Generative AI Starter Pack

An overview of generative models

Daniel Voigt Godoy

Generative AI Starter Pack

You can dowload this presentation at

https://tinyurl.com/genaistarterpack

Generative AI in Computer Vision

Choose two out of three:

- **High quality samples**
  - Generative Adversarial Networks (GANs)
  - Denoising Diffusion Models

Generative AI in Computer Vision

Choose two out of three:

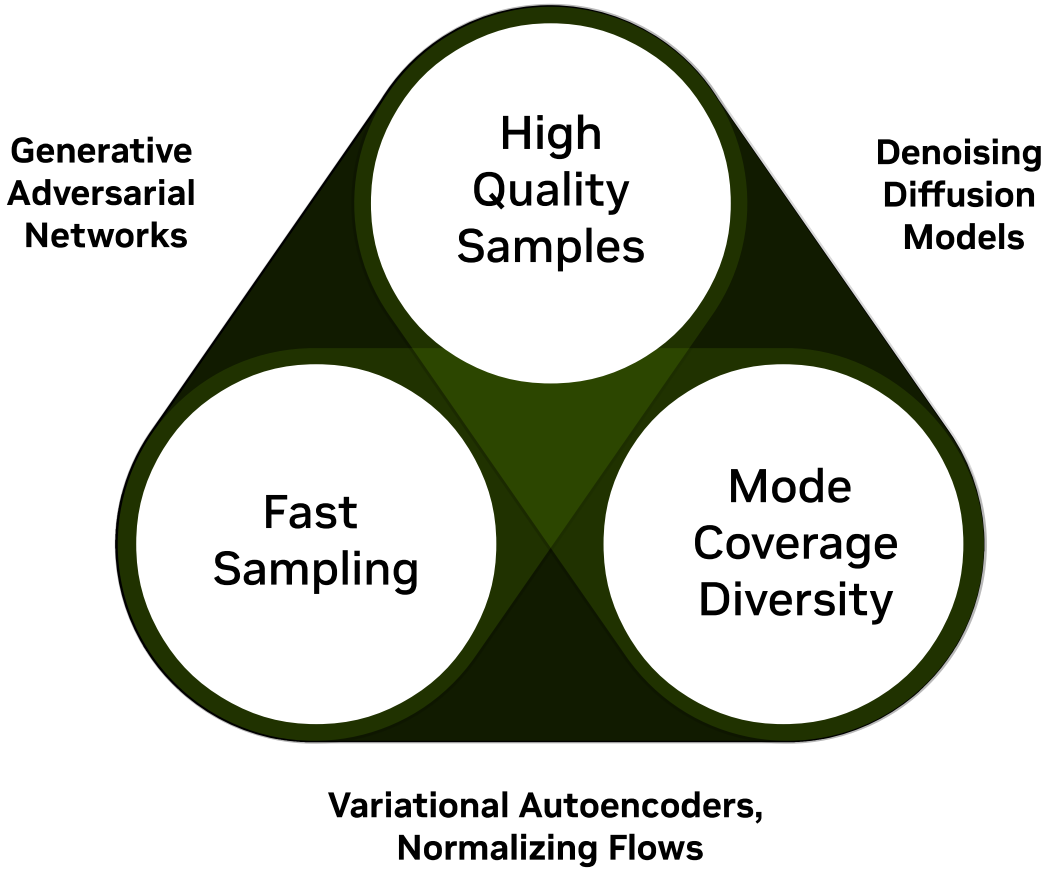
- **High quality samples**
  - Generative Adversarial Networks (GANs)
  - Denoising Diffusion Models
- **Fast sampling**
  - Generative Adversarial Networks (GANs)
  - Variational Autoencoders (VAEs)

Generative AI in Computer Vision

Choose two out of three:

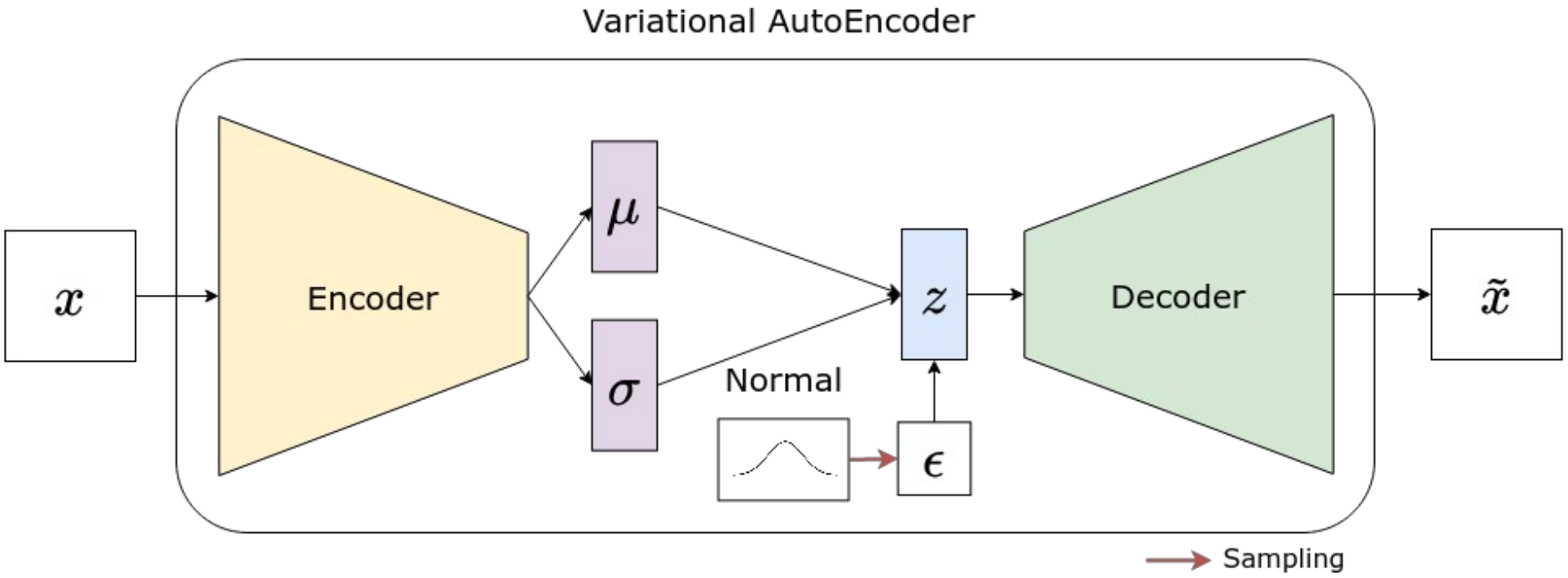
- **High quality samples**
  - Generative Adversarial Networks (GANs)
  - Denoising Diffusion Models
- **Fast sampling**
  - Generative Adversarial Networks (GANs)
  - Variational Autoencoders (VAEs)
- **Mode coverage diversity**
  - Denoising Diffusion Models
  - Variational Autoencoders (VAEs)

