

HISTORY OF IMAGE GENERATION



PRESENTED BY

Varintorn Sithisint

Parinthapat Pengpun

Agenda

1

Definition of Image Generation

2

Importance and applications

3

Early Techniques

4

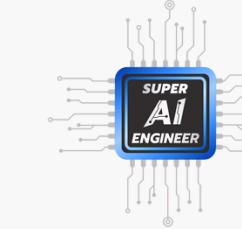
Deep Learning-based Image Generation

5

Ethical and Societal Considerations

6

The Future of Image Generation

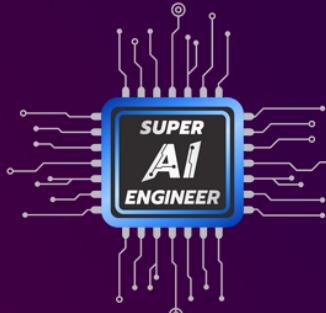


Who are we?



Parinthapat Pengpun

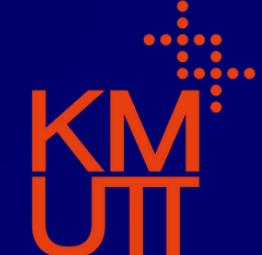
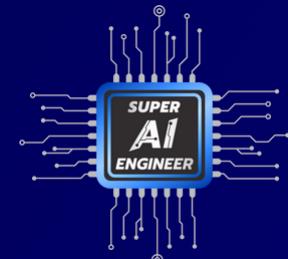
- Grade 10 Student
 - Bangkok Christian International School
- AI Builders 2022
- NLP Researcher
- Super AI Engineer Season 3
- AI Engineer at Deep Invest x Deep Capital Co. Ltd,

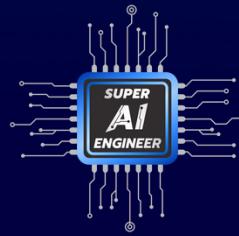


Varintorn Sithisint



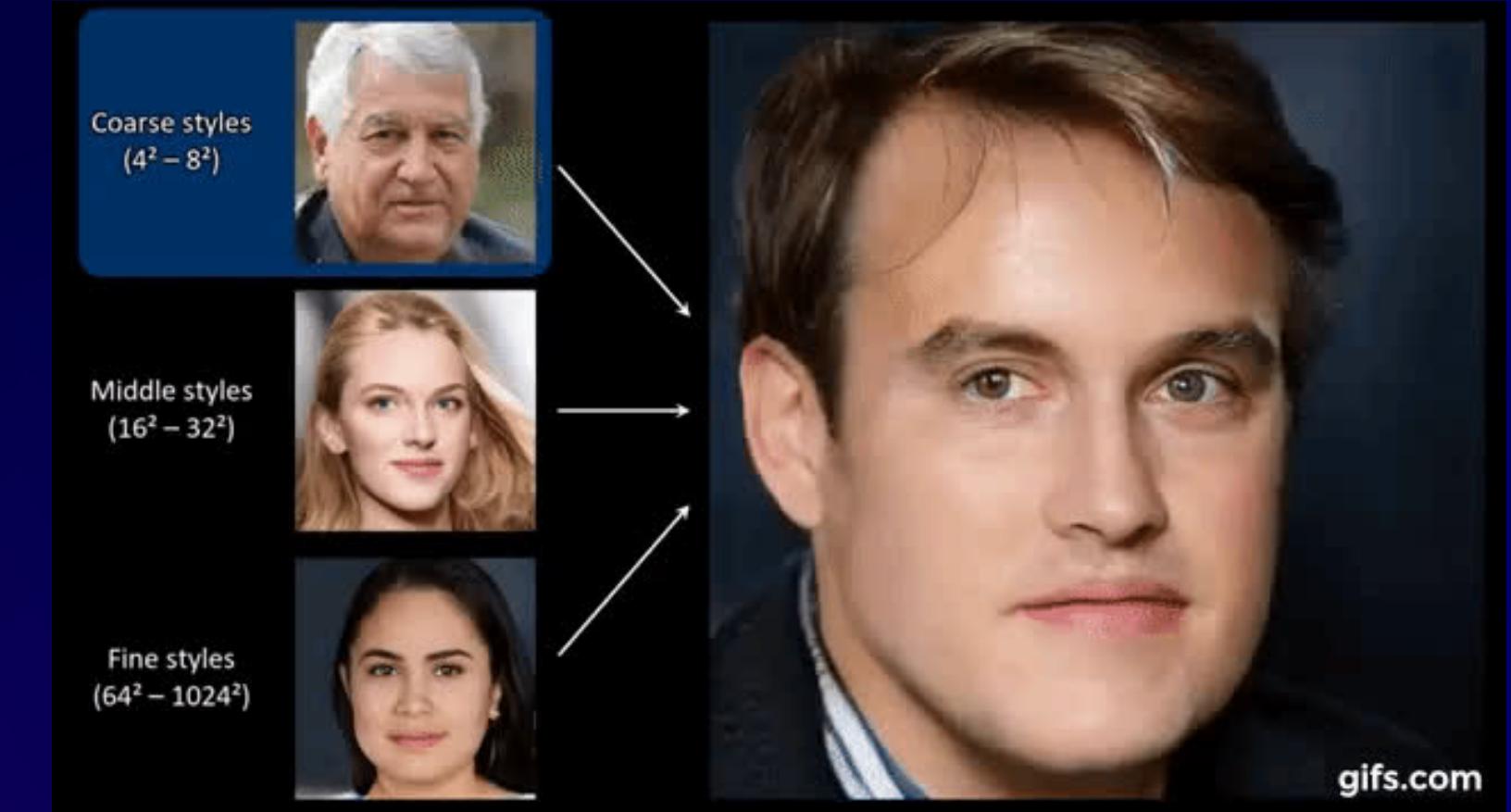
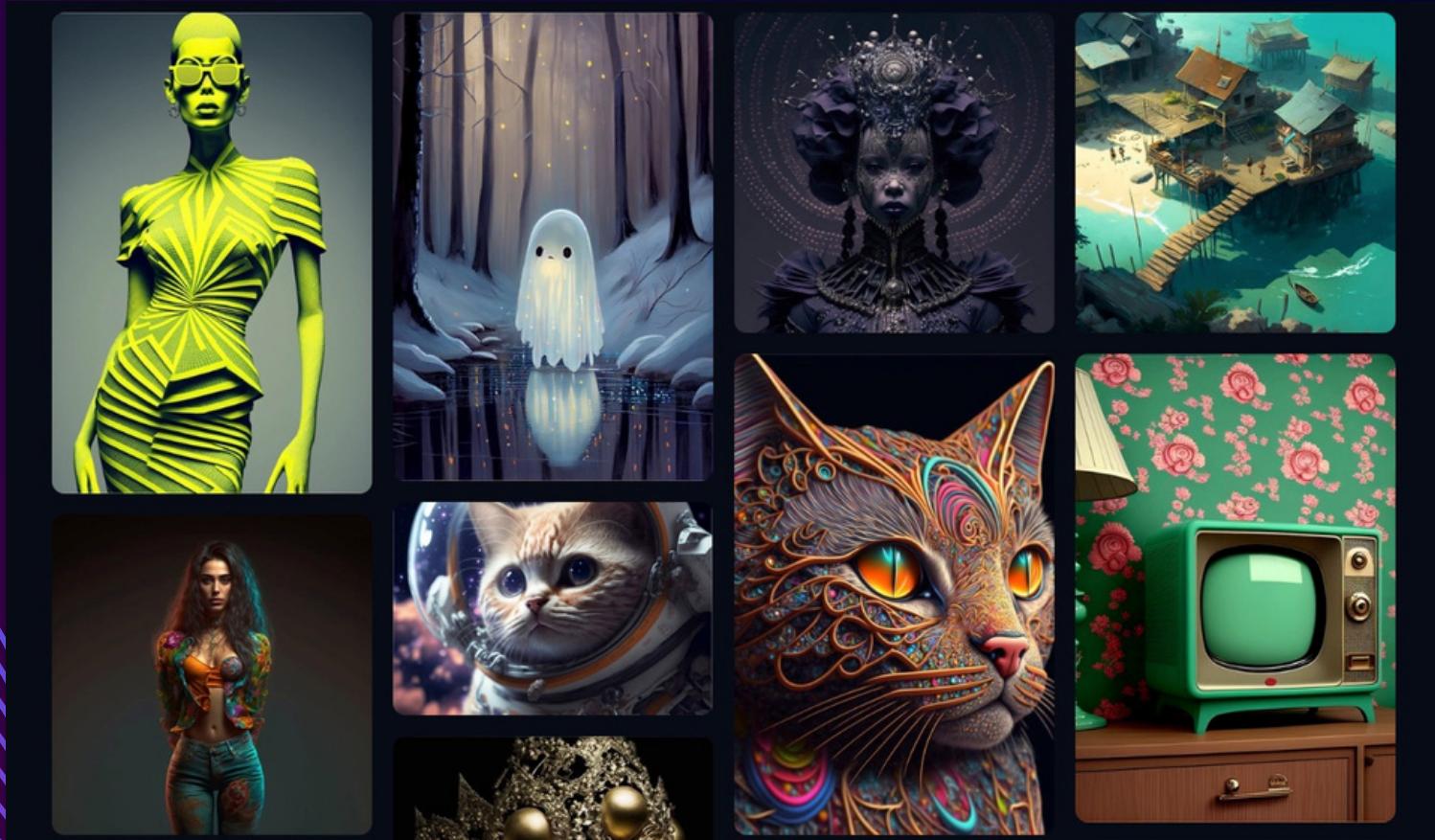
- Third-year student in applied computer science
King Mongkut's university of technology Thonburi
- Super AI Engineer Season 3
- Data scientist at AltoTech(Thailand) Co., Ltd.



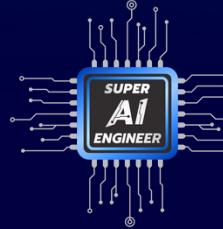


Definition of Image Generation

" It is a process where computers create new images either from scratch or by altering existing "



Two major of Image Generation



Procedural generation

uses algorithms and mathematical models to create images, often used for creating infinite landscapes in video games.

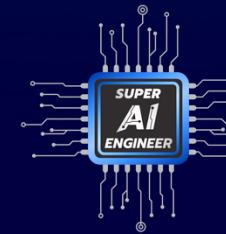


Generative models

use machine learning to create realistic images from random noise. The results are often so good that they can be difficult to distinguish from real-life photographs

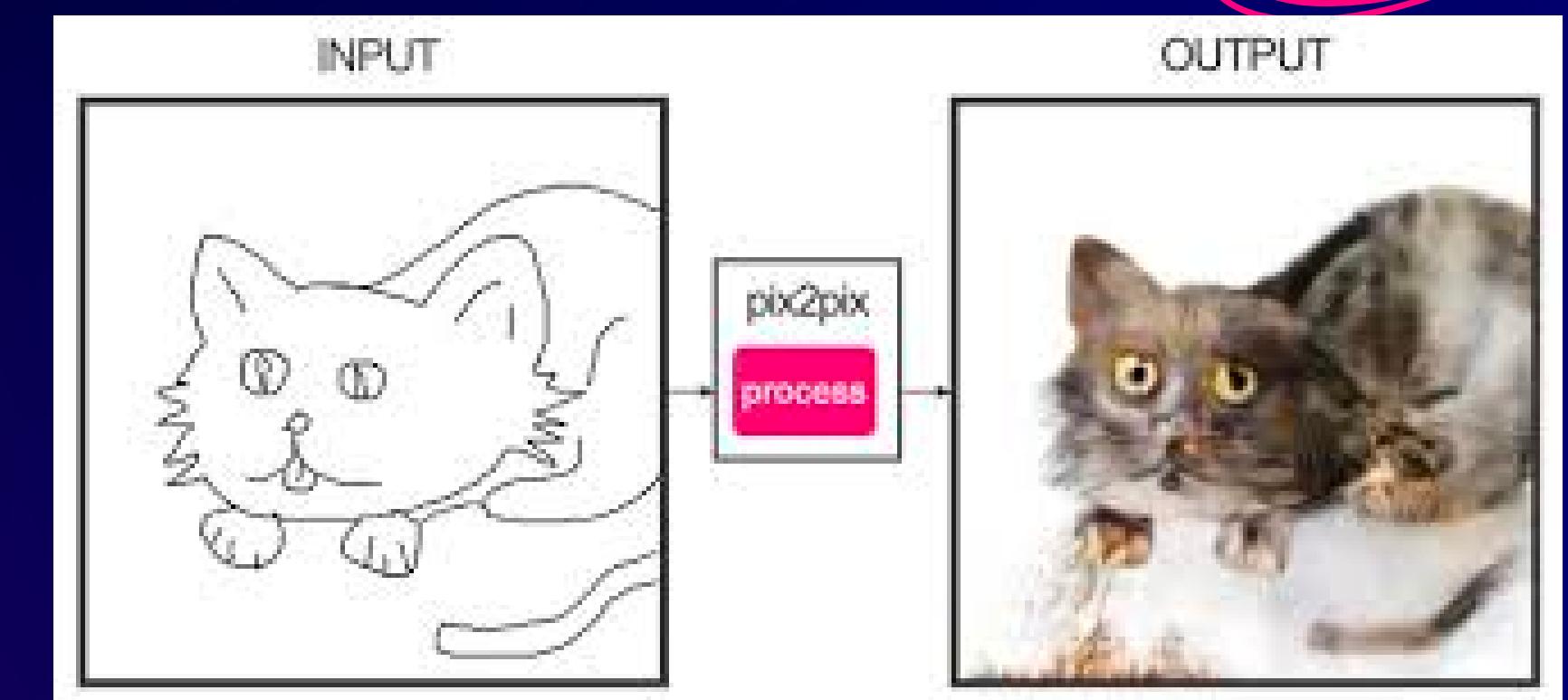
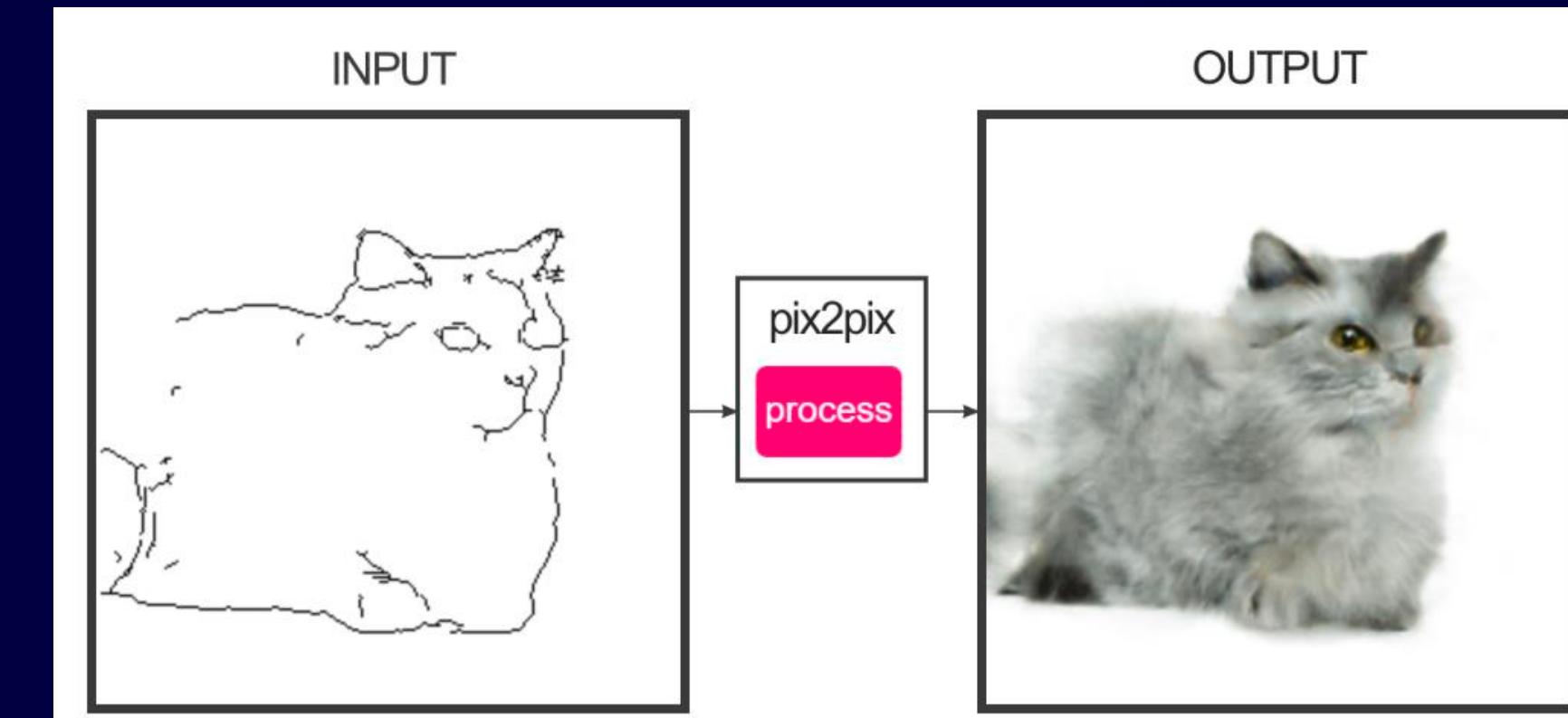


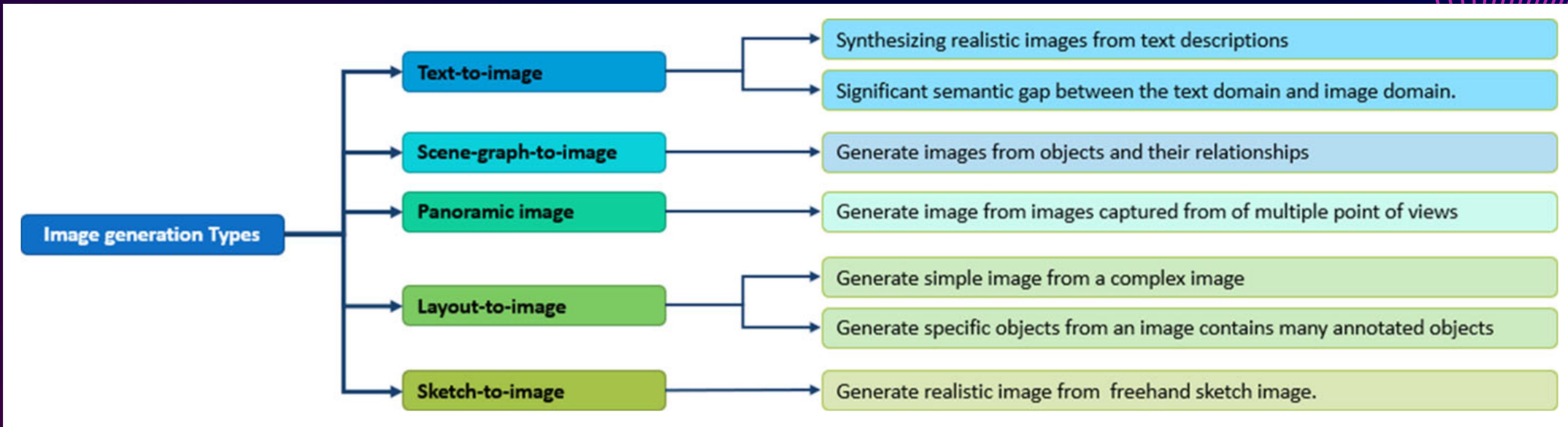
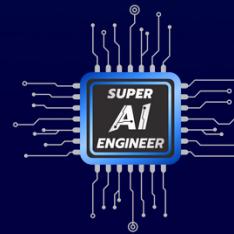
Importance and applications



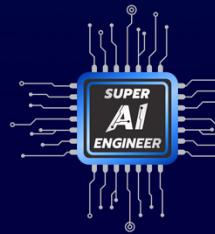
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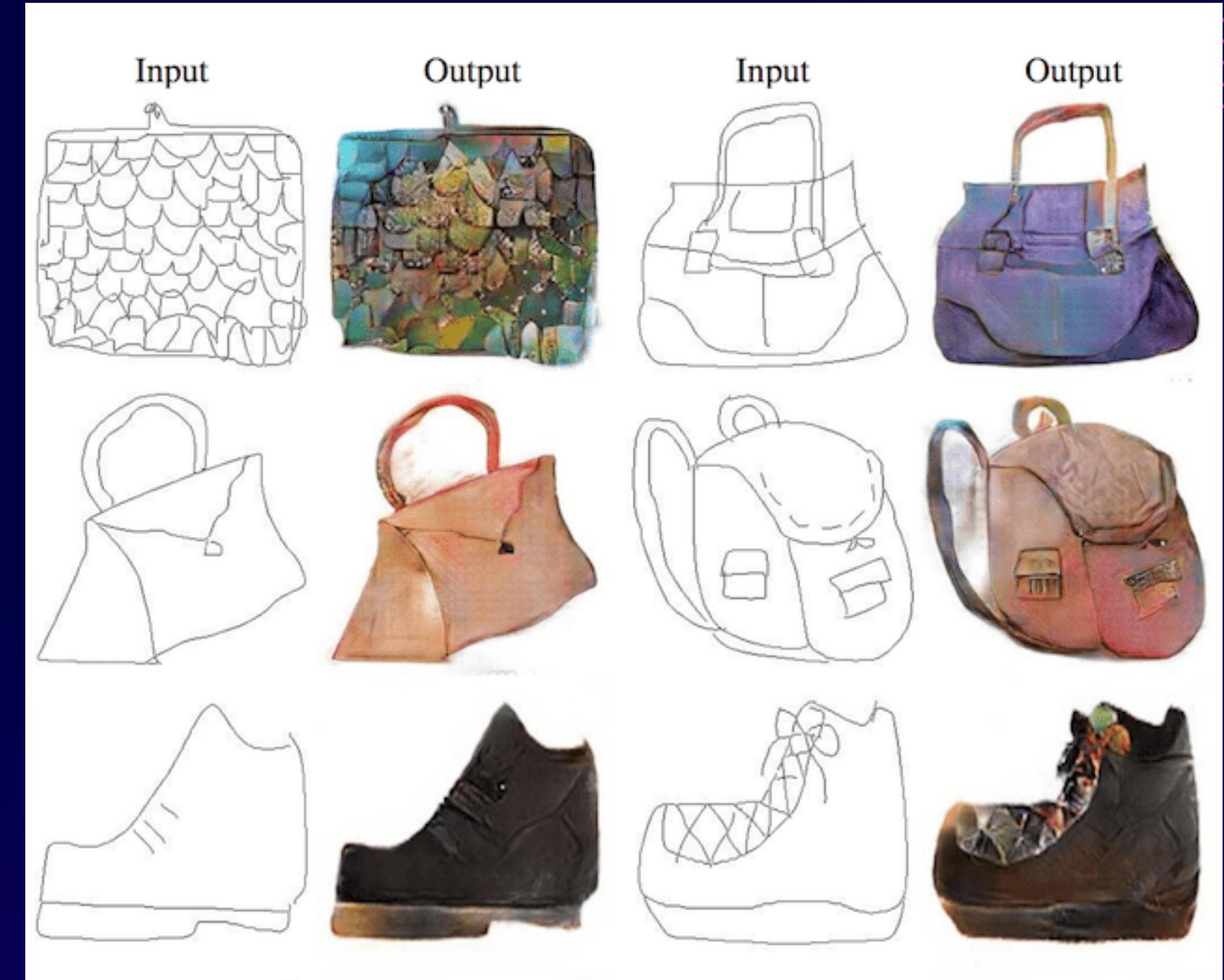




