

Evaluating CycleGANs for generating art: from realism to abstract art – Supplementary material

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I. LOSSES

A. Discriminator loss

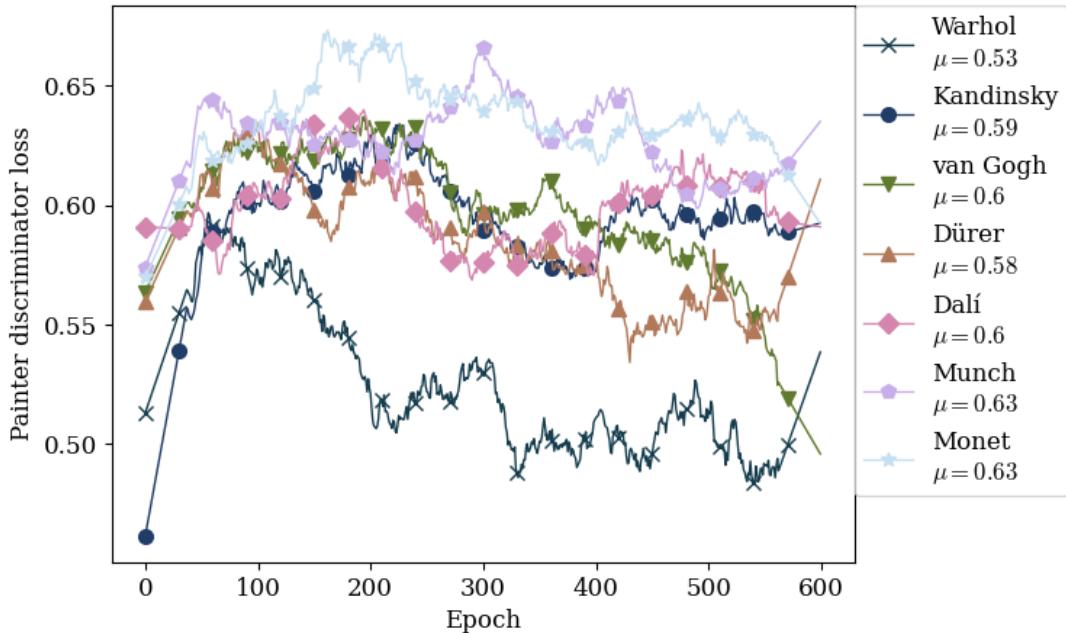


FIG. 1: The plot shows the smoothed art discriminator training loss with the ResNet architecture for each of the painters. The discriminator loss is of much lower magnitude than generator loss, and appears to be more disorganized. However, there seems to be a tendency of painters exhibiting lower generator loss to have higher discriminator loss.