Generative AI in Computer Vision



Source: "What is Generative AI?" by NVIDIA

Variational Autoencoders (VAEs)

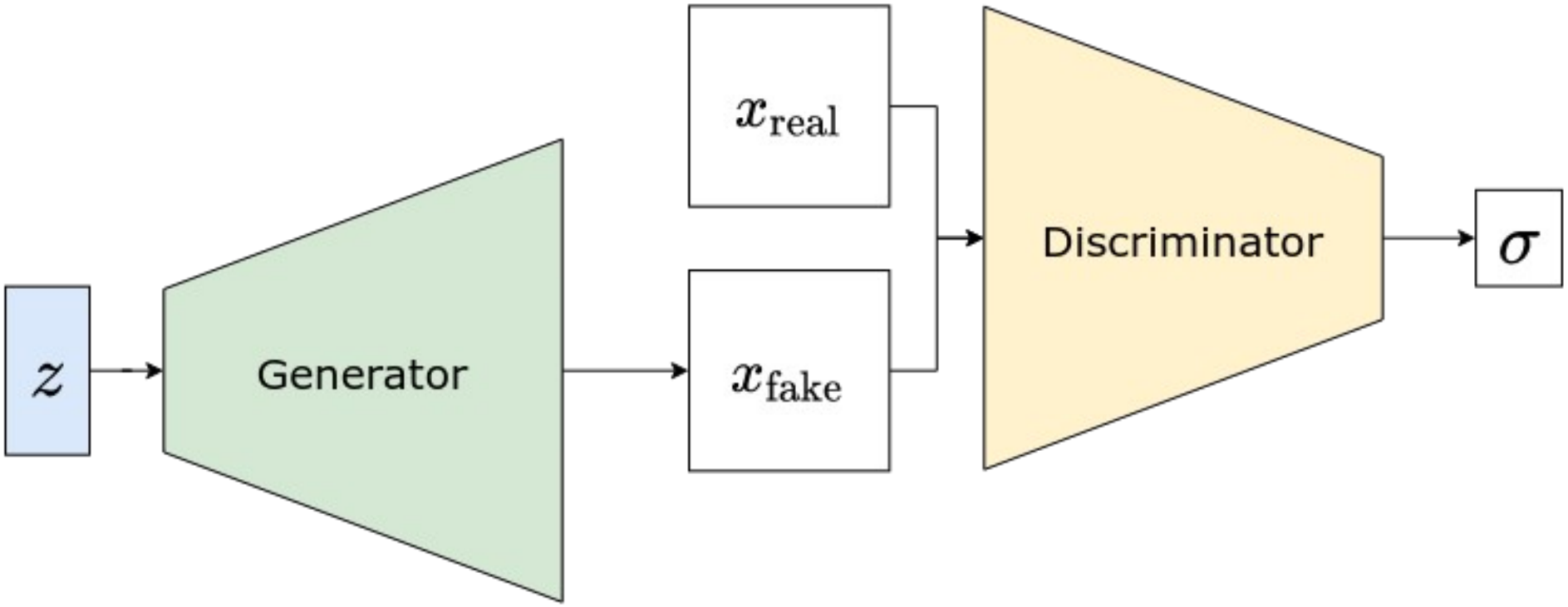


Variational Autoencoders (VAEs)

