SQL database in Microsoft Fabric

Series Scenario – Conference session application

You need:

- to store and serve data for the conference webpage.
- to be able to run analysis over the data.
- an application that allows attendees to easily search for and find sessions of interest to them.
- to follow modern best practices for application lifecycle.
- to be able to monitor and troubleshoot database and query performance.

Course Overview and agenda

Episode 1: Introduction and Overview; Getting started

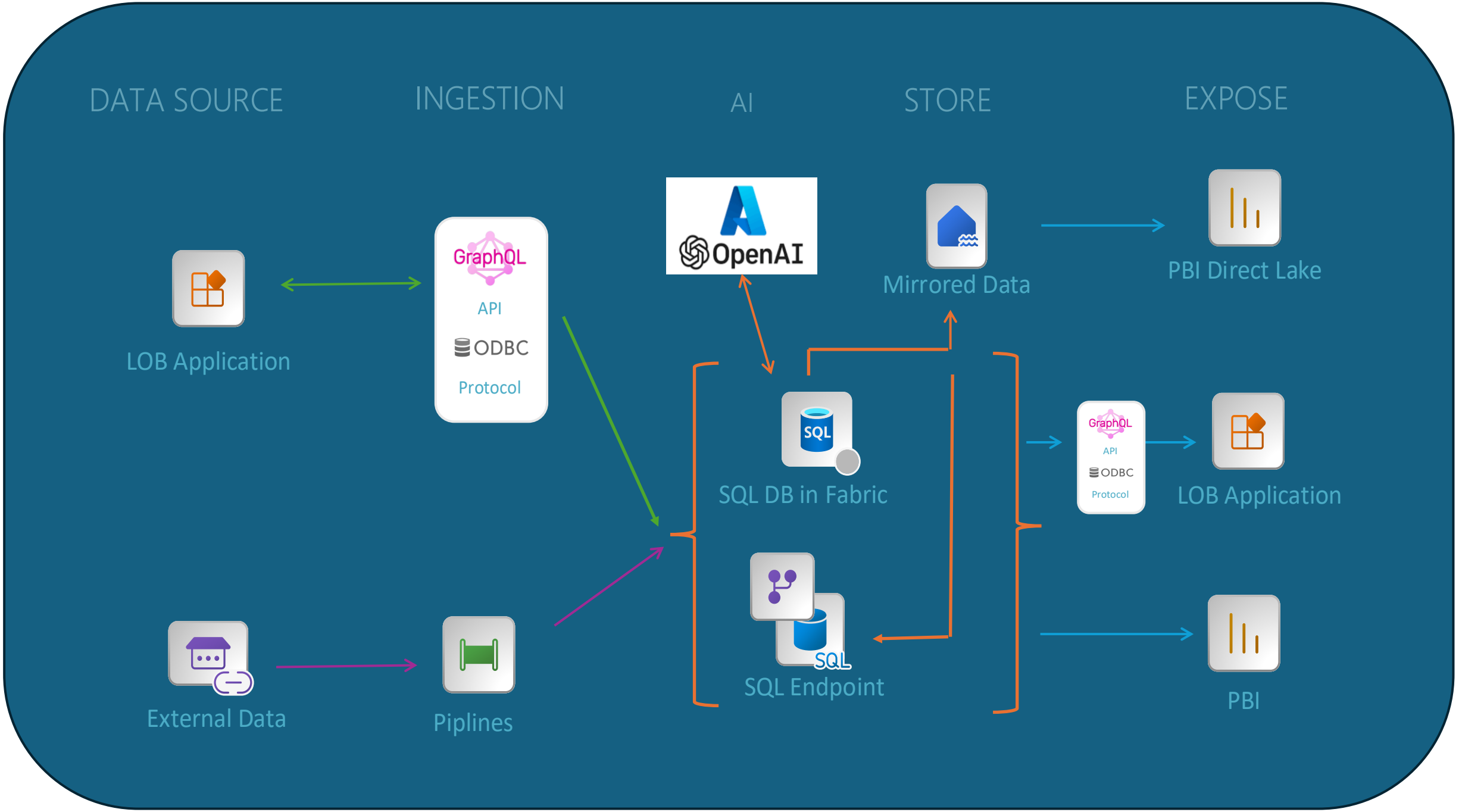
Episode 2: Dataflows, Notebooks, Reports

