Generative Adversarial Networks
Models That Create

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kaggle

#ODSC

Welcome

Do two things:

1. Download slides from https://github.com/dansbecker/odsc_2018

2. Ensure you have a **verified** Kaggle account
    - Verify by visiting kaggle.com/kernels, selecting “New Kernel” and then selecting Notebook.

This Workshop

- Learning Approach
- Ideal Background
- Use Cases
- Tools Covered

WHAT IS A GAN?

Generative vs Discriminative Models

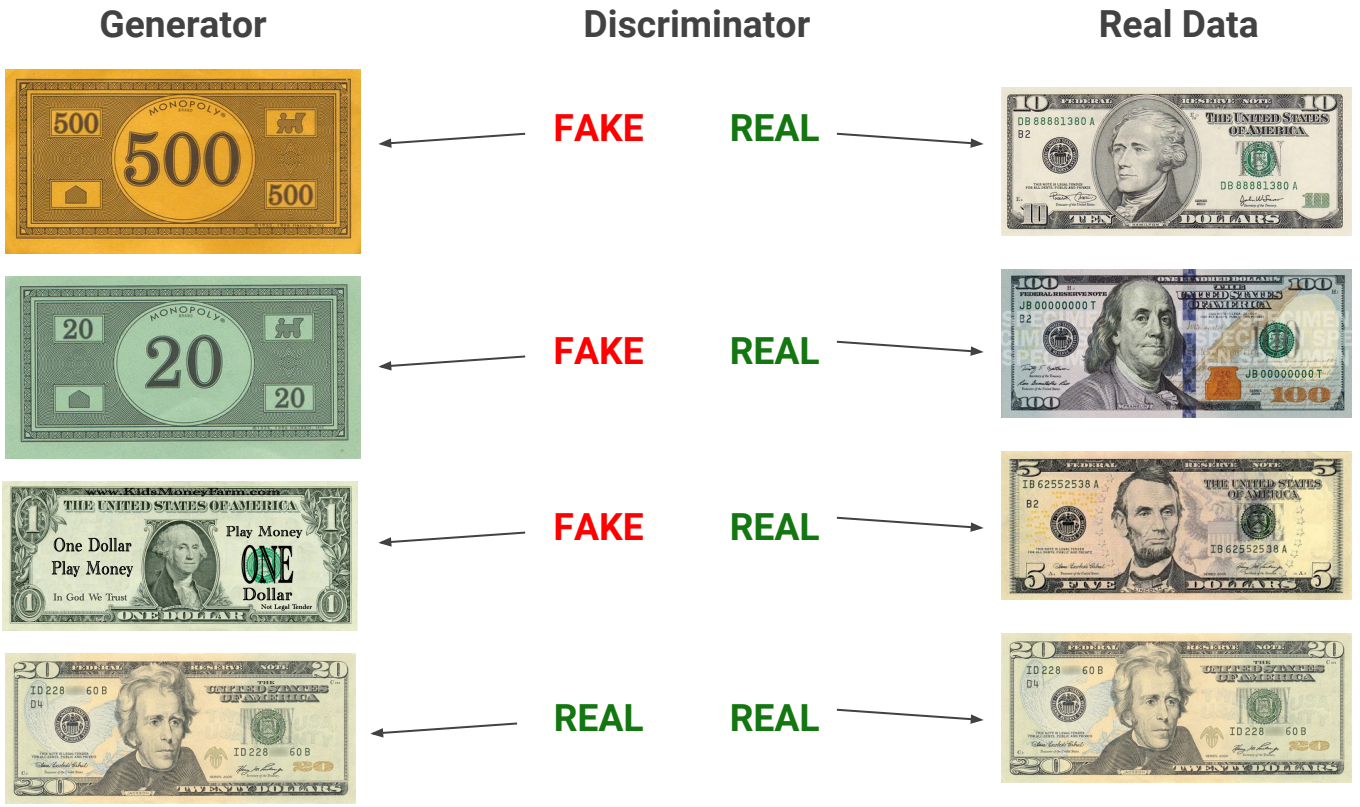
D:

A dog

G:

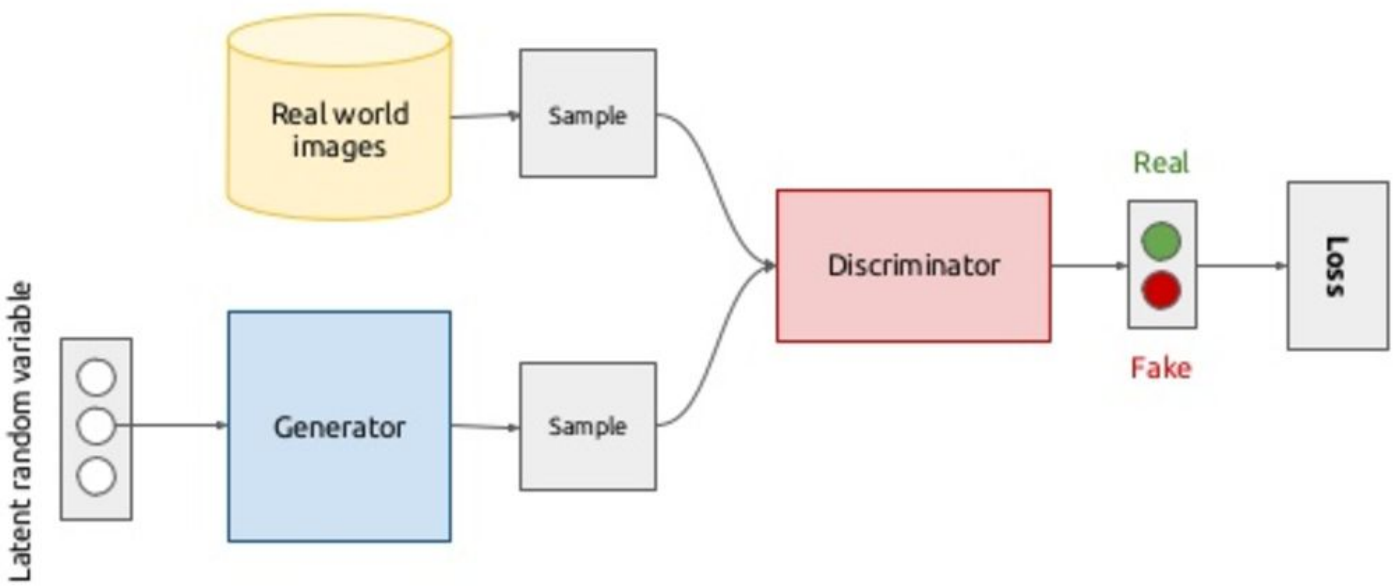
A dog

Intuition for GANs



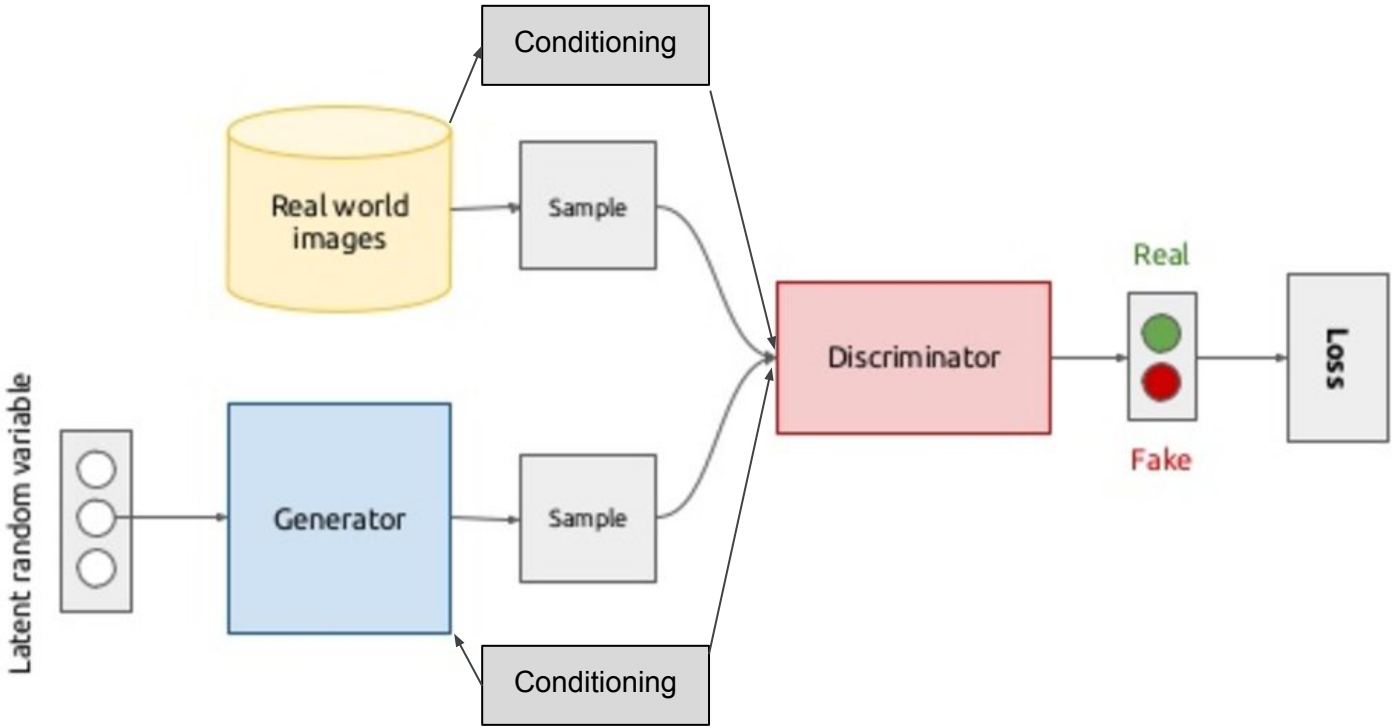
GAN Structure

- Data distribution
- Noise distribution
- Generator
- Discriminator



