Build AI-powered Search Applications with Milvus Vector Database

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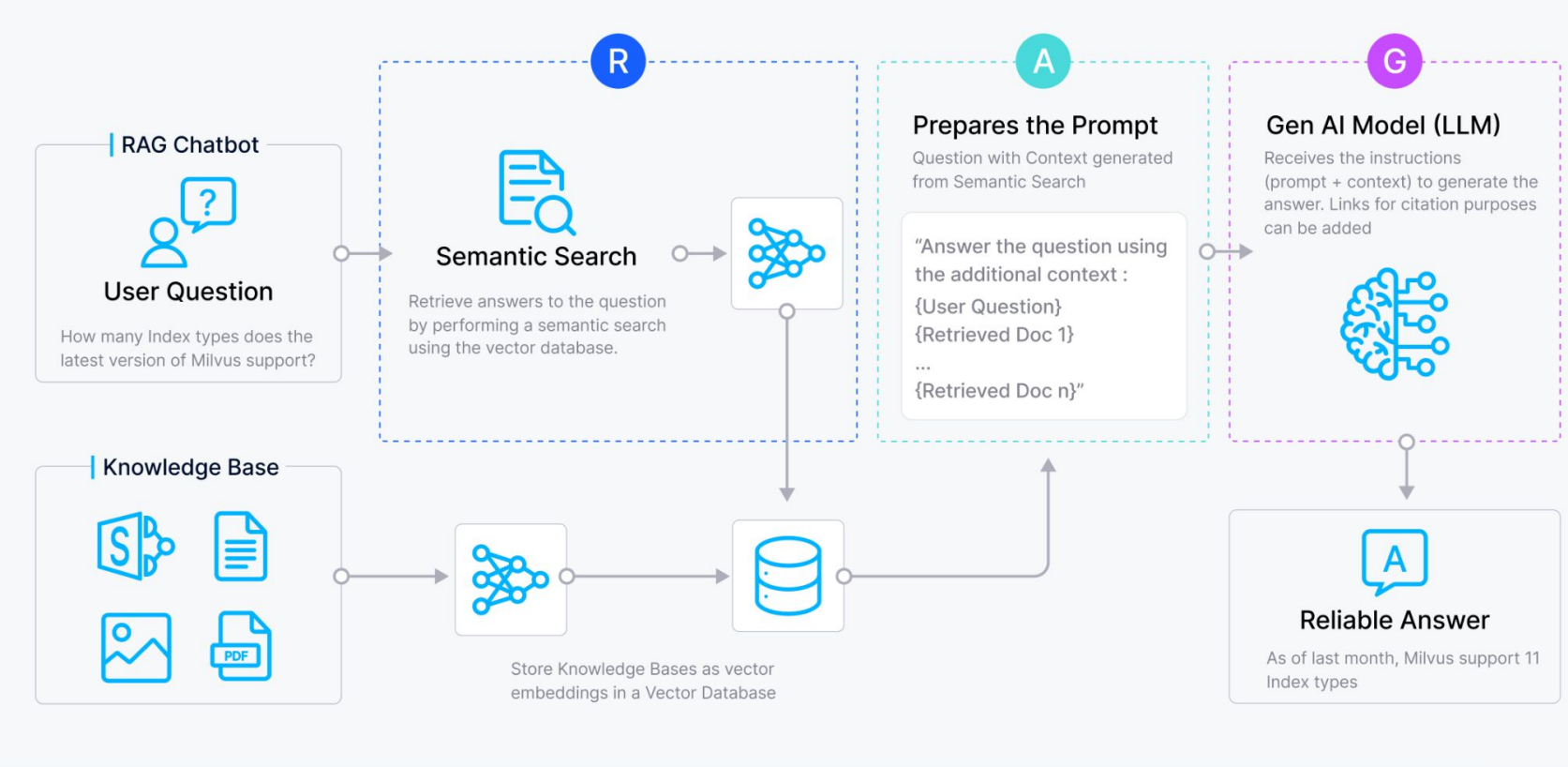
Retrieval-Augmented Generation



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Shifted Search and Data Paradigm

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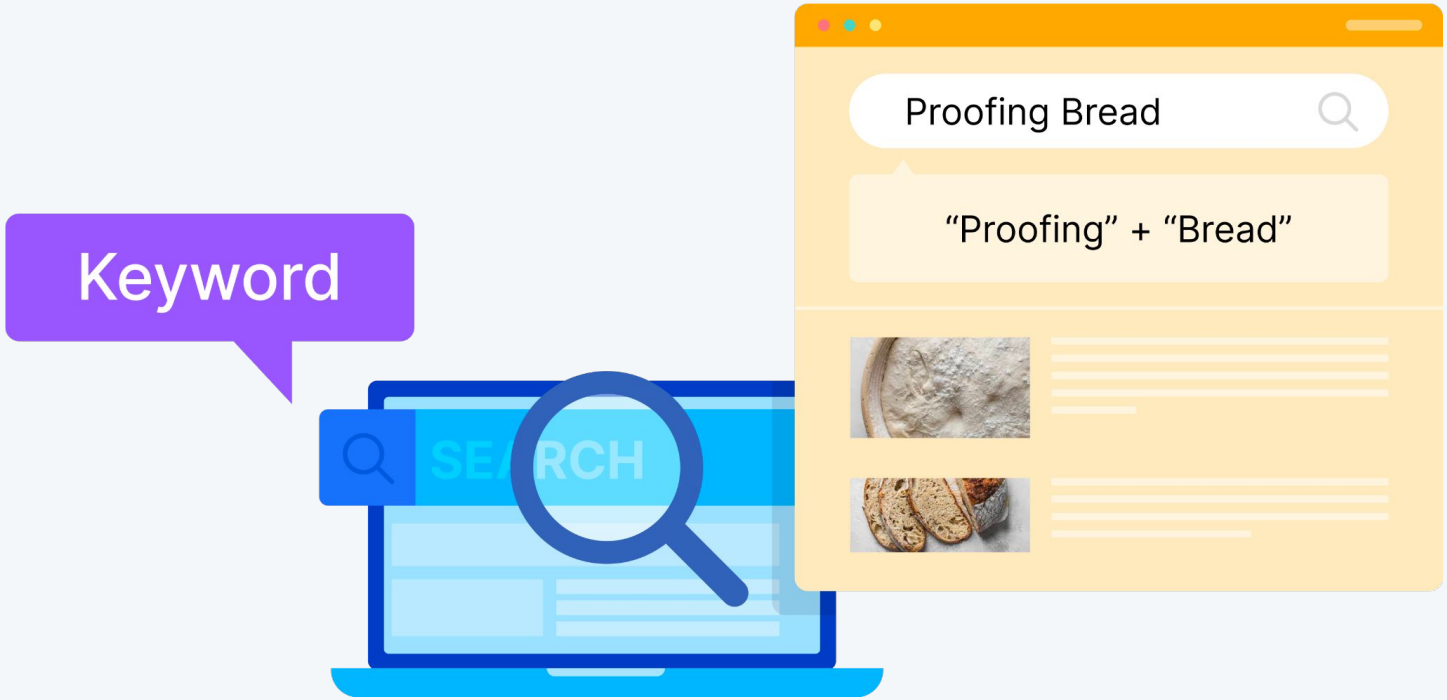
Traditional database was built upon exact search



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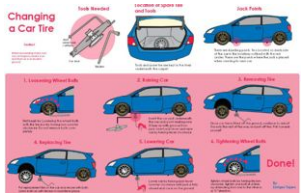
...which misses context, semantic meaning, and user intent

