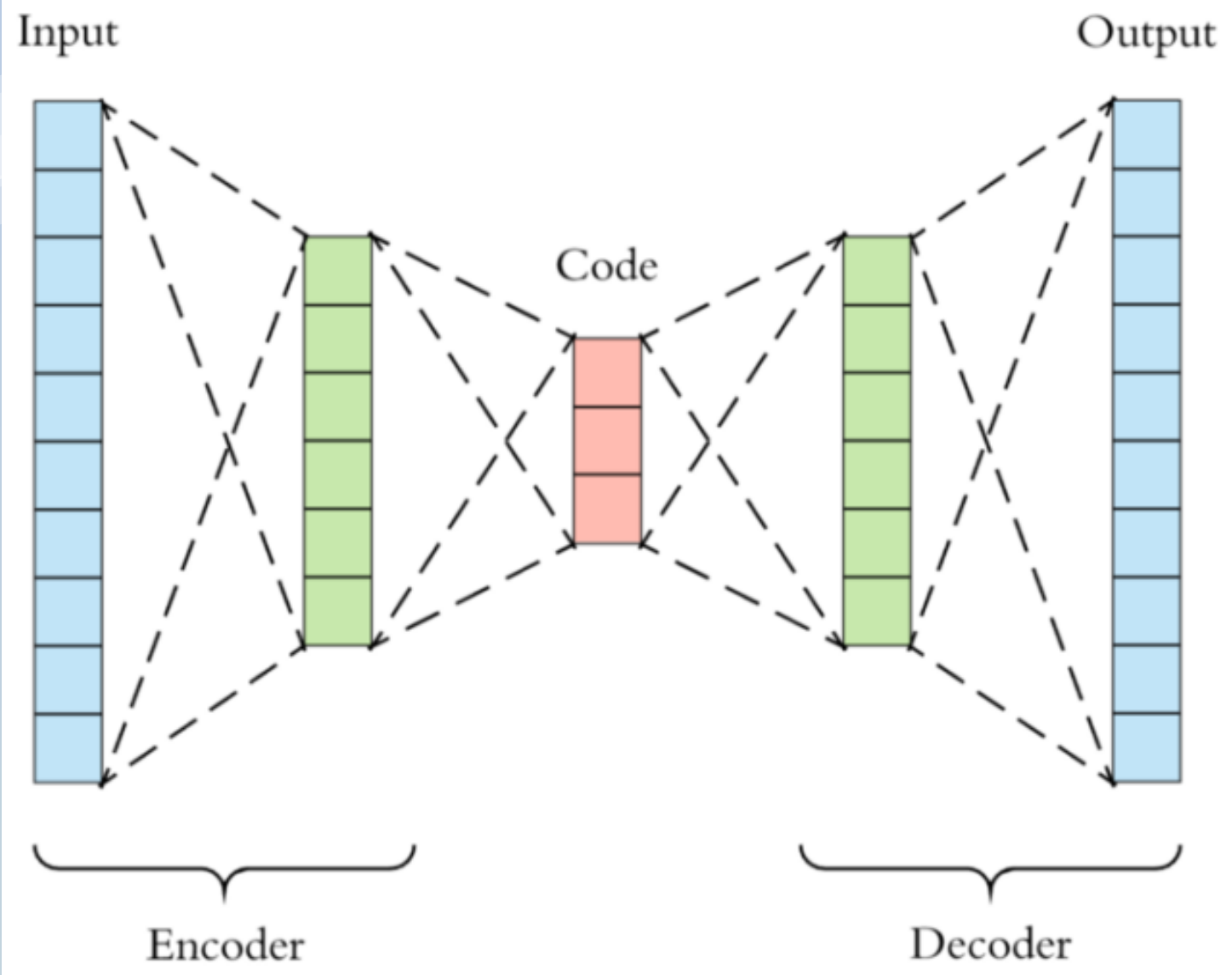
BASE DE DATOS DE VECTORES

- 25/11/2023

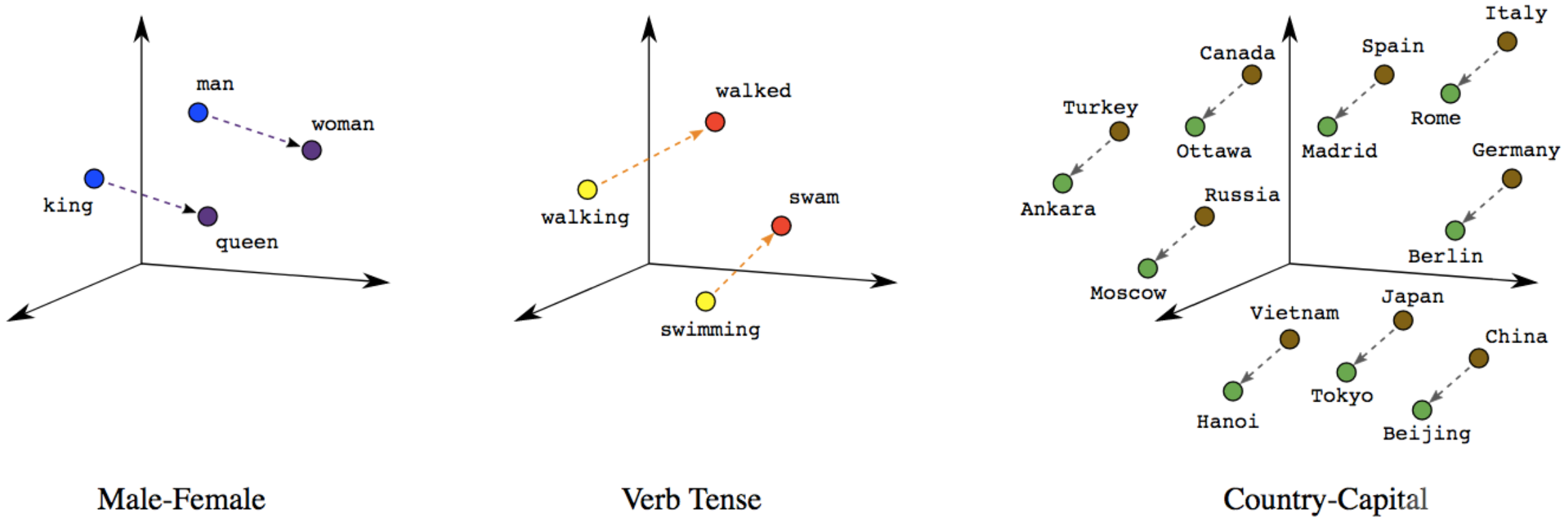
EMBEDDINGS VARIABLES LATENTES

- Un embedding es un espacio de dimensiones relativamente bajas en el que puede traducir vectores de dimensiones altas.
- Los embeddings facilitan el aprendizaje automático en entradas grandes, como vectores dispersos que representan palabras.