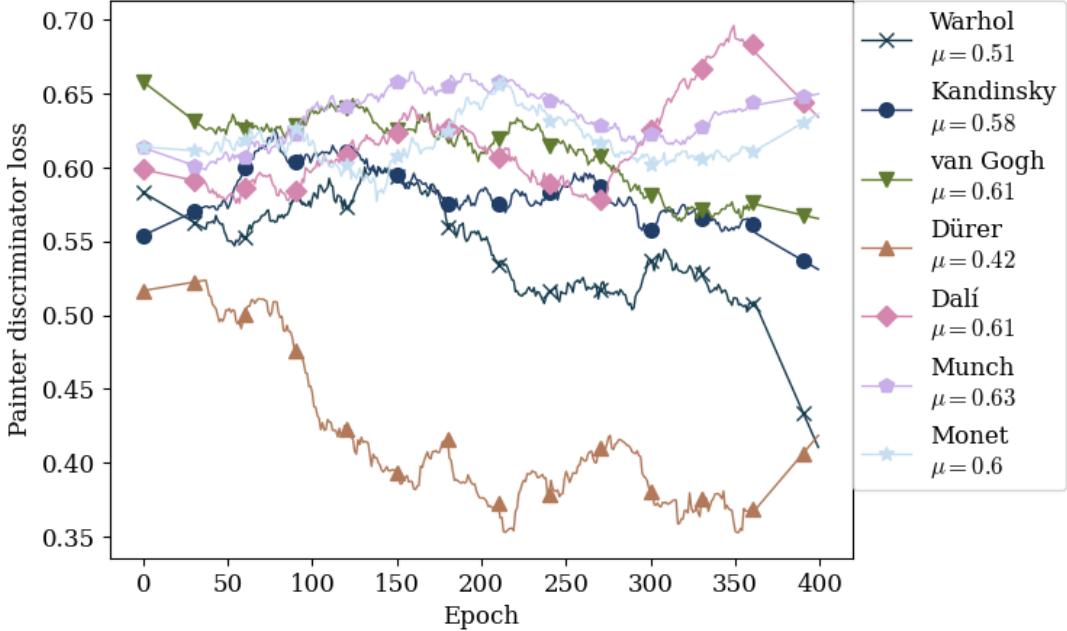


FIG. 2: The plot shows the smoothed art discriminator training loss with the U-Net architecture for each of the painters. The discriminator loss is of much lower magnitude than generator loss. In this case, a negative correlation between discriminator and generator is clear.

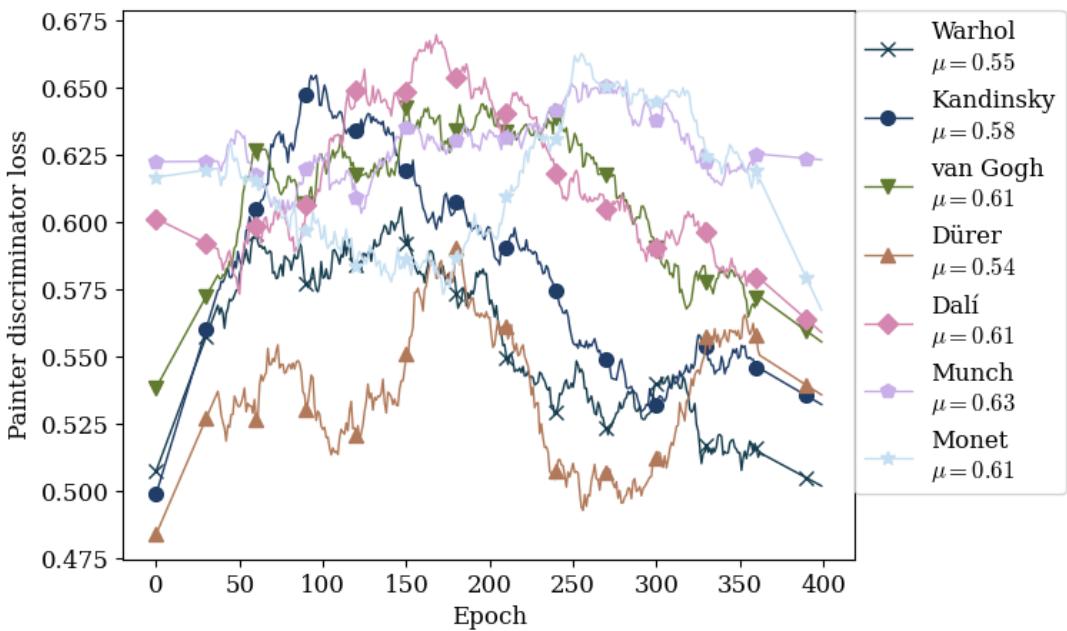


FIG. 3: The plot shows the smoothed art discriminator training loss with the U-Net architecture for each of the painters. The discriminator loss is of much lower magnitude than generator loss. There seems to be a tendency of painters exhibiting lower generator loss to have higher discriminator loss.

