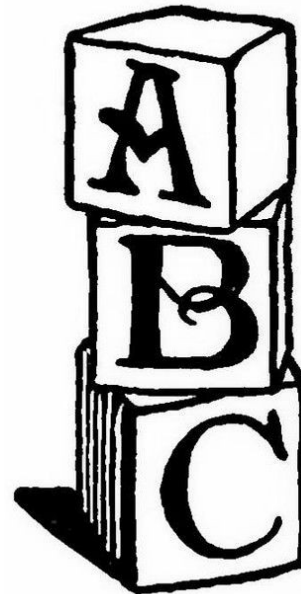


L arge L anguage M odels

A Primer



What is a Vector Database ?



A Vector Database **stores data as high-dimensional vectors.**

Each vector represents a data item, such as a word, image, or document; capturing **essential features of the data.**

Unlike traditional databases that use rows and columns (e.g. SQL), vector databases **organize data in a multi-dimensional space, optimizing search and retrieval** for such data types.

An example of a Vector Database

- INPUT DATA
 - “UAV tracking ship exiting canal”
 - “UAV tracking ship off port”
- GOALS
 1. Translate the input data to a set of ordered tokens.
 2. Build a structure that helps predict the next, most likely token as part of formulating a response to a prompt.

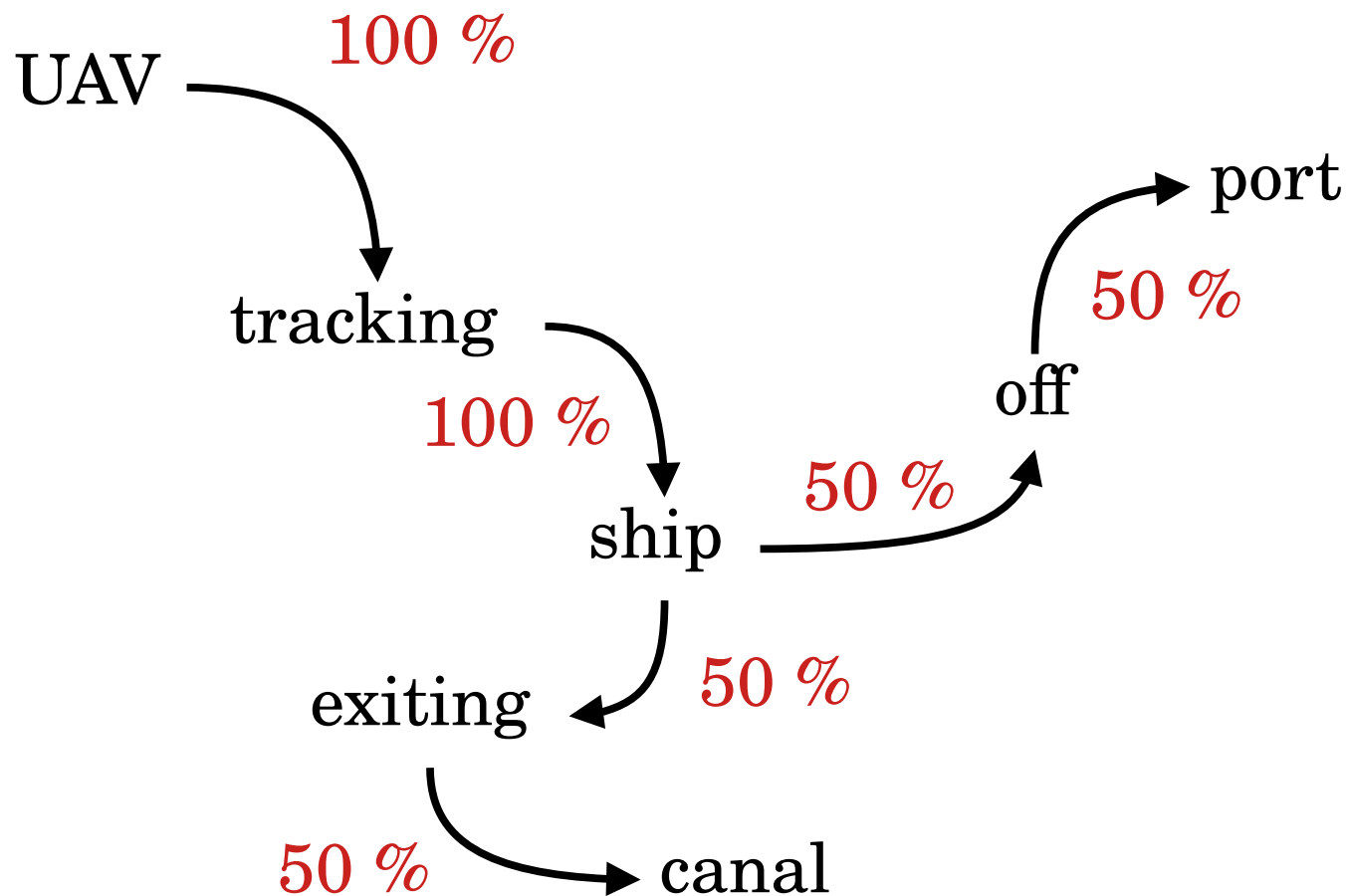
An example of a Vector Database

▼ ►	UAV	tracking	ship	exiting	canal	off	port
UAV		2					
tracking			2				
ship				1		1	
exiting					1		
canal							
off							1
port							

An example of a Vector Database

▼ ►	UAV	tracking	ship	exiting	canal	off	port
UAV		100 %					
tracking			100 %				
ship				50 %		50 %	
exiting					50 %		
canal							
off							50 %
port							

An example of a Vector Database



An example of a Vector Database

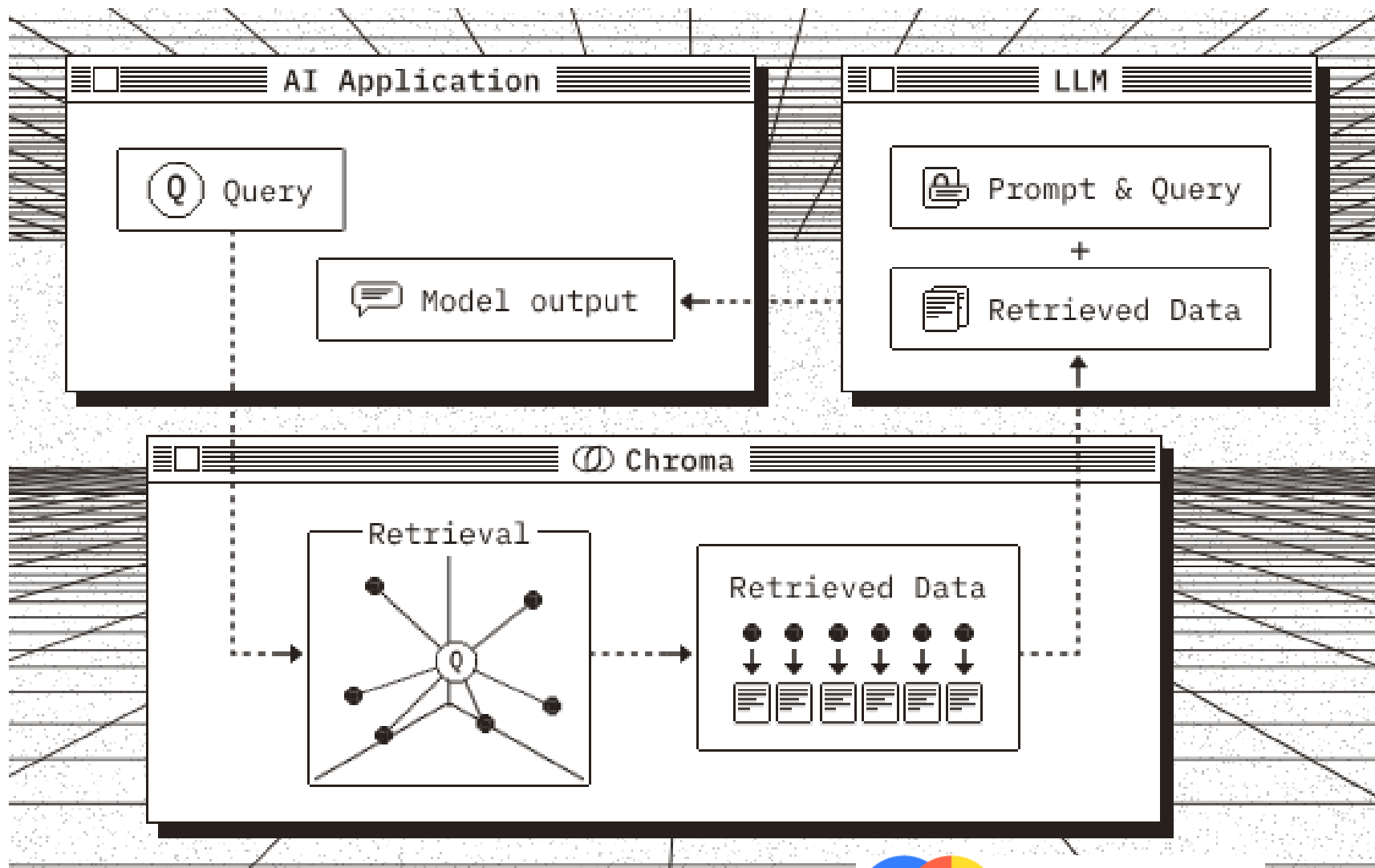
```
LLM = {"UAV":{"tracking":100.0},  
      "tracking":{"ship":100.0},  
      "ship":{"exiting":50.0,"off":50.0},  
      "exiting":{"canal":100.0},  
      "off":{"port":100.0}}
```

