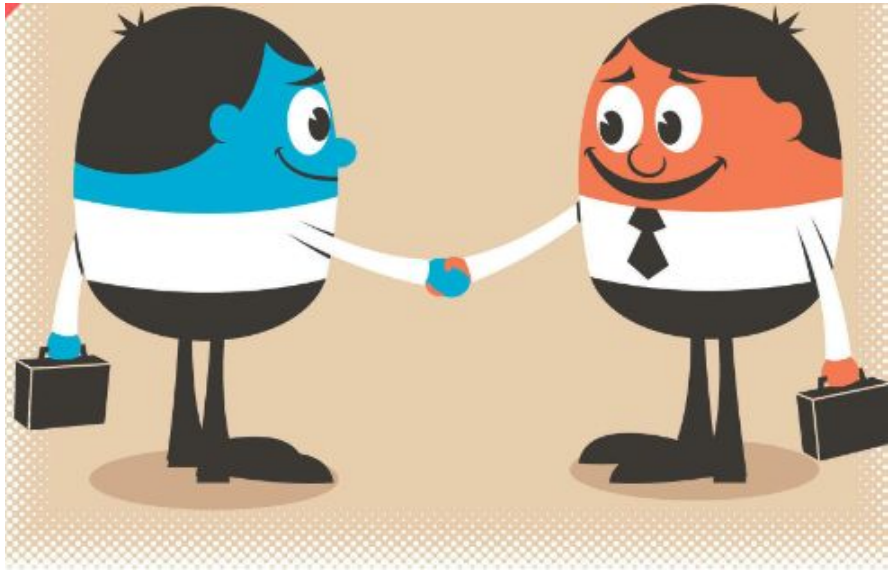
Introduction to AI and Machine Learning



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Kaggle Competition Expert (X2)
Mentor at KaggleX Fellowship Program
NLP Mentor at Coursera

Data!

image	label	price (1000$)
	cat	115
	not cat	150
	cat	210
	not cat	280
		355
		440

What is Information then?

DATA vs INFORMATION

Data is a collection of facts.

Data is unorganized

Data is not typically useful on its own

Understand the context from the data

through data analysis

Information is how you understand those facts in context.

information is structured or organized.

Rich bought a blue Car in 2022

Information is useful on its own

DATA vs INFORMATION

Data is a collection of facts.

Data is not typically useful on its own

Understand the context from the data

through data analysis

Informati ontext.

DataScience!

Acquiring data

- Manual labeling


cat


not cat


cat


not cat

- From observing behaviors

user ID	time	price ($)	purchased
4783	Jan 21 08:15.20	7.95	yes
3893	March 3 11:30.15	10.00	yes
8384	June 11 14:15.05	9.50	no
0931	Aug 2 20:30.55	12.90	yes

machine	temperature (◦C)	pressure (psi)	machine fault
17987	60	7.65	N
34672	100	25.50	N
08542	140	75.50	Y
98536	165	125.00	Y