Interesting Abilities of Image Generation Models

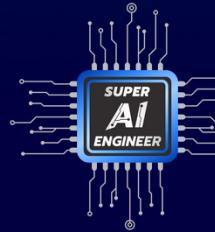


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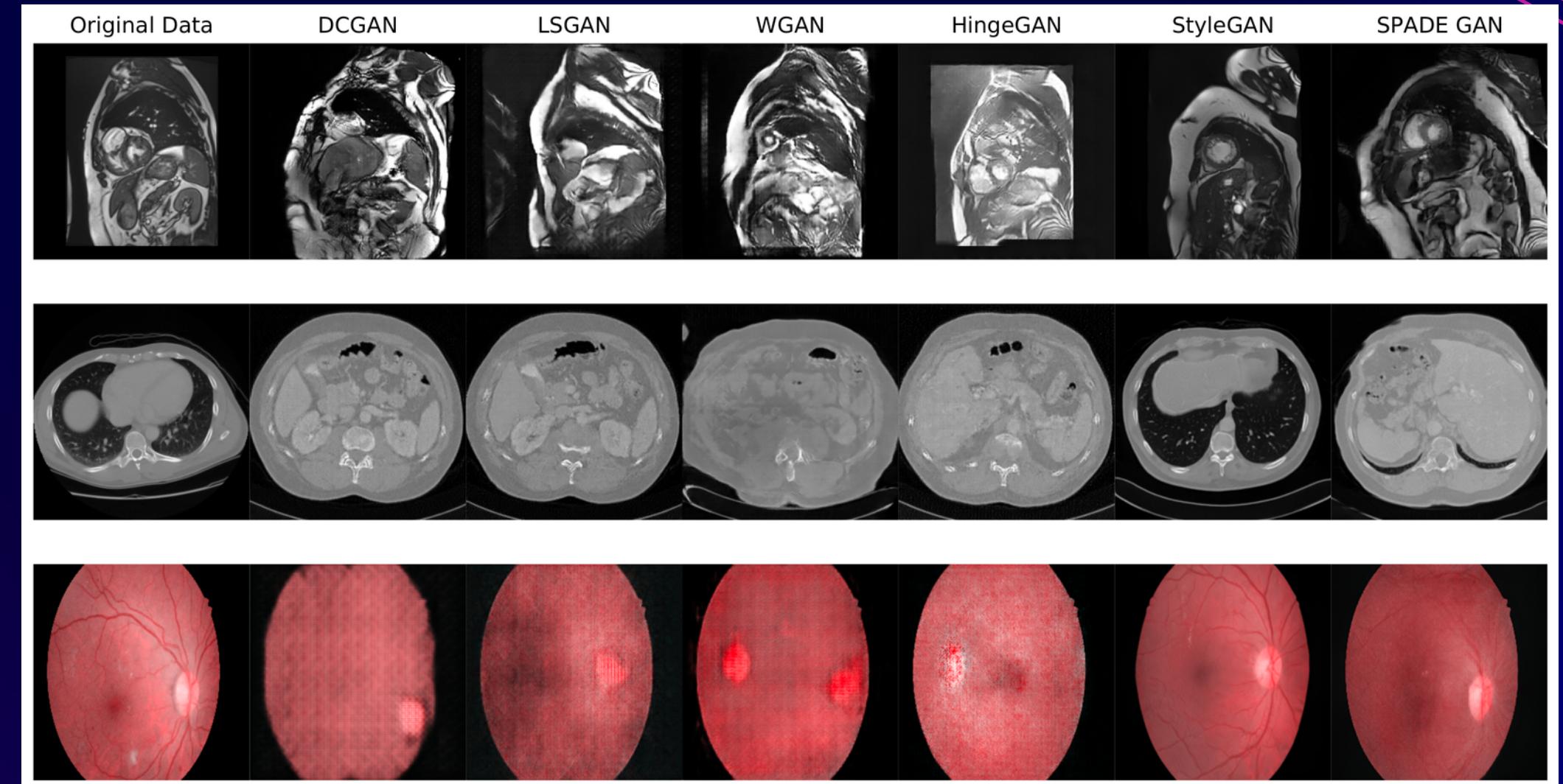
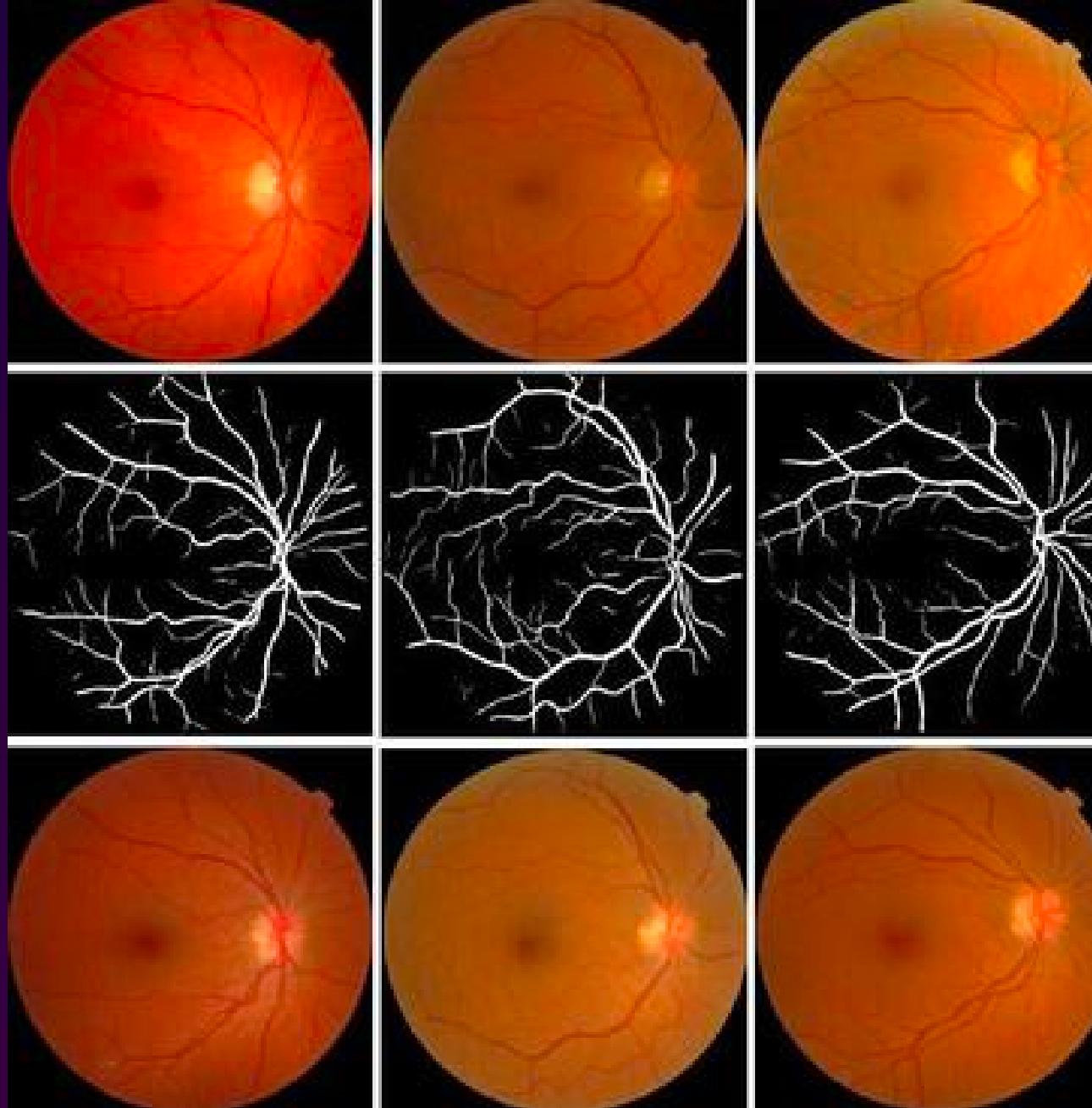
Data Generation

Interesting Abilities of Image Generation Models



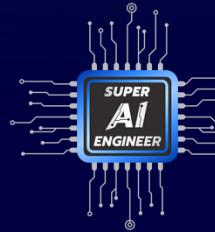
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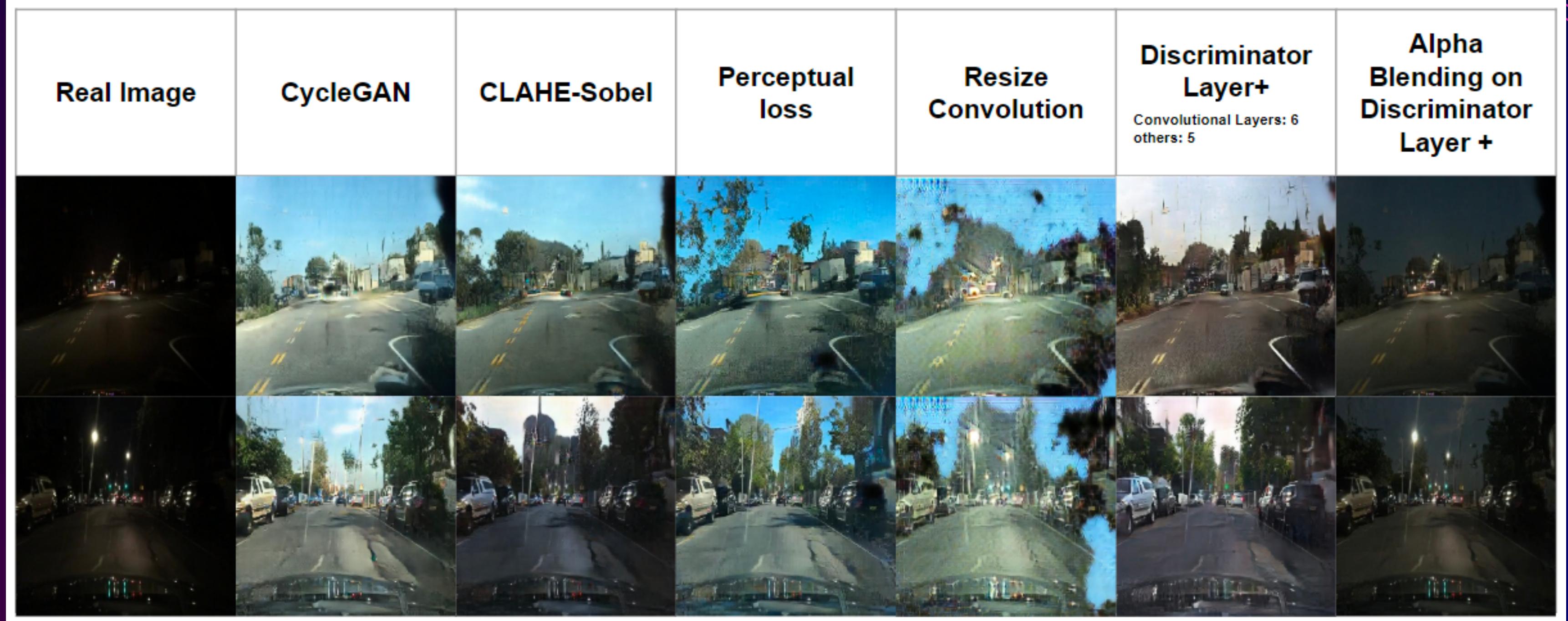
Data Generation

Interesting Abilities of Image Generation Models



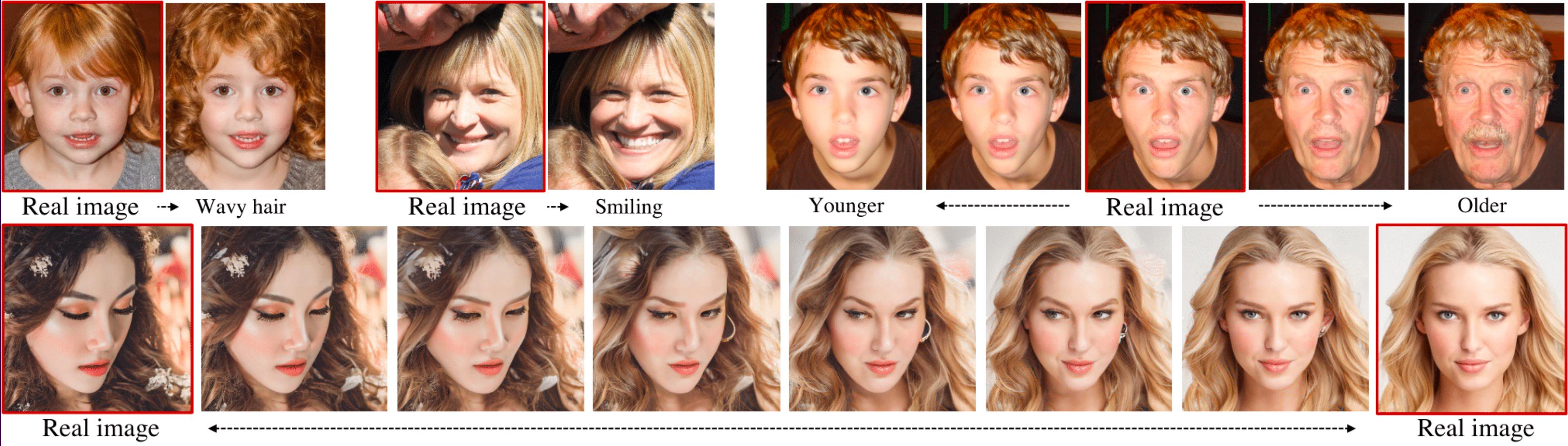
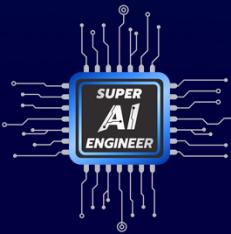
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Data Generation

Interesting Abilities of Image Generation Models

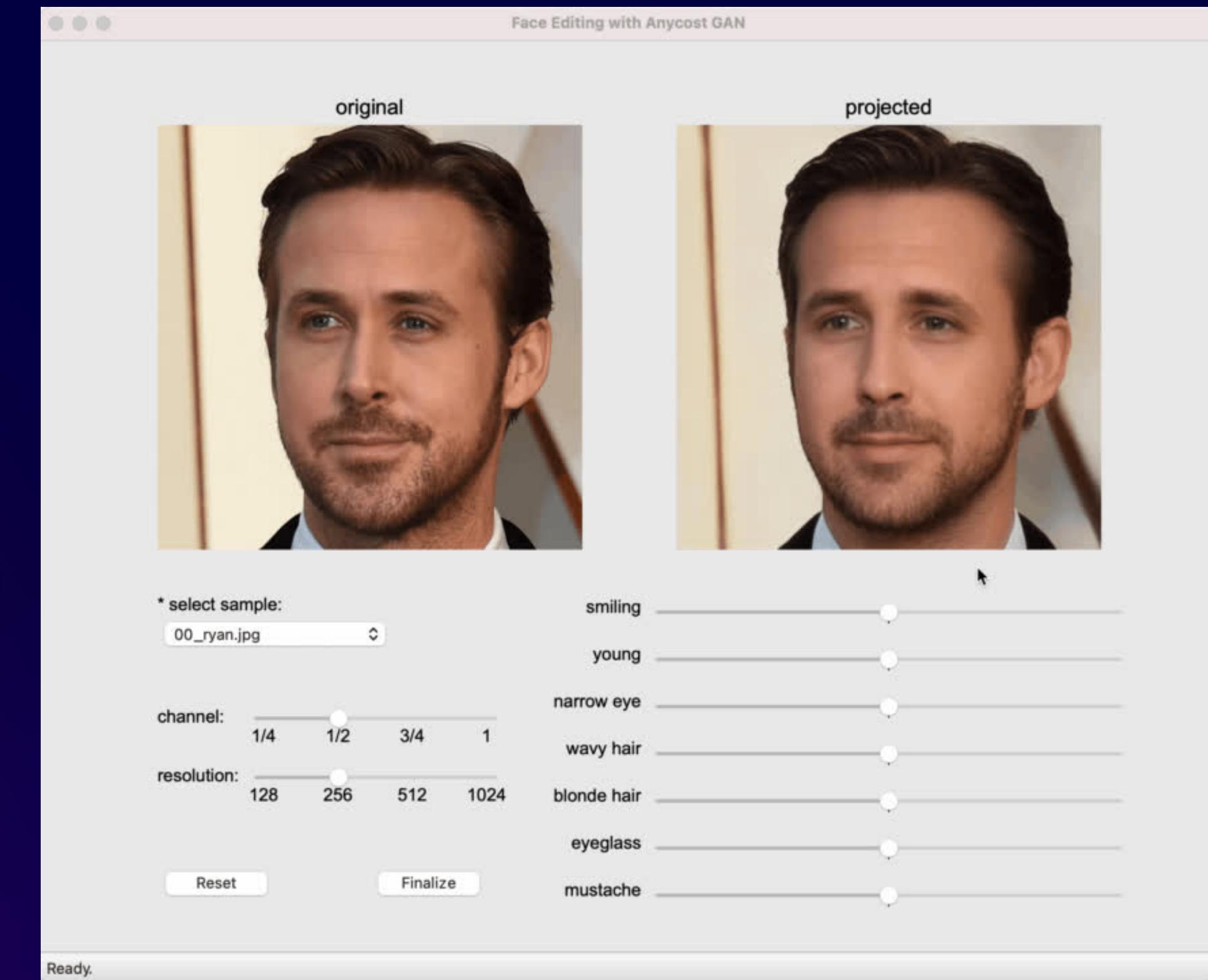
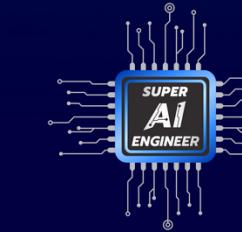


Precise Photo Manipulation

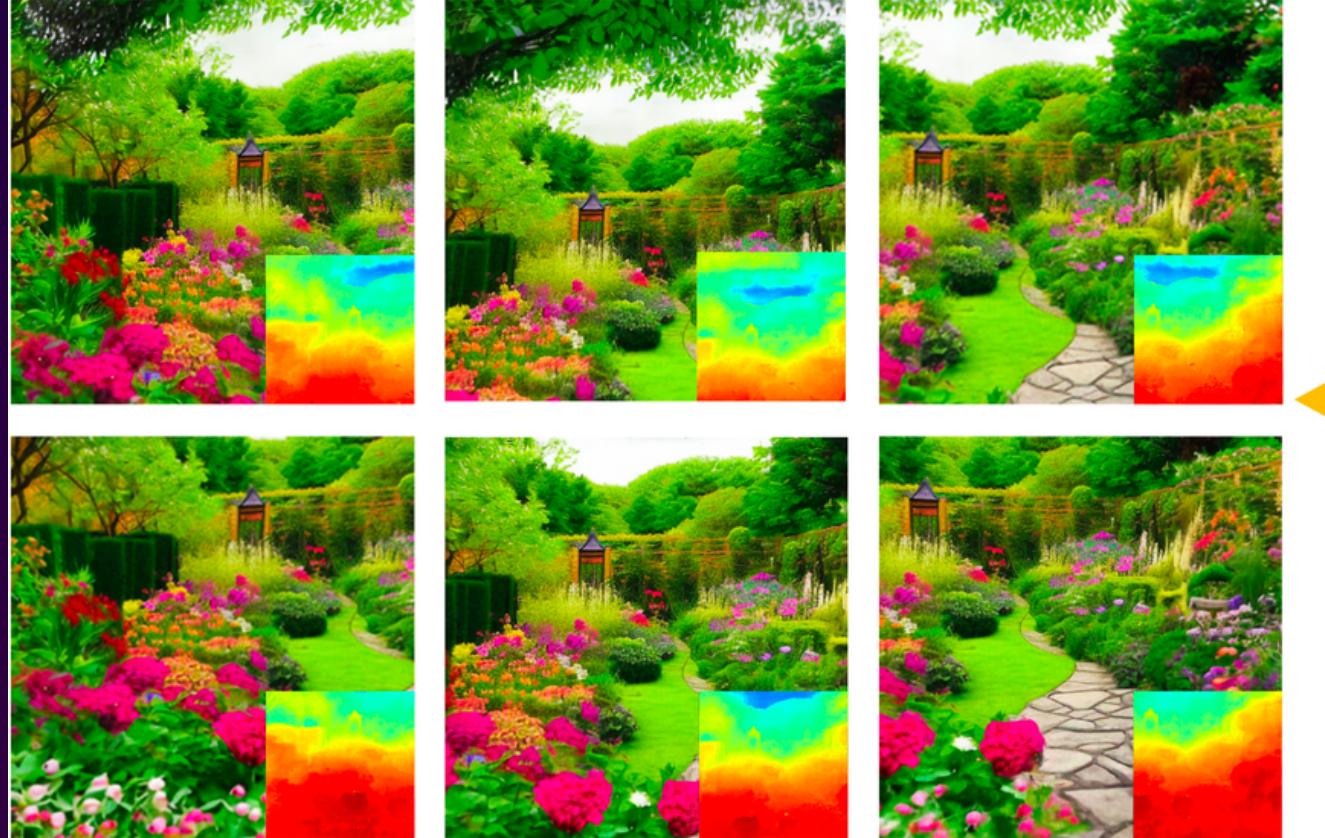
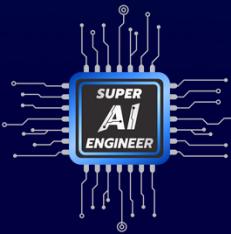
<https://diff-ae.github.io/>

Interesting Abilities of Image Generation Models

Precise Photo Manipulation

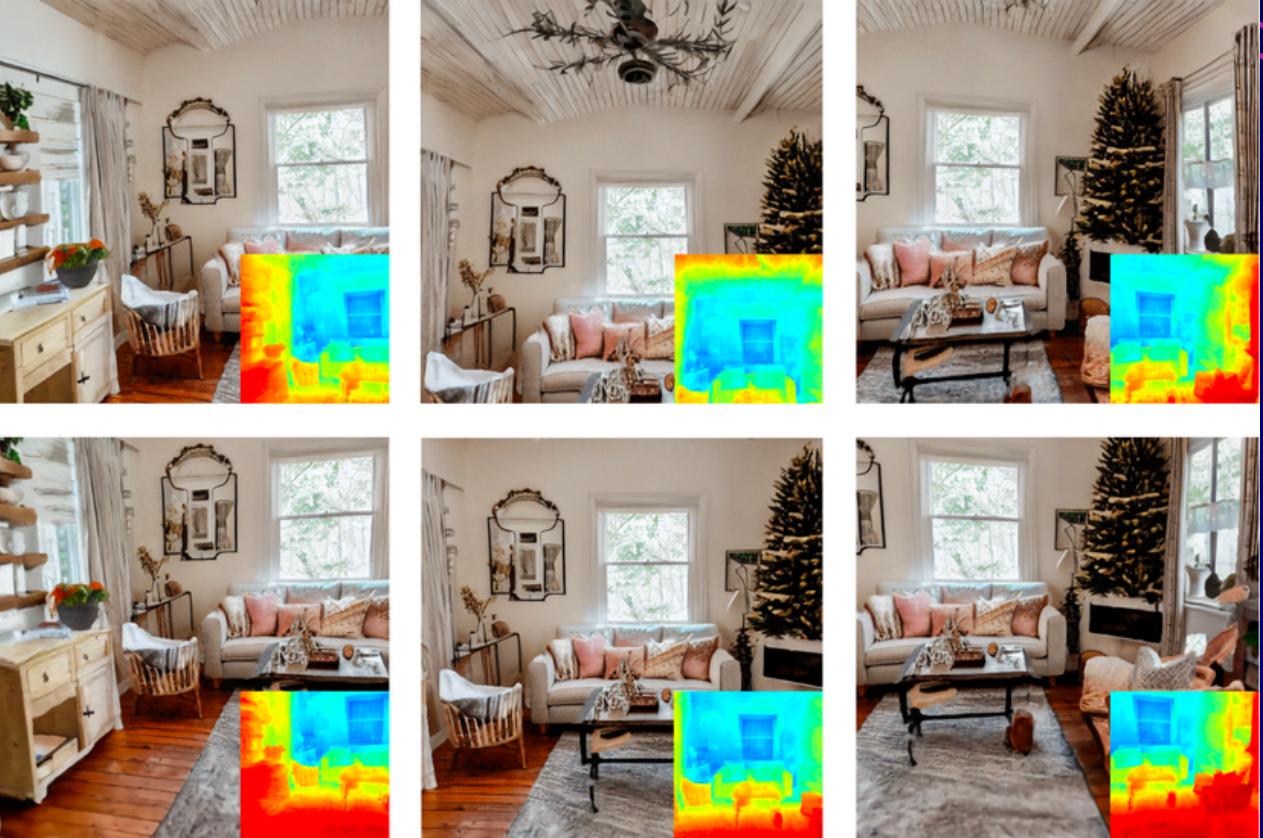


Interesting Abilities of Image Generation Models



Prompt 1:
'a beautiful garden'

