



Pimpri Chinchwad College of Engineering, Pune
Department of Computer Engineering



CESA | Computer Engineering
Students Association

Pie & AI: Pune - Intro to GANs

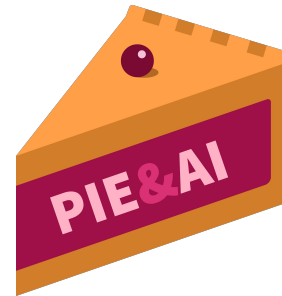
Hosted by PCCoE ACM Student Chapter



What is Pie & AI?

Pie & AI is a series of DeepLearning.AI meetups independently hosted by community groups

Events typically include conversations with leaders in the world, thought-provoking discussions, networking opportunities with your fellow learners, hands-on project practice, and pies (or other desserts you prefer.)



Deep Learning is a **superpower**. With it you can make a computer **see**, synthesize novel **art**, translate **languages**, render a medical **diagnosis**, or build pieces of a car that can **drive itself**. If that isn't a superpower, I don't know what is.

— **Andrew Ng**, Founder of deeplearning.ai and Coursera



A greeting video from Andrew & the team



Pie & AI: Pune - Intro to GANs

Introduction to Generative Adversarial Networks, their types and use cases.

It will be an event for beginners in the Machine Learning domain who want to know more about this beautiful idea of GANs. It will introduce the attendees to GANs, their various types, and use cases along with a proper understanding of its concept. The attendees will leave the event with better knowledge about it and a clear path of what can and cannot be done using GANs and will have a clear idea of where to start studying it.



Speaker

Tejas Morkar

Management Head, DSC PCCoE

Webmaster, PCCOE ACM Student Chapter

Writer at Towards Data Science

I'm currently doing a research based AI Internship at CDAC related to GANs and have worked on a handful of projects in the same domain. I love the idea of GANs and would like to share it with everyone.



[/tejasmorkar](https://github.com/tejasmorkar)



[/@tejasmorkar](https://medium.com/@tejasmorkar)



[/TejasMorkar](https://twitter.com/TejasMorkar)



