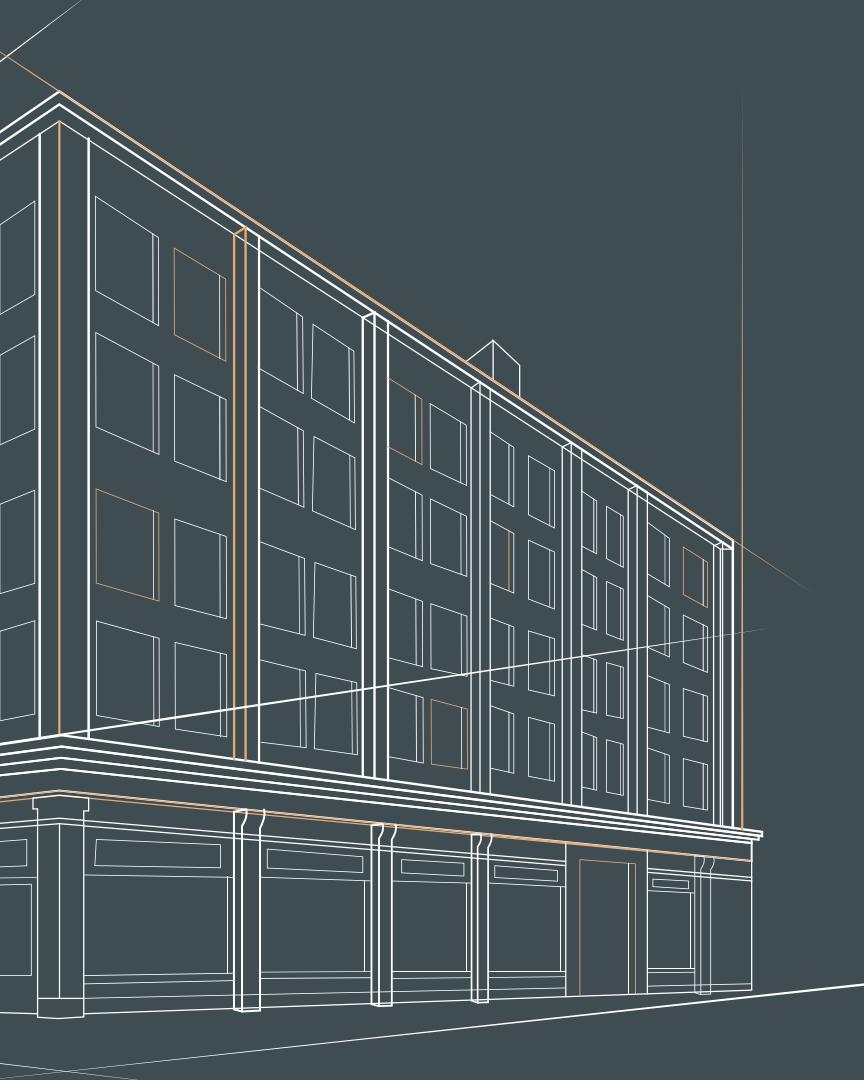


## MSML640 Course Project

# Color Skepticism

- Abhishek Kotcharlakota
- Isha Asalla



A detailed architectural line drawing of a building's facade. The drawing shows a multi-story structure with a grid of windows. Some windows are highlighted with orange outlines, and there are also orange lines indicating structural elements like columns and beams. The perspective is from the ground level looking up at the building.

# 01

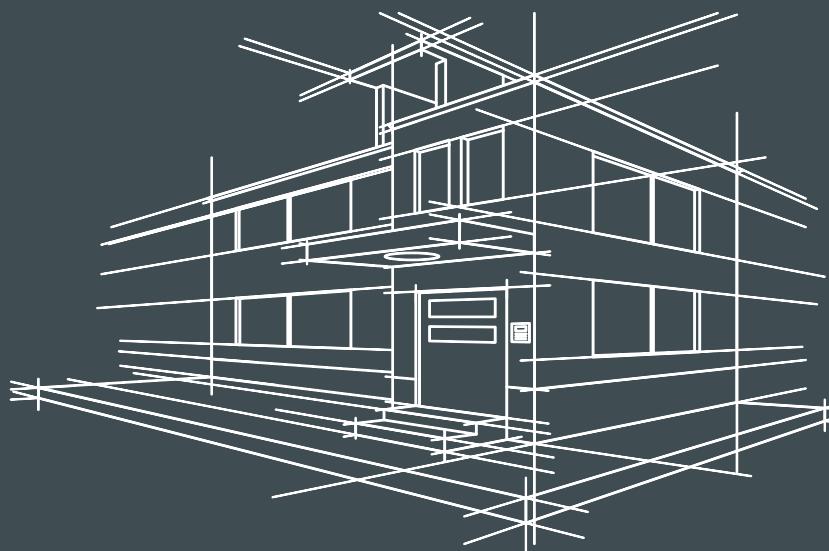
## About the Project

# Project Idea

- *The primary objective of the project is to analyze and assess different image colorization models by subjecting the input images to several manipulations using computer vision techniques.*
- *The image manipulations can be simple disturbances like blurring, rotating, flipping, activating random pixels to more complicated disturbances such as derivatives, alpha blending , object replacement, neural style transfer.*
- *The project attempts to analyze the robustness of image colorization models and comment on their fail cases.*