Apple	Rising dough	Change car tire
	Rising Dough ✔	
VS.	*VS.*	*VS.*
	Proofing Bread ❌	

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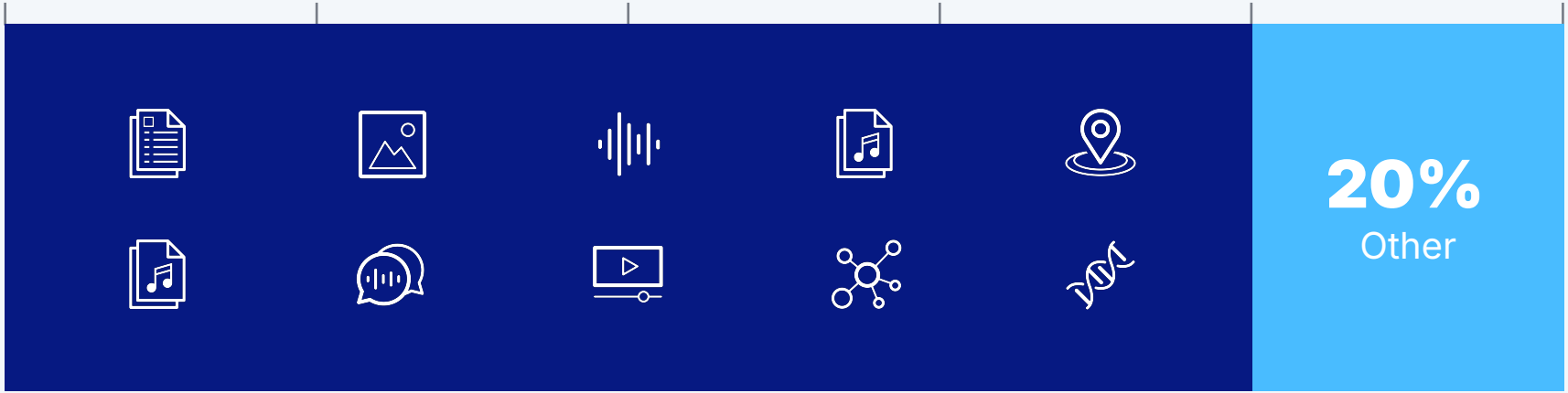
...and cannot process increasingly growing unstructured data

80% **newly generated data in 2025 will be unstructured data**



*Data Source: The Digitization of the World by *IDC*

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The evolution of AI made the semantic search of unstructured data possible

Search by Probability

Statistical analyses of common datasets established the foundation for processing unstructured data, e.g. NLP, and image classification

AI Model Breakthrough

The advancements in BERT, ViT, CBT etc. have revolutionized semantic analysis across unstructured data

Vectorization

Word2Vec, CNNs, Deep Speech pioneered unstructured data embeddings, mapping the words, images, videos into high-dimensional vectors

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This new AI breakthrough requires new databases to fully unleash its potential

Support multiple use case types

Accommodate diverse data requirements, enhancing flexibility and effectiveness in varied operational contexts

Scale as needed

Enable robust handling of expanding data volumes and search demands

Highly performant

Ensures swift and accurate query responses, crucial for optimal user experience

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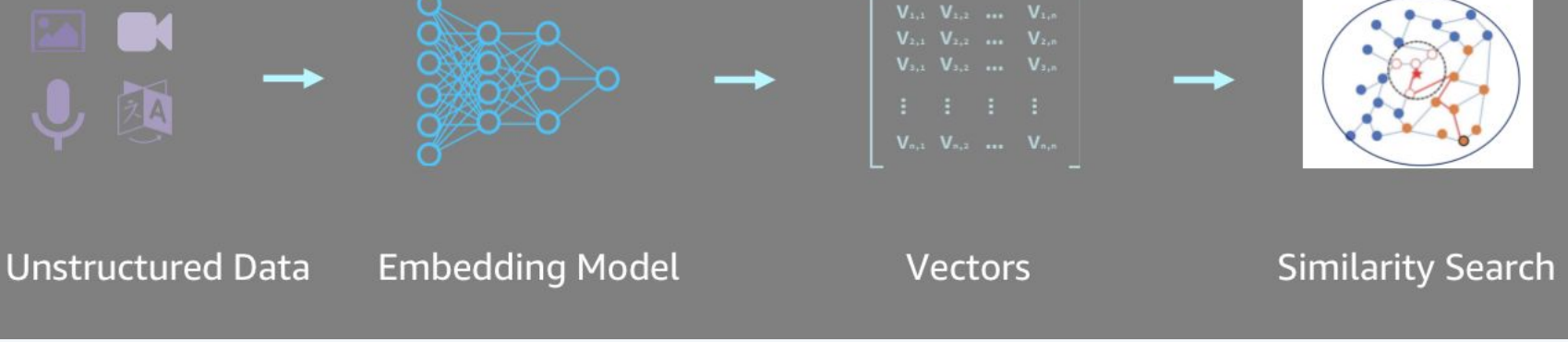

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Milvus: The most widely-adopted vector database

Milvus is an **Open-Source Vector Database** to **store**, **index**, **manage,** and **use** the massive number of **embedding vectors** generated by deep neural networks and LLMs.

400+
contributors

29K+
stars

66M+
docker pulls

2.7K
+
forks

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Built by database & AI experts

Milvus was built by a top-tier team of **algorithm and database engineers** with a strong pedigree in developing **high-performance**, **scalable**, and **highly available** distributed systems, uniquely tailored for **vector search.**

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Milvus Users

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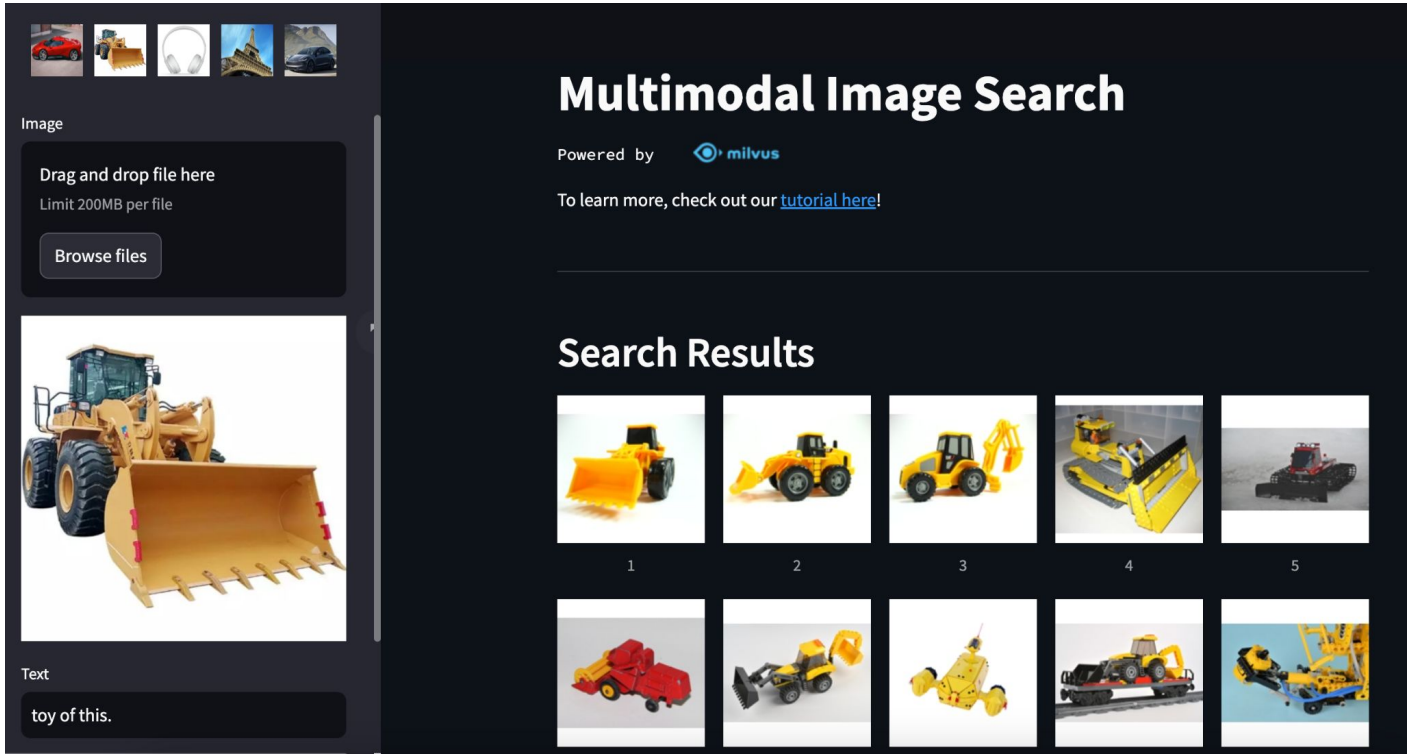
Multi-modal Search