B. Cycle loss

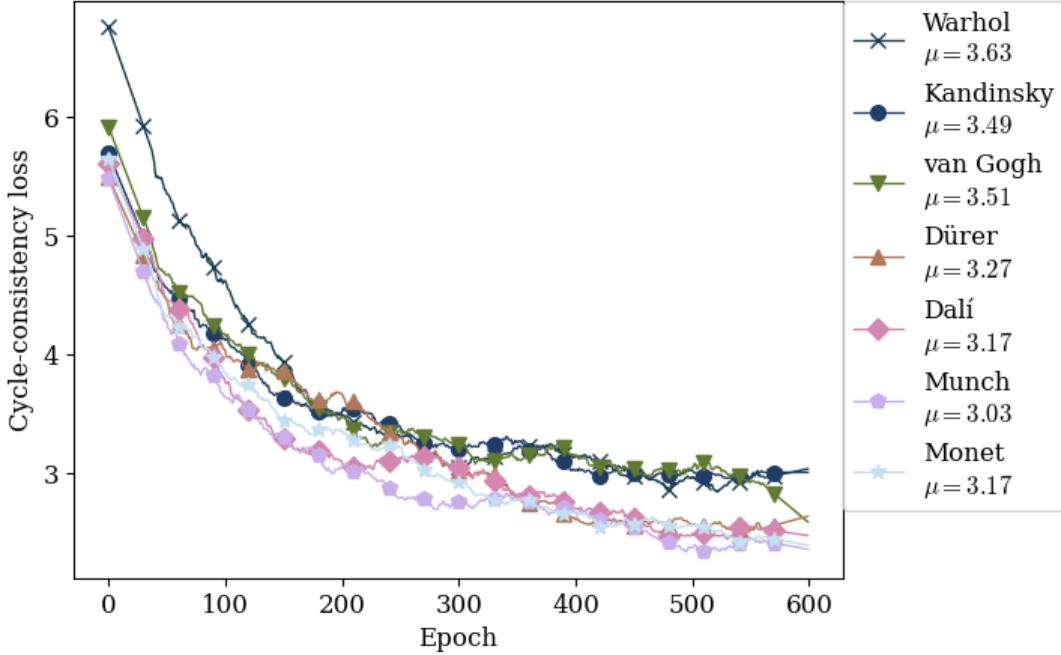


FIG. 4: The plot shows the smoothed cycle-consistency loss with the ResNet architecture for each of the painters. The ResNet cycle loss makes up approximately half of the total generator loss. The cycle loss also mimics the appearance of the generator loss by showing the same small divide between van Gogh, Kandinsky, Warhol and the rest.

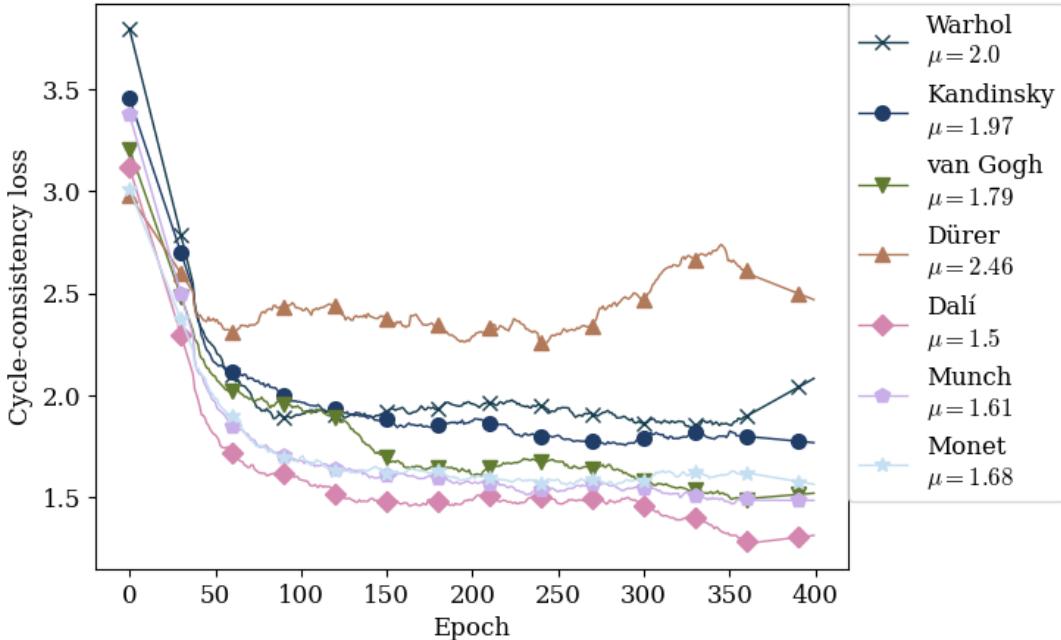


FIG. 5: The plot shows the smoothed cycle-consistency loss with the U-Net architecture for each of the painters. The U-Net cycle loss makes up approximately half of the total generator loss.