Learning Resources

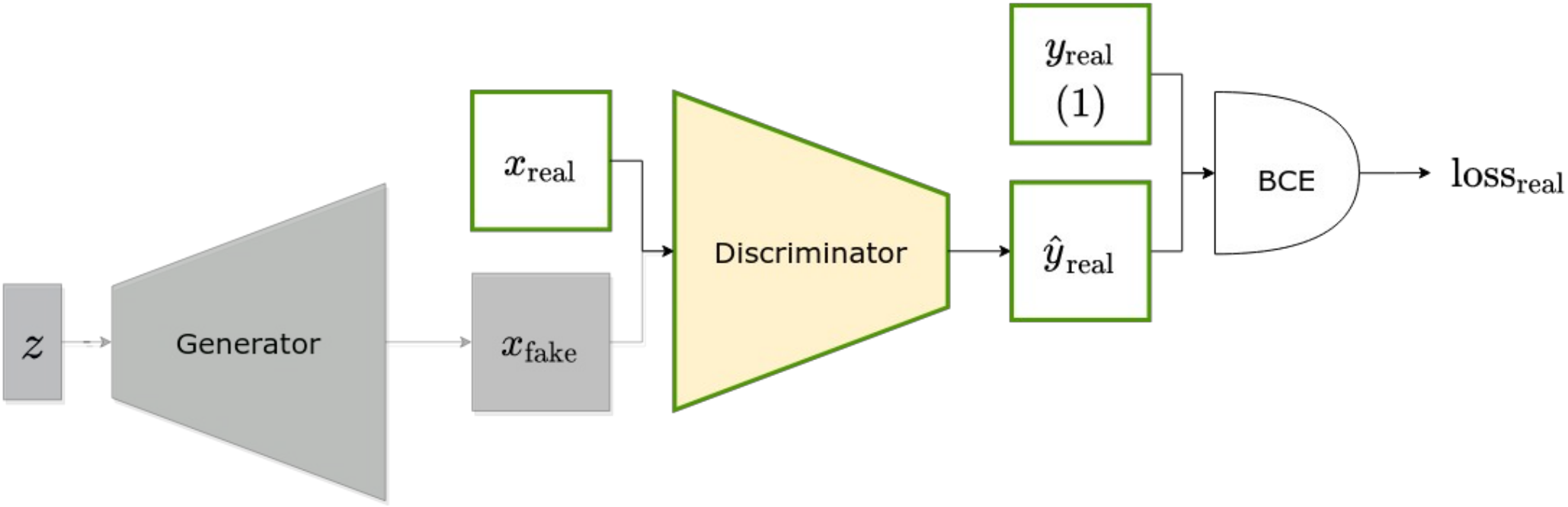
- **Understanding AutoEncoders with an example: A step-by-step tutorial**
  - Part I: Vanilla AutoEncoders
  - Part II: Variational Autoencoders

Generative Adversarial Networks (GANs)



Generative Adversarial Networks (GANs)

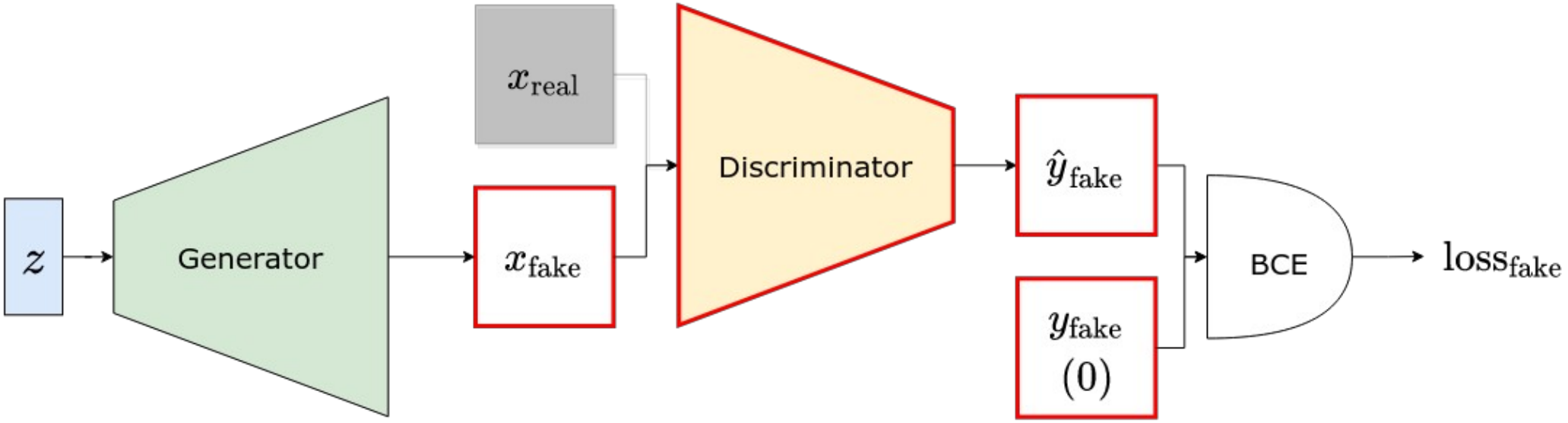
Training the Discriminator (Step 1)



Training Discriminator on Real Data

Generative Adversarial Networks (GANs)