An example of a Vector Database

▼ ►	UAV	tracking	ship	exiting	canal	off	port
UAV		100 %					
tracking			100 %				
▼ ►	UAV	tracking	ship	exiting	canal	off	port
UAV		100 %					
tracking			100 %				
▼ ►	UAV	tracking	ship	exiting	canal	off	port
UAV		100 %					
tracking			100 %				
ship				50 %			
exiting					50 %		
canal							
off							50 %
port							

Hundreds ?
Thousands ?
Billions ?
Trillions ?

Chroma : A Vector Database Tool



Chroma :

A Vector Database Tool

1. Access Chroma

```
import chromadb
```

2. Create a Chroma **client**

```
myclient = chromadb.Client()
```

3. Create a **collection**

```
naval_llm = myclient.get_or_create_collection(name="UAV_scan")
```

4. Populate a collection

```
naval_llm.upsert(  
    documents=["UAV tracking ship exiting canal",  
              "UAV tracking ship off port"],  
    ids = ["msg1","msg2"] )
```

3. Query a collection

```
msg_options = naval_llm.query(  
    query_texts = ["UAV tracking vessel off starboard"],  
    n_results = 3)
```

Chroma : A Vector Database Tool

```
import chromadb
myclient = chromadb.Client()

# create the naval messages LLM
naval_llm = myclient.get_or_create_collection(
    name="UAV_scan")

# populate this LLM
naval_llm.upsert(
    documents=["UAV tracking ship exiting canal",
               "UAV tracking corvette off port"],
    ids = ["msg1","msg2"] )

# test the capability of this LLM
msg_options = naval_llm.query(
    query_texts = ["UAV tracking USV off starboard"],
    n_results = 2)

# display results
print(msg_options)
```

Chroma : A Vector Database Tool

```
{'ids': [['msg2', 'msg1']],  
  'embeddings': None,
```

```
  'documents': [['UAV tracking corvette off port',  
                  'UAV tracking ship exiting canal']],
```

```
  'uris': None, 'data': None, 'metadatas': [[None, None]],
```

```
  'distances': [[0.8026132583618164, 1.1424219608306885]],
```

```
  'included': [<IncludeEnum.distances: 'distances'>,  
               <IncludeEnum.documents: 'documents'>,  
               <IncludeEnum.metadatas: 'metadatas'>]]}
```

LLM Resources

LLM basics

1. Blog

[https://blog.miguelgrinberg.com/post/
how-llms-work-explained-without-math](https://blog.miguelgrinberg.com/post/how-llms-work-explained-without-math)

2. AWS

“What is LLM (Large Language Model) ?”
<https://aws.amazon.com/what-is/large-language-model>

3. Geeks for Geeks

“What is Large Language Model” -
<https://www.geeksforgeeks.org/large-language-model-llm/>

Chroma

Tutorial - [https://docs.trychroma.com/docs/
overview/getting-started](https://docs.trychroma.com/docs/overview/getting-started)

Intallation - <https://pypi.org/project/chromadb/>

Source code - <https://github.com/chroma-core/chroma>

LLM Resources

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QUESTIONS