Conditional GANs

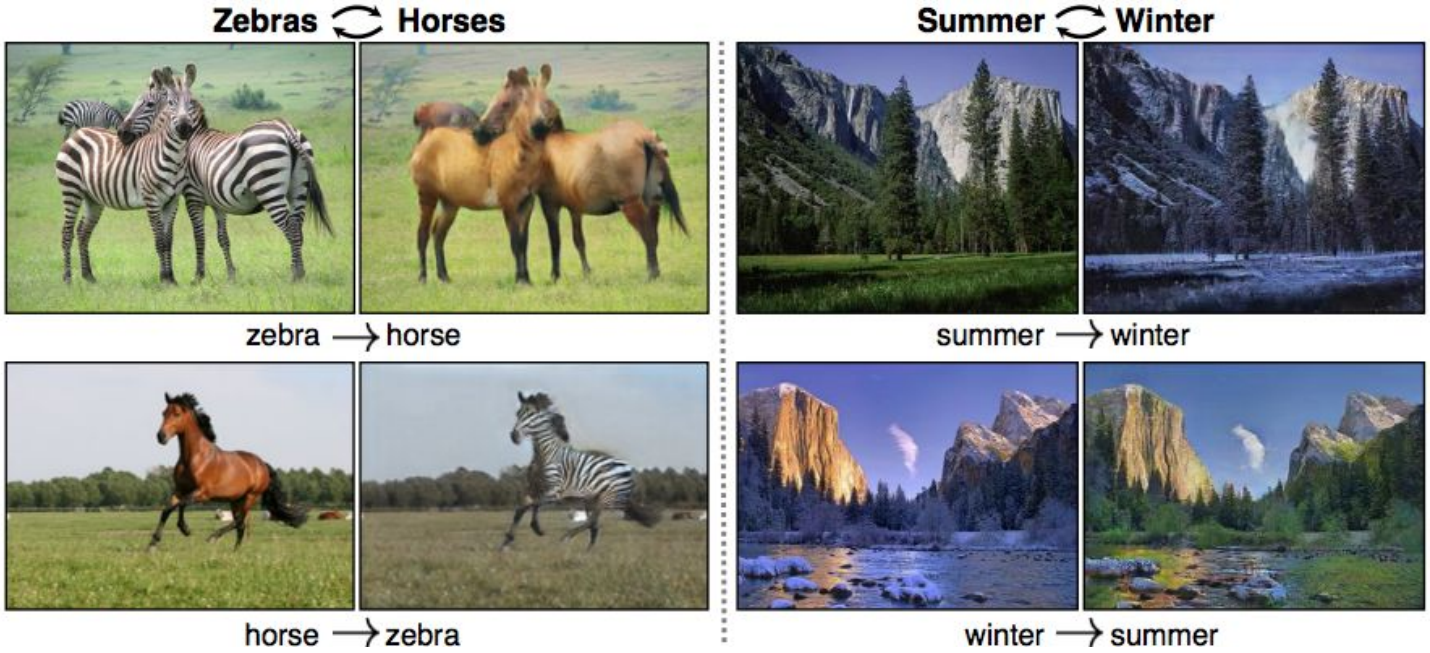
Conditional GANs



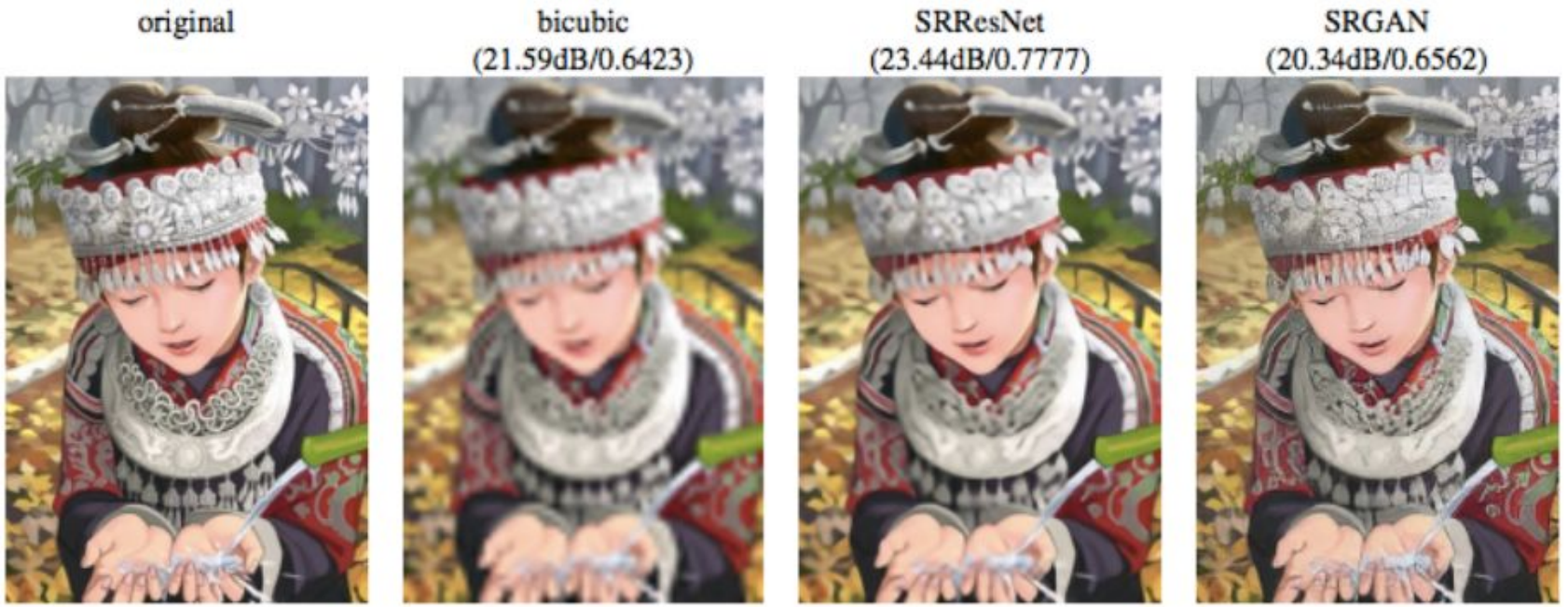
EXAMPLE APPLICATIONS

Image to Image Translation (Isola et al, 2016)