EMBEDDINGS



EMBEDDINGS



Male-Female

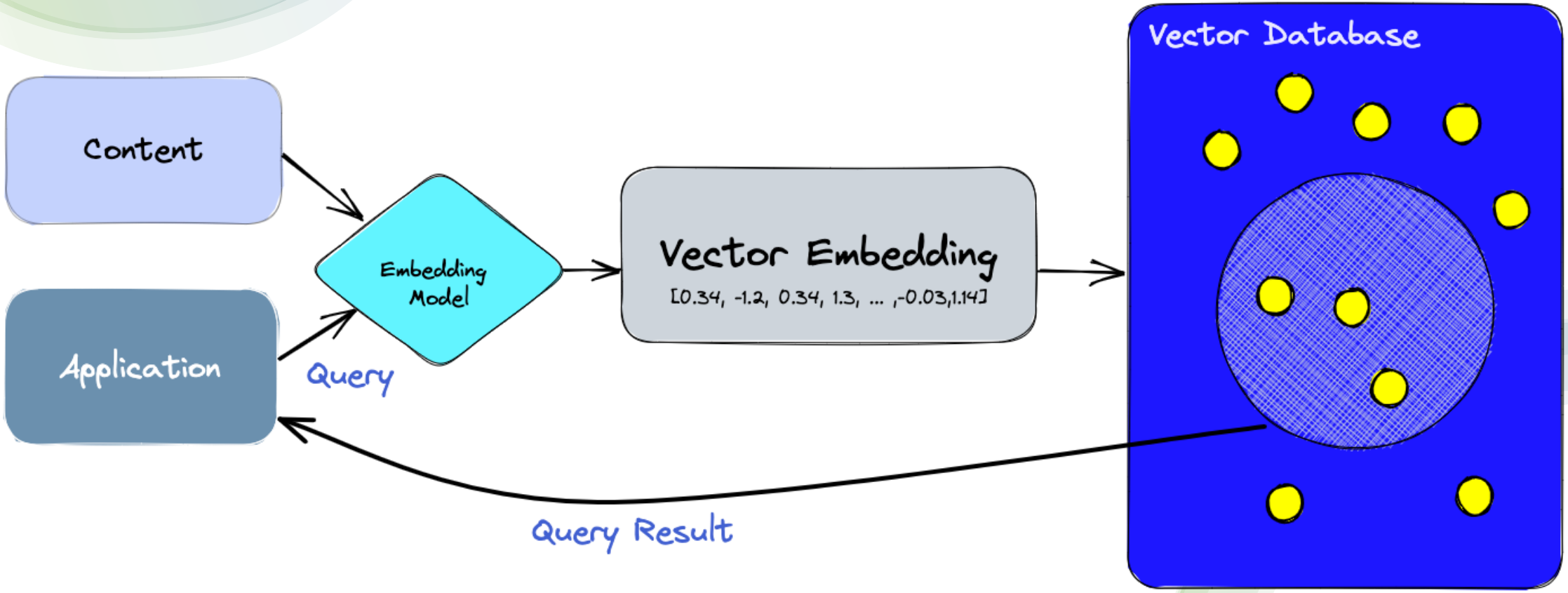
Verb Tense

Country-Capital

BASE DE DATOS DE VECTORES

- A vector database is a type of database that stores data as high-dimensional vectors, which are mathematical representations of features or attributes. Each vector has a certain number of dimensions, which can range from tens to thousands, depending on the complexity and granularity of the data.

Workflow


