Unione europea
Fondo sociale europeo

Regione Emilia-Romagna

ER Educazione Ricerca Emilia-Romagna

DATA LAB

GUARDA AVANTI

Big Data, nuove competenze
per nuove professioni.

FORM INDUSTRIA EMILIA ROMAGNA

ifoa Sapere utile

CEFORM

REISS ROMOLI la passione della conoscenza

UNIMORE Università degli Studi di Modena e Reggio Emilia

Alma Mater Studiorum Università di Bologna

Università degli Studi di Ferrara

UNIVERSITÀ DI PARMA

POLITECNICO MILANO 1863 Polo Territoriale di Piacenza

UNIVERSITÀ CATTOLICA del Sacro Cuore

"Anticipare la crescita con le nuove competenze sui Big Data - Edizione 3" Operazione Rif. PA 2021-16029/RER approvata con DGR n° 927 del 21 giugno 2021 e co-finanziata dal Fondo Sociale Europeo PO 2014-2020 Regione Emilia-Romagna

Deep Learning

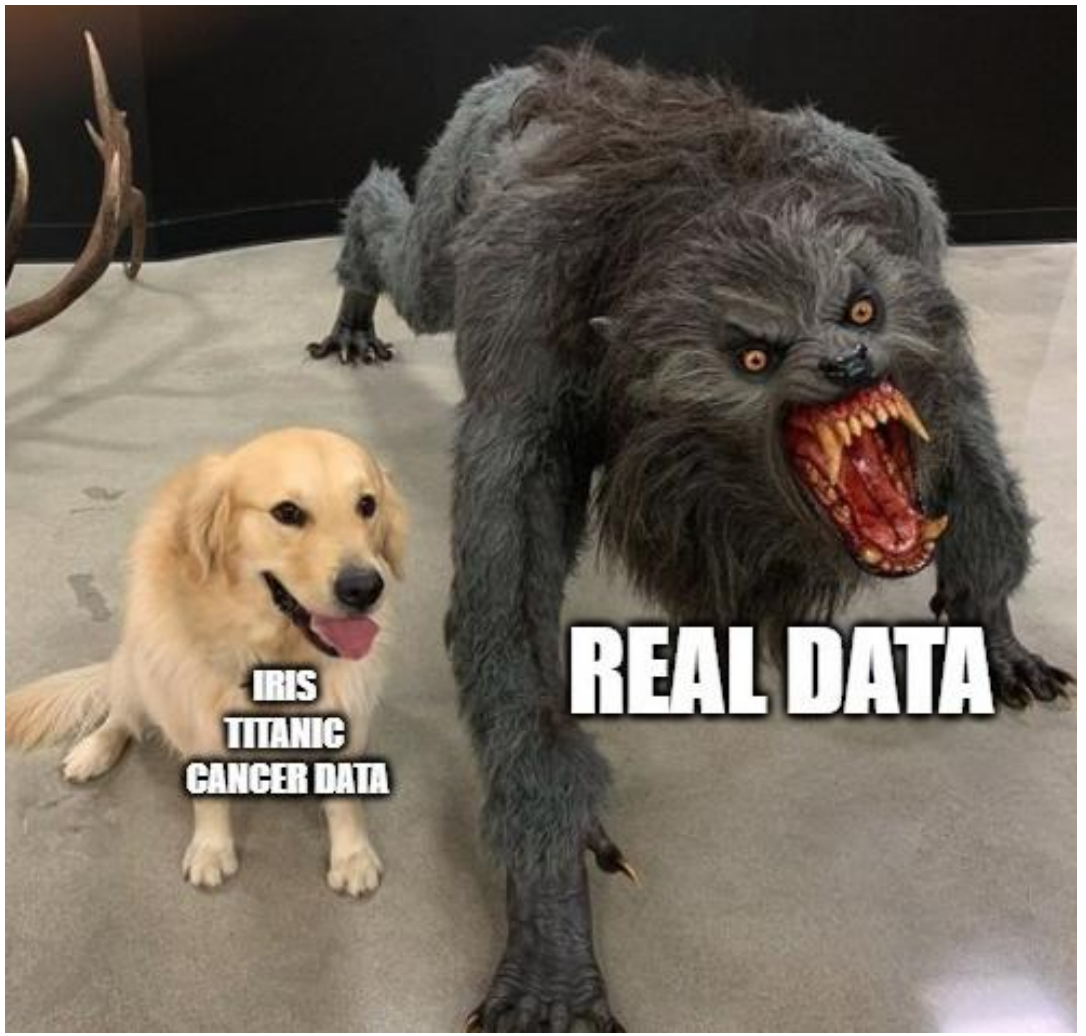
DISCRIMINATIVE

VS.

GENERATIVE

AI

Noi utizziamo l'AI invece
di inutili umani soggetti a Bias
E dove prendete i dati
per allenare i modelli?
...
Dove prendete i dati
per allenare i modelli?


IRIS
TITANIC
CANCER DATA
REAL DATA

What Is Generative Modeling?