tejasmorkar.tech

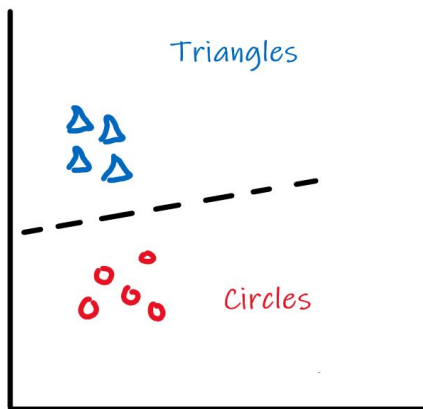


Generative Adversarial Networks - GANs

Discriminative Models

$$P(y|x)$$

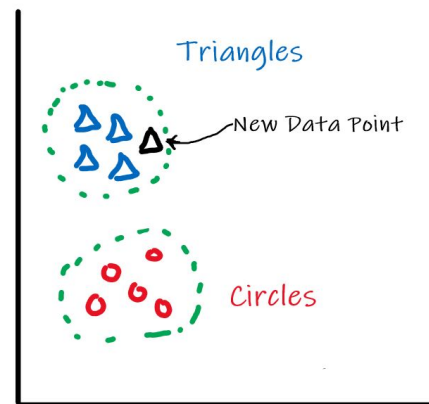
Probability of y given x



Generative Models

$$P(x,y)$$

Joint Probability of x and y



Generative Adversarial Networks - GANs



Generator

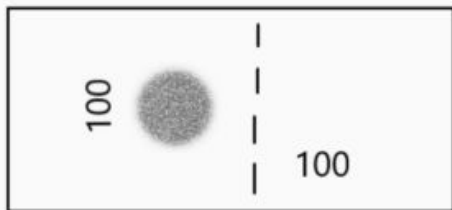
Vs



Discriminator



Before



Fake



Real

After



Fake



Real



Before

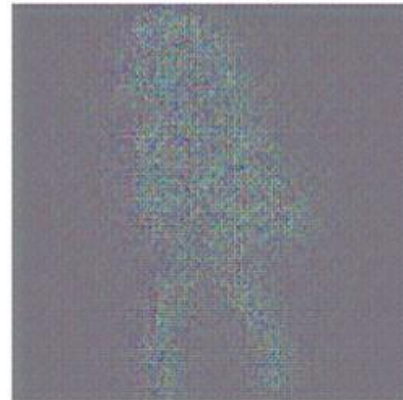
Input Image



Ground Truth



Predicted Image



After

Input Image



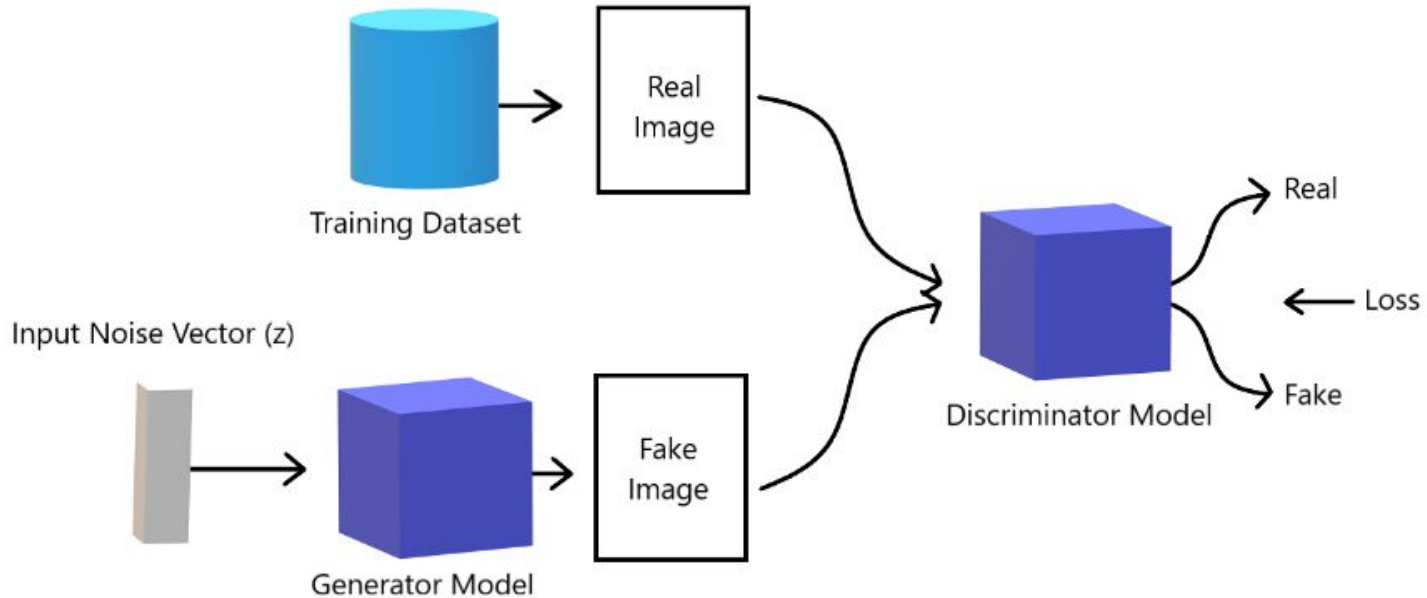
Ground Truth



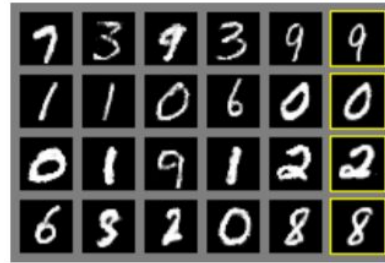
Predicted Image



Basic Structure of GANs



Types of GANs



a)



b)



