Modern SQL: Vector Search with Embeddings

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Author Audition

The Problem

Keyword Search

🔍 optimize SQL queries

❌ `0 results found`

- Keyword-based search only
- Misses results that mean the same

The Solution

Vector Search

✨ optimize SQL queries

```
✅ Tips for improving database performance
✅ How to troubleshoot slow queries

2 results found
```

- Understands meaning, not just keywords
- Finds relevant results

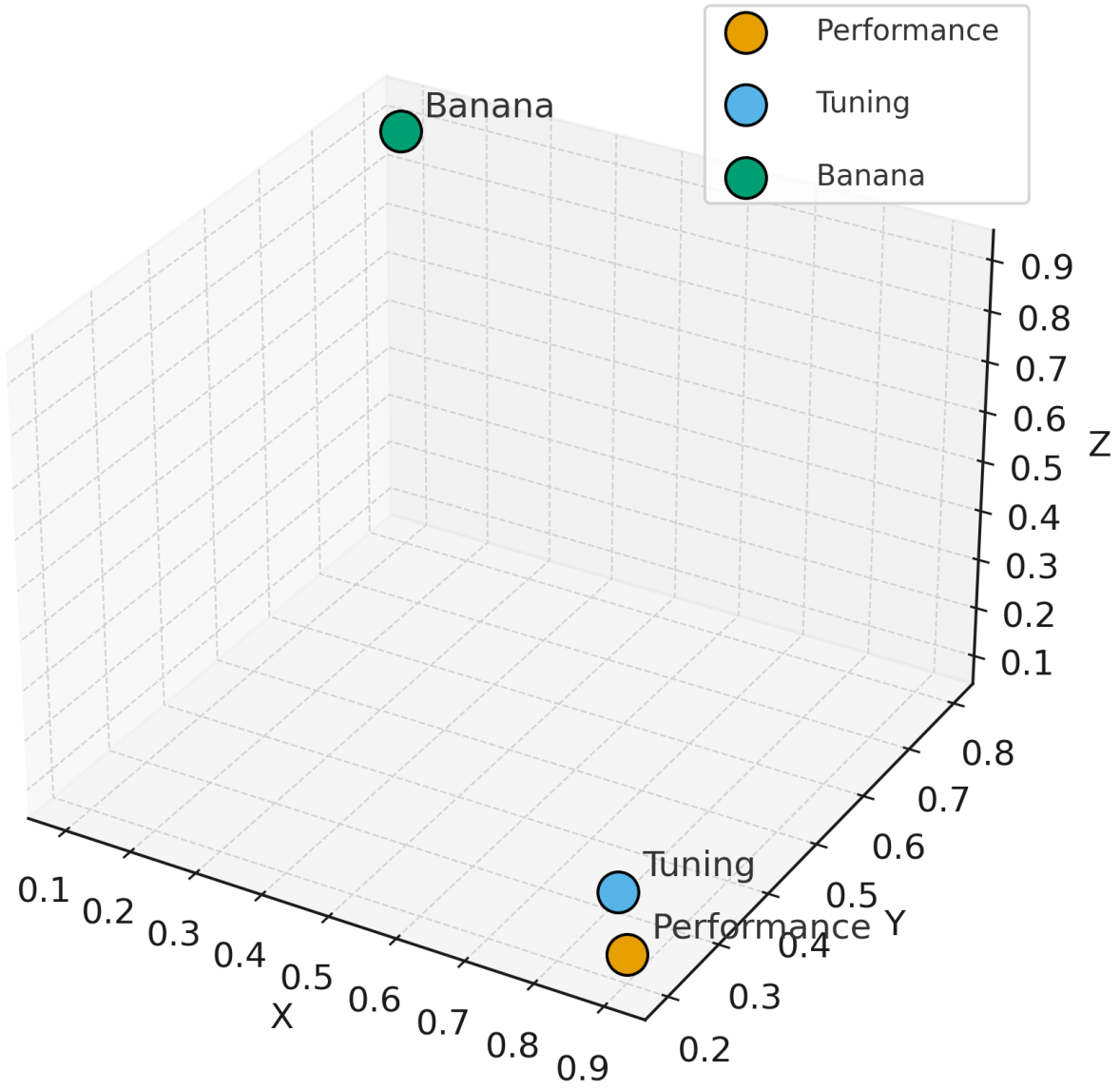
How Vector Search Works

🔍 **Embeddings** = numbers for meaning

🌌 **Semantic space** → words that are **close** = related

🔢 **Example:**

- **Performance** ↔ **Tuning** (close)
- **Banana** (far away)



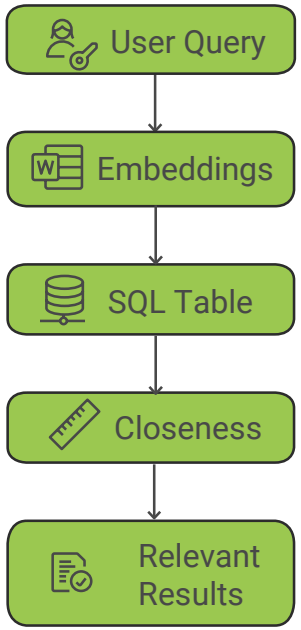
SQL Server 2025 Vector Search

🔍 **Vector Search**
Finds vectors close to a query vector

📐 **Closeness**
Distance between vectors (e.g., cosine distance)

🗄️ **SQL Server 2025:**

- Built-in vector data type
- Stored in optimized binary format
- Exposed as JSON arrays for convenience



Why Vectors in SQL

Key Advantages

One Database, One Truth
Store vectors and structured data together

Enterprise Strengths
Leverage SQL Server's strengths

Performance Boost
Native vector operations + hybrid queries

Developer-Friendly
Use familiar T-SQL, tooling, and workflows

Limitations to Note

Embedding generation requires external AI services.

Potential to improve vector indexes and algorithms.

Not ideal for extreme-scale vector-only workloads.

SQL Server 2025 = Integration over specialization

Demo

How It's Done: 3 Steps

1. Store: Create a table with a VECTOR column.

2. Populate: Insert text and its corresponding embeddings.

3. Query: Use VECTOR_DISTANCE() to find similar matches.

Summary

Embeddings capture meaning

SQL can now store vectors

VECTOR_DISTANCE enables semantic search

Next Steps

Try the demo for yourself:
https://github.com/CristianLefter/modern-sql-vector-search

Read more about the topic:
https://learn.microsoft.com/en-us/sql/sql-server/ai/vectors?view=sql-server-ver17