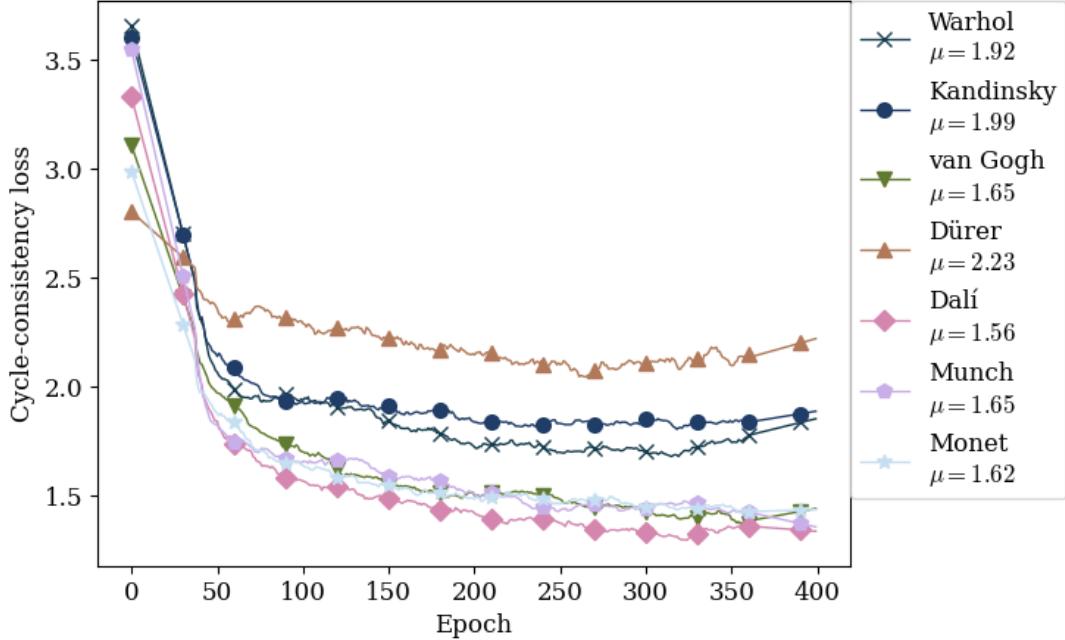


FIG. 6: The plot shows the smoothed cycle-consistency loss with the improved U-Net architecture for each of the painters. The U-Net cycle loss makes up approximately half of the total generator loss.

II. CYCLED IMAGES



FIG. 7: Examples of cycled photos for all painters with the ResNet architecture. Some residual effects from the painters' styles are still seen.



FIG. 8: Examples of cycled photos for all painters with the U-Net architecture. All cycled images look very similar to the query, except for Dürer. Dürer gets a more yellow tinge than expected.



FIG. 9: Examples of cycled photos for all painters with the improved U-Net architecture. All cycled images look very similar to the query, except for Dürer. Some improvements such as a better color on the sky and less yellow cityscape are seen for Dürer when compared with standard U-Net.

III. GOOGLE REVERSE IMAGE SEARCH



Image size:
256 × 256

No other sizes of this image found.

Possible related search: [grassland](#)

<https://en.wikipedia.org/wiki/Grassland> ▾

Grassland - Wikipedia

Grasslands are areas where the vegetation is dominated by grasses (Poaceae). However, sedge (Cyperaceae) and rush (Juncaceae) can also be found along ...

<https://www.britannica.com/science/Environment> ▾

grassland | Definition, Animals, Plants, Types, & Facts ...

Grassland, area in which the vegetation is dominated by a nearly continuous cover of grasses. Grasslands occur in environments conducive to the growth of this ...

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Grassland 



Grasslands are areas where the vegetation is dominated by grasses. However, sedge and rush can also be found along with variable proportions of legumes, like clover, and other herbs. Grasslands occur naturally on all continents except Antarctica and are found in most ecoregions of the Earth. [Wikipedia](#)

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FIG. 10: Searching a generated painting in the style of Monet with Google reverse image search. The visually similar images are original Monet paintings.



Image size:
256 × 256

No other sizes of this image found.

Possible related search: [fine arts](#)

https://en.wikipedia.org/wiki/Fine_art ▾

Fine art - Wikipedia

Historically, the five main **fine arts** were painting, sculpture, architecture, music, and poetry, with performing arts including theatre and dance. ... In practice, outside ...

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Fine Arts



In European academic traditions, fine art is art developed primarily for aesthetics or beauty, distinguishing it from decorative art or applied art, which also has to serve some practical function, such as pottery or most metalwork. [Wikipedia](#)

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FIG. 11: Searching a generated painting in the style of Kandinsky with Google reverse image search. The visually similar images are original Kandinsky paintings. Furthermore, the generated painting is classified as fine arts.