- Download from websites / partnerships

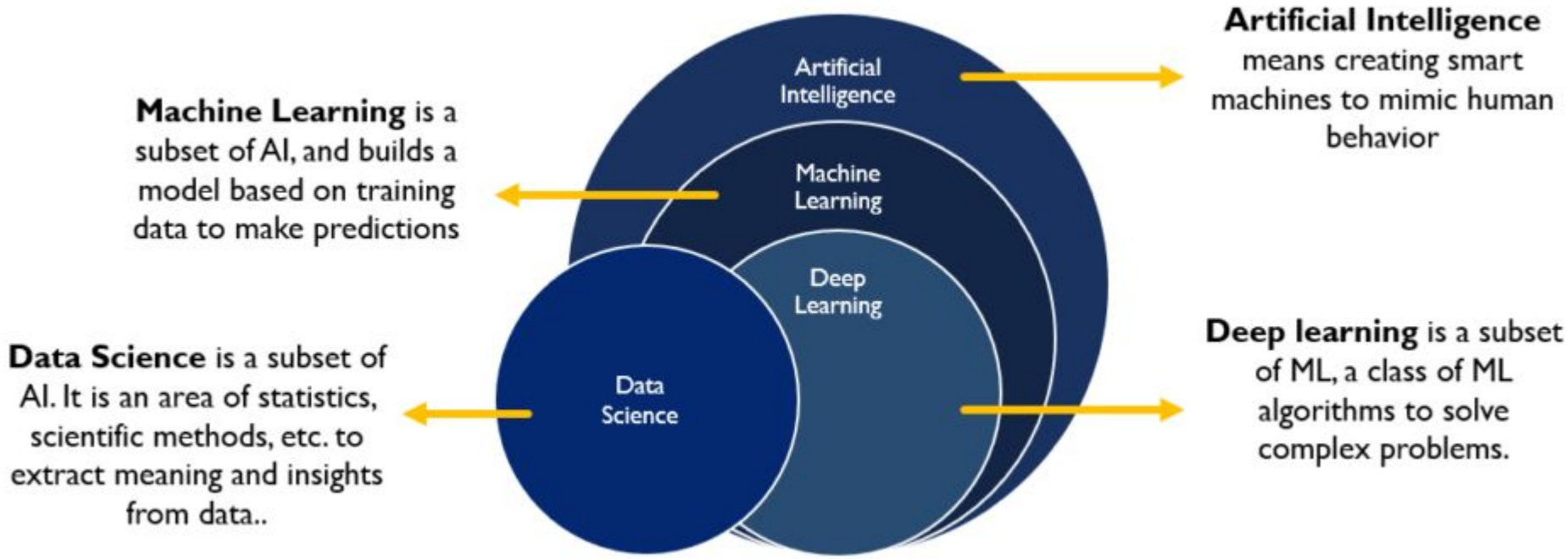
kaggle

Google Dataset Search

Introduction to AI and Machine Learning

Overview of AI, ML, and DL

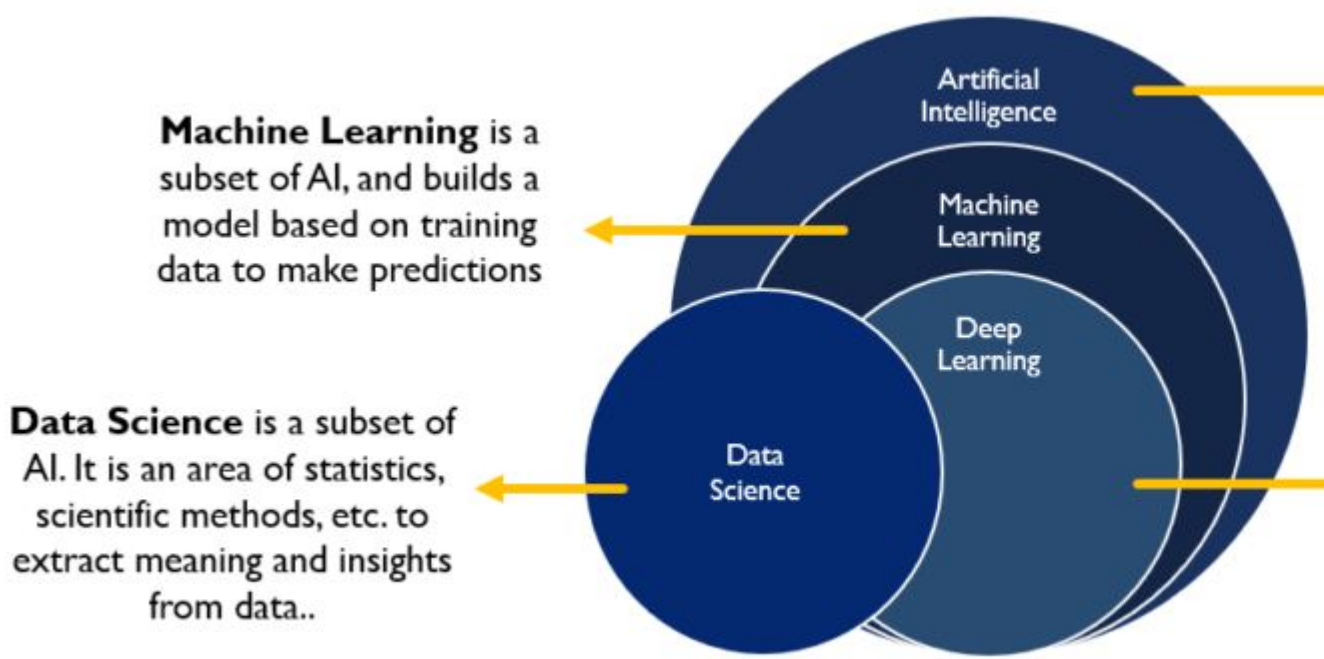
Data



Introduction to AI and Machine Learning

Overview of AI, ML, and DL

Data



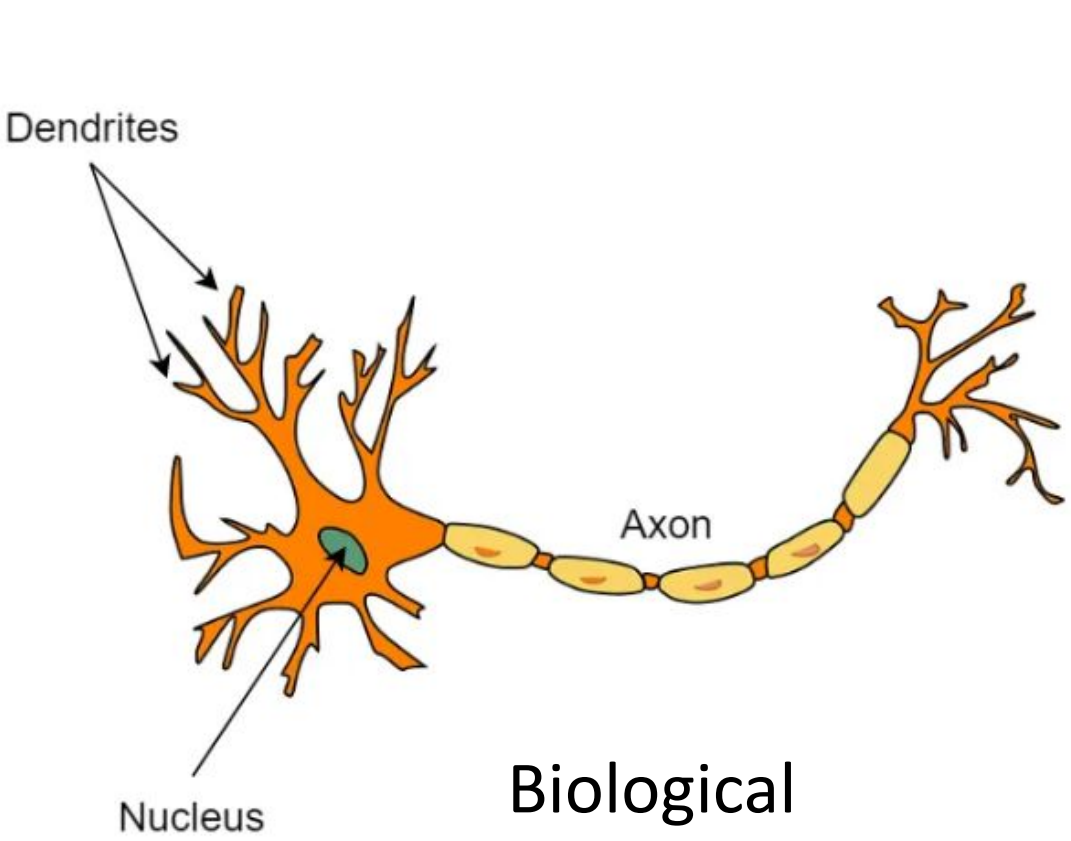
Machine Learning is a subset of AI, and builds a model based on training data to make predictions

Data Science is a subset of AI. It is an area of statistics, scientific methods, etc. to extract meaning and insights from data..

