Understanding Generative Al Basics

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Overview

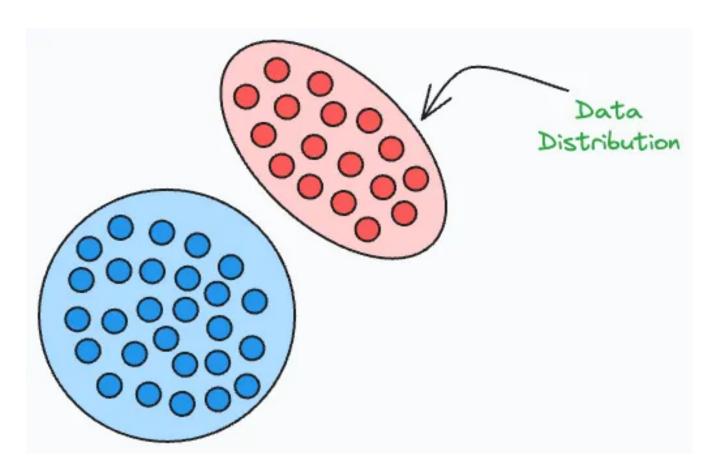
- Understanding Generative AI Basics
 - Definition and distinction from traditional AI
 - Overview of applications: language, audio, image, video
 - Brief look at key architectures: VAEs, GANs, diffusion models, Transformers
 - Role of Large Language Models (LLMs) in the GenAI landscape

Defining Generative Al



What is Generative Al?

Key Characteristics



- Creativity: Generates novel outputs.
- **Probabilistic Models**: Often works with probability distributions to generate diverse outcomes.
- Unsupervised or Semi-supervised: Can learn from unlabelled data.



Distinction from Traditional AI

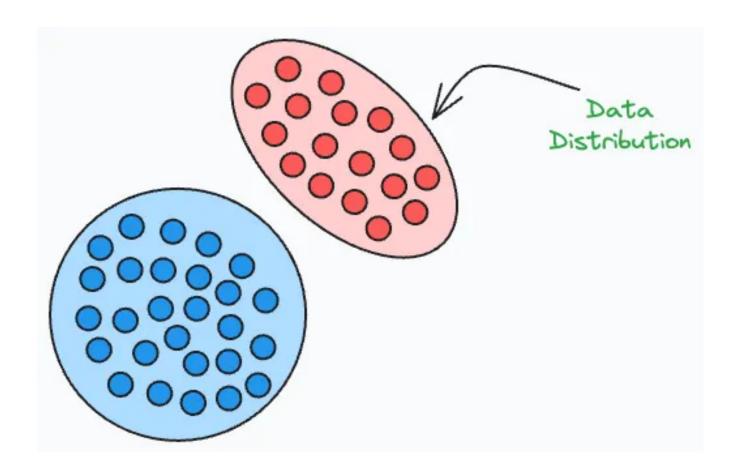


Traditional AI

Artificial Intelligence Al involves techniques that equip computers to emulate human behavior, enabling them to learn, **Artificial Intelligence** make decisions, recognize patterns, and solve complex problems in a manner akin to human intelligence. **Machine Learning Machine Learning** ML is a subset of AI, uses advanced algorithms to detect patterns in large data sets, allowing machines to learn and adapt. ML algorithms use supervised or unsupervised learning methods. **Deep Learning** DL is a subset of ML which uses neural networks for in-depth data processing and analytical tasks. **Deep Learning** DL leverages multiple layers of artificial neural networks to extract high-level features from raw input data, simulating the way human brains perceive and understand the world. **Generative AI** Generative AI is a subset of DL models that generates content like text, images, or code based **Generative Al** on provided input. Trained on vast data sets, these models detect patterns and create outputs without explicit instruction, using a mix of supervised and unsupervised learning.

- Focus: Classification, prediction, optimization.
- Examples: Decision Trees, SVMs, Regression Models.
- Tasks: Recognizing objects, predicting trends, optimizing processes.

