



Assignment 5:

Creative Artwork Generation

using Stable Diffusion

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Introduction

- Generative AI enables machines to create new content
- Image generation is a key application of Generative AI
- Diffusion models are widely used for high-quality image synthesis
- Stable Diffusion is a popular text-to-image diffusion model

Diffusion Models

- Diffusion models generate images by reversing a noise process
- Random noise is gradually removed to form meaningful images
- Two phases:
 - Forward diffusion (adds noise)
 - Reverse diffusion (removes noise)
- Produces realistic and detailed images

Stable Diffusion

- Stable Diffusion is a latent text-to-image diffusion model
- Converts textual prompts into visual content
- Works in latent space for efficiency
- Open-source and computationally optimized

Diffusion Model Used

Model Name: Stable Diffusion v1.5

Architecture: Latent Diffusion Model

Core Network: U-Net

Text Encoder: CLIP

Image Decoder: VAE

Reason for Selection:

- High-quality image generation
- Open-source and well-documented
- Efficient for GPU-based inference

Problem Statement



Problem 1

Manual digital artwork creation is time-consuming



Problem 2

Requires skilled designers



Problem 3

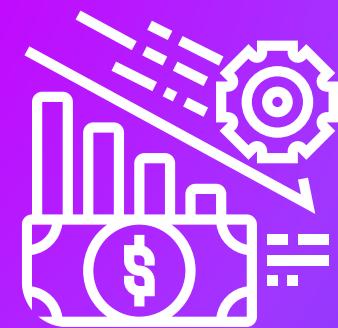
Need for an automated artwork generation system



Problem 4

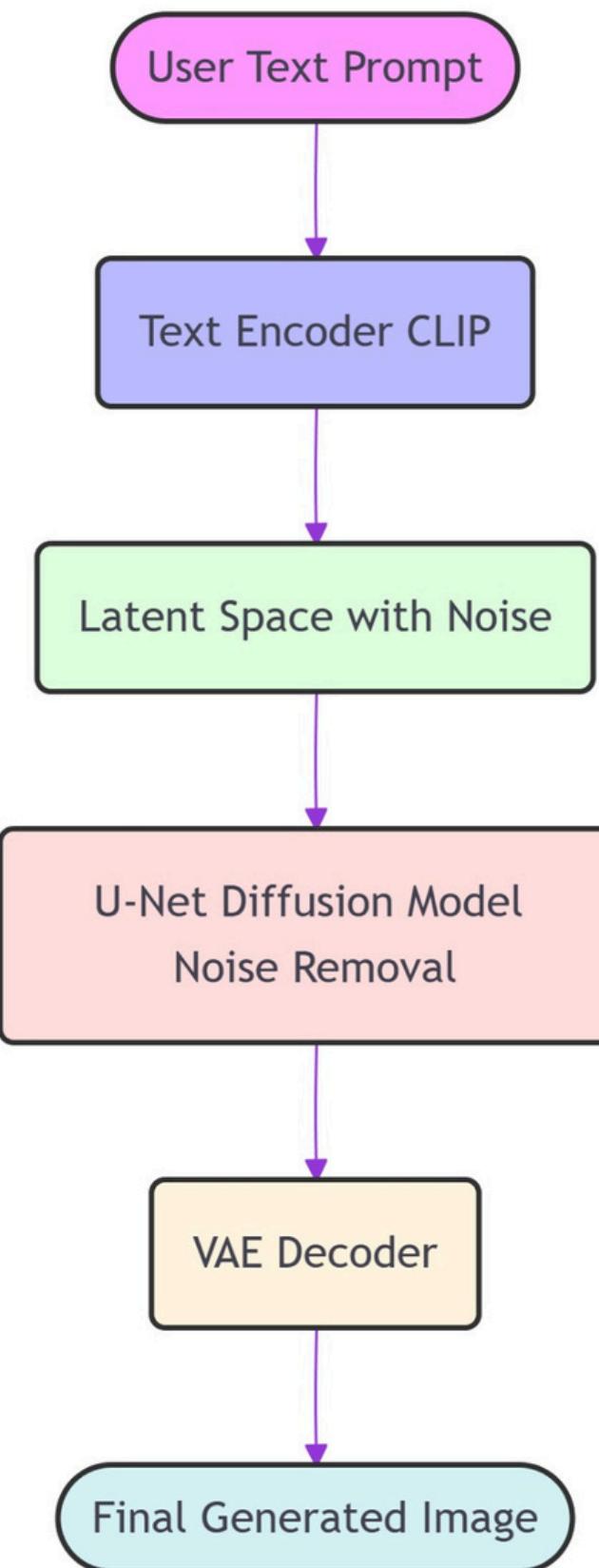
Difficult to scale creative content production