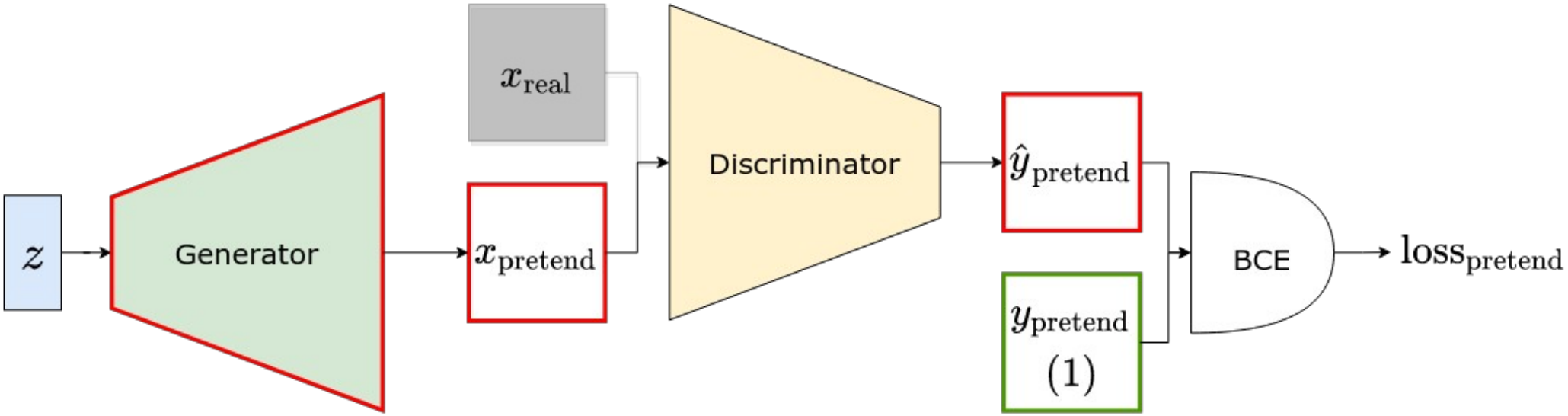
Training the Discriminator (Step 2)



Training Discriminator on Fake Data

Generative Adversarial Networks (GANs)

Training the Generator

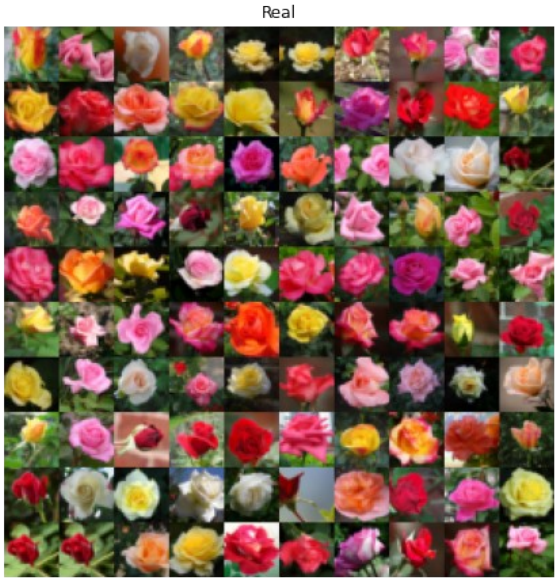


Training Generator on Pretend Data

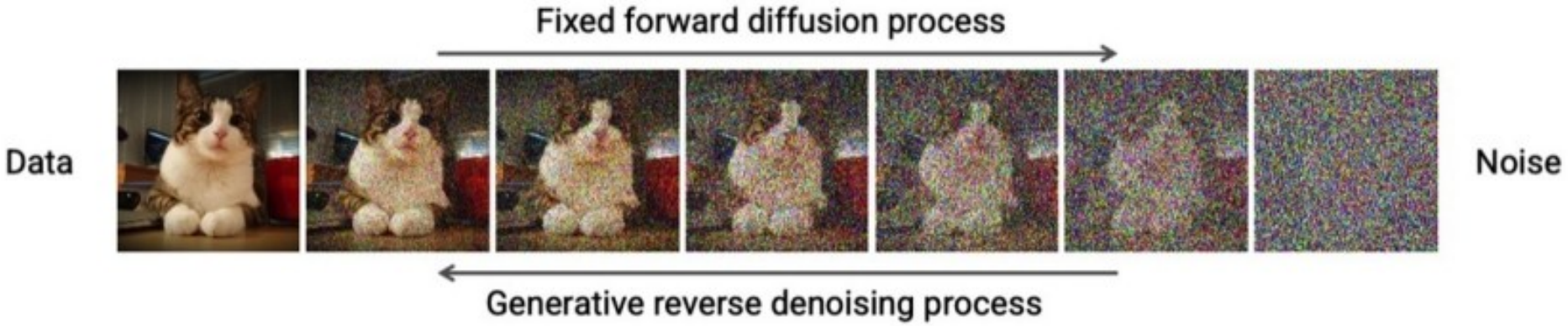
Generative Adversarial Networks (GANs)

Learning Resources

- **GANs 101**
  - GitHub repo
  - YouTube Video
- **GANs'N'Roses**
  - GitHub repo