Generative Al

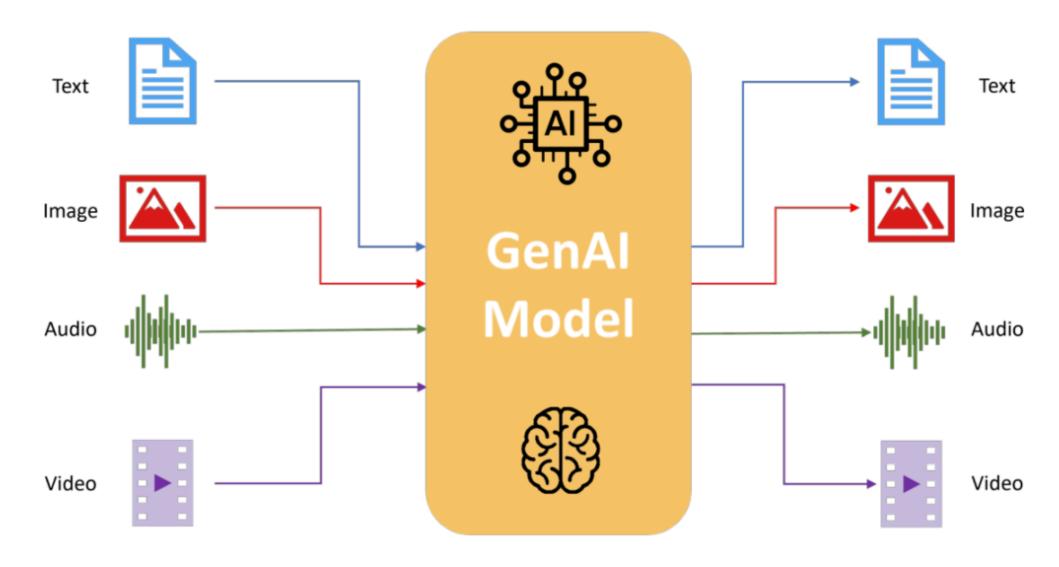


- Focus: Generation of new, original content.
- **Examples**: GANs, VAEs, Transformers.
- Tasks: Creating realistic images, generating text, synthesizing speech.

Applications of Generative Al



Overview of Applications





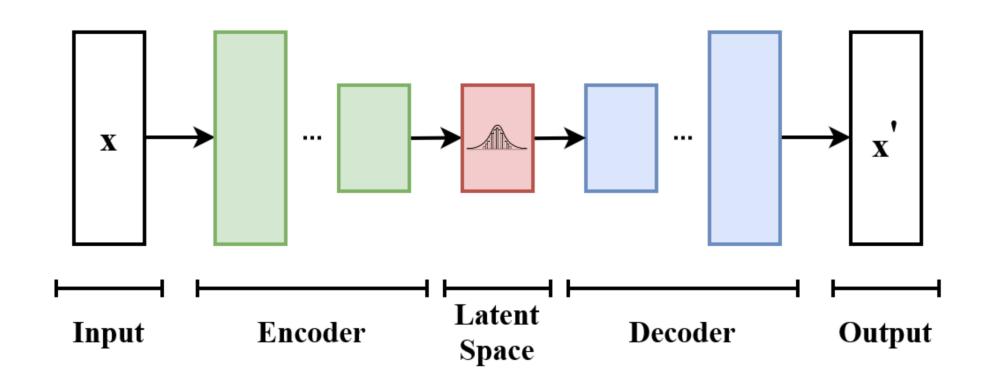
Overview of Applications

- Language Generation
 - Text completion (GPT models)
 - Translation, summarization
- Audio Generation
 - Speech synthesis (Tacotron)
 - Music composition (Jukedeck)
- Image Generation
 - Style transfer, inpainting (DALL-E, StyleGAN)
- Video Generation
 - Frame prediction

Key Architectures in Generative Al



Variational Autoencoders (VAEs)

