MACHINE LEARNING & DATA ANALYTICS

FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG

FACULTY OF ENGINEERING

Generating of Real Looking Images Using GANs

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July 15th, 2020

Motivation

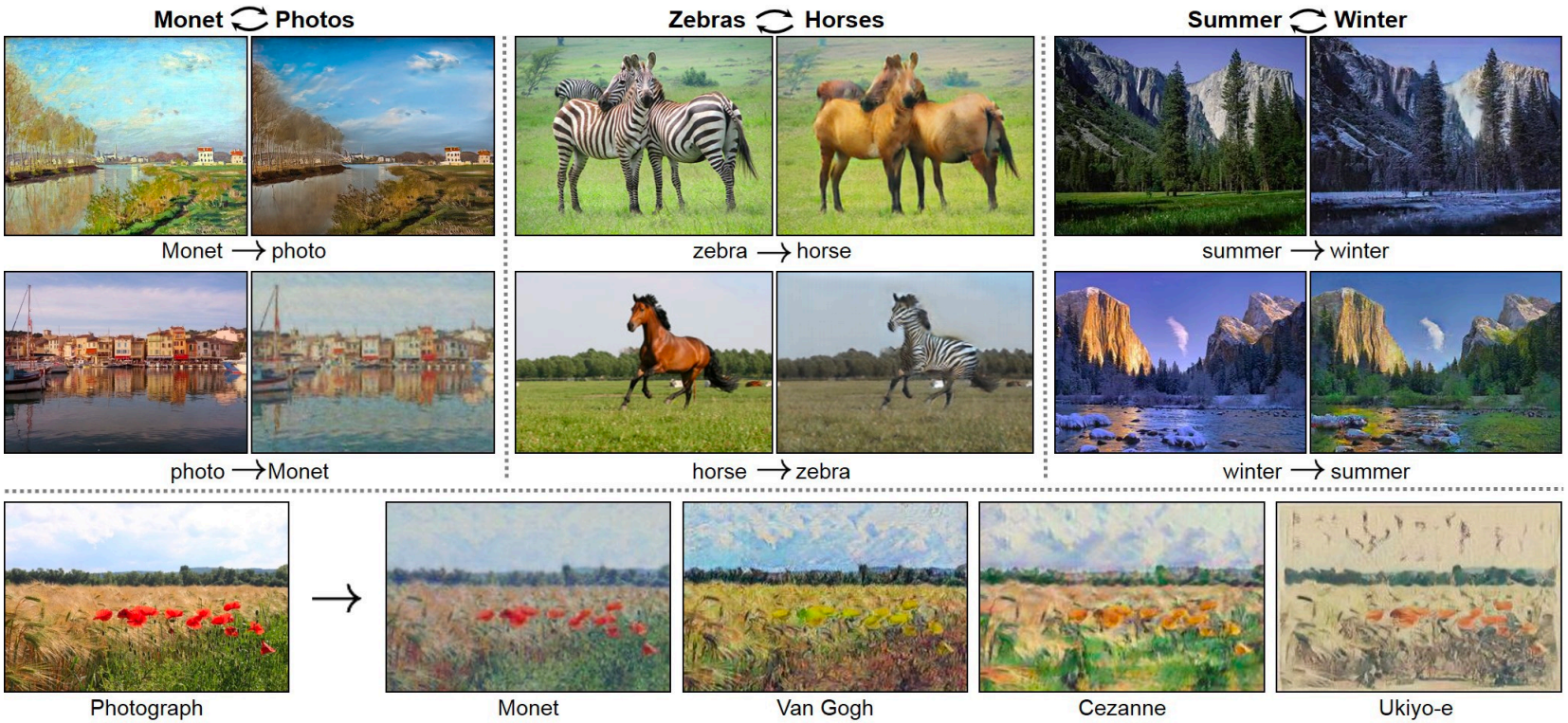


Image to Image Translation

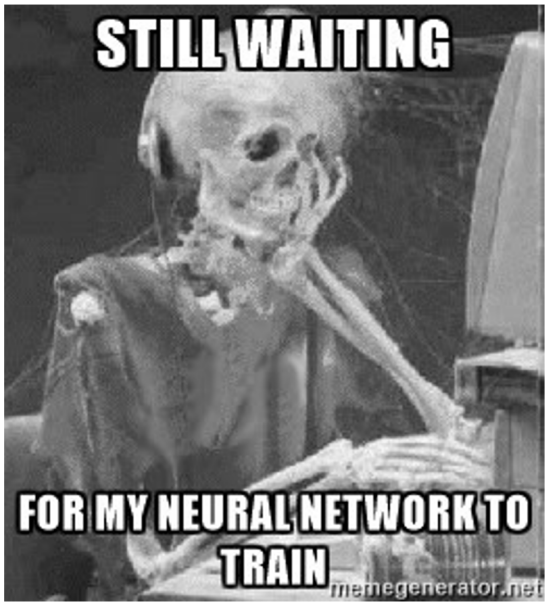
Motivation

Text to Photo-Realistic Image Synthesis

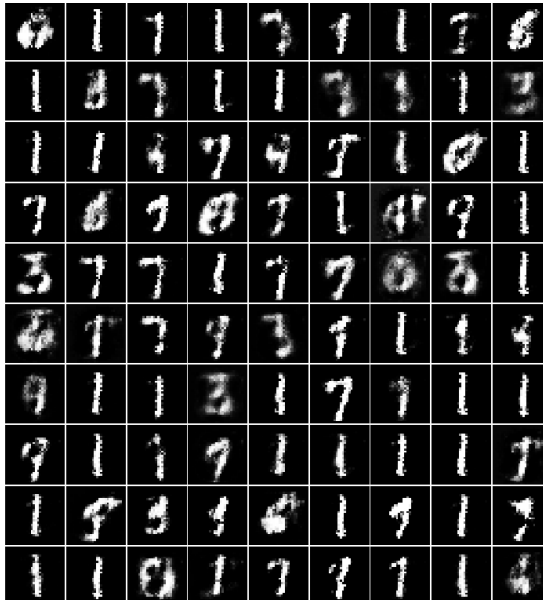
Motivation

Text to Photo-Realistic Image Synthesis

Problem Statement



Slow Training



Mode Collapse

Related Work

Improved Techniques for Training GANs

Tim Salimans tim@openai.com
Ian Goodfellow ian@openai.com
Wojciech Zaremba woj@openai.com
Vicki Cheung vicki@openai.com
Alec Radford alec.radford@gmail.com
Xi Chen peter@openai.com

Image-to-Image Translation with Conditional Adversarial Networks

Phillip Isola Jun-Yan Zhu Tinghui Zhou Alexei A. Efros
Berkeley AI Research (BAIR) Laboratory, UC Berkeley
{isola,junyanz,tinghuiz,efros}@eecs.berkeley.edu