Episode 3: GenAI and vector databases

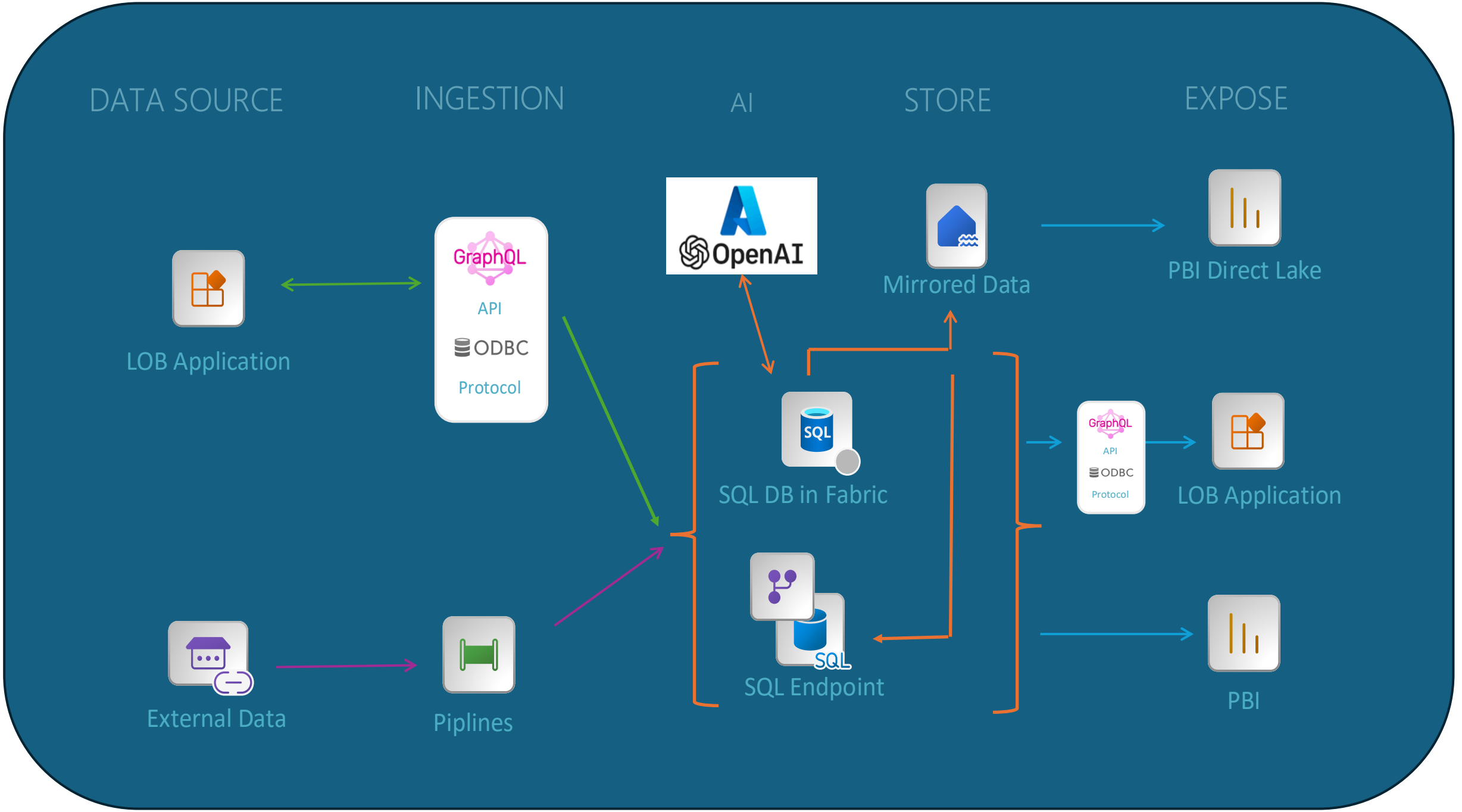
Episode 4: GraphQL and application development