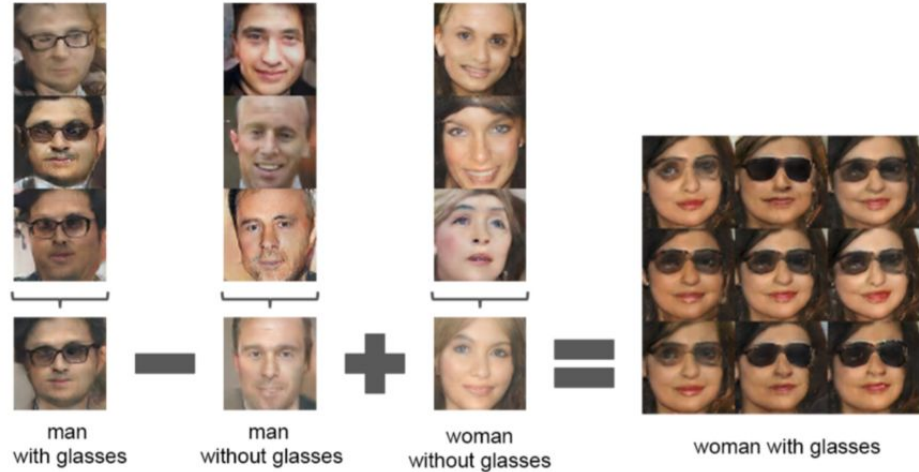
c)



d)

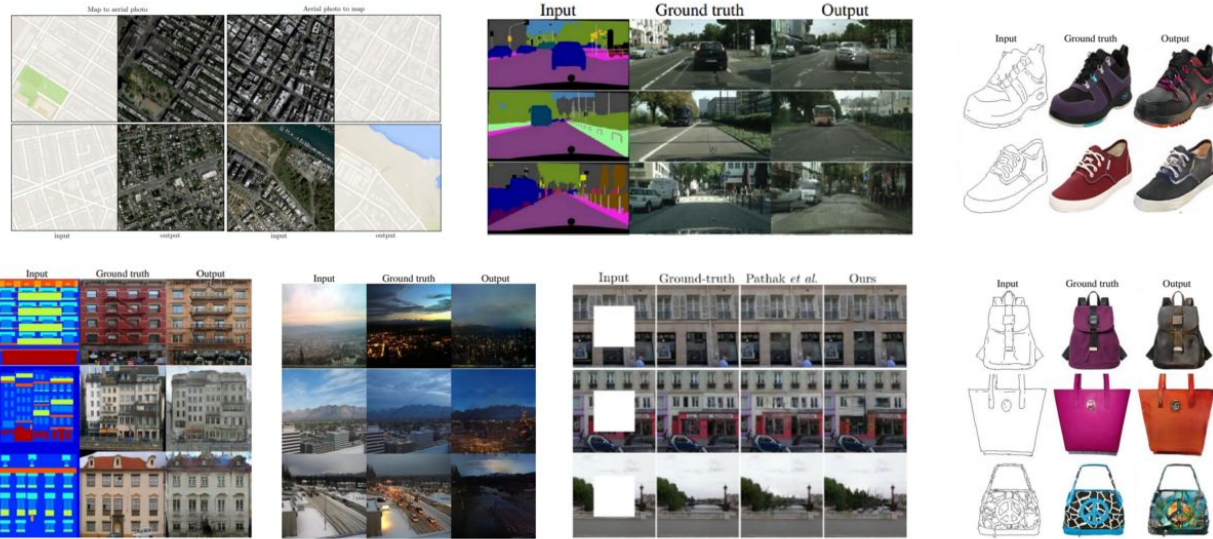
GANs - Ian J. Goodfellow et al. 2014, [Generative Adversarial Networks](#)

Types of GANs



DCGANs - Alec Radford et al. 2015, [Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks](#)