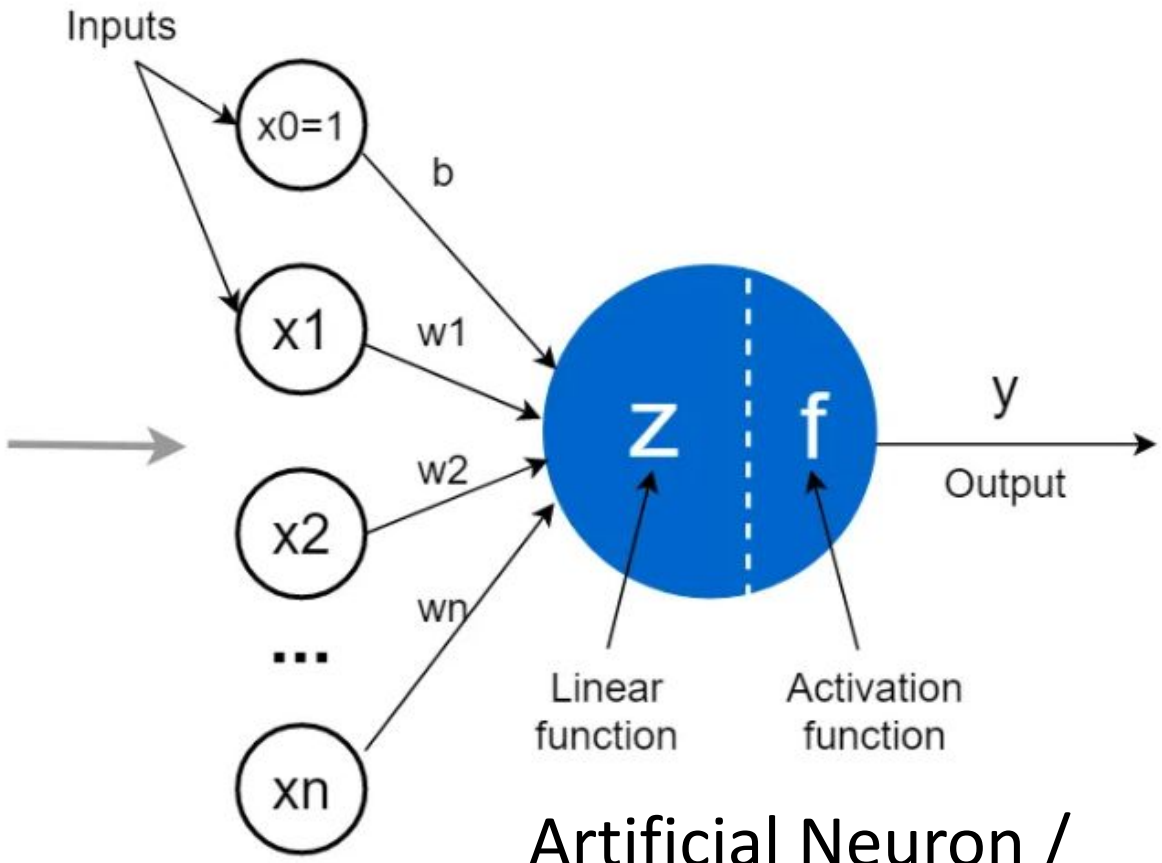
Artificial Intelligence means creating smart machines to mimic human behavior

Deep learning is a subset of ML, a class of ML algorithms to solve complex problems.