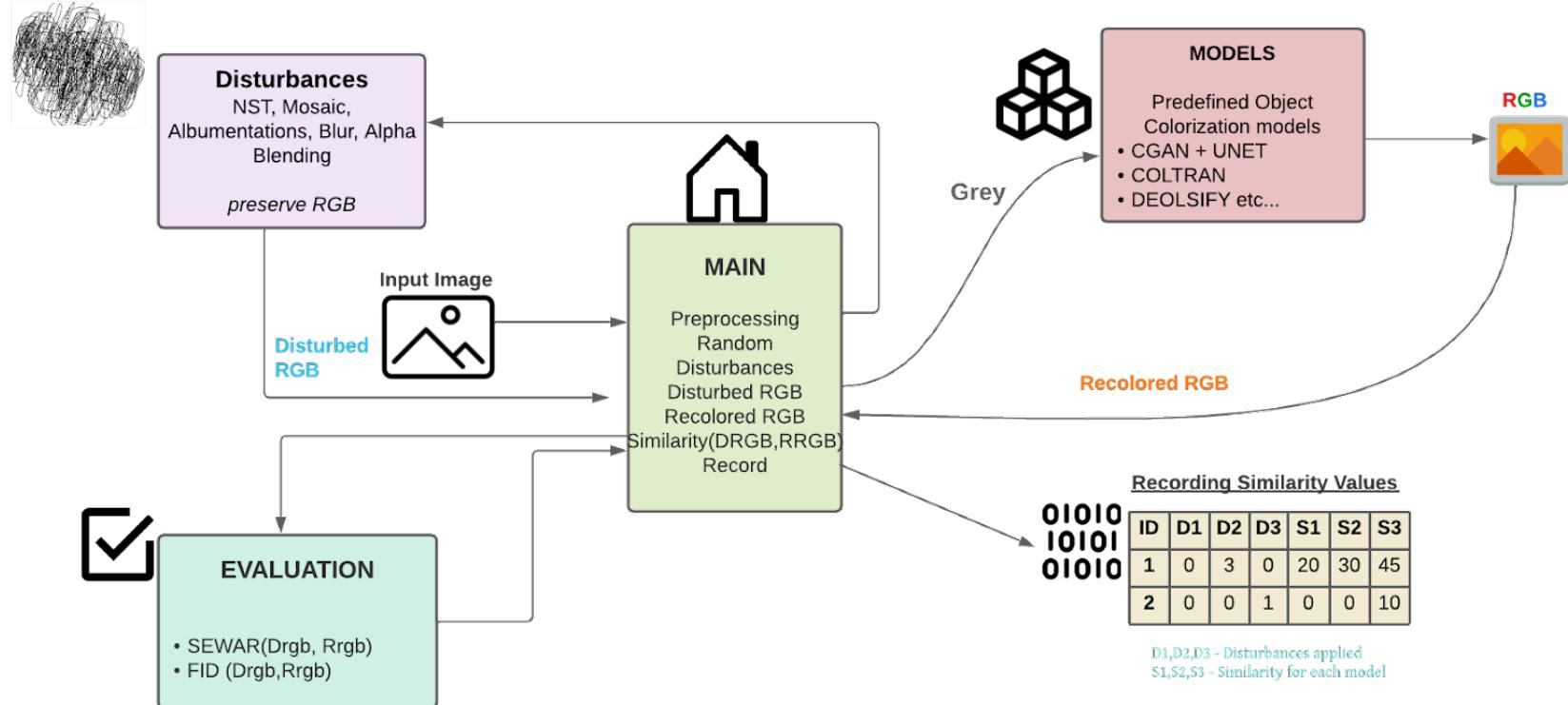
# 02



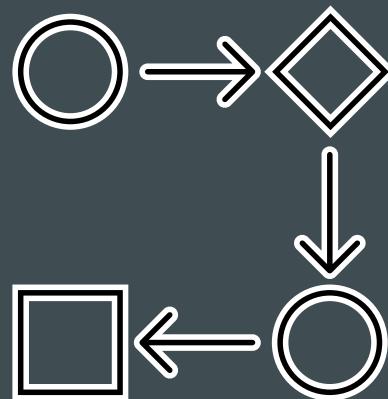
# Architecture

The workflow consists of four blocks:

1. Adding disturbances
2. Feeding the grey scale image to the models
3. Evaluating similarity scores
4. Recording these values for ML analysis.



