Understanding Generative AI Basics

Iván Moreno

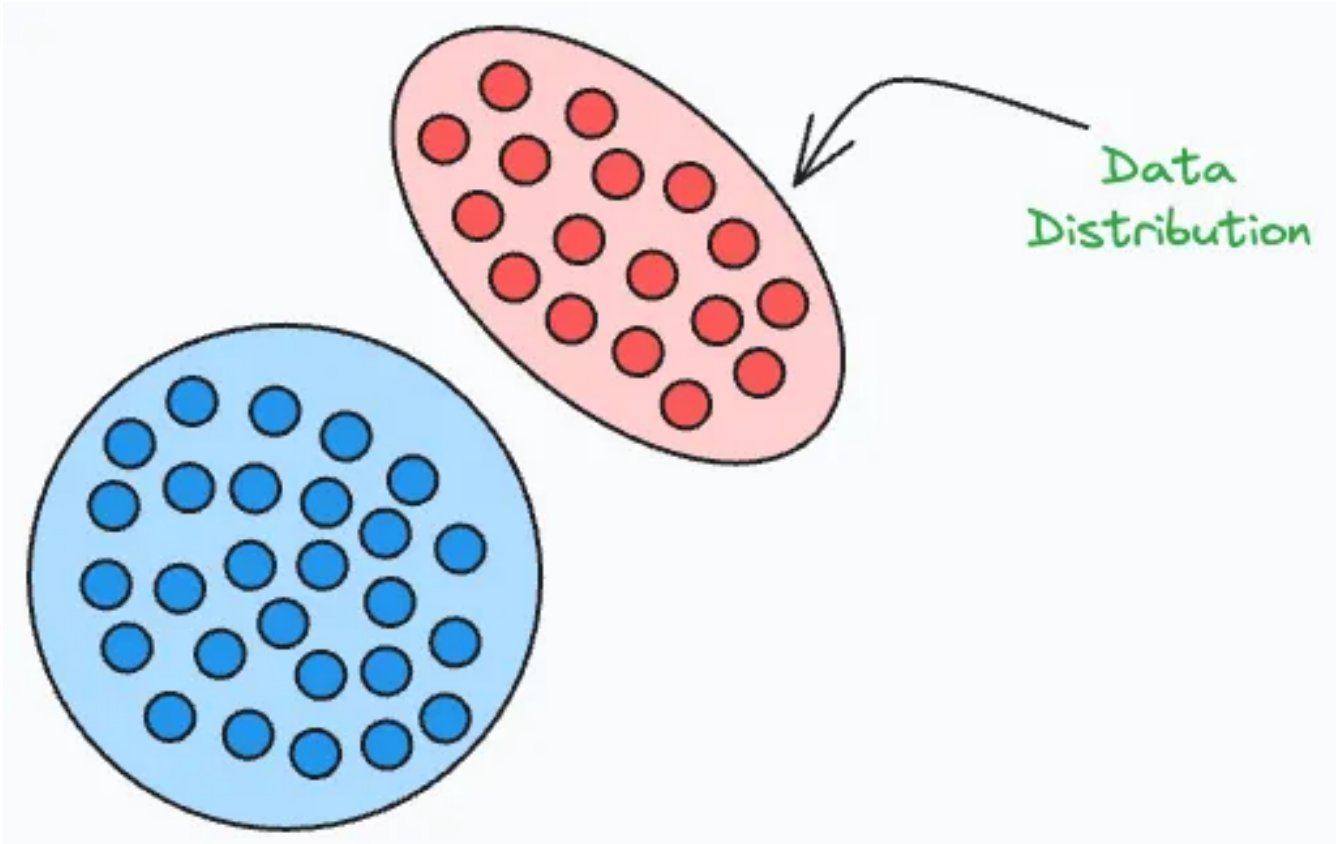
Overview

- **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 AI

What is Generative AI?