multimodal-demo.milvus.io

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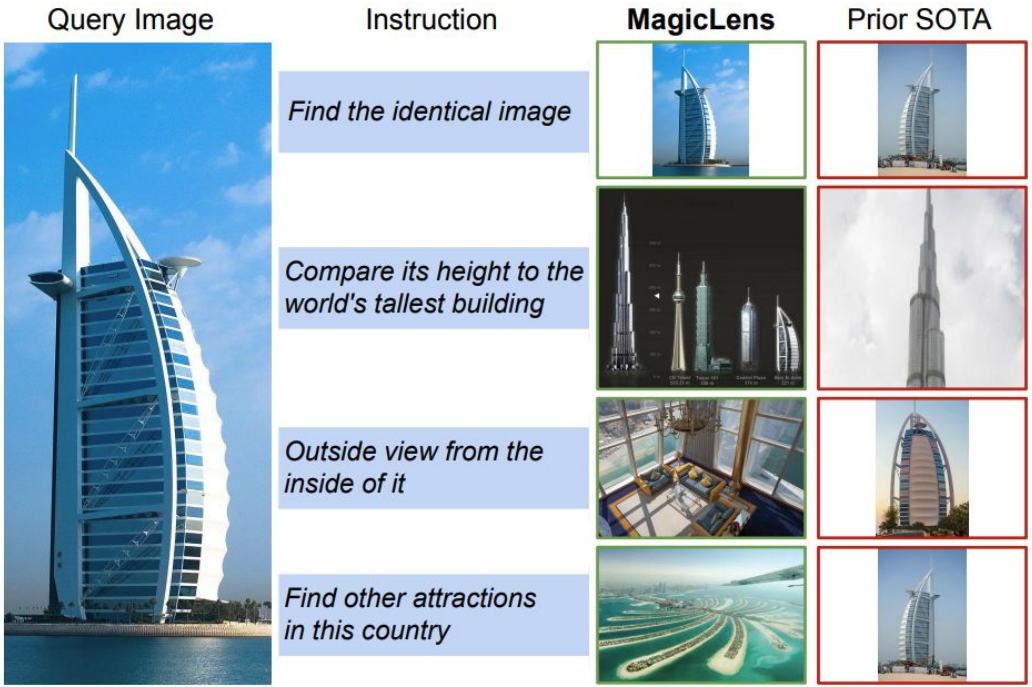
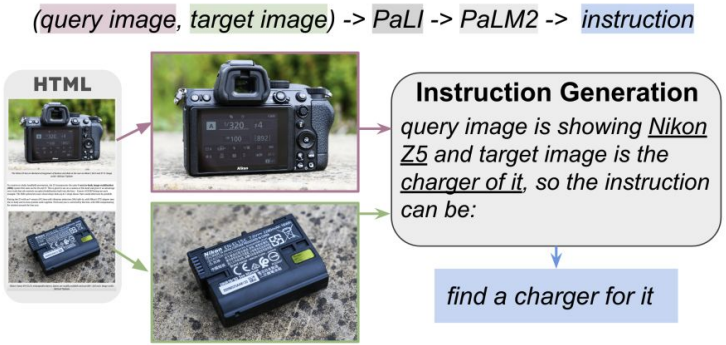
MagicLens





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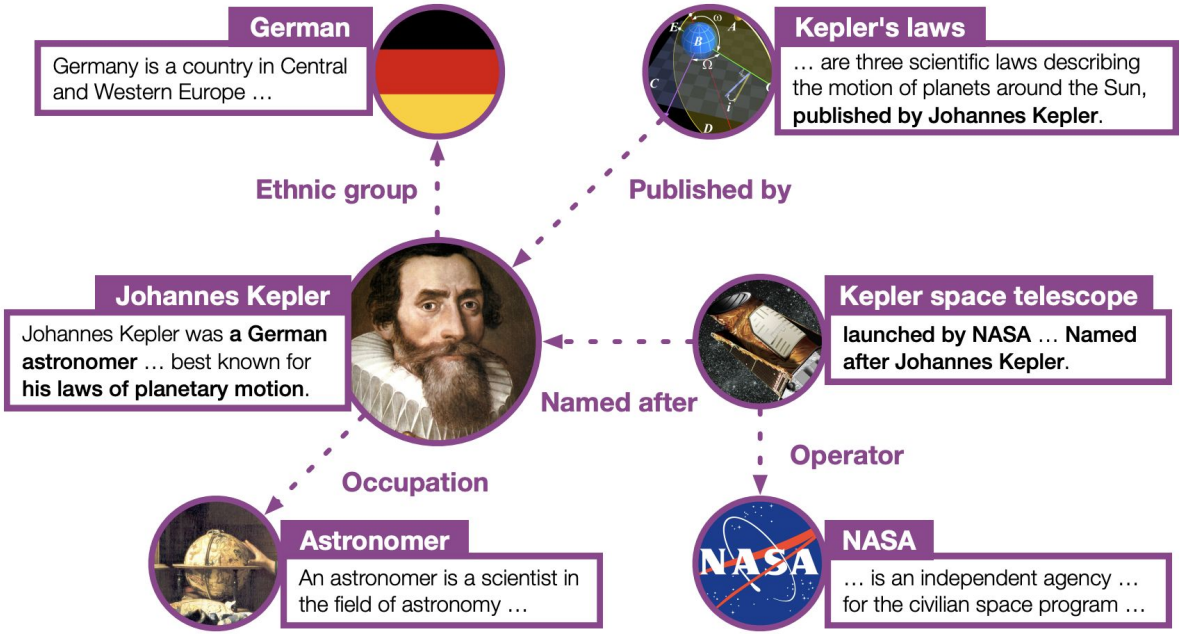
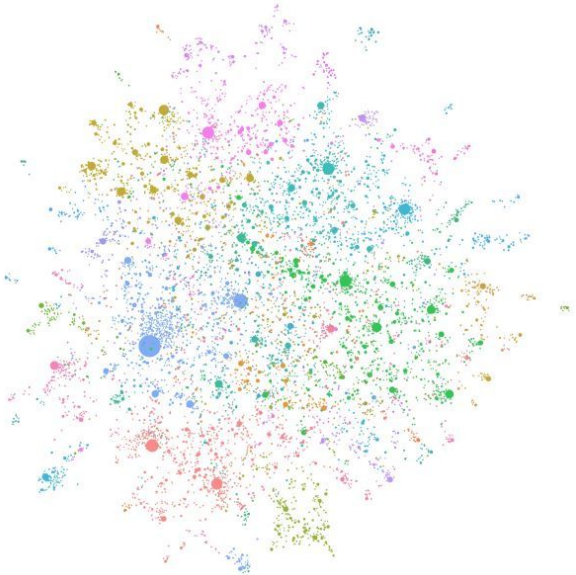
Knowledge Graph and Data Mining