IV. COLOR STATISTICS

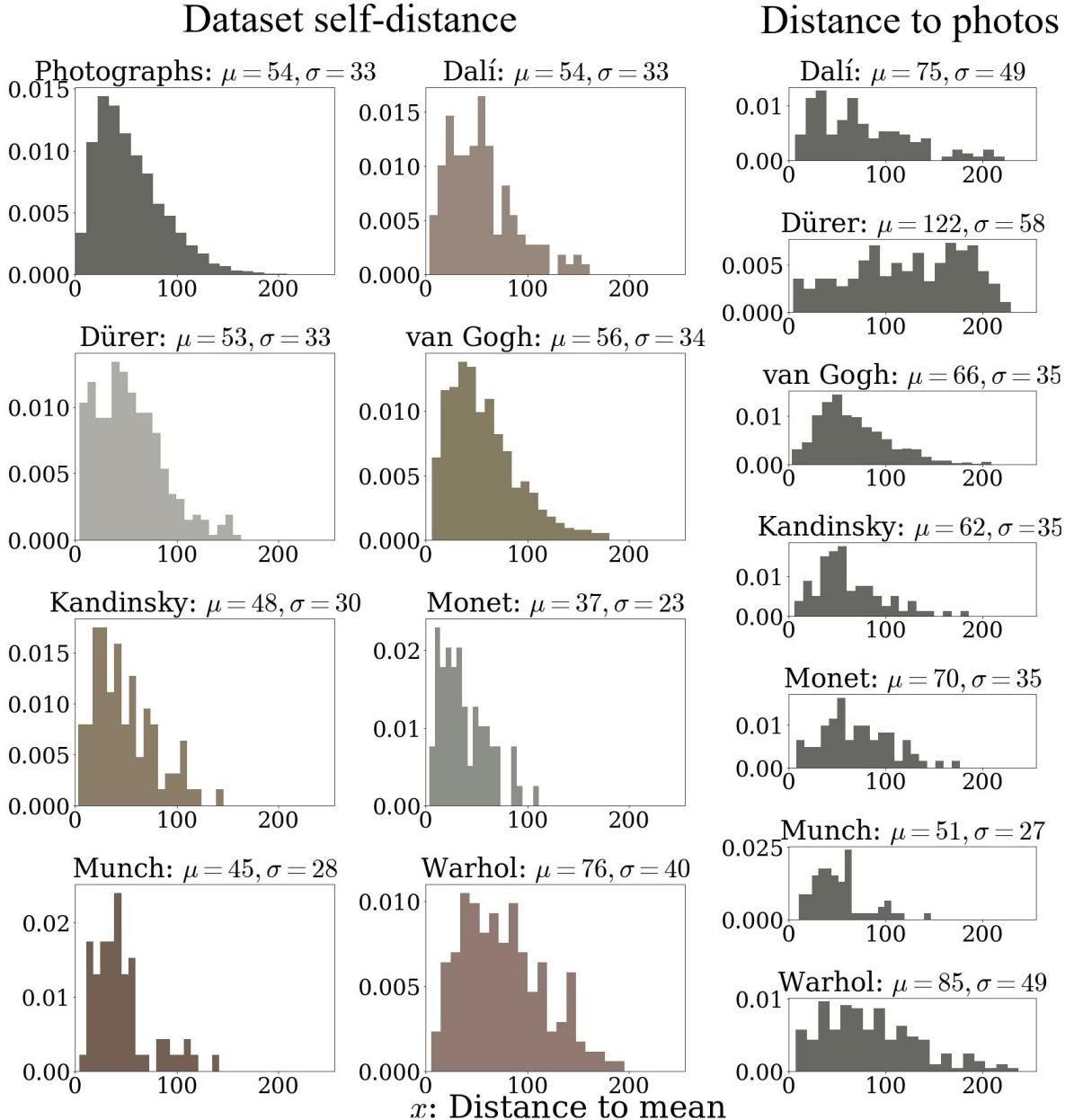


FIG. 12: Histograms of Euclidean distances in RGB space of images within each dataset to the specific dataset mean color. The third column shows the distances to the photo dataset mean color. The first and second column histograms are colored according to the dataset mean color. These seem to correspond quite well with the general color schemes of generated artworks. The x -axis shows the distance to the dataset mean color, and the y -axis shows the normalized frequencies. μ is the dataset mean and σ the standard deviation. For the dataset self-distance, the high mean and standard deviation for Warhol and the low mean and standard deviations for Monet and Munch could partially explain why the painters are on the opposite sides of the loss spectrum, but no clear conclusion can be drawn from these histograms alone.