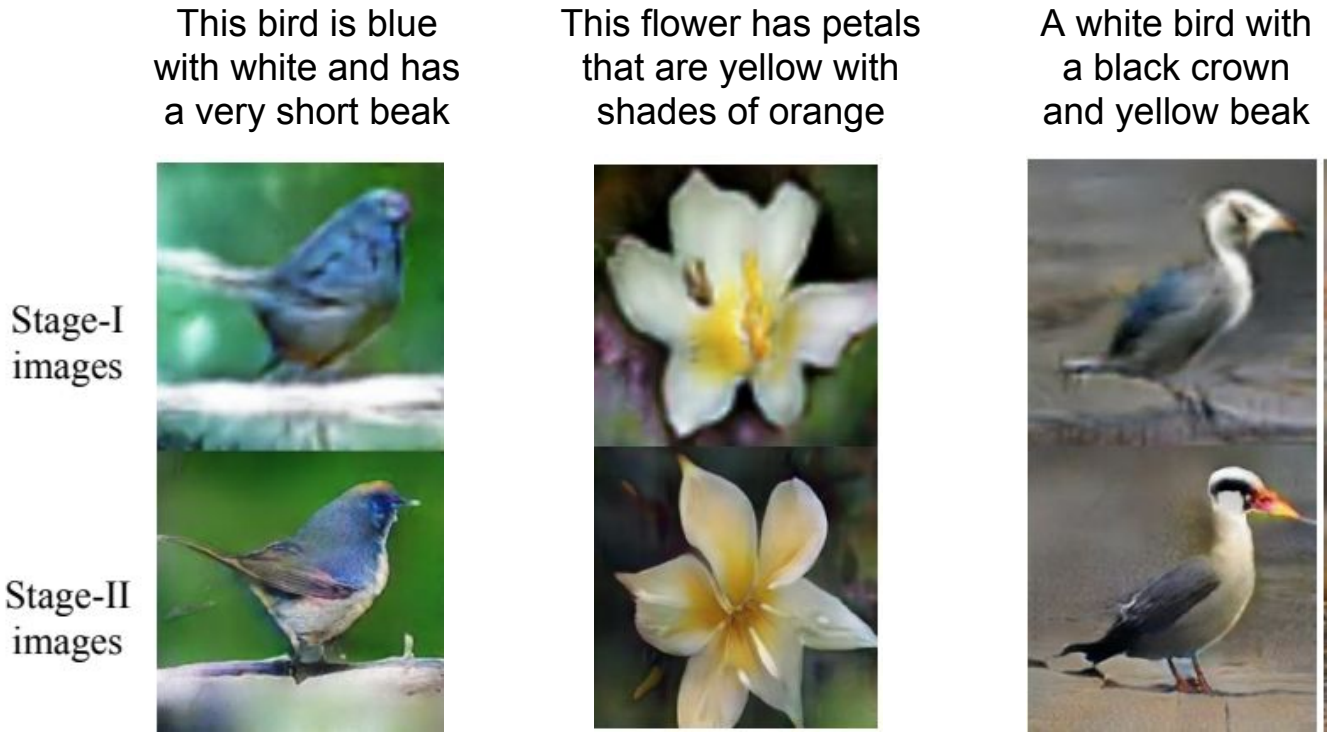
Unpaired Image Translation (Zhu et al, 2017)



Superresolution (Ledig et al, 2016)



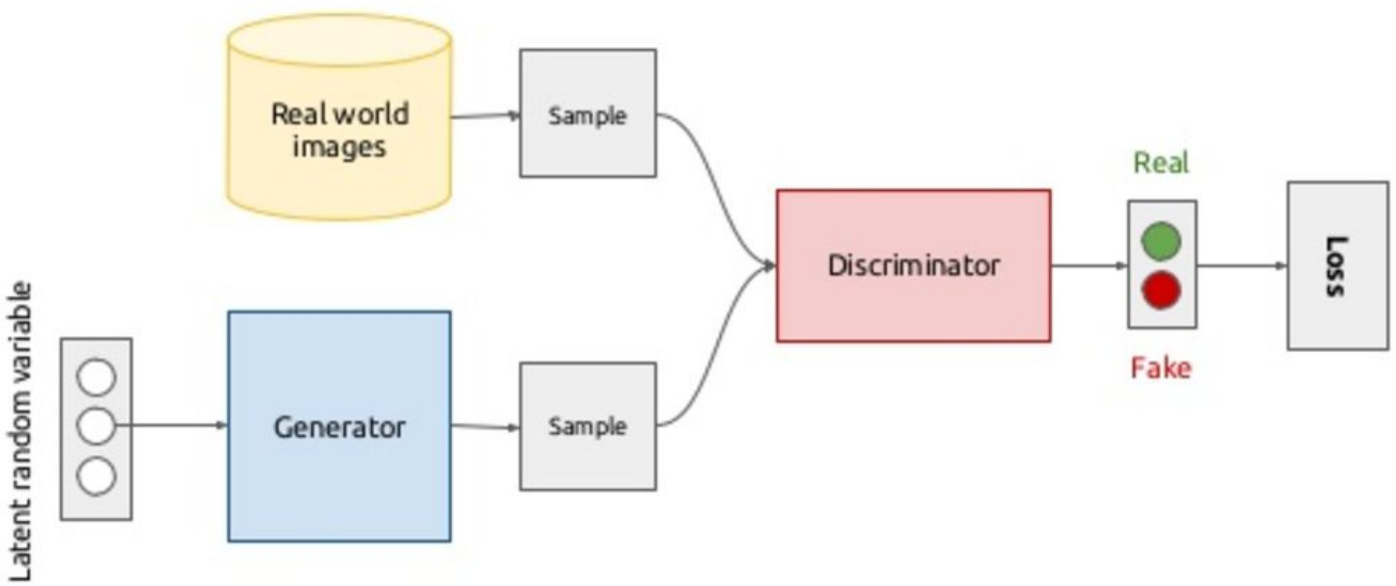
Text-to-image Synthesis (Zhang et al, 2016)



