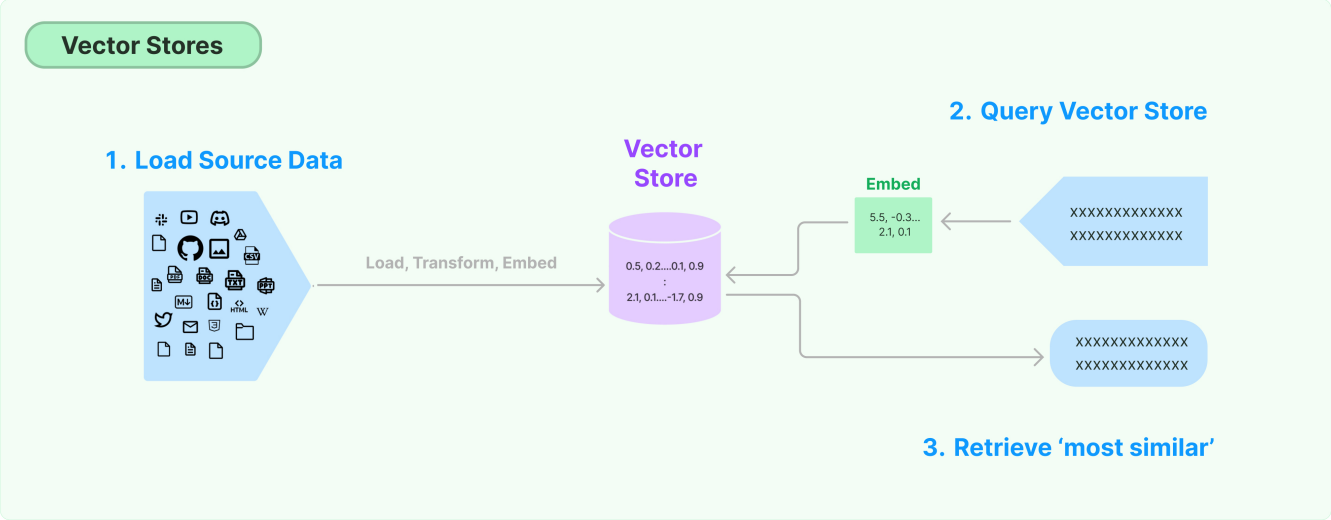
# Vector stores

> **INFO**
>
> Head to Integrations for documentation on built-in integrations with 3rd-party vector stores.

One of the most common ways to store and search over unstructured data is to embed it and store the resulting embedding vectors, and then at query time to embed the unstructured query and retrieve the embedding vectors that are 'most similar' to the embedded query. A vector store takes care of storing embedded data and performing vector search for you.




## Get started

This walkthrough showcases basic functionality related to VectorStores. A key part of working with vector stores is creating the vector to put in them, which is usually created via embeddings. Therefore, it is recommended that you familiarize yourself with the text embedding model interfaces before diving into this.

There are many great vector store options, here are a few that are free, open-source, and run entirely on your local machine. Review all integrations for many great hosted offerings.

Chroma FAISS Lance

This walkthrough uses the `chroma` vector database, which runs on your local machine as a library.

```
pip install chromadb
```

We want to use OpenAIEmbeddings so we have to get the OpenAI API Key.

```
import os
import getpass

os.environ['OPENAI_API_KEY'] = getpass.getpass('OpenAI API Key:')
```

```
from langchain.document_loaders import TextLoader
from langchain.embeddings.openai import OpenAIEmbeddings
from langchain.text_splitter import CharacterTextSplitter
from langchain.vectorstores import Chroma

# Load the document, split it into chunks, embed each chunk and load it
into the vector store.
raw_documents = TextLoader('../../../state_of_the_union.txt').load()
text_splitter = CharacterTextSplitter(chunk_size=1000, chunk_overlap=0)
documents = text_splitter.split_documents(raw_documents)
db = Chroma.from_documents(documents, OpenAIEmbeddings())
```