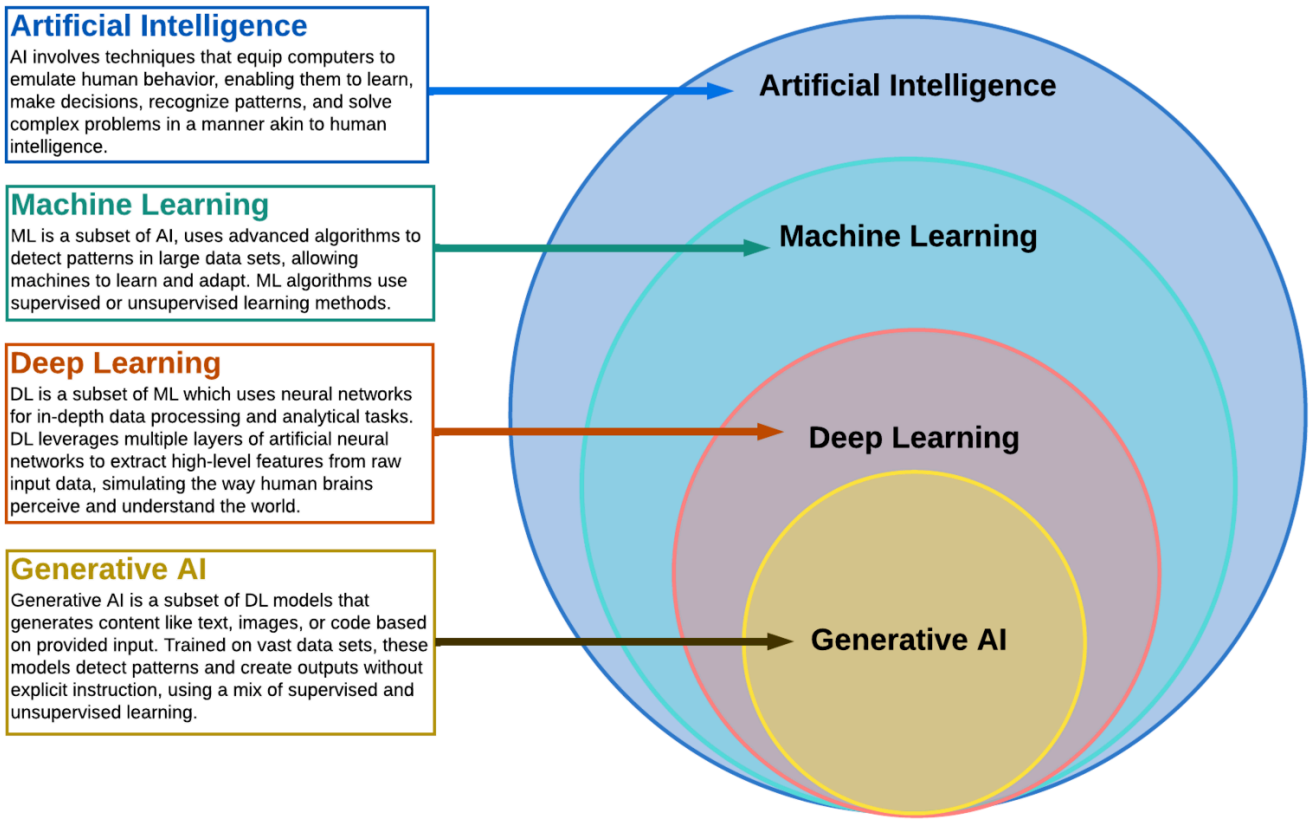
Key Characteristics



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

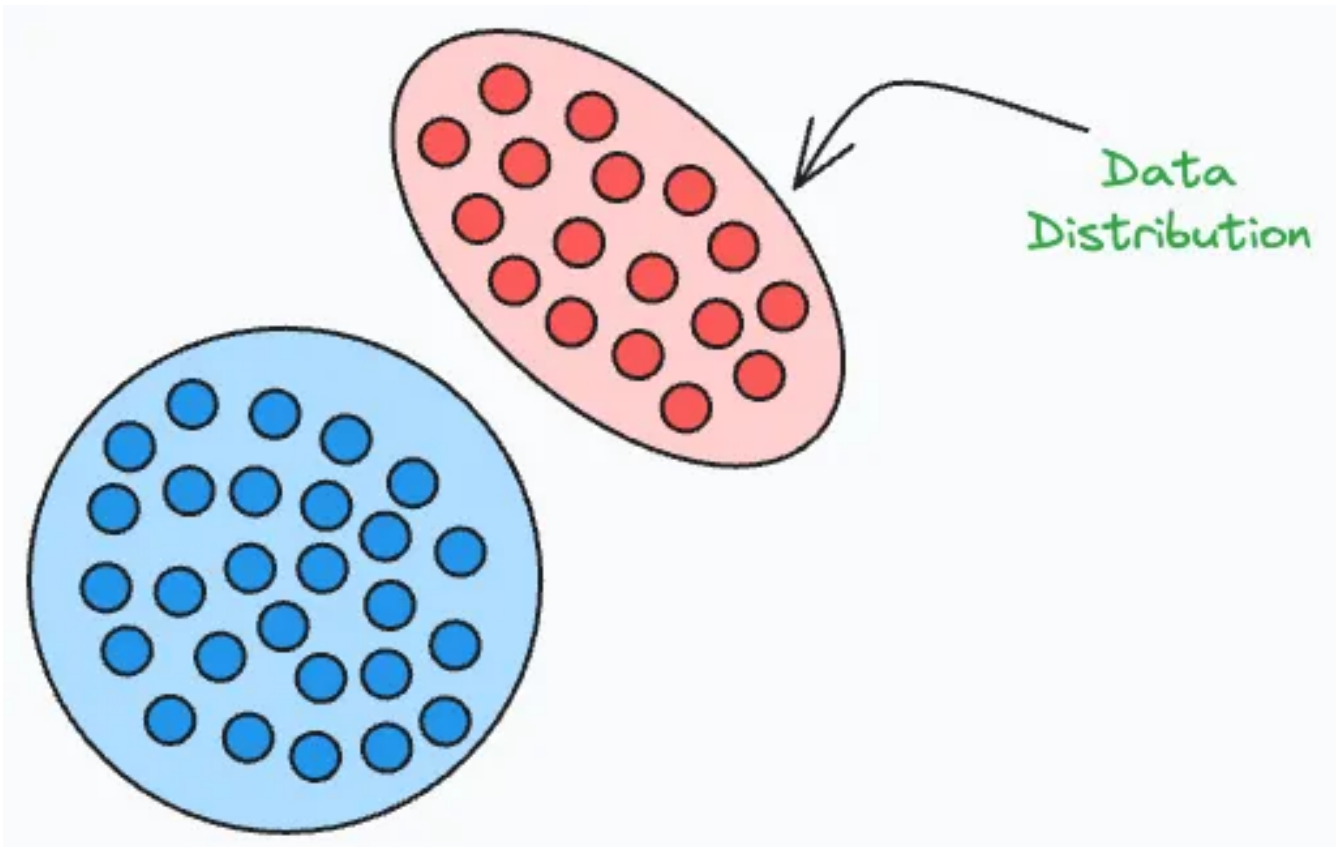
