Generative Adversarial Networks (GAN)

Supervised vs Unsupervised Learning

- supervised learning: learn a function to map x → y.

  ex) classification, regression, object detection

- unsupervised learning: learn some underlying hidden structure of the data

  ex) clustering, dimensionality reduction, **feature learning**(these learned features could be used in supervised learning), density estimation

Generative Modeling

- Given training data, generate new samples from same distribution

- x~Pdata(x) → Pmodel(x) → x hat

1. Learn Pmodel(x) that approximates Pdata(x)

2. Sampling new x from Pmodel(x)

- Taxonomy

Taxonomy of Generative Models
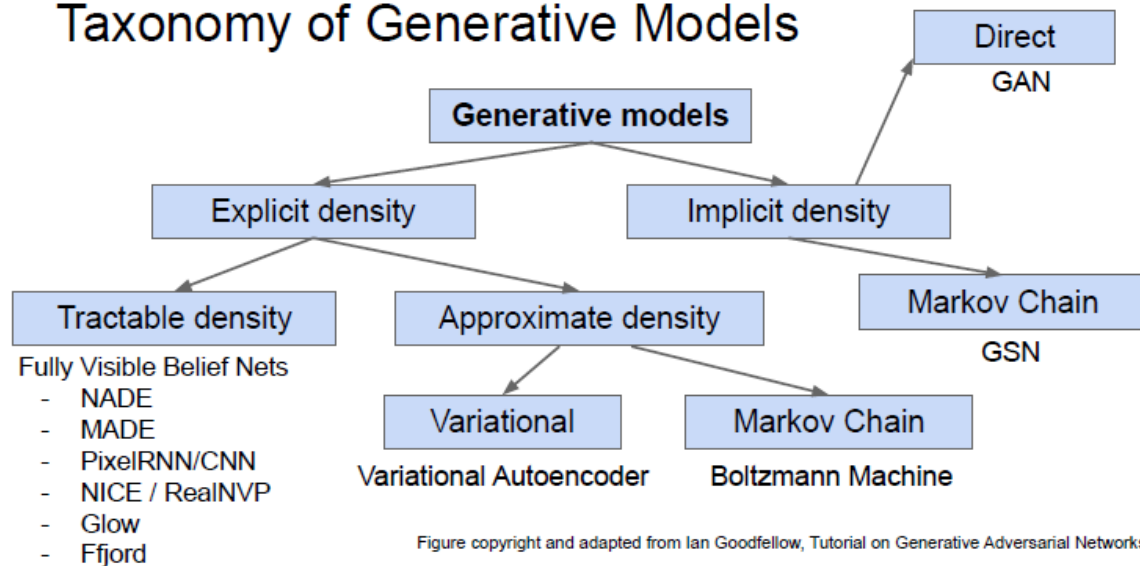
Fei-Fei Li, Ranjay Krishna, Danfei Xu   Lecture 12 - 16   May 11, 2021

1. explicit density estimation: explicitly define and solve for Pmodel(x)

2. Implicit density estimation: learn model that can sample from Pmodel(x) without explicitly defining it

    GANs are implicit density estimation, and does not model any explicit density function.

- GAN Intuition

    Problem: Want to sample from complex, high-dimensional training distribution. No direct way to do this!

    Solution: Sample from a simple distribution we can easily sample from, e.g. random noise. Learn transformation to training distribution.