Picture Credit: KEPLER: A Unified Model for Knowledge Embedding and Pre-trained Language Representation



Picture Credit: https://microsoft.github.io/graphrag/

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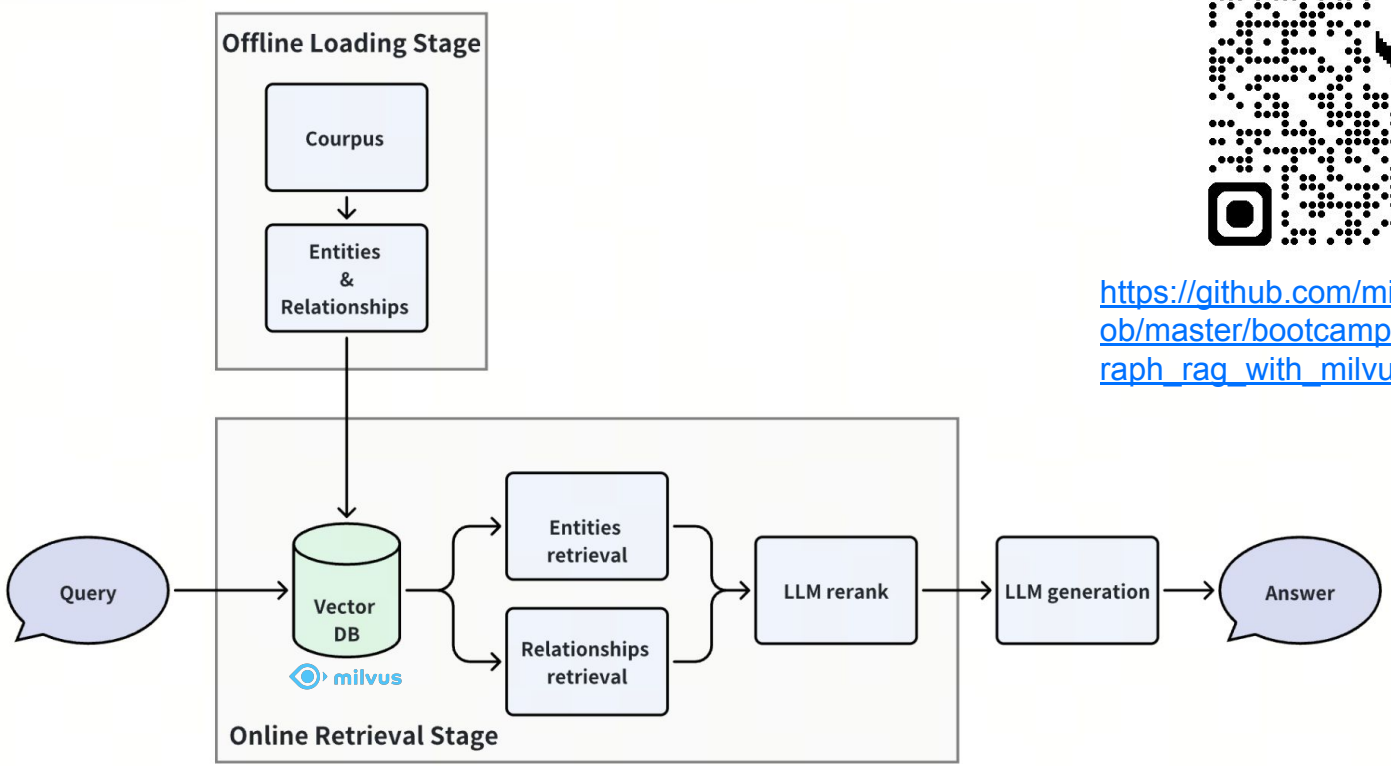
Knowledge Embedding + Vector Search



https://github.com/milvus-io/bootcamp/blob/master/bootcamp/tutorials/quickstart/graph_rag_with_milvus.ipynb

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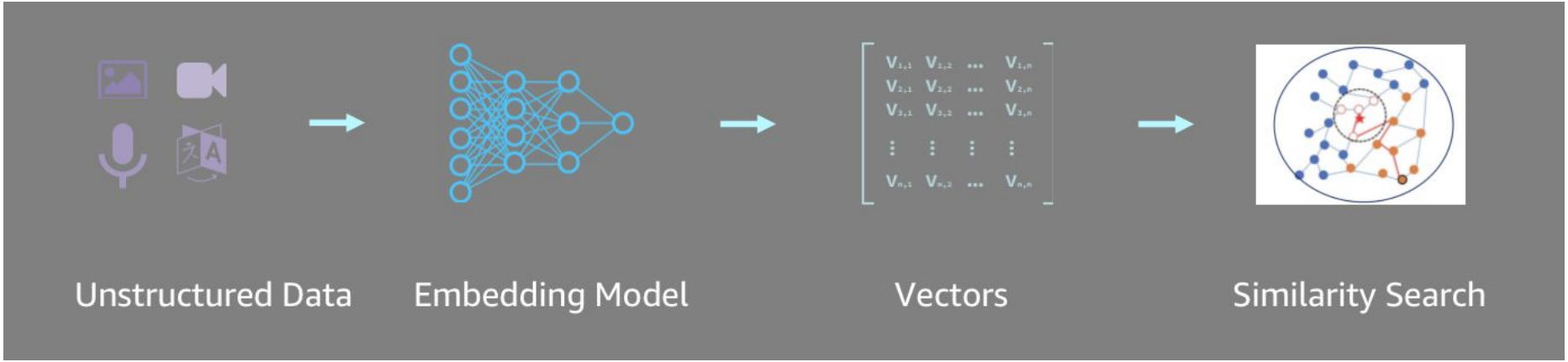
How to Embed Knowledge Entities and Triples



(Alex, *child of*, Brian) → "Alex child of Brian"
(Cole, *married to*, Brian) → "Cole married to Brian"