Denoising Diffusion Models

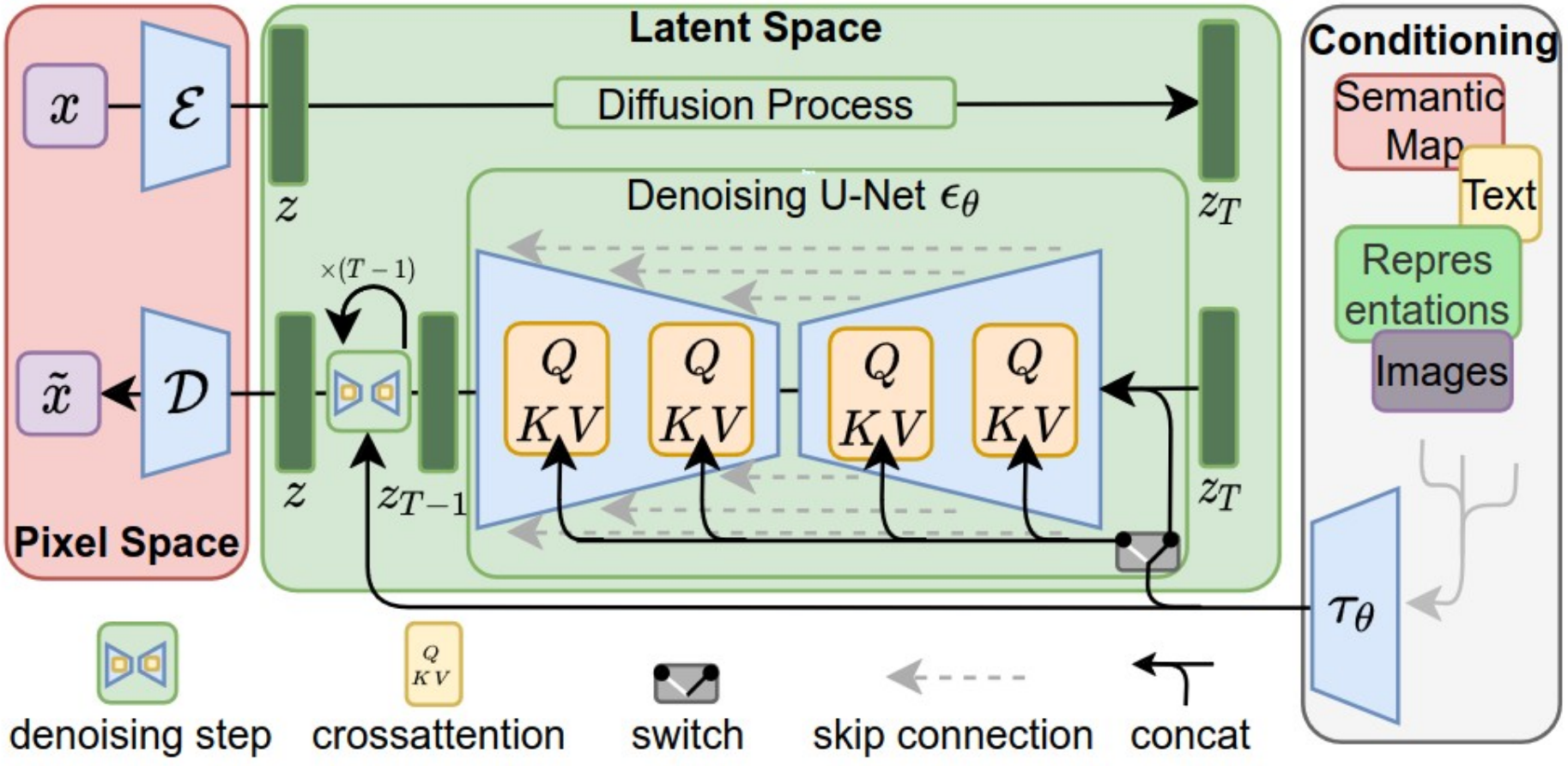


Source: “What is Generative AI?” by NVIDIA

Denoising Diffusion Models

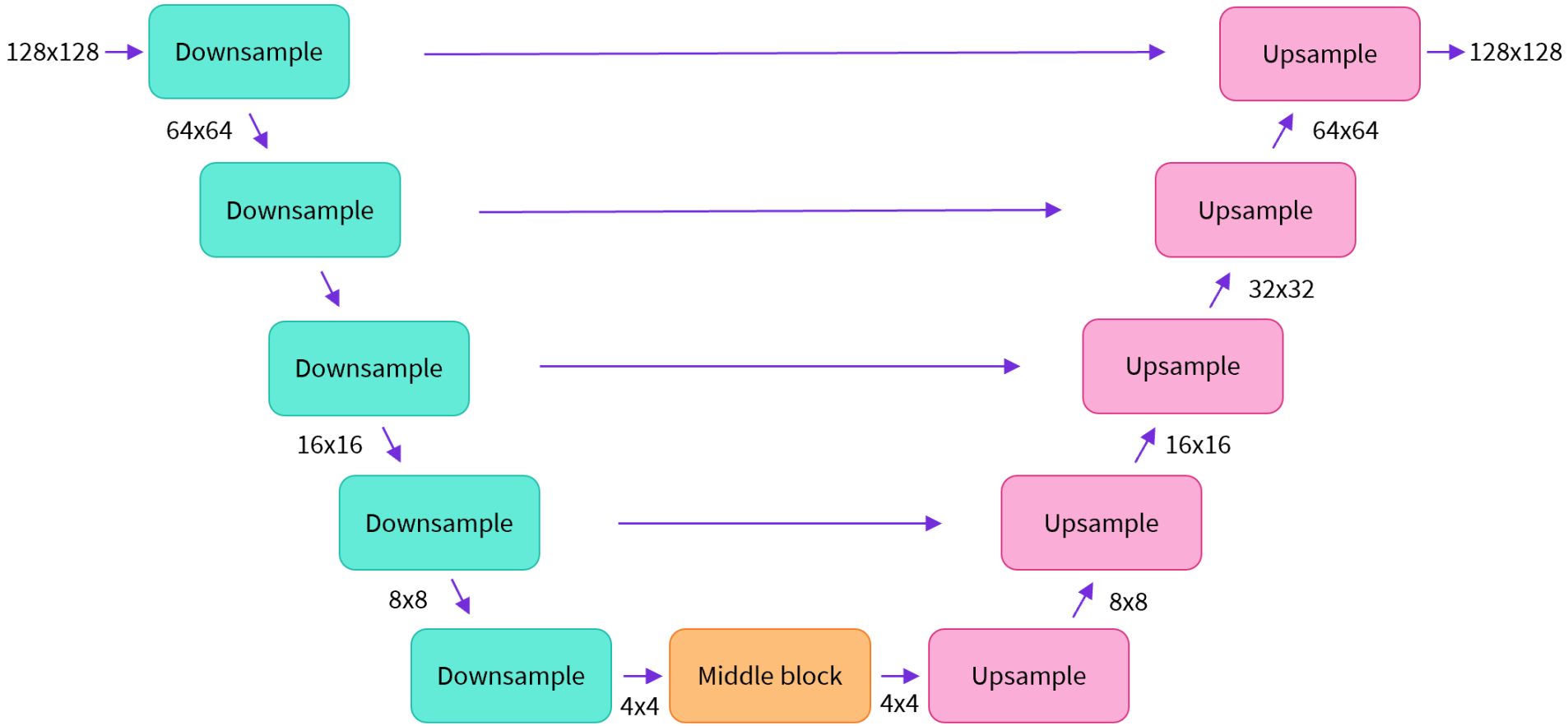
```
# Set up a generator for reproducibility
generator = torch.Generator(device=device).manual_seed(42)

# Run the pipeline, showing some of the available arguments
pipe_output = pipe(
    prompt="impressionist painting of an autumn cityscape", # What to generate
    negative_prompt="Oversaturated, blurry, low quality", # What NOT to generate
    height=480, width=640,     # Specify the image size
    guidance_scale=8,          # How strongly to follow the prompt
    num_inference_steps=35,    # How many steps to take
    generator=generator        # Fixed random seed
)
```

