Machine Learning for the Arts

UCSD SPRING 2019

FINAL PROJECT

Contour Transformation

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DESCRIPTION

Concept:
Our concept comes from the Holistically-Nested Edge models which can be used to create contour sketches of real images. We want to extend a similar idea of constructing a contour from an image to the idea of reconstructing the contour back to an image. Hopefully we can provide an insight to artists to observe the changes in between the constructing and reconstructing images to contours and contours to images. At the same time, We can also continue to explore the transformation of images from a cat into a tiger because one of our previous projects did not manage to create a good transformation.it serves as a first step to realize our concept. In addition, we want to achieve a better transformation.

Technique:
The technique we choose are based on the Holistically-NestedEdgeDetection model and pix2pix model. Holistically-NestedEdgeDetection (HED) algorithm detects edges and adopt the VGGNet architecture which takes an input, and then the input goes through a series of convolution layers and generate the output at the end. Pix2pix model is another pair images to images transformation that uses Generative Adversarial Network (GANs). The Network consists of discriminator and generator. Discrimitor plays the role to detect the images generated by generator, and the generator generated fake images to trick the discriminator.

Process:
Since the transformation has been explored using cycleGAN in our previous project, we use the other models to implement our idea. A pretrained model of HED is managed to generate contours from the input image with different convolution layers of the model. We obtain the cat and tiger images from sketchy dataset. We take the generated contours as the pair images to train the pix2pix model. Meanwhile, we also take sketches from sketchy dataset as the input pair images to train the pix2pix model.

Training ideas
Tiger contour(HED) + Tiger real images ------training in pix2pix model ----->
contour2tiger_trained_model
Tiger sketches + tiger real images -----training in pix2pix model
------>sketches2tiger_trained_model

Testing purposes

Input cat sketches ----contour2tiger trained model -----> tiger

Result folder:

ml-art-final2-amcda-anymlcandoart\results\contour2tiger_trained_model\tes-set

Input cat contour (HED) ----contour2tiger trained model ------> tiger

Result folder:

ml-art-final2-amcda-anymlcandoart\results\contour2tiger_trained_model\tes_set2

Input cat sketches -----sketches2tiger trained model -----> tiger

Result folder:

ml-art-final2-amcda-anymlcandoart\results\sketch2tiger_trained_model\test_set_example1

Input cat contour (HED)-----sketches2tiger trained model ------> tiger

Result folder:

ml-art-final2-amcda-anymlcandoart\results\sketch2tiger_trained_model\test_set_example2

Difficulties encountered

We are not familiar with original HED github repository that utilize the caffe[2] frameworks, so we make use of the pretrained model offered by harsimrat-eyeem. However the model offered by harsimrat-eyeem has some limitations too. We are trying to figure how to manually changing the parameter, canny scales σ as mentioned in [1]. Alternatively, we use the HED model which modified by harsimrat-eyeem to convert the images into contours.

Also, datahub doesn't allow the package management and environment set up(apt, apt-get, pip2, sudo, etc.), So we set up the conda virtual environment to actually allow changing the setting of linking library and packages. We have gone through many issues to create the machine to actually run through Holistically-Nested Edge models since it requires cuda8.0 instead of 9.0 and libjpeg-dev. One of the biggest is the non-support so we ended install it on our own machine.
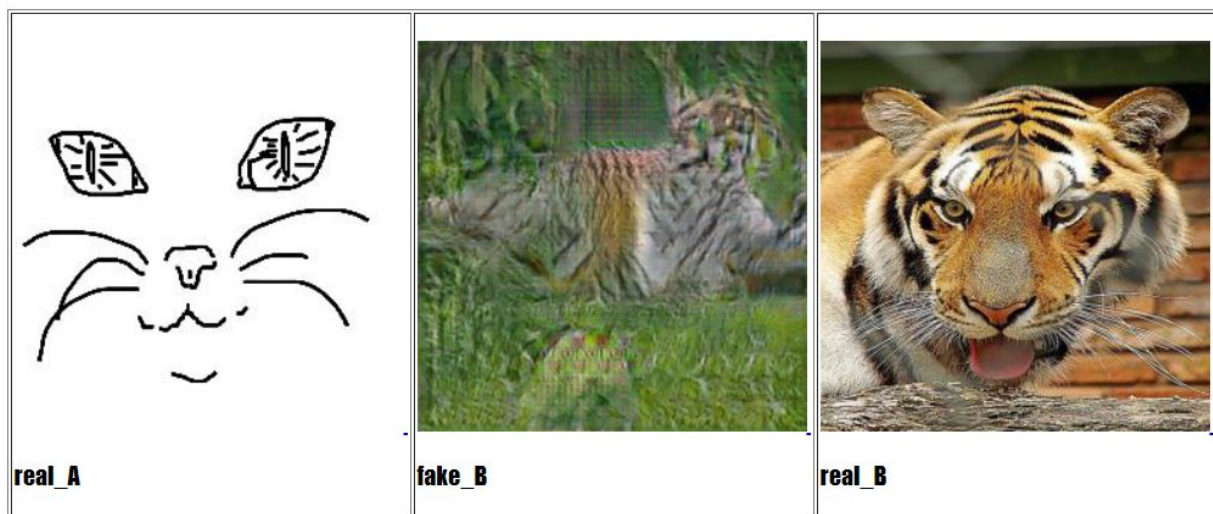
Result:

