

# Image Style Transfer



*tl;dr: take the style of one image and apply it to the content of another. Don't like neural networks? Maybe this project is for you!*

The “state-of-the-art,” while very much up to one’s artistic license, uses **moment matching** in deep convolutional neural networks [4]. There are several other approaches, though:

- **patch-based** style transfer [3]: the gist of this method is to transfer style and color by finding and applying a patch in the source image that matches a patch in the target image. The trick is to use local image features to **determine the best scale of a patch** (e.g., image gradients). The proposed algorithm produces decent results but one might notice that it **does not transfer edge styles and misses out on the “semantics” of a style**. Perhaps you could try
  - using **superpixel-based patches instead of squares** (and making this not slow),
  - performing patch transfer at **multiple scales (think pyramids)**
  - finding a **patch similarity metric** that corresponds well to human perception
- **texture synthesis** [1]: a significantly beefed (or vegetable, if that’s more your style) up version of the previous patch-based algorithm. The results are more varied than before and may be considered to be more “visually appealing.”
- If you read the neural style transfer paper, you’ll notice that **the algorithm does not preserve color!** The author has a follow-up work on augmenting the algorithm to **perform color mapping color mapping** [5]. The results are promising but maybe you can improve on them by applying approaches in [2] or devising one of your own!

## References

- [1] Michael Elad and Peyman Milanfar. “Style-Transfer via Texture-Synthesis”. In: *CoRR* abs/1609.03057 (2016). URL: <http://arxiv.org/abs/1609.03057>.
- [2] Hasan Sheikh Faridul et al. “Colour Mapping: A Review of Recent Methods, Extensions and Applications”. In: *Comput. Graph. Forum* 35.1 (2016), pp. 59–88. DOI: 10.1111/cgf.12671. URL: <http://dx.doi.org/10.1111/cgf.12671>.

- [3] Oriel Frigo et al. “Split and Match: Example-Based Adaptive Patch Sampling for Unsupervised Style Transfer”. In: *Proc. CVPR 2016*. 2016. URL: [http://www.cv-foundation.org/openaccess/content\\_cvpr\\_2016/papers/Frigo\\_Split\\_and\\_Match\\_CVPR\\_2016\\_paper.pdf](http://www.cv-foundation.org/openaccess/content_cvpr_2016/papers/Frigo_Split_and_Match_CVPR_2016_paper.pdf).
- [4] Leon A. Gatys, Alexander S. Ecker, and Matthias Bethge. “A Neural Algorithm of Artistic Style”. In: *CoRR* abs/1508.06576 (2015). URL: <http://arxiv.org/abs/1508.06576>.
- [5] Leon A. Gatys et al. “Preserving Color in Neural Artistic Style Transfer”. In: *CoRR* abs/1606.05897 (2016). URL: <http://arxiv.org/abs/1606.05897>.