## Similarity search

```
query = "What did the president say about Ketanji Brown Jackson"
docs = db.similarity_search(query)
print(docs[0].page_content)
```

```
    Tonight. I call on the Senate to: Pass the Freedom to Vote Act.
Pass the John Lewis Voting Rights Act. And while you're at it, pass the
Disclose Act so Americans can know who is funding our elections.

    Tonight, I'd like to honor someone who has dedicated his life to
serve this country: Justice Stephen Breyer—an Army veteran,
Constitutional scholar, and retiring Justice of the United States
Supreme Court. Justice Breyer, thank you for your service.

    One of the most serious constitutional responsibilities a President
```

```
has is nominating someone to serve on the United States Supreme Court.

    And I did that 4 days ago, when I nominated Circuit Court of
Appeals Judge Ketanji Brown Jackson. One of our nation's top legal
minds, who will continue Justice Breyer's legacy of excellence.
```

### Similarity search by vector

It is also possible to do a search for documents similar to a given embedding vector using `similarity_search_by_vector` which accepts an embedding vector as a parameter instead of a string.

```
embedding_vector = OpenAIEmbeddings().embed_query(query)
docs = db.similarity_search_by_vector(embedding_vector)
print(docs[0].page_content)
```

The query is the same, and so the result is also the same.

```
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```

## Asynchronous operations

Vector stores are usually run as a separate service that requires some IO operations, and therefore they might be called asynchronously. That gives performance benefits as you don't waste time waiting for responses from external services. That might also be important if you work with an asynchronous framework, such as FastAPI.

Langchain supports async operation on vector stores. All the methods might be called using their async counterparts, with the prefix `a`, meaning `async`.

`Qdrant` is a vector store, which supports all the async operations, thus it will be used in this walkthrough.

```
pip install qdrant-client
```

```
from langchain.vectorstores import Qdrant
```

## Create a vector store asynchronously

```
db = await Qdrant.afrom_documents(documents, embeddings,
"http://localhost:6333")
```

## Similarity search

```
query = "What did the president say about Ketanji Brown Jackson"
docs = await db.asimilarity_search(query)
print(docs[0].page_content)
```

```
    Tonight. I call on the Senate to: Pass the Freedom to Vote Act.
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minds, who will continue Justice Breyer's legacy of excellence.
```

## Similarity search by vector

```
embedding_vector = embeddings.embed_query(query)
docs = await db.asimilarity_search_by_vector(embedding_vector)
```

## Maximum marginal relevance search (MMR)

Maximal marginal relevance optimizes for similarity to query AND diversity among selected documents. It is also supported in async API.

```
query = "What did the president say about Ketanji Brown Jackson"
found_docs = await qdrant.amax_marginal_relevance_search(query, k=2,
fetch_k=10)
for i, doc in enumerate(found_docs):
    print(f"{i + 1}.", doc.page_content, "\n")
```

```
1. Tonight. I call on the Senate to: Pass the Freedom to Vote Act. Pass
the John Lewis Voting Rights Act. And while you're at it, pass the
Disclose Act so Americans can know who is funding our elections.

Tonight, I'd like to honor someone who has dedicated his life to serve
this country: Justice Stephen Breyer—an Army veteran, Constitutional
scholar, and retiring Justice of the United States Supreme Court.
Justice Breyer, thank you for your service.

One of the most serious constitutional responsibilities a President has
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And I did that 4 days ago, when I nominated Circuit Court of Appeals
Judge Ketanji Brown Jackson. One of our nation's top legal minds, who
will continue Justice Breyer's legacy of excellence.

2. We can't change how divided we've been. But we can change how we
move forward—on COVID-19 and other issues we must face together.

I recently visited the New York City Police Department days after the
funerals of Officer Wilbert Mora and his partner, Officer Jason Rivera.

They were responding to a 9-1-1 call when a man shot and killed them
with a stolen gun.

Officer Mora was 27 years old.

Officer Rivera was 22.
```

Both Dominican Americans who’d grown up on the same streets they later chose to patrol as police officers.

I spoke with their families and told them that we are forever in debt for their sacrifice, and we will carry on their mission to restore the trust and safety every community deserves.

I’ve worked on these issues a long time.

I know what works: Investing in crime preventionand community police officers who’ll walk the beat, who’ll know the neighborhood, and who can restore trust and safety.