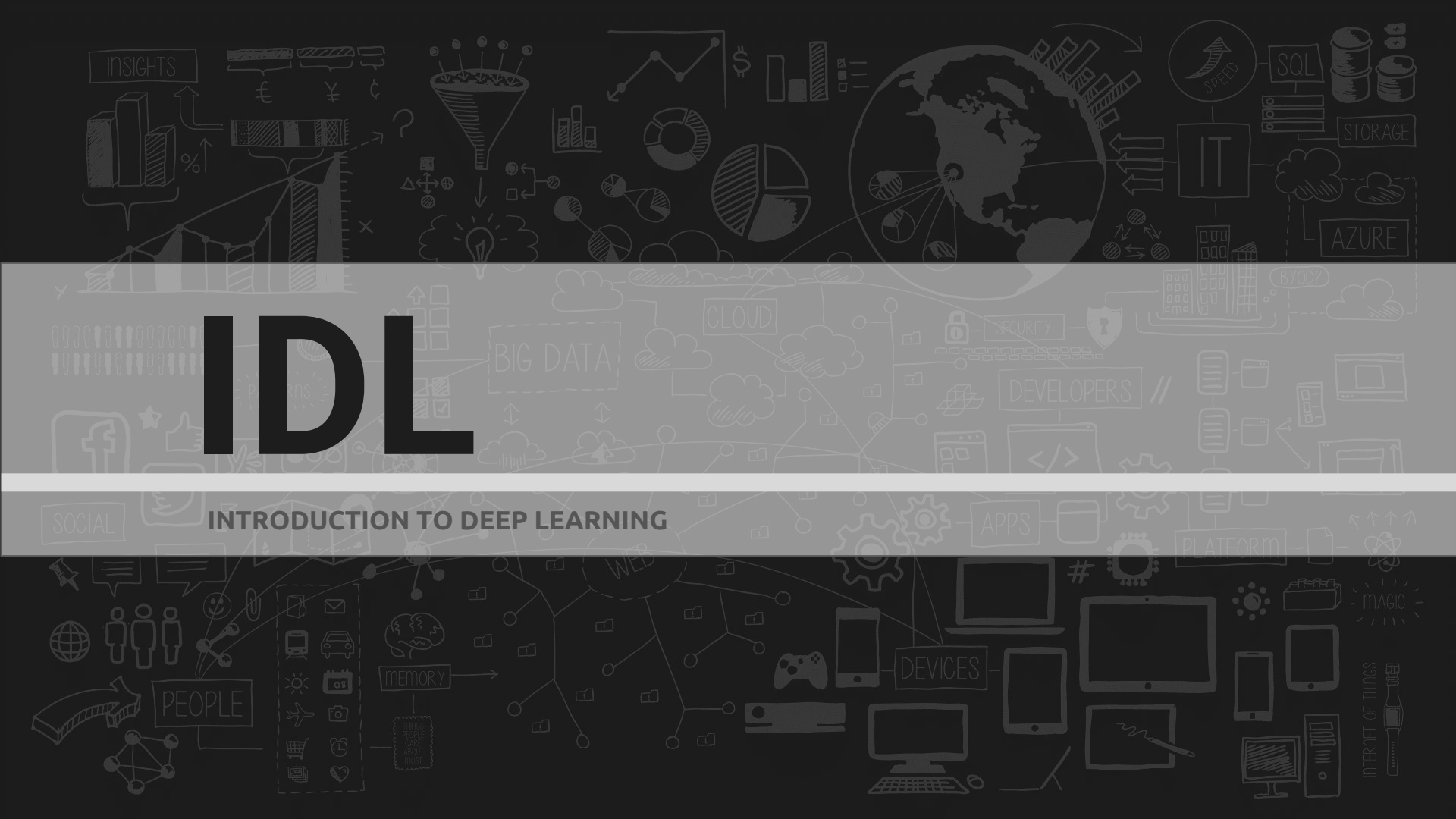
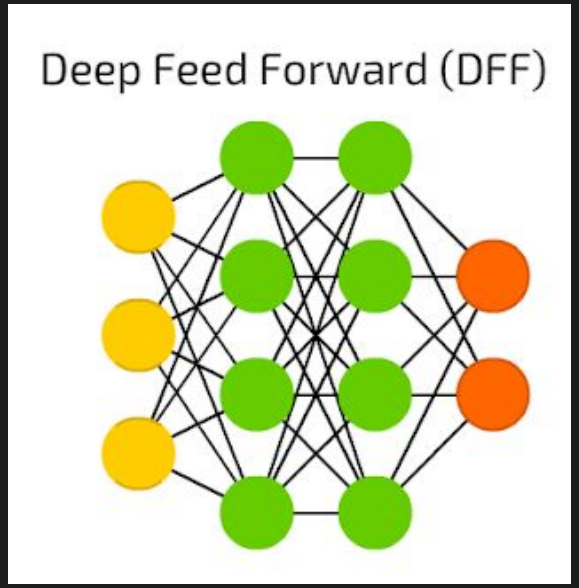


