EI320A(3) 深度學習使用 Python

Instructors

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Week	Date	Content	Note	Total
1	2/26	Welcome to the course	Homework (1)	1
2	3/5	Crash Course of Python, NumPy, Pandas, and Matplotlib	In class hands-on (4)	5
3	3/12	Get to know about Data, ML: Classification Models	In class hands-on (5)	10
4	3/19	ML: Regression Models	In class hands-on (5)	15
5	3/26	ML: Clustering/Apriori Models	In class hands-on (5)	20
6	4/2	Holiday		
7	4/9	Introduction to Deep Learning (ANN)		
8	4/16	ANN Labs, Introduction to Convolutional Neural Network (CNN)	In class hands-on (10)	30
9	4/23	Convolutional Neural Network (CNN) & CNN Labs	In class hands-on (5)	35
10	4/30	Introduction to Recurrent Neural Network (RNN)	In class hands-on (5)	40
11	5/7	Recurrent Neural Network (RNN) & RNN Labs	In class hands-on (5)	45
12	5/14	Wrap Up all ANN, CNN, RNN Project Proposal Presentation	Proposal Presentation (10)	55
13	5/21	Generative Adversarial Network (GAN)	In class hands-on (5)	60
14	5/28	Reinforcement Learning (RL)	In class hands-on (5)	65
15	6/4	NLP & S2S & Attention Neural Network	In class hands-on (5)	70
16	6/11	N/A	In class hands-on (5)	75
17	6/18	Final Project Presentation	Final Presentation (25)	100

GAN Plan of Attack

- The Idea Behind Generative Adversarial Networks (GANs)
- How Do GANs Work (3 Steps)
- Applications

The Idea Behind GANs

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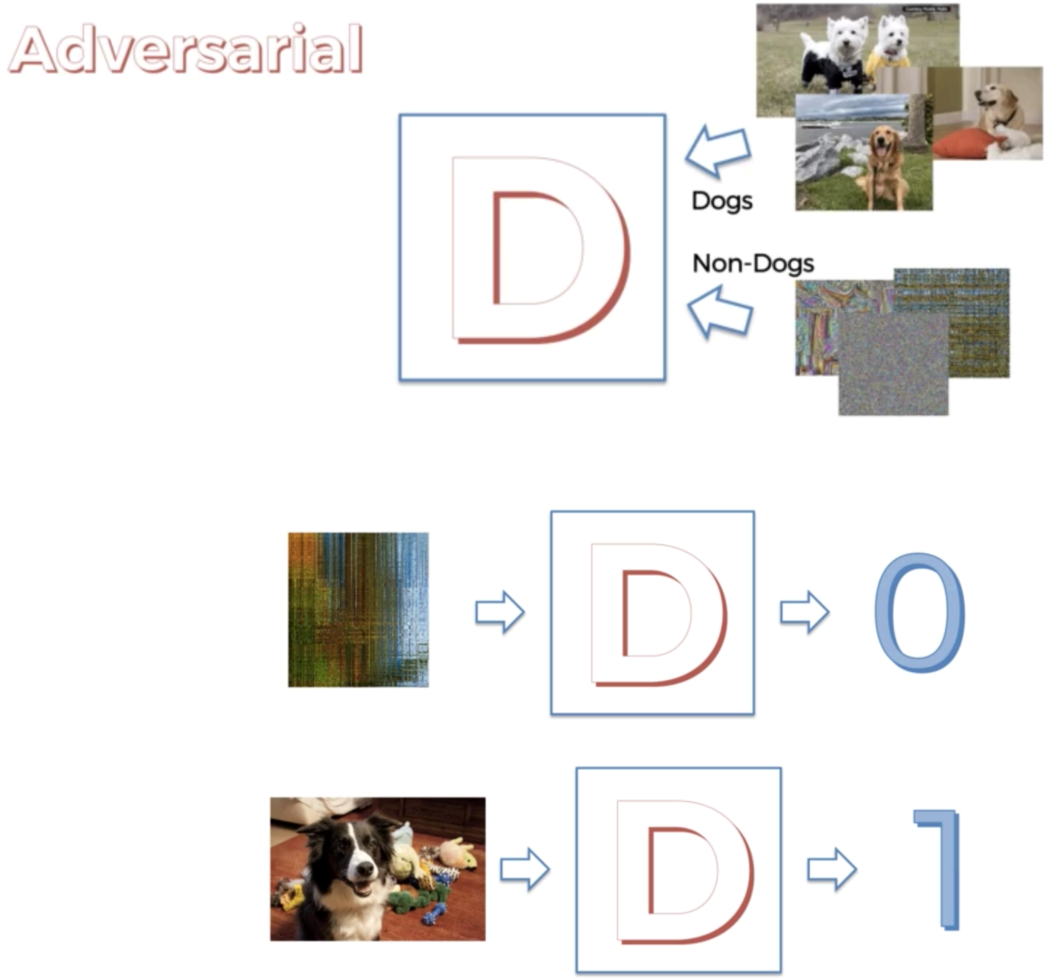
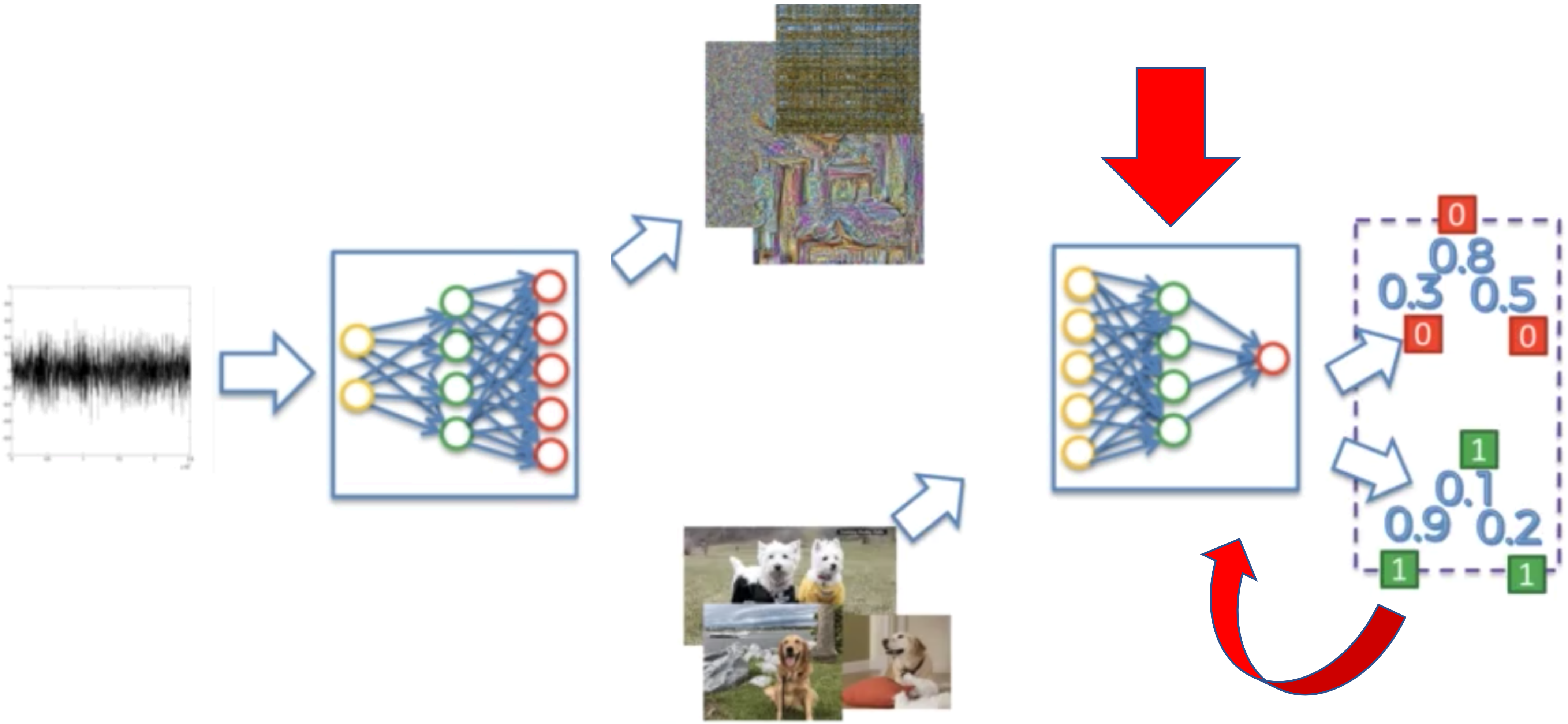
How Do GANs Work? (Step1)