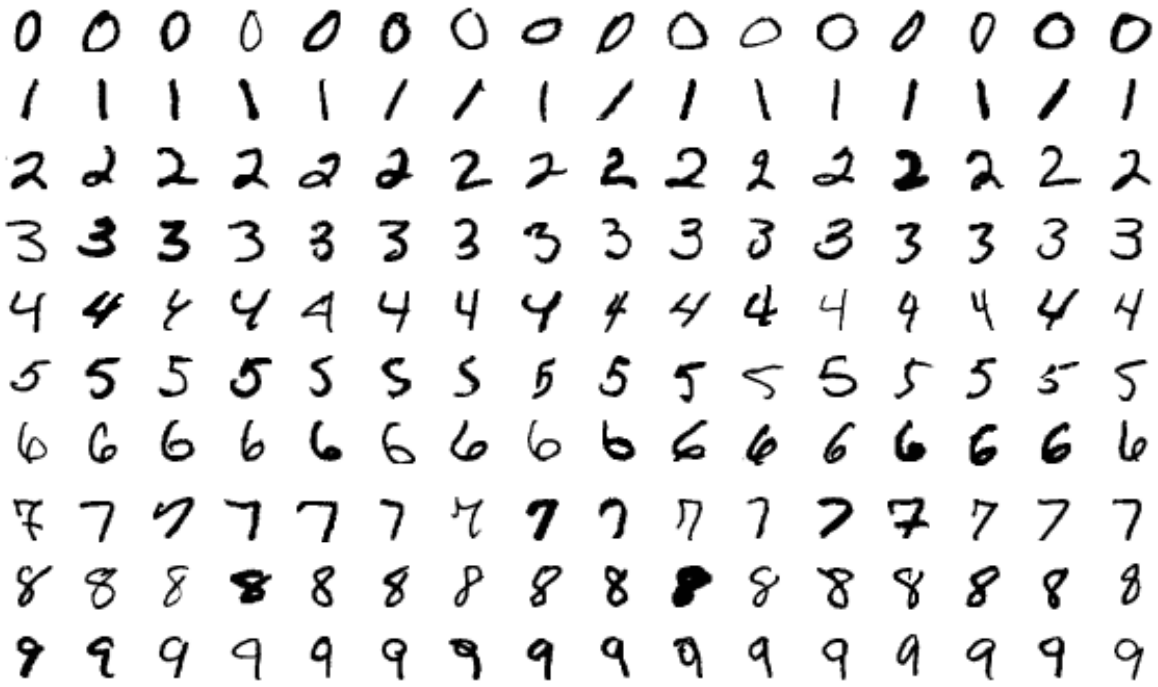
Improved GANs → Evolved GANs

Research Questions

Can we generate real looking images?

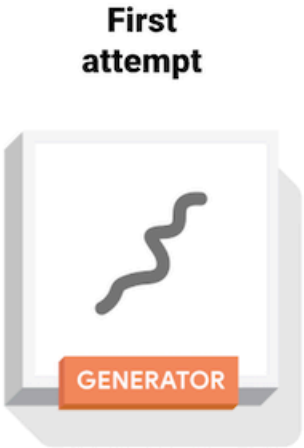
Can we introduce enough inter-class variance for training?