Episode 5: Application lifecycle management

Episode 6: Performance Dashboard, Recap


DATA SOURCE
INGESTION
AI
STORE
EXPOSE
LOB Application
GraphQL
API
ODBC
Protocol
OpenAI
Mirrored Data
PBI Direct Lake
SQL
SQL DB in Fabric
GraphQL
API
ODBC
Protocol
LOB Application
SQL
SQL Endpoint
External Data
Piplines
PBI

Episode 3: AI-Integration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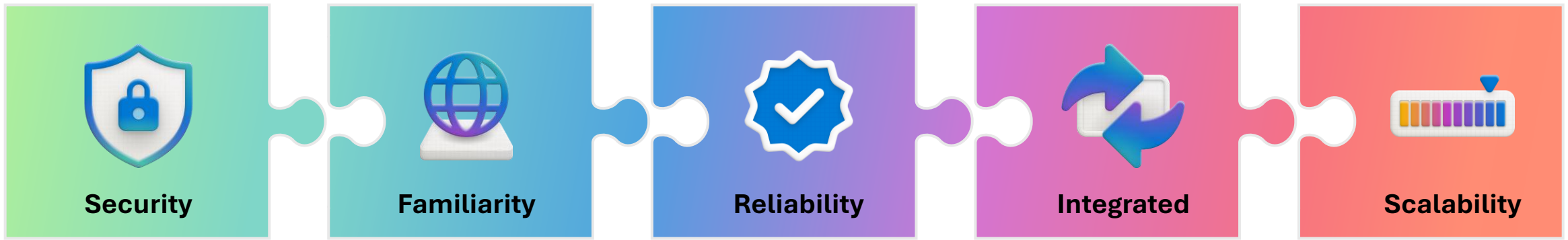
Why AI Integration?

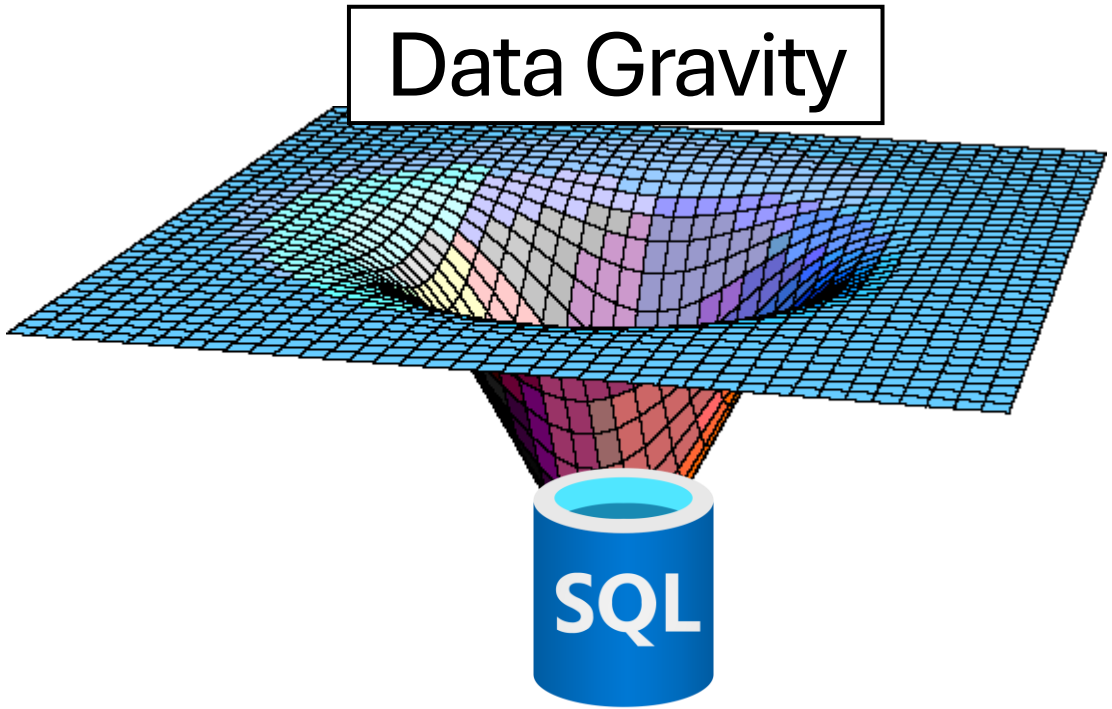
Why SQL for AI apps?