IDL

INTRODUCTION TO DEEP LEARNING

Neural Networks

Deep Feedforward Networks



- There are no feedback connections in which outputs of the model are fed back into itself.
- Information flows from input to output through intermediate (hidden) layers

Generative Adversarial Neural Networks

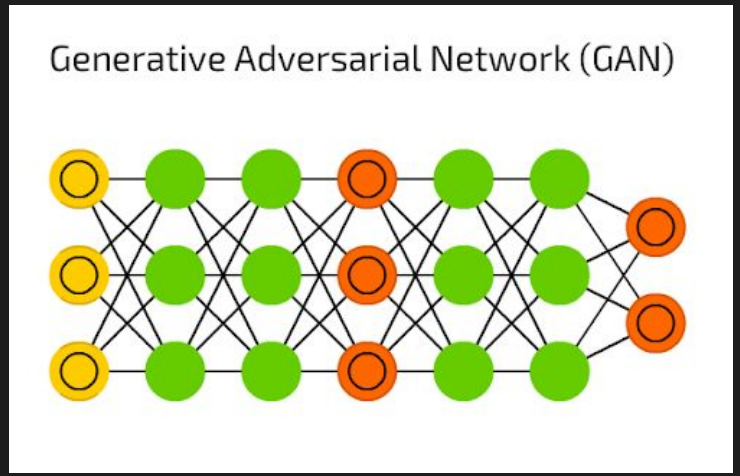
Discriminative Network

- Classify Input data
- Given some features they give probability of a label
- Eg- Spam Detection