Data Set

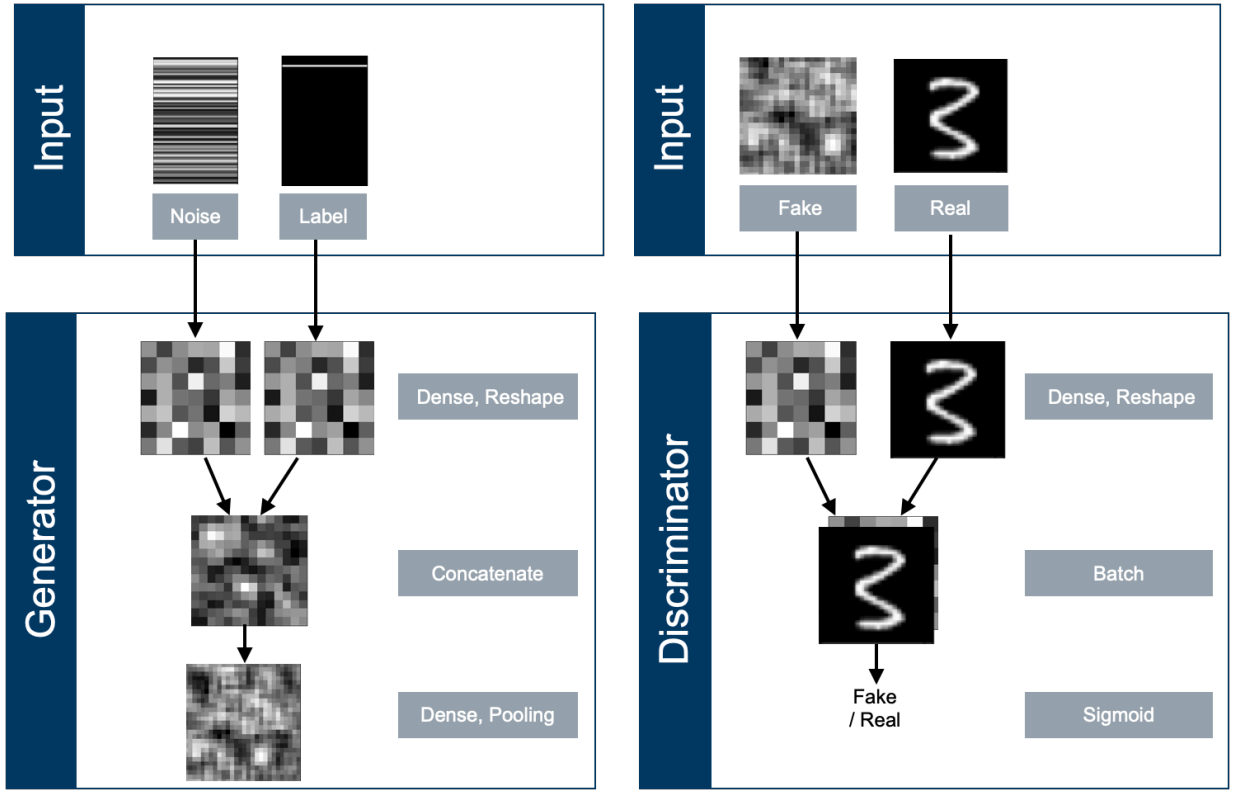


MNIST database

Methods

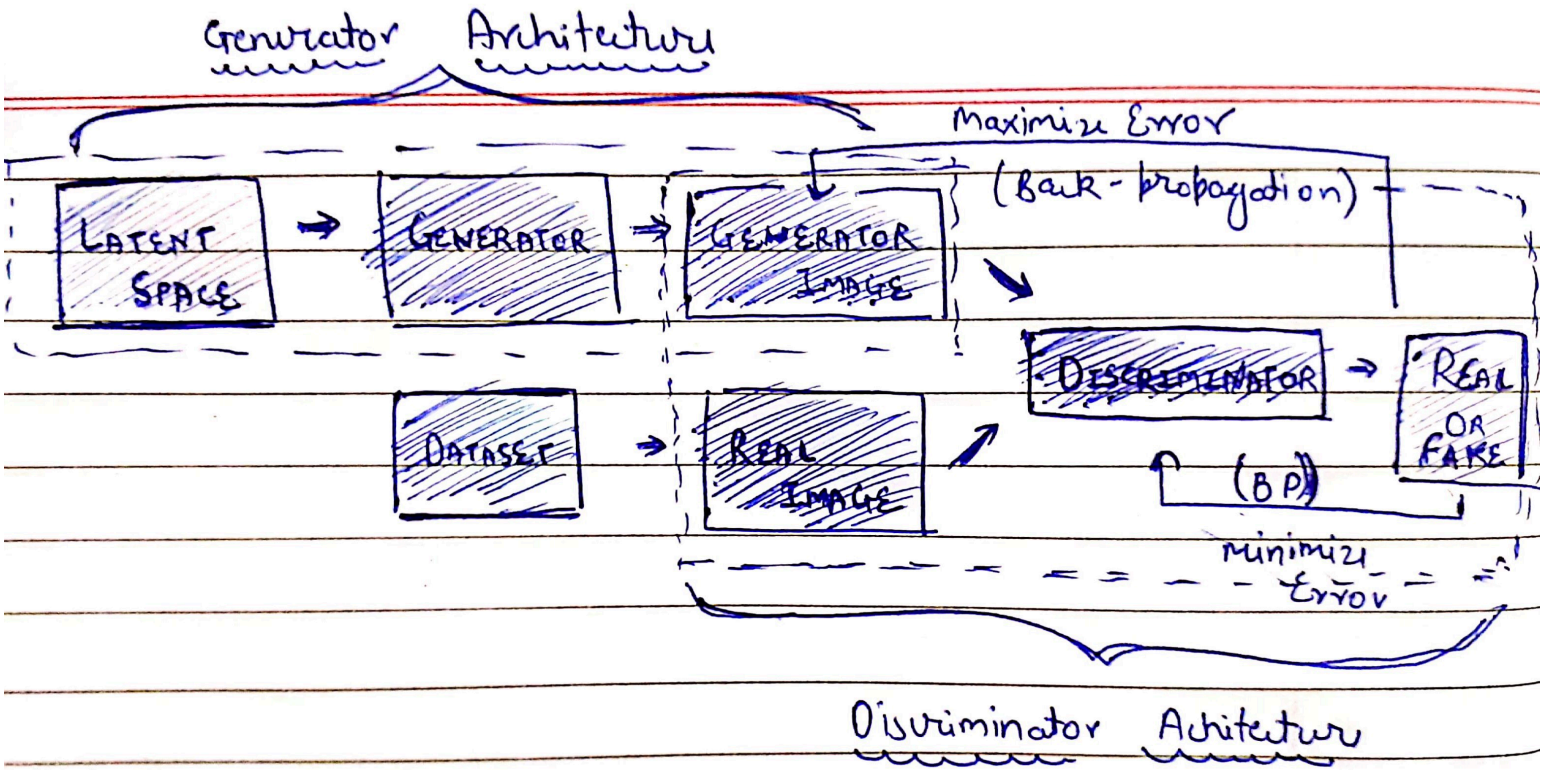