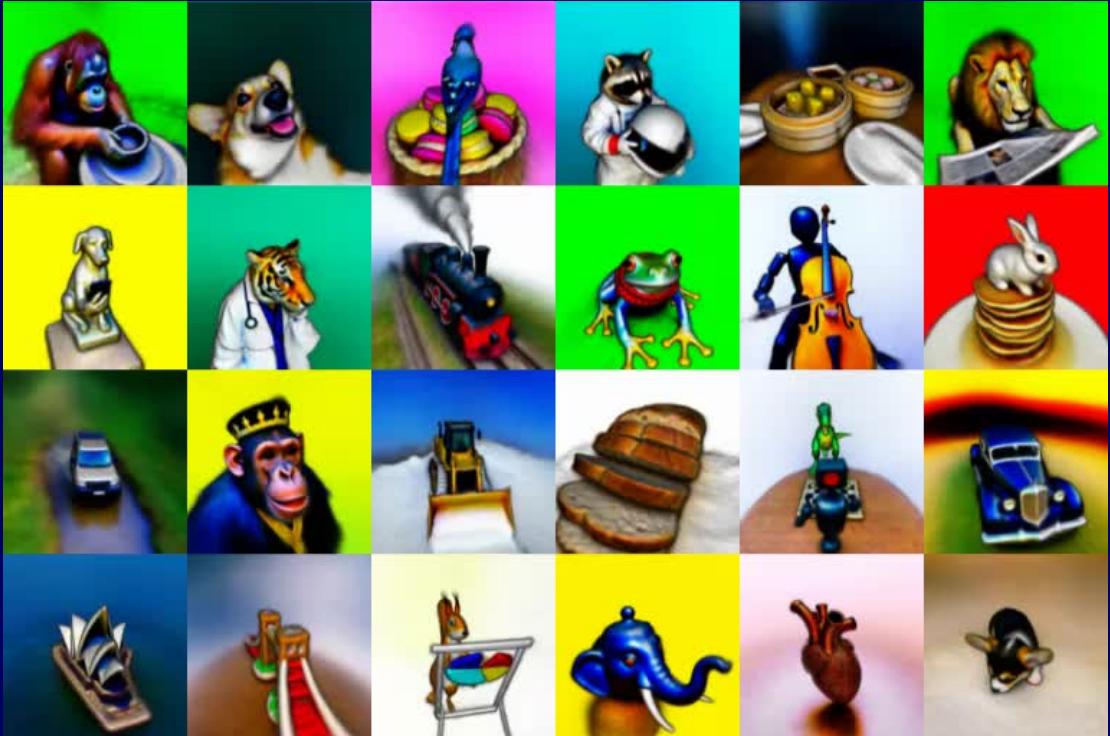
Text2NeRF



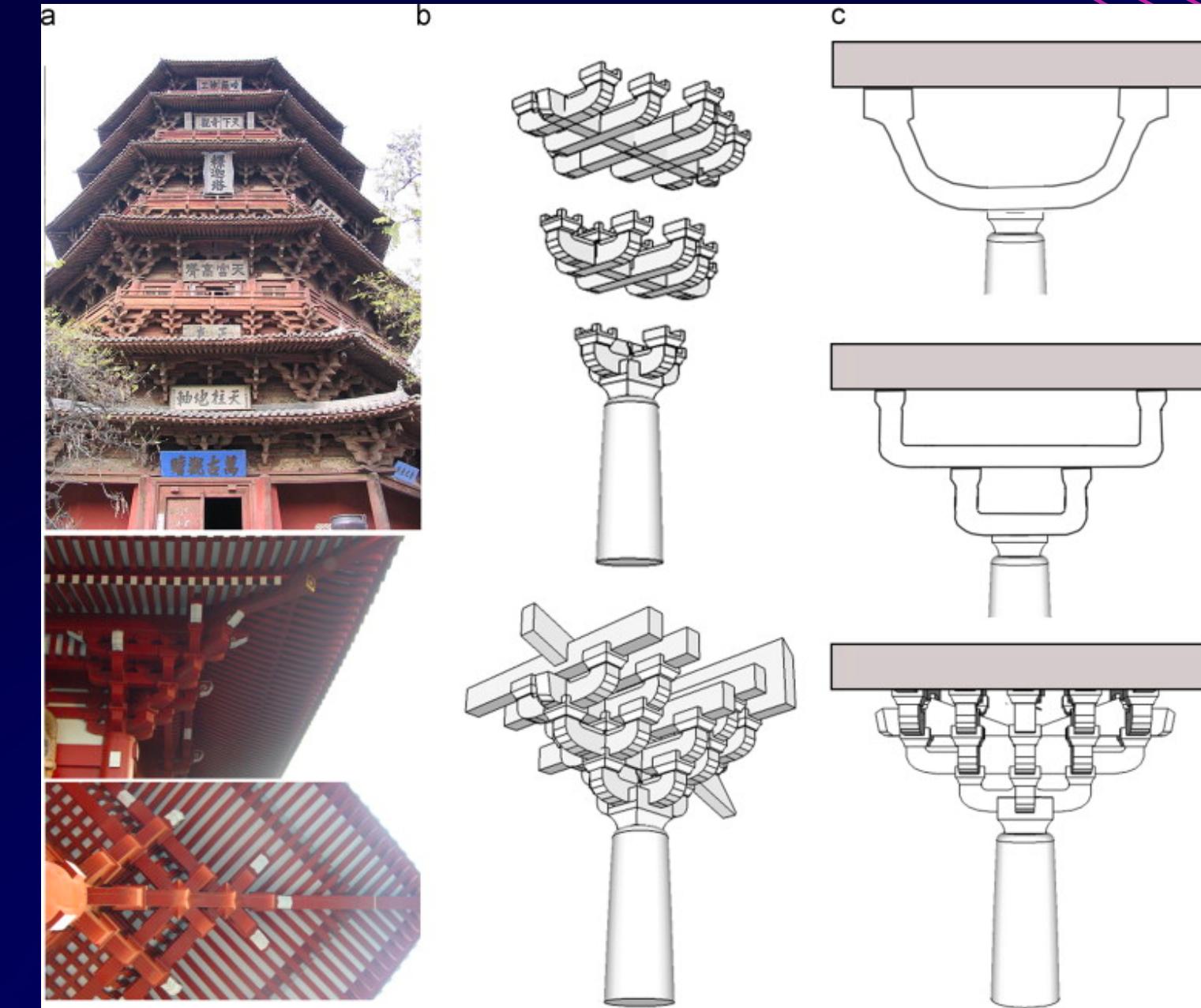
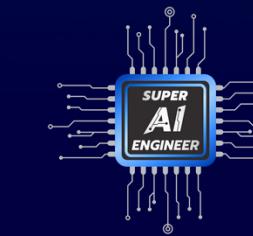
Prompt 2:
'a cozy living room'



Text-to-3d

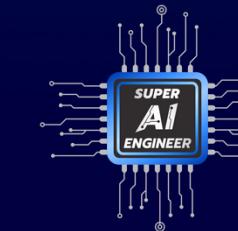


Interesting Abilities of Image Generation Models



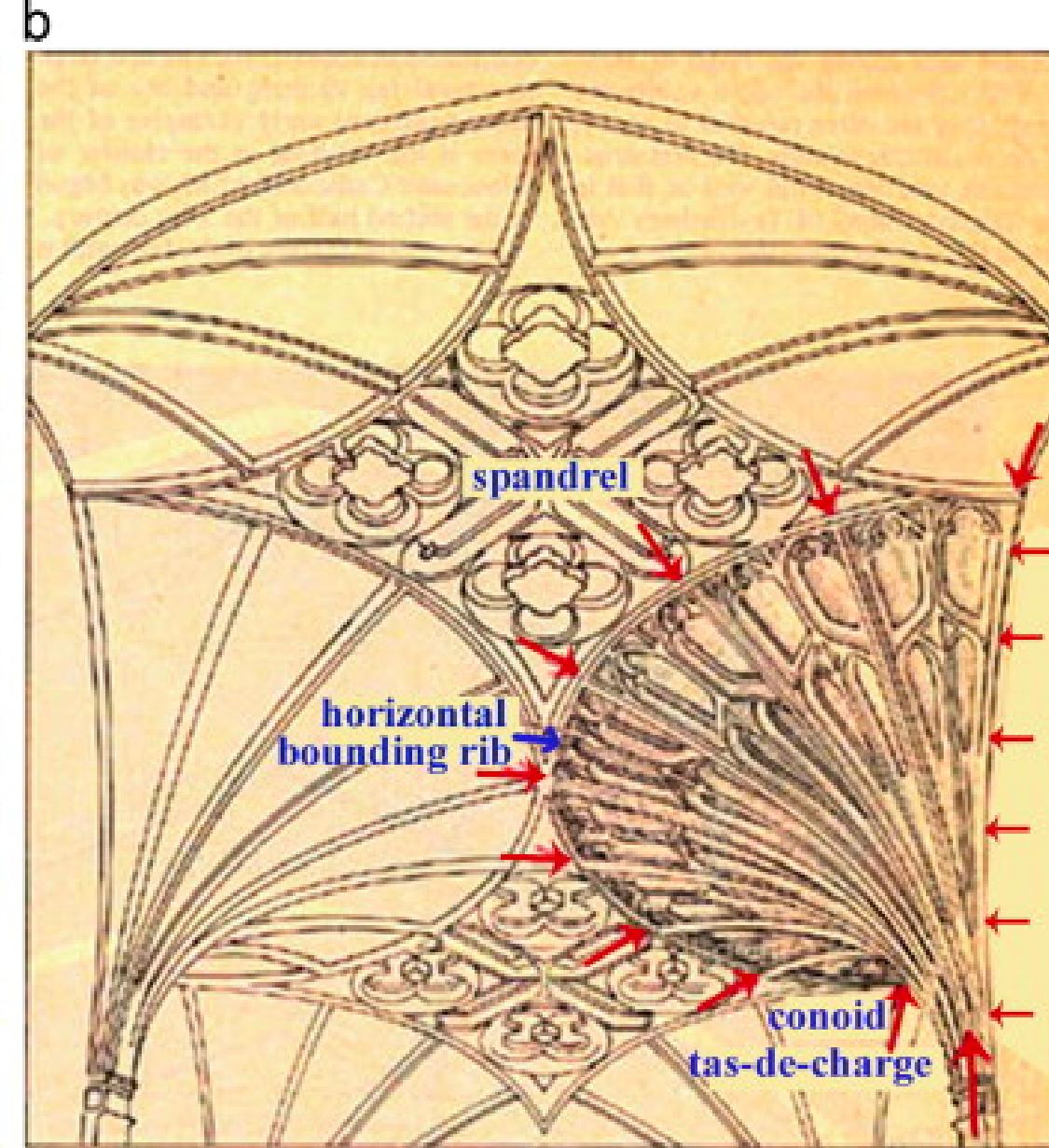
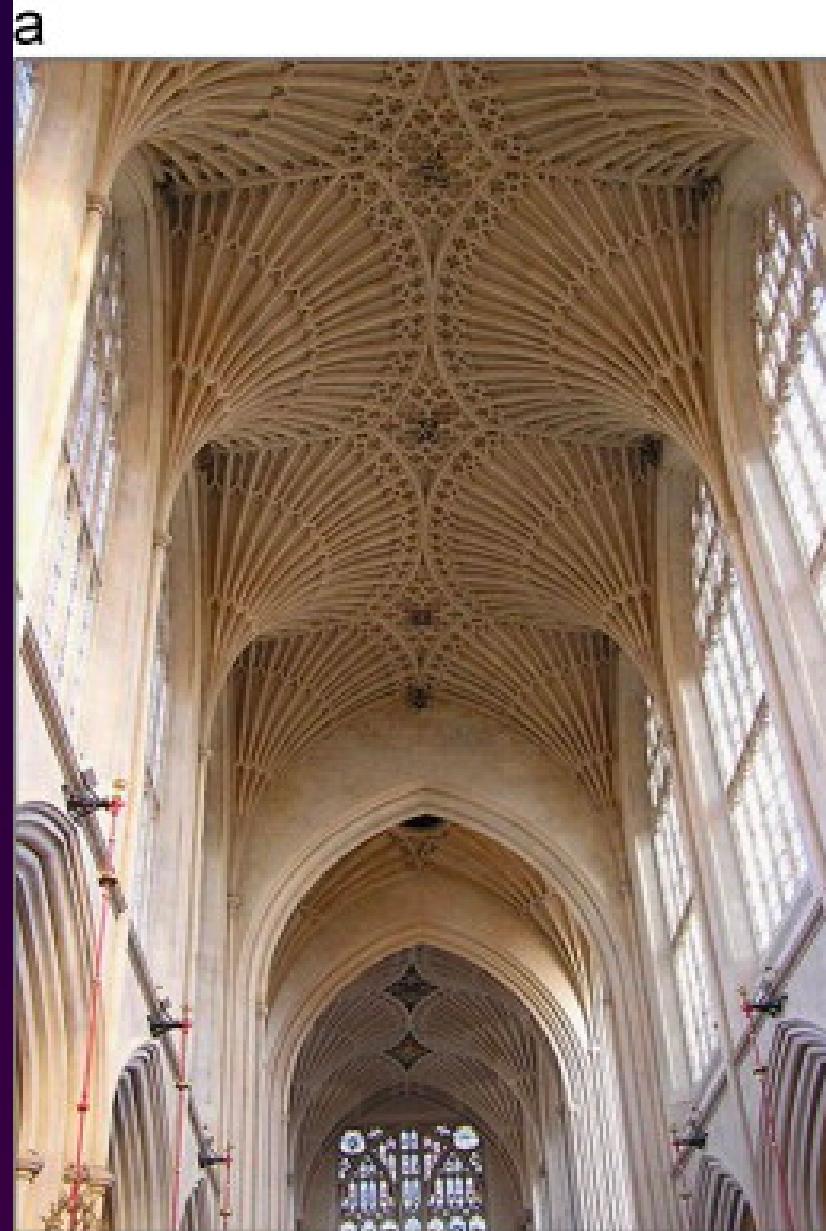
Fractal Art & Design

Interesting Abilities of Image Generation Models

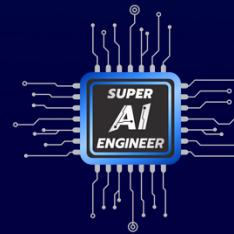


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Fractal Art & Design

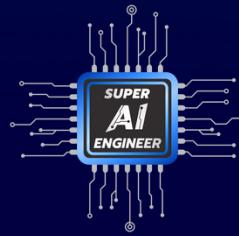


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Why are these games so fun?

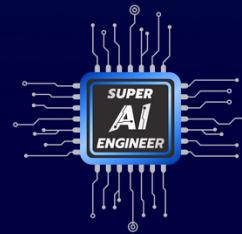




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Because of the limitless world they give you to explore!

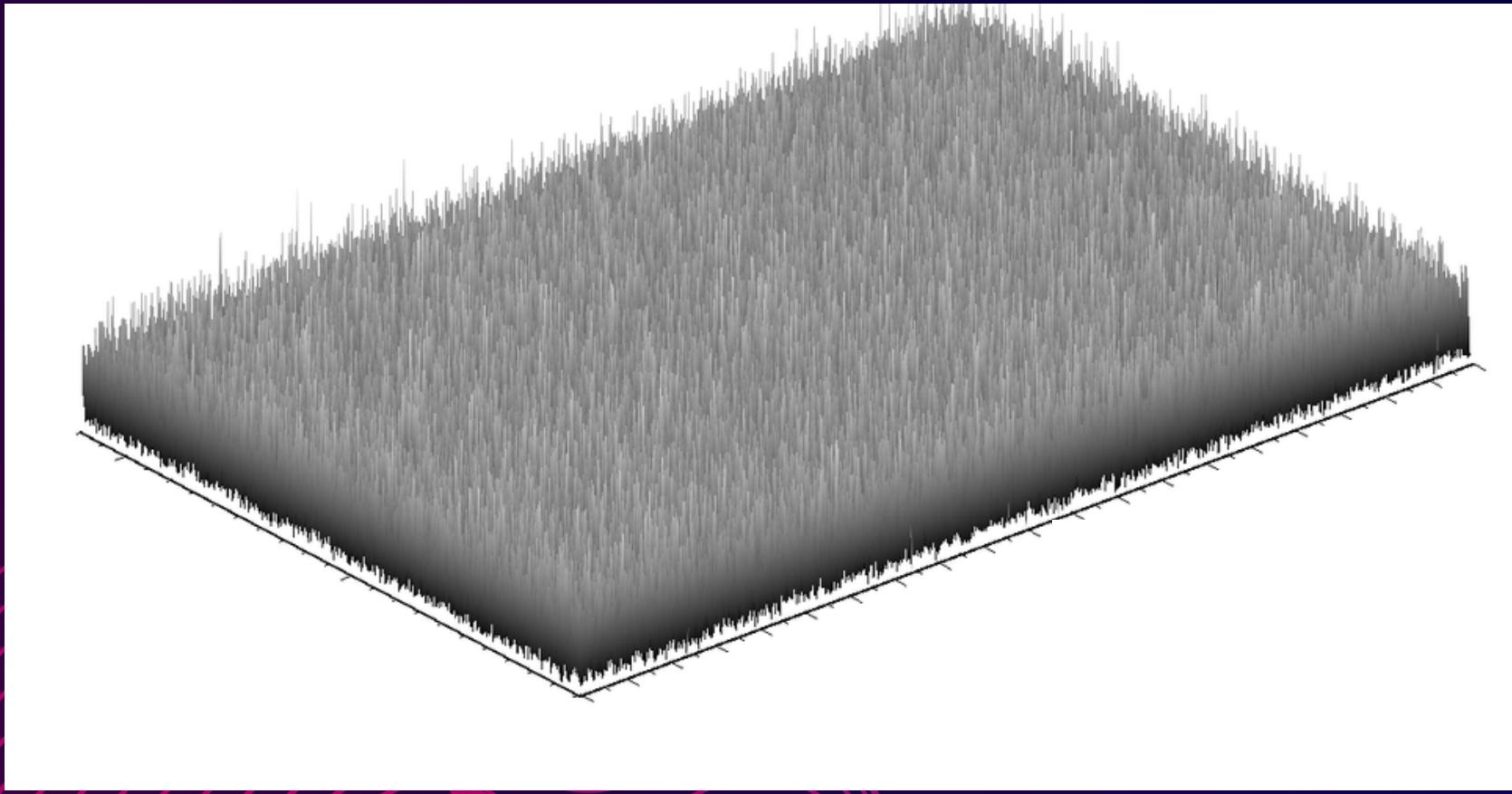


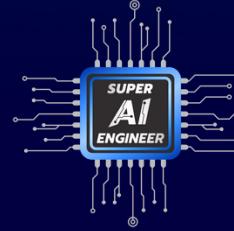


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Random world with white noise ?

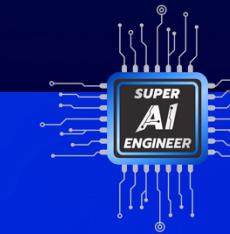




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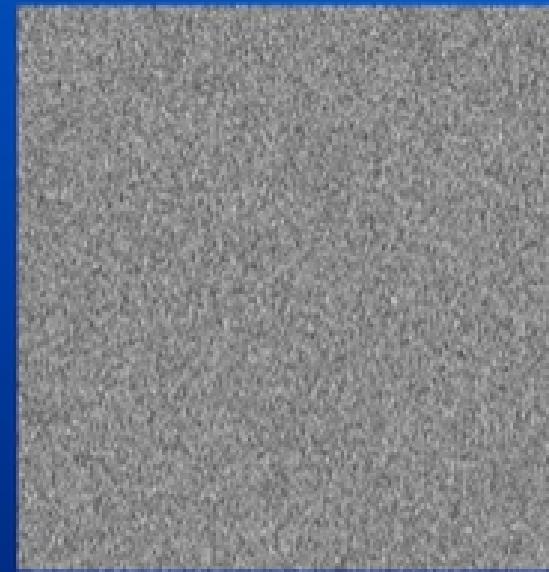
Early Techniques