How Do GANs Work? (Step1)

Network

How Do GANs Work? (Step1)



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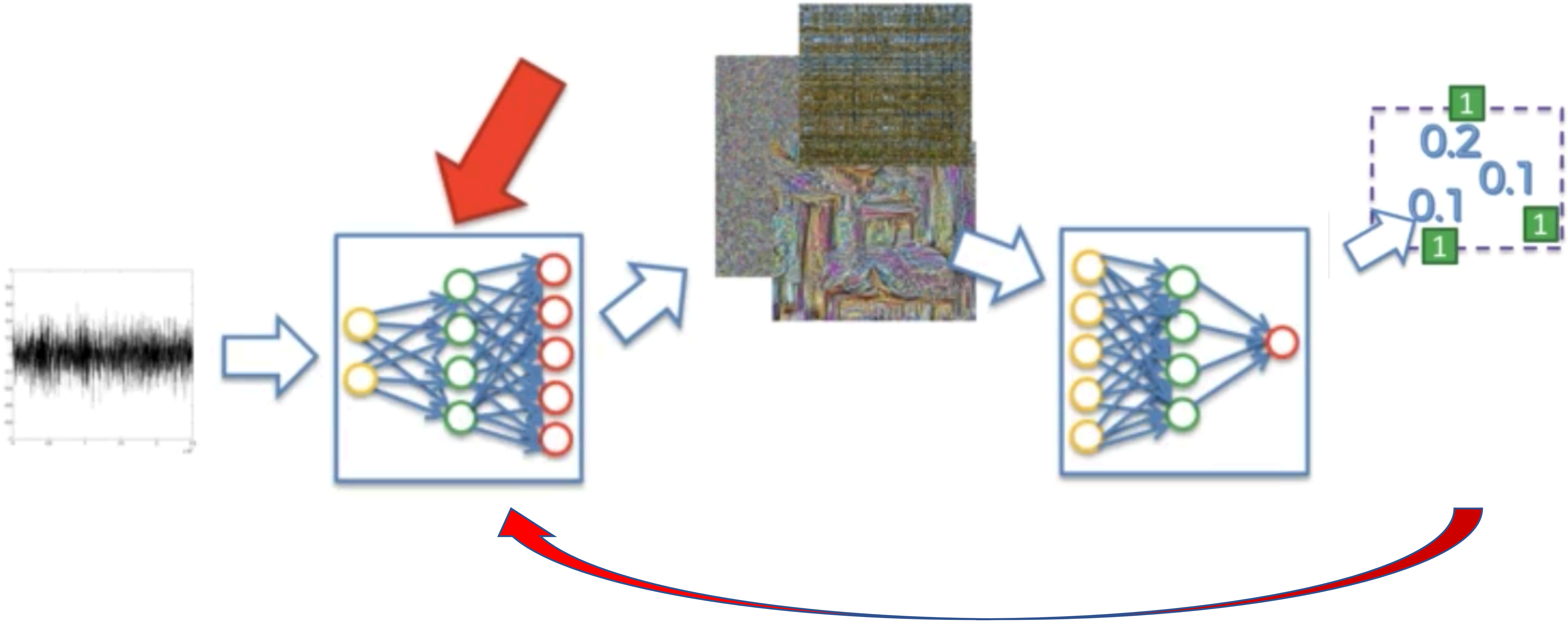
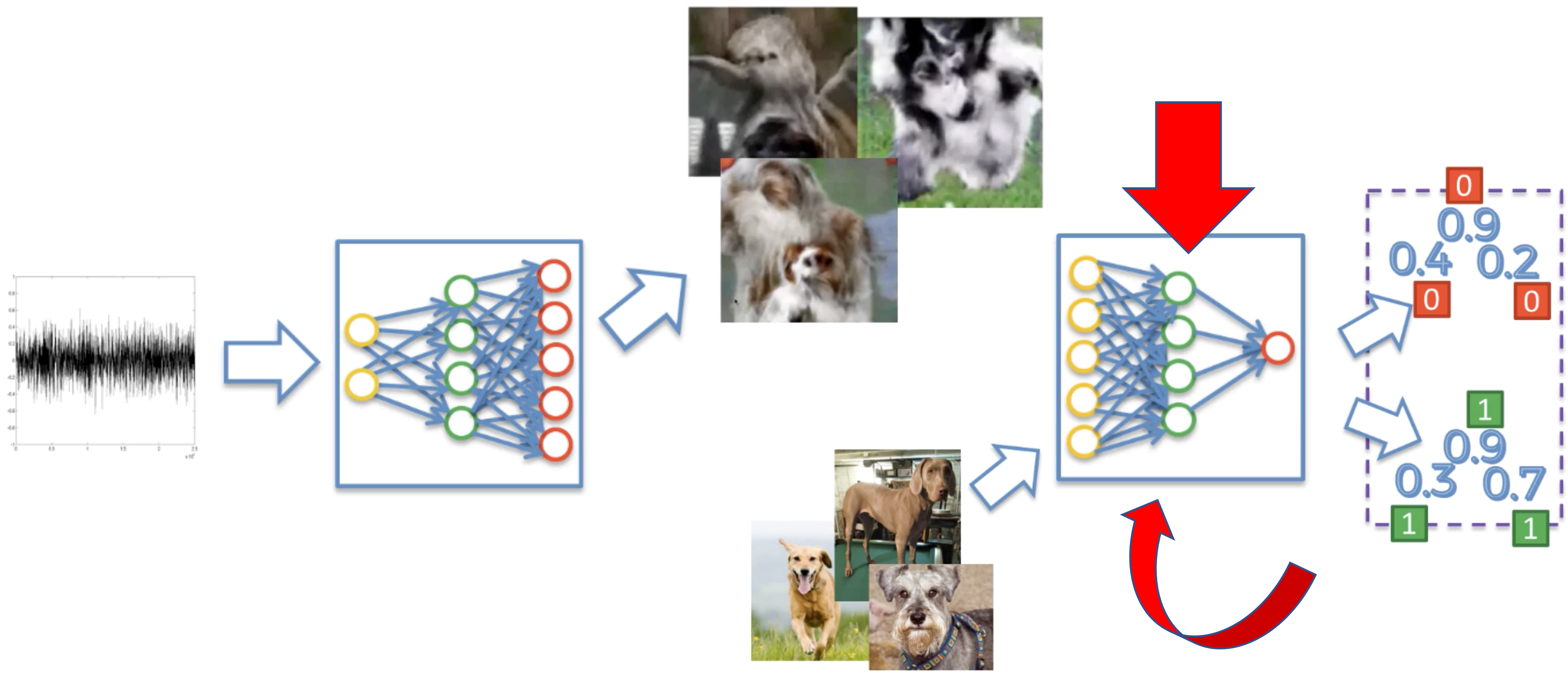


How Do GANs Work? (Step2)