Content
Application
Embedding Model
Query
Vector Embedding
[0.34, -1.2, 0.34, 1.3, ... ,-0.03,1.14]
Vector Database
Query Result

METODOS DE BUSQUEDA

- ESTABLECER METRICAS Y MEDIDAS DE DISTANCIA
- COMO OBTENEMOS LOS VECTORES MÁS “PARECIDOS”

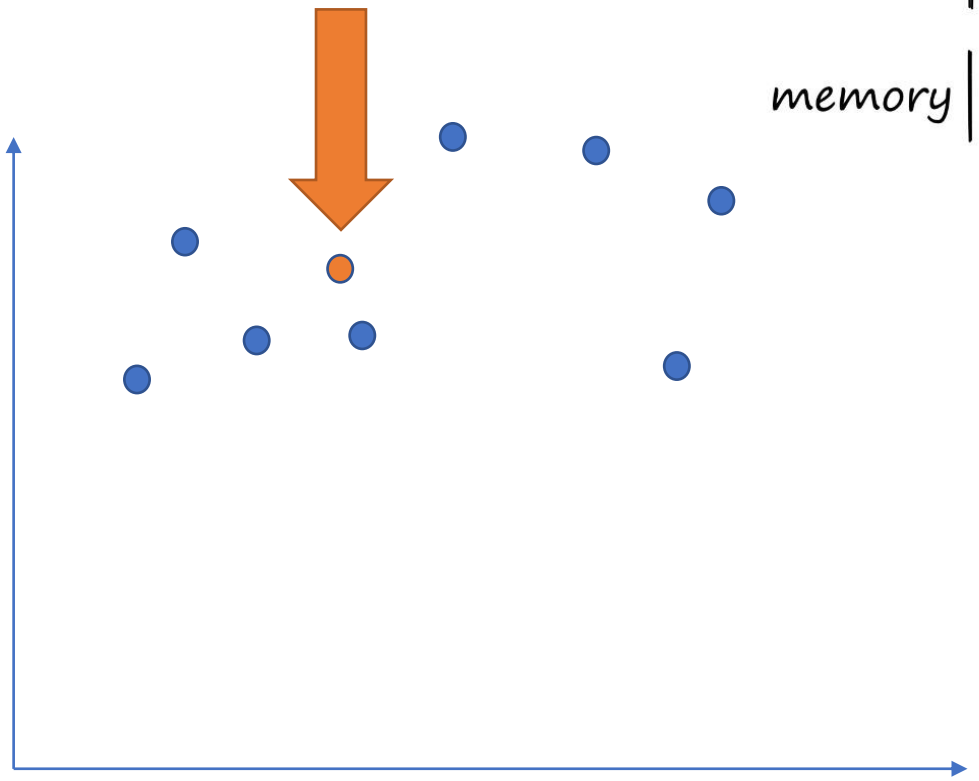
MÉTRICAS DE BUSQUEDA

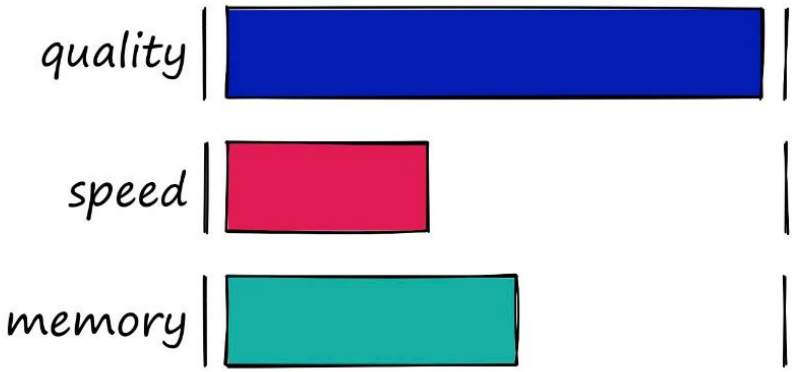
- Euclideana (**L2**)
- Producto Interno (**IP**)
- Similaridad por coseno (**normalize_L2**)