Generative Networks

- Can be considered as opposite of Discriminative Network

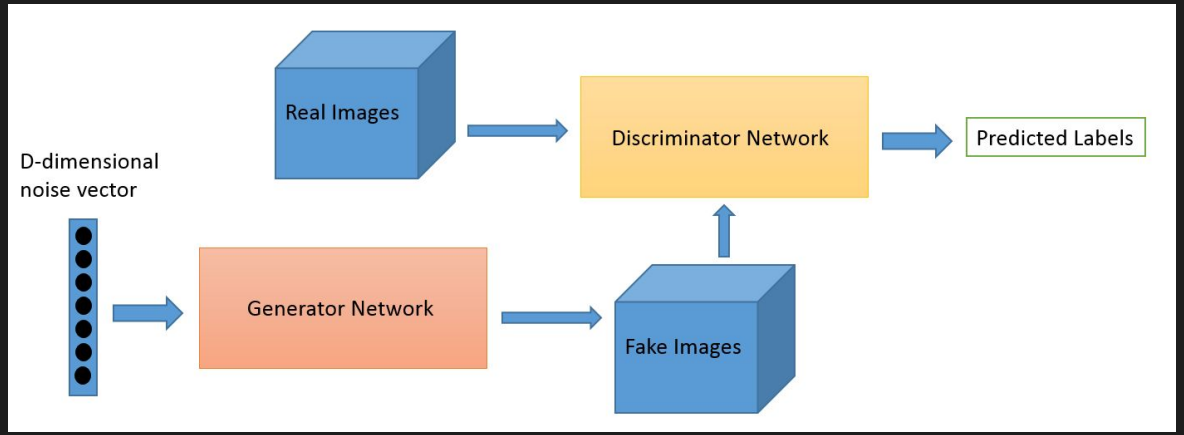
GAN Definition



- comprised of two networks, pitting one against the other

How GANs Work

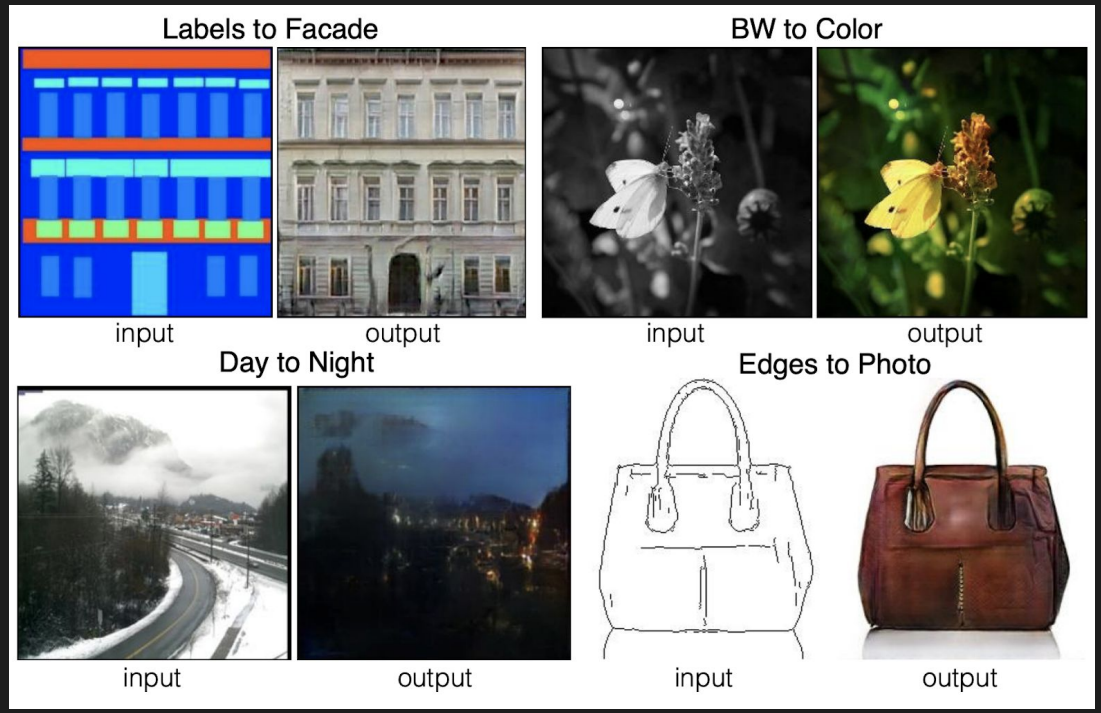
- One neural network, called the generator, generates new data instances, while the other, the discriminator, evaluates them for authenticity.



Training GANs

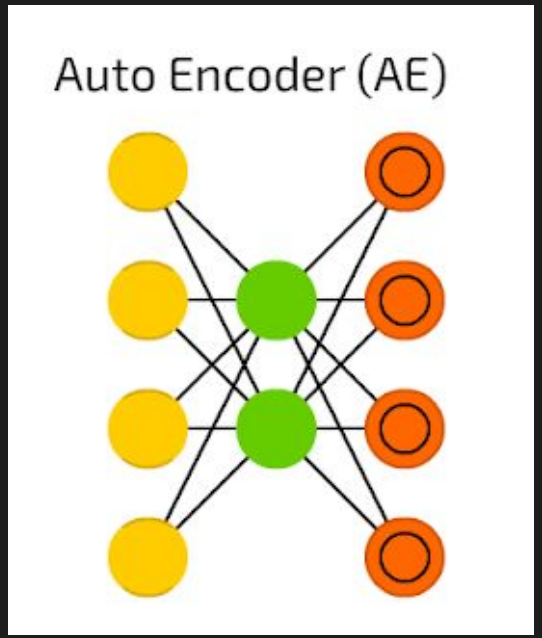
- One side may overpower the other. Can be solved by adjusting learning rates.
- So while training the opponent should be static.
- GANs take a long time to train.

