Generative Models

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Preface

In 2006, Christopher Bishop publish his excellent book about machine learning, Pattern Recognition and Machine Learning(Christopher Bishop, 2006). Ten years later, Goodfellow, Yoshua Bengio, and Aaron Courville publish the excellent book about deep learning, Deep Learning(Goodfellow et al., 2016). I begin my research on generative models aroud the spring of 2023. At that time, there isn't a comprehensive book about generative models, and then I make up my mind to write a book about generative models.

Nomenclature

- c Speed of light in a vacuum
- h Planck constant

Introduction

Generative models

Part I Preliminary Knowledge

Linear Algebra

Probability

Other Knowledge

- 4.1 Other math knowledge
- 4.2 Information theory
- 4.3 Physics

Artificial Intelligence

- 5.1 The History of Artificial Intelligence
- 5.2 Machine Learning
- 5.3 Deep Learning and Neural Networks

Natural Language Processing

- 6.1 Natural Language Processing tasks
- 6.2 The procedure for NLP task
- 6.3 Text generation

Computer Vision

- 7.1 Computer Vision tasks
- 7.2 Convolutional Neural Networks
- 7.3 Vision Transformer
- 7.4 Computer Vision Generation

Multimodal

- 8.1 Multimodal Overview
- 8.2 Connect Computer Vision and Natural Language Processing

Part II Generative Models

Normalizing Flows

Autoregressive Models

Energy-based Models

Variational Autoencoders

Denoising Diffusion Models

Generative Adversarial Networks

Evaluating Generative Models

Part III Practical Methods and Outlook

Train Large Models

Fine-tuning Large Models

Model Distillation

From Generative Models to AGI

Bibliography

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Ian Goodfellow, Yoshua Bengio, and Aaron Courville. *Deep Learning*. MIT Press, 2016. ISBN 978-0-262-03561-3.

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