# 03



## Workflow

# Preprocessing Requirements



## DATA Collection

- COCO

## DISTURBANCES

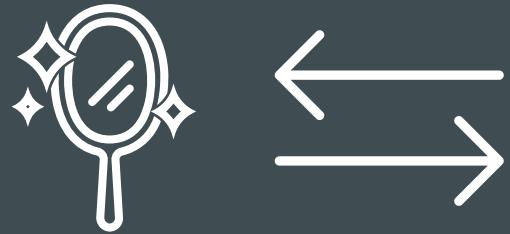
- Blur, Rotate, Flip
- NST
- Alpha Blending
- Alumentations

## COLORIZATION

- Implementing 5 existing models
- Evaluation of outcomes

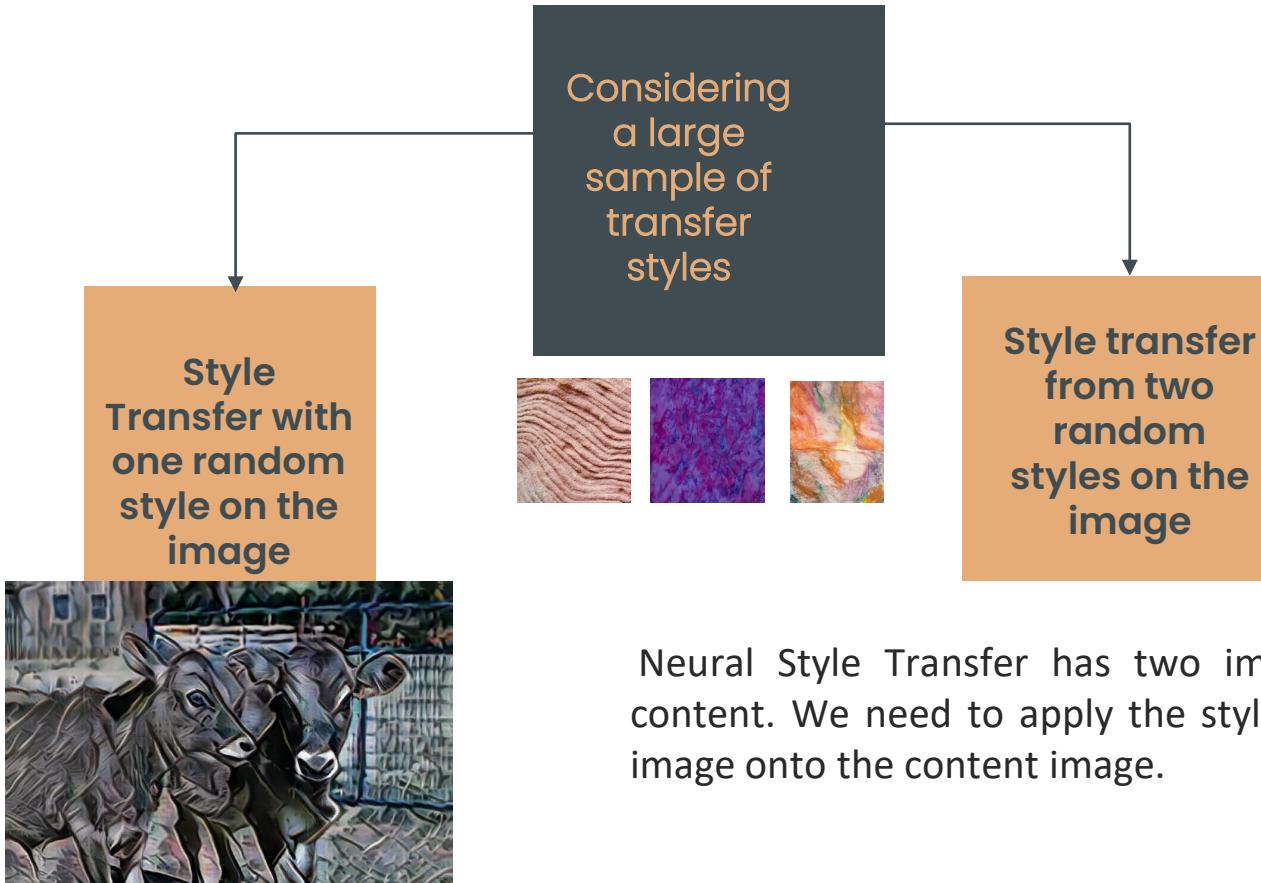


# 04



## Neural Style Transfer

# Neural Style Transfer



# 05



## Alpha Blending

# Alpha Blending

- Alpha blending is the process of inserting a **foreground** image over a **background** image such that the background blends in with transparency. Transparency is often the fourth channel of an image ( e.g. in a transparent PNG), but it can also be a separate image.
- Alpha merging is the superimposing of one image over the other .Alpha parameter decides how smooth the merging is.



# 06



## Disturbances

# Observations



## Case 1

Disturbances  
that did not fool  
any model

- Rotation
- Histogram  
equalization
- Invert(negative)
- Sharpen



## Case 2

Disturbances  
that fooled few  
models

- Multiplicative  
Noise
- Sharpen
- Noise

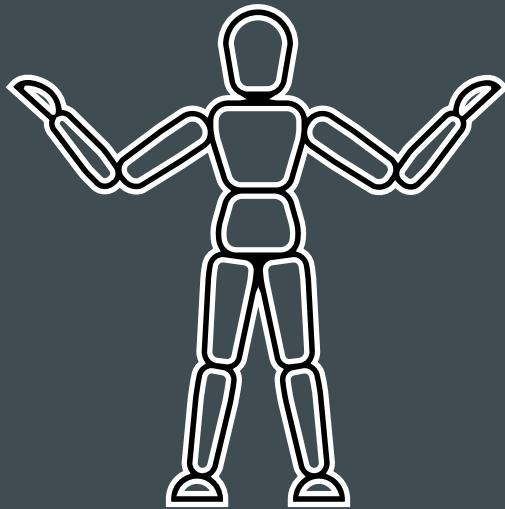


## Case 3

Disturbances  
that fooled all of  
the models

- Invert
- Noise

# 07



# Models/Design

# Colorization Models

## Models Implemented

Zhang et al (2 models –  
CNN)