Distinction from Traditional AI

Traditional AI



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

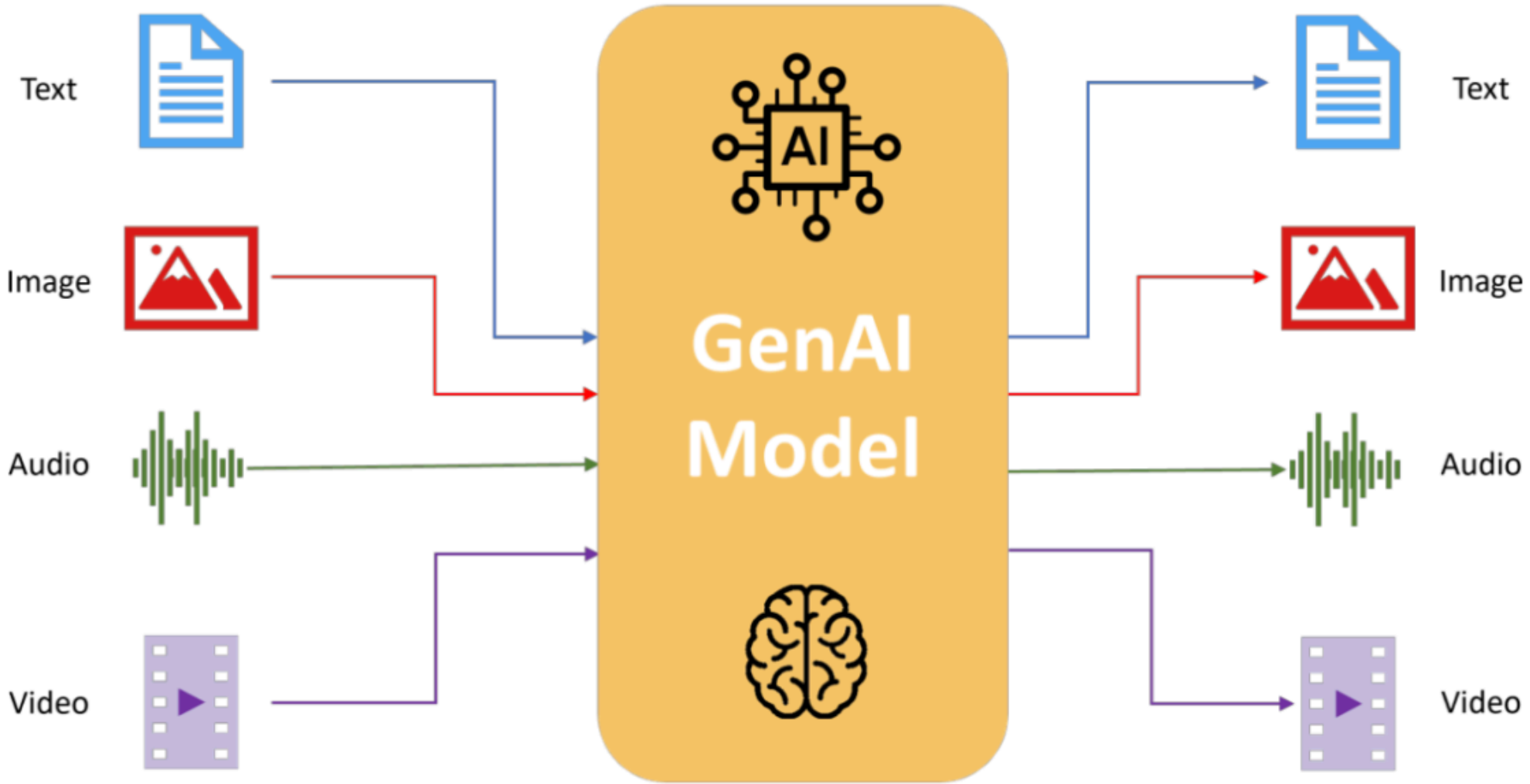
Generative AI



