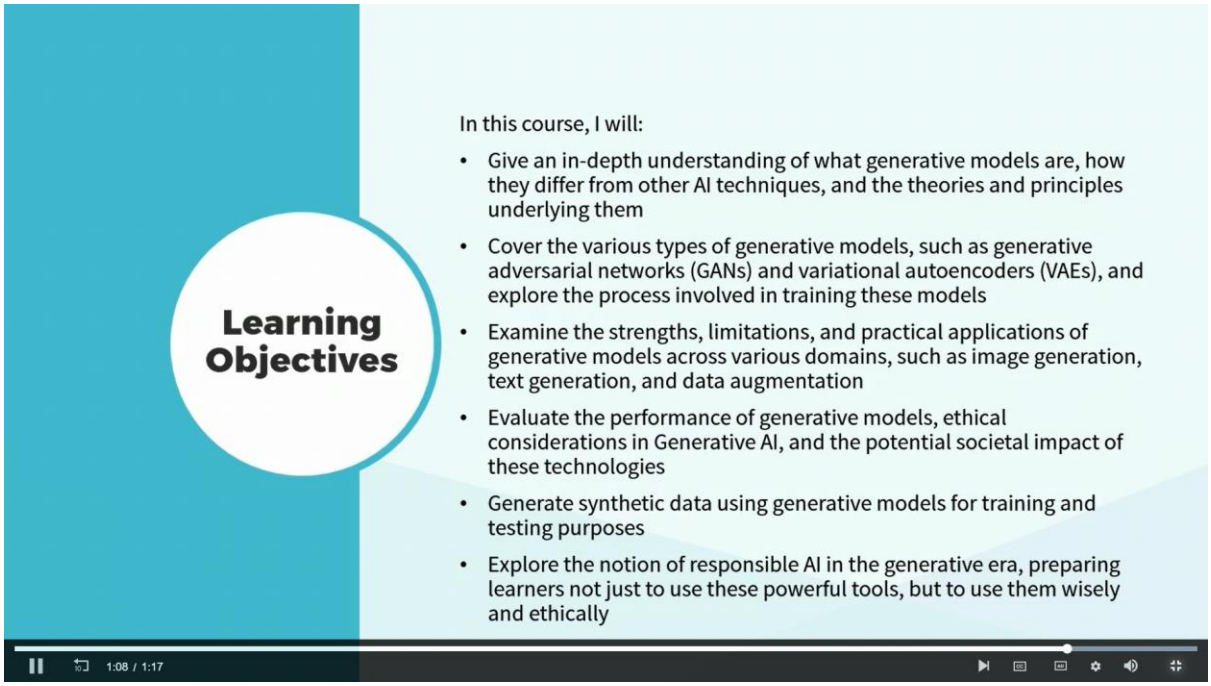
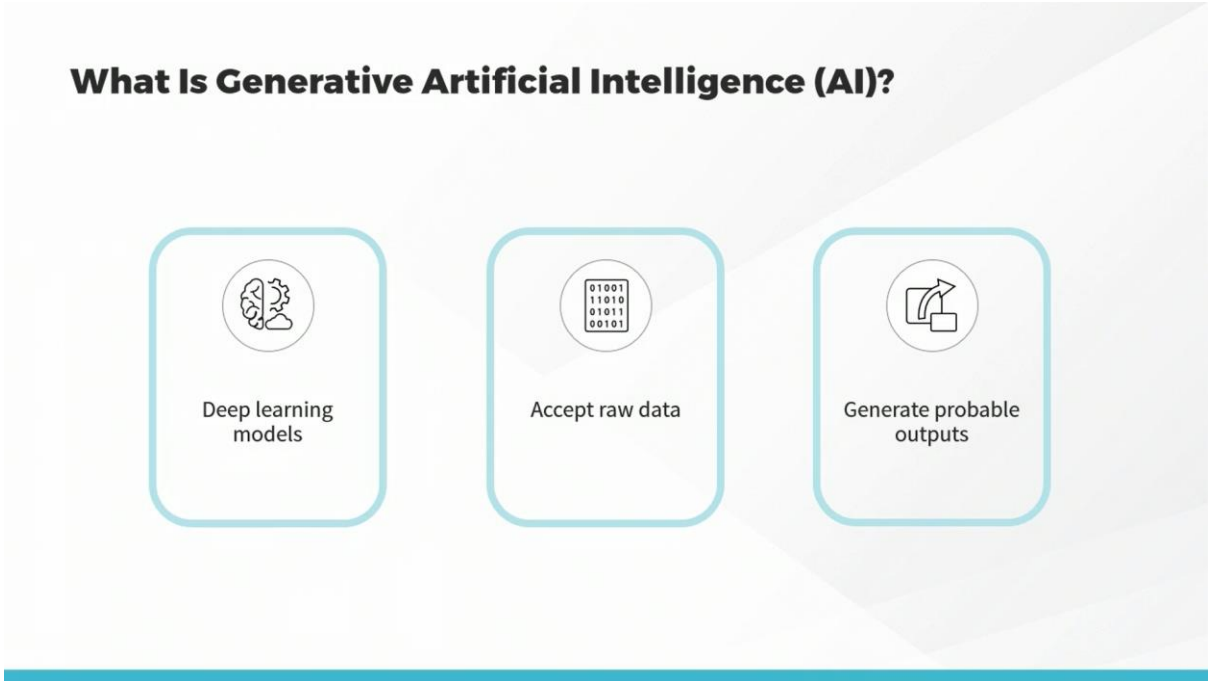