METODOS DE BUSQUEDA

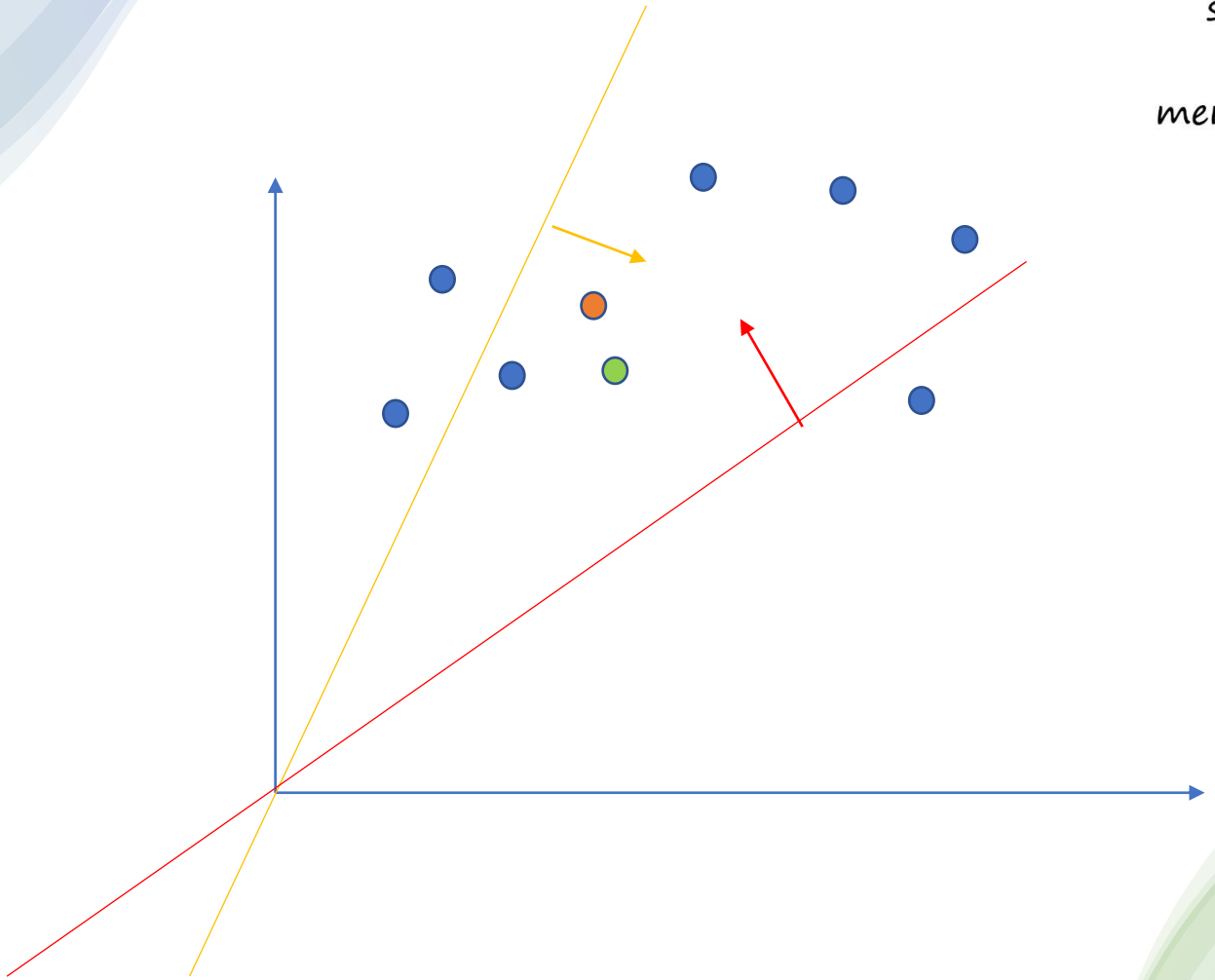
- kNN (**FLAT)**
- **L**ocal **S**ensitivity **H**ashing (**LSH**)
- **H**ierarchical **N**avigable **S**mall **W**orld (**HNSW**)
- **P**roduct **Q**uantization (**PQ**)
- **I**nverted **F**ile **I**ndex (**IVF**)