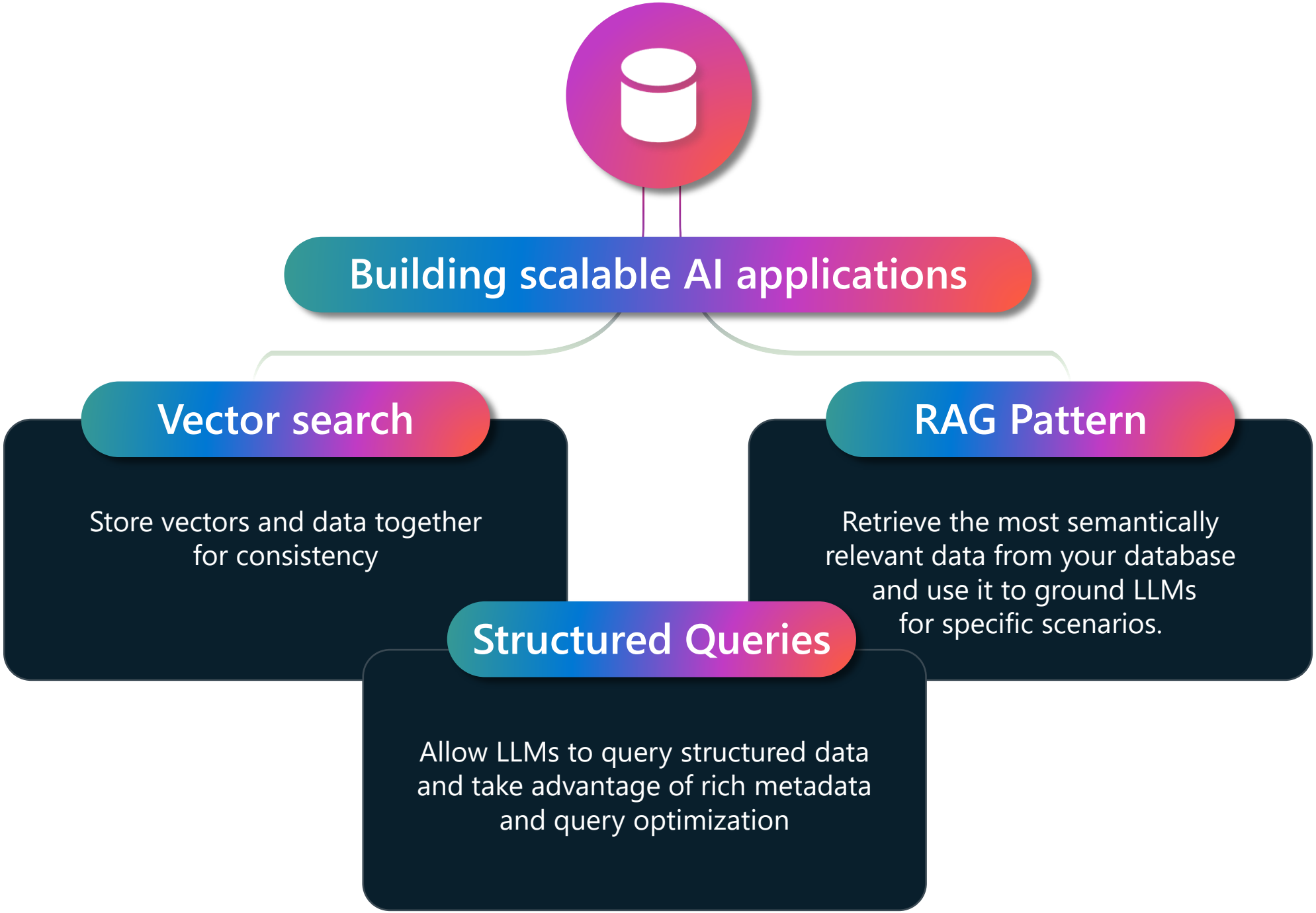


Why SQL for AI apps?

SQL already contains all valuable (present and future) company's data: make sense to move AI to data instead of the other way round!

Why SQL for AI apps?




Building scalable AI applications
Vector search
Store vectors and data together for consistency
RAG Pattern
Retrieve the most semantically relevant data from your database and use it to ground LLMs for specific scenarios.
Structured Queries
Allow LLMs to query structured data and take advantage of rich metadata and query optimization

Deploy Azure OpenAI

https://ms.portal.azure.com/#home

Databases | Analyze | Analyze | Analyze | Home - Microsoft A... | SQL Source code se... | MSW (Microsoft We... | Blog Dashboard - M... | GitHub - microsoft/... | Other favorite

Microsoft Azure (Preview) | Search resources, services, and docs (G+/) | Copilot

Azure services

Create a resource | Resource groups | SQL databases | Subscriptions | Azure DevOps organizations | GitHub | Storage accounts | Reservations | Elastic Job agents | More services

Resources

Recent | Favorite

Name	Type	Last Viewed
[redacted]	SQL database	a week ago
Core-ES-WorkManagement	Subscription	a week ago
AdventureWorks2017 (rs-sqlserver2/AdventureWorks2017)	SQL database	2 years ago
abnamro (sqlscale/abnamro)	Azure SQL Database Hyperscale	4 years ago
DS-SQLDB-SQLAzurePMDemos_ajayj_COGS_42477	Subscription	4 years ago

See all

Navigate

About Vector Databases

Vectors and Embeddings

Feature Vector

Ordered array of numbers typically created by a human to train a model

`[Height, Weight, Age, Fur Length, Energy Level]`

"dog"