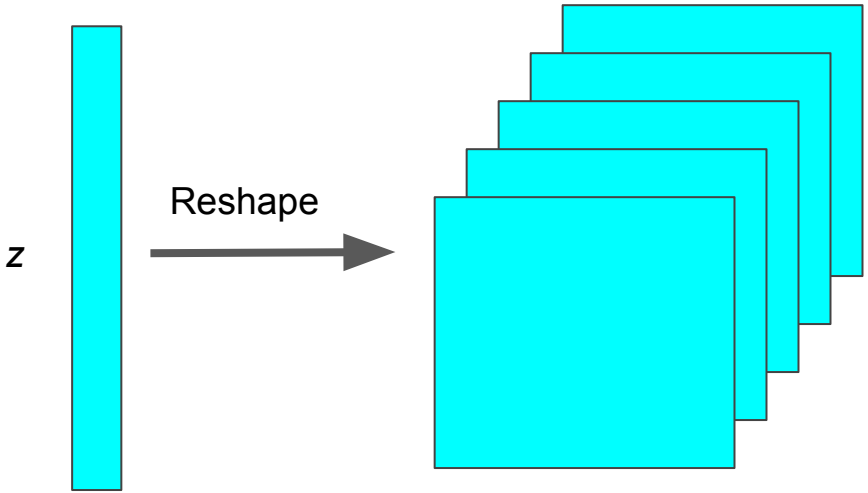
Google Photos Demo (2017)

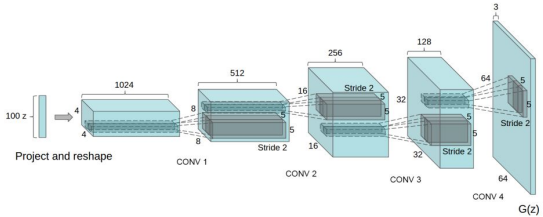
THE GENERATOR

GAN Structure