Denoising Diffusion Models



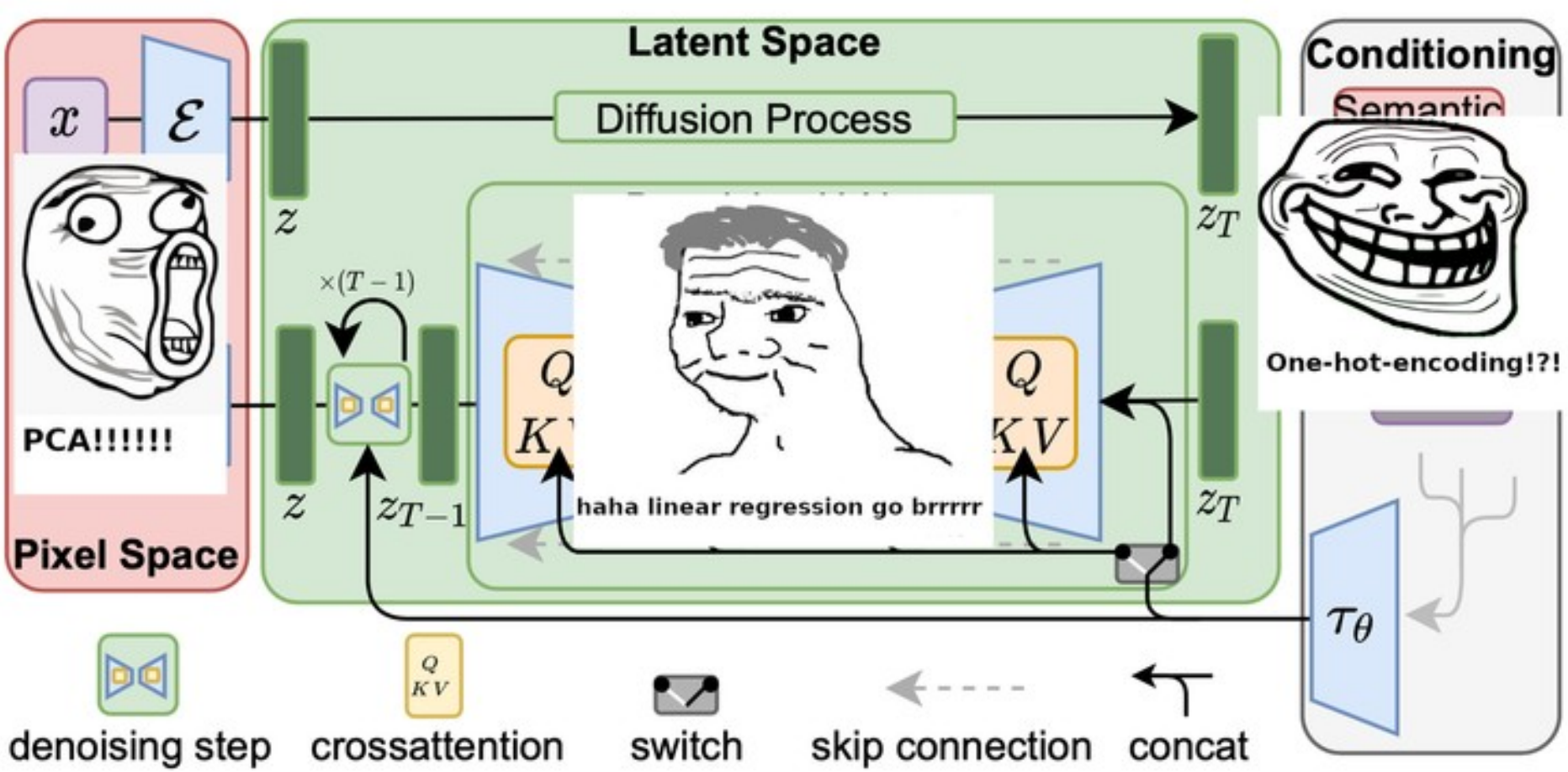
Source: High-Resolution Image Synthesis with Latent Diffusion Models