Methods



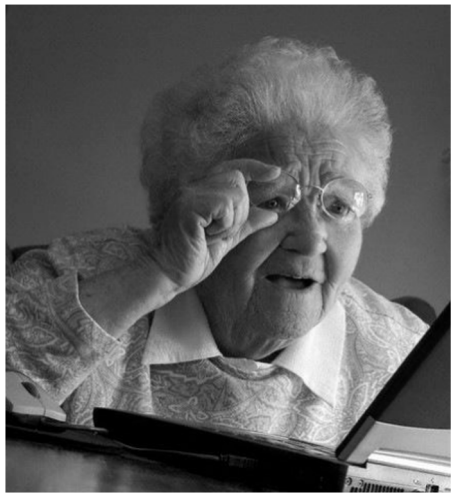
Forward Step cDCGAN → Demo

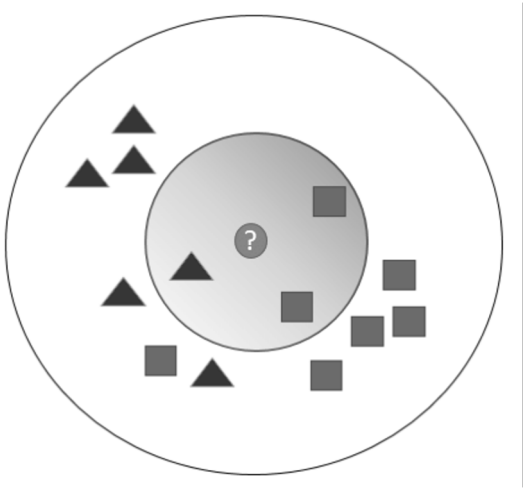
Methods