Deep Learning

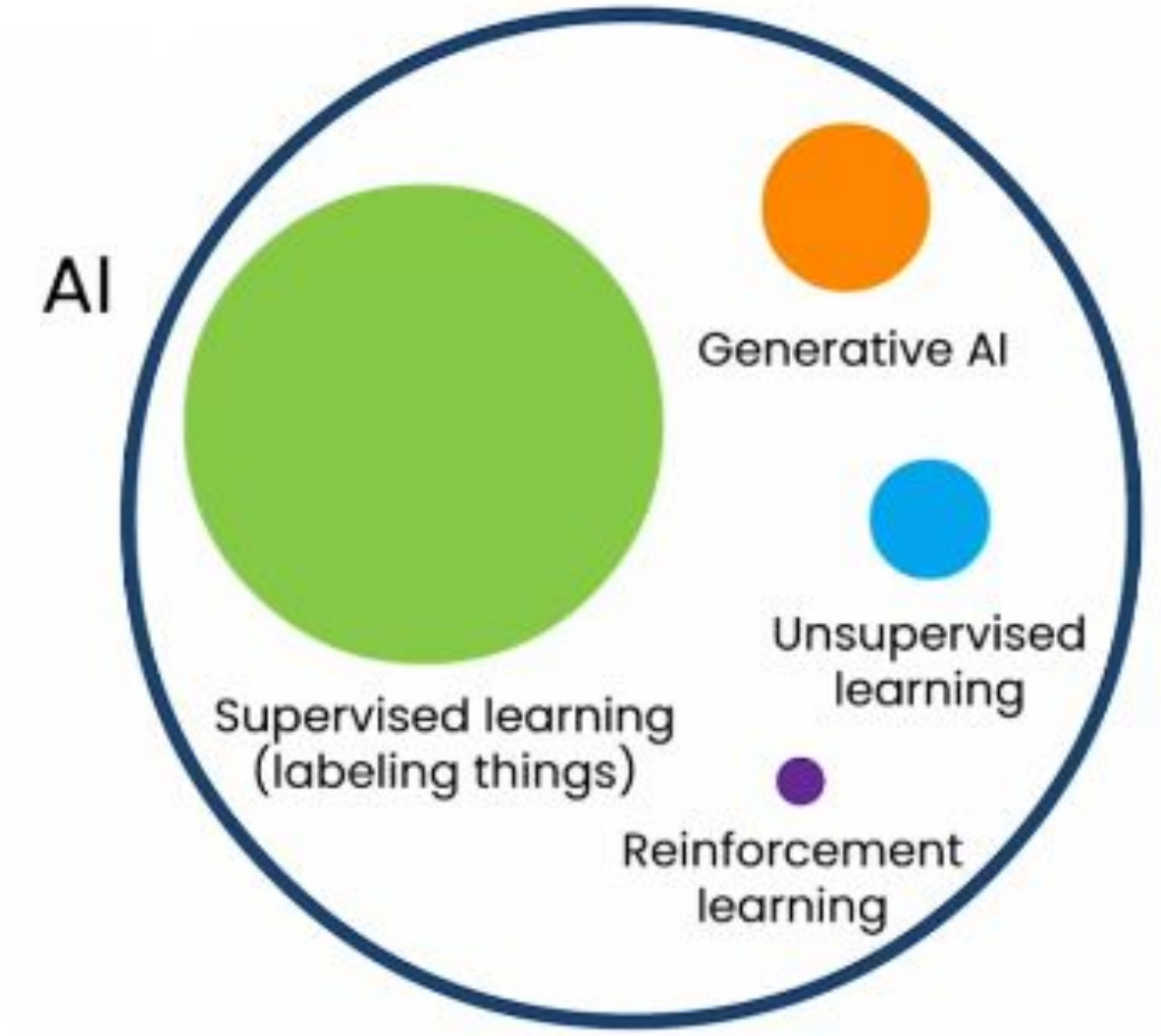


Biological Neuron



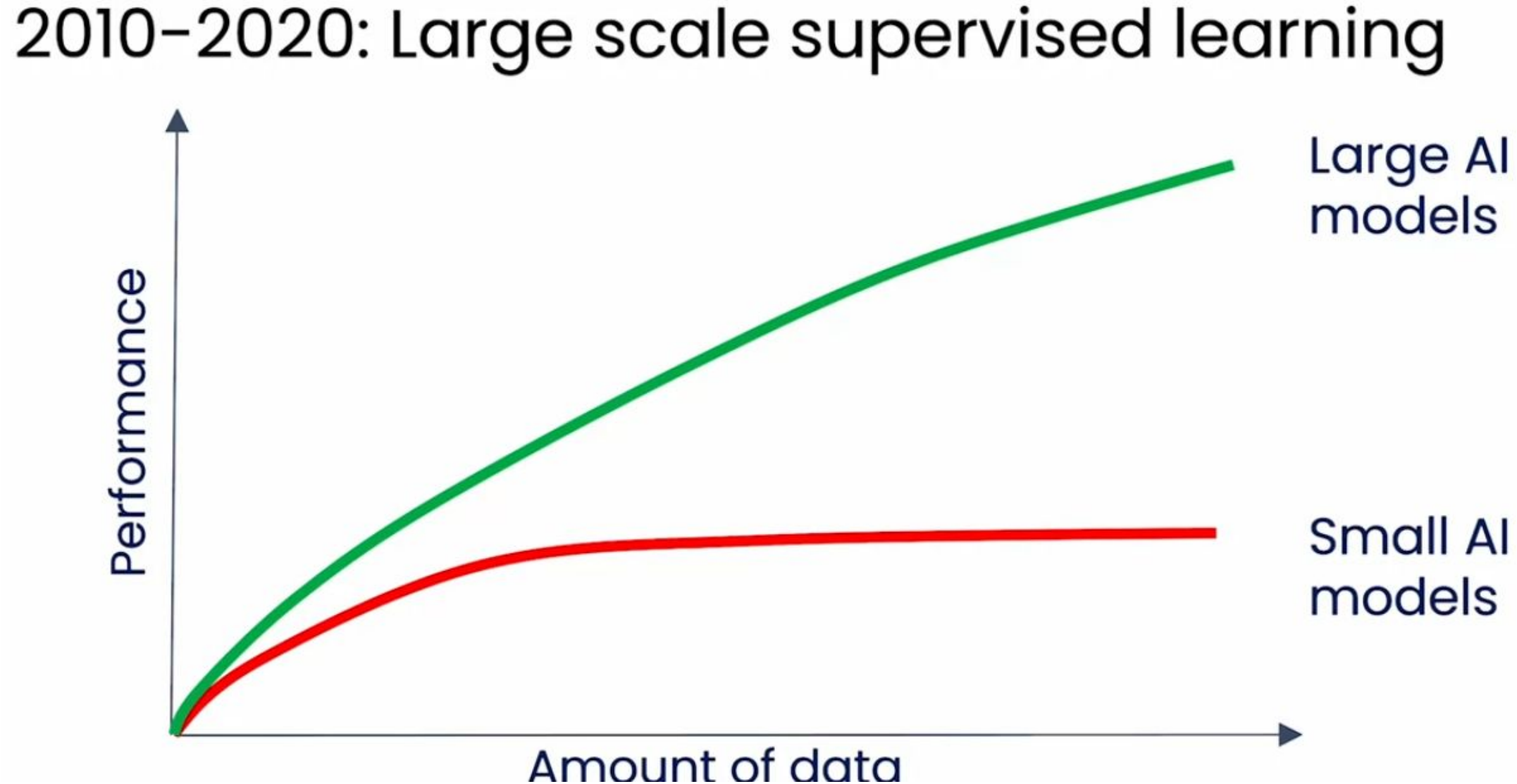
Artificial Neuron / Perceptron

Learning!


AI
Generative AI
Supervised learning
(labeling things)
Unsupervised
learning
Reinforcement
learning

Supervised learning (labeling things)

Input (A)	Output (B)	Application
Email	Spam? (0/1)	Spam filtering
Ad, user info	Click? (0/1)	Online advertising
Image, radar info	Position of other cars	Self-driving car
X-ray image	Diagnosis	Healthcare
Image of phone	Defect? (0/1)	Visual inspection
Audio recording	Text transcript	Speech recognition
Restaurant reviews	Sentiment (pos/neg)	Reputation monitoring


2010-2020: Large scale supervised learning
Performance
Amount of data
Large AI models
Small AI models

Generating text using Large Language Models (LLMs)

Text generation process

I love eating _____

Generating text using Large Language Models (LLMs)

Text generation process

I love eating _____

Generating text using Large Language Models (LLMs)

Text generation process

I love eating _____

prompt

bagels with cream cheese

my mother's meatloaf

out with friends

How Large Language Models (LLMs) work

LLMs are built by using supervised learning (A→B) to repeatedly predict the next word.

How Large Language Models (LLMs) work

LLMs are built by using supervised learning (A→B) to repeatedly predict the next word.

My favorite food is a bagel with cream cheese

Input (A)	Output (B)

How Large Language Models (LLMs) work

LLMs are built by using supervised learning (A→B) to repeatedly predict the next word.

