Topic: Neural Art Methodology

What are the common AI tools used in the realm of visual art creation?
How does artists uses them and what outcome has been achieved?
How do I make breakthroughs in this "AI x Art"?

I. Artists to study

- **Mario Klingemann** (Google Arts, huge resources)
- **Sofia Crespo** (Biology texture synthesis)
- **Anna Ridler** (custom dataset)
- **Robbie Barrat** (Stanford young coder, actual author of the first AI artwork sold in the auction)
- **Tom White** (aesthetically-pleasing outcome)
- **Sougwen Chung** (Collaboratively drawing with AI robot arms)
- **Memo Akten** (webcam gan, use towels to generate fire/ocean images)

* A longer list:
https://news.artnet.com/market/9-artists-artificial-intelligence-1384207
https://www.artsy.net/article/artsy-editorial-art-failing-grasp-christies-ai-portrait-coup
http://www.naturemorte.com/exhibitions/gradientdescent/

* Other names: (art-related researcher)
- Gene Kogan: https://genekogan.com
- Aaron Hertzmann: https://www.dgp.toronto.edu/~hertzman/index.html
- Ahmed Elgammal: https://sites.google.com/site/digihumanlab/home

II. Some conclusions:

1. A neural network can be treated as an image synthesizer, creating wilder results, but with less direct control over the result than the tradition image-generating software/algorithms.

2. Artist can guide the AI by changing:
   - Dataset: feeding appropriate dataset; sometimes the artist has to build their unique dataset, which is extremely time consuming
   - Features: decide which features to be considered more, and which less.

3. In the earlier machine learning period, the dataset is smaller and the features and hand-coded. In contrast, in the current deep learning period, as the features are not pre-defined, the dataset has to be big enough for the machine to grasp the features. (like crack a passcode with brutal force, trying on all different possibilities)

4. The breakthrough possibilities lies in:
   - A better **dataset** complies visual artists' taste
   - A better **model** about artistic visual properties. Essentially, how do we experience aesthetics? and how to model this experience with visual features? Maybe visual indeterminacy is one of the answers?

5. Common AI tools categories:
   - Whole image generation (the whole image outcome is generated at once):
     • Neural Style Transfer:
       - https://en.wikipedia.org/wiki/Neural_Style_Transfer
       - https://genekogan.com/works/style-transfer/
     • Texture Synthesis
     • Text to Image https://experiments.runwayml.com/generative_engine/

   - Procedure based image generation: (AI make decision about next step, there is a process of image making)
     • Robots-Human collaborative drawing
       - Drawing Operations, Sougwen Chung, https://sougwen.com/artworks
     • Computer Drawing
       - AARON, Harold Cohen, https://computerhistory.org/blog/harold-cohen-and-aaron-a-40-year-collaboration/
       - Perception Engines, Tom white, https://medium.com/artists-and-machine-intelligence/perception-engines-8a46bc598d57
   - Image recognition and conversion
     • Image To Text
       • Im2txt, Image Caption Generator: https://github.com/tensorflow/models/tree/master/research/im2txt
     • Image Evaluation
     • Image To Sound
       • Nao Tokui, https://twitter.com/naotokui_en/status/963310211950772224

6. The influence of AI art and the future prediction: (Can Computers Create Art?)
   - Elimination: hand-coded algorithm, simulations, etc
   - Improving: More abstract images; More interesting randomizer;

III. Major related Papers
A. GANs
1. Cycle GAN: https://junyanz.github.io/CycleGAN/
   a) Does not need data of image pairs (A and A', B and B'), only need two different dataset.
2. Nvidia hight-res roadimage GAN: https://arxiv.org/abs/1711.11585

        a) Uses image segmentation map to guide the synthesis

        b) uses upscaling training to generate high-res results

        c) Interactive tools

B. Texture Synthesis (generally higher resolution than GAN model, still in exploration)

    1. Deep dream

    2. Learning Texture Manifolds with the Periodic Spatial GAN: https://arxiv.org/pdf/1705.06566.pdf

C. Image Assessment

    1. Datta: https://link.springer.com/chapter/10.1007/11744078_23

        a) Classical image-rating training framework

        b) Image-rating related features

    2. PieAPP: http://openaccess.thecvf.com/content_cvpr_2018/papers/Prashnani_PieAPP_Perceptual_Image-Error_CVPR_2018_paper.pdf

        a) Innovative pairwise-training method

    3. Computational Understanding fo Visual Interestingness: https://dl.acm.org/citation.cfm?id=3301299

        a) A good overview of different paper relating visual interestingness rating, but not very artist-oriented

    4. Openness Predicts: https://www.frontiersin.org/articles/10.3389/fpsyg.2015.01877/full

        a) Psychological user study about aesthetic emotions in aesthetic people

        b) Cares more about aesthetics

D. Other Papers:

    1. Visual Indeterminacy in Generative Neural Art: https://arxiv.org/abs/1910.04639

        a) Why AI art is so popular, why AI is so good at making "art"?

    2. Can Computers Create Art? https://arxiv.org/abs/1801.04486 https://www.youtube.com/watch?v=V6ogUxTqAsA&t=3s

        a) Great sorting out the relationship between AI and art, the future prediction.

IV. Others Resources:

A. ITP Class: Neural Aesthetic: https://ml4a.github.io/classes/itp-F18/