Use-cases of GAN



Autoencoders

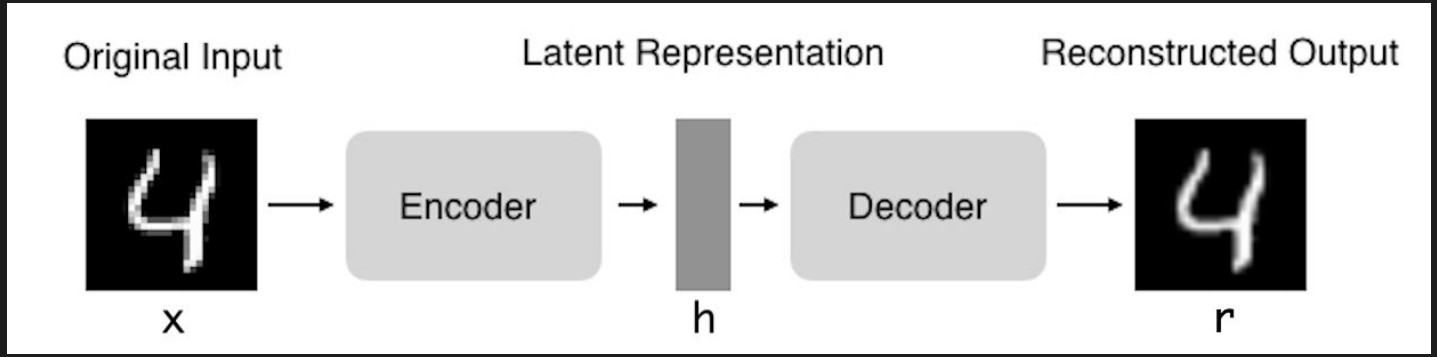
Definition



- Autoencoders encode input data as vectors. They create a hidden, or compressed, representation of the raw data.
- Usually paired with a decoder

How Autoencoders Work

- Encoder: represented by an encoding function h=f(x).
- Decoder: represented by a decoding function r=g(h).
- Overall can be represented as *g(f(x)) = r* where you want r as close as the original input x.



Why Autoencoders?

- If the only purpose of autoencoders was to copy the input to the output, they would be useless.
- The latent representation h will take on useful properties.
- We can constrain *h* to have smaller dimensions than *x*, in this case the autoencoder is called undercomplete.
- The opposite where the dimension of the latent representation is greater than the input. The network doesn't learn anything about the data is called overcomplete