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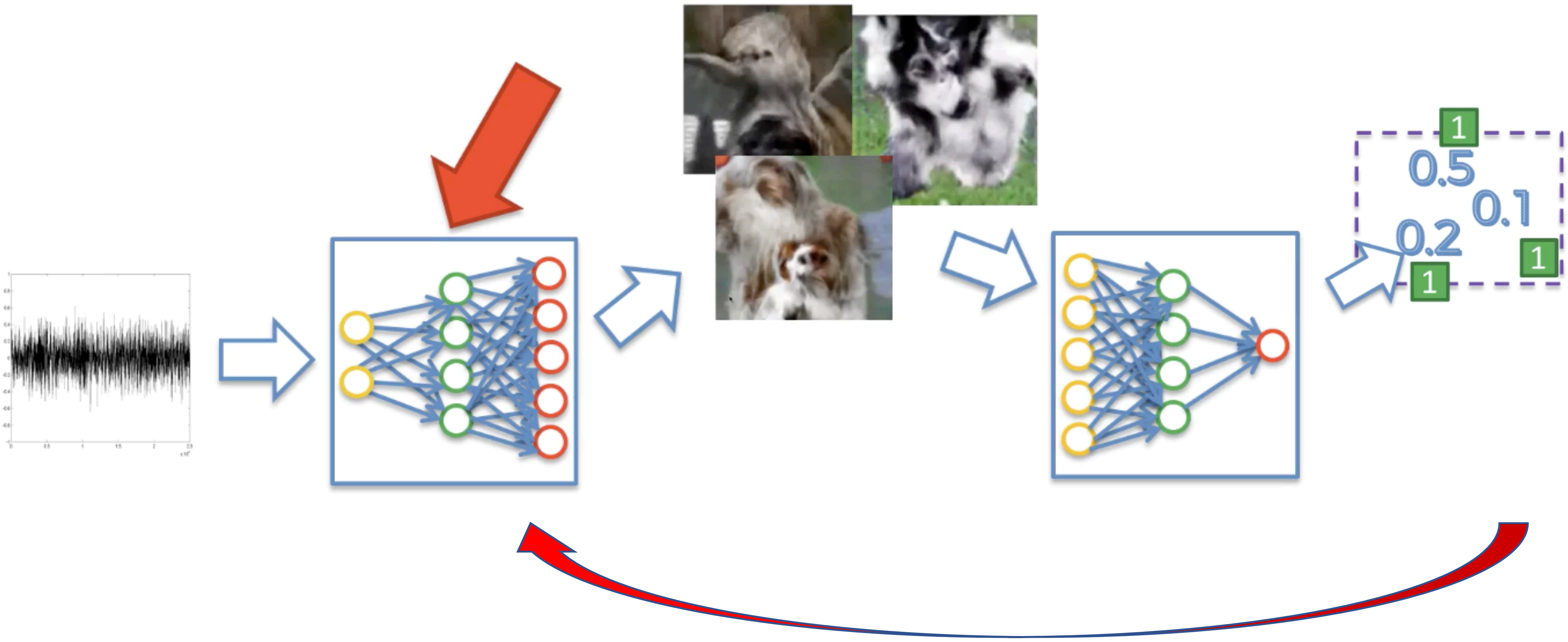
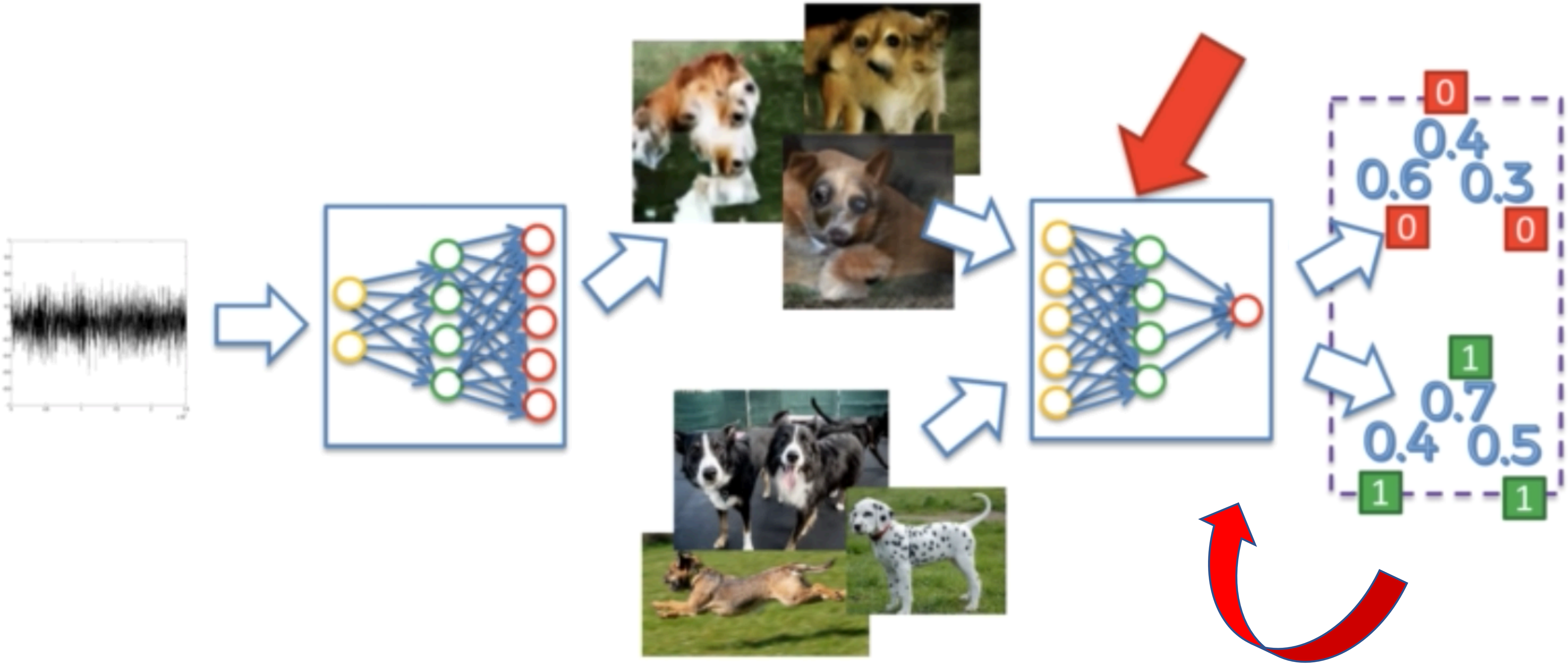


How Do GANs Work? (Step3)



