UNSUPERVISED REPRESENTATION LEARNING WITH DEEP CONVOLUTIONAL GENERATIVE ADVERSARIAL NETWORKS

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Outline

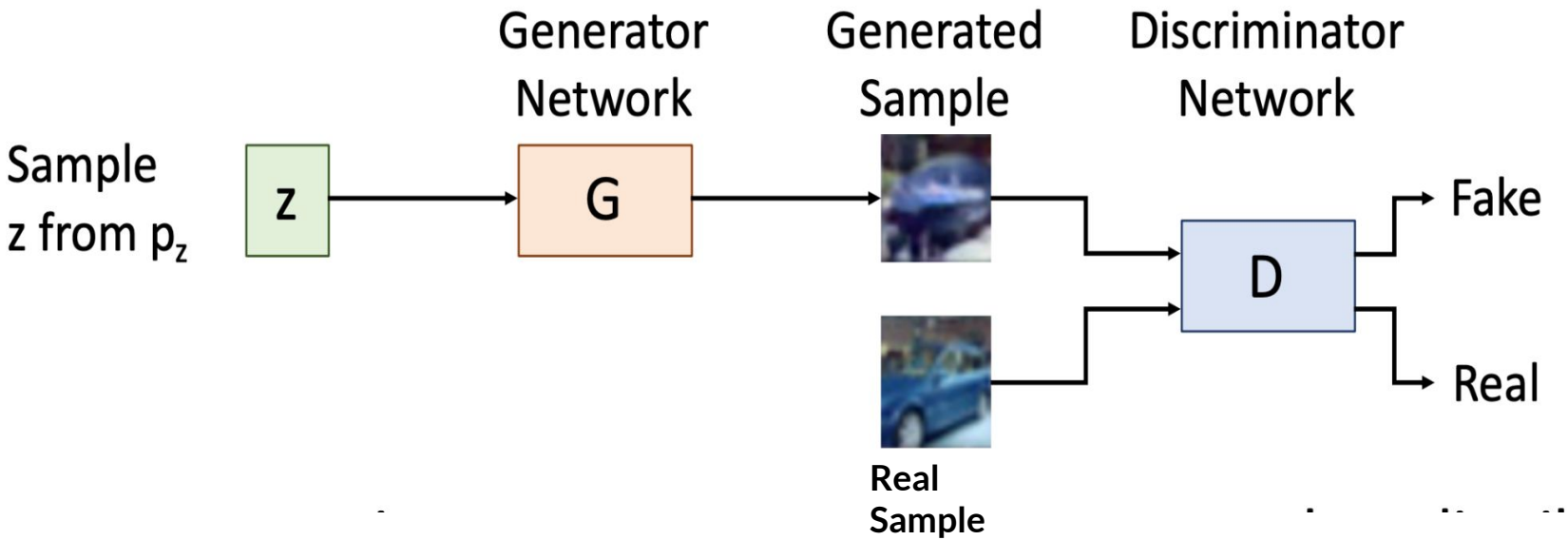
1. Core idea of the paper.
2. Novel model architecture.
3. Implementation approach.
4. Personal experiments.
5. Comparison between the original and personal results.
6. Challenges and future work.

Idea

Unsupervised Learning

- We have **data without labels**, to learn the hidden structure of the data.
- E.g: clustering, dimensionality reduction, feature learning, etc.