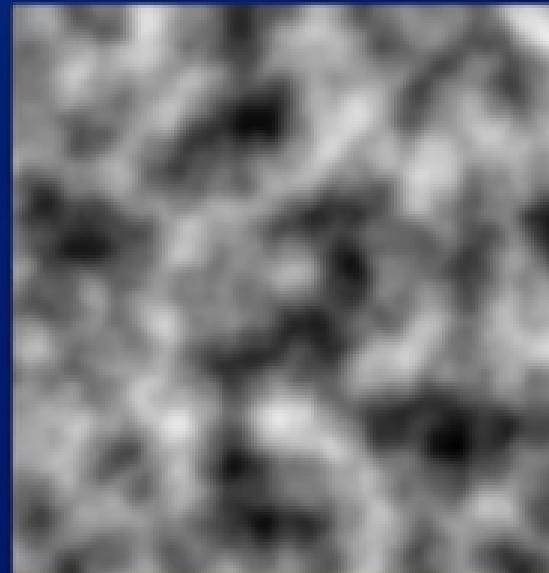


Categories of Noise

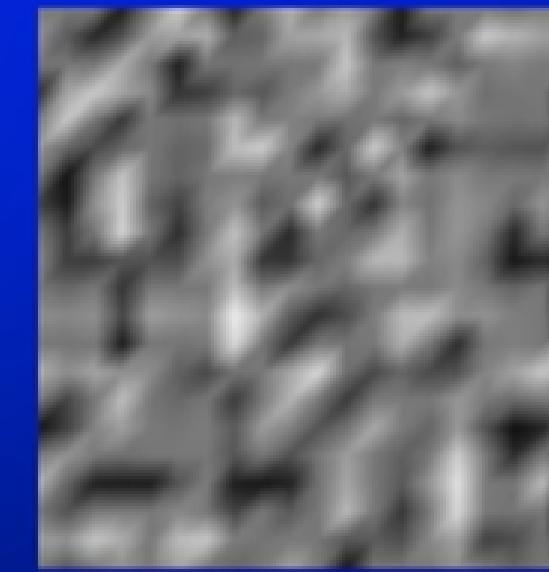
White Noise



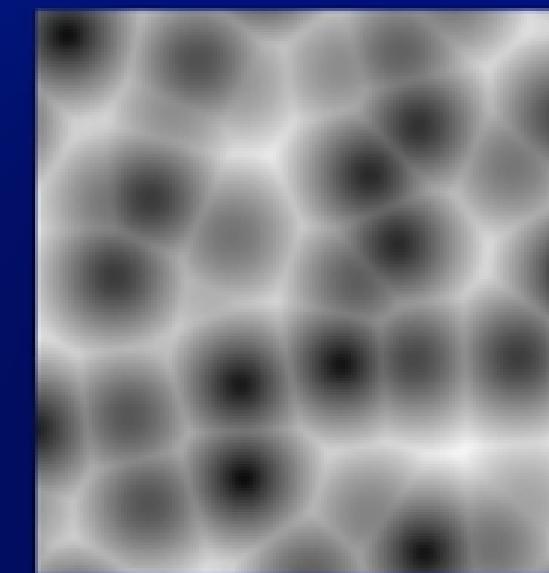
Gradient Noise



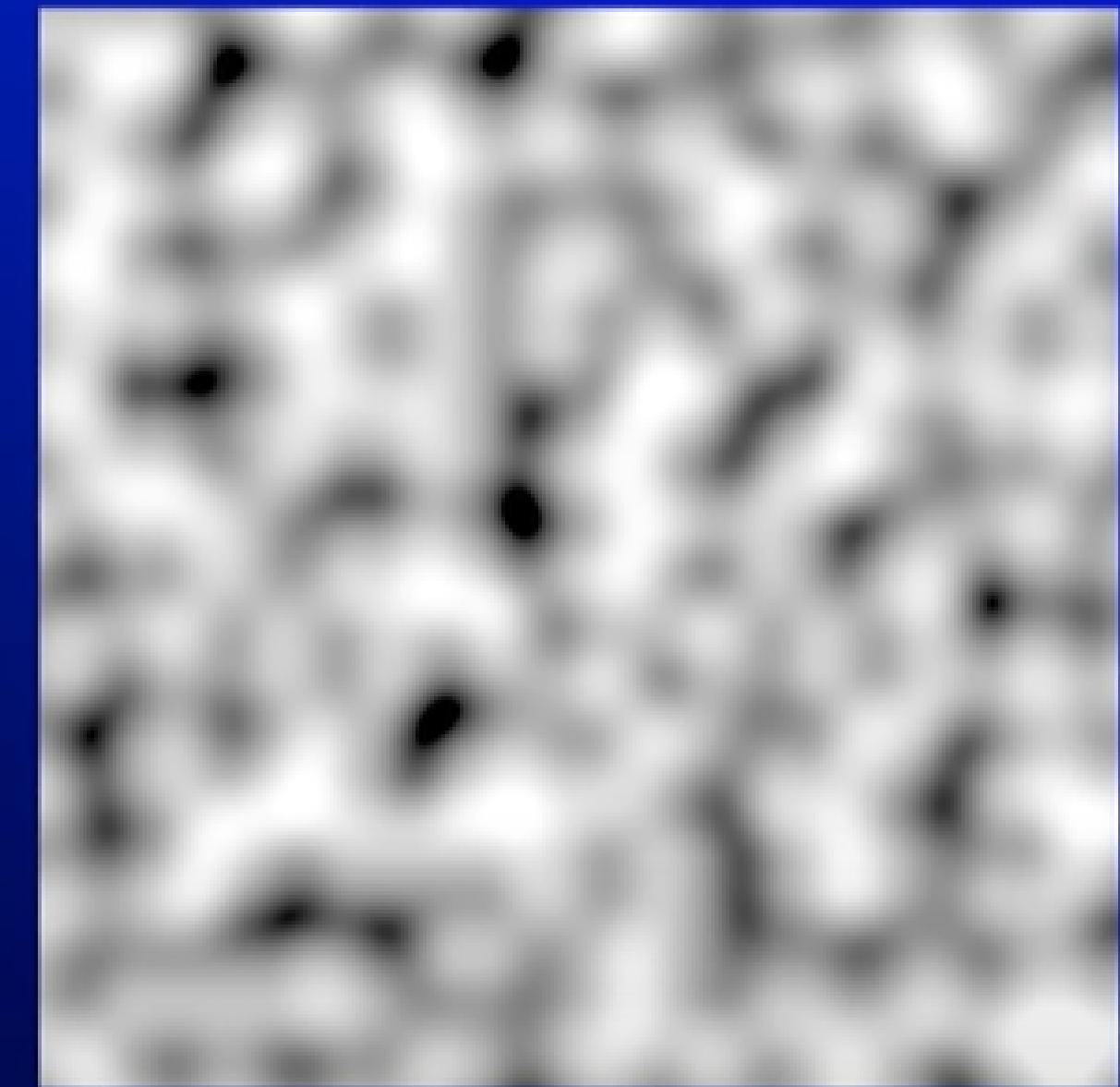
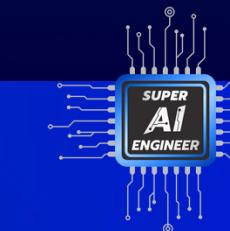
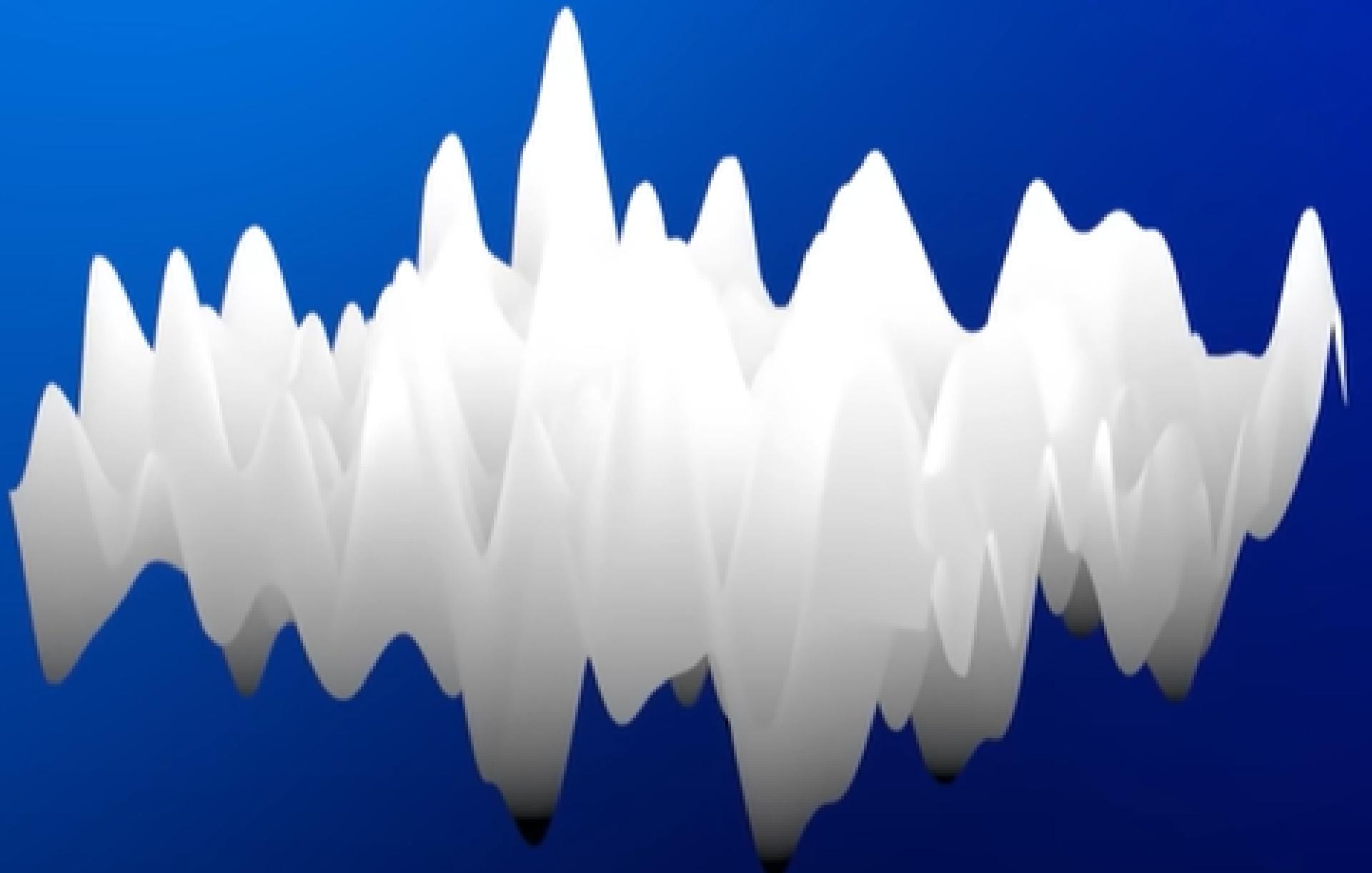
Value Noise



Cell Noise

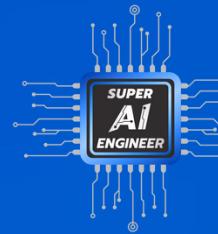


Perlin Noise

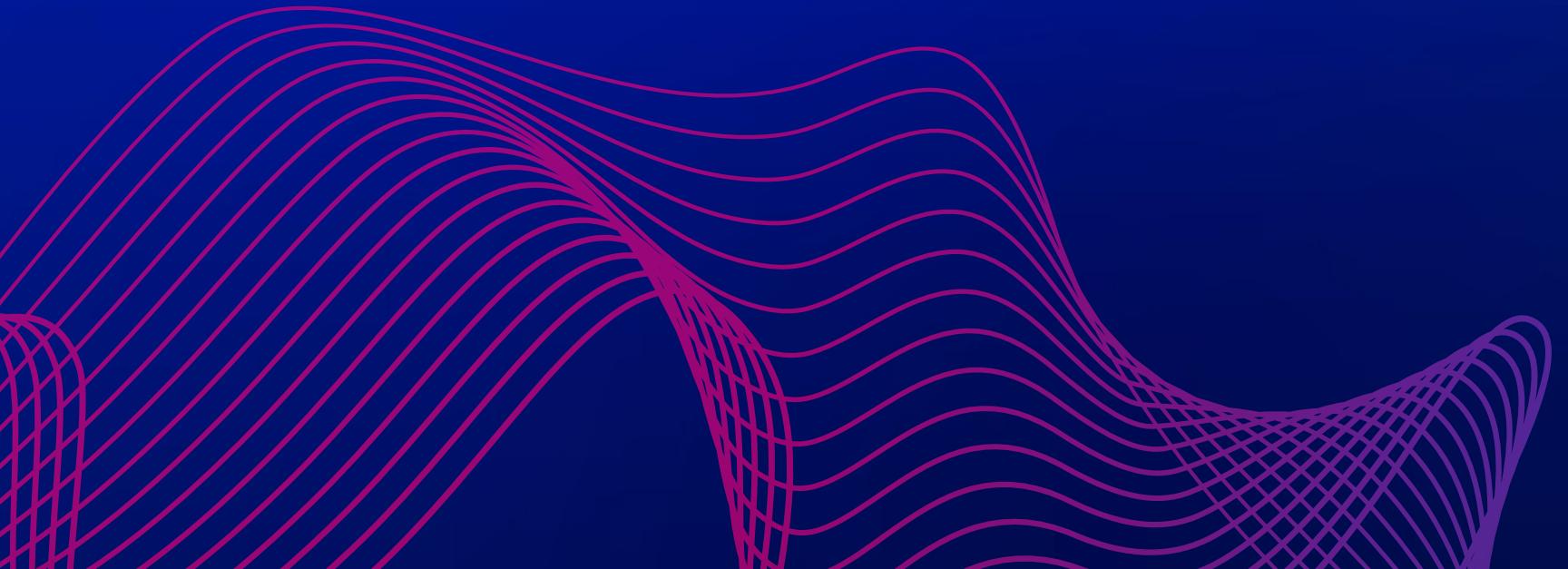
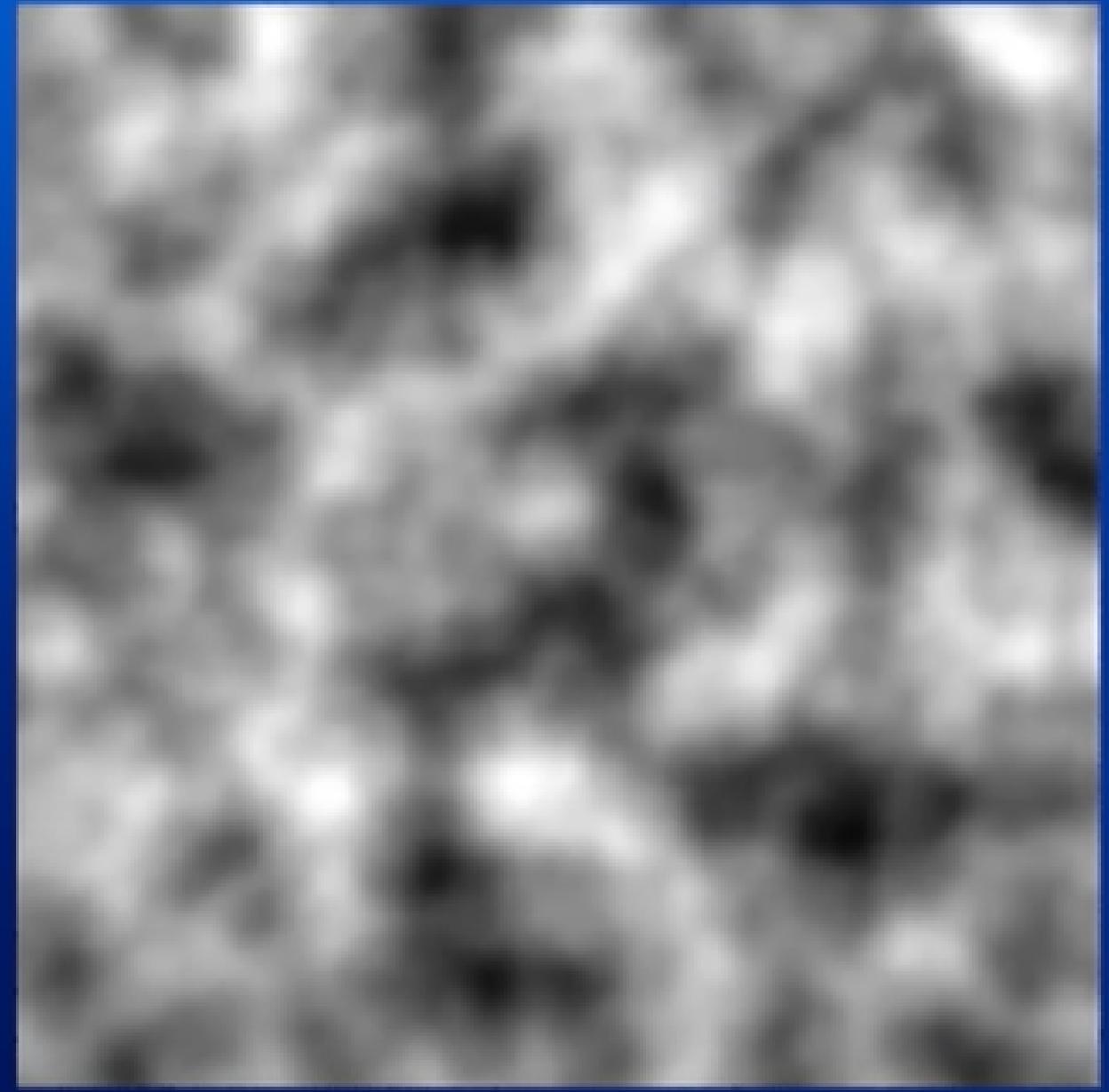


<https://www.youtube.com/watch?v=ZsEnnB2wrbl>

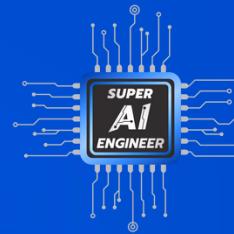
Perlin Noise Overview



Seed
861351150



<https://www.youtube.com/watch?v=ZsEnnB2wrbl>



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Seed
861351150

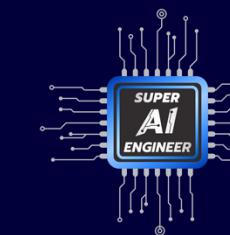


Pseudo-
Random
Number
Generator



1 3 5 1 5 6 1 4 4 8 . . .



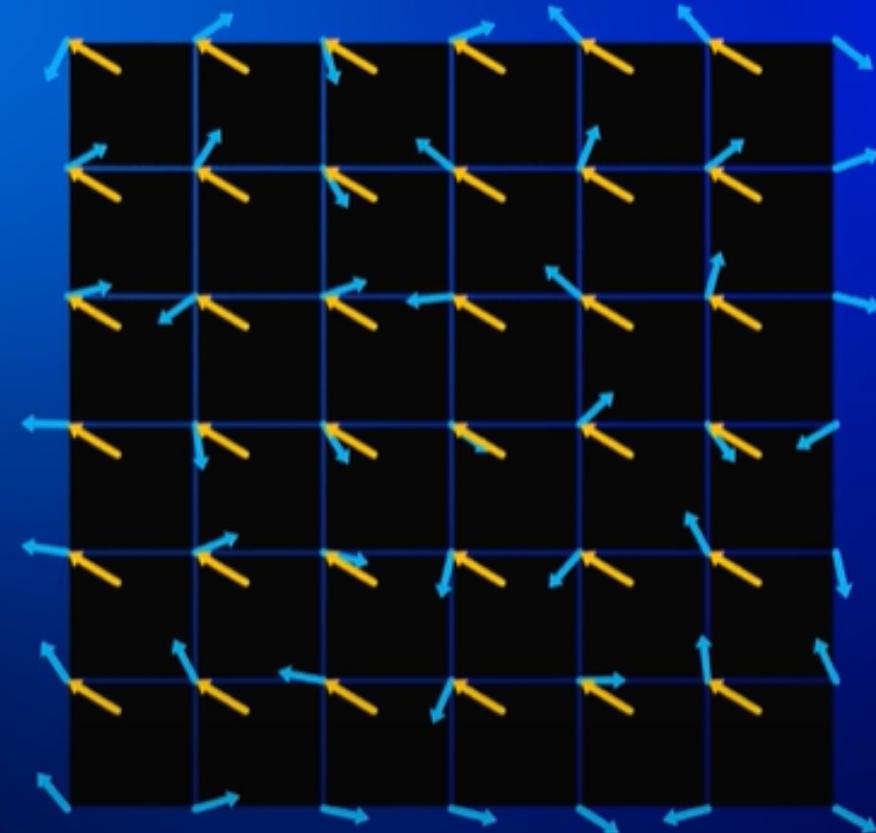


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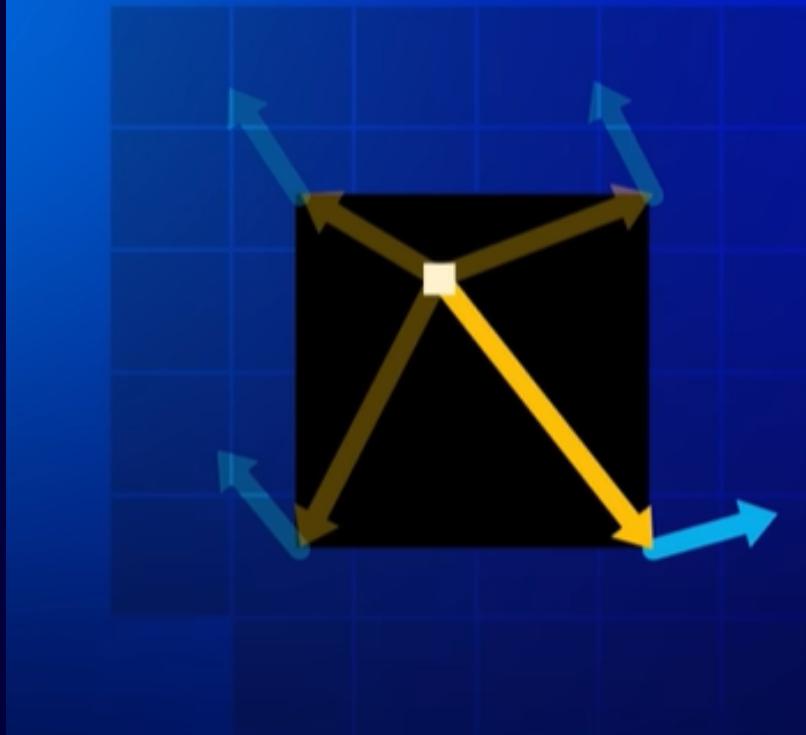
Influence
Vector

Offset
Vector

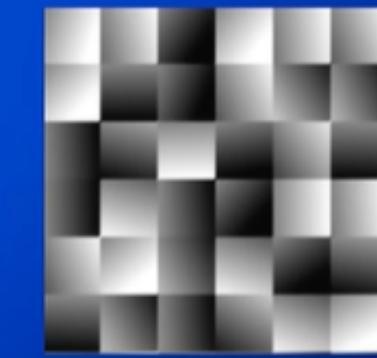


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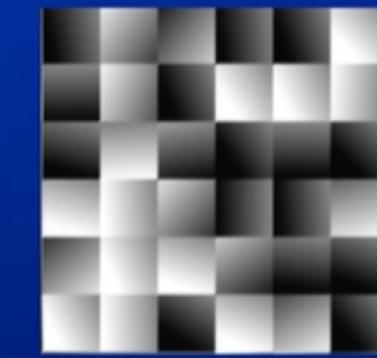
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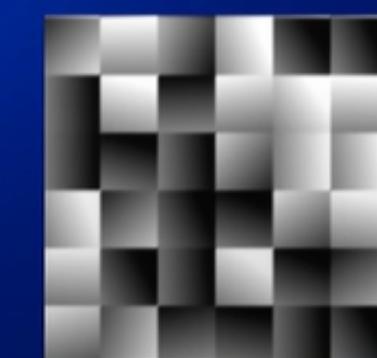
Upper Left



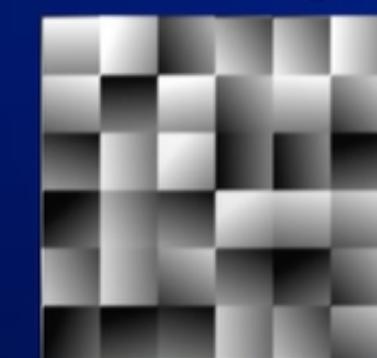
Upper Right

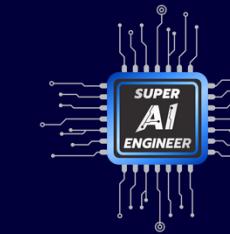


Lower Left



Lower Right

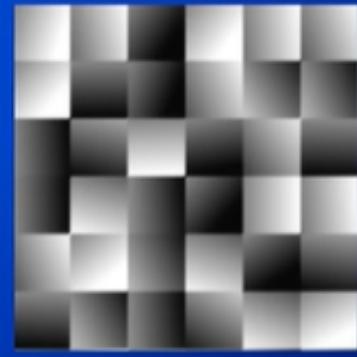




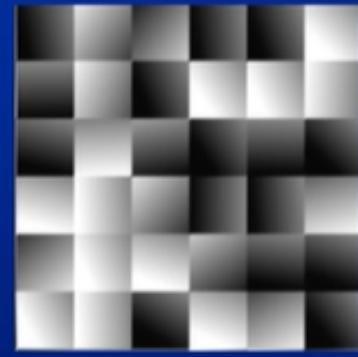
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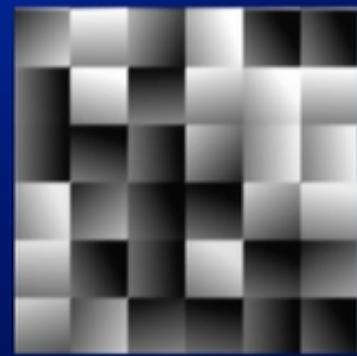
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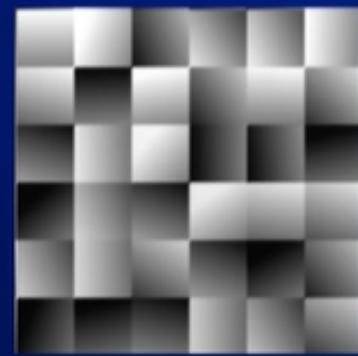
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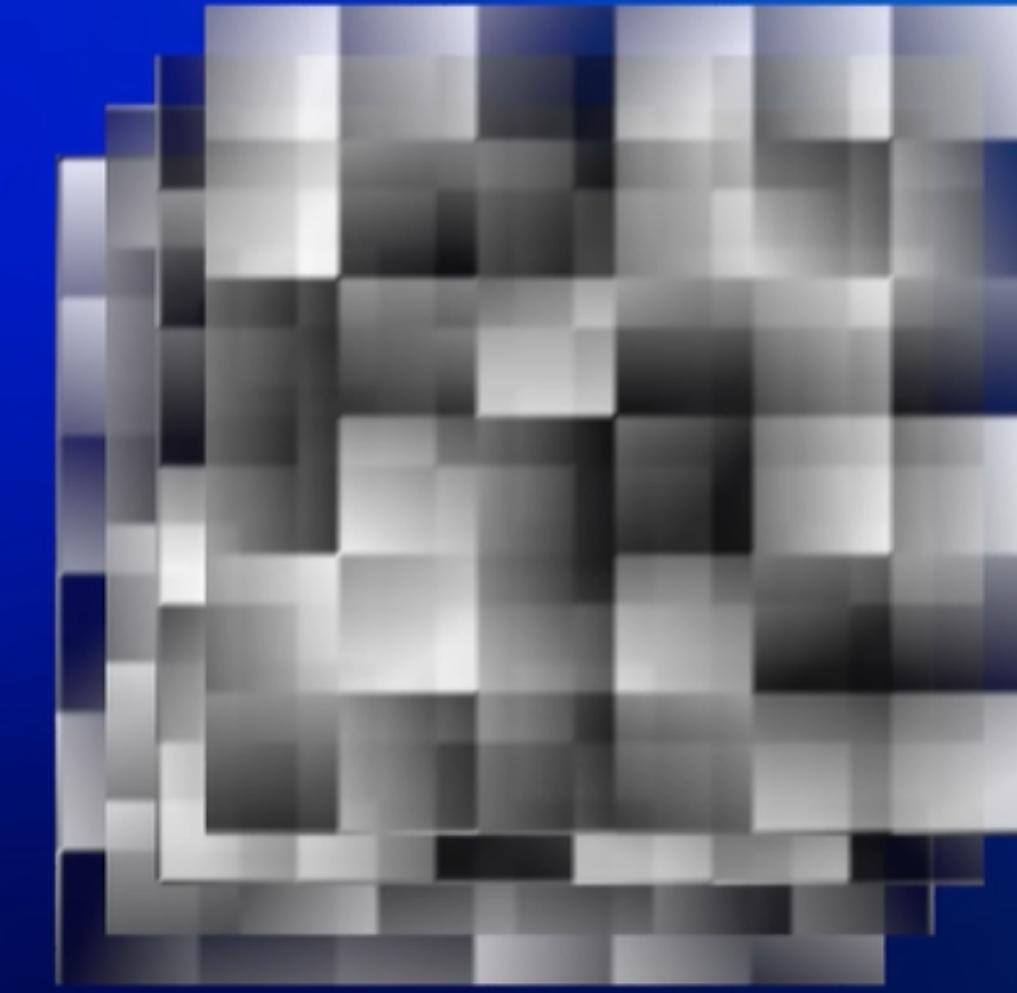
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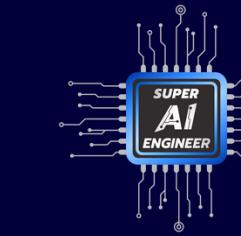
Lower Right



Blend the
4 Influence Maps
using a
Smooth Step
function.