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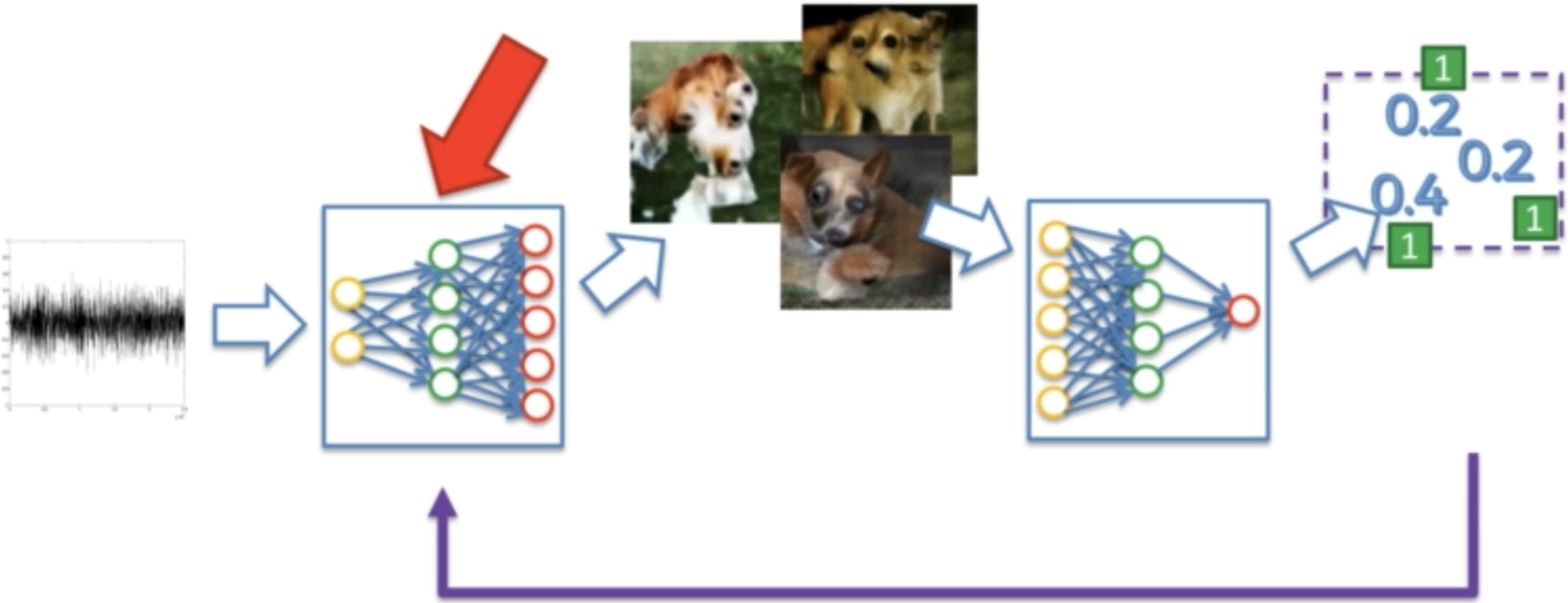
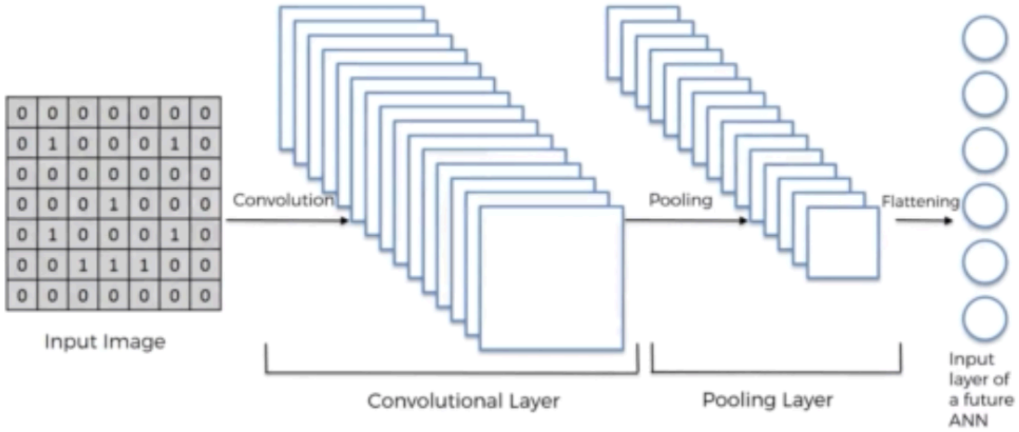
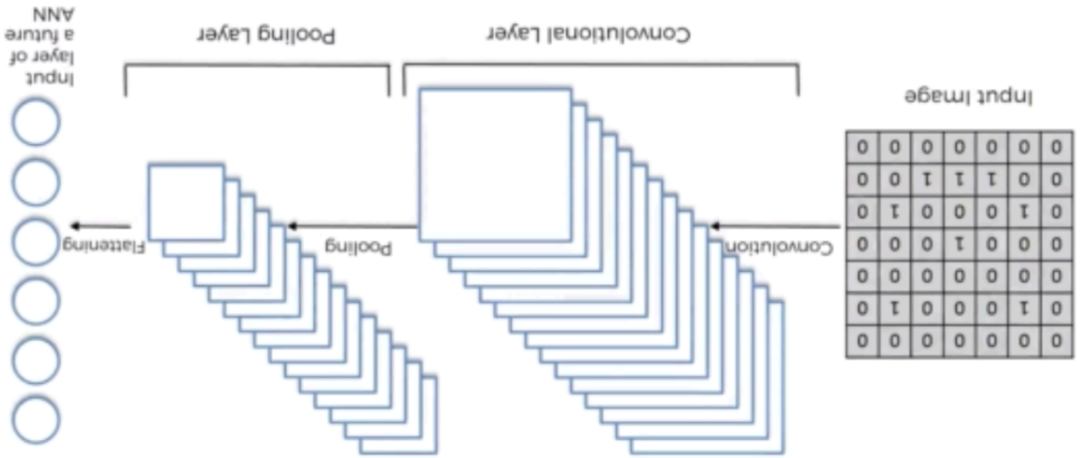