GANs

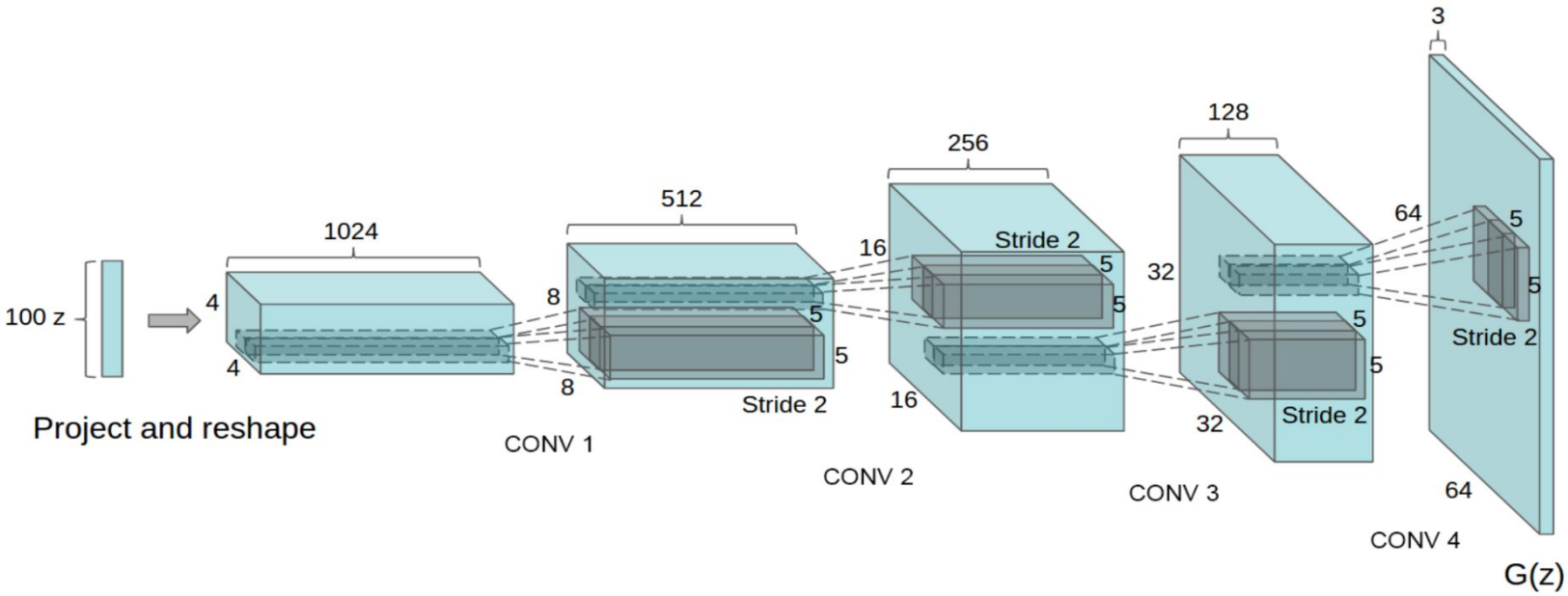

Generator Network
Generated Sample
Discriminator Network
Sample z from p_z
z
G
D
Fake
Real
Real Sample

DCGANs

- This paper introduces a version of GAN called Deep Convolutional Generative Adversarial Networks (**DCGAN**), which are stable to train in most settings.
- This by removing the fully connected layers that in GANs and replacing any pooling layers with strided convolutions. It is illustrated in the next section.

Architecture of DCGANs

Generator Network



Methodology

- To prevent mode collapse, **Batch Normalization** has been used.
- The **generator** uses **ReLU** activations for all layers except the output, which uses **Tanh**.
- The **discriminator** uses **LeakyReLU** activations for all layers. the last layer is flattened and then fed into a single **sigmoid** output.
- **Dropout** was used to decrease the likelihood of memorization.

Experiments

Paper Experiment Settings

- **Datasets**: Large Scale Scene Understanding (LSUN), Imagenet-1K, and assembled Faces dataset.
- Minibatch size of 128.
- LeakyRelu slope of 0.2.
- Using Adam optimizer, with learning rate of 0.0002, and a momentum term of 0.5.

Personal Experiment Settings

- **Dataset**: celebA, which contains faces of celebrities.
- Using the same experimental settings mentioned in the paper, to preserve the stability of the model.
- **Implementation**: available here.