- Eccv16
- siggraph17

Palette

Deoldify

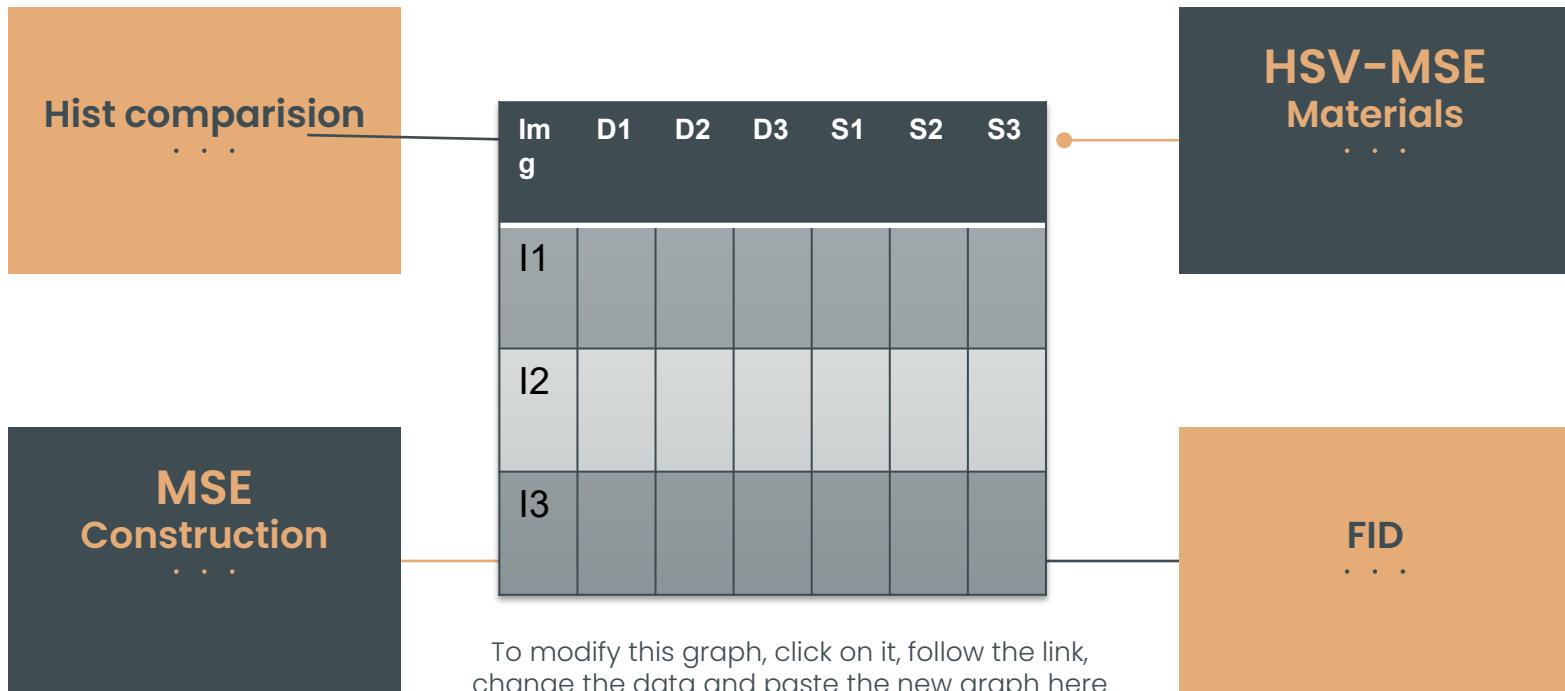
DeepAI – Paracolorizer

# 08

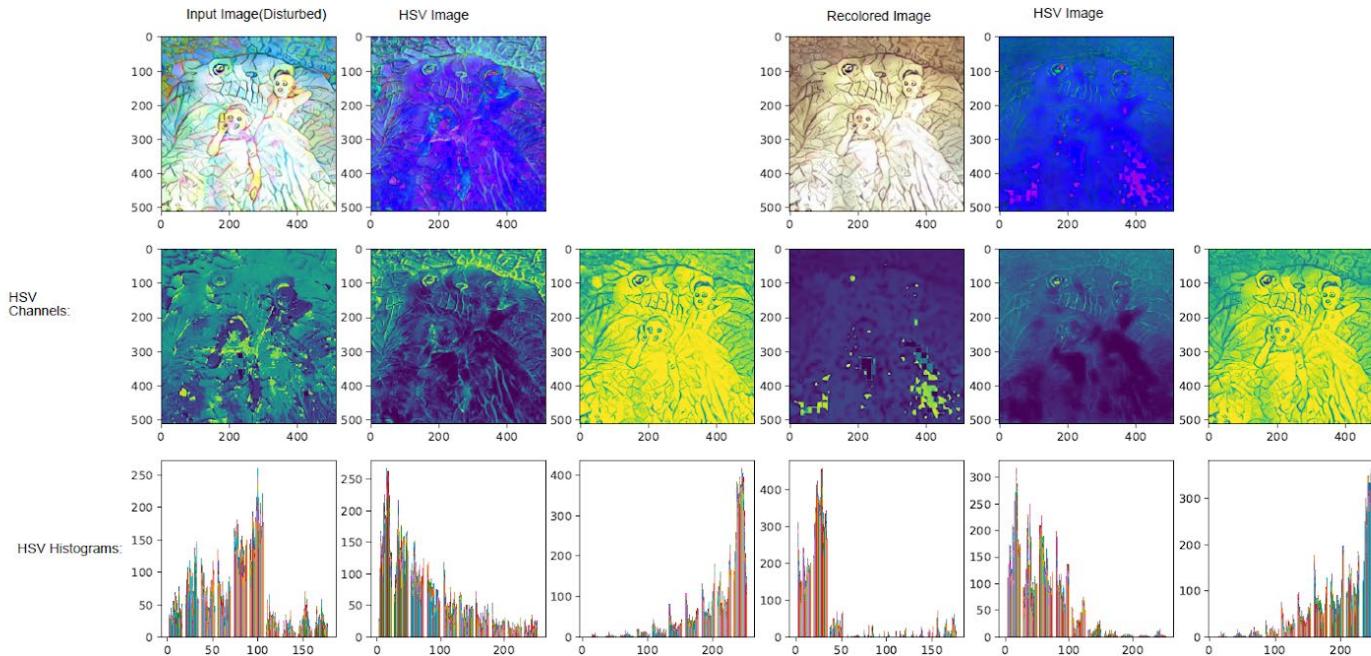


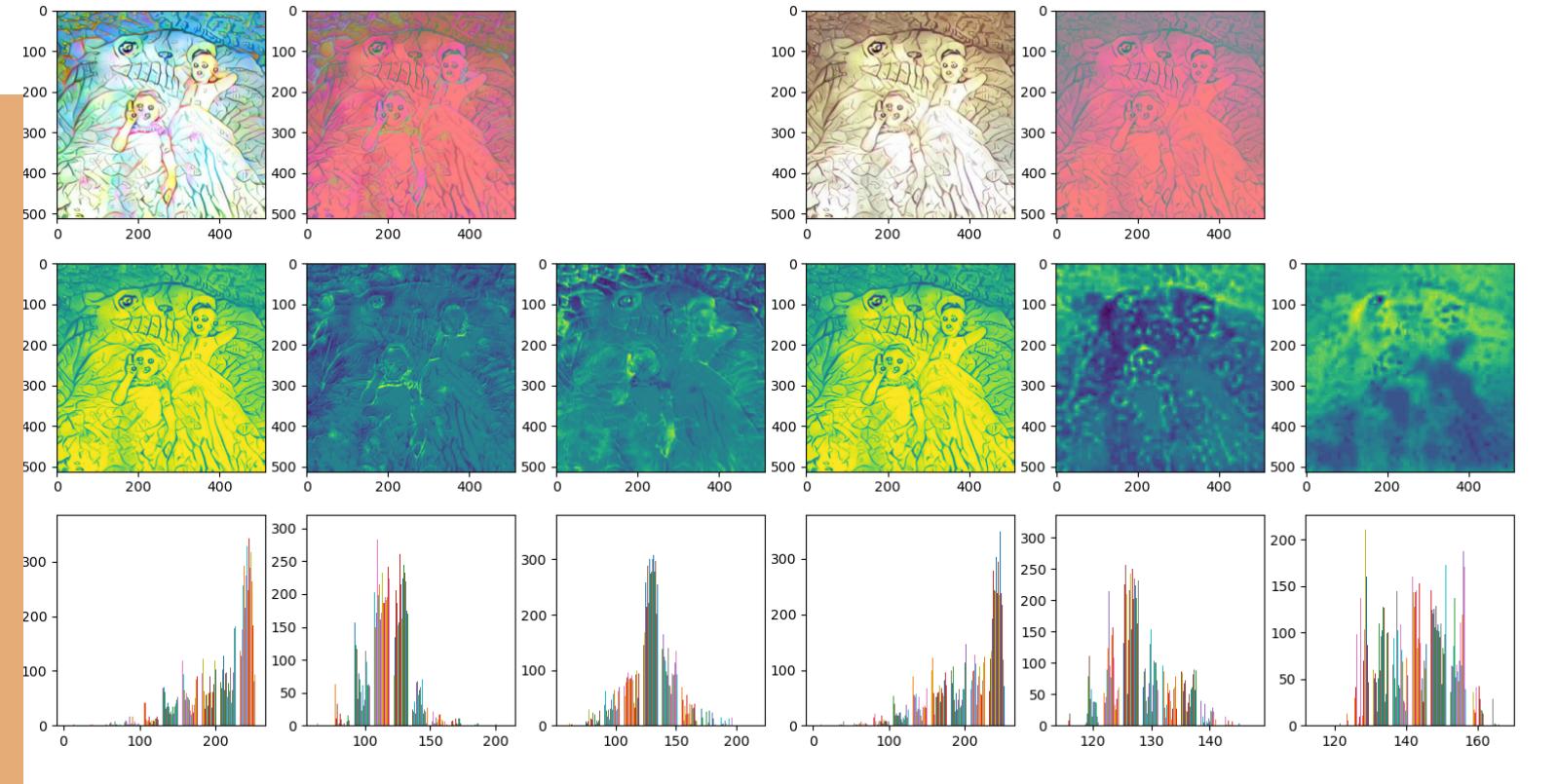
# Evaluation

# Similarity Metrics

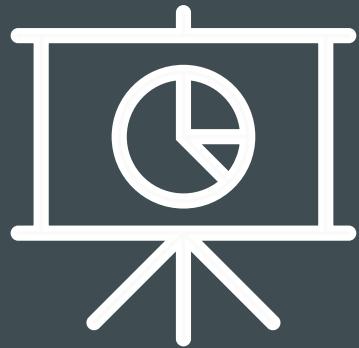


# HSV Comparision





# 09

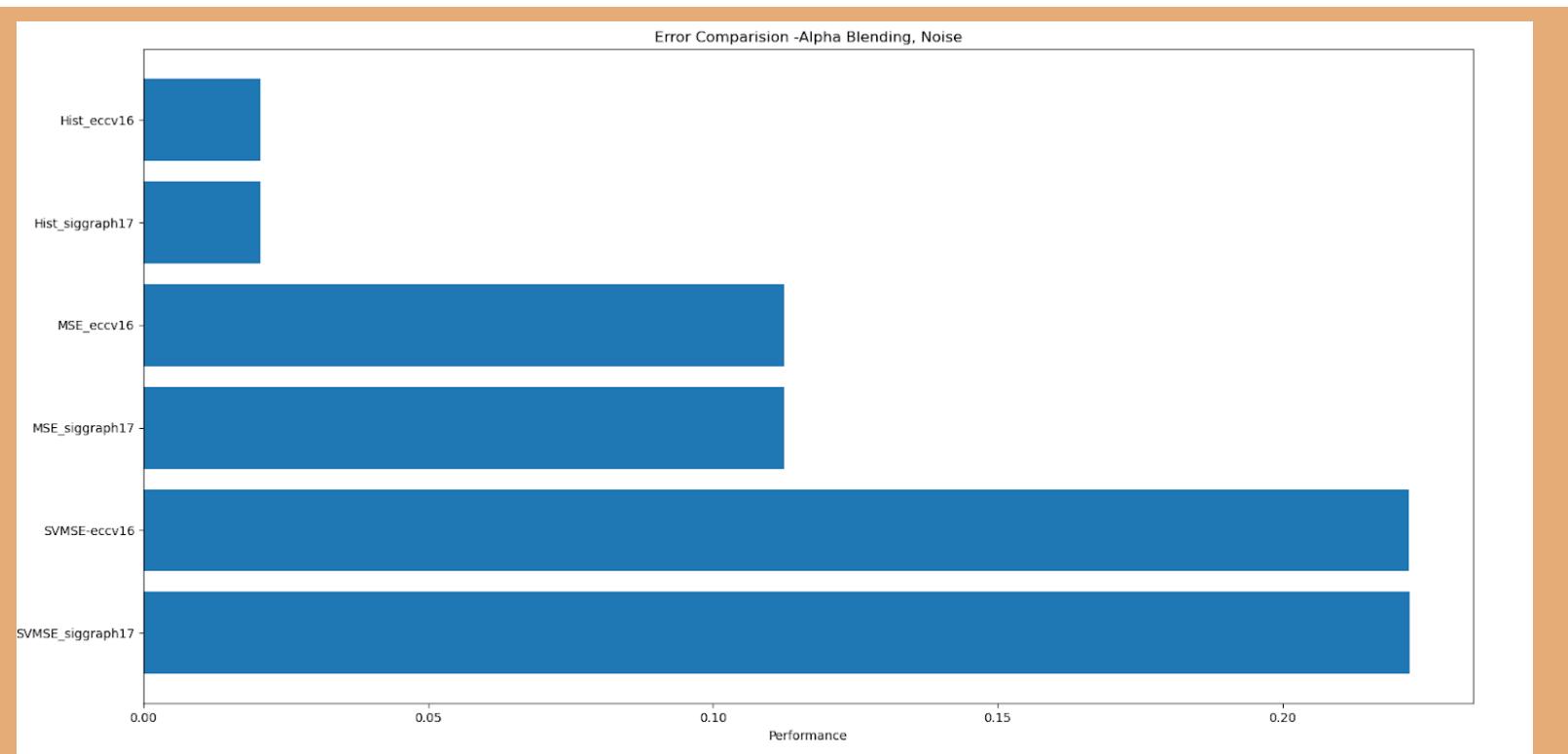


# Results

# Disturbed Image



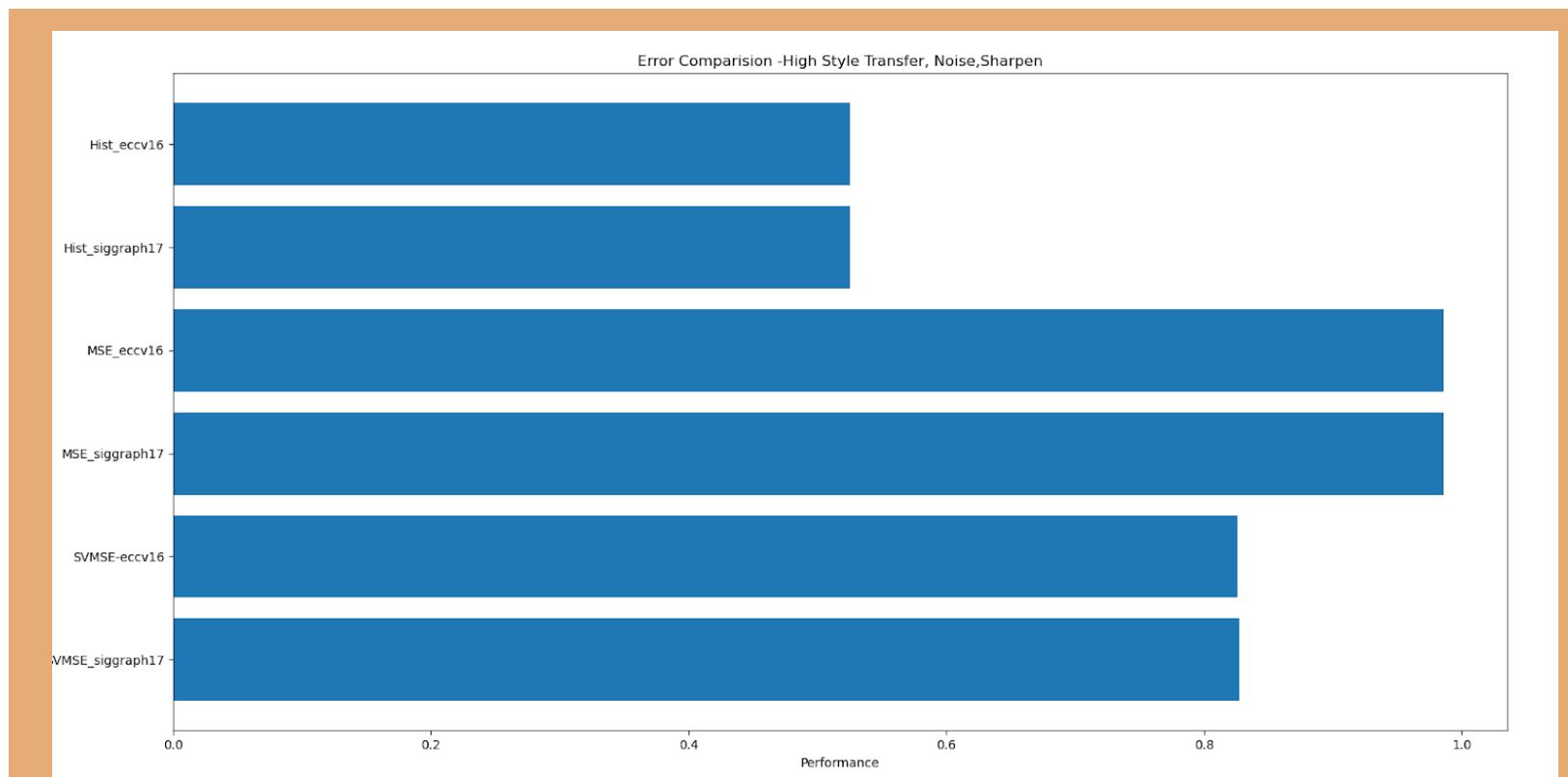