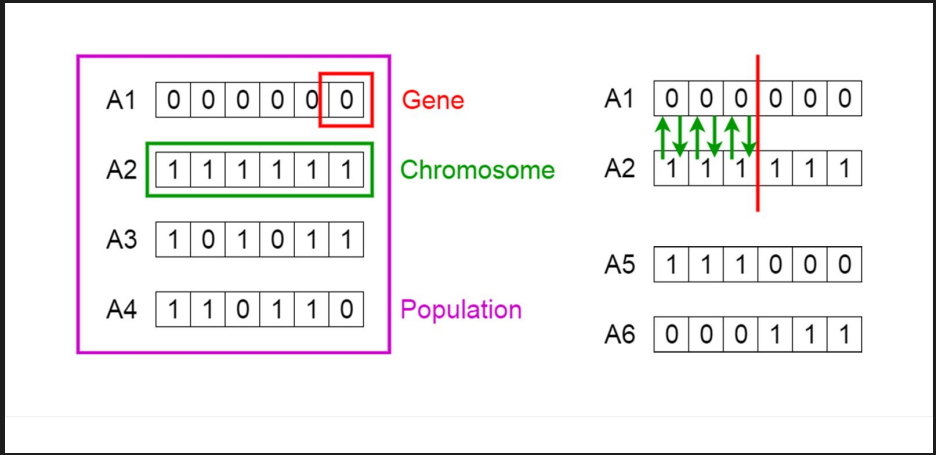
Uses of Autoencoders

- Today data denoising and dimensionality reduction for data visualization are considered as two main interesting practical applications of autoencoders.
- Autoencoders are trained to preserve as much information as possible when an input is run through the encoder and then the decoder, but are also trained to make the new representation have various nice properties.

Genetic Algorithm

Definition

- Inspired by Charles Darwin’s theory of natural evolution.
- This algorithm reflects the process of natural selection where the fittest individuals are selected for reproduction in order to produce offspring of the next generation.



Idea of Natural Selection

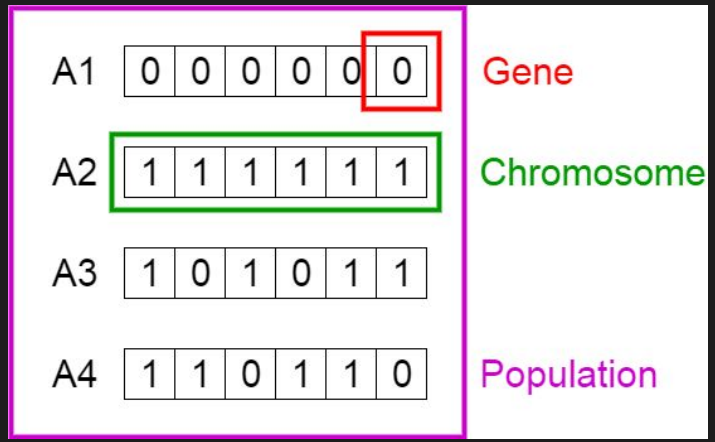
- The process of natural selection starts with the selection of fittest individuals from a population. They produce offspring which inherit the characteristics of the parents and will be added to the next generation.
- This Idea can be applied to Search Problem

5 Phases of Genetic Algorithms

- Initial Population
- Fitness Function
- Selection
- Cross-over
- Mutation

Initial Population

- The process begins with a set of individuals which is called a Population.
- An individual is characterized by a set of parameters (variables) known as Genes. Genes are joined into a string to form a Chromosome (solution).



Fitness Function

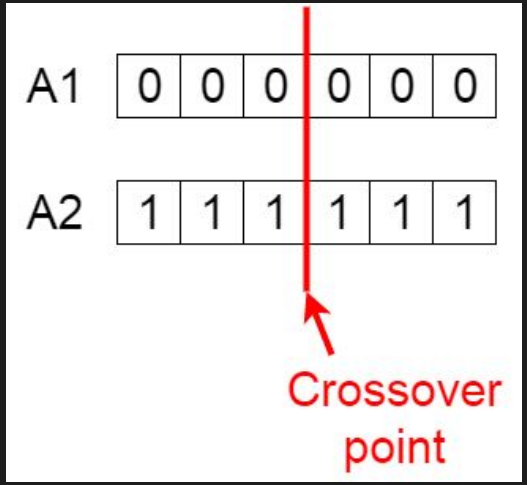
- The fitness function determines how fit an individual is (the ability of an individual to compete with other individuals). It gives a fitness score to each individual. The probability that an individual will be selected for reproduction is based on its fitness score.

Selection

- The idea of selection phase is to select the fittest individuals and let them pass their genes to the next generation.