Learning Objectives
In this course, I will:
• Give an in-depth understanding of what generative models are, how they differ from other AI techniques, and the theories and principles underlying them
• Cover the various types of generative models, such as generative adversarial networks (GANs) and variational autoencoders (VAEs), and explore the process involved in training these models
• Examine the strengths, limitations, and practical applications of generative models across various domains, such as image generation, text generation, and data augmentation
• Evaluate the performance of generative models, ethical considerations in Generative AI, and the potential societal impact of these technologies
• Generate synthetic data using generative models for training and testing purposes
• Explore the notion of responsible AI in the generative era, preparing learners not just to use these powerful tools, but to use them wisely and ethically
1:08 / 1:17


What Is Generative Artificial Intelligence (AI)?
Deep learning models
01001
11010
01011
00101
Accept raw data
Generate probable outputs

What Is Generative AI?

Images

Speech

Complex data

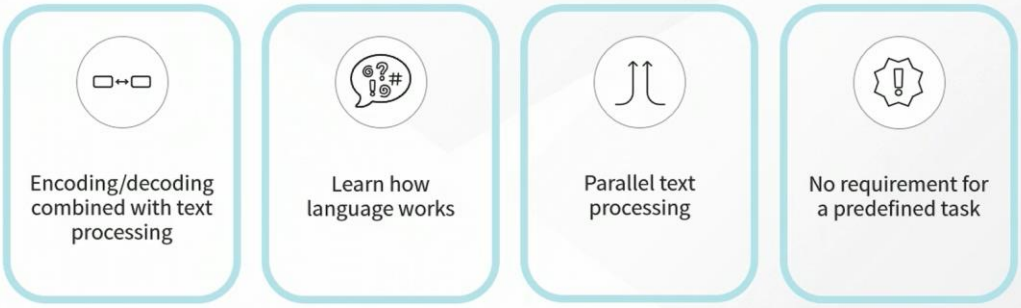
Traditional AI	Generative AI
Pattern recognition	Pattern creation
Makes predictions	Creates something new
Rules-based	Data-driven
Rules are generated by humans	Learns from large datasets

Variational Autoencoders (VAEs)

- Deep learning models
- Used to generate images and speech
- Simplified scaling of models

