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CS 770 – Deep Learning

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## CS 770 - Deep Learning Final Project

**Project Title:** Generating Images in the Style of a Chosen Artist

**Project Description:** For a very long time, I have enjoyed the art of a man named Yoshitaka Amano and have longed to be able to paint and draw in the same way that he does. However, I am not as artistically inclined as Amano. I could not mimic his style. I thought I could never create art like Amano's, so I pushed the idea to the back of my mind.

After joining this course, the idea came back to my mind. I could create a generative AI using a GAN to take in any image, process it, and generate a new image that has augmented the original to look like Yoshitaka Amano drew it.

**Literature Review:** The concept of generating images using AI has been well-established for years. Similarly, AI has been used to match and identify subtleties in fabrics in a picture, such as the fabric's texture, shapes, and colours, signifying that the AI can pick up and identify the visual subtleties within Amano's art. From that recognition, the GAN can spit out an image that tunes and combines those subtleties at high precision to generate our desired art.

Despite the GAN's appearance of perfection for this task, it's important to recognise that some instabilities and errors may accumulate throughout the generation process. Sometimes these errors are almost undetectable to the human eye; at other times, they may appear as a huge departure from our target. Even so, the cost of these errors will be minimised in this project as it will not generate critical data, such as trying to detect diseases or generate images for organic structures/proteins used in medicine.

**Cloth and Clothing Match:** <https://www.sciencedirect.com/science/article/pii/S0925231219303133>

**GAN Usage and Architectures:** [https://www.researchgate.net/profile/Florentina-Pintea/publication/348565063\\_Creative\\_and\\_Cognitive\\_Explorations\\_in\\_the\\_New\\_Media/links/6005509f45851553a050f441/Creative-and-Cognitive-Explorations-in-the-New-Media.pdf](https://www.researchgate.net/profile/Florentina-Pintea/publication/348565063_Creative_and_Cognitive_Explorations_in_the_New_Media/links/6005509f45851553a050f441/Creative-and-Cognitive-Explorations-in-the-New-Media.pdf)

**Understanding Neural Networks Through Deep Visualization:**

[https://yosinski.com/media/papers/Yosinski\\_2015\\_ICML\\_DL\\_Understanding\\_Neural\\_Networks\\_Through\\_Deep\\_Visualization\\_.pdf](https://yosinski.com/media/papers/Yosinski_2015_ICML_DL_Understanding_Neural_Networks_Through_Deep_Visualization_.pdf)

**Generative AI with Python and TensorFlow 2: Create images, text, and music with VAEs, GANs, LSTMs, Transformer models:** [https://www.amazon.com/Generative-AI-Python-TensorFlow-Transformer/dp/1800200889/ref=sr\\_1\\_1?keywords=9781800208506&linkCode=qs&qid=1680931473&s=books&sr=1-1](https://www.amazon.com/Generative-AI-Python-TensorFlow-Transformer/dp/1800200889/ref=sr_1_1?keywords=9781800208506&linkCode=qs&qid=1680931473&s=books&sr=1-1)

**On instabilities of deep learning in image reconstruction and the potential costs of AI:**  
<https://www.pnas.org/doi/epdf/10.1073/pnas.1907377117>

**Sample Architecture Image:** Apologies, but I cannot provide an exact image of the networks so I will describe it and include a generic outline for an image-generating GAN.

The network is split between 2 smaller Neural Networks, first is to create the generator. This contains 6 hidden layers that alternate between dense and LeakyRelu. The generator will attempt to create an image based on the training data. The generator will try to convince the discriminator that the output of the generator is a real piece of art created by Amano. The output layer will use a tanh activation function.

The discriminator is the second neural network that makes up our GAN. This follows a similar structure to our Generator with 6 hidden layers that are made up of 2 groupings of Dense, LeakyRelu, Dropout, and the output will use a sigmoid activation function.

**Dataset:** The core training data will be based on the images from multiple of Amano's books and Anthologies that have copies of his professional artwork, sketches, etc. Additional art must be pulled or scraped from online sources and then reviewed. These images will go through light pre-processing to prepare them for the network. We may add a trial network at the beginning that attempts to separate his watercolour paintings from his sketches and other artwork.