# Error Comparision



# Disturbed Image



# Error Comparision



# 10



## Fail Cases

# **Fail Cases**

**Input**



**Disturbed**



**Greyscale**



**Palette**



**Deoldify**

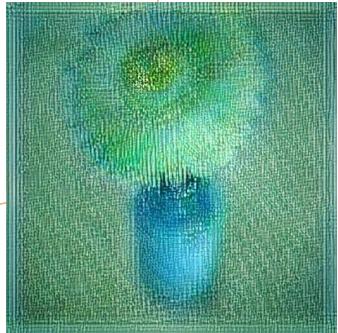


**Zhang\_eccv16**

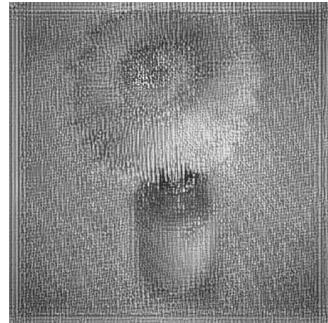


## **Fail Cases**

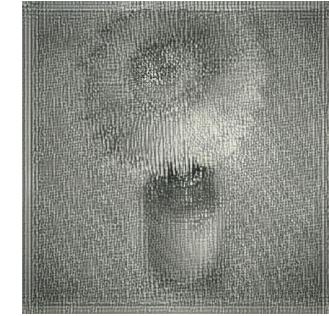
**Disturbed**



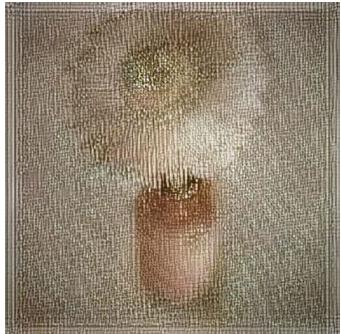
**Greyscale**



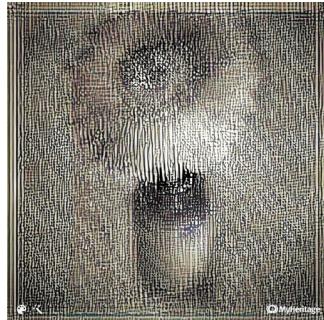