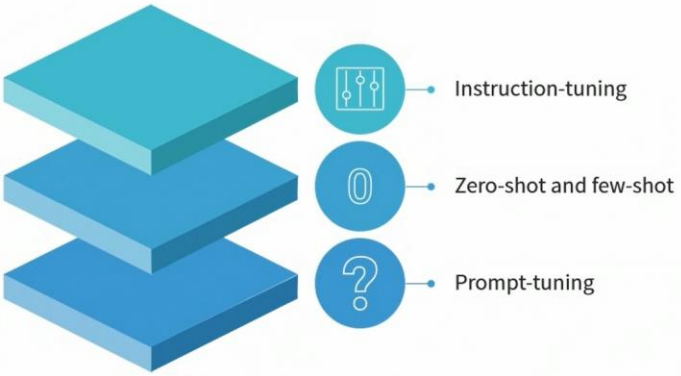
Variational Autoencoders

Transformers



Language Transformers

The Resurgence of Supervised Learning



Alignment

Reinforcement Learning from Human Feedback (RLHF)

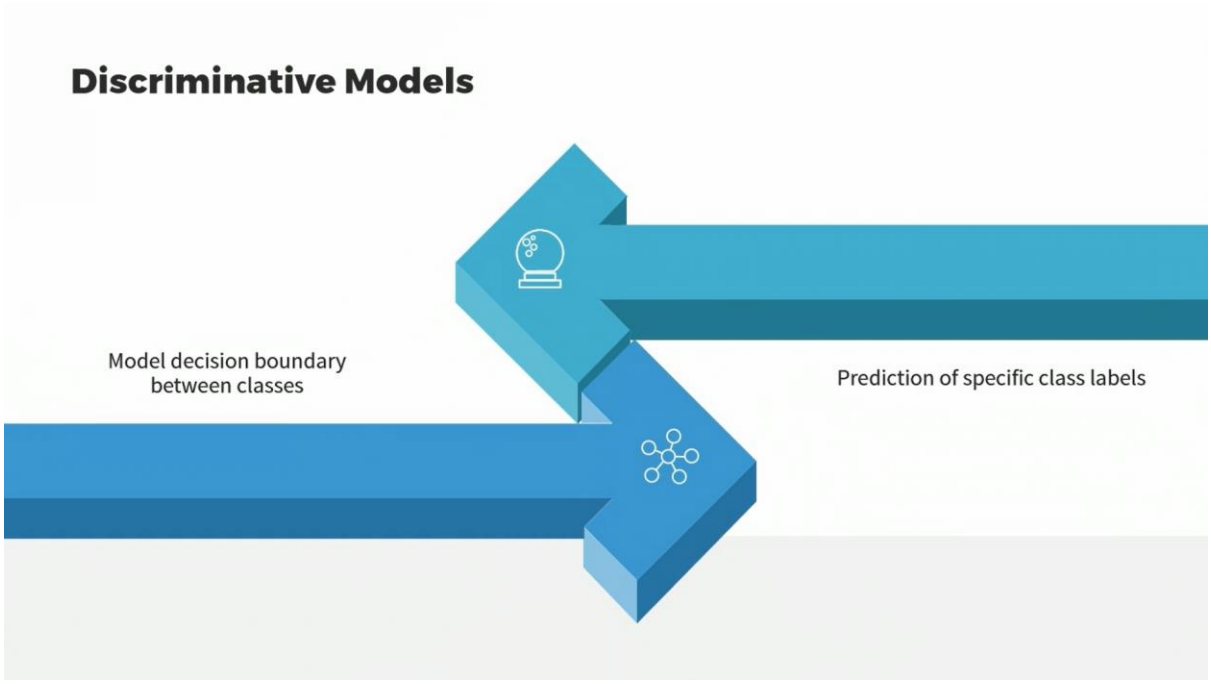
Align model to resemble human responses

The Future of Generative AI