Deconvolutions and The Generator





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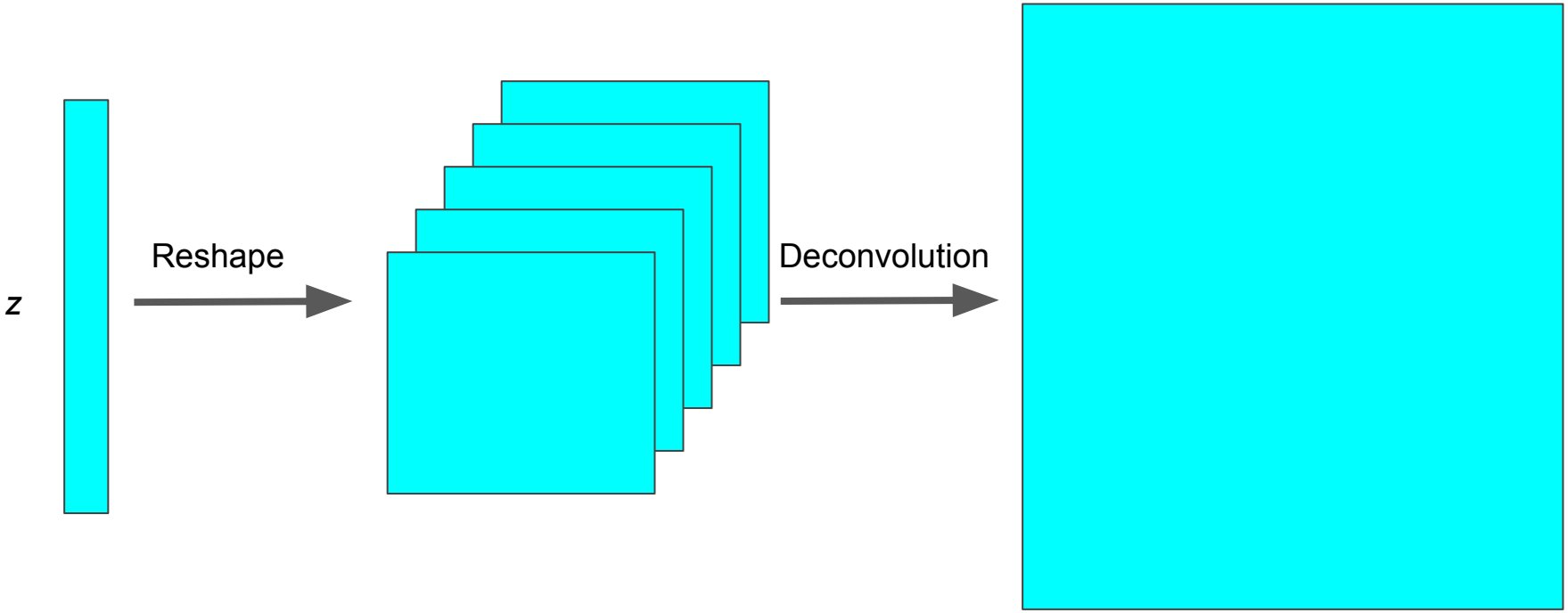
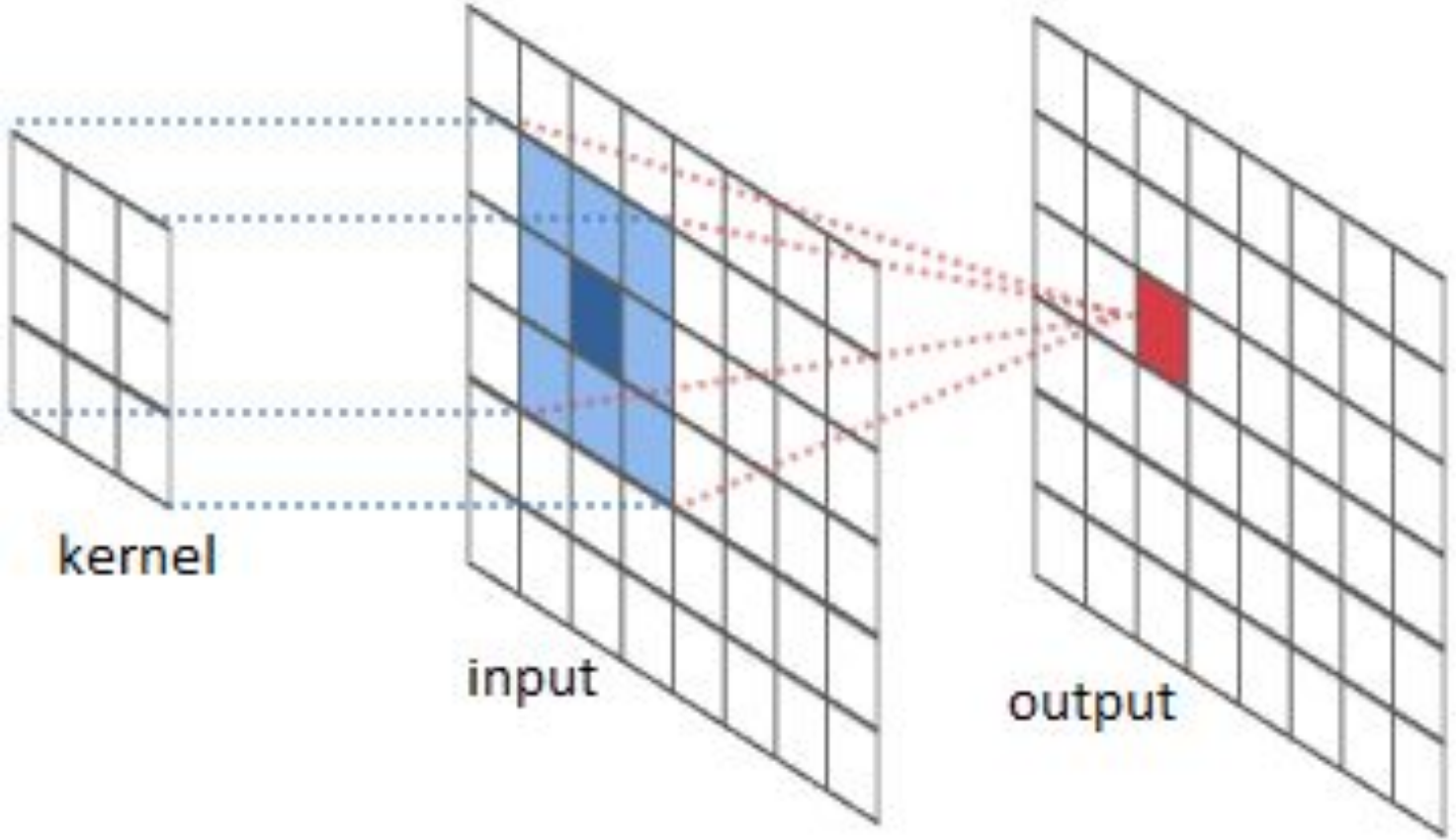