Generative modeling can be broadly defined as follows:

> *Generative modeling is a branch of machine learning that involves training a model to produce new data that is similar to a given dataset.*

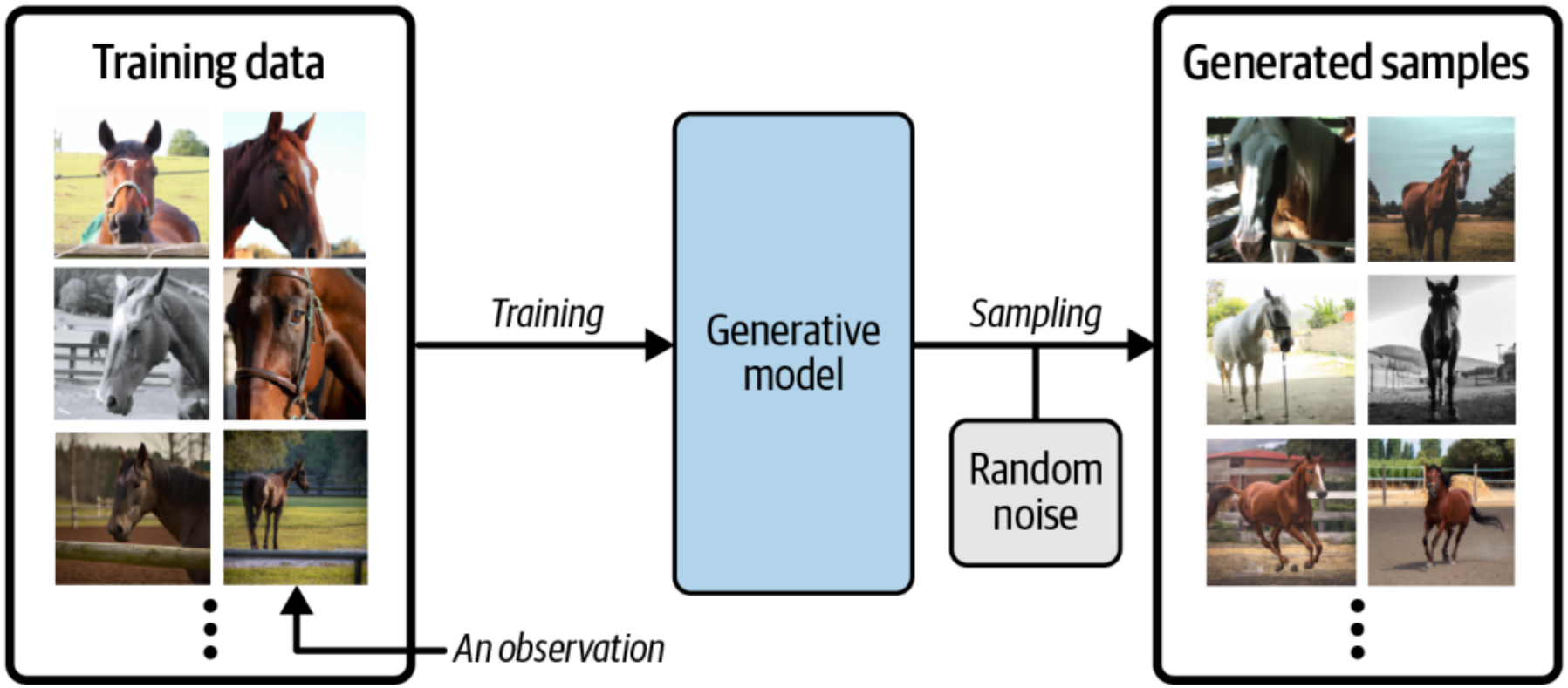


Figure 1-1. A generative model trained to generate realistic photos of horses

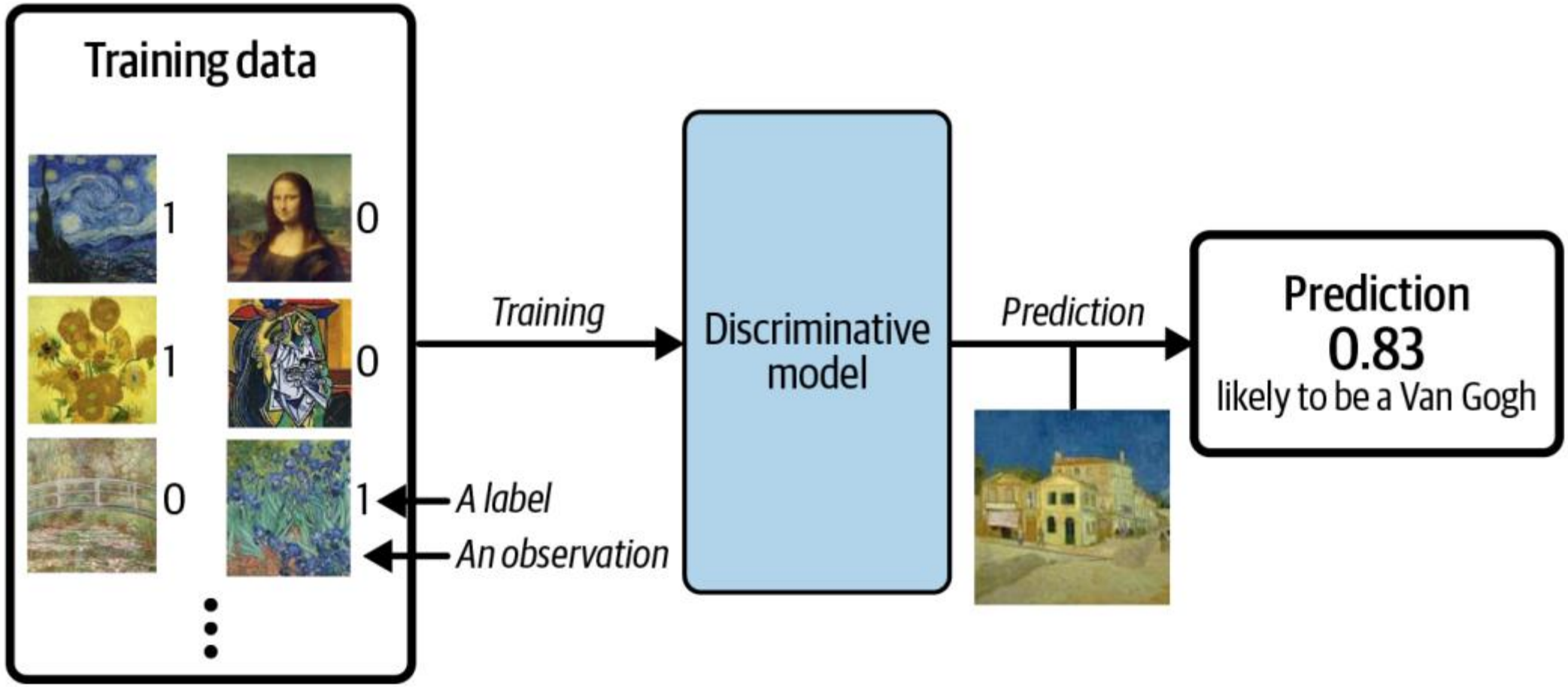
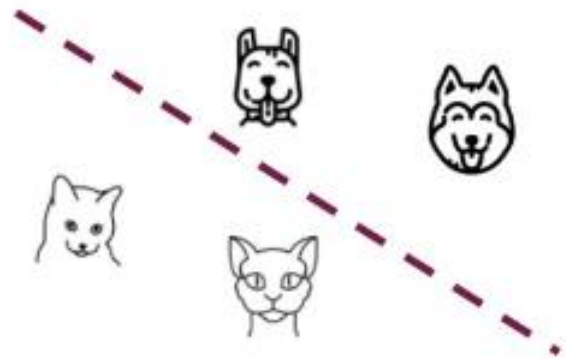