V. GENERATED TEST IMAGES

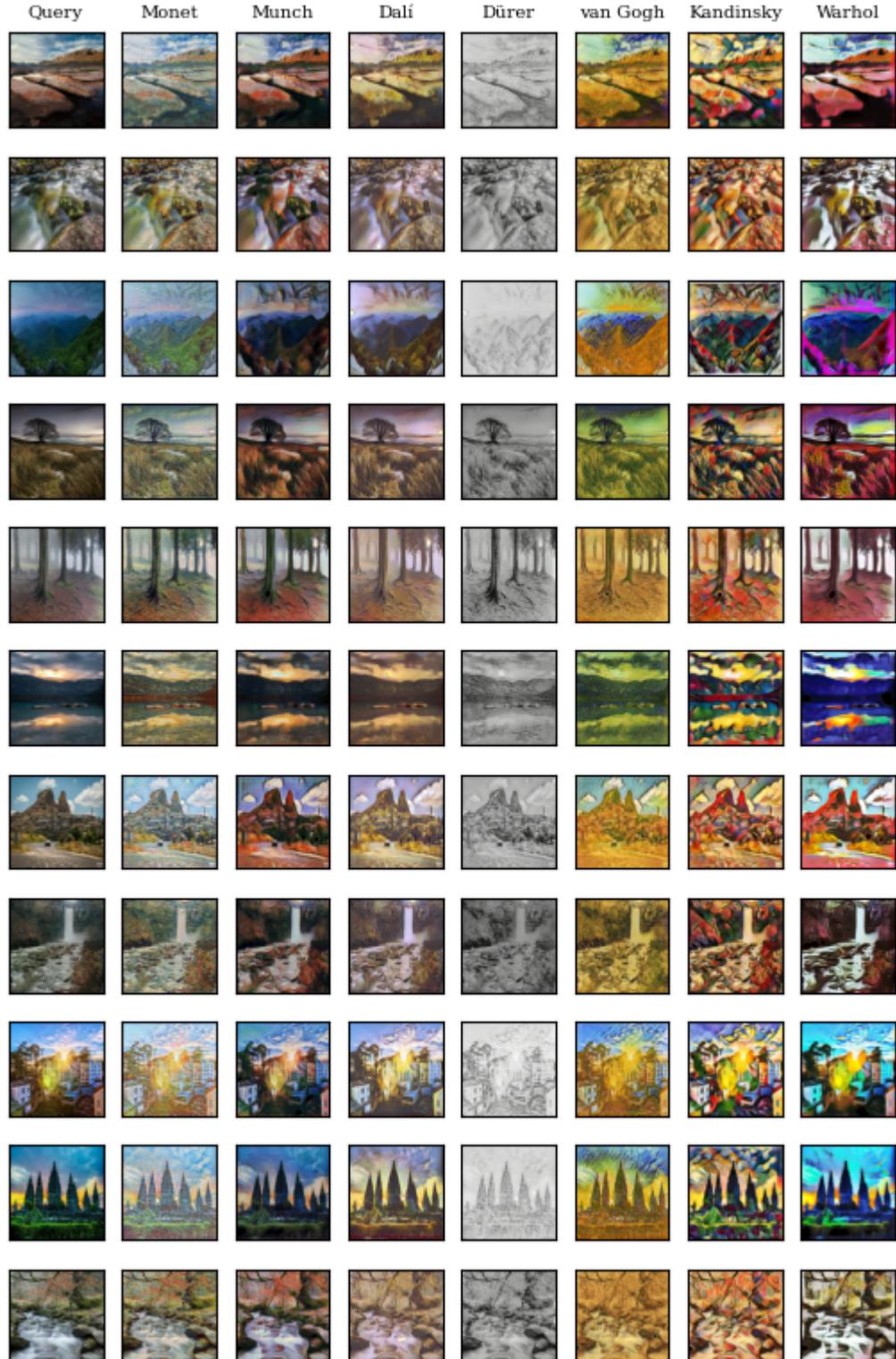


FIG. 13: Generated ResNet artworks for some of the test images. ResNet appears to produce the most natural transformations, with the least artifacts.