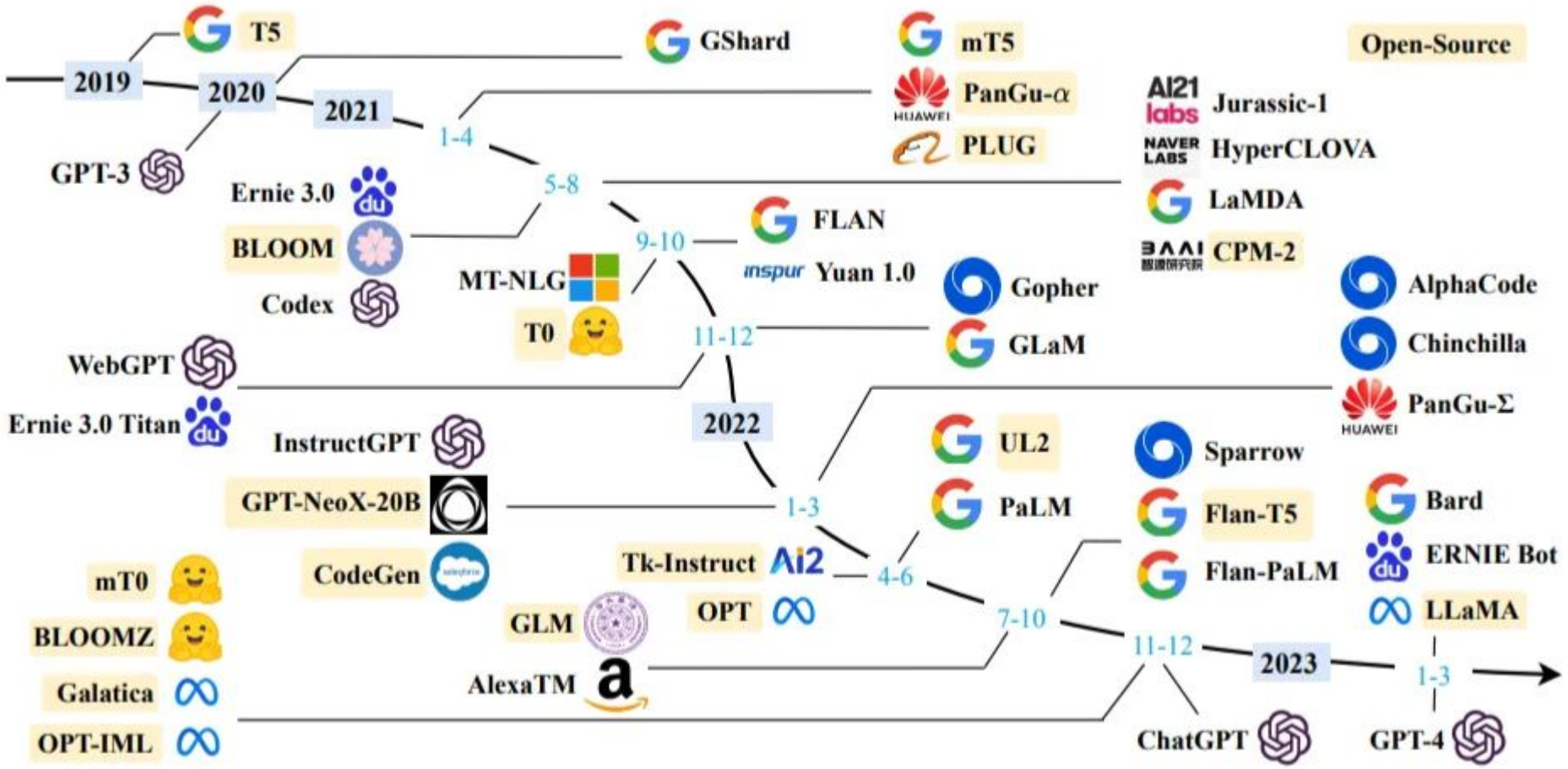
My favorite food is a bagel with cream cheese

Input (A)	Output (B)
My favorite food is a	bagel
My favorite food is a bagel	with
My favorite food is a bagel with	cream
My favorite food is a bagel with cream	cheese

Close source LLM

Bard	ChatGPT	Claude	Cohere	Jurassic
Google	OpenAI	Anthropic	Cohere	AI21
2023-03-21	2022-11-30	2023-03-14	2021-11-15	2021-08-11

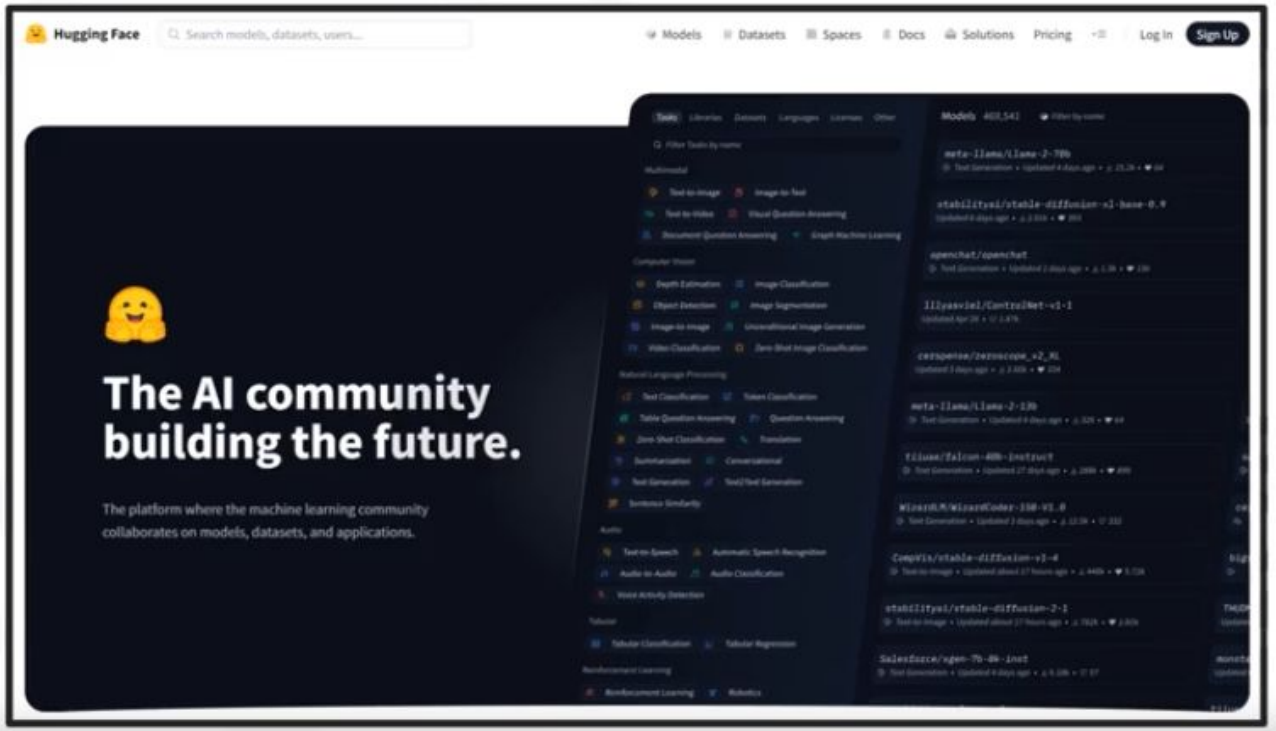
Opensource LLM



What is Hugging Face?