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

Applications of Generative AI

Overview of Applications

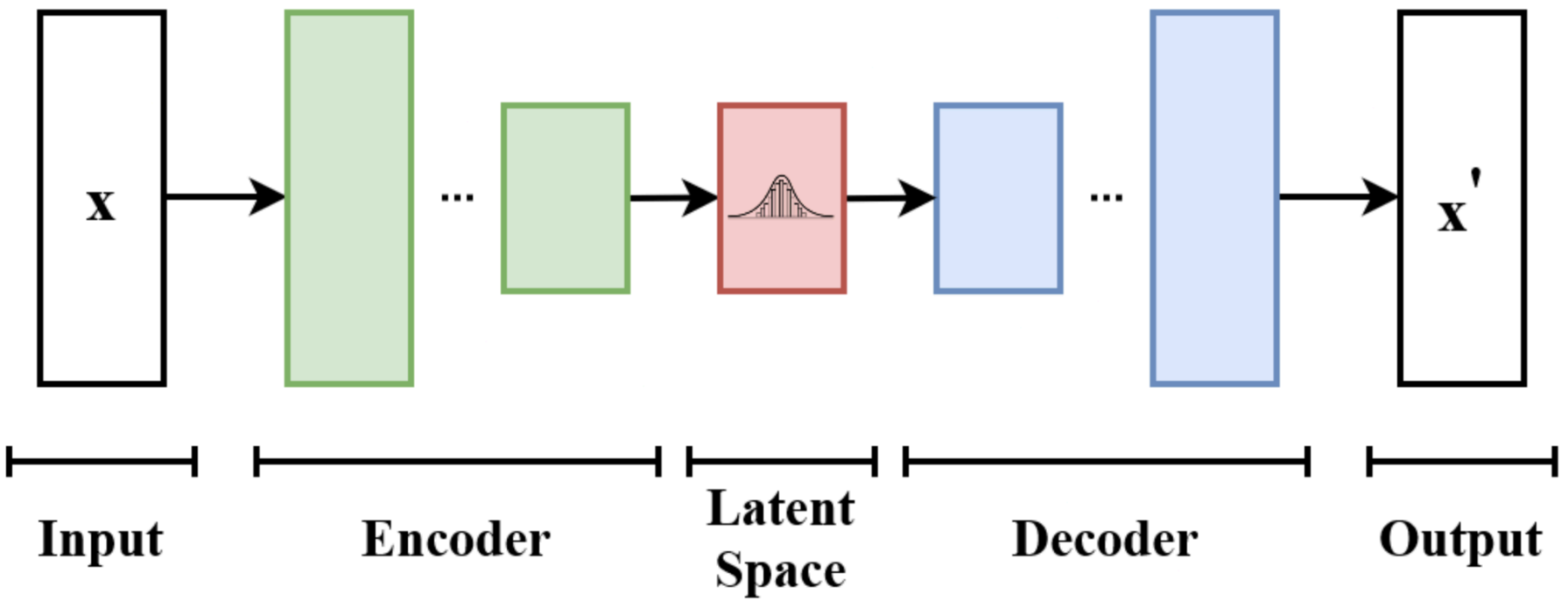