Figure 1-2. A discriminative model trained to predict if a given image is painted by Van Gogh

Generative Models vs. Discriminative Models

Discriminative models



Features Class

$$X \rightarrow Y$$

$$P(Y|X)$$

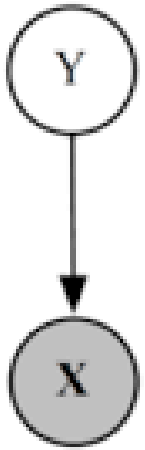
Generative models

Noise Class Features

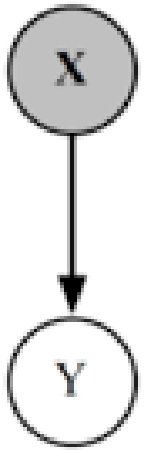
$$\xi, Y \rightarrow X$$

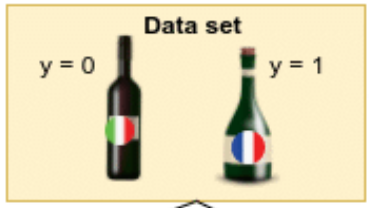
$$P(X|Y)$$

Generative



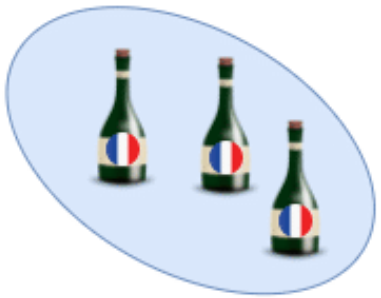
Discriminative

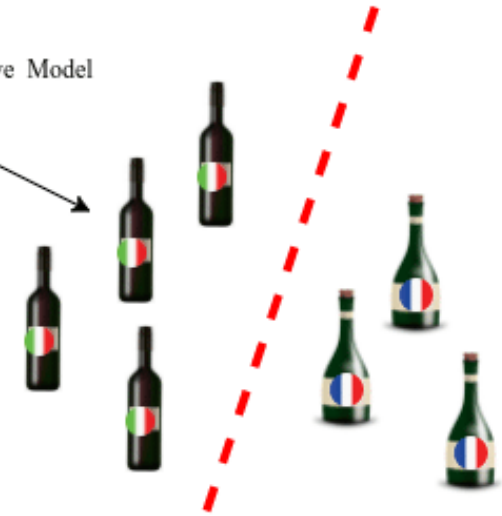


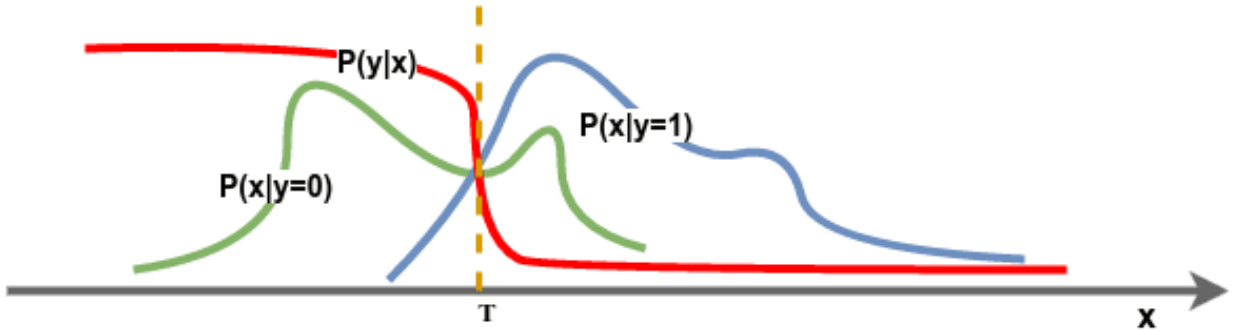


Generative Model

Discriminative Model







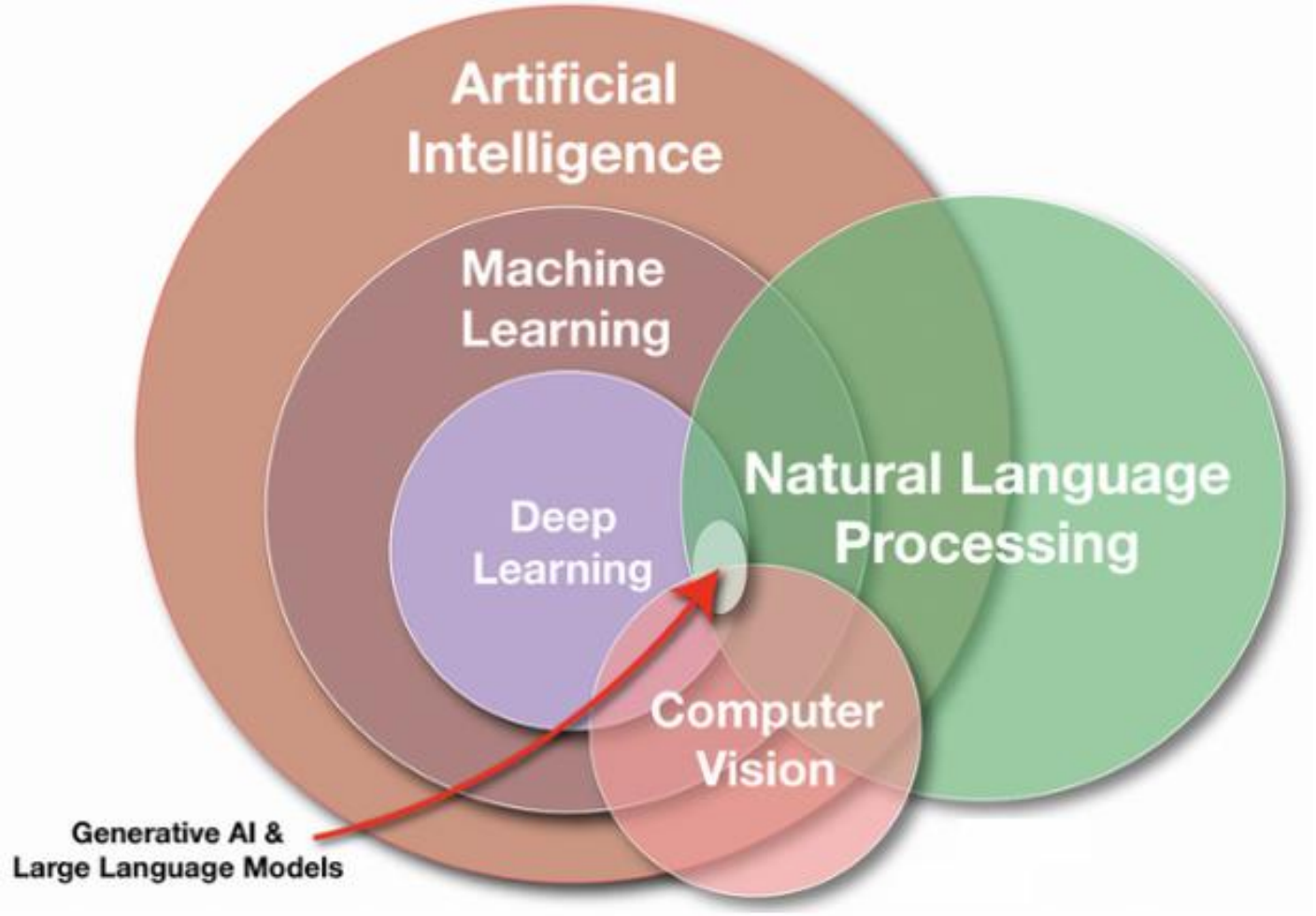
new wine to classify

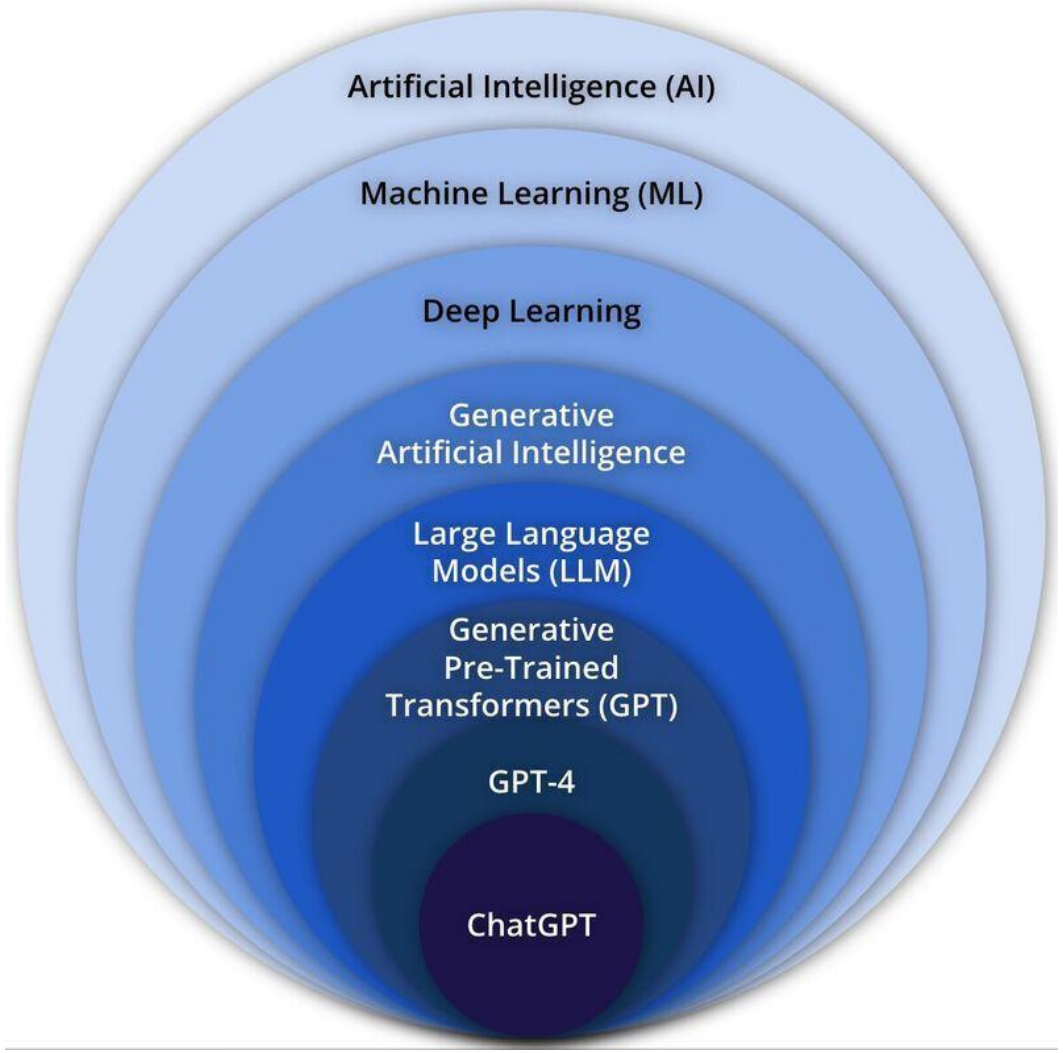
Generative Model - - - - - max(P(x|y=0), P(x|y=1))