Hugging Face is an open-source AI platform where scientists, developers, and businesses collaborate.

- Build personalized machine learning tools
- Create a hub for the open-source AI community
- Share models, data sets, and applications



LLM Development Tools:

LangChain

VectorDB

Overview

Open-source developer framework for building LLM applications

Python and TypeScript packages

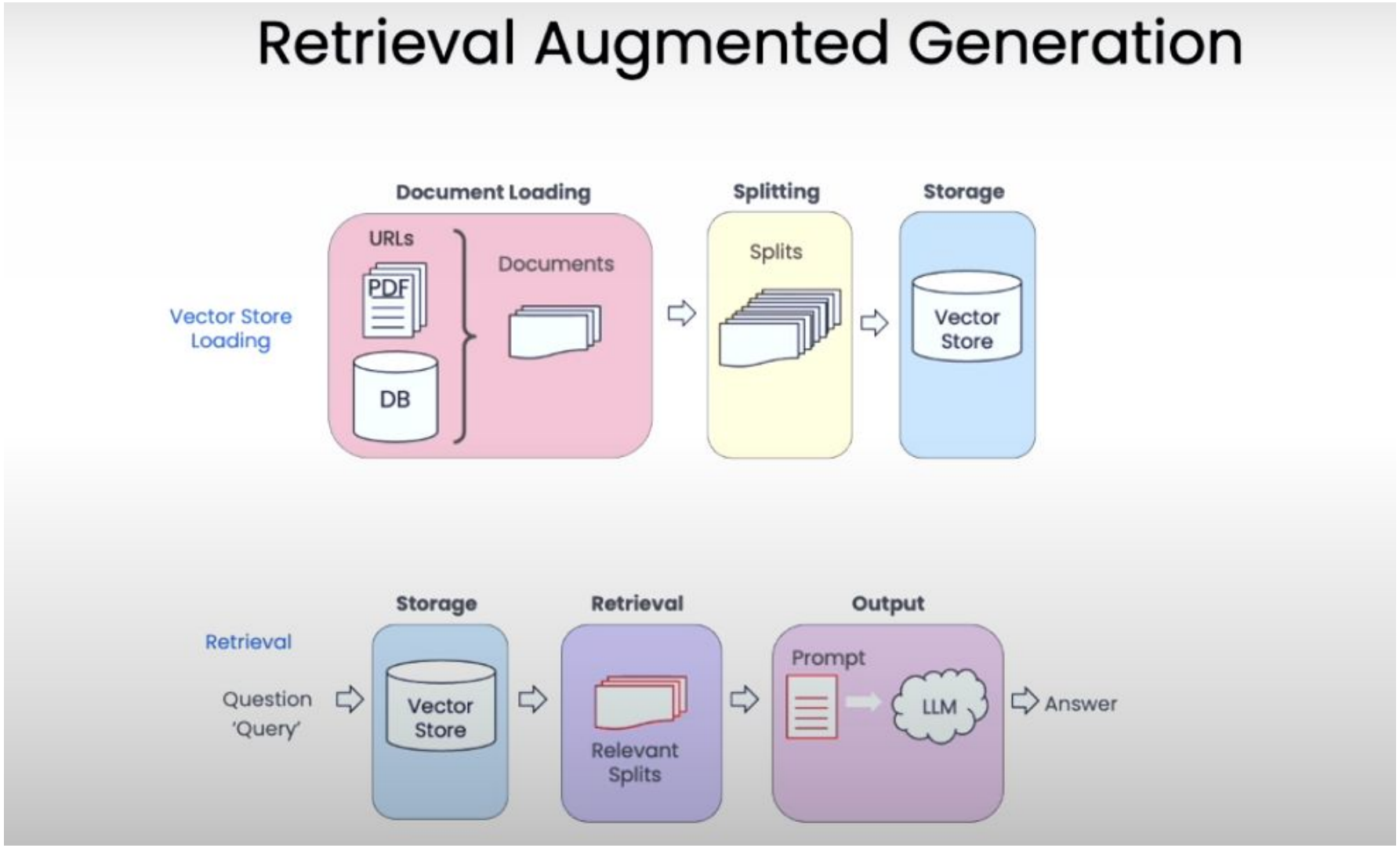
Focused on composition and modularity

Key value adds:

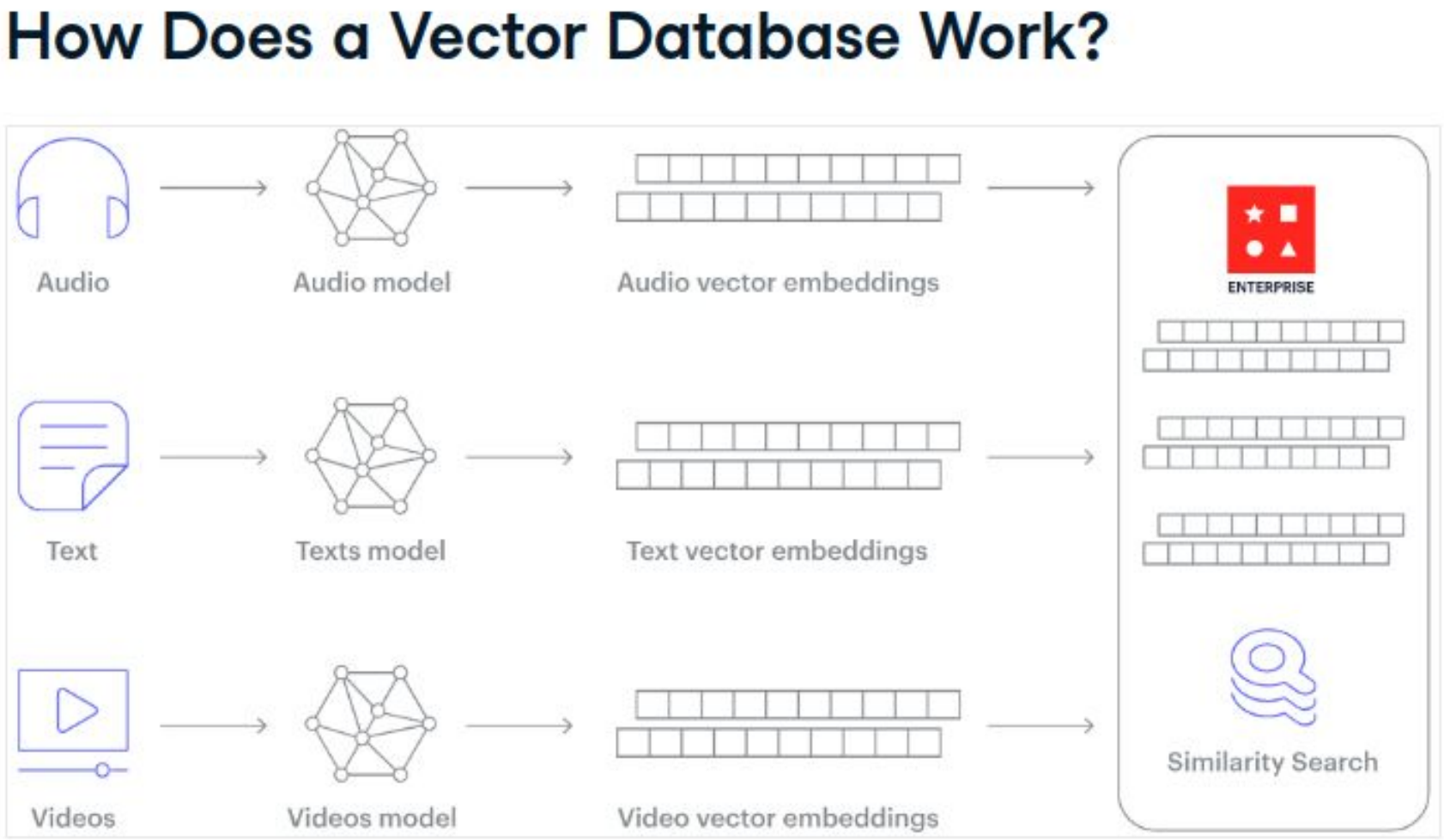
1. Modular components (and implementations of those components)
2. Use cases - common ways to combine those components together

Components

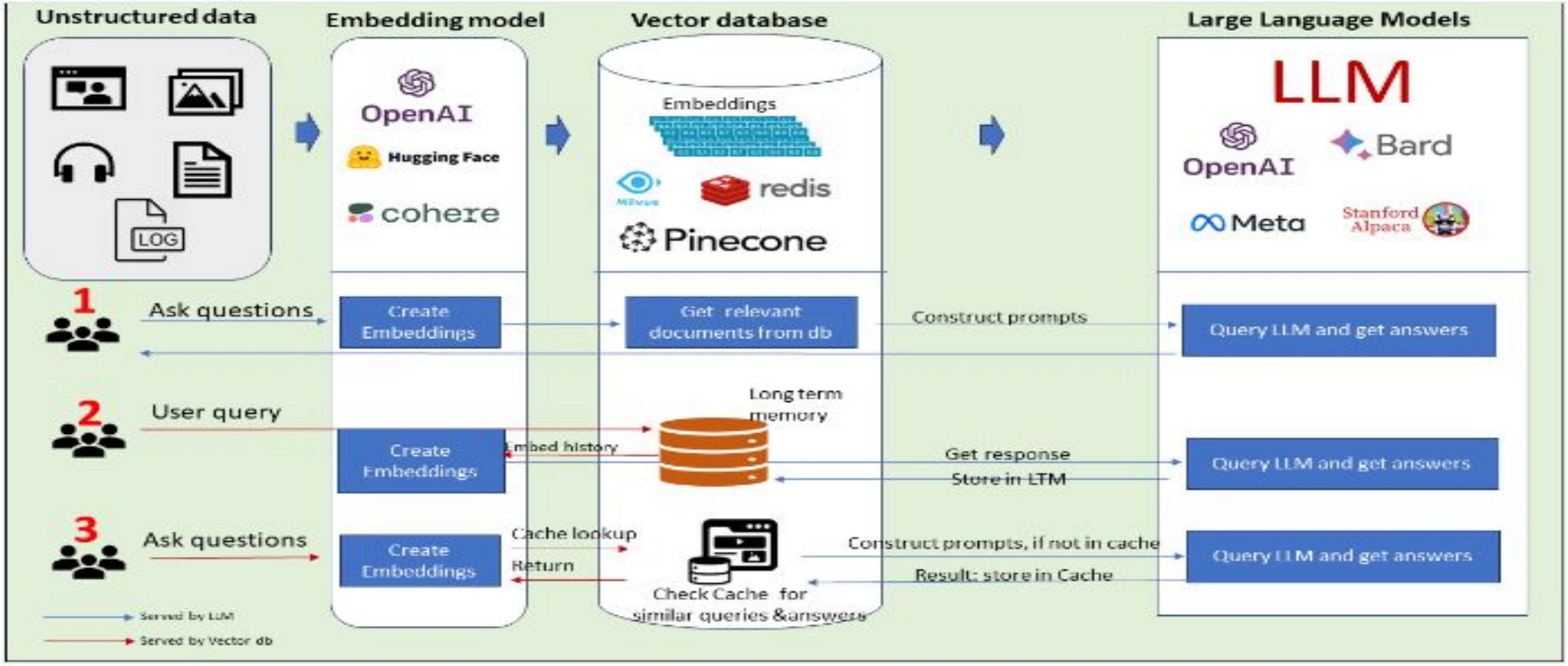
- Prompts
  - Prompt Templates
  - Output Parsers: 5+ implementations
    - Retry/fixing logic
  - Example Selectors: 5+ implementations
- Models
  - LLM's: 20+ integrations
  - Chat Models
  - Text Embedding Models: 10+ integrations
- Indexes
  - Document Loaders: 50+ implementations
  - Text Splitters: 10+ implementations
  - Vector stores: 10+ integrations
  - Retrievers: 5+ integrations/implementations
- Chains
  - Can be used as building blocks for other chains
  - More application specific chains: 20+ different types
- Agents
  - Agent Types: 5+ types
    - Algorithms for getting LLMs to use tools
  - Agent Toolkits: 10+ implementations
    - Agents armed with specific tools for a specific application