Overview of Applications

- **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 AI

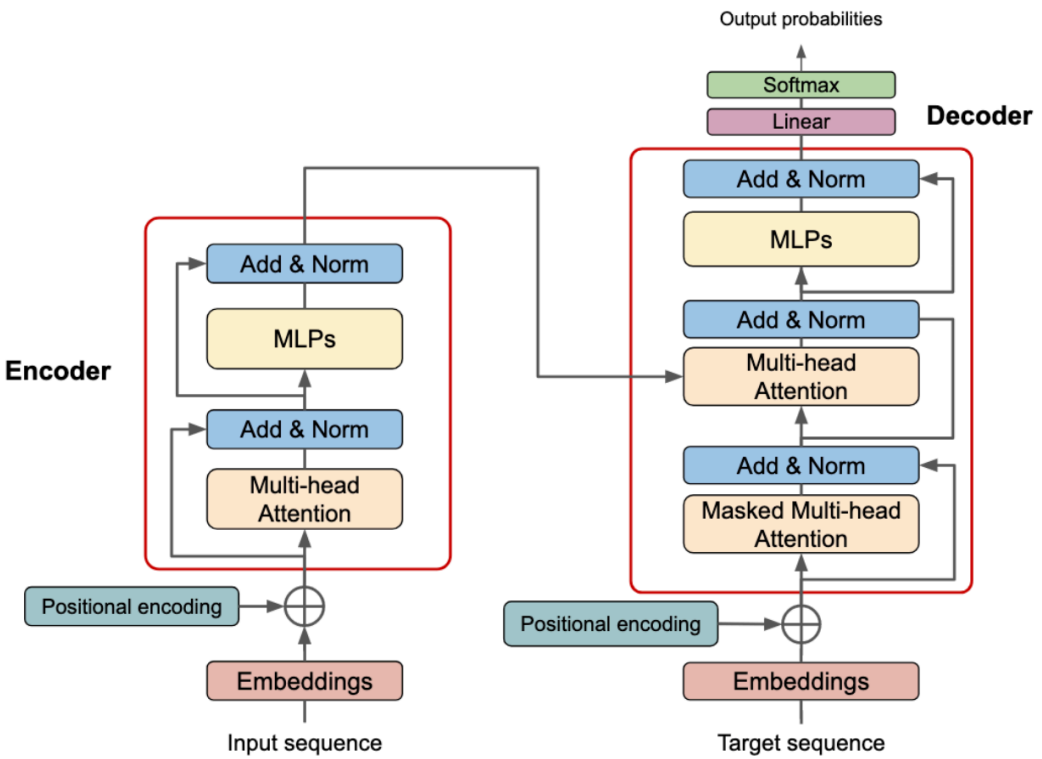
Variational Autoencoders (VAEs)