Convolutional Neural Network



DeConvolutional Neural Network



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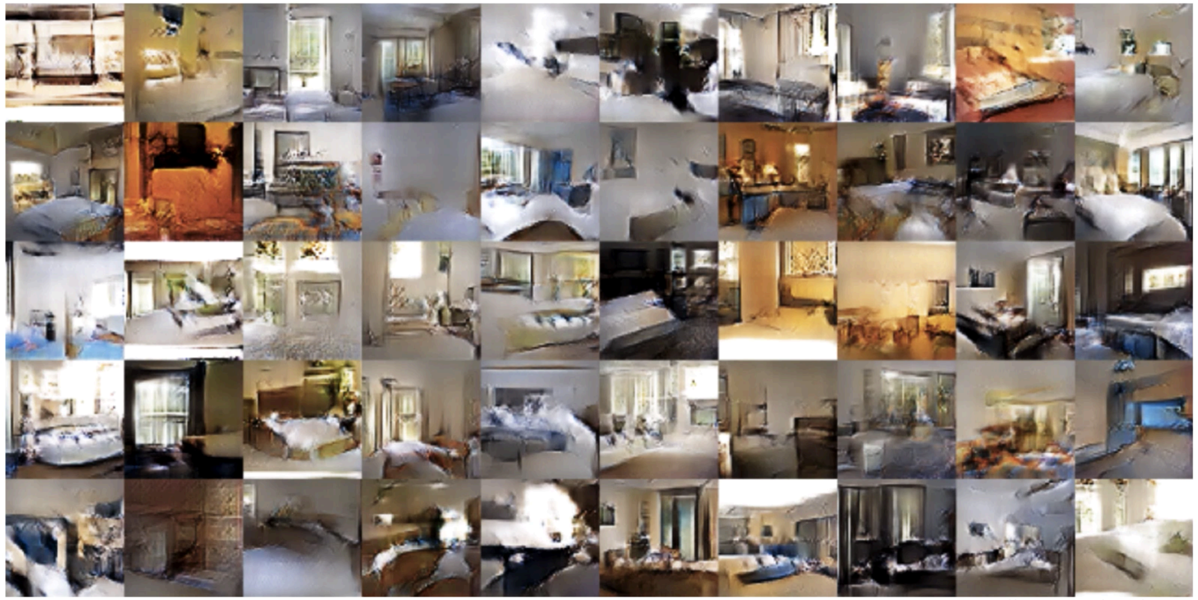
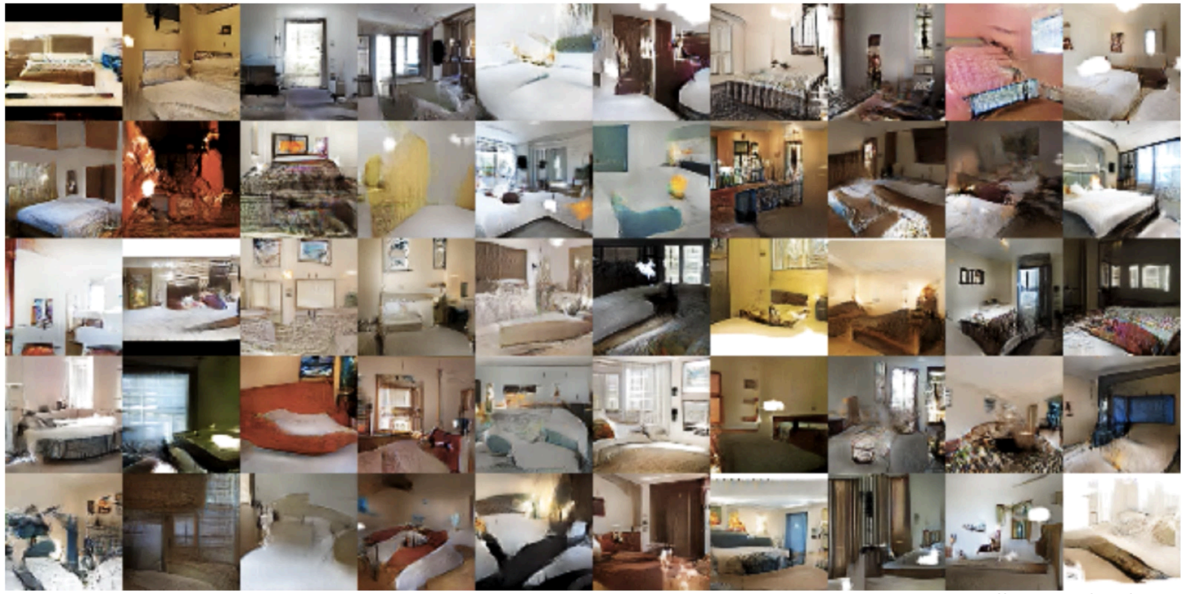
GAN Application

- Generating Images
- Image Modification
- Super Resolution
- Assisting Artists
- Phot—Realistic Images
- Speech Generation
- Face Ageing