**DeepAI**



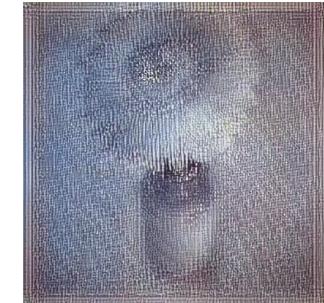
**Palette**



**Deoldify**



**Zhang\_eccv16**



# Fail Cases

Input

Disturbed

Greyscale



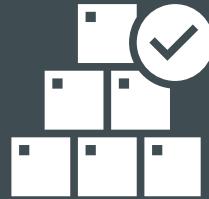
Palette

Deoldify

Zhang\_eccv16



11



# Best Cases

# Best Cases

Input



Disturbed



Greyscale



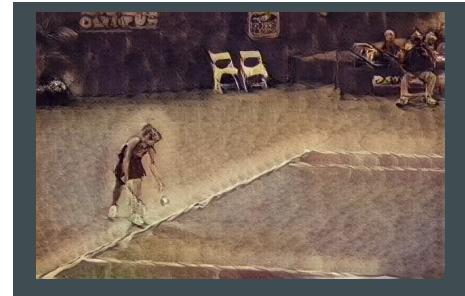
Palette



Deoldify



Zhang\_eccv16



## Best Cases

Disturbed



Greyscale



DeepAI



Palette



Deoldify



Zhang\_eccv16