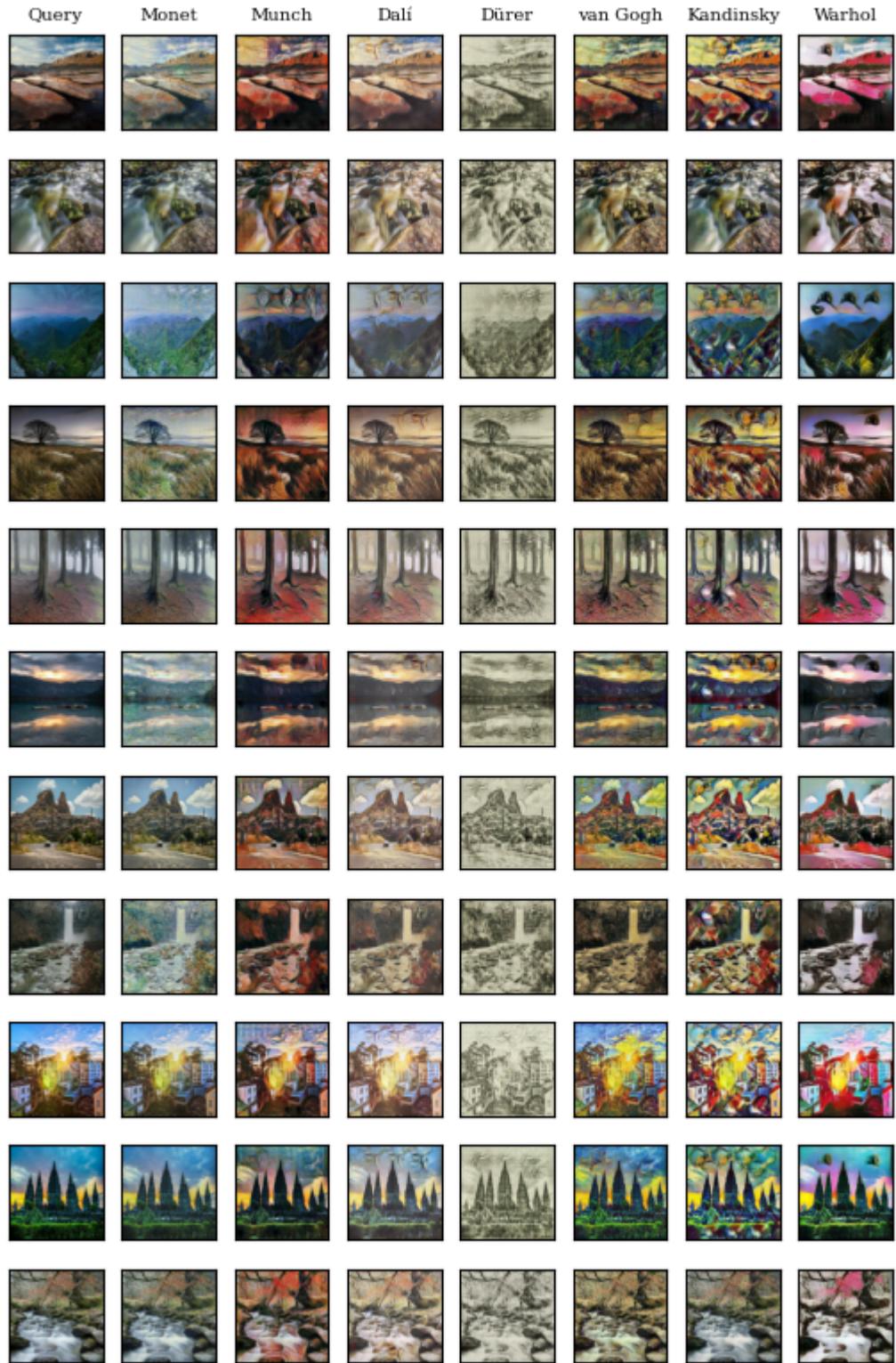


FIG. 14: Generated U-Net artworks for some of the test images. U-Net is prone to producing more artifacts than ResNet.