Backward Step cDCGAN

Evaluation

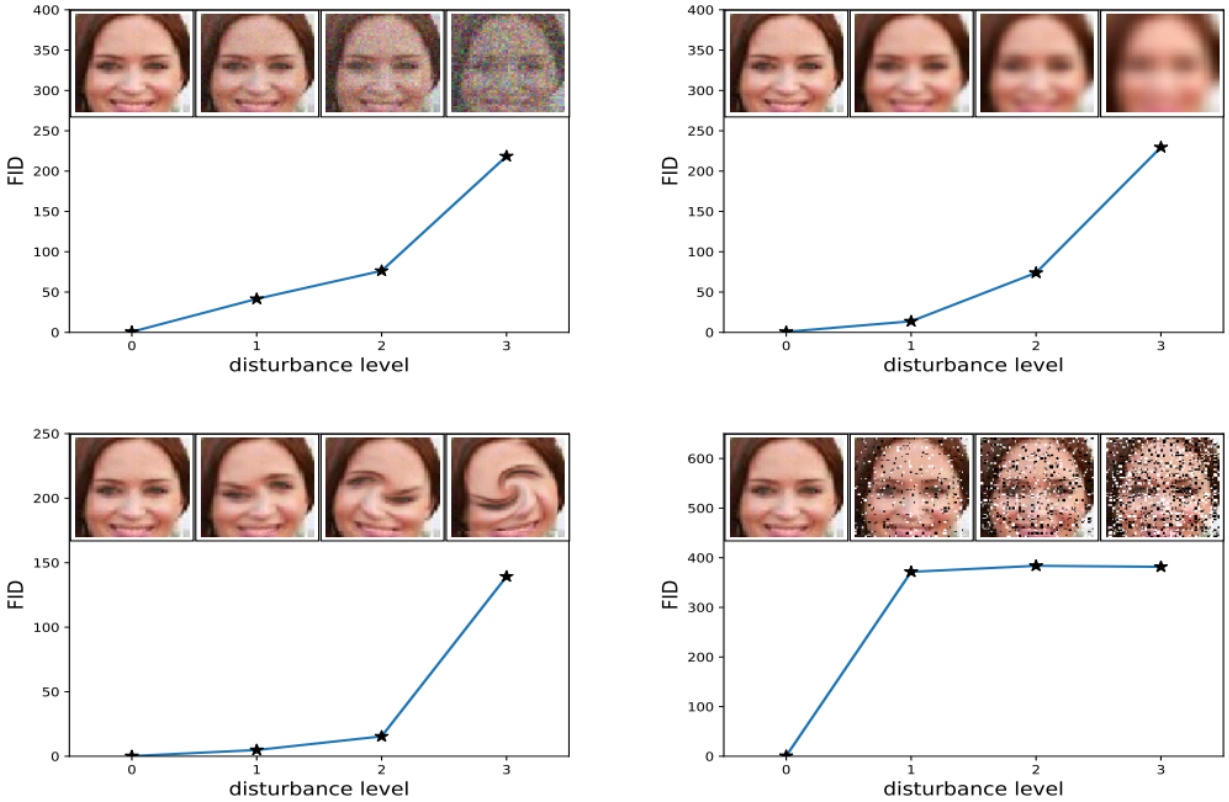




Visual Examination

Nearest Neighbour