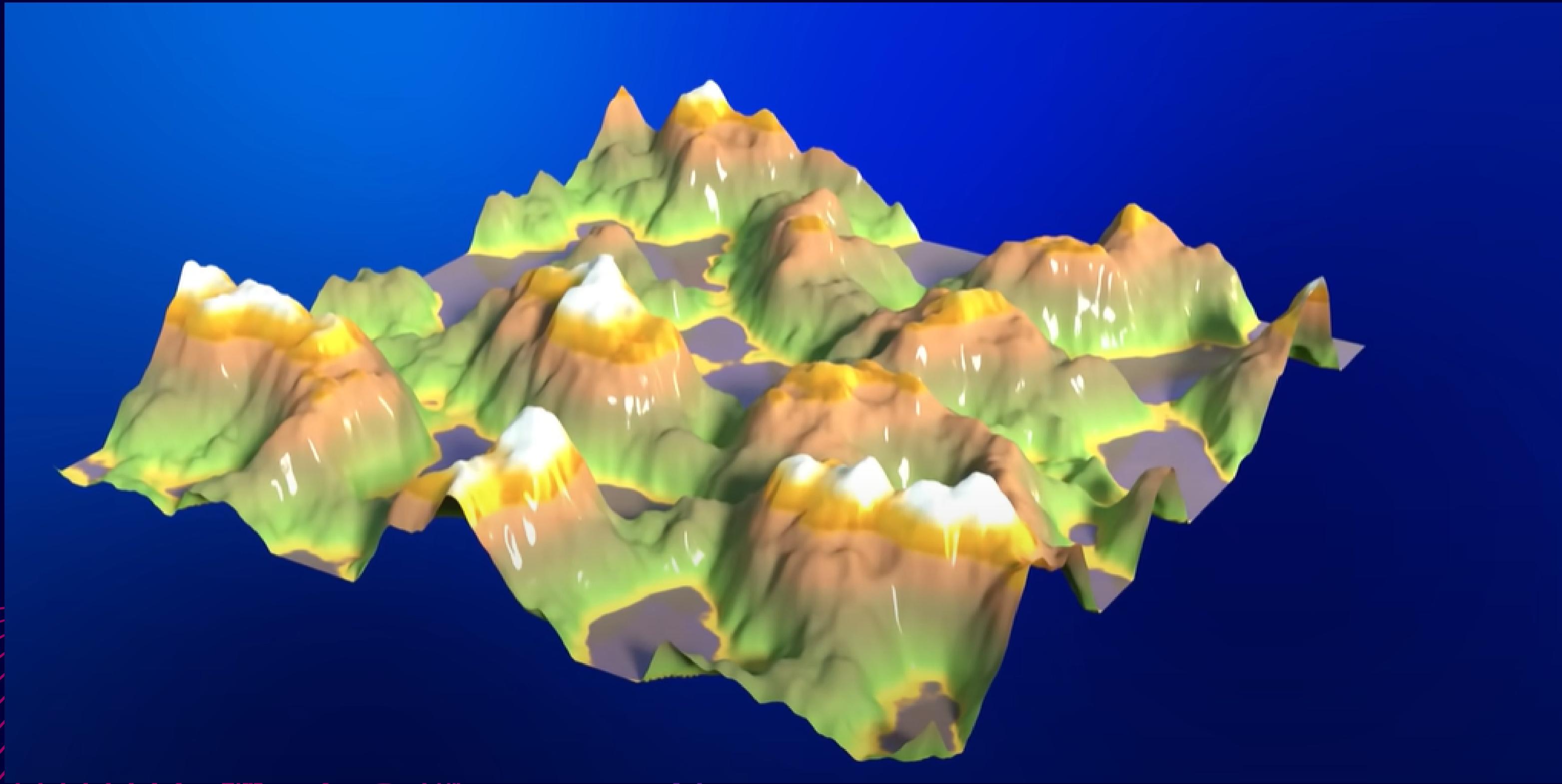


Perlin Noise

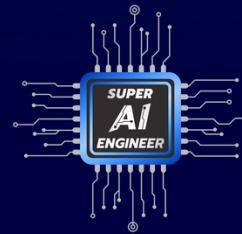


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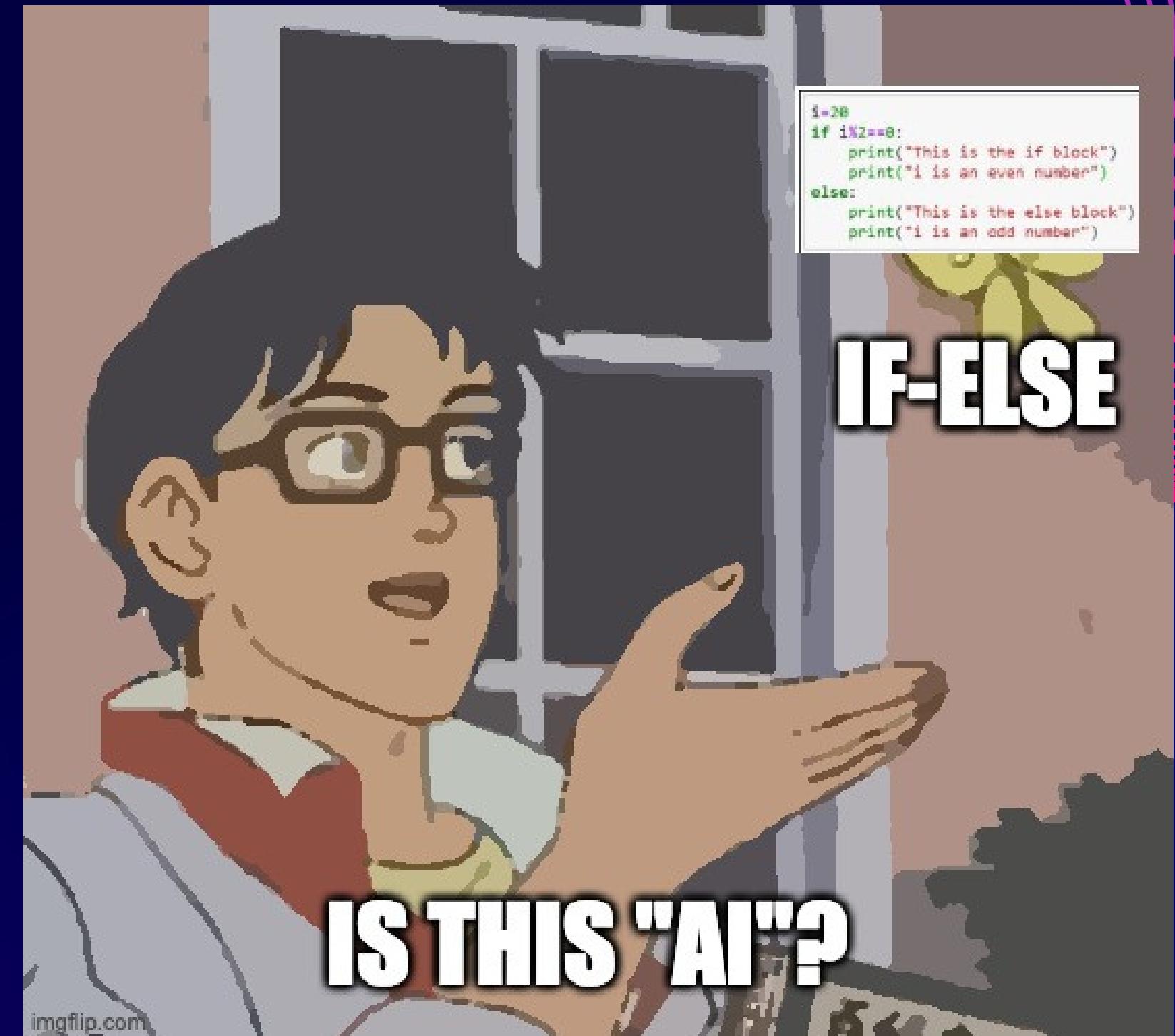
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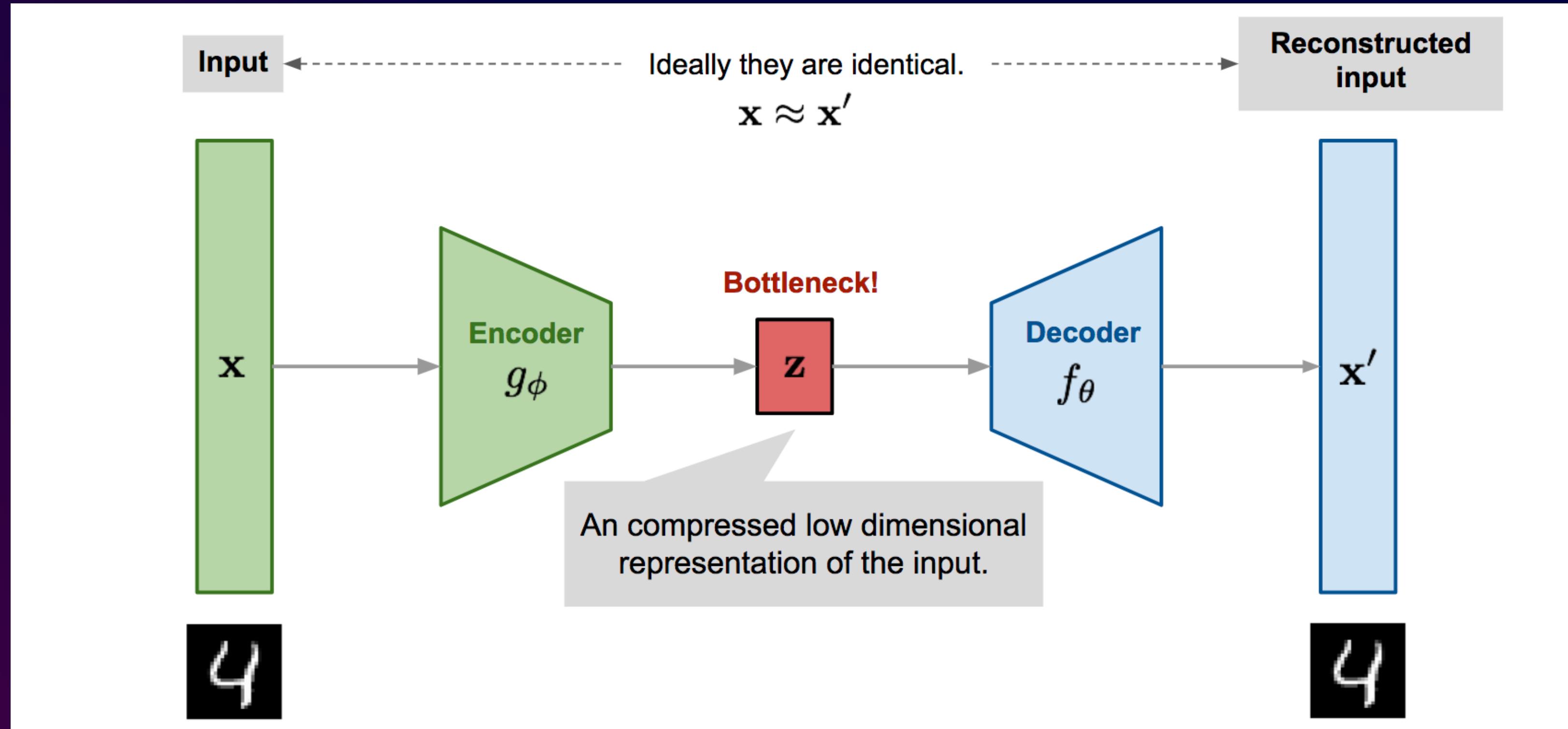
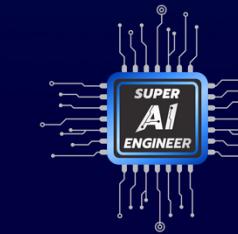
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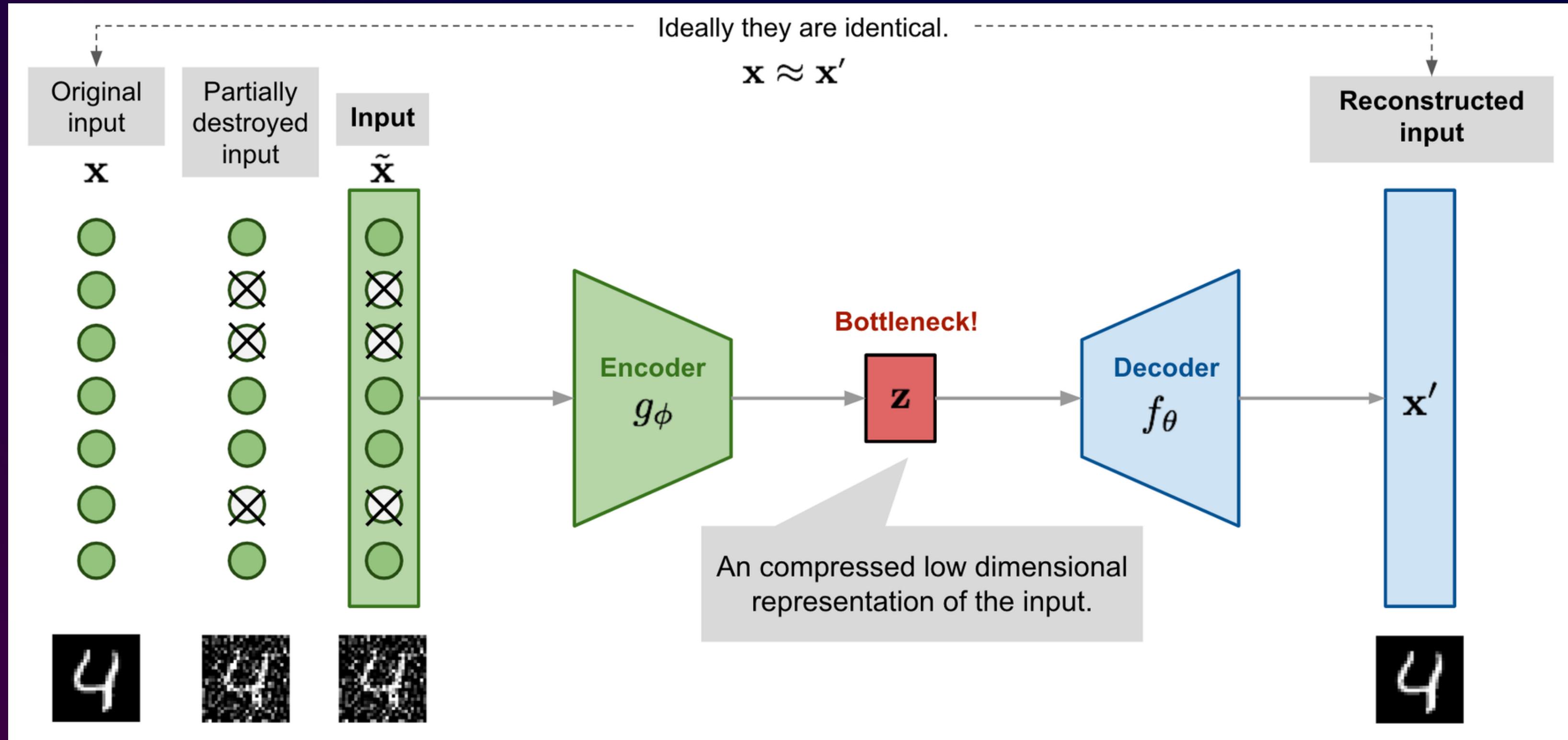
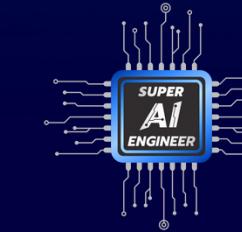
Deep Learning Image Generation



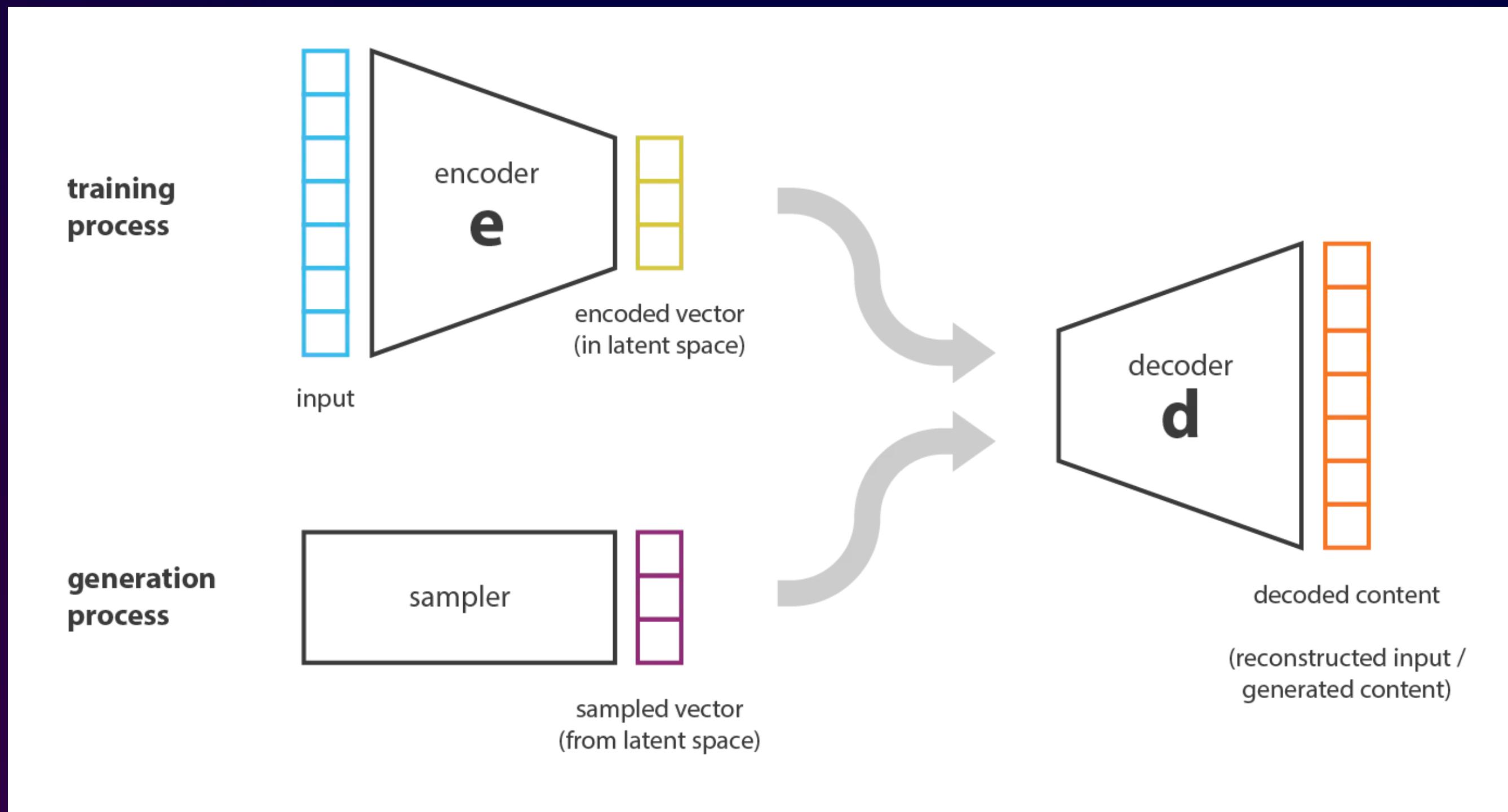
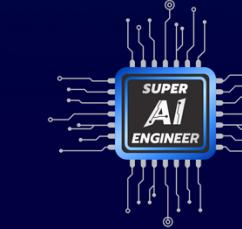
Autoencoders - 1990s



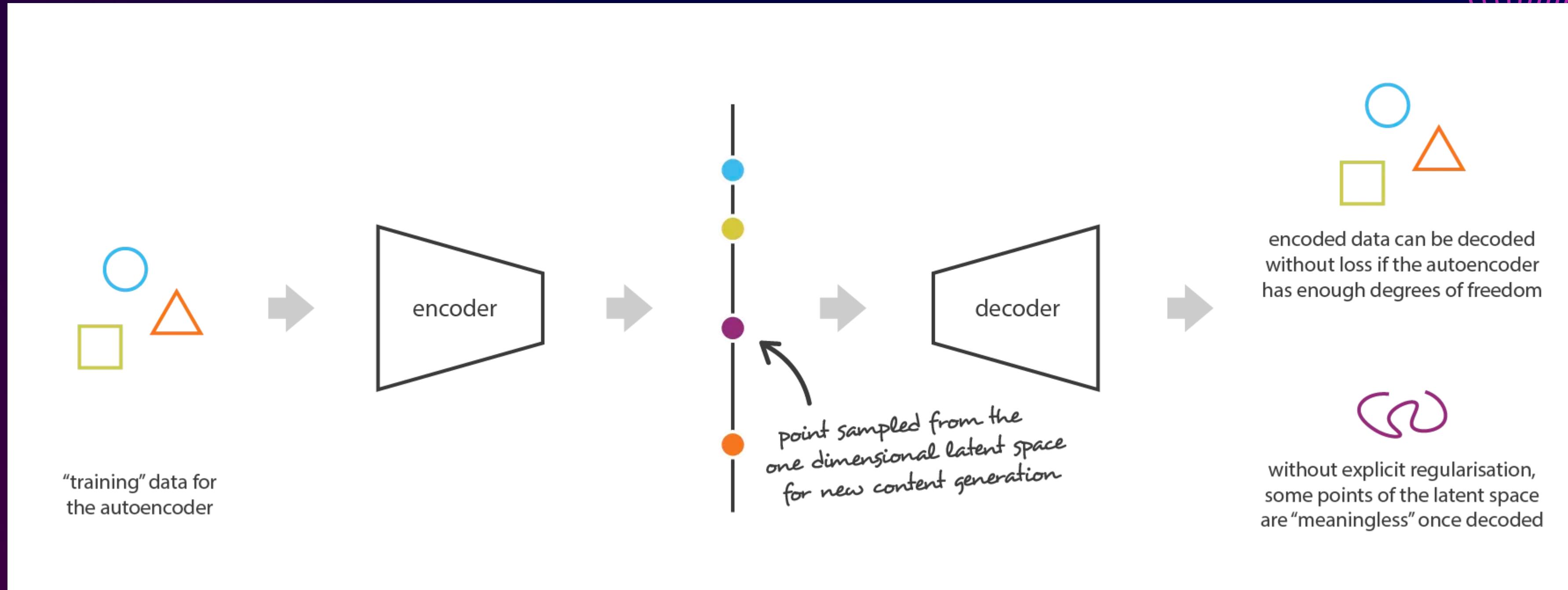
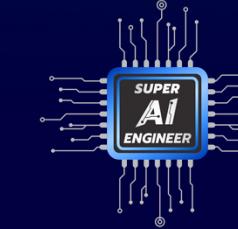
Denoising Autoencoder - 2010s