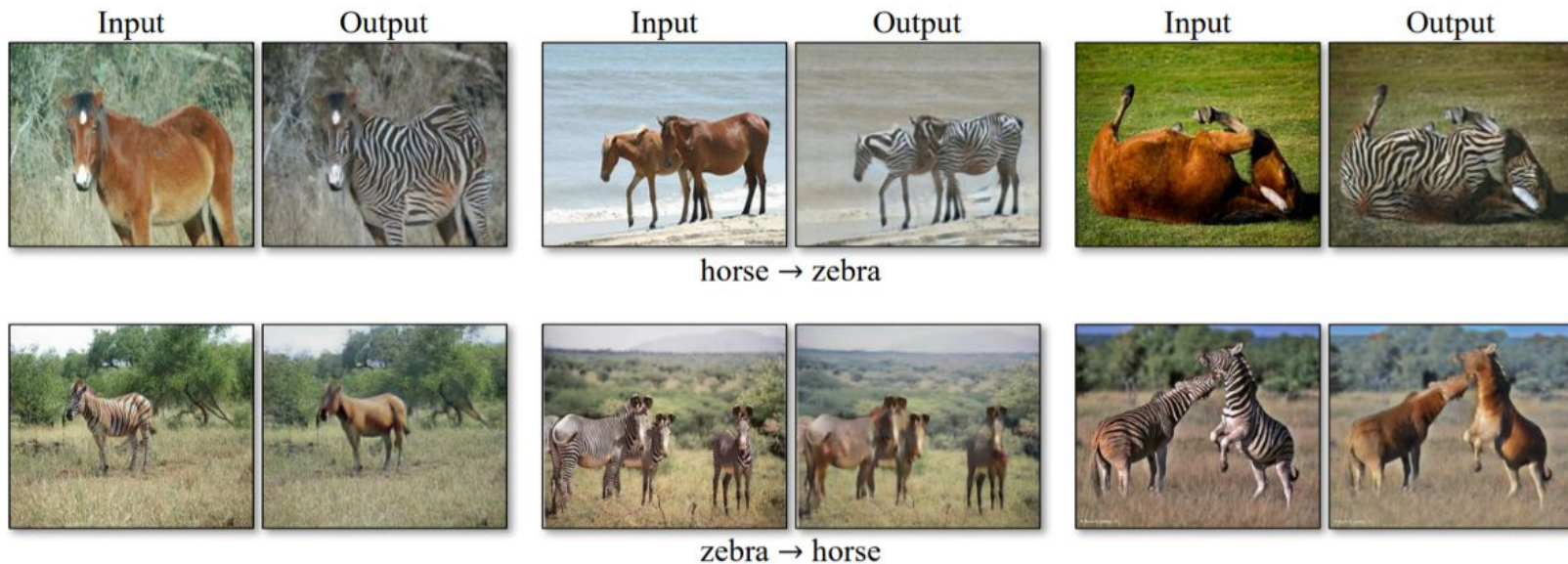
Types of GANs



Conditional GANs - Phillip Isola, Jun-Yan Zhu, Tinghui Zhou, Alexei A. Efros 2016, [Image-to-Image Translation with Conditional Adversarial Networks](#)