Evaluation



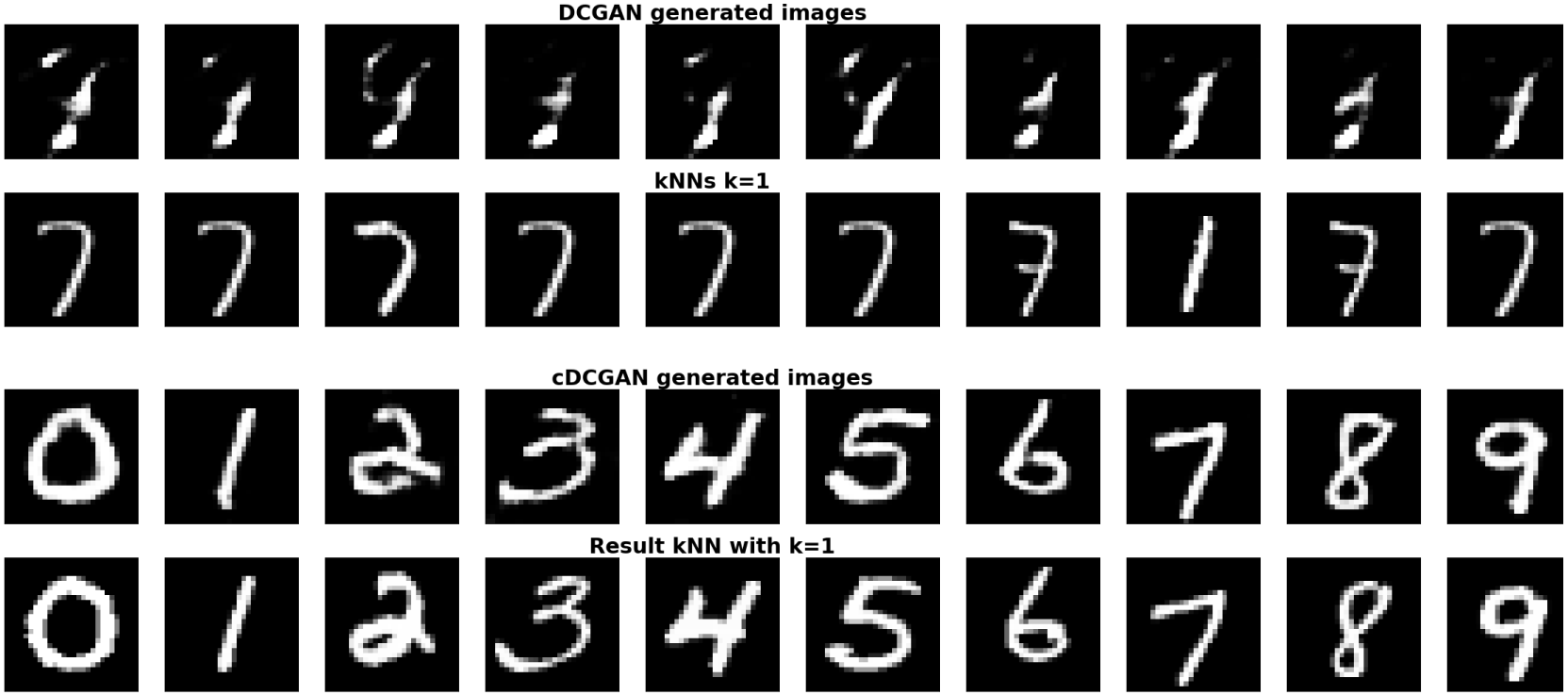
A low Fréchet Inception Distance correlate with better-quality images