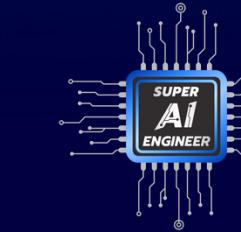
Autoencoder for Generation



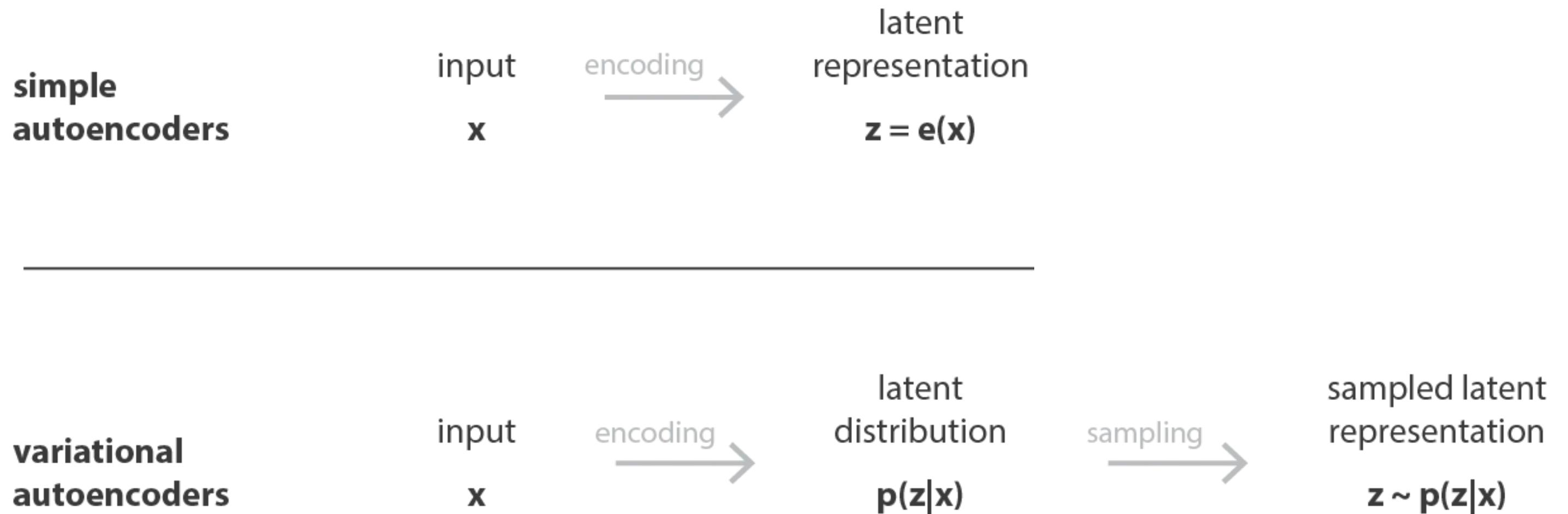
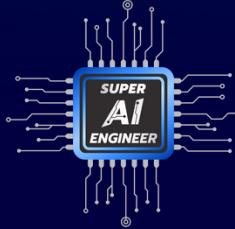
Autoencoder for Generation



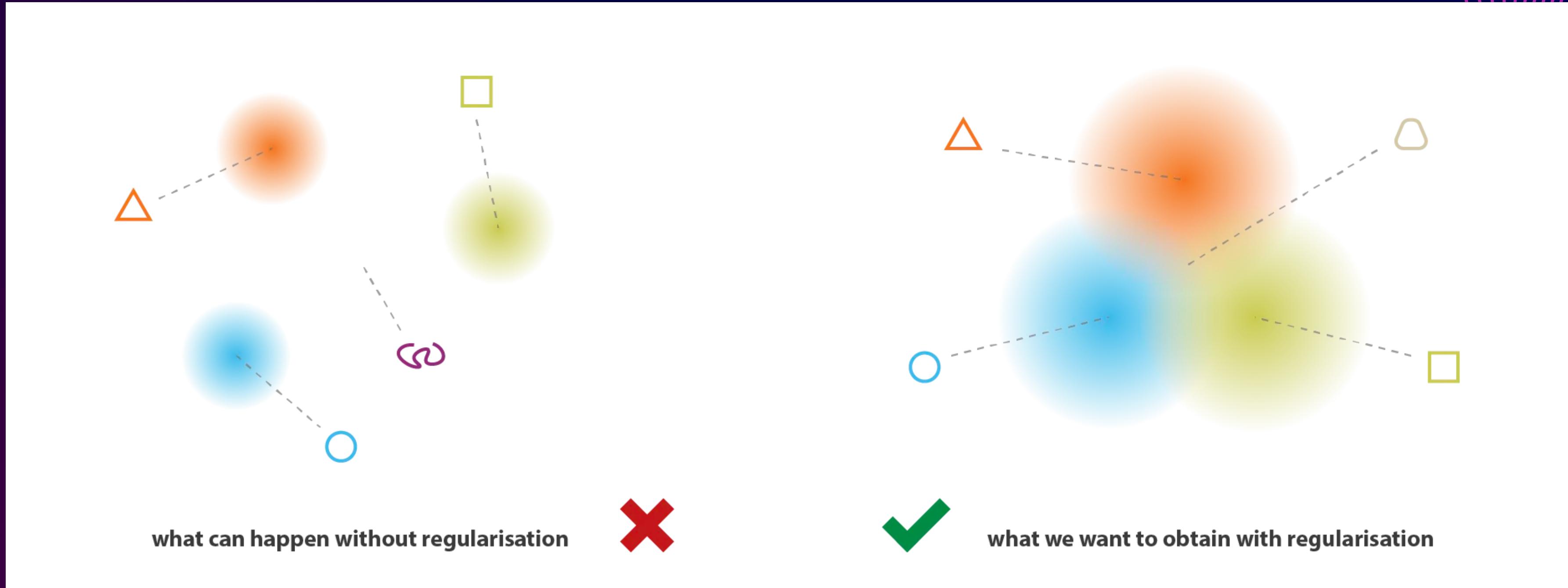
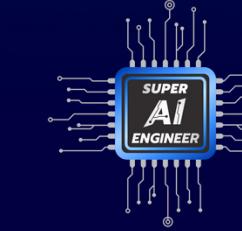
Variational Autoencoders - 2013



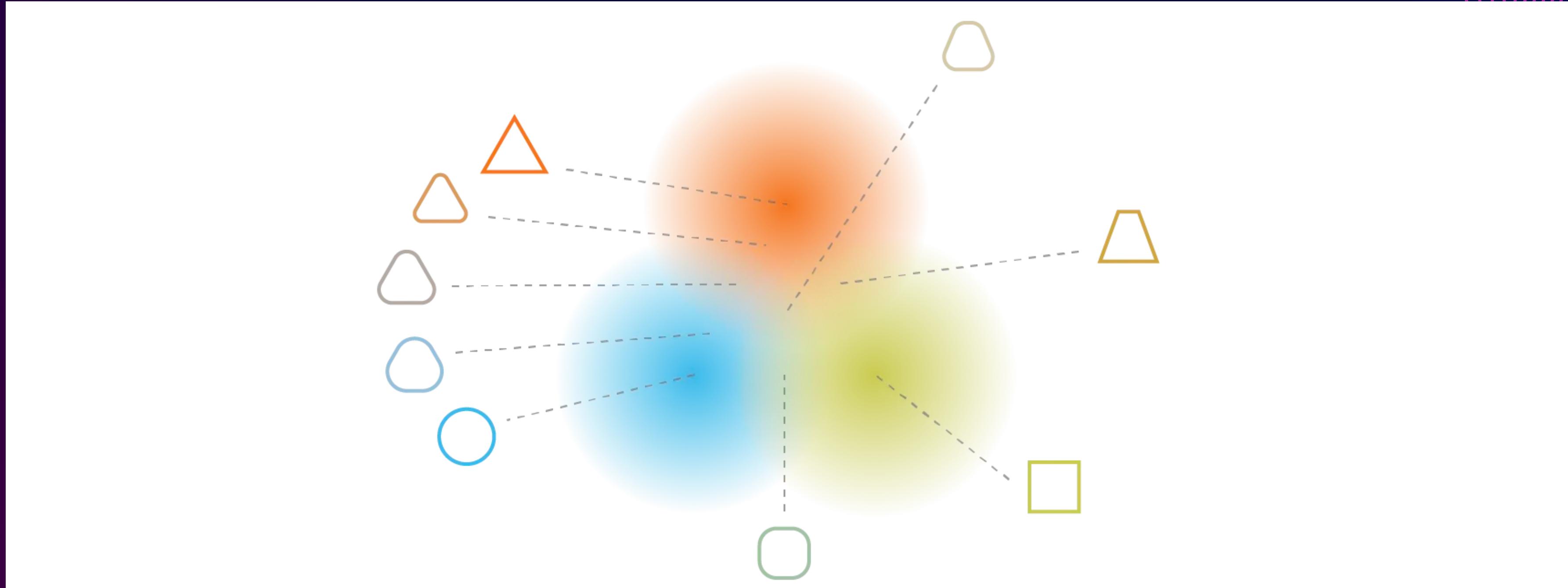
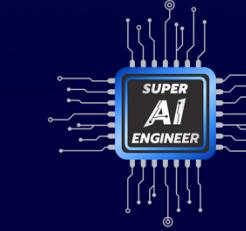
Variational Autoencoders - 2013



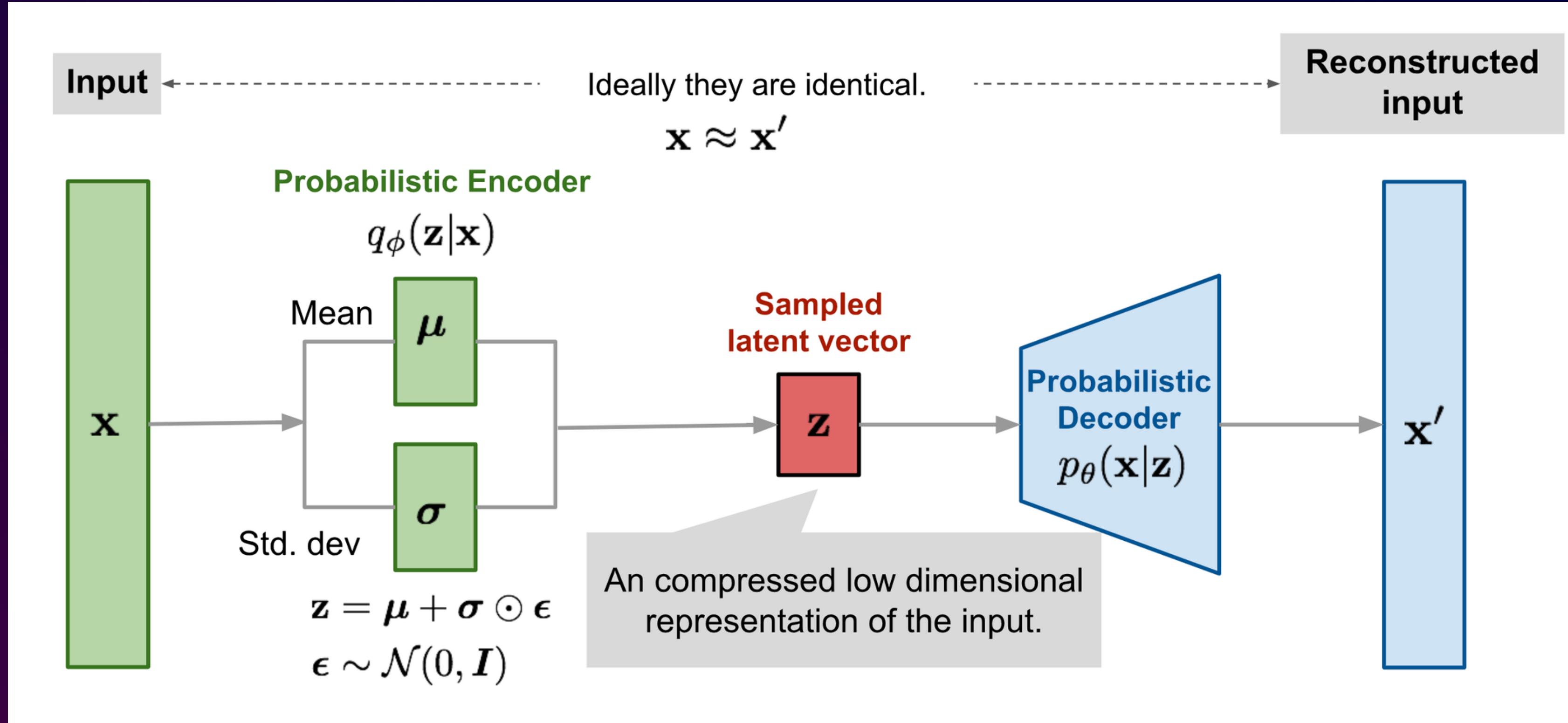
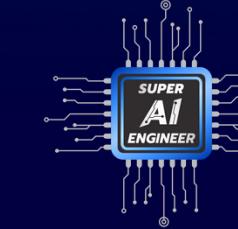
Variational Autoencoders - 2013



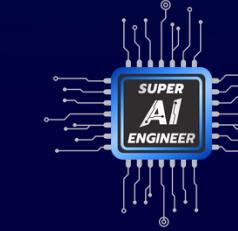
Variational Autoencoders - 2013



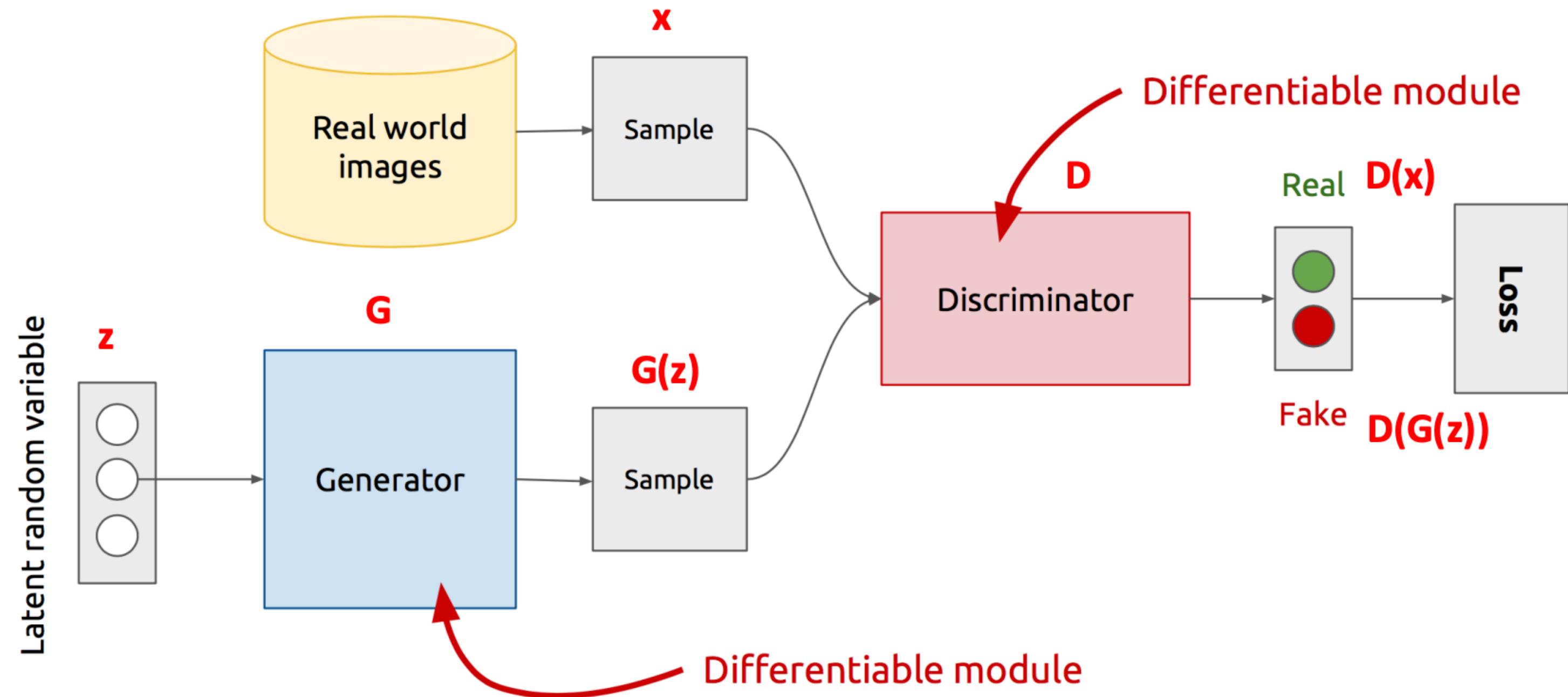
Variational Autoencoders - 2013



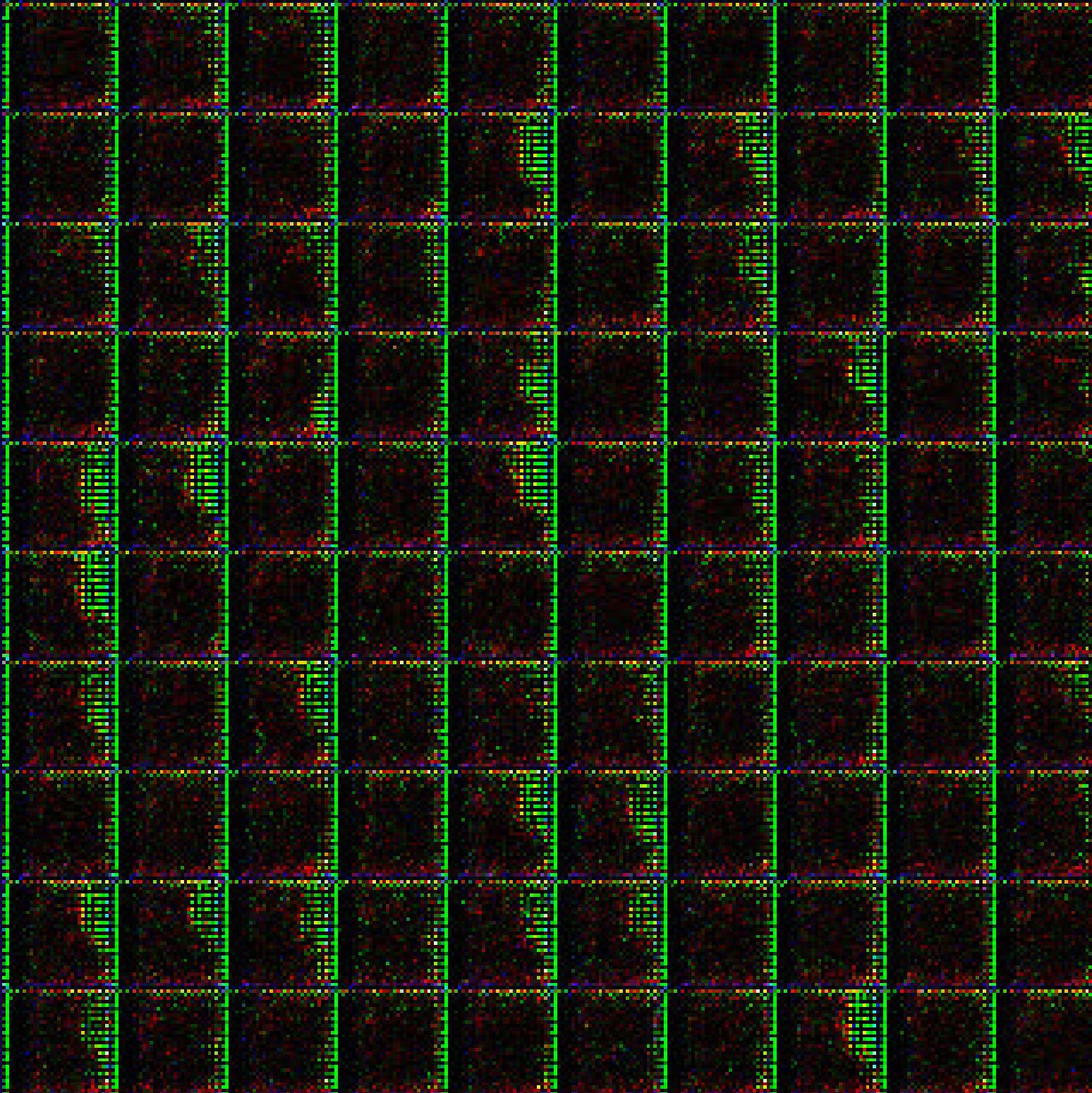
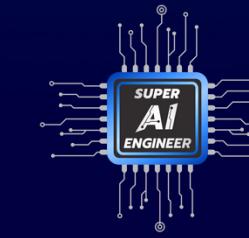
GANs: Generative Adversarial Networks



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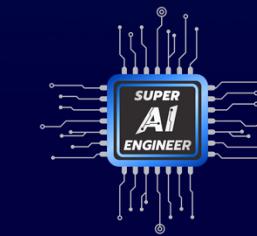


GANs: Generative Adversarial Networks



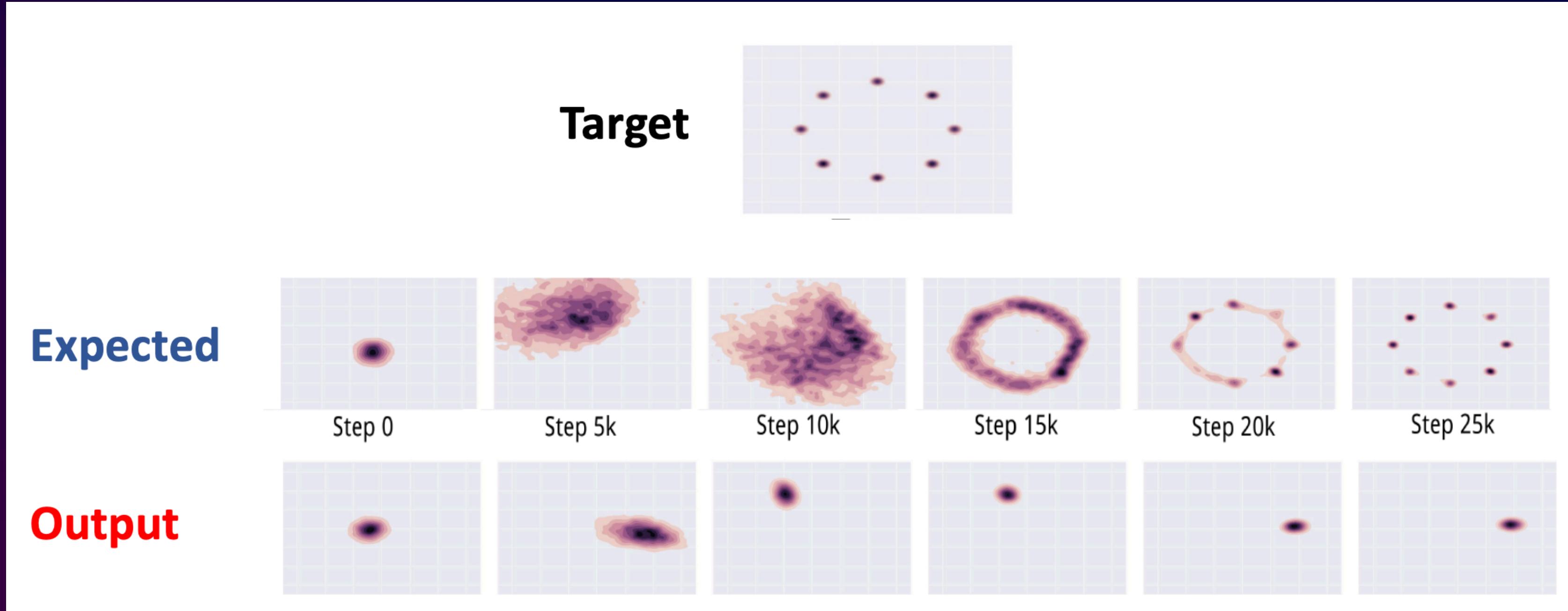
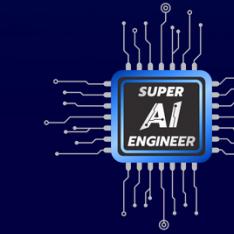
https://slazebni.cs.illinois.edu/spring17/lec11_gan.pdf