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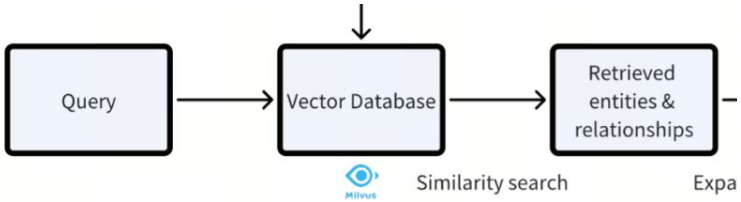
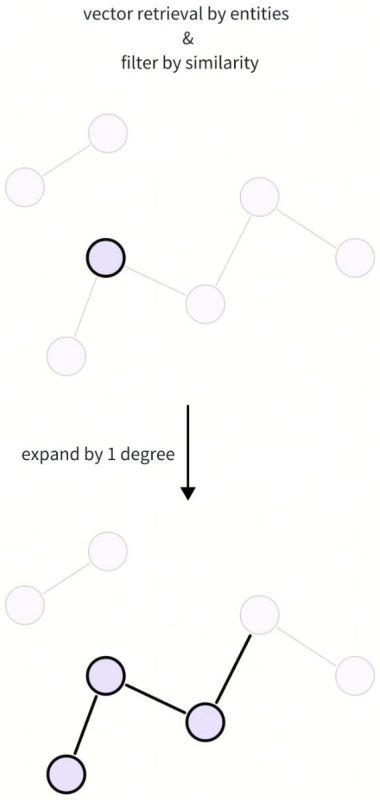
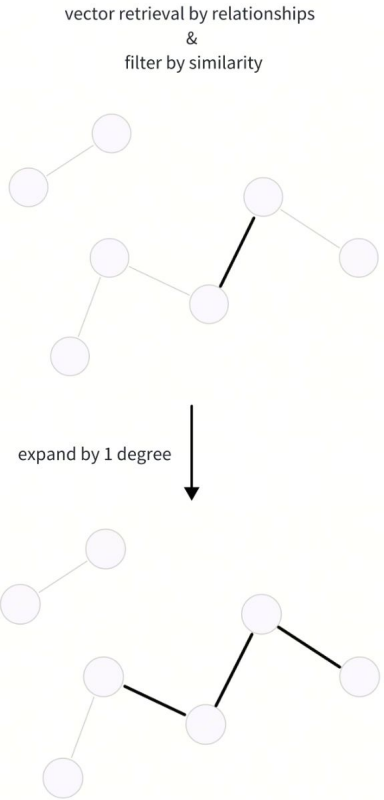
Knowledge Retrieval with Vector Embedding







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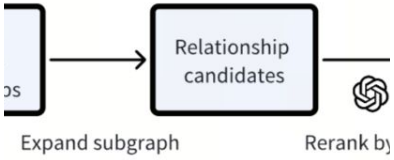
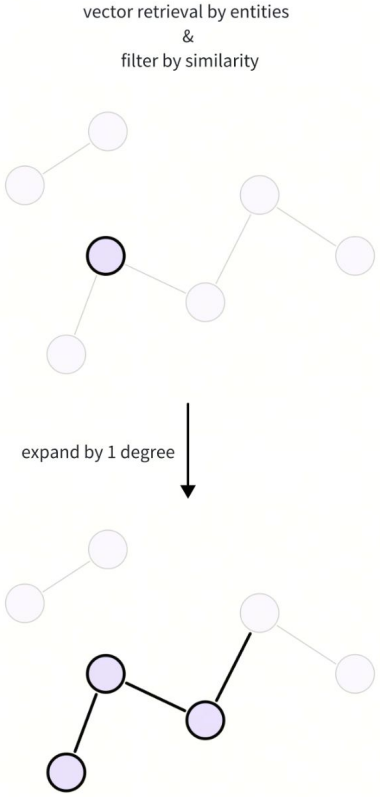
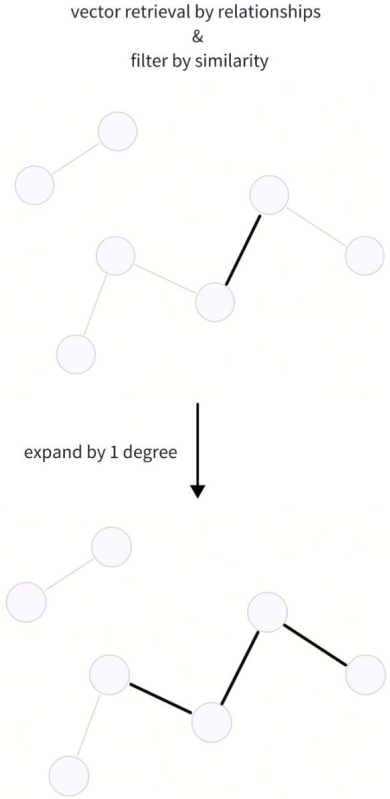
Knowledge Retrieval with Vector Embedding







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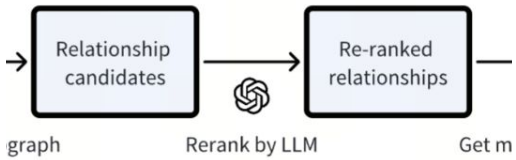
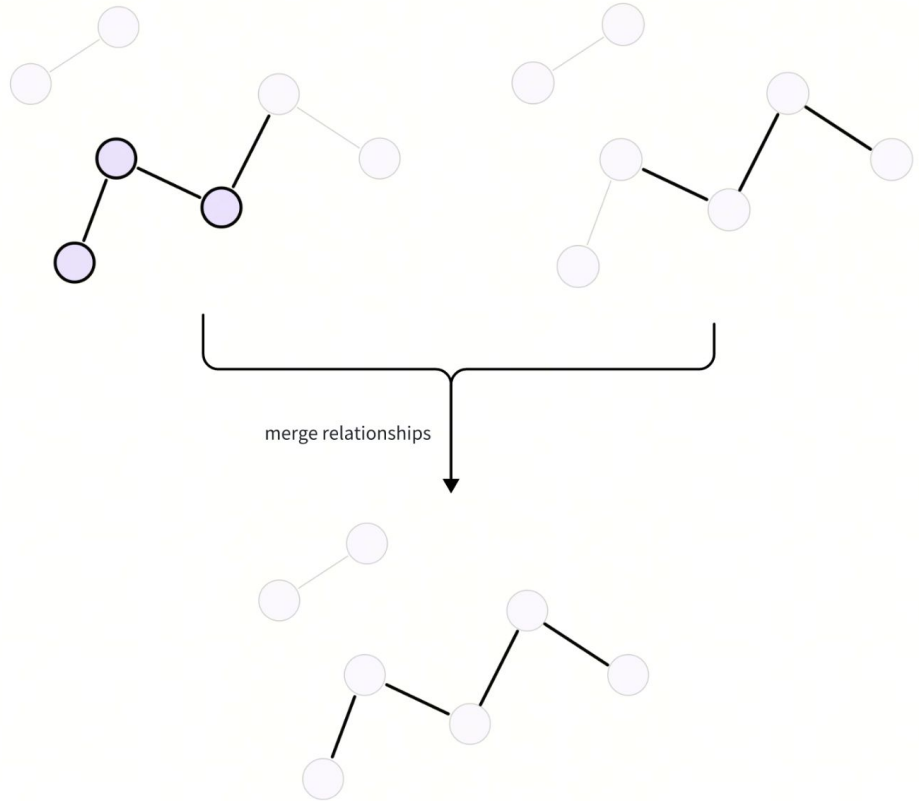
Knowledge Retrieval with Vector Embedding





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Why is Milvus special

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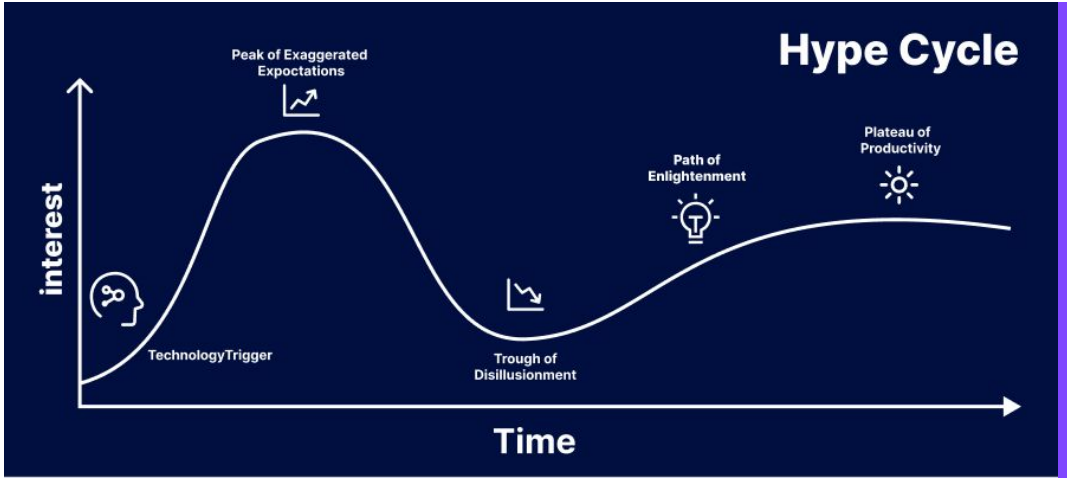
AI Hype?