Generating Images



Source: https://arxiv.org/pdf/1511.064

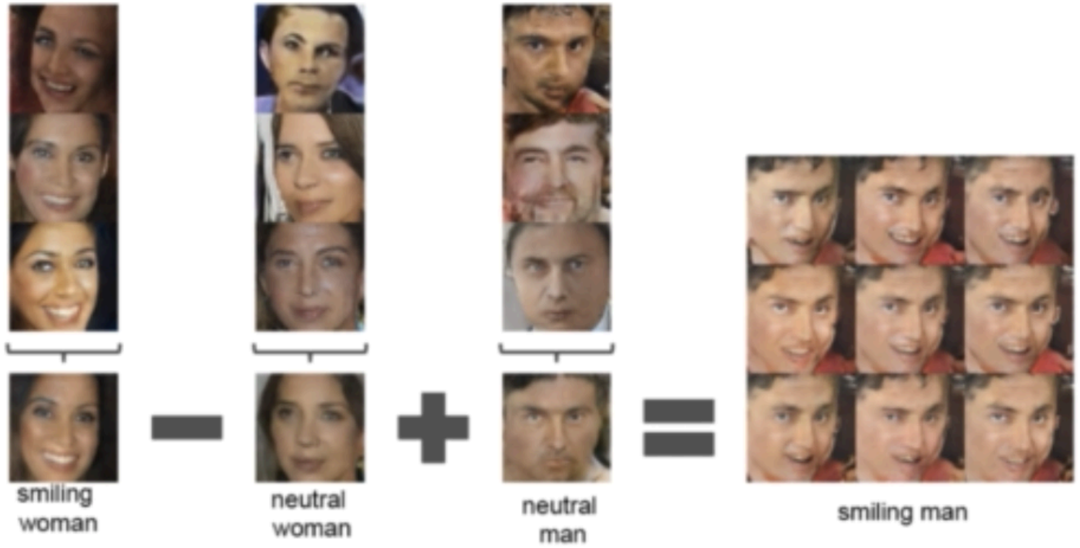


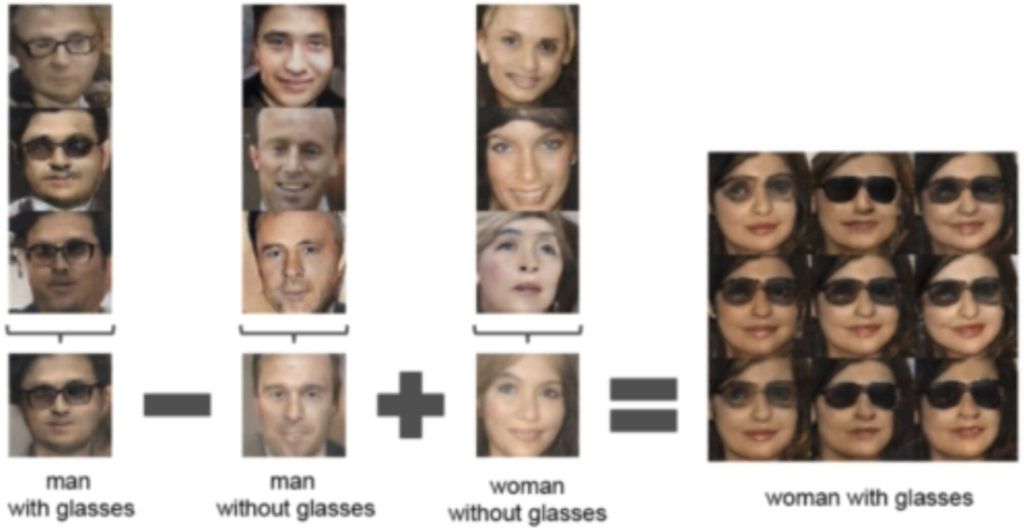
Source: https://arxiv.org/pdf/1511.06434.pdf

