Applications of deep learning: generating images

This includes problems such as: completing a partial image, colorizing an image, animating an image, upscaling or improving the details in an image, transferring the style of one image to another image, swapping faces between images.

2a. Convolutional neural style transfer
Citation: Leon A. Gatys, Alexander S. Ecker, Matthias Bethge. A Neural Algorithm of Artistic Style. arXiv:1508.06576. 2015. [PDF]
Citation: Leon A. Gatys, Alexander S. Ecker, Matthias Bethge. Image Style Transfer Using Convolutional Neural Networks. In Proceedings of the 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '16). [PDF]
[Notebook (via fhcollet)] [Github] [Github - updates (see references in README)]

2b. Deepfake (face swap)
Survey: Thanh Thi Nguyen, Cuong M. Nguyen, Dung Tien Nguyen, Duc Thanh Nguyen, Saeid Nahavandi. Deep Learning for Deepfakes Creation and Detection: A Survey. arXiv:1909.11573. (2019). [PDF]
Survey: Ruben Tolosana, Ruben Vera-Rodriguez, Julian Fierrez, Aythami Morales, Javier Ortega-Garcia. DeepFakes and Beyond: A Survey of Face Manipulation and Fake Detection. arXiv:2001.00179 (2020). [PDF]
[Faceswap-GAN: Github, notebook] [DeepFaceLab: Github, Colab version]
[Few shot face translation: Github, notebook]

2c. Super resolution with PixelCNN
Citation: Aaron van den Oord, Nal Kalchbrenner, Koray Kavukcuoglu. Pixel Recurrent Neural Networks. In Proceedings of the 33rd International Conference on Machine Learning (ICML '16). [PDF]
Citation: Ryan Dahl, Mohammad Norouzi, Jonathon Shlens. Pixel Recursive Super Resolution. In Proceedings of the 2017 IEEE International Conference on Computer Vision (ICCV '17). [PDF] [Article] [Blog post: PixelCNN][Another blog post]
[Notebook (see "Image Super-Resolution" section)]
[Github: Other models for super resolution, with notebooks]

2d. Image animation
Citation: Aliaksandr Siarohin, Stéphane Lathuilière, Sergey Tulyakov, Elisa Ricci and Nicu Sebe. First Order Motion Model for Image Animation. In Proceedings of the 2019 Conference on Neural Information Processing Systems (NeurIPS '19). [PDF]
[Open review] [Website] [Github] [Notebook]

2e. Sketch RNN
Citation: David Ha, Douglas Eck. A Neural Representation of Sketch Drawings. In Proceedings of the 2018 International Conference on Learning Representations (ICLR '18). [PDF] [Blog post] [Github (official)][Notebook] [Github (notebook)]

2f. LipGAN: generating talking faces from image and audio
Citation: Prajwal K R, Rudrabha Mukhopadhyay, Jerin Philip, Abhishek Jha, Vinay Namboodiri, C.V. Jawahar. Towards Automatic Face-to-Face Translation. In Proceedings of the 27th ACM International Conference on Multimedia (MM '19).
[PDF] [Github] [Notebook] [Another notebook]

2g. Modifying generated images with model rewriting
Citation: David Bau, Steven Liu, Tongzhou Wang, Jun-Yan Zhu, Antonio Torralba. Rewriting a Deep Generative Model. In Proceedings of the 2020 European Conference on Computer Vision. (ECCV '20).
[PDF] [Website] [Video] [Github] [Notebook (demo)]

2h. Generating images with a small number of examples
Citation: Shengyu Zhao, Zhijian Liu, Ji Lin, Jun-Yan Zhu, Song Han. Differentiable Augmentation for Data-Efficient GAN Training. arXiv:2006.10738 (2020). [PDF] [Website] [Github] [Notebook]

2i. Image colorization
Citation: Jason Antic. DeOldify. No paper, but here's a video presentation from Facebook F8 conference, and more details.
[Github (includes notebooks)]
Citation: Patricia Vitoria, Lara Raad, Coloma Ballester. ChromaGAN: Adversarial Picture Colorization with Semantic Class Distribution. In Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV '20).
[PDF] [Video] [Github] [Notebook (demo)]
Citation: Jheng-Wei Su, Hung-Kuo Chu, Jia-Bin Huang. Instance-aware Image Colorization. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR '20). [PDF] [Github] [Website] [Notebook]