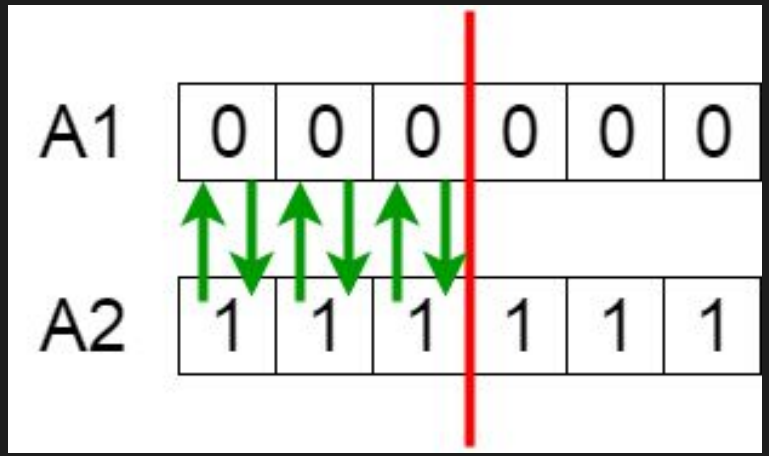
Crossover

- Crossover is the most significant phase in a genetic algorithm. For each pair of parents to be mated, a crossover point is chosen at random from within the genes.



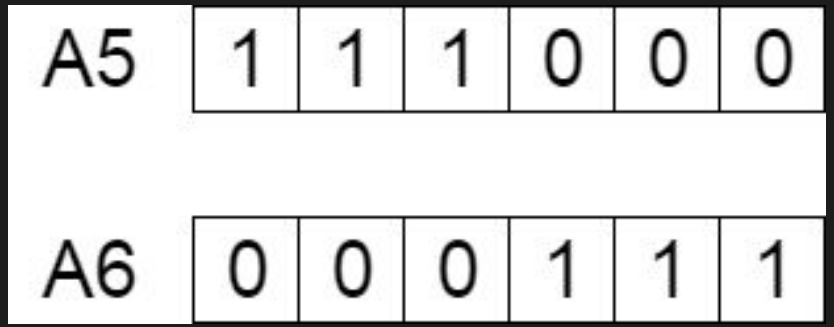
Crossover

- Offspring are created by exchanging the genes of parents among themselves until the crossover point is reached.



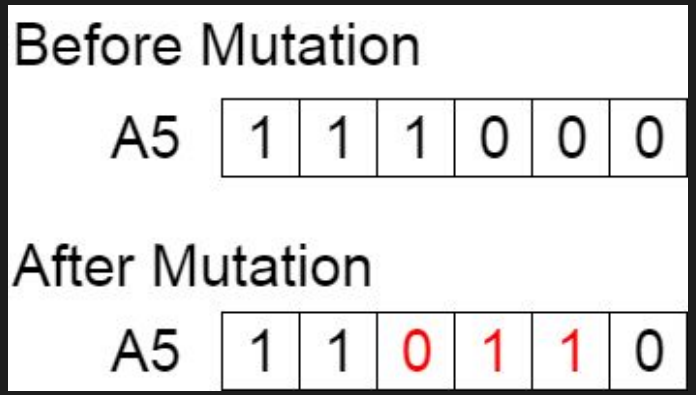
Crossover

- Offspring are added to the population



Mutation

- In certain new offspring formed, some of their genes can be subjected to a mutation with a low random probability
- Mutation occurs to maintain diversity within the population and prevent premature convergence.



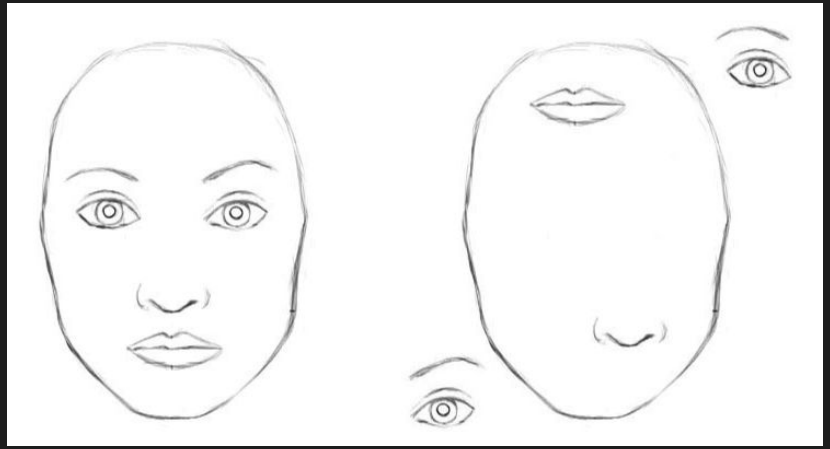
Termination

- The algorithm terminates if the population has converged (does not produce offspring which are significantly different from the previous generation).