Results

Mode Collapse
FID Score: 1.3

Realistic Images
FID Score: 0.01

Results


DCGAN generated images
kNNs k=1
cDCGAN generated images
Result kNN with k=1

Discussion

Large data set leads to exponential model size

↓

Large model size leads to an unstable model

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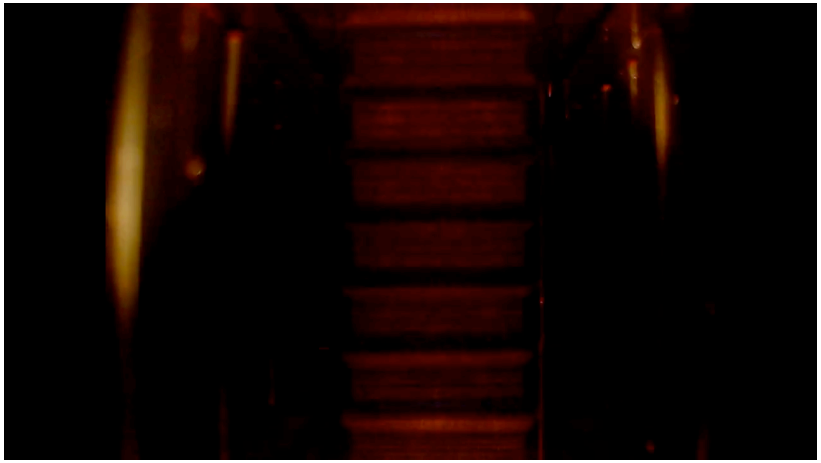
Unstable model difficult to tune hyperparameters

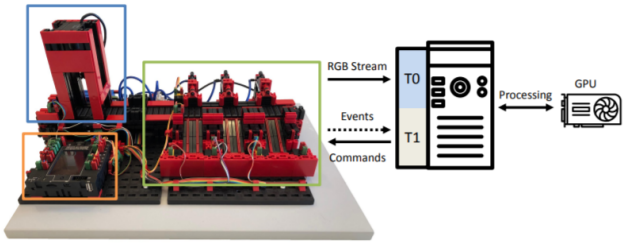
Conclusion

Generated images quite realistic

Introduced enough inter-variance in training

Future Work





GANs for a sorting machine

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Thanks for your attention!

Sources

Figure 1: Christian Ledig, et al. in their 2016 paper titled “Photo-Realistic Single Image Super-Resolution Using a Generative Adversarial Network”

Figure 2: Han Zhang, et al. in their 2016 paper titled “StackGAN: Text to Photo-realistic Image Synthesis with Stacked Generative Adversarial Networks”

Figure 3: Jun-Yan Zhu in their 2017 paper titled “Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks”

Figure 4: Internet Meme, retrieved from https://memegenerator.net/instance/72296984/waiting-skeleton-near-computer-still-waiting-for-my-neural-network-to-train

Figure 5: Created by Timo Bohnstedt July 2020

Figure 6. Ian Goodfellow, et al. in their paper 2016 paper titled "Improved Techniques for Training GANs"

Figure 7: Tim Salimans, et al. in their 2018 paper titled "Image to Image Translation with Conditional Adversarial Networks"

Figure 8: Internet Image, retrieved from https://en.wikipedia.org/wiki/MNIST_database

Figure 9 What are GANs? by TensorFlow Tutorials, 2020, retrieved from https://www.tensorflow.org/tutorials/generative/dcgan

Figure 10: Created by Timo Bohnstedt July 2020

Figure 11: Backward Propagation within GAN-Nets by Pawan Ian, retrieved https://towardsdatascience.com/my-first-encounter-with-gans-6c0114f60cd7

Figure 12: Figure 4: Internet Meme, retrieved from http://www.quickmeme.com/meme/360ykq

Figure 13: Internet Image, retrieved https://en.wikipedia.org/wiki/KNN

Figure 14: Tim Salimans, et al. in their 2018 paper titled "Image to Image Translation with Conditional Adversarial Networks"

Figure 15: Created by Timo Bohnstedt July 2020

Figure 16: Created by Timo Bohnstedt July 2020

Figure 17: Created by Timo Bohnstedt July 2020

Figure 18: Created by Franz Koeferl 2019

Figure 20: Created by Franz Koeferl 2019