Unsupervised Cross-Domain Image Generation

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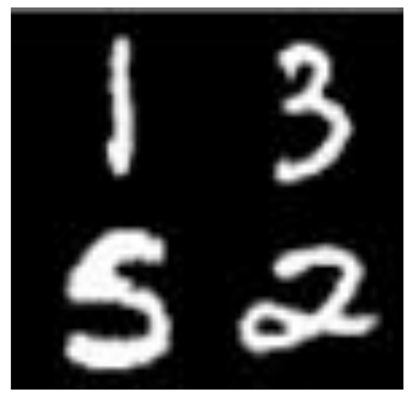
Goals and Motivation

- General domain transfer has varied applications like drawing analogies between different domains and producing new data
- Our aim here is to create a general domain transfer model which maps samples from one domain to another.
- We aim to transfer samples from one domain to another in an unsupervised manner, while preserving the correspondences between the samples.

Our Problem

Source Target



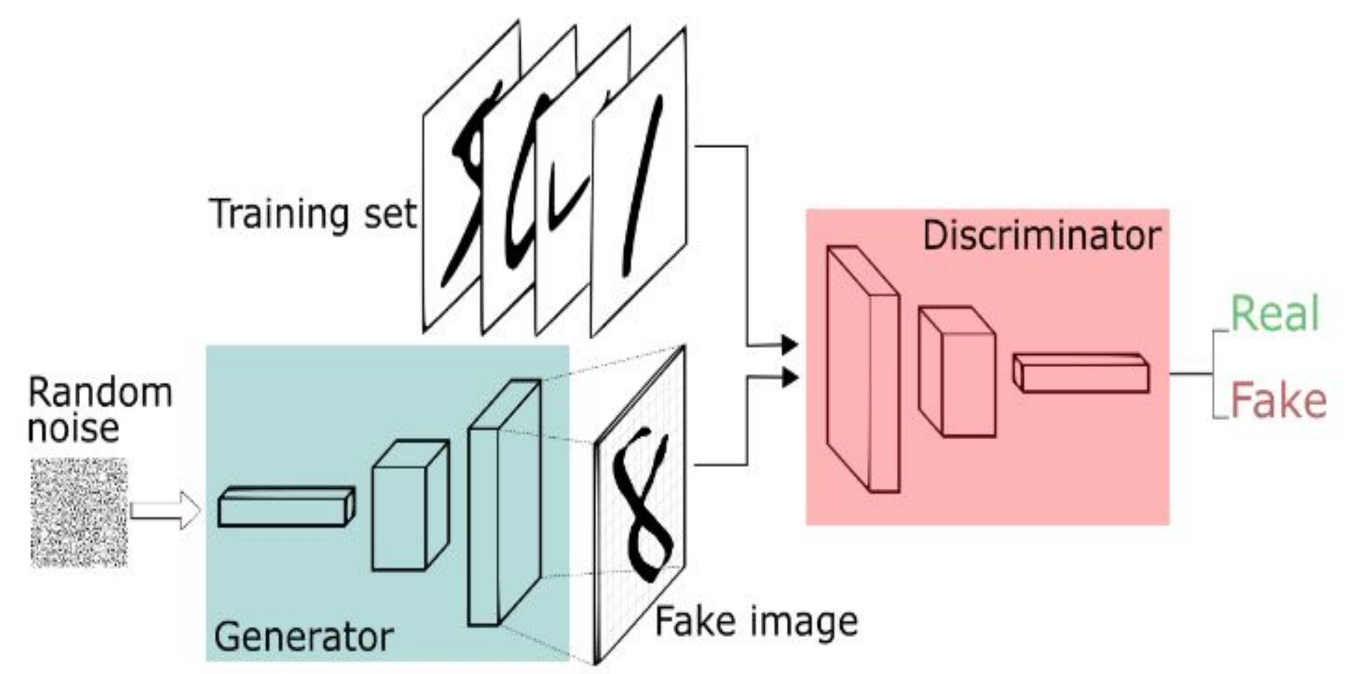
SVHN MNIST

MS Celeb Bitmoji

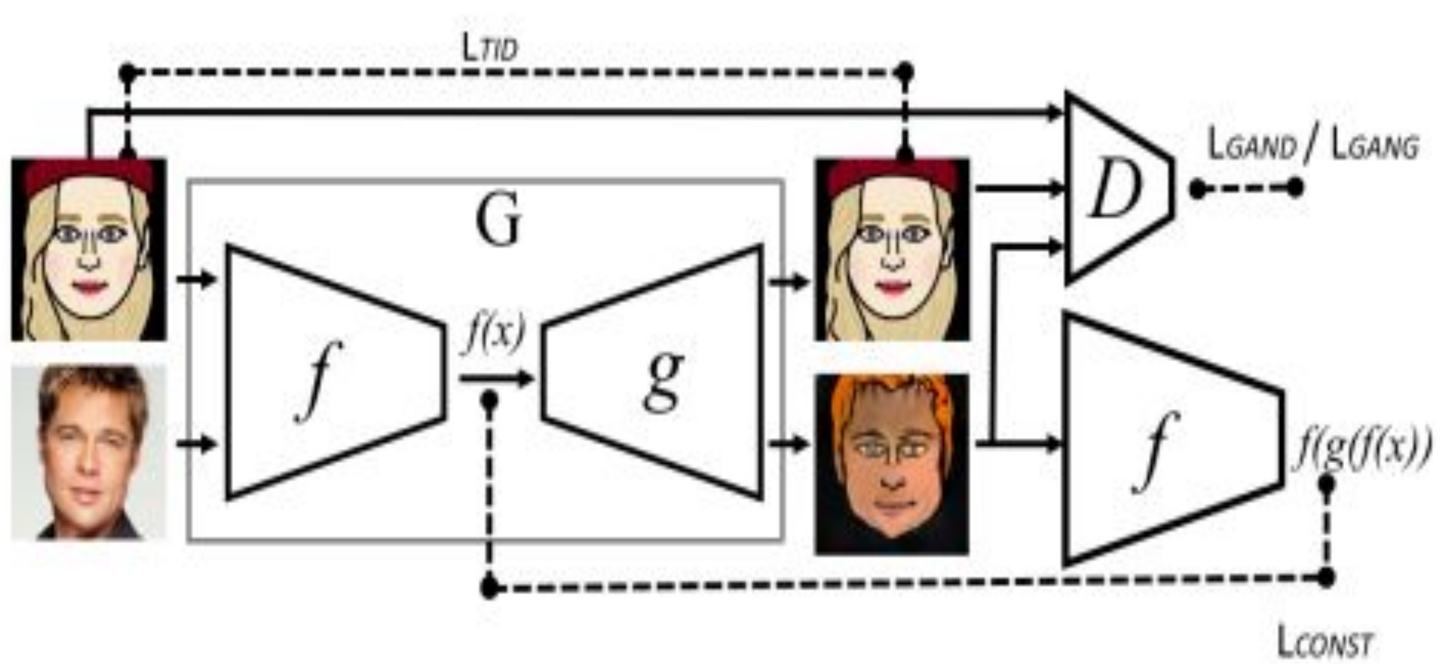
- Given a sample in the SVHN Domain, generate the corresponding MNIST sample
- Given a person's face, generate their corresponding Bitmoji sample

Approach

Use a modified GAN to somehow capture the requirements of the task at hand.