What do these companies that navigated the "trough of disillusionment" have in common?

Data Volumes.

Unfortunately, Not All The data are born Equal

Use Case: Data Search	**Use Case**: Drug Discovery	**Use Case**: Image Search	**Use Case:** Product Recommender
Vectors: 2 billion	**Vectors:** 12 billion	**Vectors**: 20 billion	**Vectors**: 10 Million
Req'ts: 200 ms, Cost	**Req'ts:** High recall	**Req'ts**: High insertion, Cost	**Req'ts**: 5000 QPS
Index: DiskANN for cost savings	**Index:** BIN_FLAT	**Index**: Disk Based Index	**Index**: HNSW&&Cagra

https://milvus.io/use-cases

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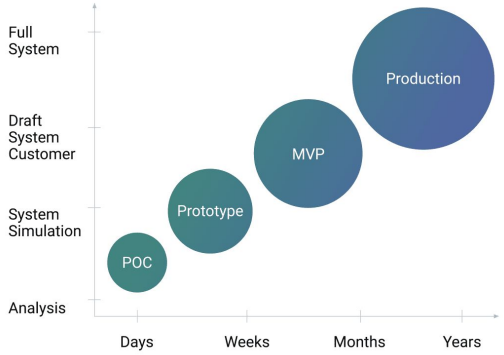
Challenges we see for Vector Search



Challenge 1
Search Quality

Challenge 2
Computation Intensity

Challenge 3
Storage Cost

Challenge 4
Data at Scale

Challenge 5
Ease of Operation

Challenge 6
Ecosystems && Ease of use

Challenge 7
Ensuring Privacy and Security

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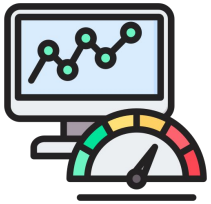
That’s why we build Milvus

And it’s open sourced under Apache license!

Fast & Cost effective



3X faster, 3X Cheaper

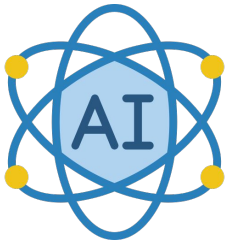
Pluggable Vector Search Lib
Tiered Storage

Scalable & Reliable

Cloud Native, K8s Native

Scale from 1 - 10B
Storage compuation disggregation

AI Powered



Vector Native

Rich functionality for AI
Born for vector data processing

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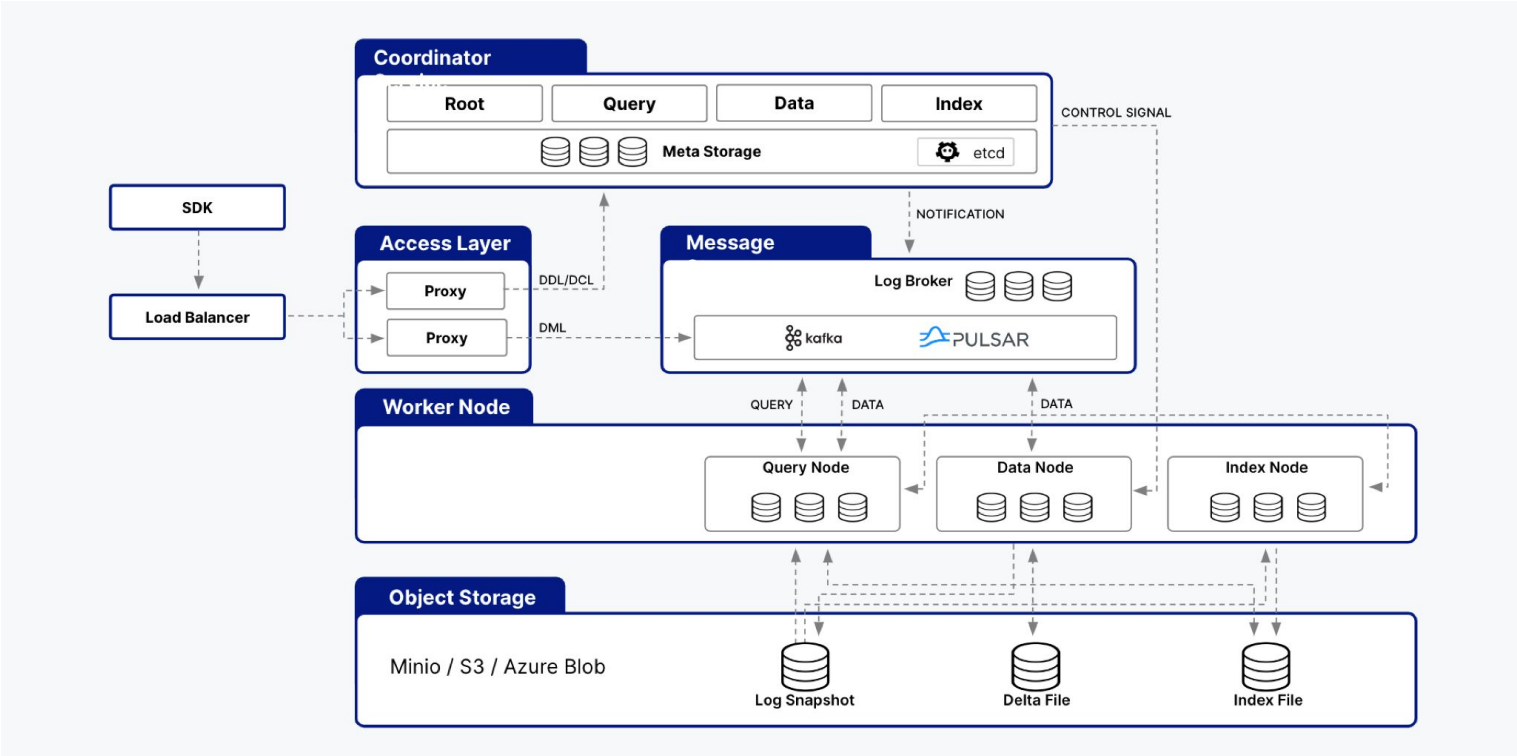
Milvus Architecture



