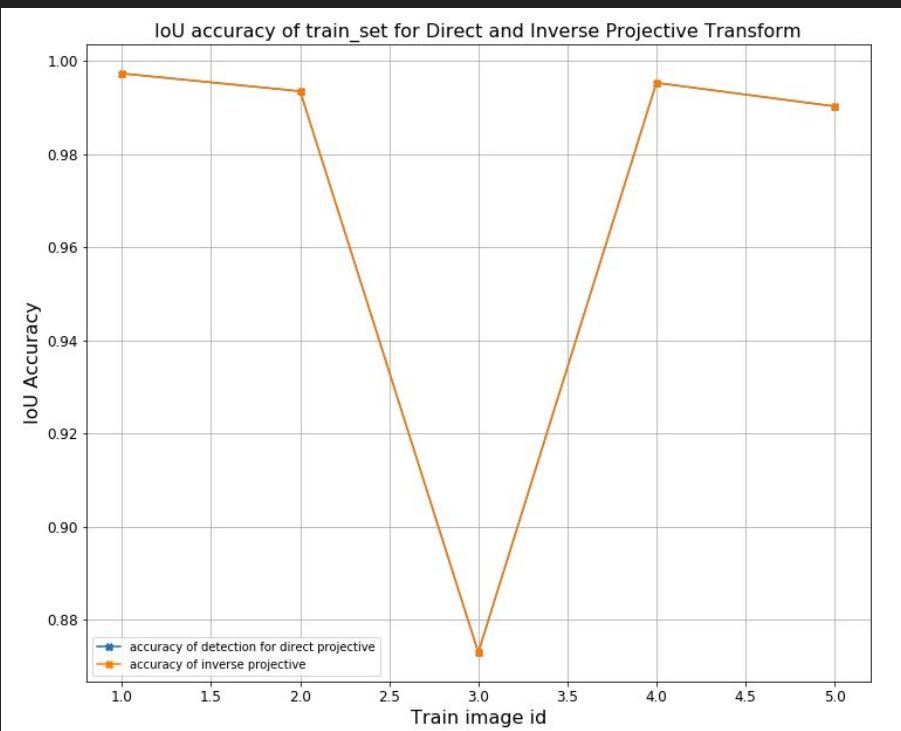
Kernel of Detected Painting  
(Direct Transform)



Kernel of Inverse transform



# Evaluation



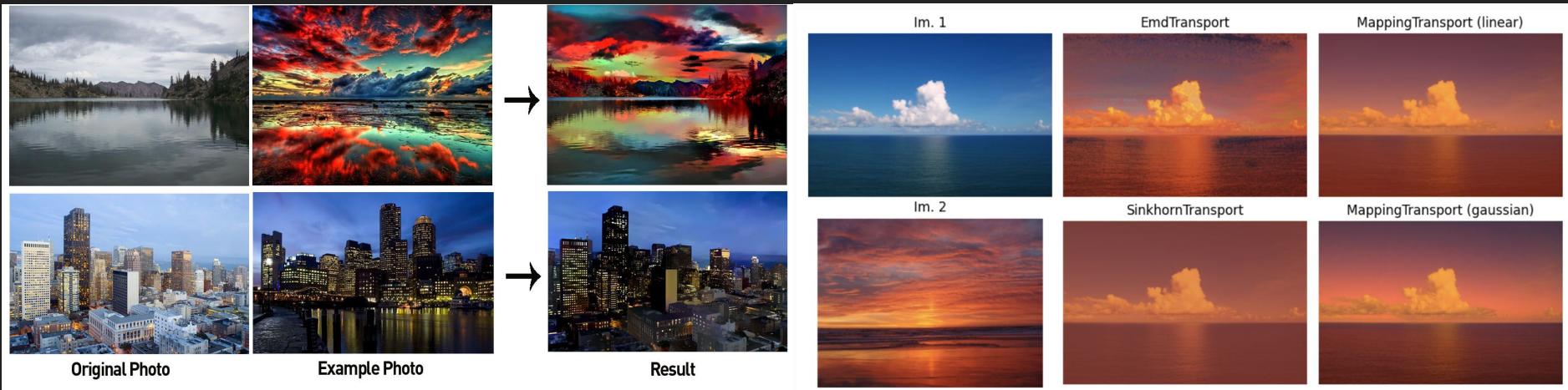
# Evaluation: Average IoU

- On train set :
  - Detection of Painting: 0.97
  - Applying inverse projection: 0.97
- On test set:
  - Detection of Painting: 0.88
  - Applying inverse projection: 0.88

# Alternatives

## Deep Photo Style Transfer

Color matching via Optimal Transport algorithms like Sinkhorn



# Conclusion

1. Visits to the exhibitions can be more interesting and funnier
2. More attention - better support of museums ()
3. Can be enhanced with GAN-based models (or other generative models)
4. Detection can be better (multiple paintings in a shot)
5. Crowds can be removed before style appliance
6. Models should be highly optimized (takes around ~20m per image on Colab)

# Thank you for the attention!

Papers:

- <https://arxiv.org/abs/1508.06576>
- <https://arxiv.org/abs/1703.07511>