Convolution Review



Convolution Review

Image

200	**200**	**...**	**...**	**...**
0	**0**	**...**	**...**	**...**
...	**...**	**...**	**...**	**...**
...	**...**	**...**	**...**	**...**
...	**...**	**...**	**...**	**...**

Convolution

1.5	1.5
-1.5	-1.5

Output

600	?
?	?

Deconvolution (Transposed Convolution)

Image

200	...	...	...	...
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...

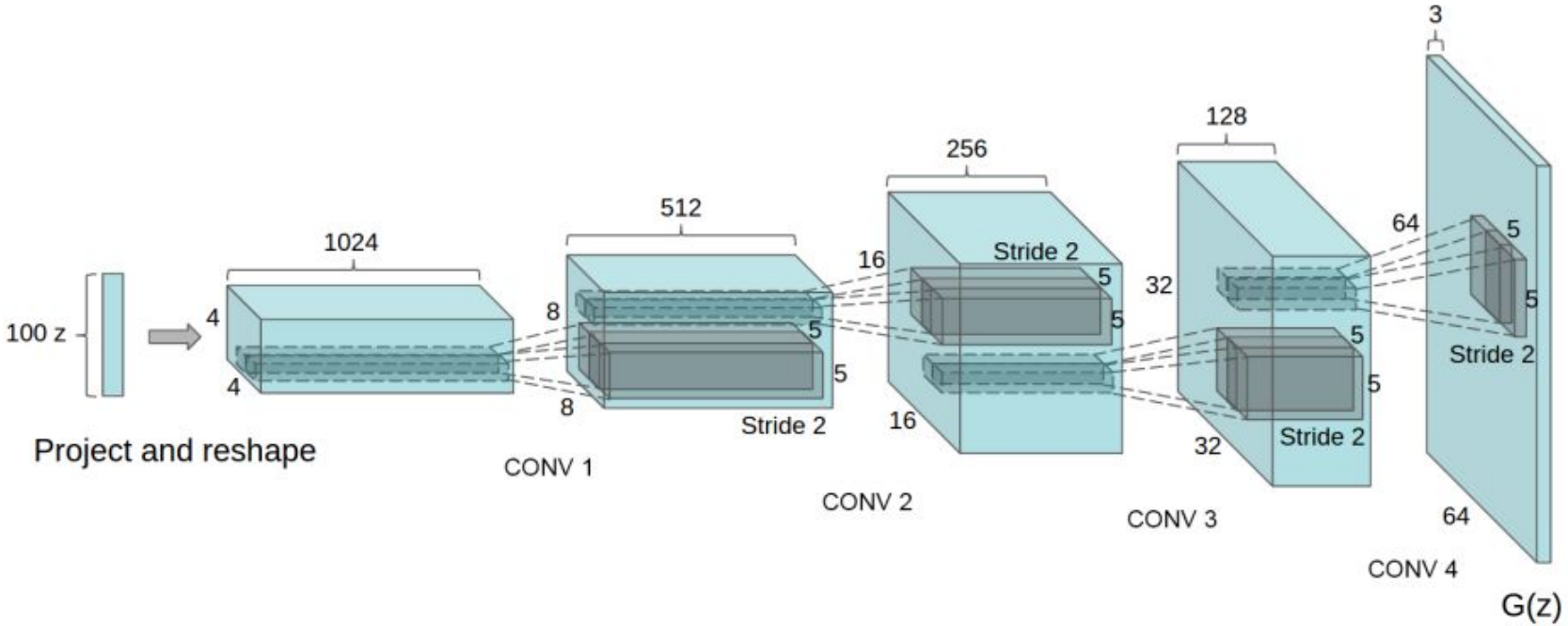
Convolution

1.5	1.5
-1.5	-1.5

Output

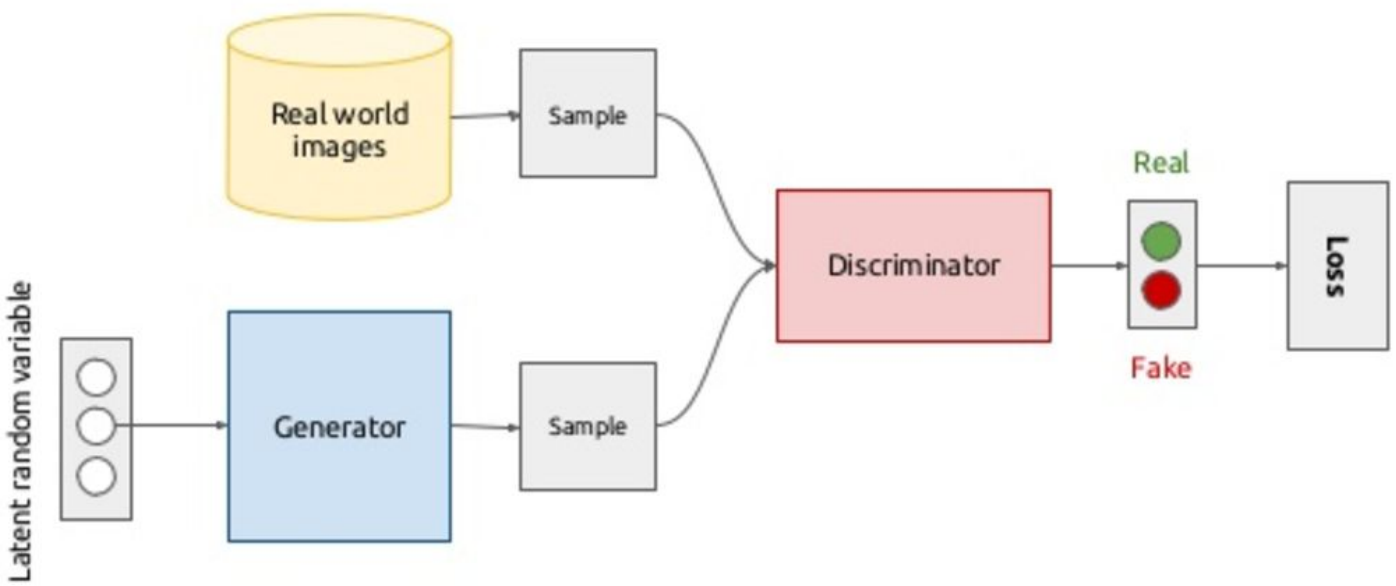
300	300	?
-300	-300	?
?	?	?

Generator (Radford et al, 2015)



THE DISCRIMINATOR

GAN Structure



Discriminator

- Standard classifier architecture

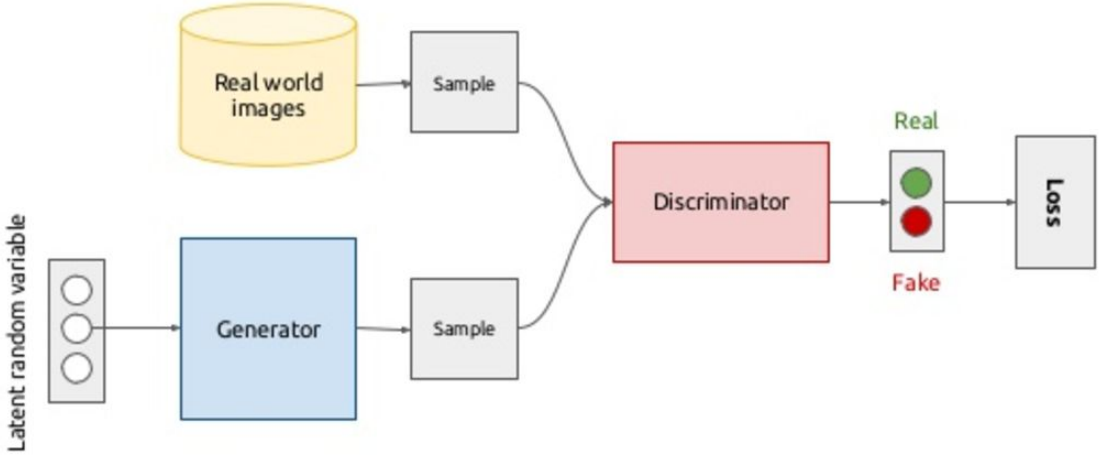
- Results in high perceptual quality

CODING

TFGAN - A Framework for Training GANs

You Specify

- Generator and Discriminator Models
- Real data and random noise
- Loss Functions
- Optimizer Settings
- Training Sequence