GANs: Generative Adversarial Networks

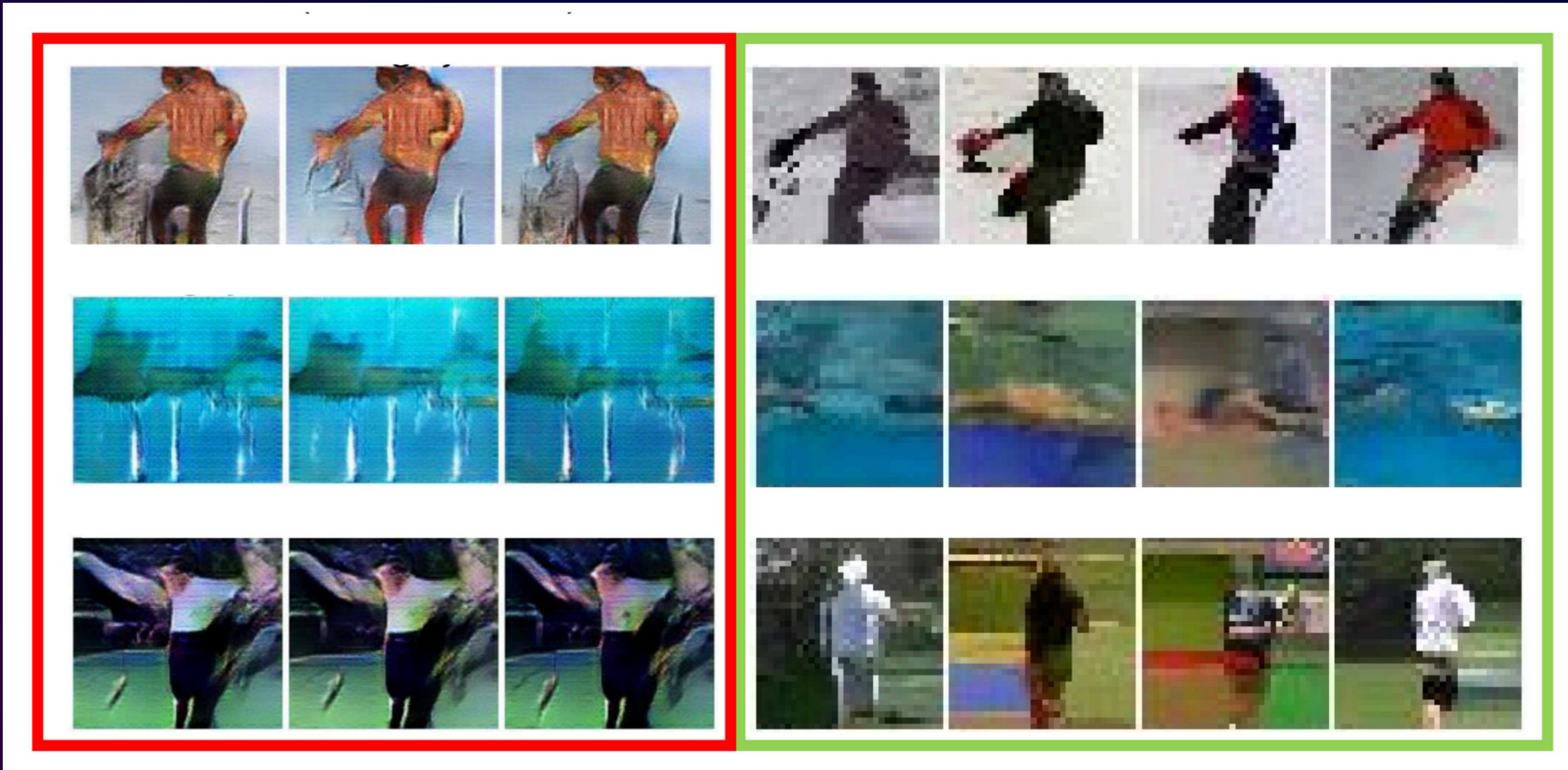
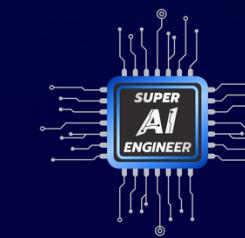


Conditional GAN

GANs: Generative Adversarial Networks



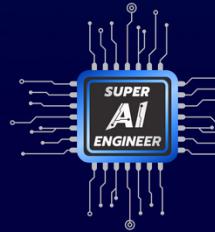
GANs: Generative Adversarial Networks (2014)



GAN Mode Collapse

No Mode Collapse

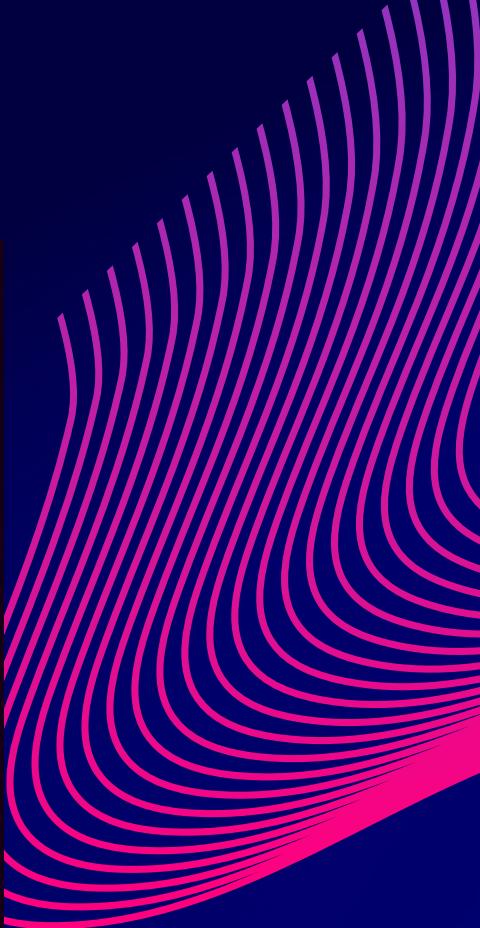
Diffusion Models – 2015



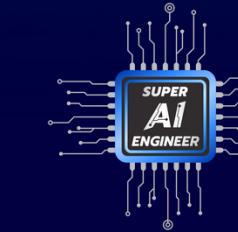
Midjourney



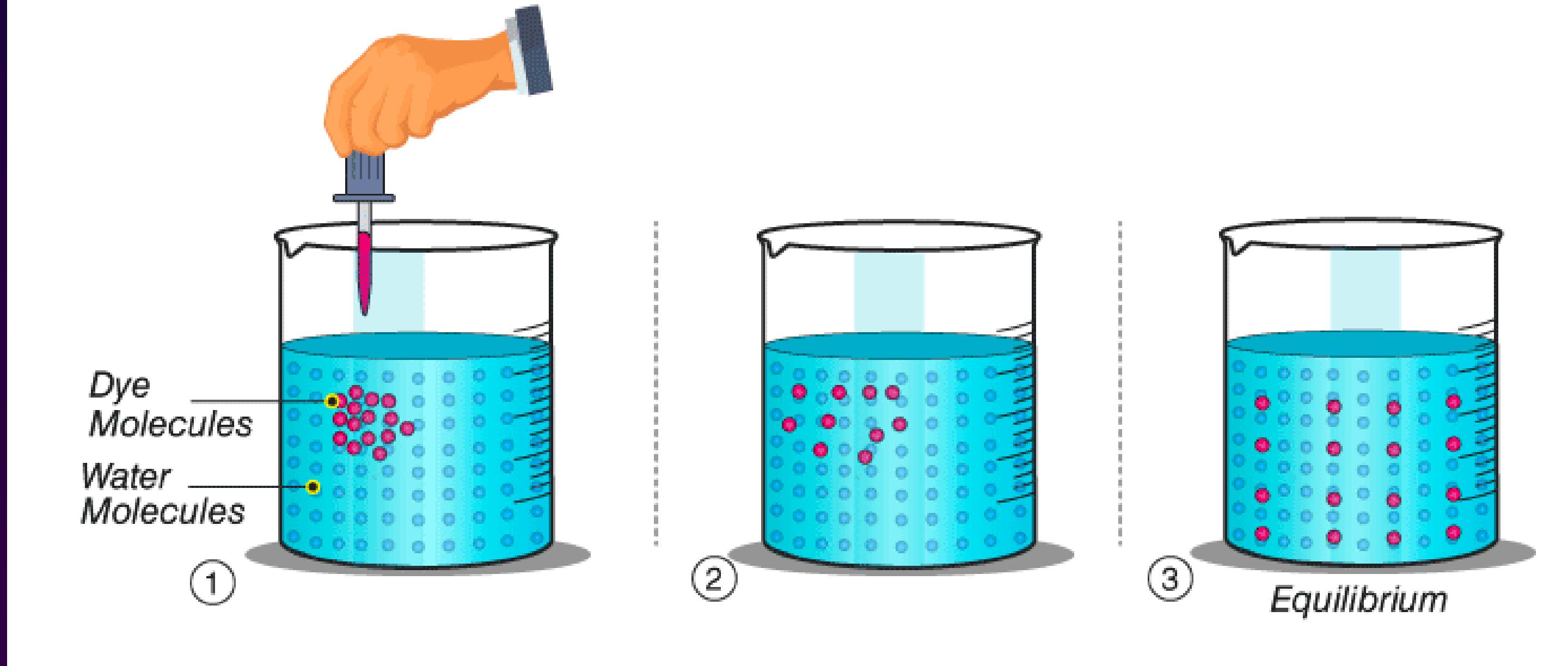
Imagen Model



Diffusion Models – 2015



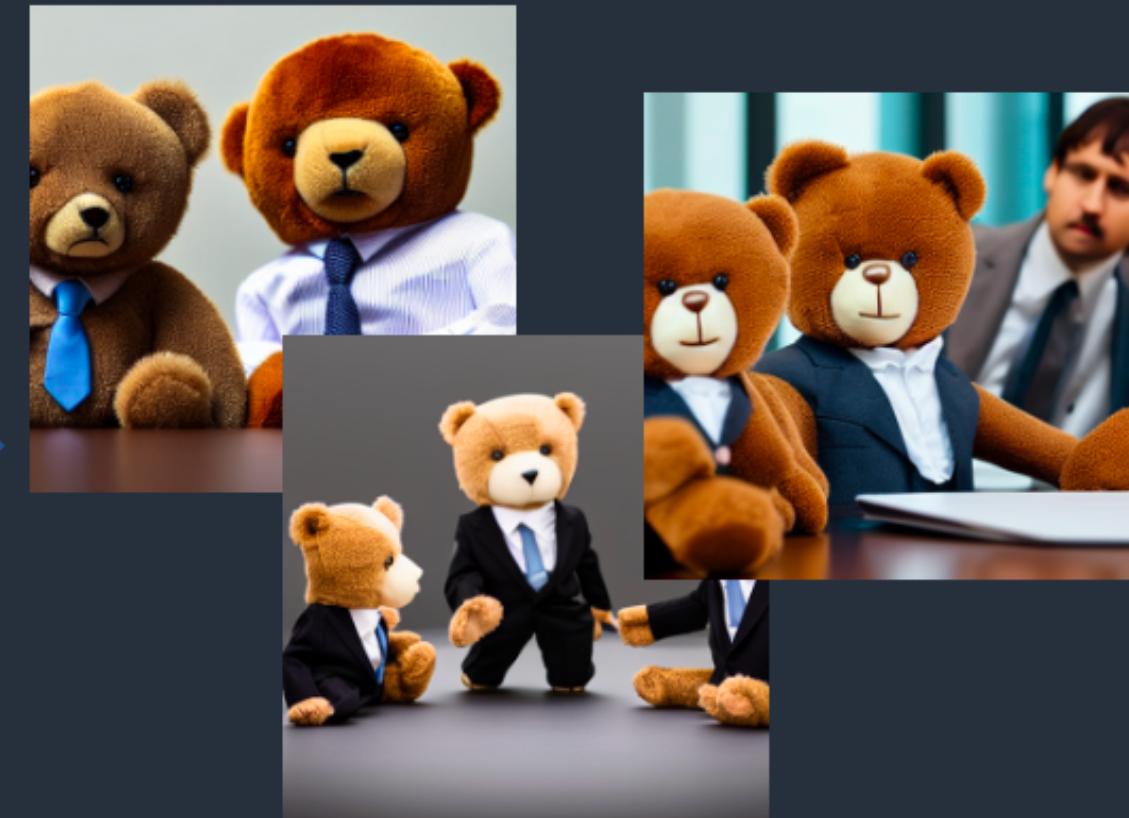
DIFFUSION



Stable Diffusion



“Teddy bears wearing suit discussing a business proposal around office table”

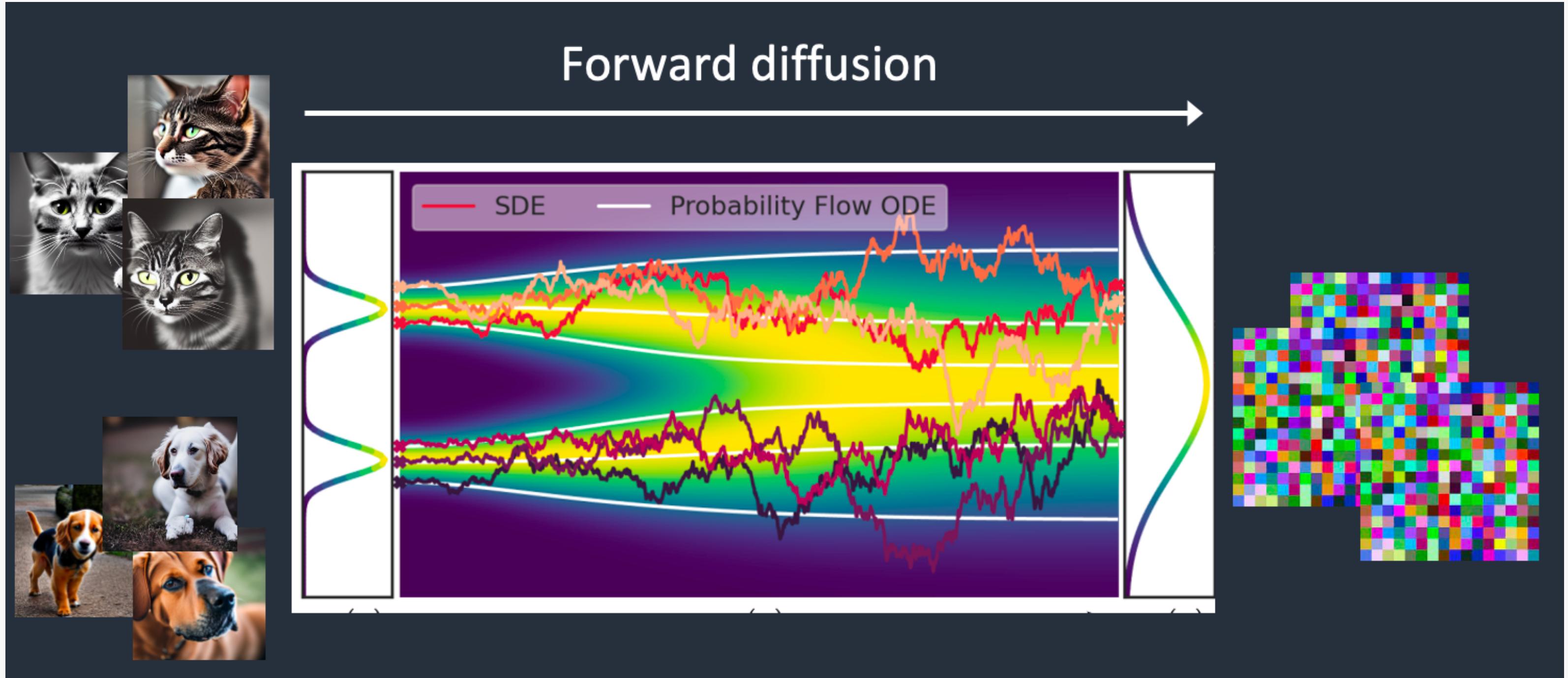


<https://stable-diffusion-art.com/how-stable-diffusion-work/>

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Stable Diffusion

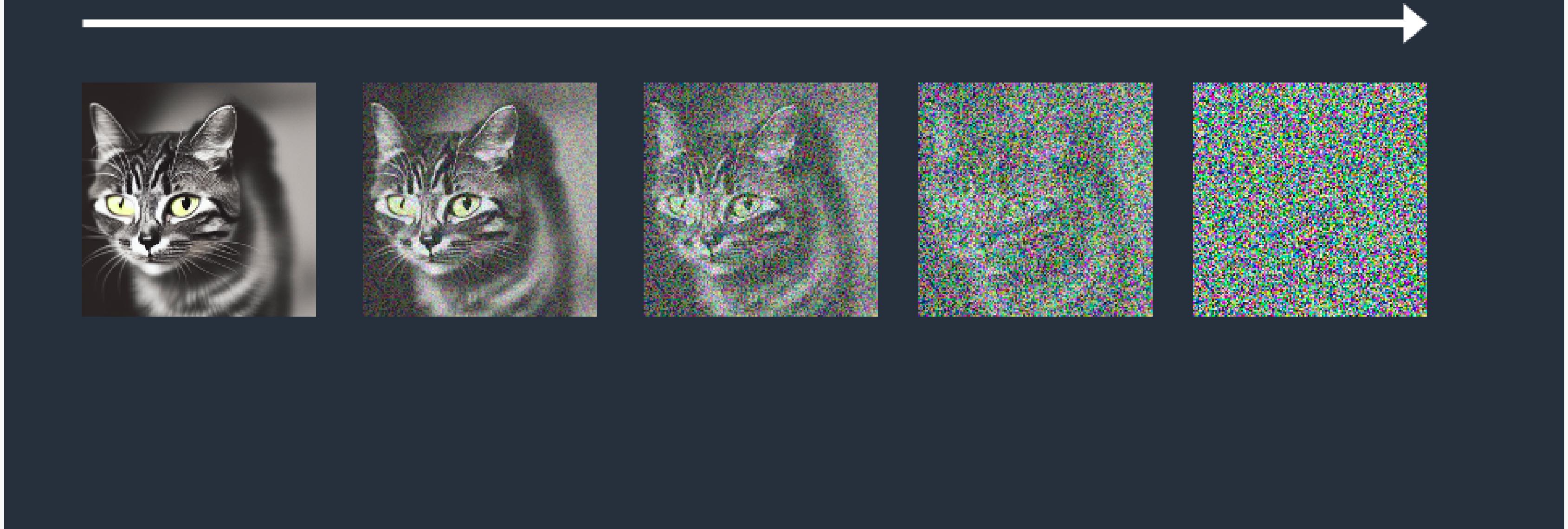


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Stable Diffusion

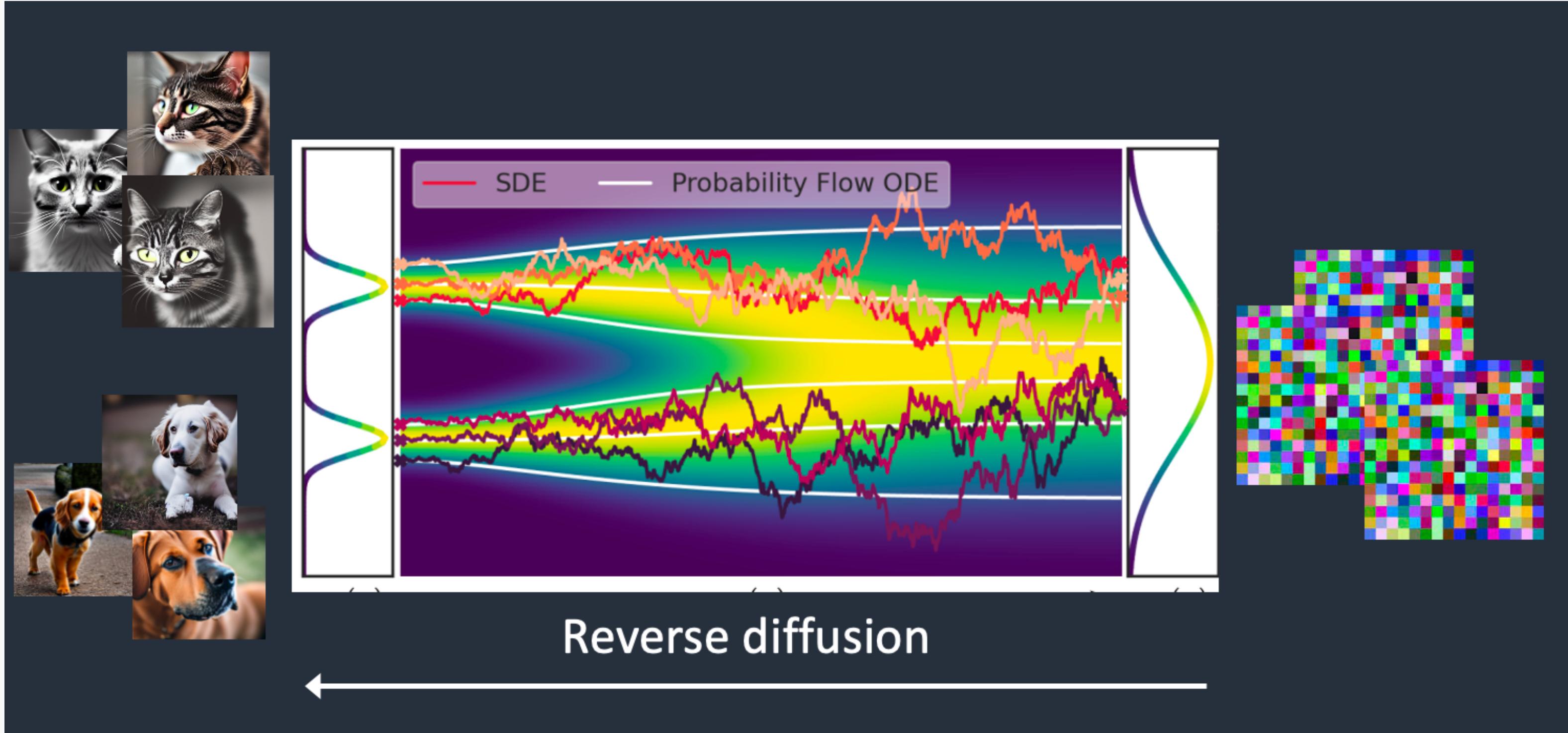


Forward diffusion



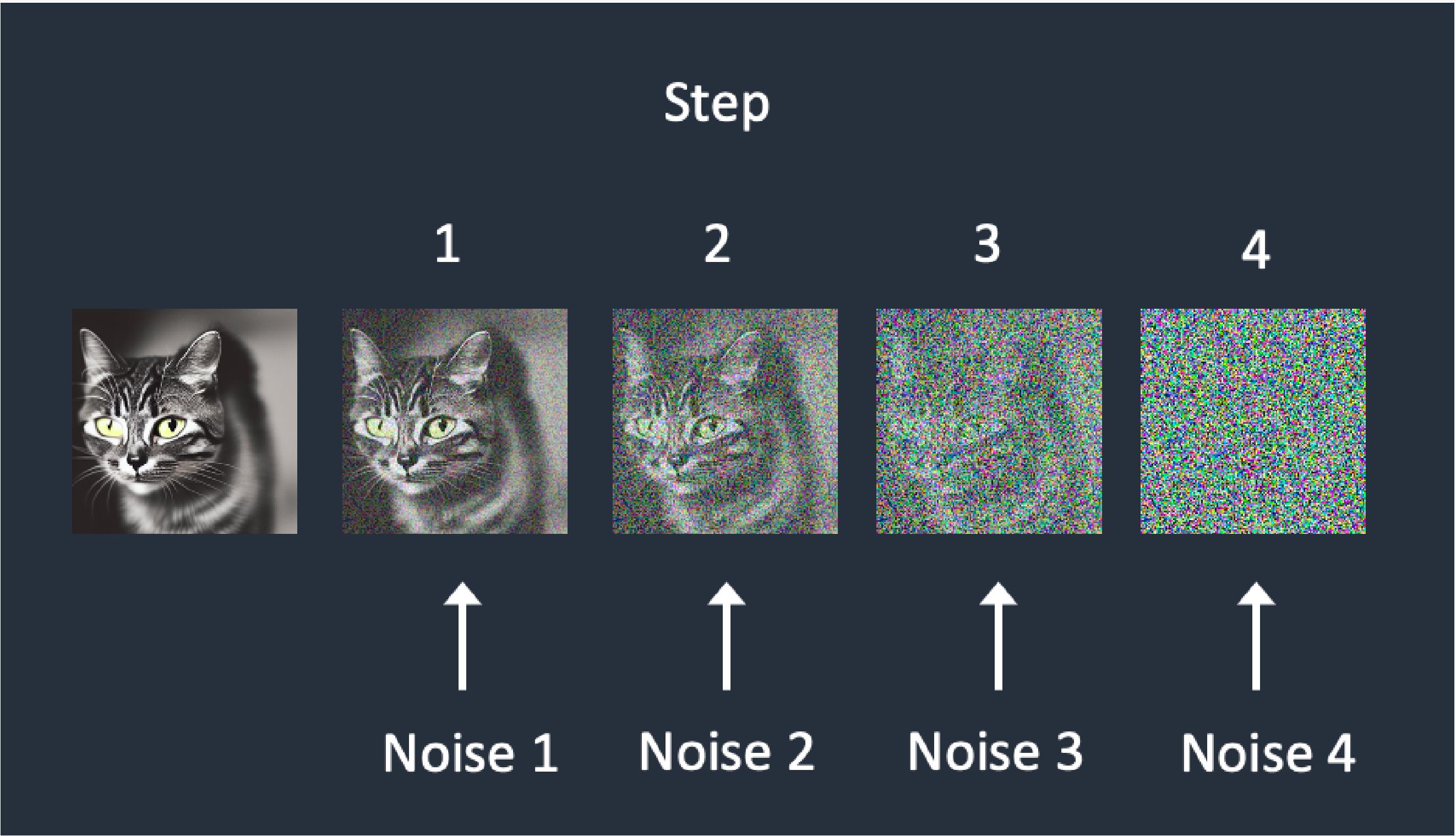
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Stable Diffusion