Discriminative Model - - - - - { y = 0 if P(y|x) <= T

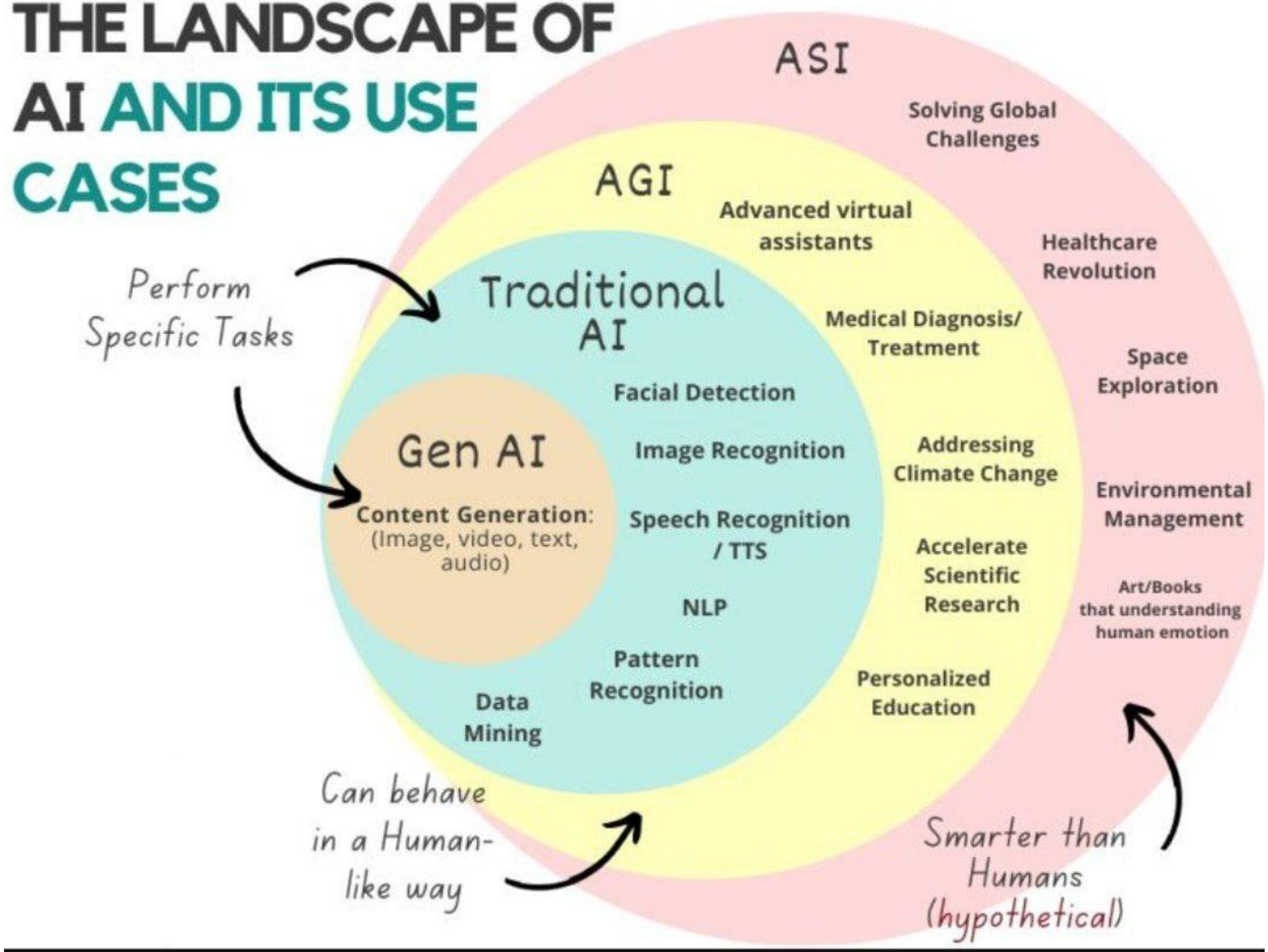
y = 1 otherwise

Placing Generative AI and LLMs in the bigger picture

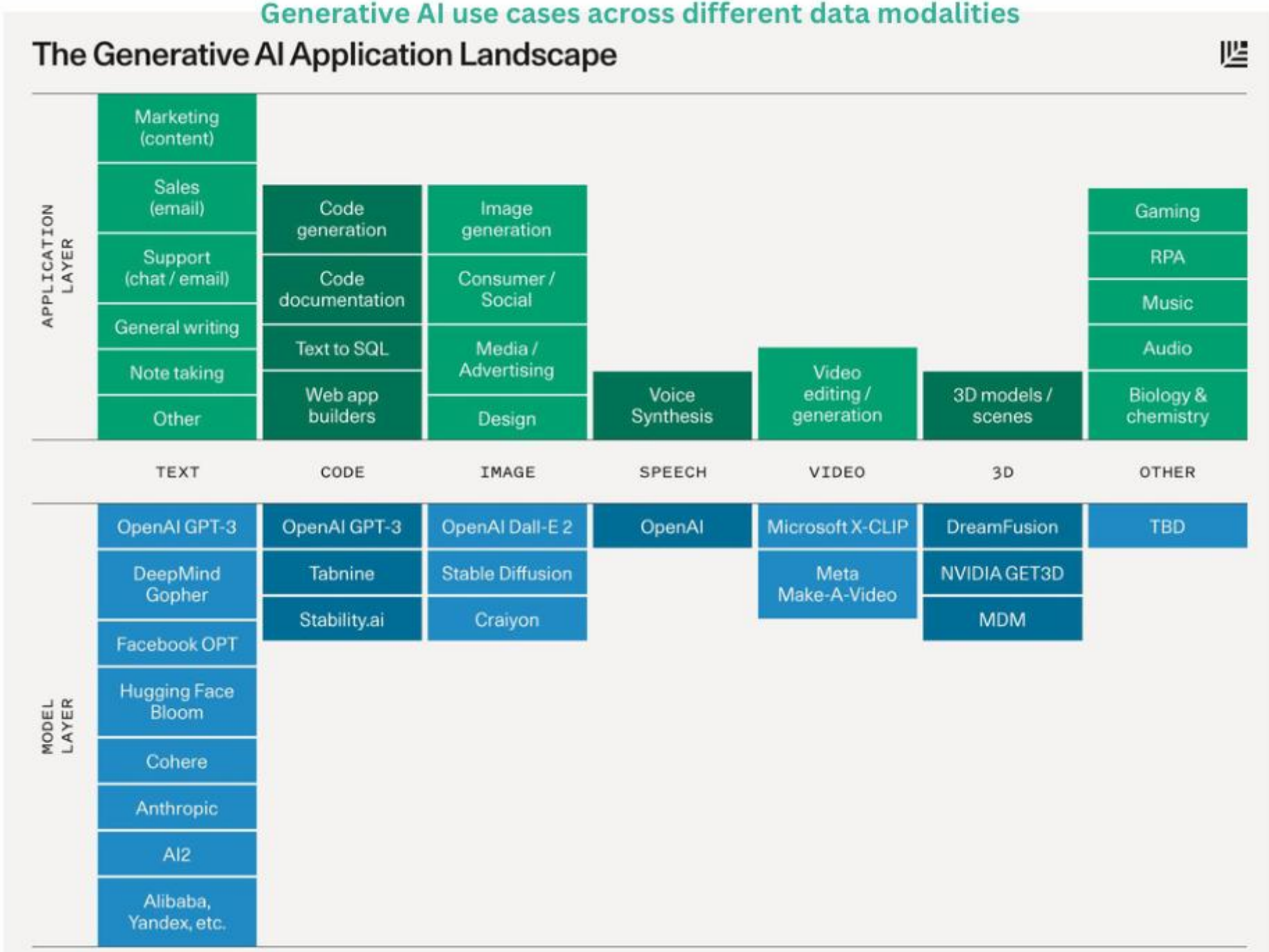




THE LANDSCAPE OF AI AND ITS USE CASES



Generative AI use cases across different data modalities



Generative Models

NeRF

2D GAN

3D GAN

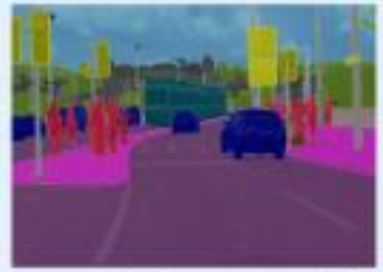
Text-to-Image

?