real_A   fake_B   real_B
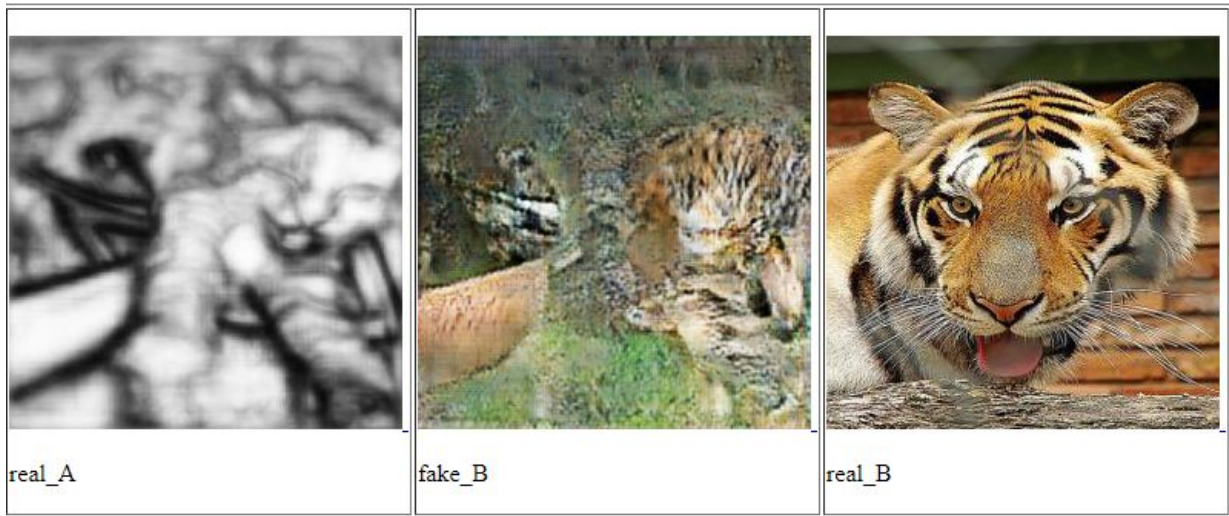
This test_set2 which convert the contour to tiger using contour2tiger model

real_A   fake_B   real_B
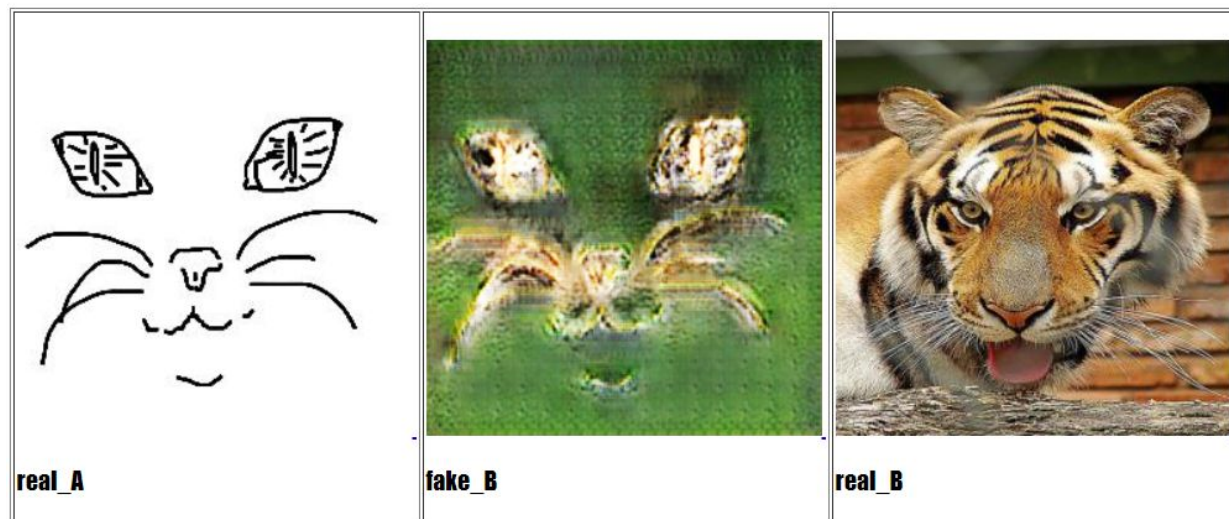
This is test_set example 1 which converts the sketches to tiger using contour2tiger model

real_A   fake_B   real_B

Test set example 2 which converts the contour to tiger using sketch2tiger model

real_A   fake_B   real_B

Test set example 1 which converts the Sketches to tiger using sketch2tiger model

Reflection:
The reason we choose these images from many generated results is because they fail in different significant ways. Through the image generating process, we can definitely see how machine try hard to interpret the contour with either hand-writing or machine generation. The reconstruction from the contour to image using pix2pix model does not work well. It is mainly because pix2pix model is leaning toward coloring the input sketches given random sketches as an input.

We are a bit disappointed about pix2pix model might not have a fairly good interpretation on the black and white photos and especially contour feeds, so the result looks a bit of confusing and misleading. It failed to generate a good intermediate transformation between a cat and a tiger. Future direction would be choosing the other generative method like DCGANs to explore the way to generate the intermediate result of reconstructing from sketches to real images.

REFERENCE:

[1] Saining Xie, Zhuowen Tu, Holistically-NestedEdgeDetection
https://arxiv.org/pdf/1504.06375.pdf

CODE: https://github.com/ucsd-ml-arts/ml-art-final2-amcda-anymlcandoart