Capsule Networks

Drawbacks of CNNs

- Internal data representation of a convolutional neural network does not take into account important spatial hierarchies between simple and complex objects.



Idea behind CapsNET

- In computer Graphics rendering is the generation of a visual image from some internal representation of data.
- The idea behind Capsule Networks is that our brains called do Inverse graphics
- And the key idea is that representation of objects in the brain does not depend on view angle.
- So how do we represent this inside Neural Networks?
- in order to correctly do classification and object recognition, it is important to preserve hierarchical pose relationships between object parts. This is the Key idea of Capsule Networks

Idea behind CapsNET

Your brain can easily recognize this is the same object, even though all photos are taken from different angles. CNNs do not have this capability.

Idea behind CapsNET

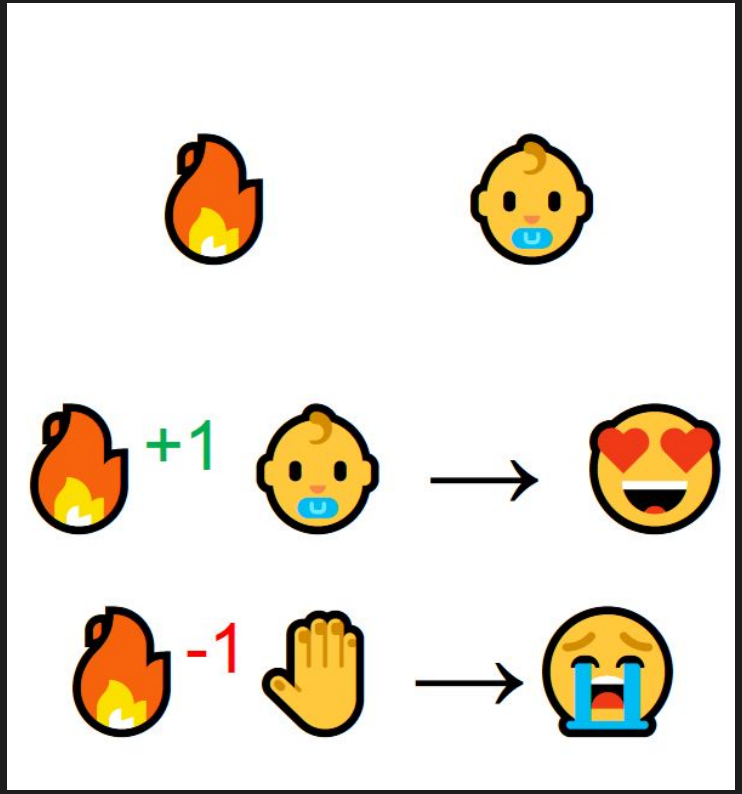
Your brain can easily recognize this is the same object, even though all photos are taken from different angles. CNNs do not have this capability.