Computer Vision

Image Classification

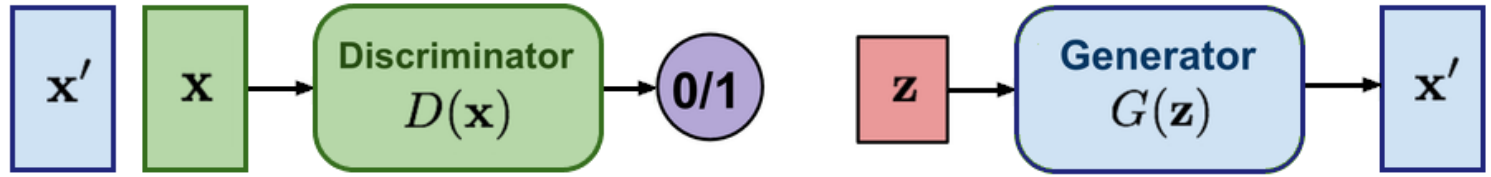
Object Detection



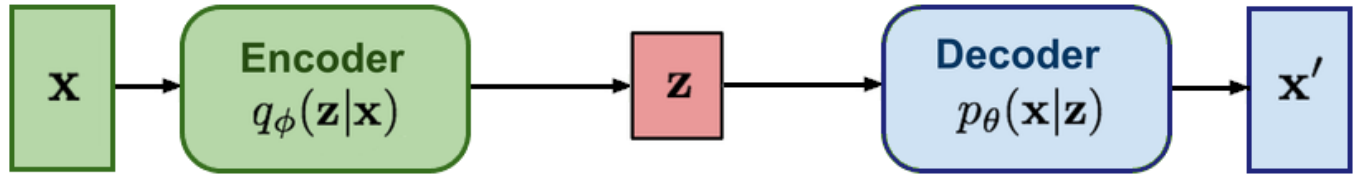
Semantic Segmentation

Pose Estimation

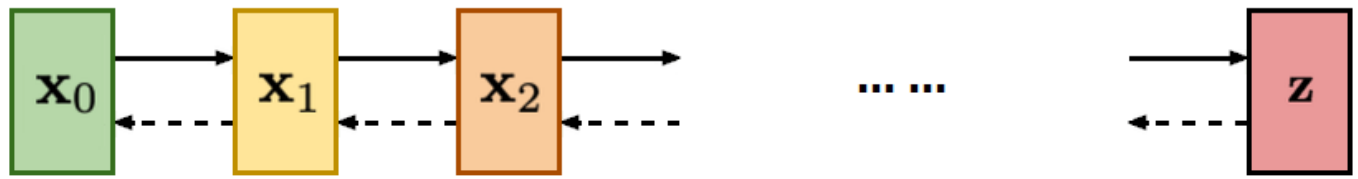
GAN: Adversarial training

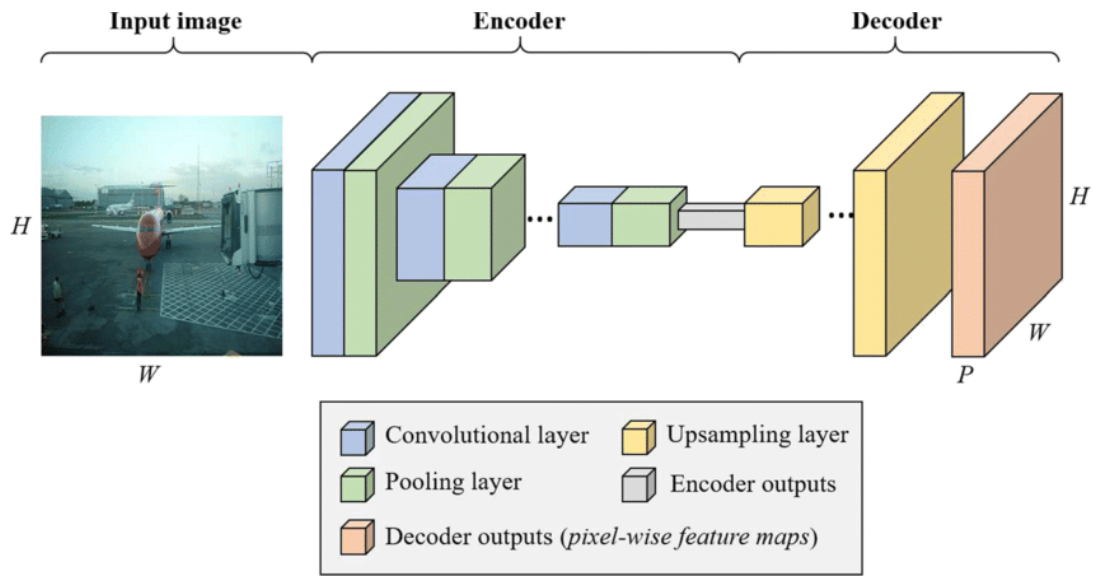


VAE: maximize variational lower bound



Diffusion models: Gradually add Gaussian noise and then reverse





Discriminative vs Generative NLP Models: Different Use-Cases

Discriminative and generative machine learning language models have different strengths and weaknesses, so they are used for different tasks.