Retrieval Augmented Generation
Document Loading
Splitting
Storage
URLs
Documents
PDF
DB
Splits
Vector Store
Vector Store Loading
Storage
Retrieval
Output
Retrieval
Question
'Query'
Vector Store
Relevant Splits
Prompt
LLM
Answer

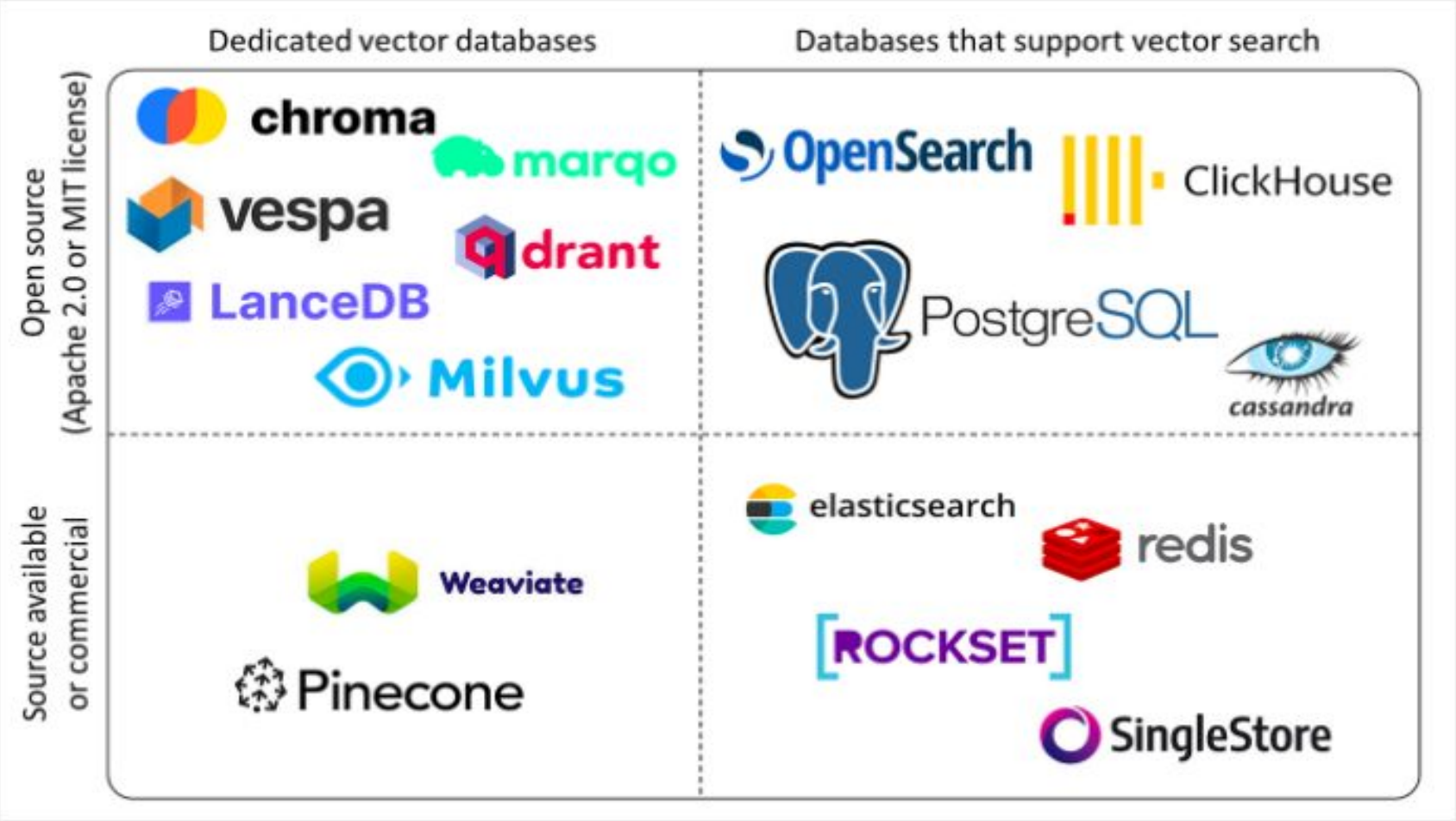
VectorDB


How Does a Vector Database Work?
Audio
Audio model
Audio vector embeddings
Text
Texts model
Text vector embeddings
Videos
Videos model
Video vector embeddings
ENTERPRISE
Similarity Search

VectorDB


Unstructured data
Embedding model
Vector database
Large Language Models
LOG
OpenAI
Hugging Face
cohere
Embeddings
redis
Pinecone
LLM
OpenAI
Bard
Meta
Stanford Alpaca
1
Ask questions
Create Embeddings
Get relevant documents from db
Construct prompts
Query LLM and get answers
2
User query
Long term memory
Create Embeddings
Embed history
Get response
Store in LTM
Query LLM and get answers
3
Ask questions
Create Embeddings
Cache lookup
Return
Check Cache for similar queries &answers
Construct prompts, if not in cache
Result: store in Cache
Query LLM and get answers
Served by LLM
Served by Vector db

VectorDB


Dedicated vector databases
Databases that support vector search
Open source (Apache 2.0 or MIT license)
Source available or commercial
chroma
marqo
vespa
qdrant
LanceDB
Milvus
OpenSearch
ClickHouse
PostgreSQL
cassandra
elasticsearch
redis
Weaviate
ROCKSET
Pinecone
SingleStore

Jobs!
Profile!