Reinforcement Learning

Definition

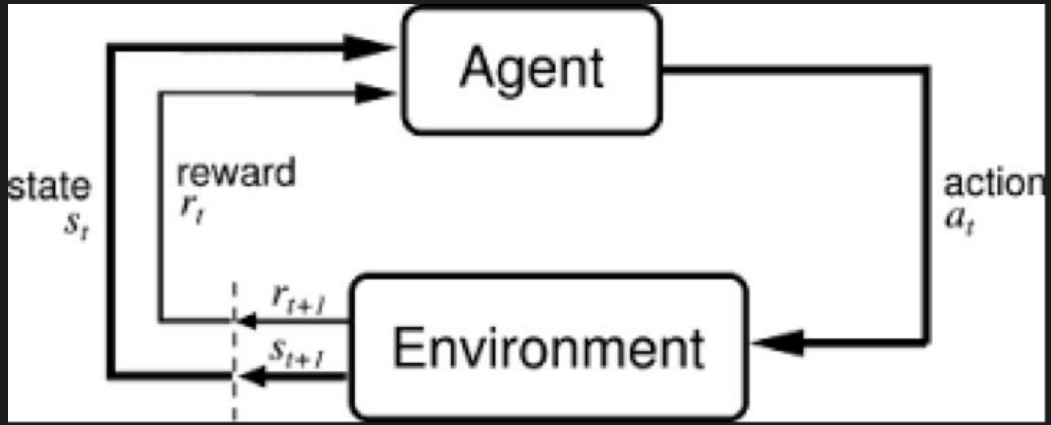
- Reinforcement learning is an important type of Machine Learning where an agent learn how to behave in a environment by performing actions and seeing the results.

Idea Behind Reinforcement Learning



Reinforcement Learning

- Agent: An agent takes actions
- Action : Action is the set of all possible moves the agent can make.
- Environment: The world through which the agent moves.
- State (S): A state is a concrete and immediate situation in which the agent finds itself;



AlphaGO

Definition

- AlphaGo is the first computer program to defeat a professional human Go player, the first program to defeat a Go world champion, and arguably the strongest Go player in history.
- During the games, AlphaGo played a handful of highly inventive winning moves.

What is Go?

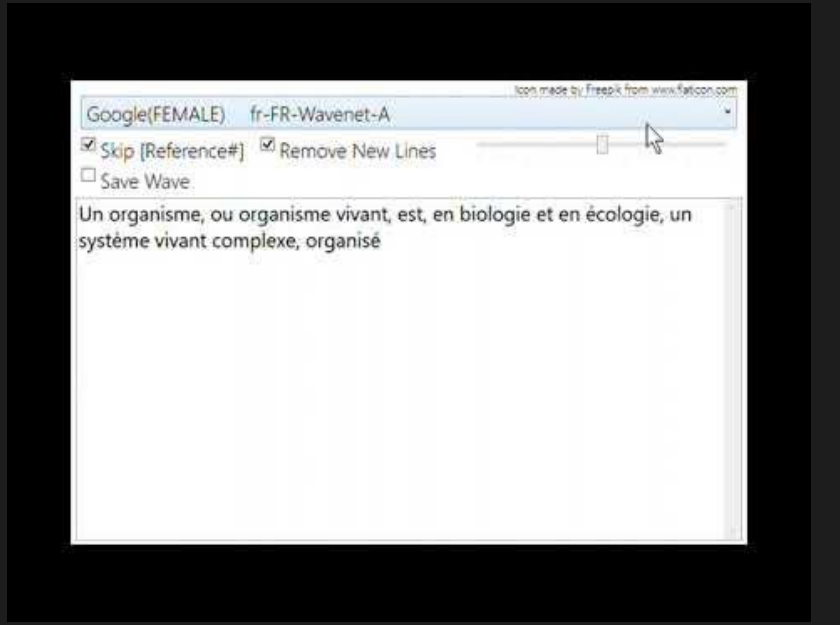
- The game of Go originated in China 3,000 years ago. The rules of the game are simple: players take turns to place black or white stones on a board, trying to capture the opponent's stones or surround empty space to make points of territory.

Why AlphaGo is Better?

- We showed AlphaGo a large number of strong amateur games to help it develop its own understanding of what reasonable human play looks like. Then we had it play against different versions of itself thousands of times, each time learning from its mistakes and incrementally improving until it became immensely strong, through a process known as reinforcement learning.

WaveNet

WaveNet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Un organisme, ou organisme vivant, est, en biologie et en écologie, un système vivant complexe, organisé

Face2Face

OpenAI GPT2