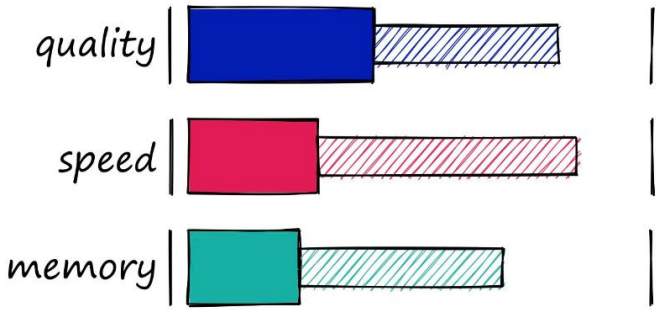
KNN



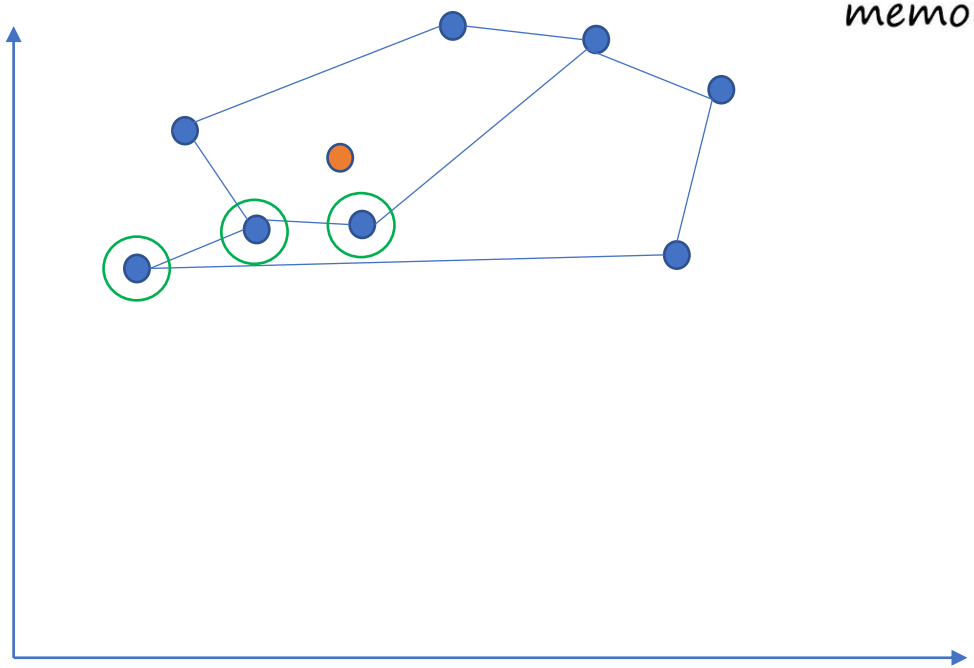


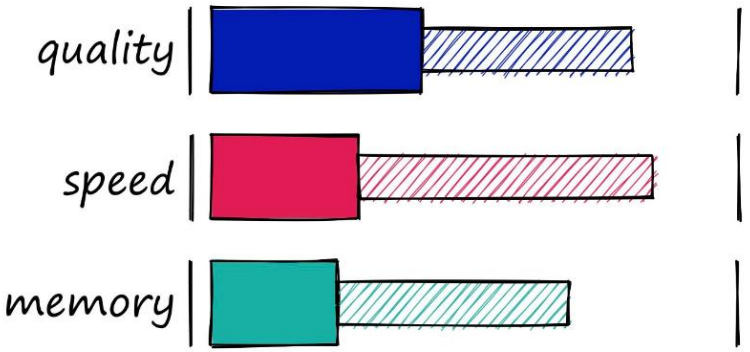
LSH



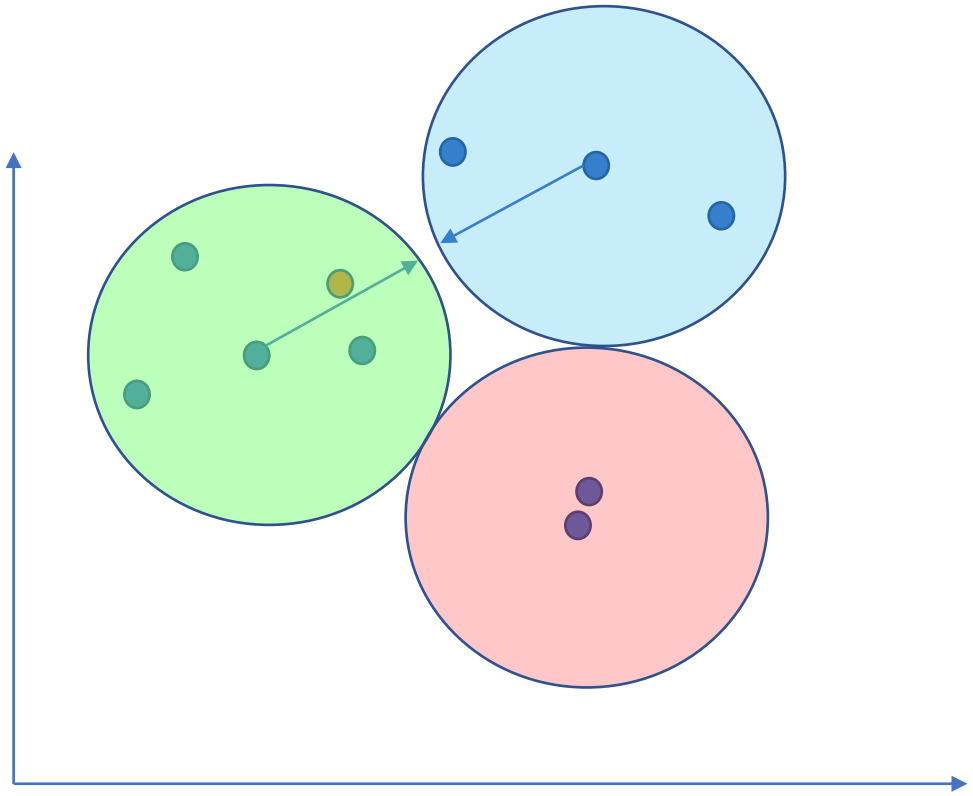


HNSW

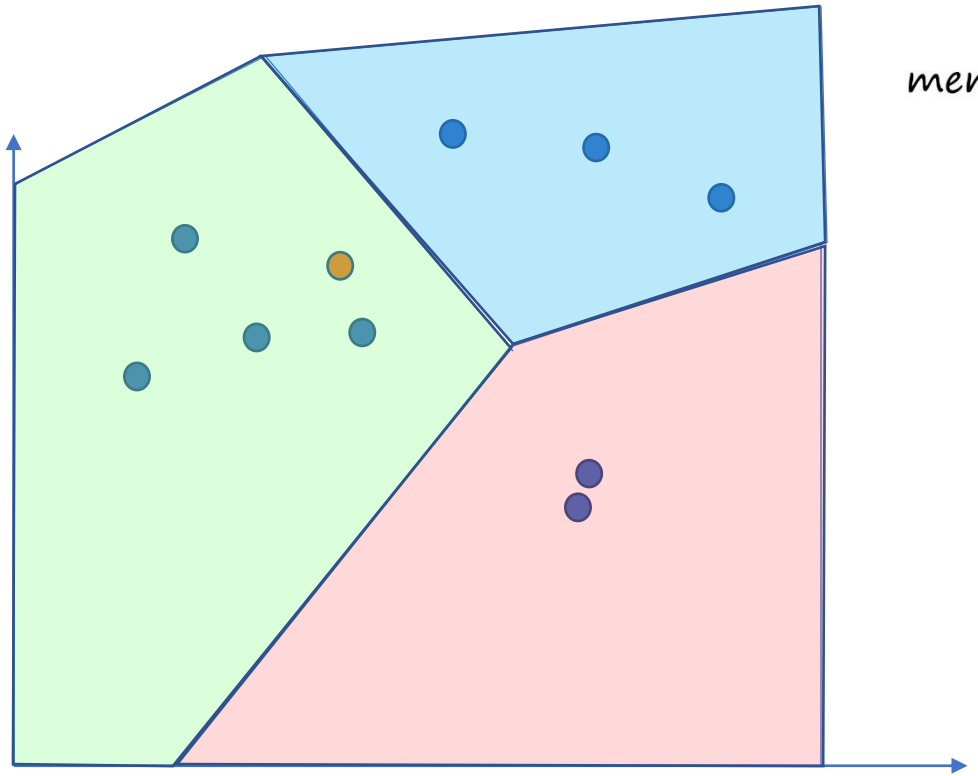


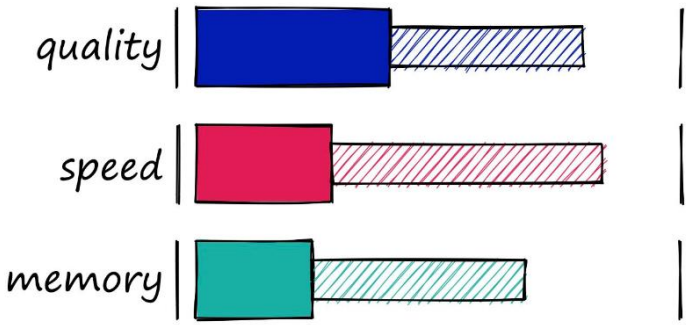


IVF



IVF

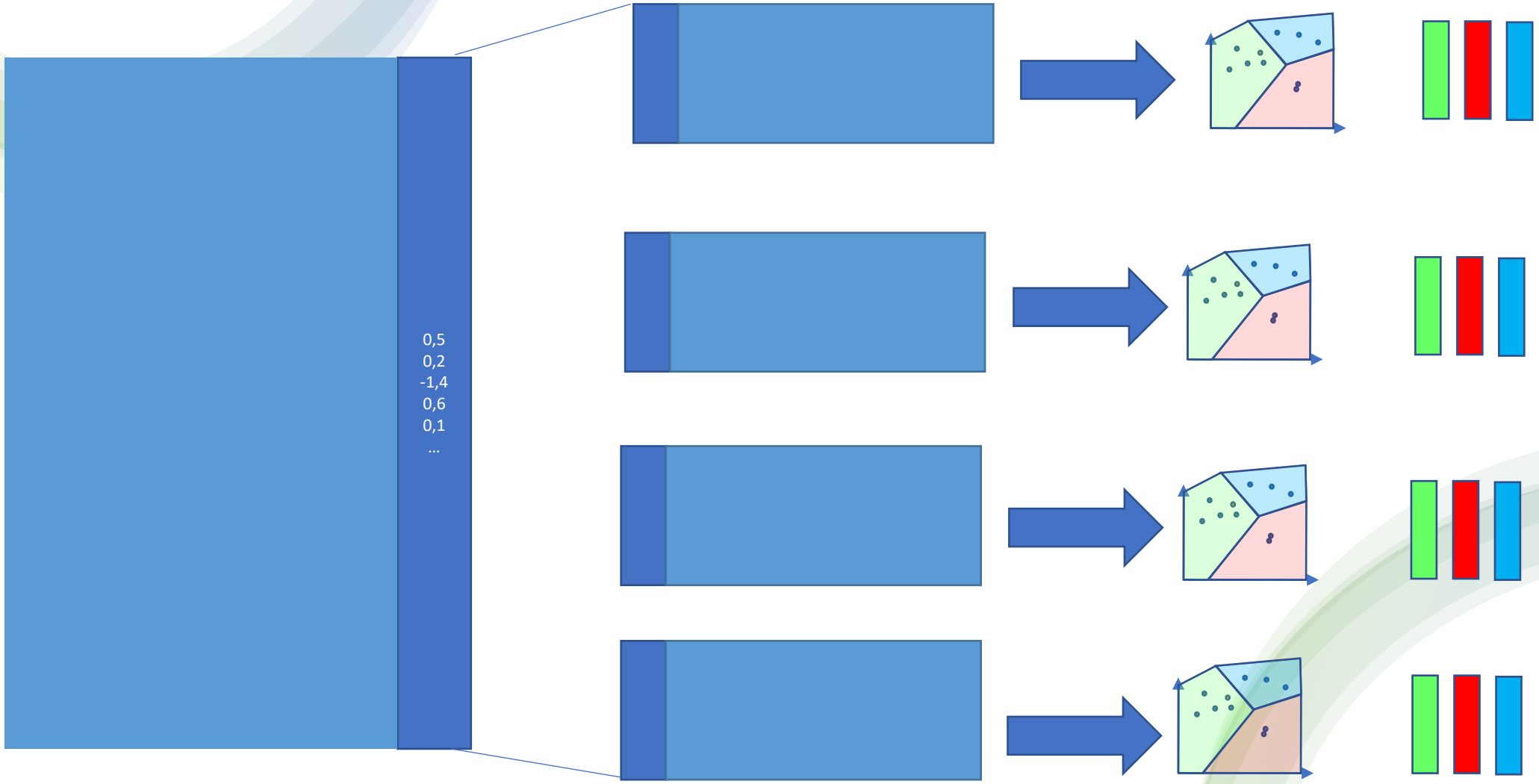




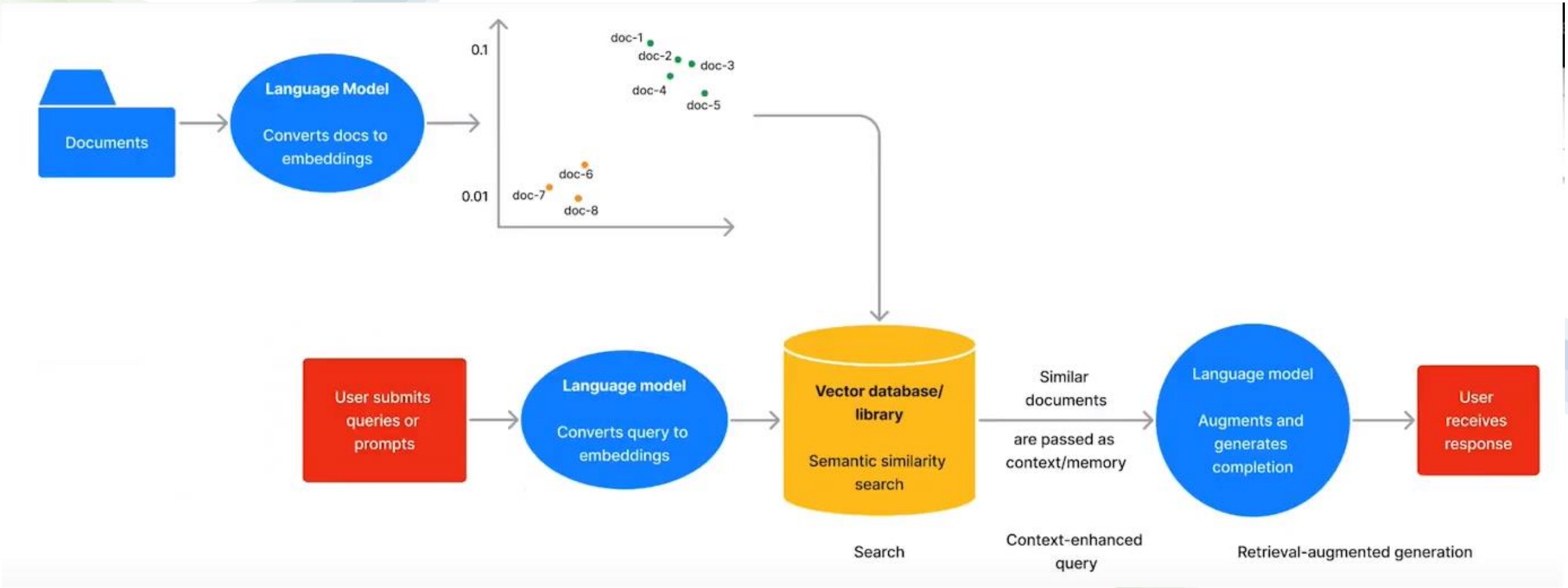
