1.1 Overview

(1) Generative AI models { denoising diffusion models; flow matching }

(2) basic principle: converting noise into data by simulation of ordinary or stochastic differential equations

1.3 Generative Modeling as Sampling

(1) key Idea 1: We identify the objects being generated as vector $\vec{z} \in \mathbb{R}^d$

(2) This course focuses on continuous data

(3) Data distribution: diversity of possible images (p_{data})

(4) key Idea 2: Generating an object $\vec{z}$ is modeled as sampling from the data distribution $\vec{z} \sim p_{data}$

(5) key Idea 3: A dataset consists of a finite number of samples $\vec{z}_1, \vec{z}_2, \ldots, \vec{z}_N \sim p_{data}$

(6) key Idea 4: Conditional generation involves sampling from $\vec{z} \sim p_{data}(\cdot|y)$, where y is a conditional variable.

Conditional data distribution

(7) overall path: unconditional generation model $\Rightarrow$ conditional generation model