Rich functionality

Dynamic Schema

Float, Binary and
Sparse Vector

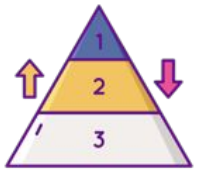
Tag + Vector
Optimized filtering

Hybrid Search
Sparse + Dense

RBAC
TLS, Encryption

Million level
Tenants support

Disk based Index

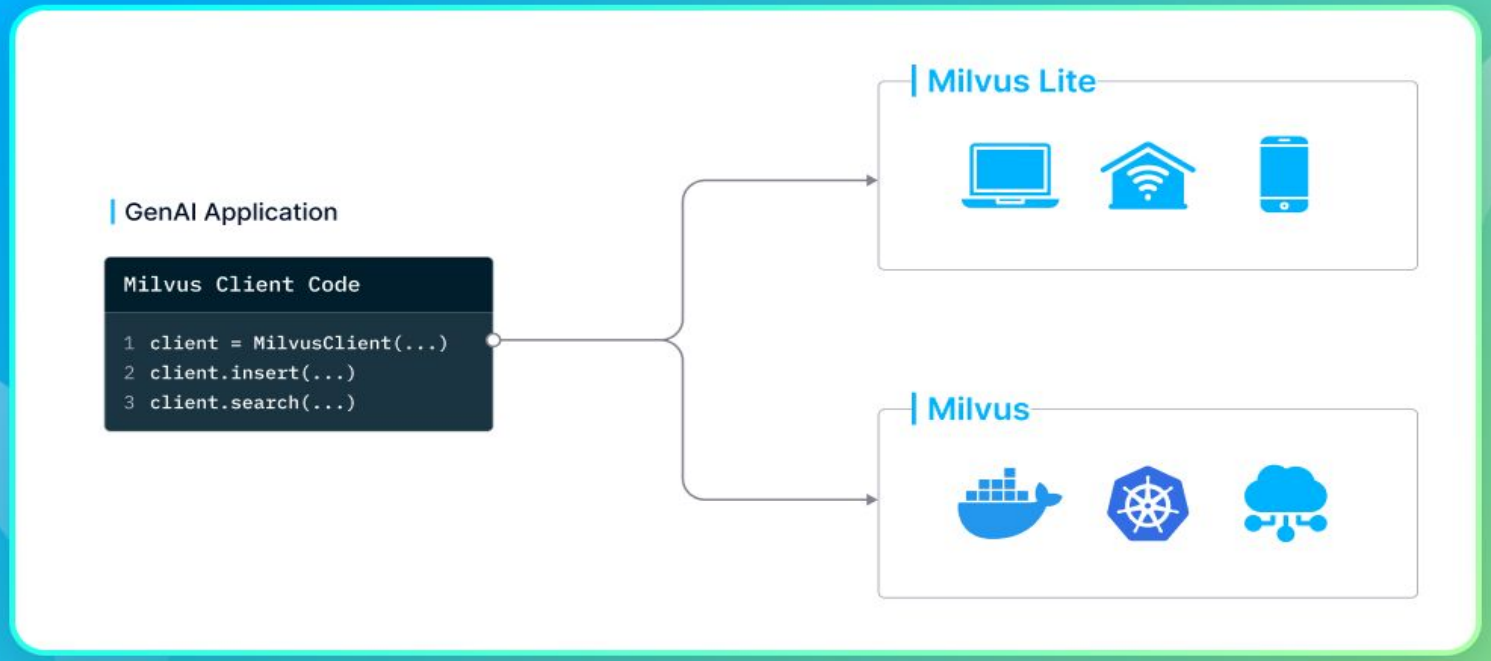


Tiered Storage

Support bulk import

GPU Support
Intel + ARM Cpu Support

Build Once
Deploy Anywhere



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Easy to start with, can even run on edge devices!

Install Milvus

In this guide we use Milvus Lite, a python library included in `pymilvus` that can be embedded into the client application. Milvus also supports deployment on Docker and Kubenetes for production use cases.

Before starting, make sure you have Python 3.7+ available in the local environment. Install `pymilvus` which contains both the python client library and Milvus Lite:

```
$ pip install -U pymilvus
```

Set Up Vector Database

To create a local Milvus vector database, simply instantiate a `MilvusClient` by specifying a file name to store all data, such as "milvus_demo.db".

```
from pymilvus import MilvusClient

client = MilvusClient("milvus_demo.db")
```

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Scale-up on Docker

Install Milvus in Docker

Milvus provides an installation script to install it as a docker container. The script is available in the Milvus repository. To install Milvus in Docker, just run

```
# Download the installation script
$ curl -sfL https://raw.githubusercontent.com/milvus-io/milvus/master/scripts/standalone_embed.sh

# Start the Docker container
$ bash standalone_embed.sh start
```

After running the installation script:

- A docker container named milvus has been started at port **19530**.
- An embed etcd is installed along with Milvus in the same container and serves at port **2379**. Its configuration file is mapped to **embedEtcd.yaml** in the current folder.
- The Milvus data volume is mapped to **volumes/milvus** in the current folder.

```
client = MilvusClient(
    uri="http://localhost:19530",
    token="root:Milvus"
)
```

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Up to 100 billion vectors with K8s!

You can install Milvus Operator in either of the following ways:

- With Helm
- With kubectl

Install with Helm

Run the following command to install Milvus Operator with Helm.

```
$ helm install milvus-operator \
  -n milvus-operator --create-namespace \
  --wait --wait-for-jobs \
  https://github.com/zilliztech/milvus-operator/releases/download/v0.9.15/milvus-operator-0.9.15.tg
```

You will see the output similar to the following after the installation process ends.

```
NAME: milvus-operator
LAST DEPLOYED: Thu Jul  7 13:18:40 2022
NAMESPACE: milvus-operator
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
Milvus Operator Is Starting, use `kubectl get -n milvus-operator deploy/milvus-operator` to check i
If Operator not started successfully, check the checker's log with `kubectl -n milvus-operator logs
Full Installation doc can be found in https://github.com/zilliztech/milvus-operator/blob/main/docs/
Quick start with `kubectl apply -f https://raw.githubusercontent.com/zilliztech/milvus-operator/mai
More samples can be found in https://github.com/zilliztech/milvus-operator/tree/main/config/samples
CRD Documentation can be found in https://github.com/zilliztech/milvus-operator/tree/main/docs/CRD
```

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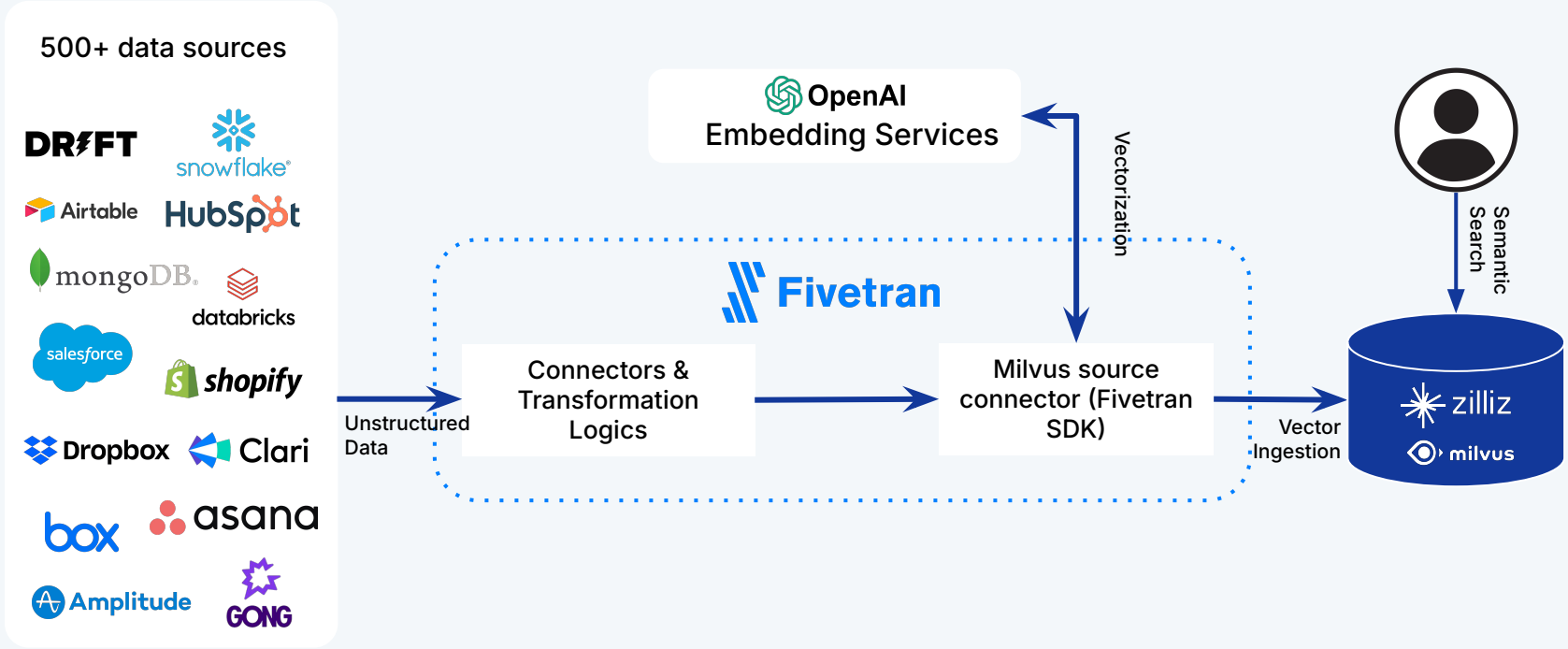
Fivetran Source Connector