Denoising Diffusion Models



Source: Introduction to Diffusers - Unit 1 - HuggingFace's Diffusion Models class

Denoising Diffusion Models



Source: Will Kurt's Linear Diffusion: Building a Diffusion Model from linear Components

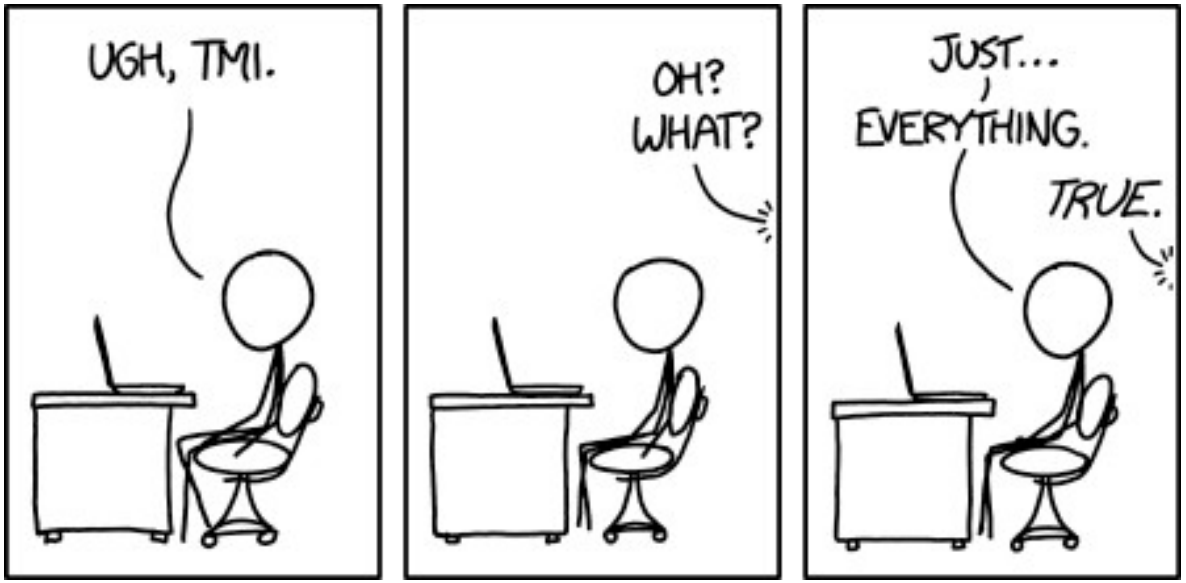
Denoising Diffusion Models

Learning Resources

- **Diffusion Models 101**
  - GitHub repo
- **HuggingFace Diffusion Models Course**
  - GitHub repo
- **Linear Diffusion by Will Kurt**
  - Blog post
  - GitHub repo

Large Language Models

TMI = Too Much Information!