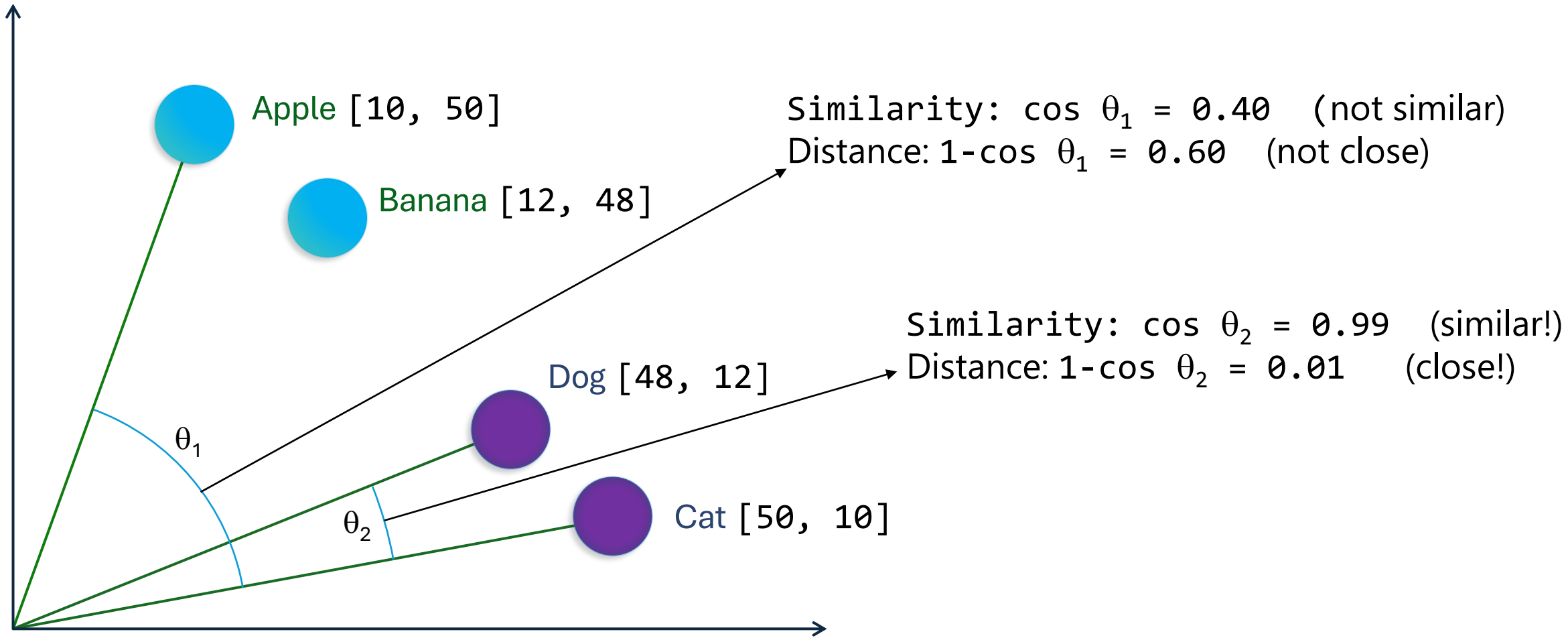
Embedding

Vector generated by a model that has semantic meaning

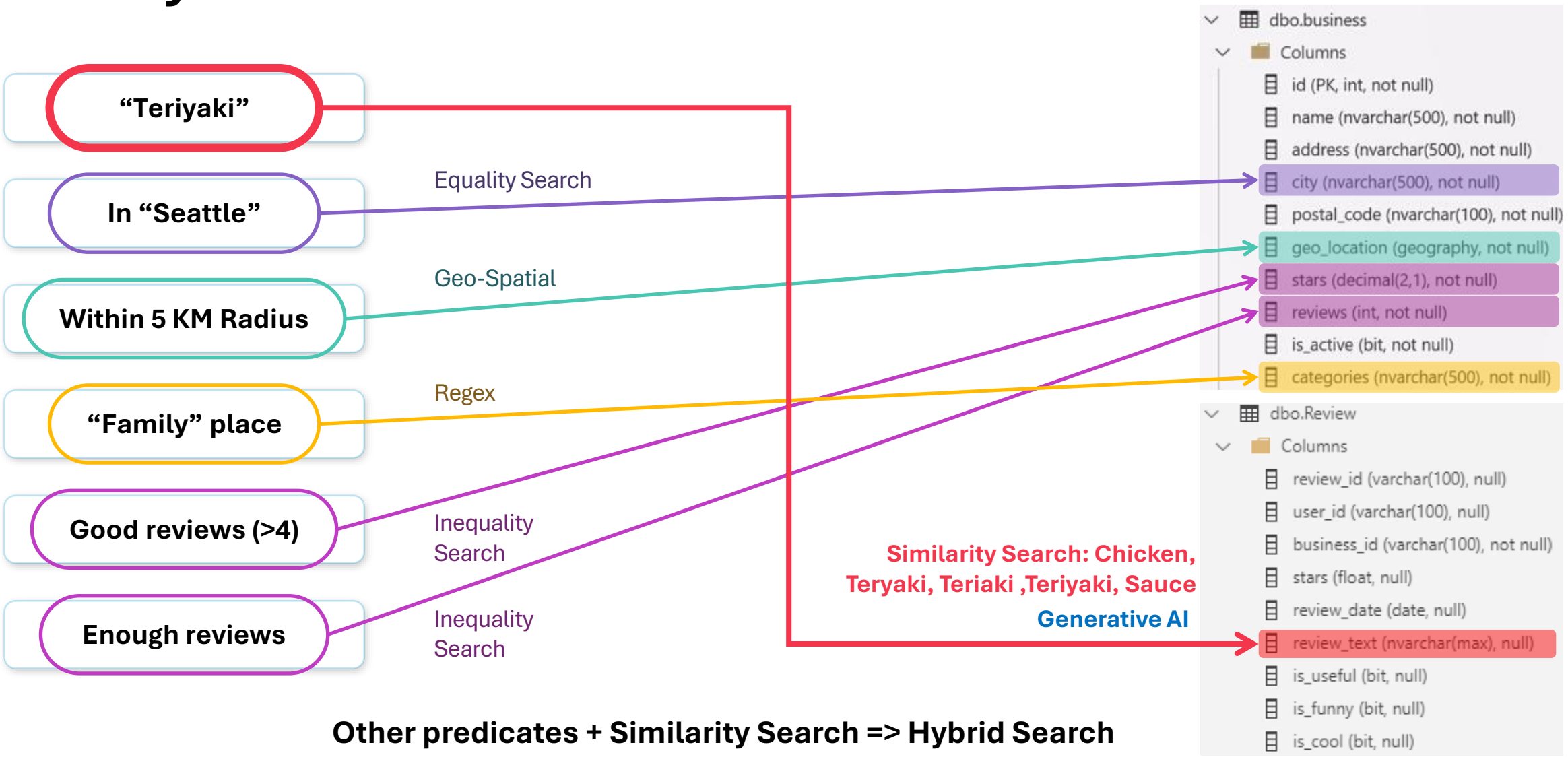
```
dog: [0.9, 0.3, 0.2, ...]
Image of a dog: [0.9, 0.3, 0.2, ...]
puppy: [0.88, 0.33, 0.21, ...]

"I took the dog for a walk": [1.5, -0.8, 2.1, ...]
```

"dog"

Similarity Searching using Cosine



Why vectors in a modern relational database?



Other predicates + Similarity Search => Hybrid Search

Vector support in Fabric SQL

```
create procedure [web].[find_similar_sessions] @topic nvarchar(max)
as

declare @e vector(1536)
exec [web].[get_embedding] @topic, @e output;

with similar_details as
(
    select top(10)
        e.session_id,
        vector_distance('cosine', @e, details_vector_text3) as distance
    from
        [web].[sessions_details_embeddings] e
    order by
        distance
),
```

Vector support in Fabric SQL database

Item	About
New VECTOR(n) data type	Creates an object of the Vector type with the given dimension.
CAST('[1,2,3]' AS VECTOR(3))	Casts a string that represents an array to a vector of the given dimension.
CAST(@v AS VARCHAR(MAX))	Casts a vector to a string equivalent
VECTOR_NORM	Measures the length/magnitude of a vector*
VECTOR_NORMALIZE	Scales the vector to have a length of 1*
VECTOR_DISTANCE	Measures the cosine distance between two vectors

*For a given '*norm type*'

Use Cases

Hybrid search: vector (semantic) search + full-text search + filters

- E.g.: “Find all the documents from Acme customer written by John Doe that are related to the new security policies“

Chatbot

- Memories and chat history

Retrieval Augmented Generation

- Today’s project!

NL2SQL

- Copilot

Connecting to OpenAI to obtain embeddings

Working with vector features

End Episode 3

Introduction to OpenAI

- Deploy your own Azure OpenAI instance and model

Overview of Vector databases

- Integrate OpenAI and Vector support