2j. Image GPT
Citation: Mark Chen, Alec Radford, Rewon Child, Jeff Wu, Heewoo Jun, David Luan, Ilya Sutskever. Generative Pretraining from Pixels. In Proceedings of the 37th International Conference on Machine Learning (ICML '20). [PDF] [Website] [Github][Notebook] [Notebook (image generation, completion)]
[Note: for that first notebook, I needed to install specific library versions:
`tensorflow==1.13.1 tensorflow-gpu==1.13.1 keras==2.3.0`]

2k. Cartoonization
Citation: Yang Chen, Yu-Kun Lai, Yong-Jin Liu. CartoonGAN: Generative Adversarial Networks for Photo Cartoonization. In Proceedings of the 2018 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '18). [PDF] [Github (unofficial) notebook, blog post][Github (unofficial) notebook, blog post]
Citation: Xinrui Wang, Jinze Yu. Learning to Cartoonize Using White-Box Cartoon Representations. In Proceedings of the 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR '20). [PDF] [Github] [Website]

2l. Face generation

Citation: Tero Karras, Samuli Laine, Timo Aila. A Style-Based Generator Architecture for Generative Adversarial Networks. In Proceedings of the 2019 IEEE Conf. on Computer Vision and Pattern Recognition (CVPR '19). [PDF] [Github]

Citation: Tero Karras, Samuli Laine, Miika Aittala, Janne Hellsten, Jaakko Lehtinen, Timo Aila. Analyzing and Improving the Image Quality of StyleGAN. In Proceedings of the 2020 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '20 [PDF] [Github] [Video] [Notebook (via Jeff Heaton)] [Another notebook]

Citation: Sachit Menon, Alexandru Damian, Shijia Hu, Nikhil Ravi, Cynthia Rudin. PULSE: Self-Supervised Photo Upsampling via Latent Space Exploration of Generative Models. In Proceedings of the 2020 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '20). [PDF] [Github] [Notebook][Video]

2m. Removing obstructions from images

Citation: Yu-Lun Liu, Wei-Sheng Lai, Ming-Hsuan Yang, Yung-Yu Chuang, Jia-Bin Huang. Learning to See Through Obstructions. In Proceedings of the 2020 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '20). [PDF] [Github] [Notebook] [Website] [Video]

2n. Pose transfer

Citation: Zhen Zhu, Tengteng Huang, Baoguang Shi, Miao Yu, Bofei Wang, Xiang Bai. Progressive Pose Attention Transfer for Person Image Generation. In Proceedings of the 2019 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '19). [PDF] [Github (official)]

Citation: Yurui Ren, Xiaoming Yu, Junming Chen, Thomas H. Li, Ge Li. Deep Image Spatial Transformation for Person Image Generation. In Proceedings of the 2020 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '20). [PDF] [Website] [Github (official), especially this]

2o. Deep dream

Citation: Alexander Mordvintsev, Christopher Olah, Mike Tyka. Inceptionism: Going Deeper into Neural Networks. (2015, blog post). [URL] [Github (official, old)] [Notebook]

2p. Text to image

Citation: Scott Reed, Zeynep Akata, Xinchen Yan, Lajanugen Logeswaran, Bernt Schiele, Honglak Lee. Generative Adversarial Text to Image Synthesis. In Proceedings of the 33rd International Conference on Machine Learning (ICML '16). [PDF] [Github (official, old)]
[Github (unofficial, PyTorch)] [Github (unofficial, TF)]

Citation: Tao Xu, Pengchuan Zhang, Qiuyuan Huang, Han Zhang, Zhe Gan, Xiaolei Huang, Xiaodong He. AttnGAN: Fine-Grained Text to Image Generation with Attentional Generative Adversarial Networks. In Proceedings of the 2018 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '18). [PDF] [Github (official, note this)]
[Notebook (unofficial)]