- Scaling laws
- Emergent capabilities
- Model distillation

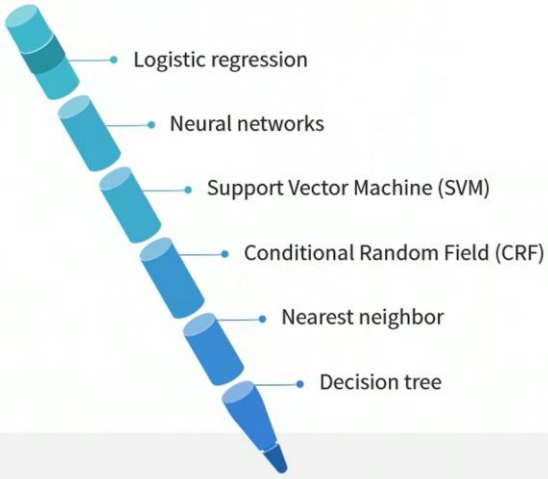
Discriminative Models

- Conditional models
- Supervised machine learning (ML)

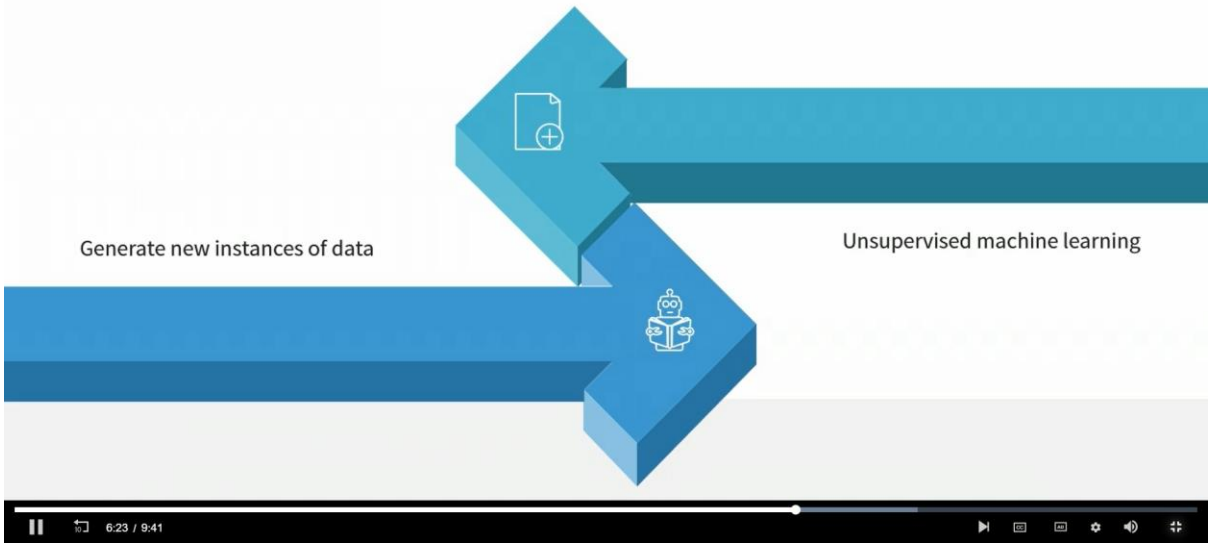

Discriminative Models
Model decision boundary between classes
Prediction of specific class labels