@1Epoch

@10Epoch

Image Modification





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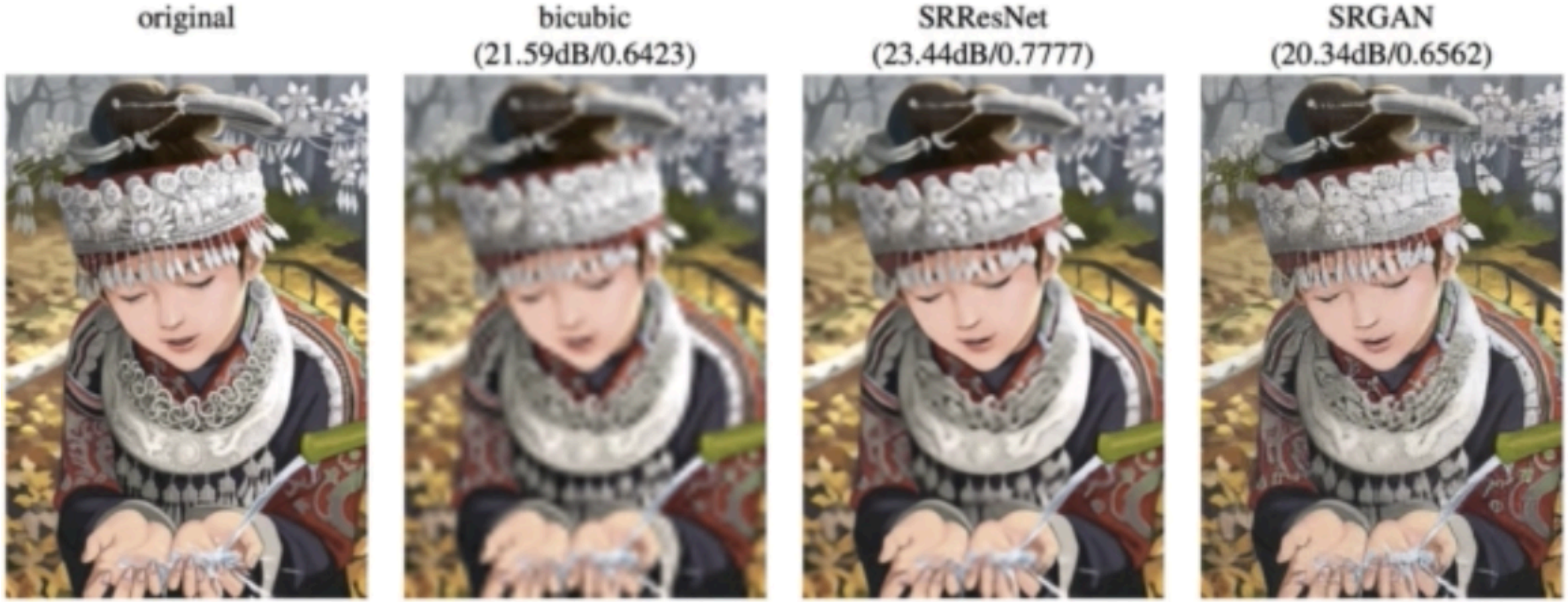
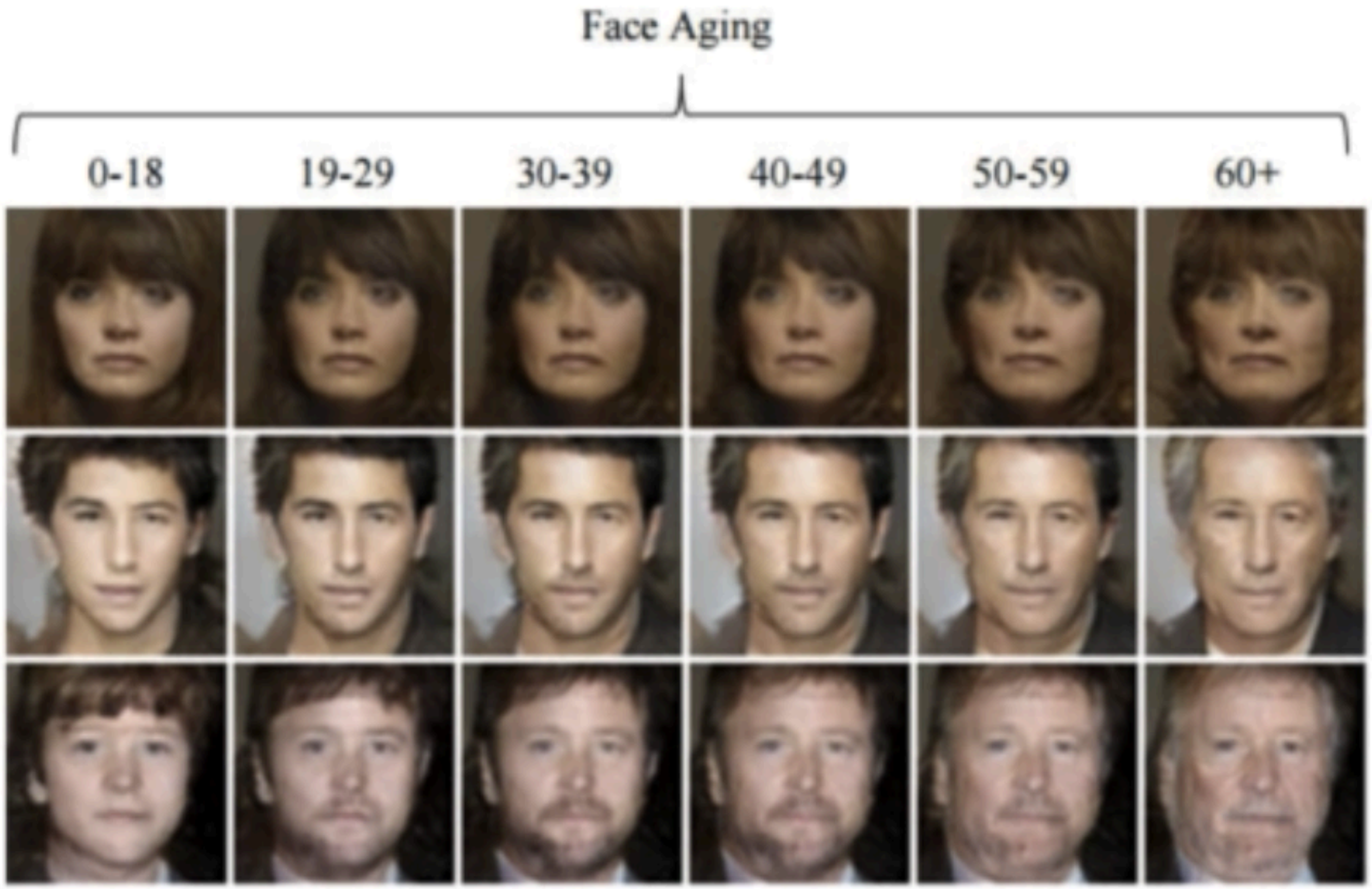
Super Resolution