- **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.

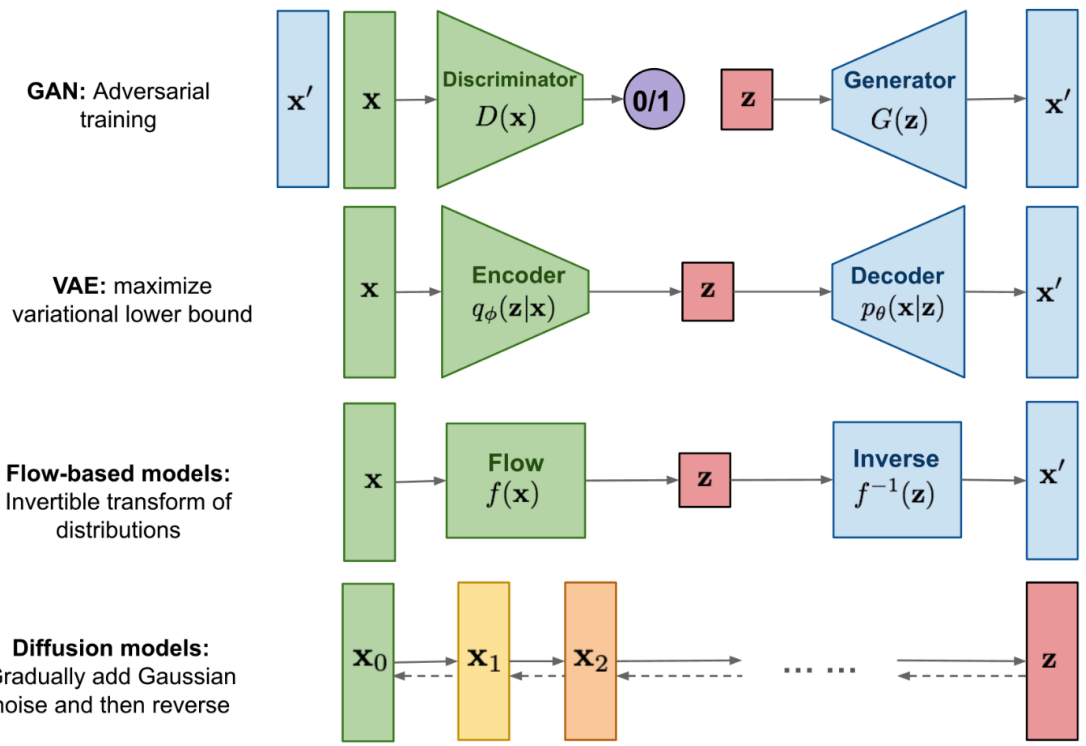
Generative Adversarial Networks (GANs)