Source: XKCD 1369

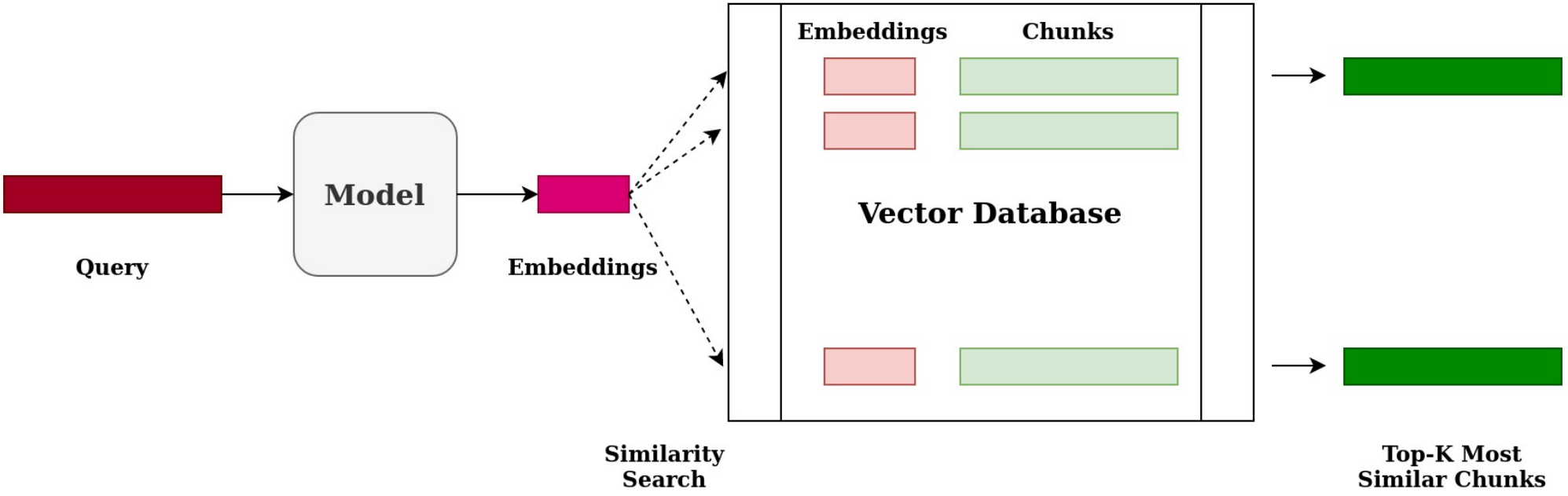
Large Language Models

Cutting-Edge LLMs

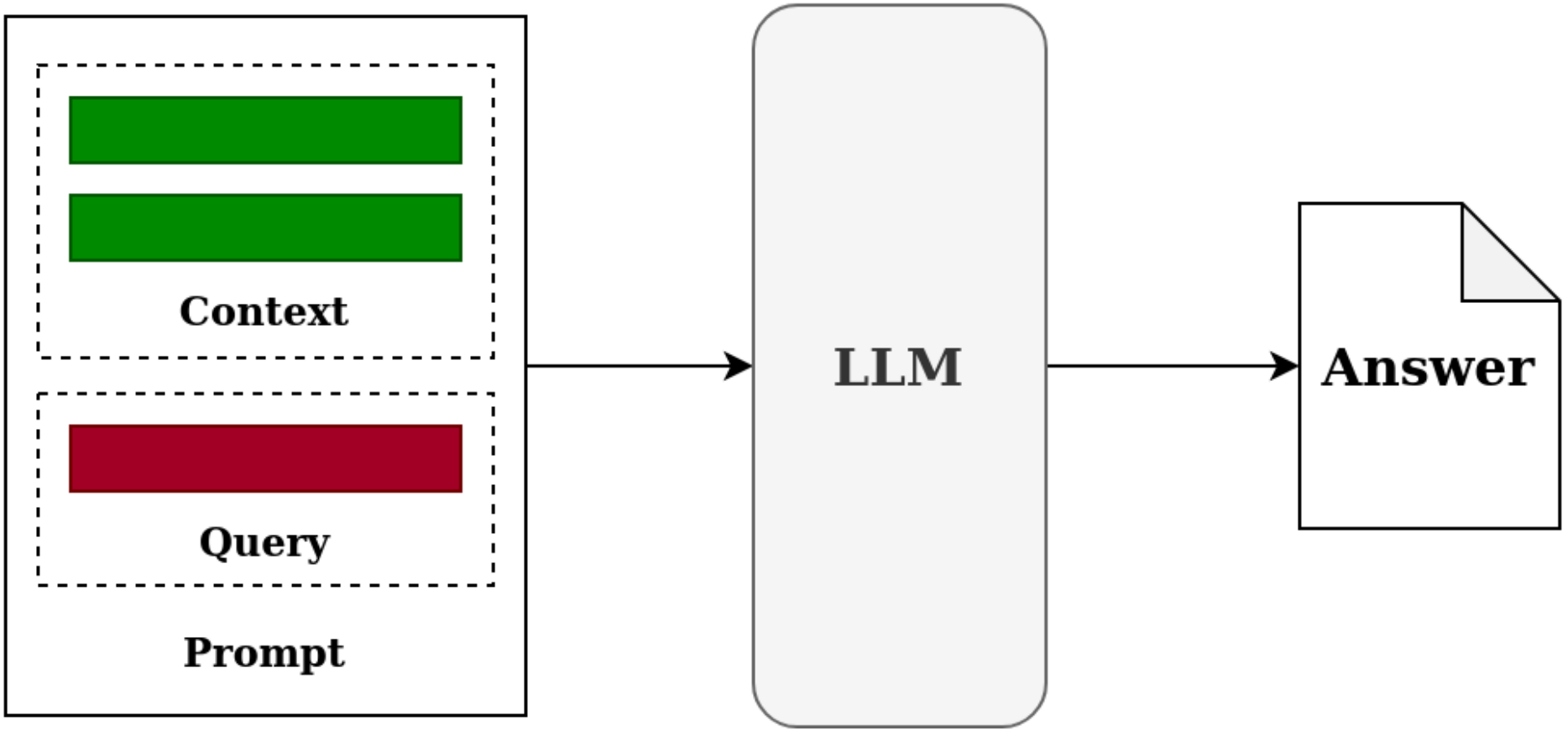
Source: Johann "nojhan" Dréo, CC BY-SA 3.0, via Wikimedia Commons

Source: Jürgen Dietrich, CC BY 3.0 DE, via Wikimedia Commons

Document Q&A


Embeddings
Chunks
Model
Vector Database
Query
Embeddings
Similarity Search
Top-K Most Similar Chunks

Document Q&A



Large Language Models

Learning Resources

- **Deep Learning.AI**
  - Short Courses
- **Phil Schmid’s Blog**
  - Generative AI posts

Learning PyTorch

- **Free eDX Course (beginner / no coding)**
  - PyTorch and Deep Learning for Decision Makers
- **The Linux Foundation Training (beginner / hands-on)**
  - Online/Live: PyTorch in Practice: An Applications-First Approach
  - Self-paced online coming soon!
- **Deep Learning with PyTorch Step-by-Step**
  - Amazon: Kindle / Paperback
  - https://leanpub.com/pytorch/c/summit coupon for $7.99

ends September 17th 2023

Thank You!