

Generating ASCII art from images via Unsupervised Learning

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There have been few developments in the field of ASCII art generation from real world images. One of the earliest forms of algorithm which existed was creating grayscale value, selecting a block, and assigning the most significant letter in the range. A simple example is given here, https://github.com/royninja/image_to_Ascii_art. There has been some work in this field, specially via similarity metrics [1], and CNN [2] but the results can be improved. There has been a few recent works which are resource intensive [3] and using gradients [4] but there can be much improvements.

We propose a novel method by firstly generating the 256 ASCII characters and converting them into images of size 10x10 pixels. What we need to do is use copy autoencoders which will reconstruct the image using MSE loss (if a better loss is discovered which captures the similarity rather than just doing MSE, then it will be better). The problem with MSE loss is it may not be low when two images are visually similar, in that case images are passed through a pre trained model and the difference in deeper layer feature is considered. We get a latent representation for every image, when passed through the autoencoder. We now split the image which needs to be converted to ASCII art to grids of almost similar size and we pass this grayscale image's grid to the autoencoder. We get an array of latent vectors say of dimension 1x8. Now we need to find the difference (Euclidean distance) between all the 256 latent vectors of dimension 1x8 from the ASCII images and this vector. We will select the minimum of those to be placed in here.

An efficient algorithm needs to be implemented here since suppose m be the total number of gray scale grids formed. The number of characters be n , so $m \gg n$ and $O(mn)$ this can be worse when the image size is much. An efficient algorithm can be built here. We can consider another case by taking eigen values and comparing them, or perhaps taking PCA and then finding the similarity metric in an unsupervised way. We can even take different scales of image sizes grid and then compare the similarity. KNN and t-SNE's comparison can also be provided. At last discretizing the image's color value to the letter's color value can also be done.

There won't be much application, but it can be proof of concept, probably image compression and rendering images in ASCII based terminal.

References

- [1] Xuemiao Xu, L. Zhang, and T. Wong. Structure-based ascii art. *ACM SIGGRAPH 2010 papers*, 2010.

- [2] O. Akiyama. Ascii art synthesis with convolutional networks. 2017.
- [3] Y. Takeuchi, D. Takafuji, Y. Ito, and K. Nakano. Ascii art generation using the local exhaustive search on the gpu. In *2013 First International Symposium on Computing and Networking*, pages 194–200, 2013.
- [4] X. Xu, L. Zhong, M. Xie, X. Liu, J. Qin, and T. Wong. Ascii art synthesis from natural photographs. *IEEE Transactions on Visualization and Computer Graphics*, 23(8):1910–1923, 2017.