Hands-On Coding

- Simple GAN
- Conditional GAN
- Image Translation (Pix2Pix)

Hands-On Coding

- https://www.kaggle.com/dansbecker/running-your-first-gan
- Conditional Gans
- Image Translation (Pix2Pix)
- https://github.com/Kaggle/learntools/tree/master/learntools/gans

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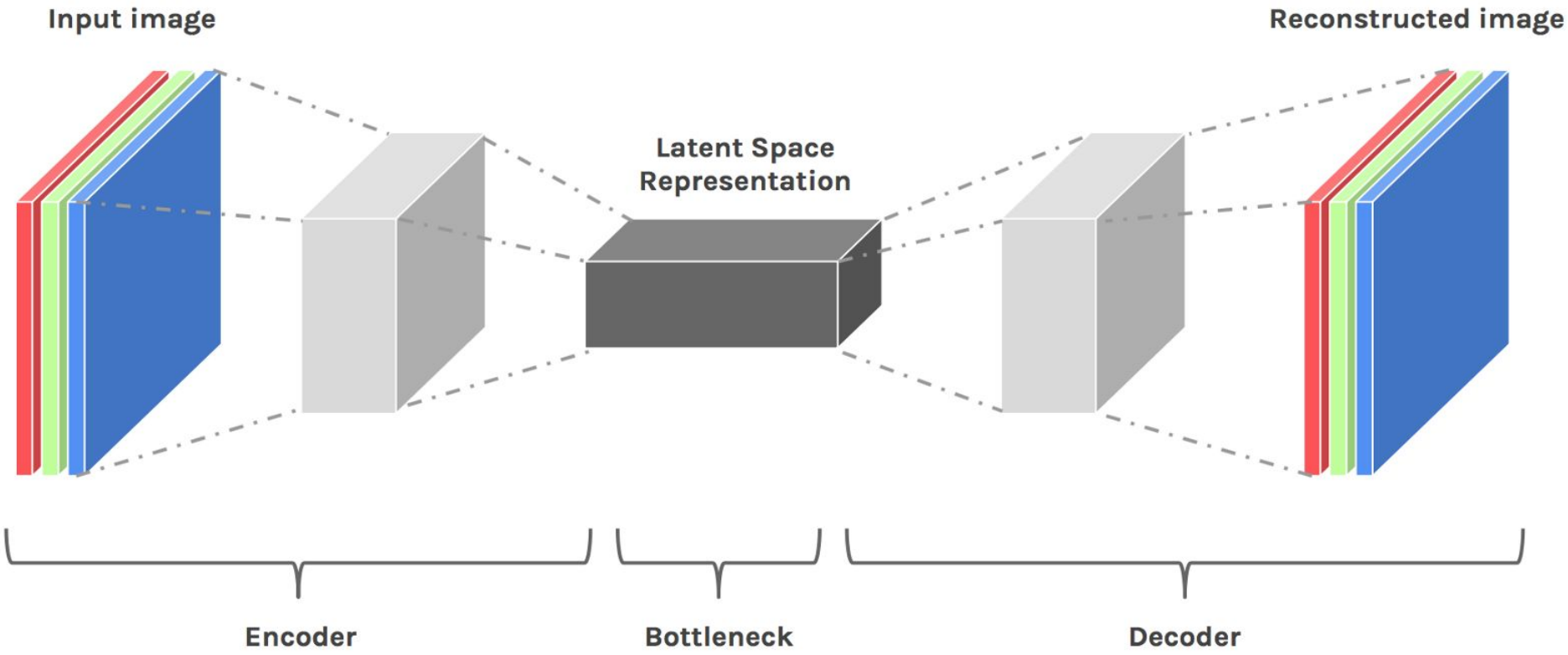
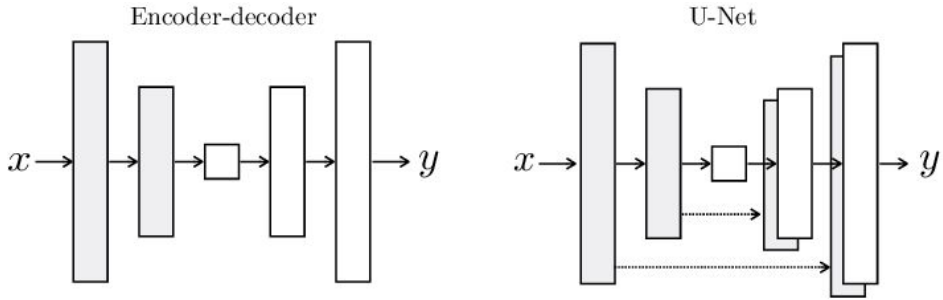
Encoder-Decoder Framework



What Next

- Bigger Networks
- U-Net
- PatchGan



- CycleGan
- Creative/Interesting Applications

It's a fast-developing field. reddit.com/r/machinelearning is a good resource for new research