Discriminative Models

Common Discriminative Models



Generative Models



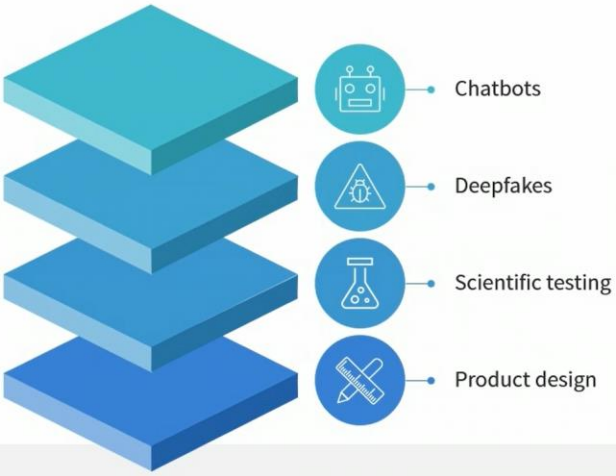
Key Generative AI Concepts

Key Generative AI Concepts

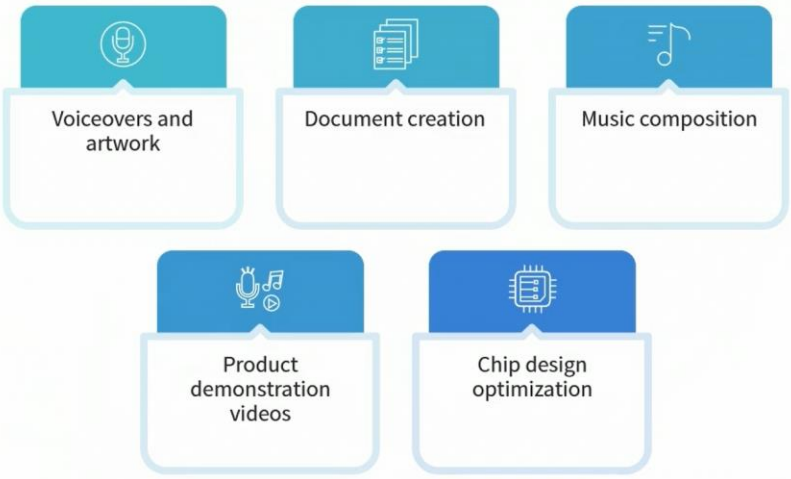
Generative adversarial networks

Generative vs. discriminative models

Typical Use Cases for Generative AI



Typical Use Cases for Generative AI

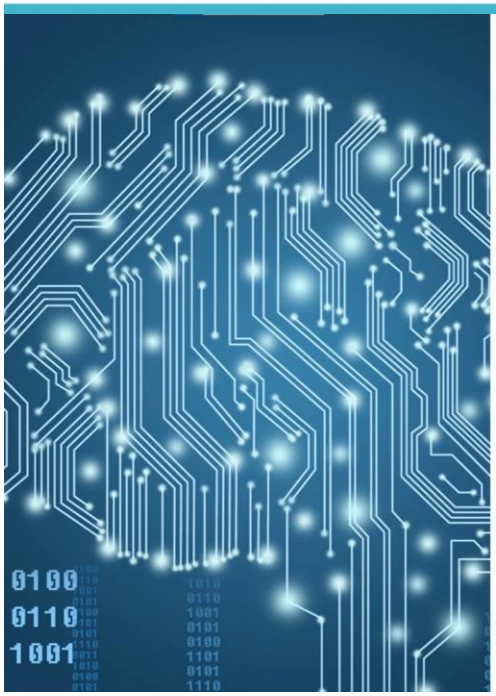


Popular Generative AI Interfaces

ChatGPT

Bard

Dall-E

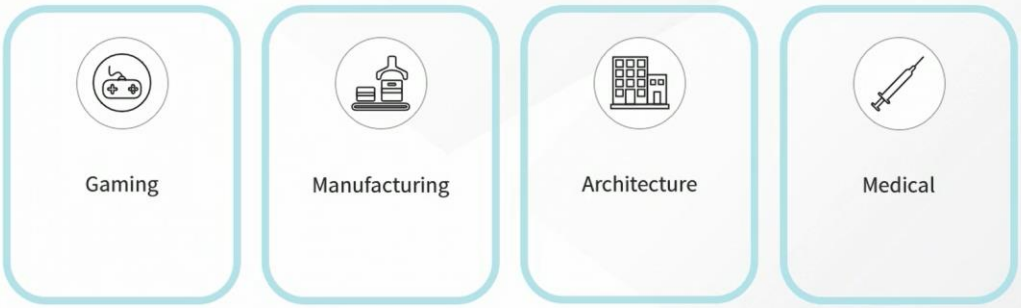


Common Generative AI Tools

- Voice synthesis tools
- Code creation tools
- Chip design tools

Common Generative AI Tools

Industries Using Generative AI



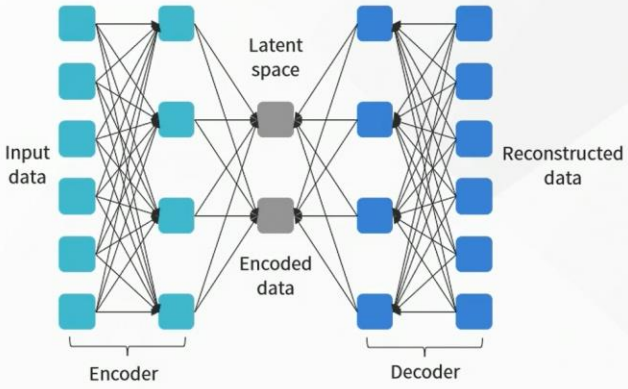
Industries Using Generative AI

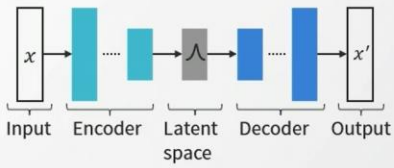
Media

Finance

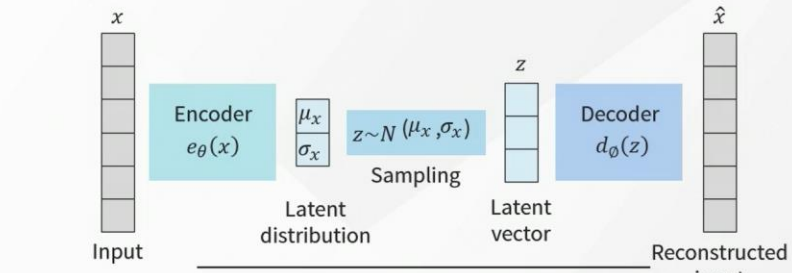
Legal

Variational Autoencoder