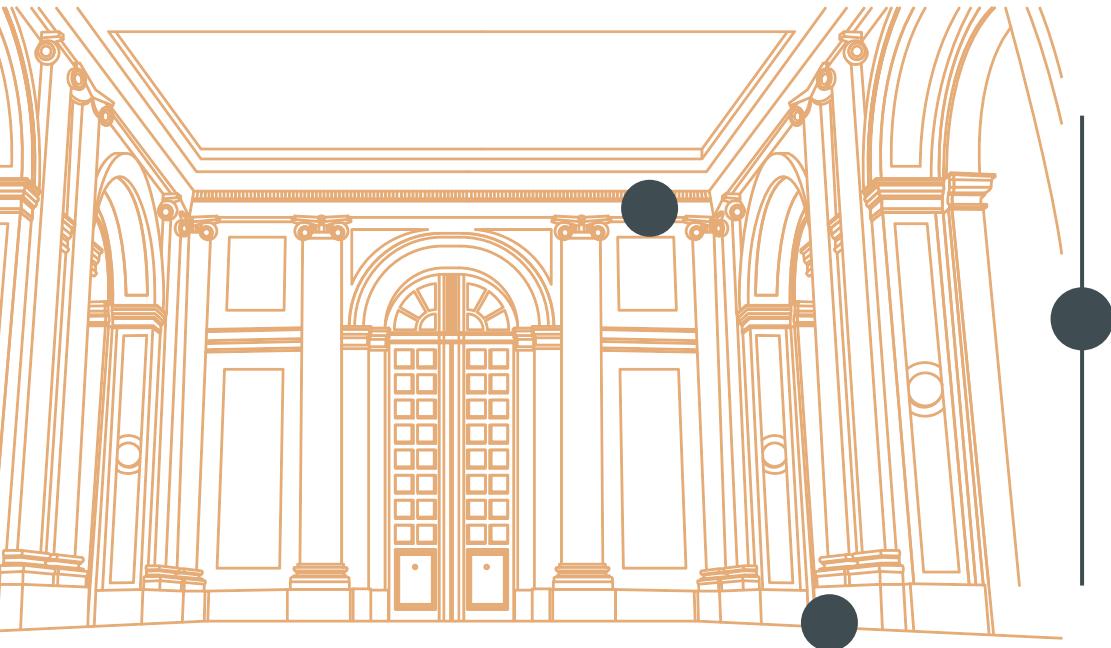


# 12



# Conclusion

## Inferences



- Models in general are robust against rotation.
- Deepai – Paracolorizer is not robust against multiplicative noise
- Zhang\_eccv16 model has a bias towards red color
- Apart from Palette, rest of the models do not have great variation in hue.

# 13



## Future Scope

## Future

Performing Machine Learning to find correlations between combination of disturbances with similarity scores given by different models.



# 14



## References

## References

- <https://richzhang.github.io/colorization/>
- <https://cocodataset.org/#home>
- [https://albumentations.ai/docs/getting\\_started/transforms\\_and\\_targets/](https://albumentations.ai/docs/getting_started/transforms_and_targets/)
- <https://www.myheritage.com/incolor/>
- <https://deepai.org/machine-learning-model/colorizer>
- <https://palette.fm/>