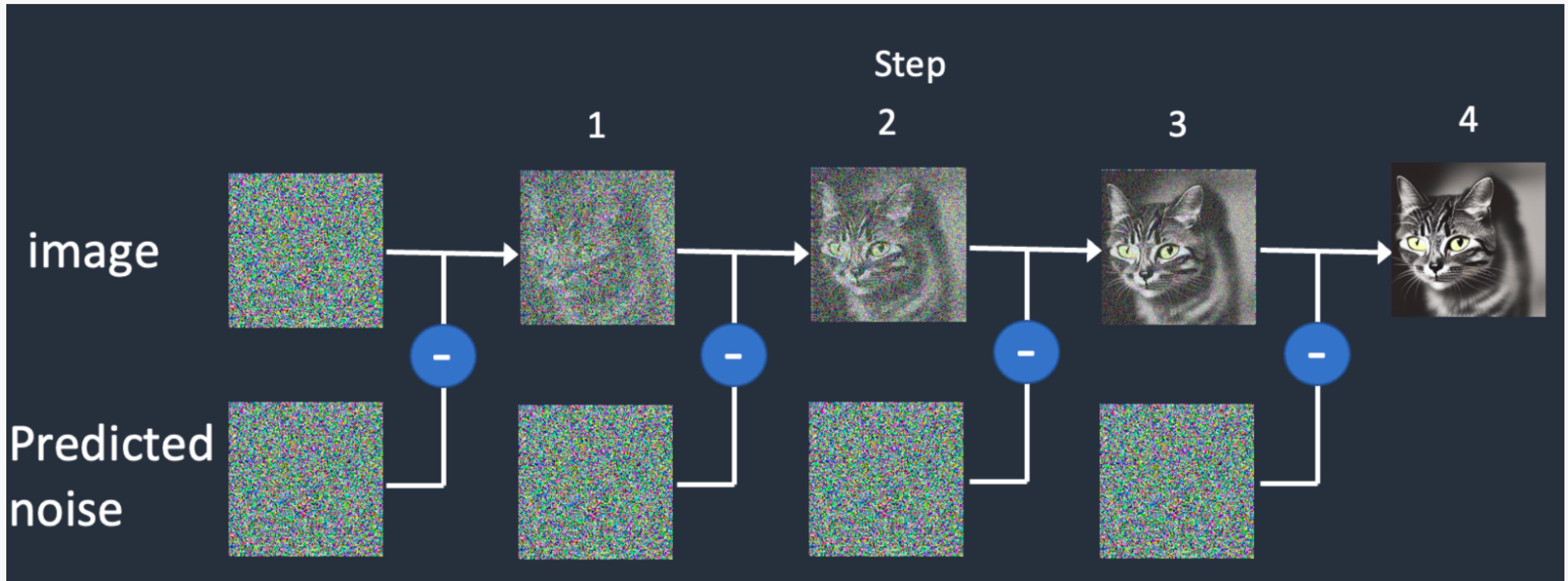
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Stable Diffusion



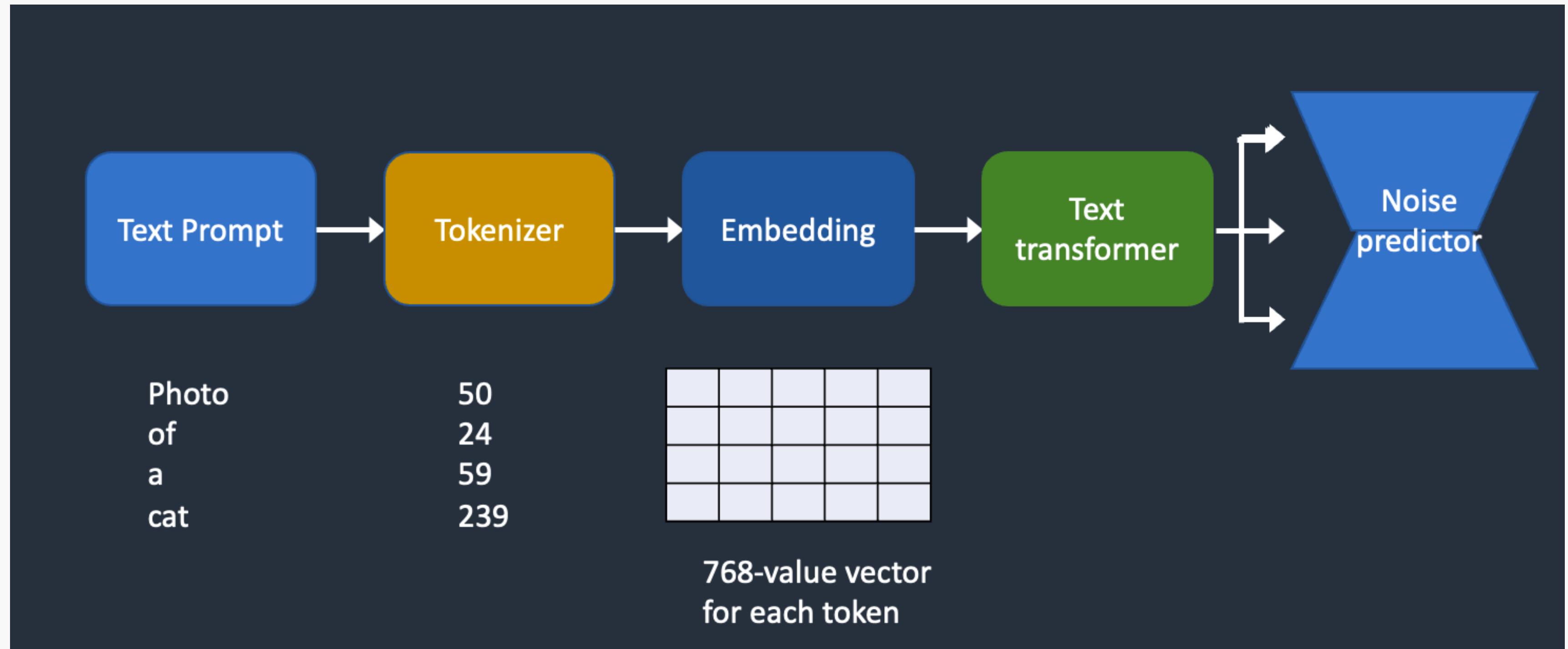
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Stable Diffusion



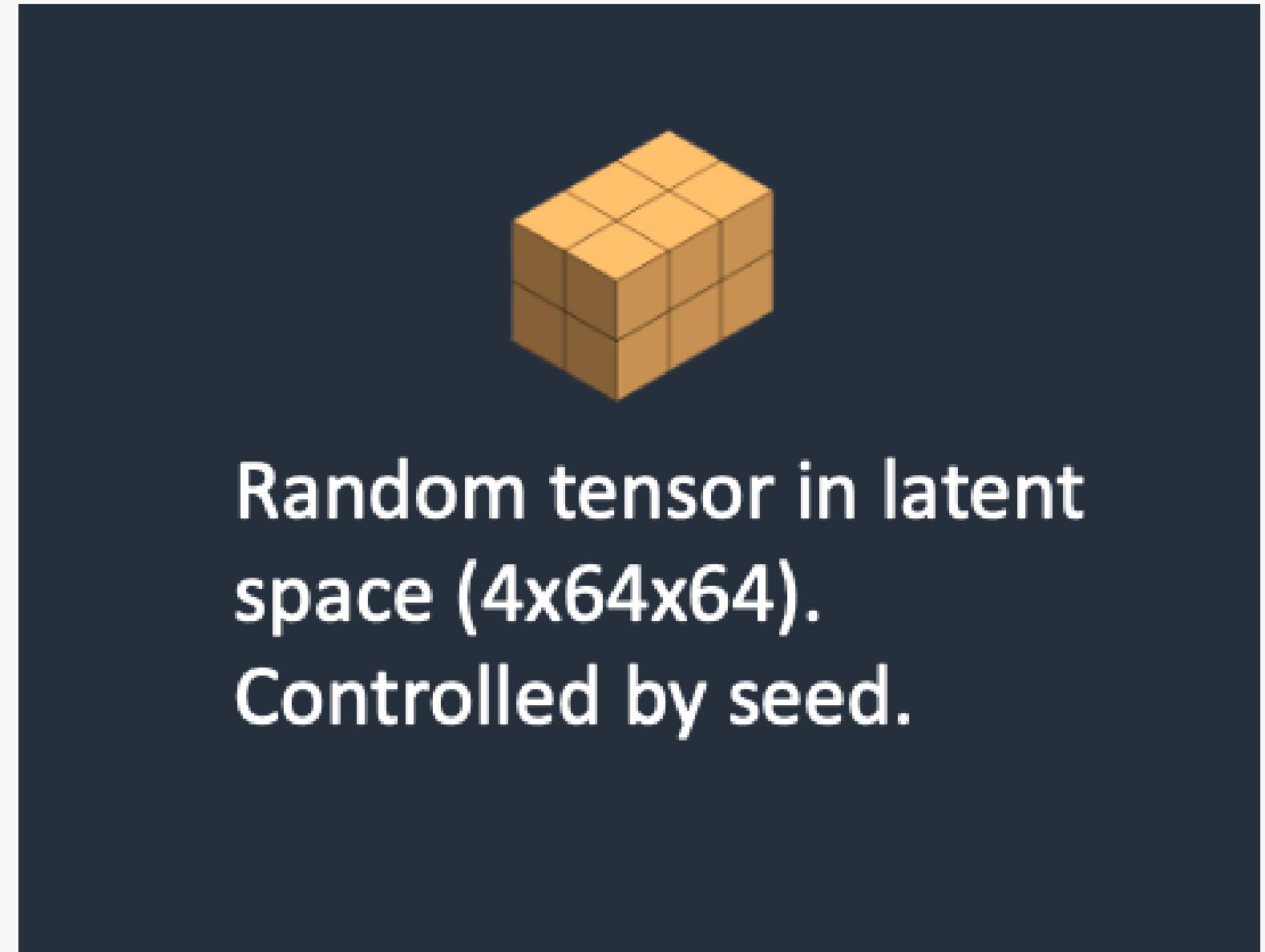
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Stable Diffusion



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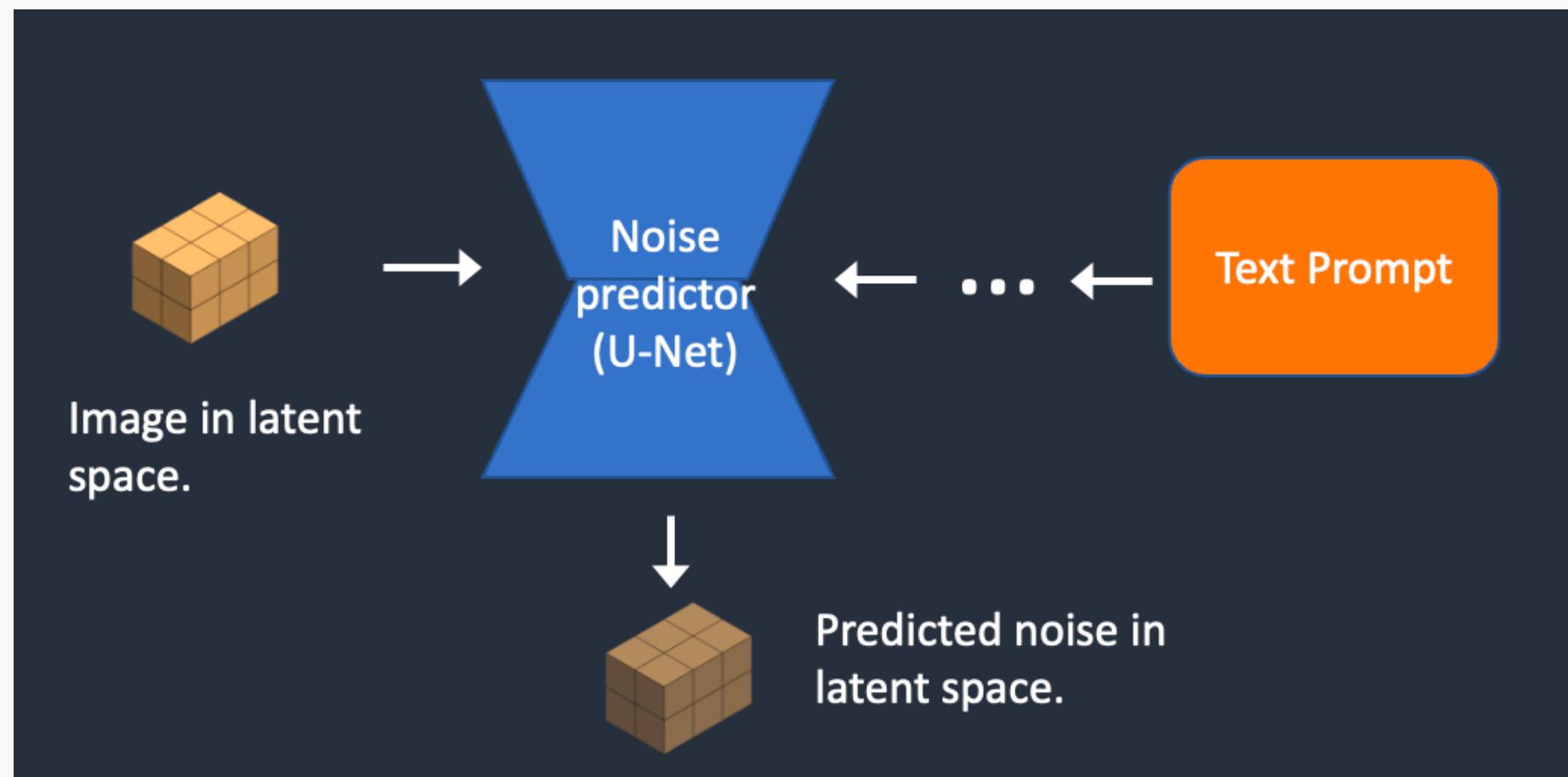
Stable Diffusion - Step by step



Step 1. สร้าง noise โดยการสุ่ม (จาก seed)

<https://stable-diffusion-art.com/how-stable-diffusion-work/>

Stable Diffusion - Step by step

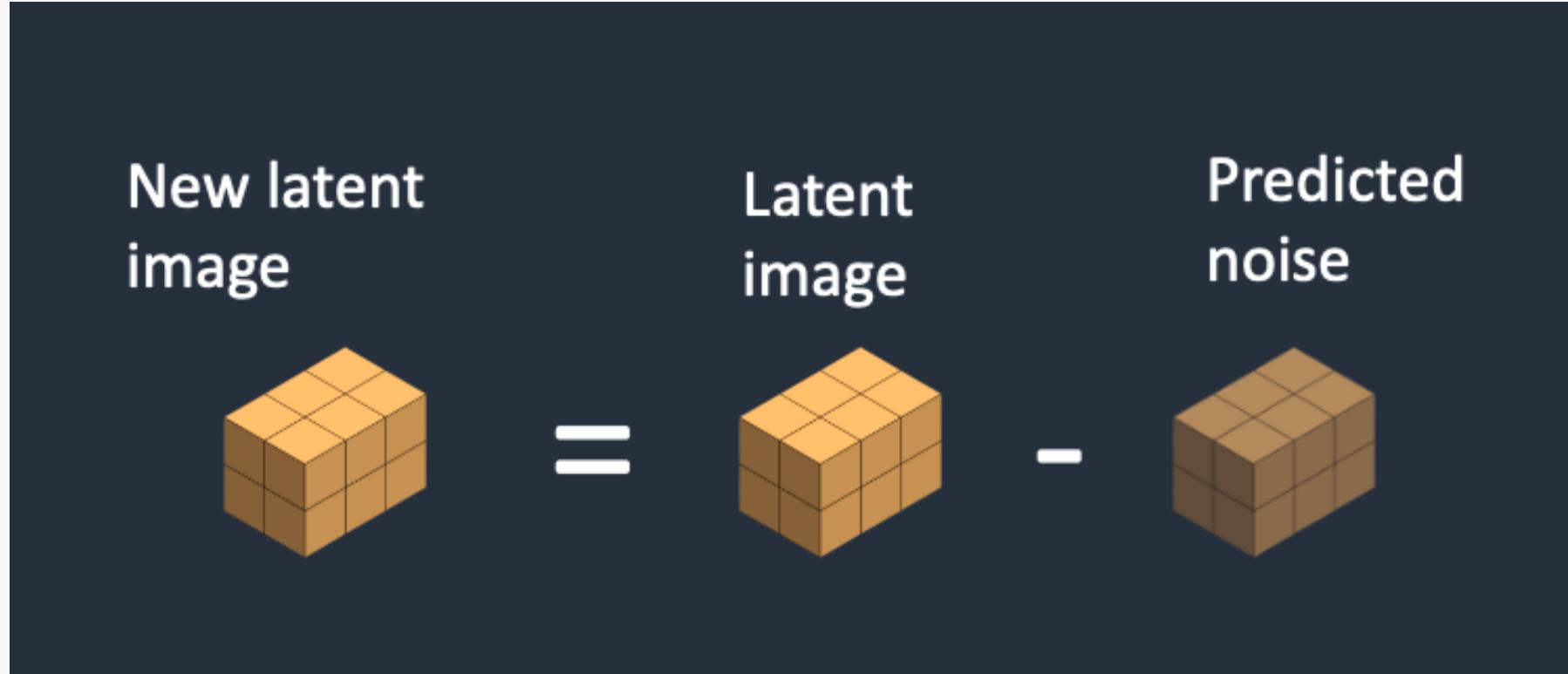


Step 1. สร้าง noise โดยการสุ่ม (จาก seed)

Step 2. กำนยา noise (จาก step 1)



Stable Diffusion - Step by step



Step 1. สร้าง noise โดยการสุ่ม (จาก seed)

Step 2. กำนวย noise (จาก step 1)

Step 3. ลบ noise จาก step 2 ออกจาก step 1

- ทำ 20-30 รอบ (sampling)

Stable Diffusion - Step by step



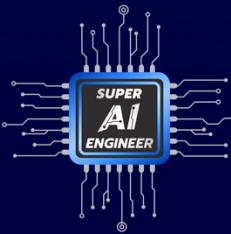
Step 1. สร้าง noise โดยการสุ่ม (จาก seed)

Step 2. กำนวย noise (จาก step 1)

Step 3. au noise จาก step 2 ออกจาก step 1

- กำ 20-30 รอบ (sampling)

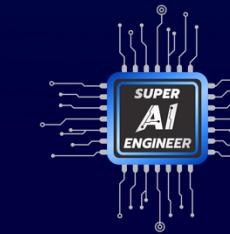
Step 4. ได้รูปที่สวยงาน



Ethical and Societal Considerations



Ethical and Societal Considerations

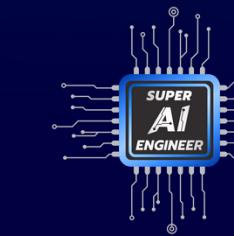


Copyright.gov

A screenshot of the Copyright.gov website. The header features the text "Copyright.gov | U.S. Copyright Office" and navigation links for "About", "News", "Opportunities", "Help", "Contact", and a search bar. Below the header, a large banner says "Welcome to the U.S. Copyright Office" with arrows for navigation. To the right is a large image of a gold seal. At the bottom, there is a section titled "What is Copyright?" with a "Learn More" button and a row of paintbrushes.

<https://www.copyright.gov/>

Ethical and Societal Considerations

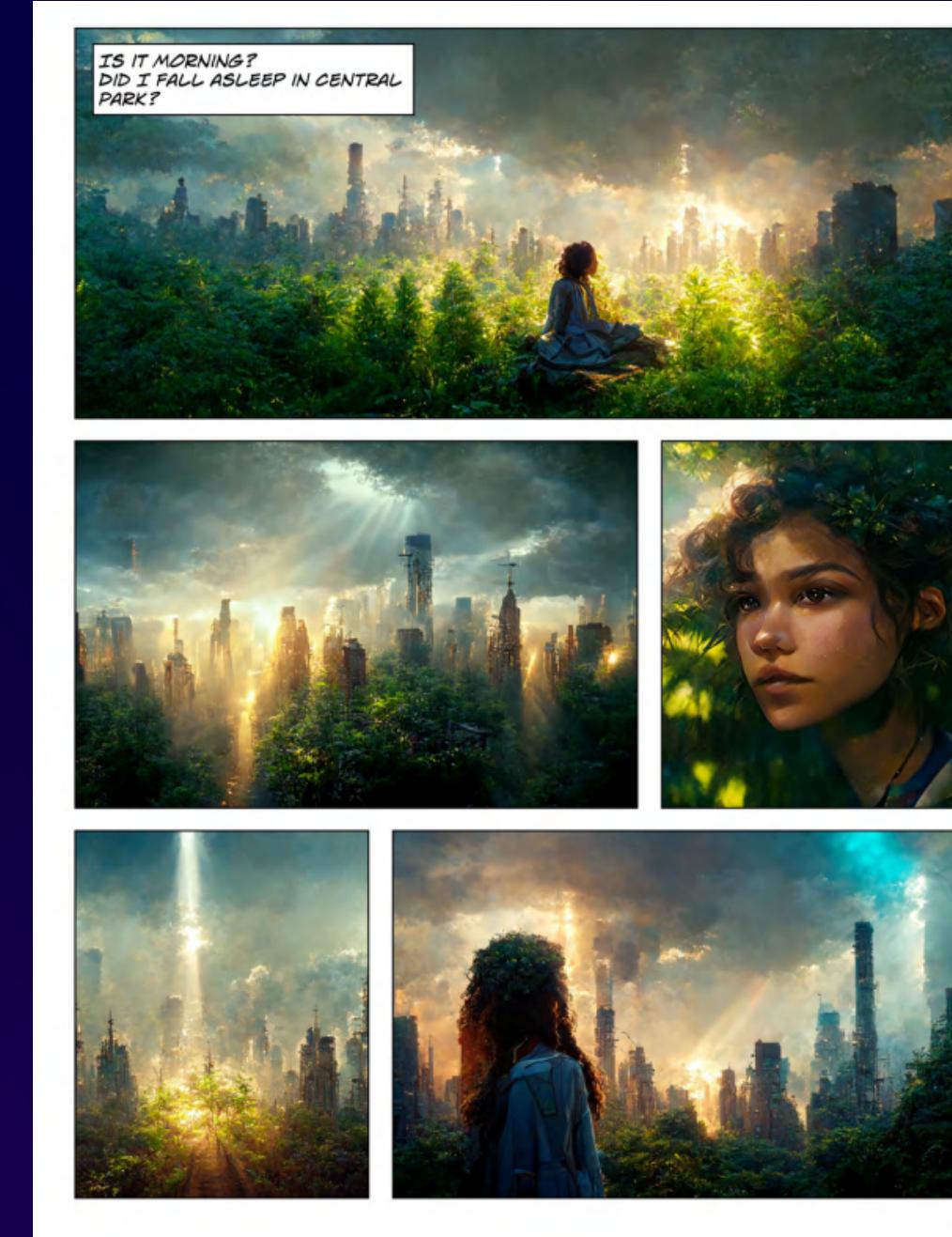


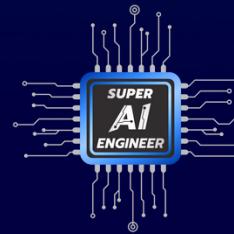
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Kristina Kashtanova





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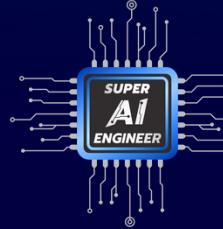
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The Future of Image Generation



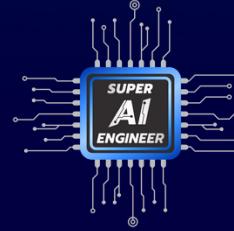
Pikachu as a Pug Dog Breed

Generation of 3D Metaverse

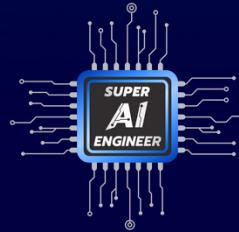


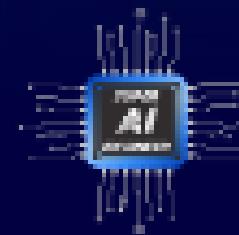
Kristina Kashtanova
Automated movie generation, story creation, game creation, and even metaverse generation— all tuned to our preferences.

Personalized Marketing



Accelerated Prototyping





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HISTORY OF IMAGE GENERATION



PRESENTED BY
Varintorn Sithisint
Parinthapat Pengpun