Simplify unstructured data retrievals from 500+ system through Fivetran



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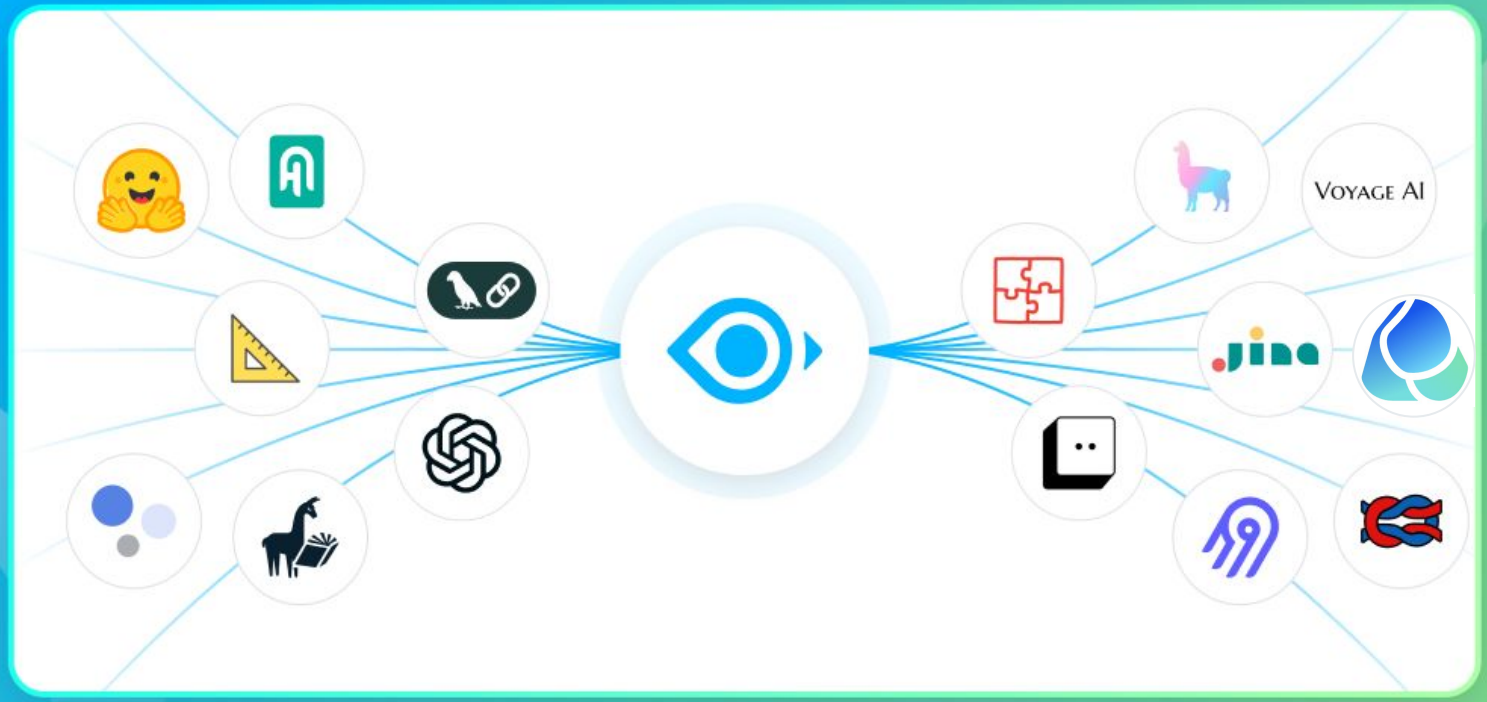
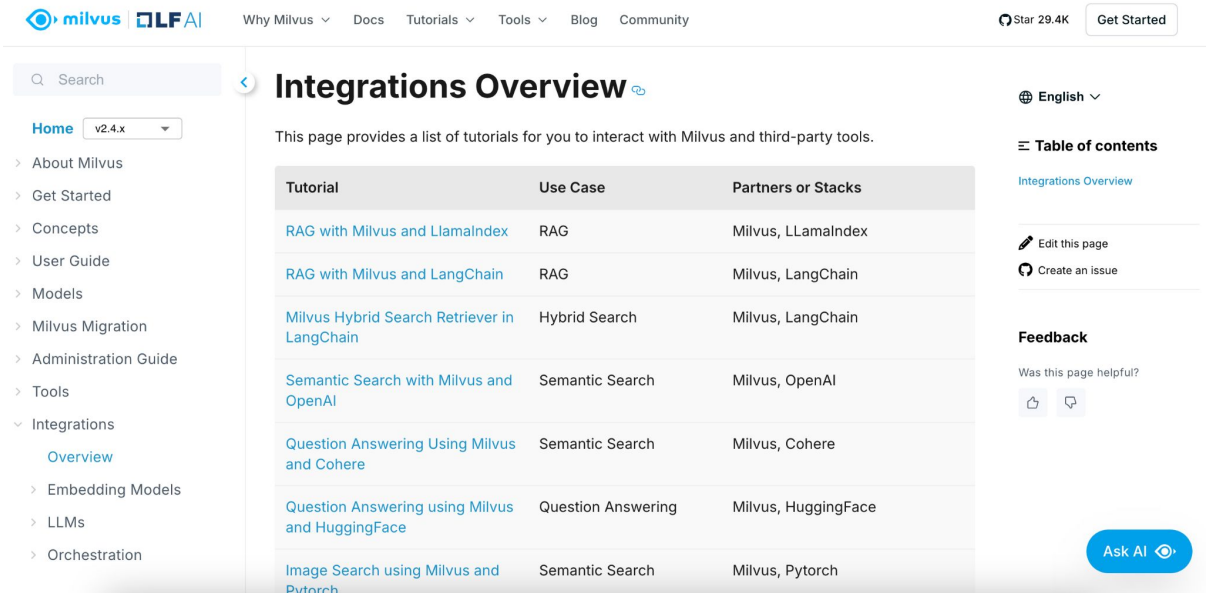
Seamless integration with all popular AI toolkits



milvus

https://milvus.io/docs/integrations_overview.md



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Thank You !

Milvus

Open Source Self-Managed

github.com/milvus-io/milvus

Zilliz Cloud

SaaS Fully-Managed

zilliz.com/cloud

🔗 milvus.io for tutorials/notebooks

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