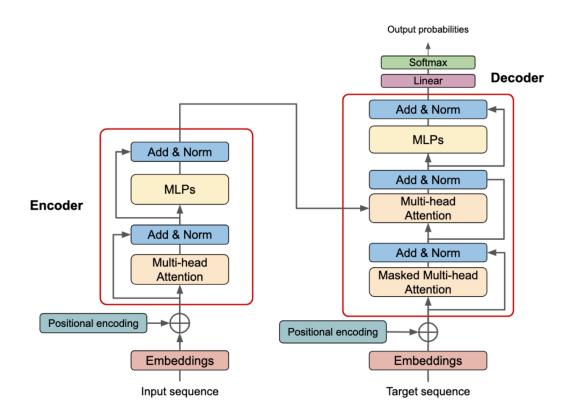


- Core Idea: Encode input into a latent space, then decode to generate similar data.
- Applications: Image generation, anomaly detection.
- **Technical Insights**: Utilizes a probabilistic encoder-decoder network, optimizing a lower bound of data likelihood.



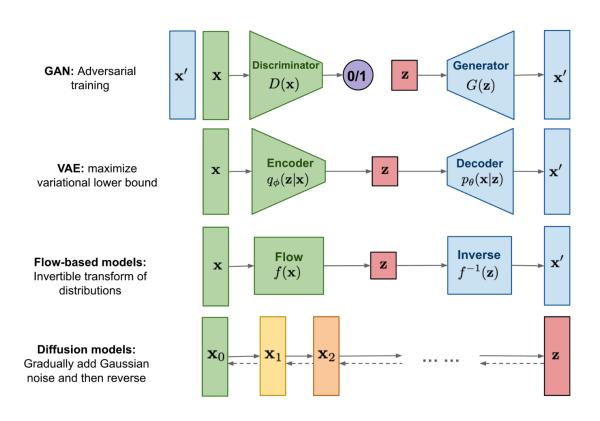
Generative Adversarial Networks (GANs)

Transformers



- Core Idea: Attention mechanism to model dependencies without regard to sequence length.
- Applications: Text generation, language modeling, image generation (e.g., DALL-E).
- Technical Insights: Scales effectively with data and compute, core to Large Language Models (LLMs).

Diffusion Models



- Core Idea: Learn to reverse a diffusion process that gradually destroys data.
- Applications: Denoising, generative tasks in images and audio.
- **Technical Insights**: Leverage a series of stochastic steps to generate high-fidelity data from noise.



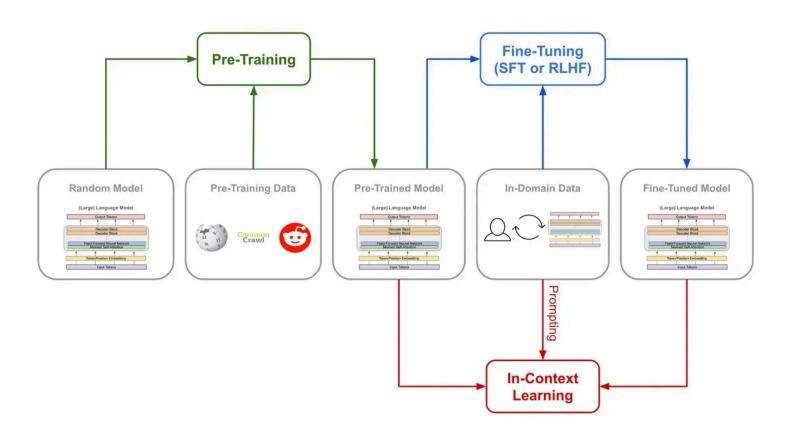
Large Language Models (LLMs) in the GenAl Landscape



Role of LLMs



Technical Considerations for LLMs



- **Pre-training**: Extensive on diverse text corpora.
- Fine-tuning: Specialized on specific tasks or domains.
- Challenges: Biases, hallucinations, and control.



Conclusion



Recap

- Generative AI is a powerful domain with a broad spectrum of applications.
- **Key Architectures**: VAEs, GANs, Diffusion Models, and Transformers.
- **LLMs**: Central to the generative AI ecosystem, powering many advances in natural language processing.