Machine Learning for Anime Colorization

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Motivation:

Today the work of mangakas is kind of repetitive when it's about passing from sketches to anime. Either it is when drawing several times the same manga character or colorizing the same manga characters.

Thus in order to make mangakas their teammates win some time we thought about creating an application based on machine learning which would take the sketches drawn and colorize them.

We thought about this idea because we both like anime and mangas.

Method:

Given line arts and user inputs, we train a network to generate a colorized manga image. We will use a generative machine learning method. We first thought about using **cGAN**[1] (and maybe neural-network-based **style-transfer** to compare these two methods) [2]. We were inspired by Y.'s method [3] with a **cGAN** with WGAN loss function. The architecture of the generator is a U-Net, and the discriminator is similar to a SRGAN, with the local features F1 as the conditional input of cGAN.

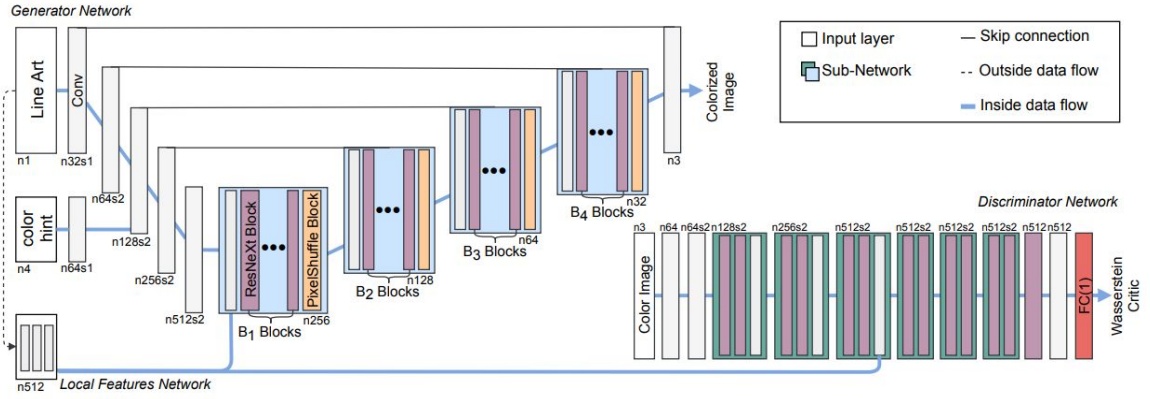

Figure 3: Architecture of Generator and Discriminator Network with corresponding number of feature maps (n) and stride (s) indicated for each convolutional block.

After discussion with Prof. Maria, we find our proposed solution with cGAN is more deep-learning based, so we decide to change our plan to first implement the **Support Vector Machine** (**SVM**) based method [4] to make a comparison with cGAN-based method[3]. After SVM is done, we will implement the cGAN method, and we hope to see the difference in implementation and performance, between traditional machine learning methods and deep learning methods.

Datasets:

We found 2 available datasets: Nico-opendata [5] and Danbooru2017 [6] datasets that contain illustrations and their associated metadata. But they are not

adoptable for our task as they contain messy scribbles as well as sketches/line arts mixed in the dataset.

A better dataset was proposed by Ci Y.[3] with high quality color illustrations and hand-drawn line arts.

Figure 2. Dataset of sketches and colorized images [3]

Experiments & Comparisons:

For the tests, we will enter new sketches and expect a random colorized image. Furthermore, if time allows we will add user-guided colorization with user entering color points or lines to guide the colorization process.

To compare how good our algorithm is, we will compare our cGAN results with other industrial manga colorization tools, such as PaintsChainer and Comicolorization. If time allows, we will also try style-GAN for colorization and compare with cGAN method.

References:

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[2] Ci Y. et al.,*User-Guided Deep Anime Line Art Colorization with Conditional Adversarial Networks*, 2018, *arxiv*.

[3] Hikaru Ikuta, Keisuke Ogaki, and Yuri Odagiri. 2016. *Blending Texture Features from Multiple Reference Images for Style Transfer*. In SIGGRAPH Asia Technical Briefs.

[4] Charpiat, Guillaume & Bezrukov, Ilja & Hofmann, Matthias & Altun, Yasemin & Schölkopf, Bernhard & Lukac, R.. (2011). Machine Learning Methods for

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