Discriminative language models are better at tasks that require understanding the relationship between words and their meaning. For example, they can be used for:

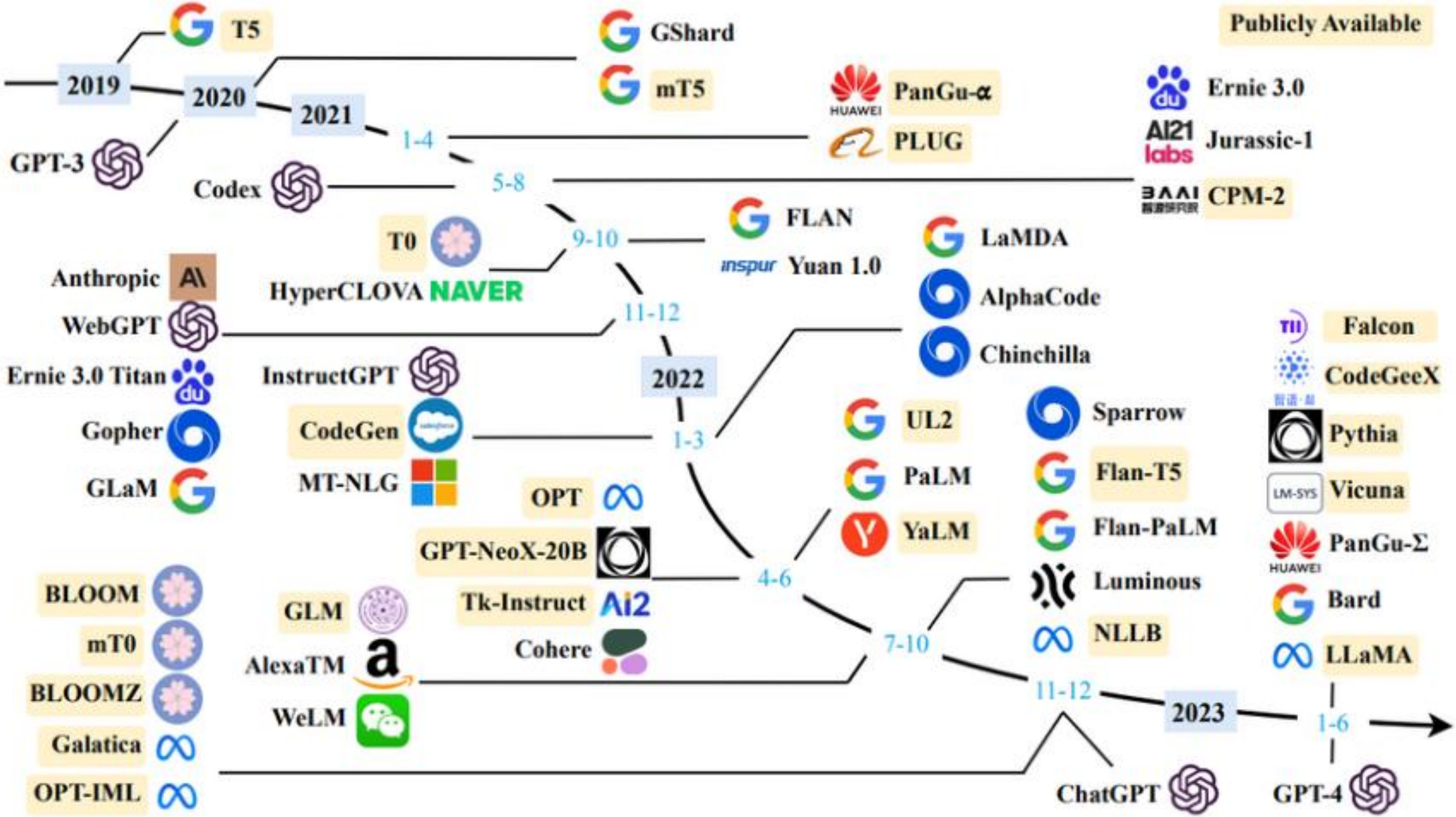
- **Text classification: Categorizing text into different classes, such as news articles, product reviews, or spam.**
- **Named entity recognition: Identifying named entities in text, such as people, places, and organizations.**
- **Sentiment analysis: Identifying the sentiment of text, such as whether it is positive, negative, or neutral.**

Generative language models are better at tasks that require creating new text. For example, they can be used for:

- **Text summarization: Generating a shorter version of a text that captures the main points.**
- **Machine translation: Translating text from one language to another.**
- **Text generation: Generating new text, such as poems, code, or scripts.**

Here are some specific examples of discriminative and generative language models:

- **Discriminative language models:** Logistic regression, support vector machines, conditional random fields etc
- **Generative language models:** Naive Bayes, Bayesian networks, hidden Markov models, etc.


Publicly Available
2019
2020
2021
2022
2023
T5
GPT-3
GShard
mT5
PanGu-α
PLUG
Ernie 3.0
Jurassic-1
CPM-2
1-4
5-8
9-10
11-12
1-3
4-6
7-10
11-12
1-6
Codex
T0
HyperCLOVA
FLAN
Yuan 1.0
LaMDA
AlphaCode
Chinchilla
Anthropic
WebGPT
Ernie 3.0 Titan
Gopher
GLaM
InstructGPT
CodeGen
MT-NLG
OPT
GPT-NeoX-20B
Tk-Instruct
Cohere
UL2
PaLM
YaLM
Sparrow
Flan-T5
Flan-PaLM
Luminous
NLLB
Falcon
CodeGeeX
Pythia
Vicuna
PanGu-Σ
Bard
LLaMA
BLOOM
mT0
BLOOMZ
Galatica
OPT-IML
GLM
AlexaTM
WeLM
ChatGPT
GPT-4