Proposed Solution

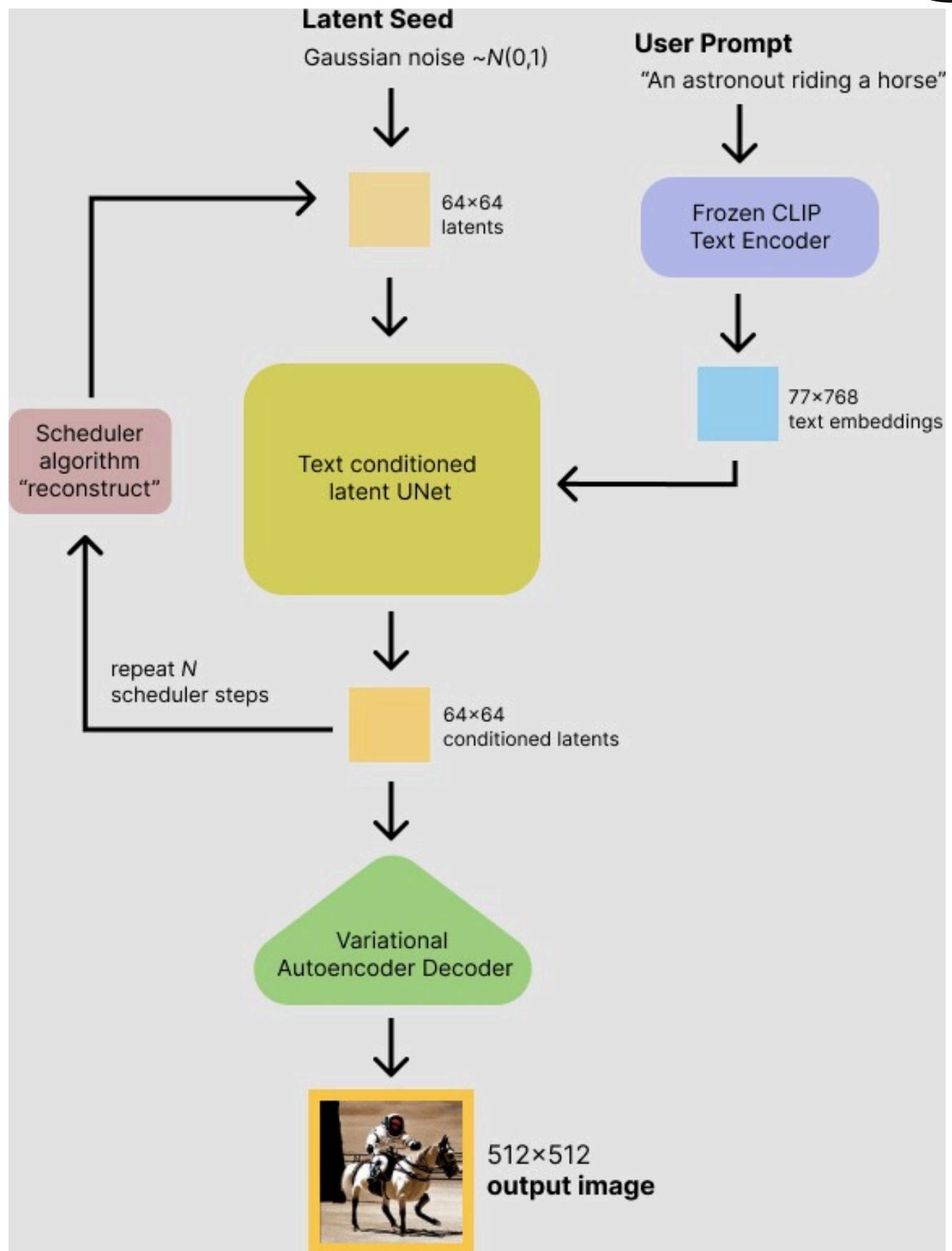


- 01 Use a pre-trained Stable Diffusion model
- 02 Generate artwork using text prompts
- 03 Modify outputs using prompt engineering
- 04 No need to train model from scratch