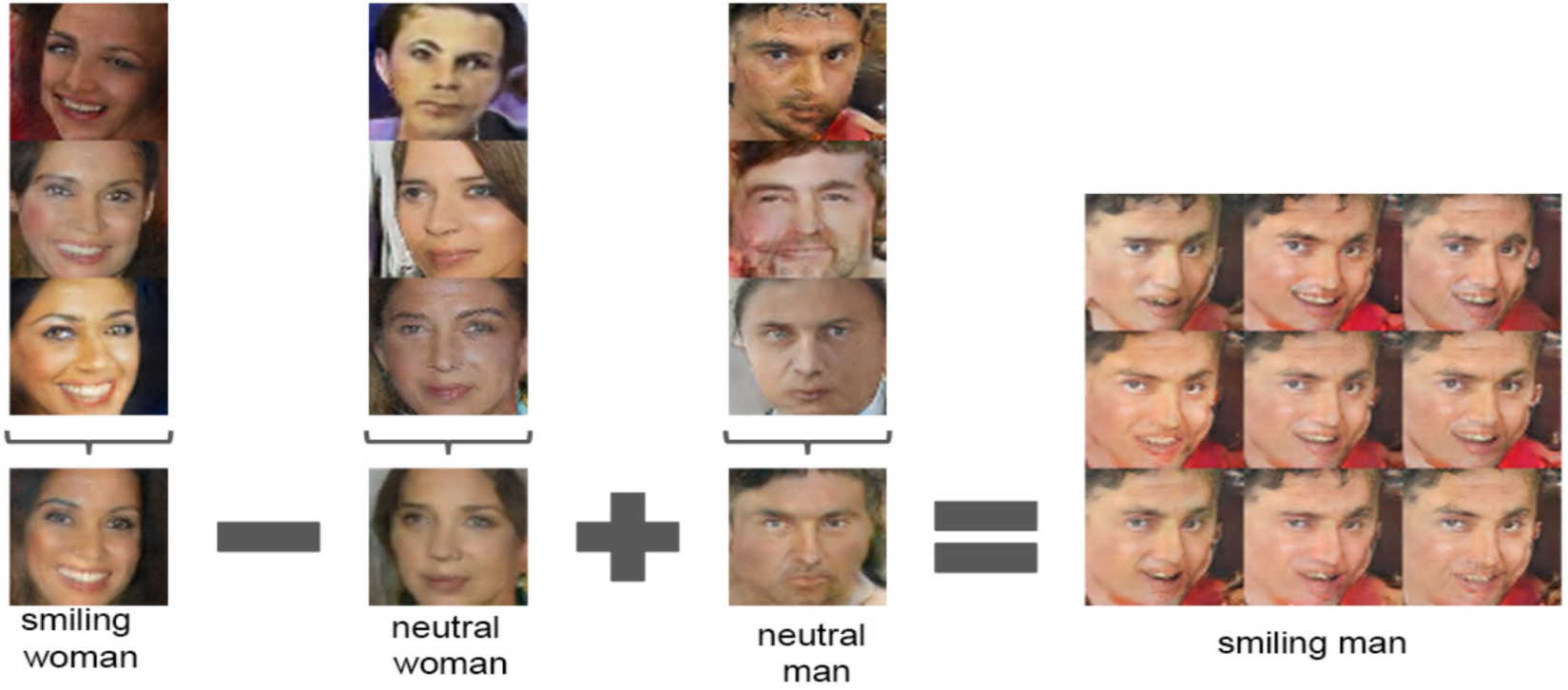
Results

Paper Results

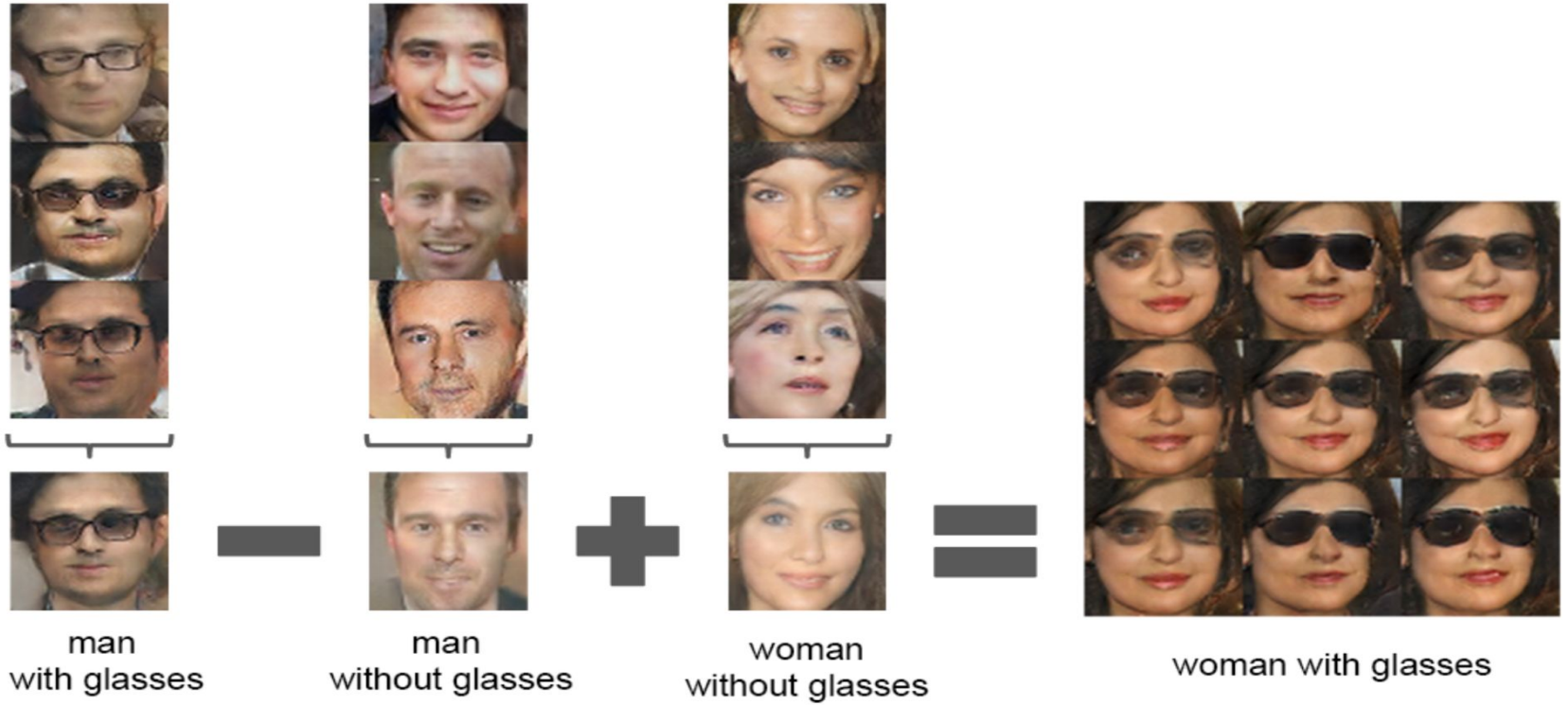
Personal Results

Interpolation

Vector Math



Vector Math


man
with glasses
man
without glasses
woman
without glasses
woman with glasses

Future work

Extending this framework to other domains, such as videos and audio.

Thank you..