A standard GAN above

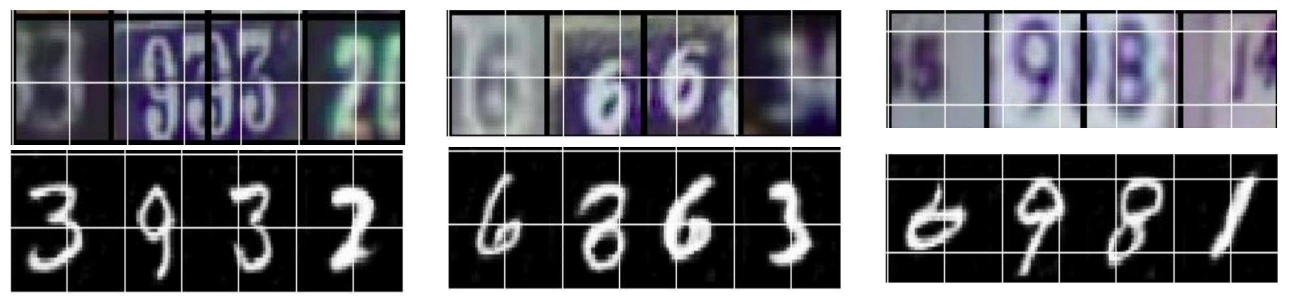


Major differences in the architectures

- Input to the generator is the output of a feature encoder unlike the standard GAN, to which the input is a noise vector.
- Additional loss functions to impose feature constancy and identity across domains
- Constancy and Identity ensure one to one correspondence
- Usage of a ternary discriminative function

Results and Discussion

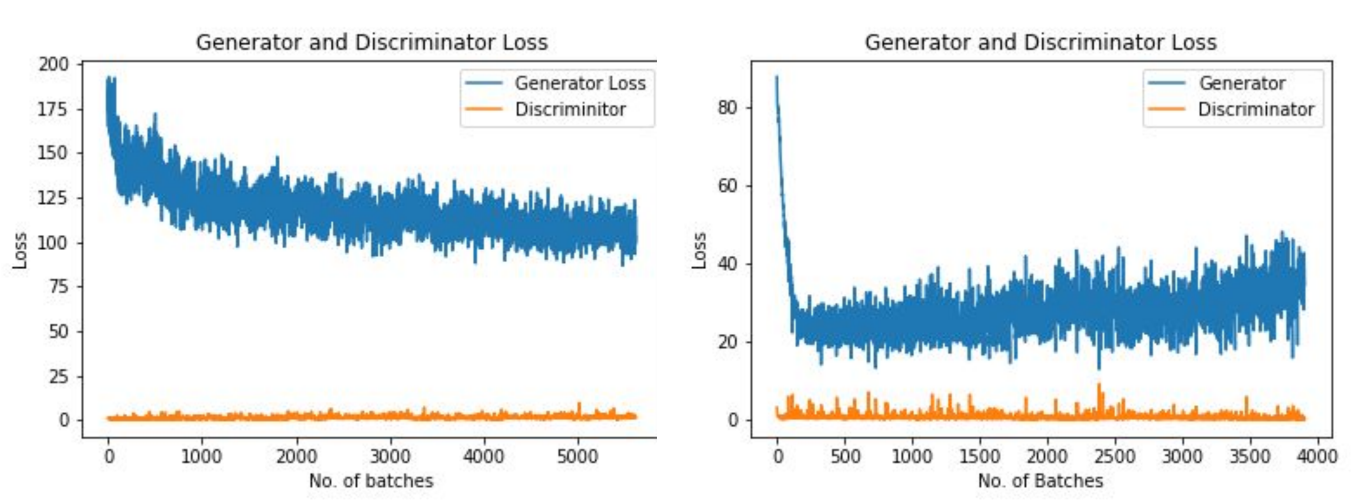
- Accuracy of 77.67% on SVHN to MNIST conversion



- Face Transfer

Loss function plots for the best transfers

SVHN to MNIST MS-Celeb to Bitmoji



Conclusions and Discussions

1. Training a GAN is a very difficult process. We had the issue of mode collapse multiple times.
2. Learning a feature encoder for a face is a much more complex task than learning the same for a number.
3. It was difficult for us to get visually pleasing results for the face transfer model. Even after trying out multiple architectures for the generator and discriminator we couldn't generate realistic images, as we could, in the digit transfer case.

References

[1] Y. Taigman, A. Polyak, and L. Wolf. Unsupervised cross-domain image generation. arXiv preprint arXiv:1611.02200, 2016.
[2] Xinru Hua, Davis Rempe, and Haotian Zhang, Unsupervised Cross-Domain Image Generation, Technical Report, Stanford University

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