System Workflow



Architecture Diagram



Implementation

- Implemented using Google Colab
- Used Hugging Face Diffusers library
- Pre-trained Stable Diffusion model
- GPU acceleration used for faster generation

Google Colab Link:

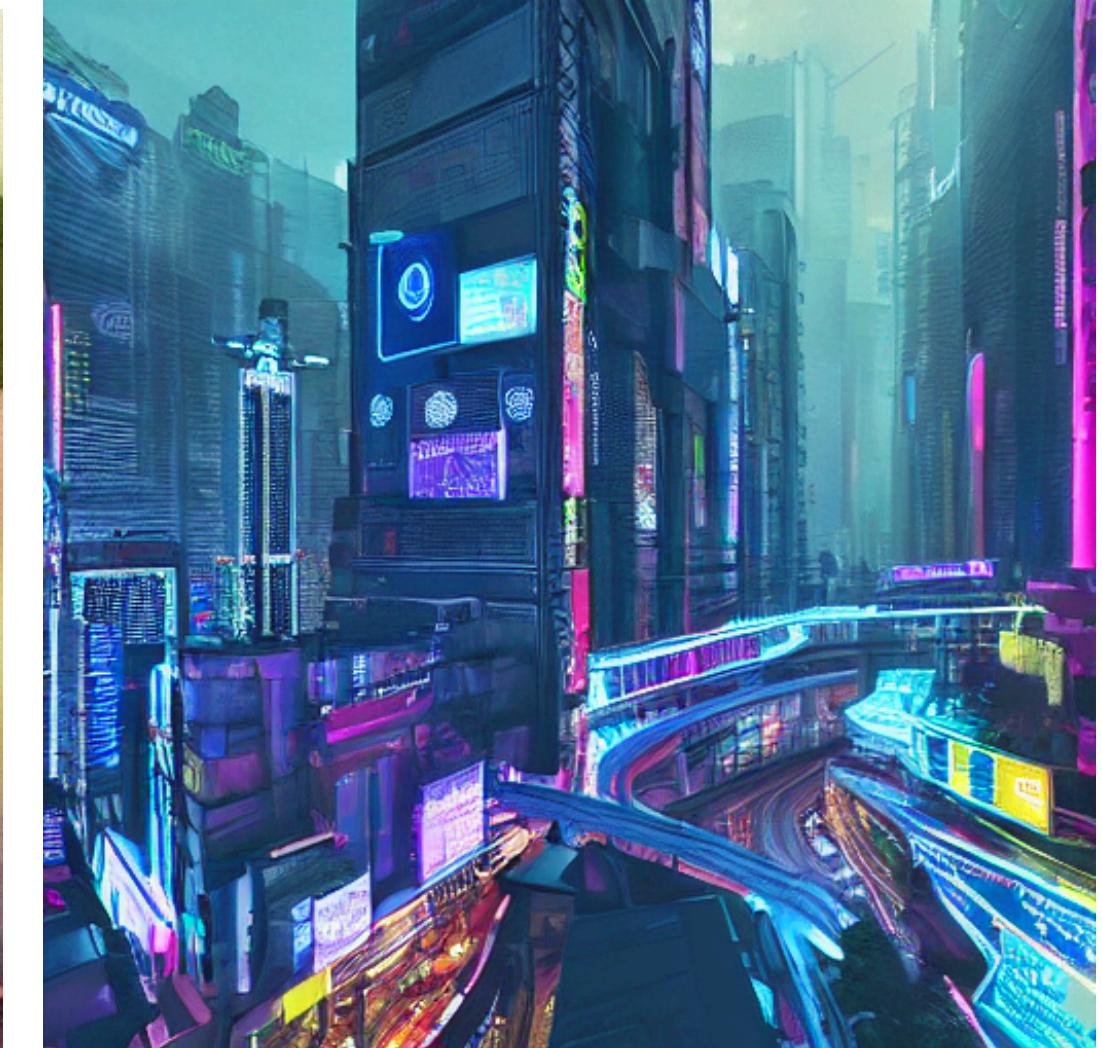
Results



prompt = "A traditional Indian village festival, colorful, digital art, highly detailed"



prompt = "Watercolor painting of a girl reading a book under a tree, soft lighting"



prompt = "A futuristic cyberpunk Mumbai city, neon lights, ultra realistic, 4K"

Conclusion

- Stable Diffusion successfully generates creative artwork
- Pre-trained diffusion models reduce computation cost
- Prompt engineering controls image quality
- Demonstrates real-world application of Generative AI



Thank you