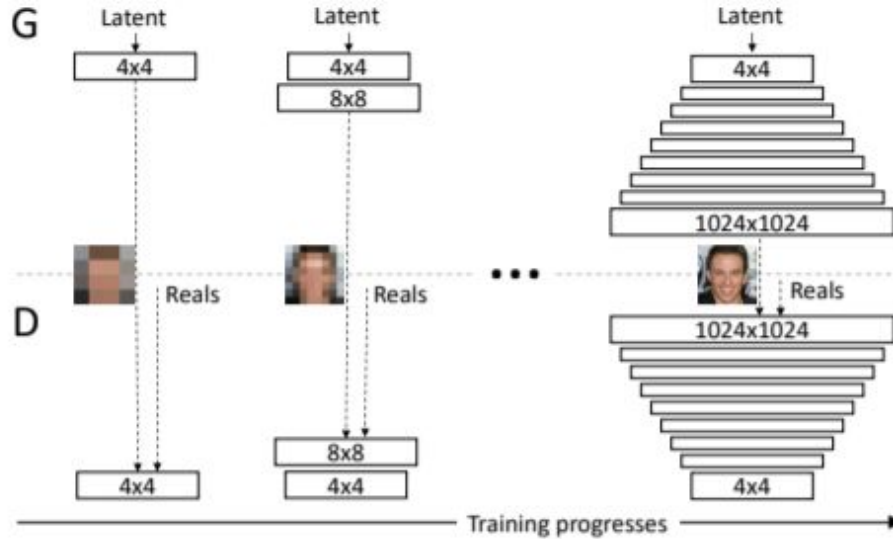


Types of GANs



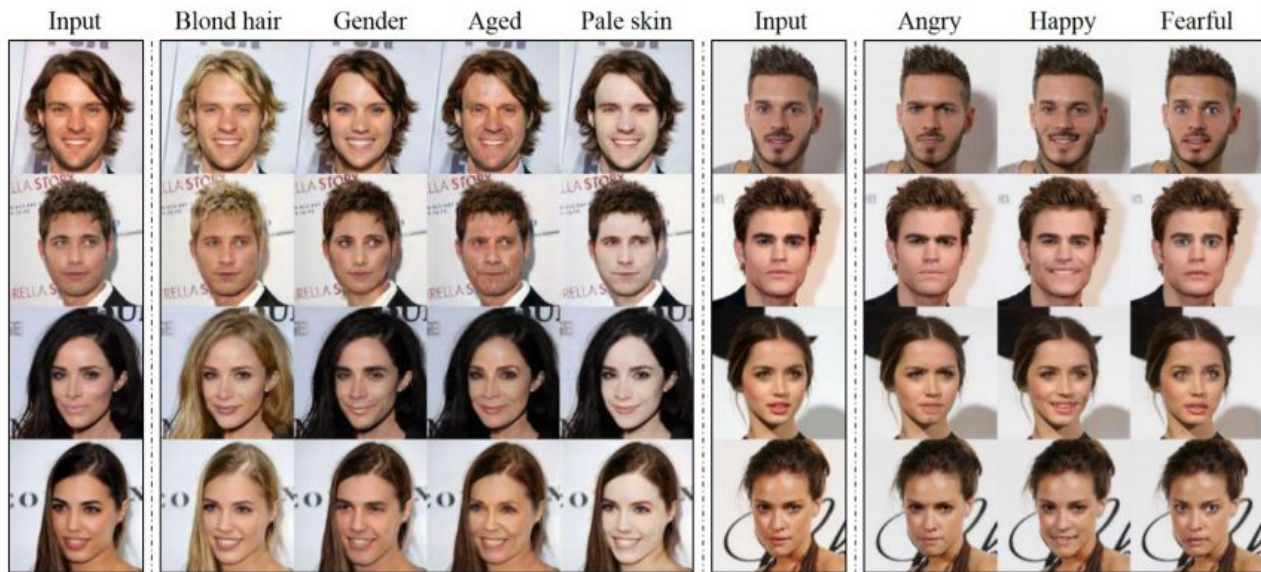
Cycle-GANs - Jun-Yan Zhu, Taesung Park, Phillip Isola, Alexei A. Efros 2017, [Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks](#)

Types of GANs



Progressive GAN - Tero Karras, Timo Aila, Samuli Laine, Jaakko Lehtinen 2017, [Progressive Growing of GANs for Improved Quality, Stability, and Variation](#)

Types of GANs



StarGAN - Yunjey Choi et al. 2017, [StarGAN: Unified Generative Adversarial Networks for Multi-Domain Image-to-Image Translation](#)



Types of GANs

Text description	A couple of men riding horses on top of a green field	A train coming to a stop on the tracks out side	A big airplane flying in the big blue sky	A group of boats on a body of water	Two public transit buses parted in a lot	The white kitchen features very contemporary cabinet arrangements	The man is standing in the water holding his surfboard
Stage-II images							
Text description	A big building with a parking lot in front of it	There is a lot of electrical sitting on the table	A couple of computer screens sitting on a desk	Three zeebras standing in a grassy field walking	A herd of cows standing on a grass covered field	A group of people standing around and posing for a picture	People who are dressed for skiing standing in the snow
Stage-II images							

StackGAN - Han Zhang et. al. 2017, [StackGAN: Text to Photo-realistic Image Synthesis with Stacked Generative Adversarial Networks](#)



Types of GANs

bicubic
(21.59dB/0.6423)



SRResNet
(23.53dB/0.7832)



SRGAN
(21.15dB/0.6868)



original



SRGAN - Christian Ledig et. al. 2017, [Photo-Realistic Single Image Super-Resolution Using a Generative Adversarial Network](#)

Applications & Demos of GANs

Video Frame Prediction

Environment Simulation for Reinforcement Learning

Semi Supervised Learning

Neural supersampling for real-time rendering - [Link](#)

Dental Restorations - [Link](#)

GAN Paint - [Link](#)

Image-to-Image Demo - [Link](#)

Paint to Realistic Photos | GauGAN - [Link](#)



Some problems with GANs

Hard to train!

Vanishing Gradients

Mode Collapse

Difficult to converge

No proper metrics to measure how good the model is doing



Resources

Blogs and Articles

Research Papers

NIPS Tutorial, 2016 by Ian Goodfellow - [Link](#)

Google Developers GANs Overview - [Link](#)

Generative Adversarial Networks Specialization - [Link](#)



Thank You!

This presentation is linked on tejasmorkar.tech