Comparación

Index	Memory (MB)	Query Time (ms)	Recall	Notes
Flat (L2 or IP)	~500	~18	1.0	Good for small datasets or where query time is irrelevant
LSH	20 - 600	1.7 - 30	0.4 - 0.85	Best for low dimensional data, or small datasets
HNSW	600 - 1600	0.6 - 2.1	0.5 - 0.95	Very good for quality, high speed, but large memory usage
IVF	~520	1 - 9	0.7 - 0.95	Good scalable option. High-quality, at reasonable speed and memory usage

PQ Product Quantization



Retrieval Augmented Generation
RAG Workflow



Ranking

include secondary database models

10 systems in ranking, July 2023

Rank			DBMS	Database Model	Score		
Jul 2023	Jun 2023	Jul 2022			Jul 2023	Jun 2023	Jul 2022
1.	1.	1.	Kdb	Multi-model	8.22	+0.22	-0.95
2.	2.		Chroma	Vector DBMS	2.41	+0.02	
3.	3.		Pinecone	Vector DBMS	2.27	+0.14	
4.	4.	↓ 2.	Milvus	Vector DBMS	1.36	+0.05	+0.99
5.	5.	↓ 3.	Weaviate	Vector DBMS	1.27	+0.19	+1.15
6.	6.		Vald	Vector DBMS	0.86	-0.04	
7.	↑ 8.	↓ 4.	Qdrant	Vector DBMS	0.61	+0.03	+0.54
8.	↑ 9.		Deep Lake	Vector DBMS	0.55	+0.05	
9.	↓ 7.		Vespa	Multi-model	0.55	-0.04	
10.	10.		MyScale	Multi-model	0.19	-0.07	

PRACTICA