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

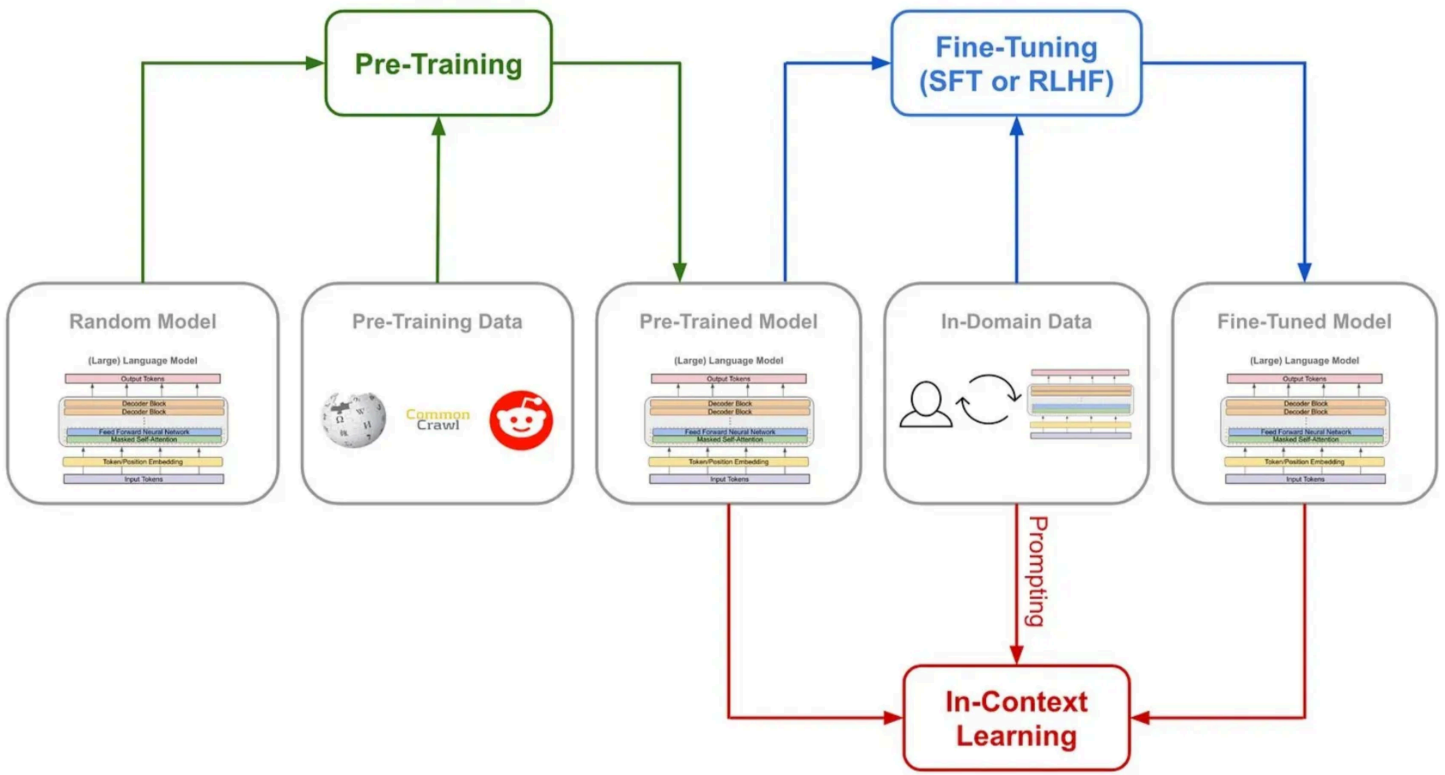


- **Core Idea**: Learn to reverse a diffusion process that gradually destroys data.
- **Applications**: Denoising, generative tasks in images and audio.
- **Technical Insights**: Leverage a series of stochastic steps to generate high-fidelity data from noise.

Large Language Models (LLMs) in the GenAI 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.