Variational Autoencoder



$$\text{Reconstruction loss} = \|x - \hat{x}\|_2 = \|x - d_\phi(z)\|_2 = \|x - d_\emptyset(\mu_x + \sigma_x \epsilon)\|_2$$

$$\mu_x, \sigma_x = e_\phi(x), \qquad \epsilon \sim N(0, I)$$

$$\textit{Similarity loss} = \textit{KL Divergence} = D_{KL}(N(\mu_x, \sigma_x) \| N(0, I))$$

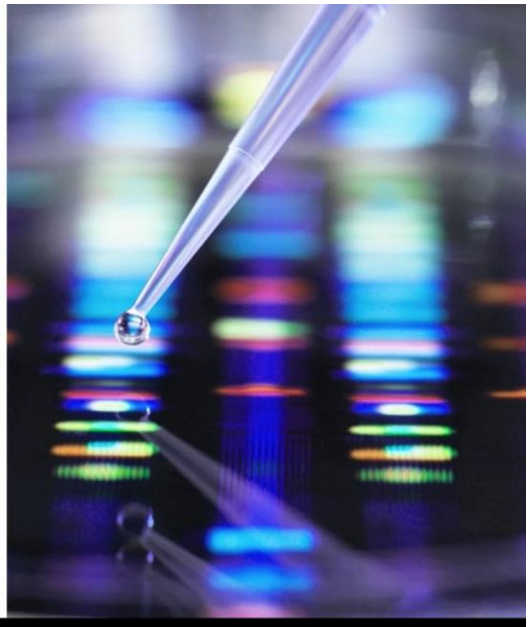
Loss = reconstruction loss + similarity loss

GAN	VAE
High resolution image generation	Image generation
Text generation	Natural language processing (NLP)
Audio generation	Detection of anomalies
Data augmentation	Medical data
Image editing	

Gather and Prepare Data

Quantity

Quality



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Select an Architecture

Several to choose from

Objective suitability

2:21 / 6:16


Apply Your Model
Generate code
Define layers
Create connections
Train Your Model
Training data
Adjustments
4:16 / 6:16