Source: Ian Goodfellow's presentation

Face Ageing



Summary

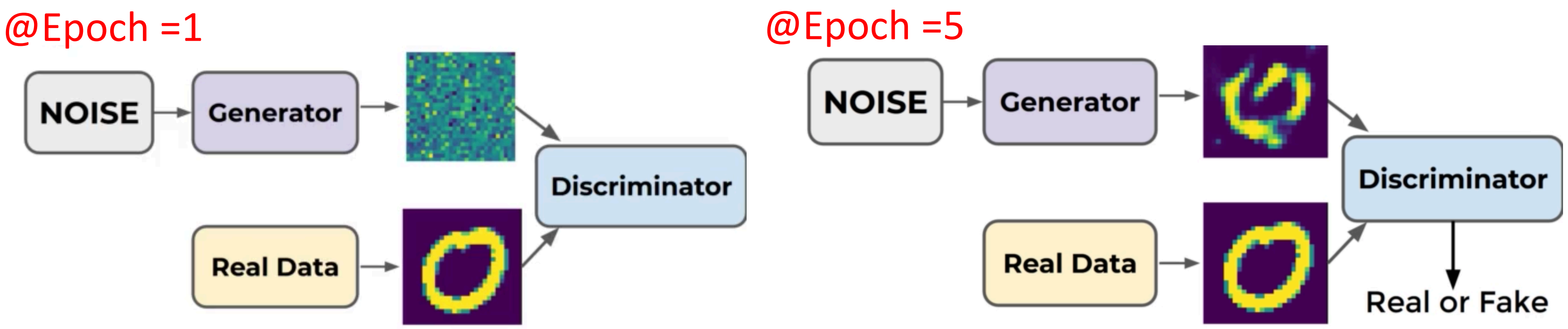
Generator:

- Receives random noise (Gaussian Distribution)
- Outputs data (often an image)

Discriminator

- Takes a dataset consisting of Real images from the real datasets and Fake images from generator.
- Attempt to classify real vs. fake images (always binary classification)

Summary



Training Phases:

- Phase1 – Train Discriminator
  - Real images (labeled 1) are combined with fake images from generator (labeled 0)
  - Discriminator trains to distinguish real from fake (with backpropagation only on discriminator weights)
- Phase2 – Train Generator
  - Produce fake images with generator
  - Feed only these fake images to discriminator with all labels set to 1 (real)
  - This causes the generator to produce images the discriminator believes to be real.
  - Because we feed in fake images with labeled 1, we **only** perform backpropagation on the generator weights in this step.

Summary

- Keep in mind, the generator **never** gets to see the actual real images!
- It generates convincing images only based on gradients flowing back through the discriminator.
- Also, the discriminator is improving as training phases continuing, meaning the generated images will also need to get better and better.

Demo →

Additional reading:

- Chanchana Sornsoontorn, 2017, How do GANs intuitively work?
- Ian Goodfellow et al., 2014, Generative Adversarial Nets
- Matthew D. Zeiler et al., 2011, Adaptive Deconvolutional Networks for Mid and High Level Feature Learning
- Alec Radford et al., 2015, Unsupervised Representation Learning With Deep Convolutional Generative Adversarial Networks
- ARTIST Vs. PIX2PIX - Is This Humor Or Horror?! YouTube Video