GAN - Generative Adversarial Networks

Research Paper

Welcome!

Internship – Kaizen Voiz

01

Why research GAN

Purpose of researching GAN?

Generate new, synthetic data that resembles some known data distribution,

Useful for data augmentation, anomaly detection, or creative applications.

02

Base Paper GAN

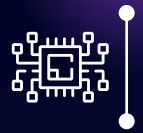
Researched about?

A new framework for estimating generative models via an adversarial process.

simultaneously train two models:

- Generative model G
- Discriminative model D

G & D:



Generative model G

Captures

↓

data distribution

Discriminative model D

estimates probability that a sample

↓

came from

↓

training data rather than G

How Training plays:

2 - P

framework corresponds to a minimax two-player game

Existance of G & D

space of arbitrary functions G and D,

↓

a unique solution exists,

↓

with G recovering the training data distribution

↓

D equal to 1/2 everywhere

How Training plays:

Transformation

In the case where G and D are defined by multilayer perceptron's

entire system can be trained

backpropagation.

Key Definitions:

(MLP) -- Type of ANN consisting of multiple layers of neurons.

Backpropagation -- A gradient estimation method used to train NN models.

INTRO on DL with GAN:

DL Promises

discover rich,
hierarchical models.

DL Findings

data encountered

artificial intelligence
applications

Data Findings

natural images,
audio waveforms
containing speech, and
symbols in natural
language corpora.

Success in DL

discriminative models →
map a high-dimensional,
rich sensory input

to a class label

DL algorithms

backpropagation and
dropout algorithms

Disadvantages

Deep generative models
have had less of an
impact.
difficulty of
approximating many
intractable probabilistic
computations.

Adversarial Nets Framework

Generative model is pitted against an adversary.

Discriminative model.

Learns

Model distribution or data distribution.

Straight forward framework
When in multilayer perceptron.

$$\min_G \max_D V(D,G) = \mathbb{E}_{\boldsymbol{x}\sim p_{\text{data}}(\boldsymbol{x})}[\log D(\boldsymbol{x})] + \mathbb{E}_{\boldsymbol{z}\sim p_{\boldsymbol{z}}(\boldsymbol{z})}[\log(1 - D(G(\boldsymbol{z})))].$$

$G(\boldsymbol{z};\theta_g)$: Parameters

Mapping to data space

$D(\boldsymbol{x};\theta_d)$: Parameters

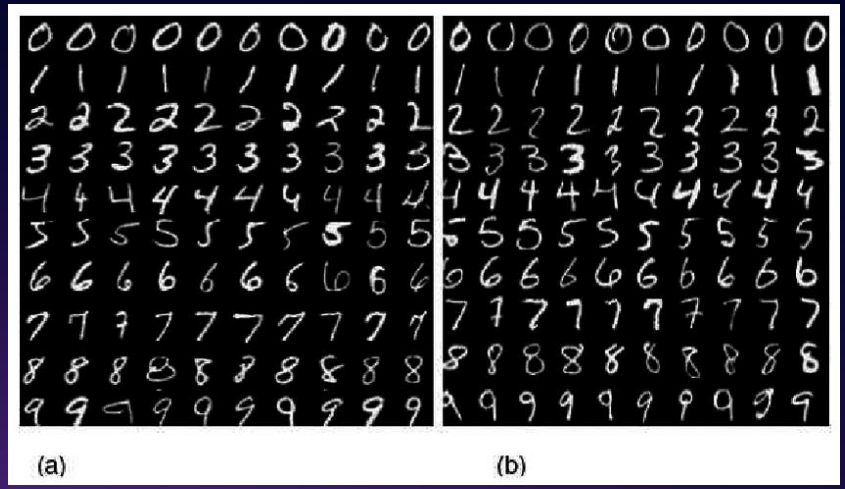
Second multilayer perceptron

$V(G,D)$: G & D play 2-P minmax game with val func


Experiments

MNIST

Modified National Institute of Standards and Technology database

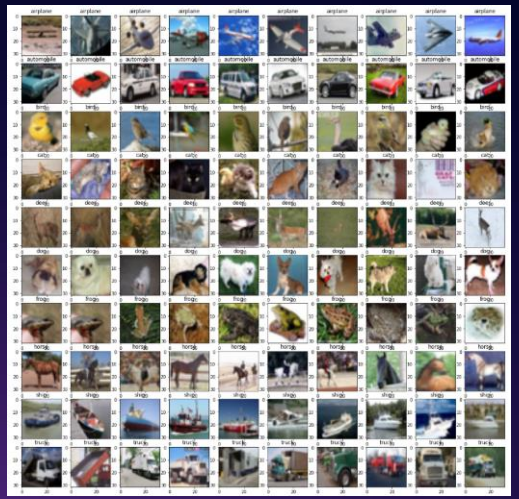


TFD

Toronto Face Database

CIFAR-10

Canadian Institute For Advanced Research
machine learning and computer vision algorithms



Thank You!..