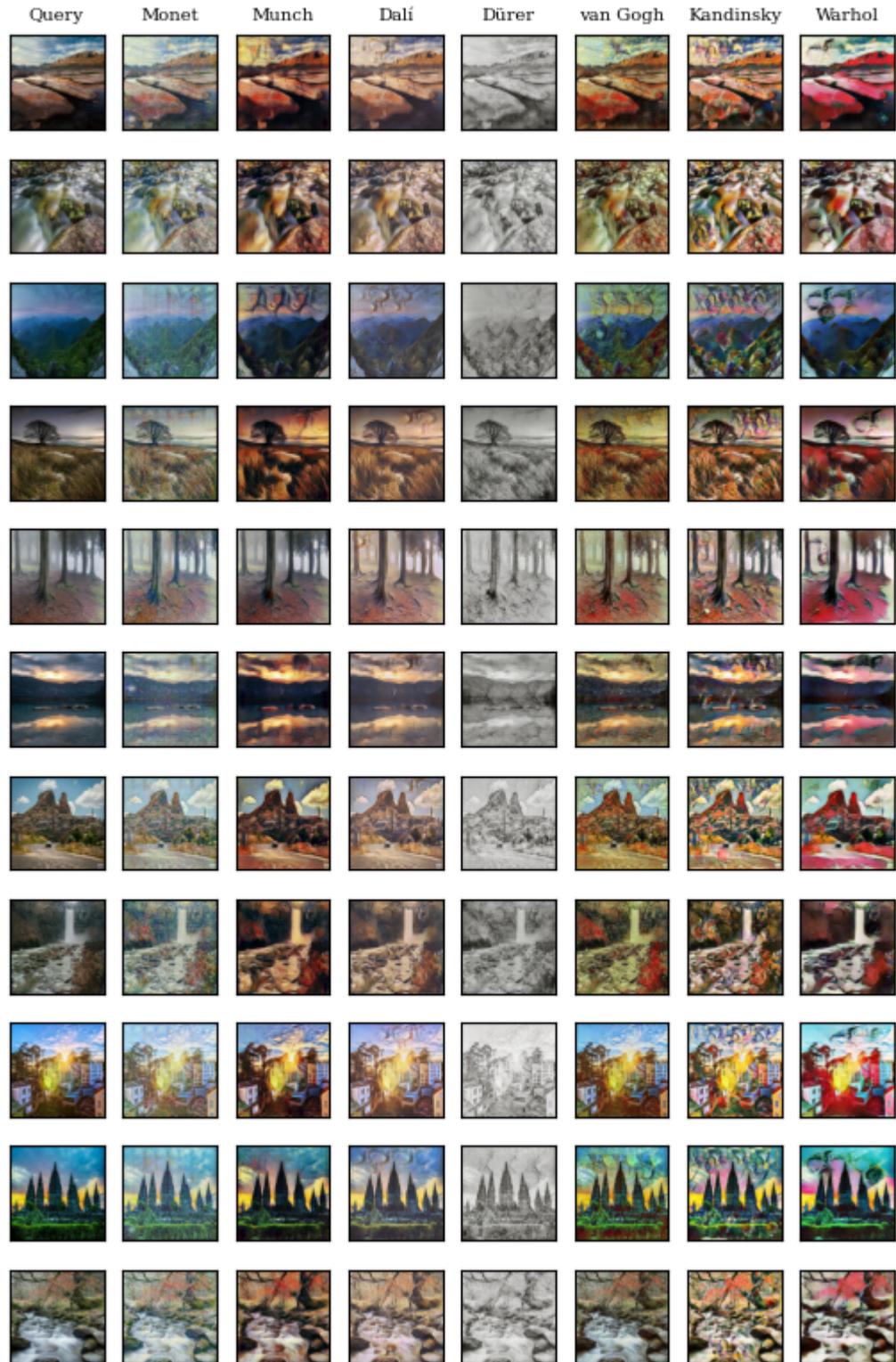


FIG. 15: Generated improved U-Net artworks for some of the test images. The most obvious change is that the generated Dürer artworks have a less yellow tinge compared to U-Net.



(a) Query



(b) Kandinsky

FIG. 16: Comparison between query image and ResNet generated art in fuller scale. **(a)**: original image (query) and **(b)**: a generated artwork in the style of Kandinsky.