

# Diffusion Models

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Diffusion Models is a probabilistic generative model based on gradually corrupting data into noise and generating data from noise by learning the inverse denoising process. It is widely used for high-quality sample generation and is trained by optimizing the variational lower bound.

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# 1. INTRODUCTION

扩散模型已经成为最先进的深度生成模型家族。它们打破了生成对抗网络(GANs)在具有挑战性的图像合成任务中的长期统治地位，并且在各种领域也显示出潜力，包括计算机视觉，自然语言处理，时间数据建模，多模态建模，鲁棒机器学习，到计算化学和医学图像重建等领域的跨学科应用。

## 2. FOUNDATIONS OF DIFFUSION MODELS

Diffusion models are a family of probabilistic generative models that progressively destruct data by injecting noise, then learn to reverse this process for sample generation.

目前对扩散模型的研究主要基于三种主要的公式:

- **denoising diffusion probabilistic models (DDPMs)**
- **score-based generative models (SGMs)**
- **stochastic differential equations(Score SDEs)**

我们将对这三个公式进行独立的介绍，同时讨论它们之间的联系。