

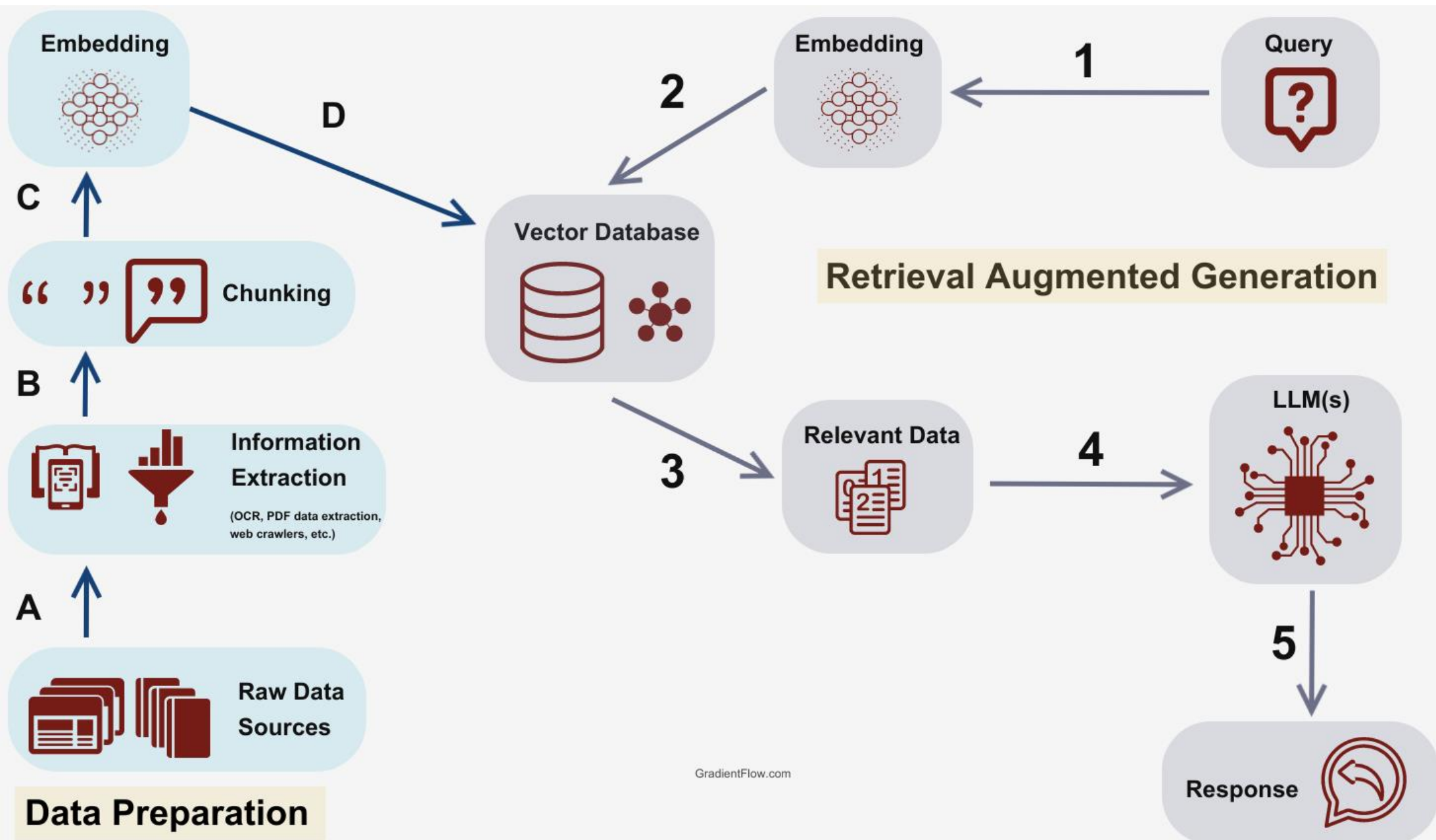


Retrieval Augmented Generation

05.06.2025

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What is Retrieval Augmented Generation (RAG)?



Word embeddings and vector space

Text

"Center for Computational Life Sciences"

Tokenization

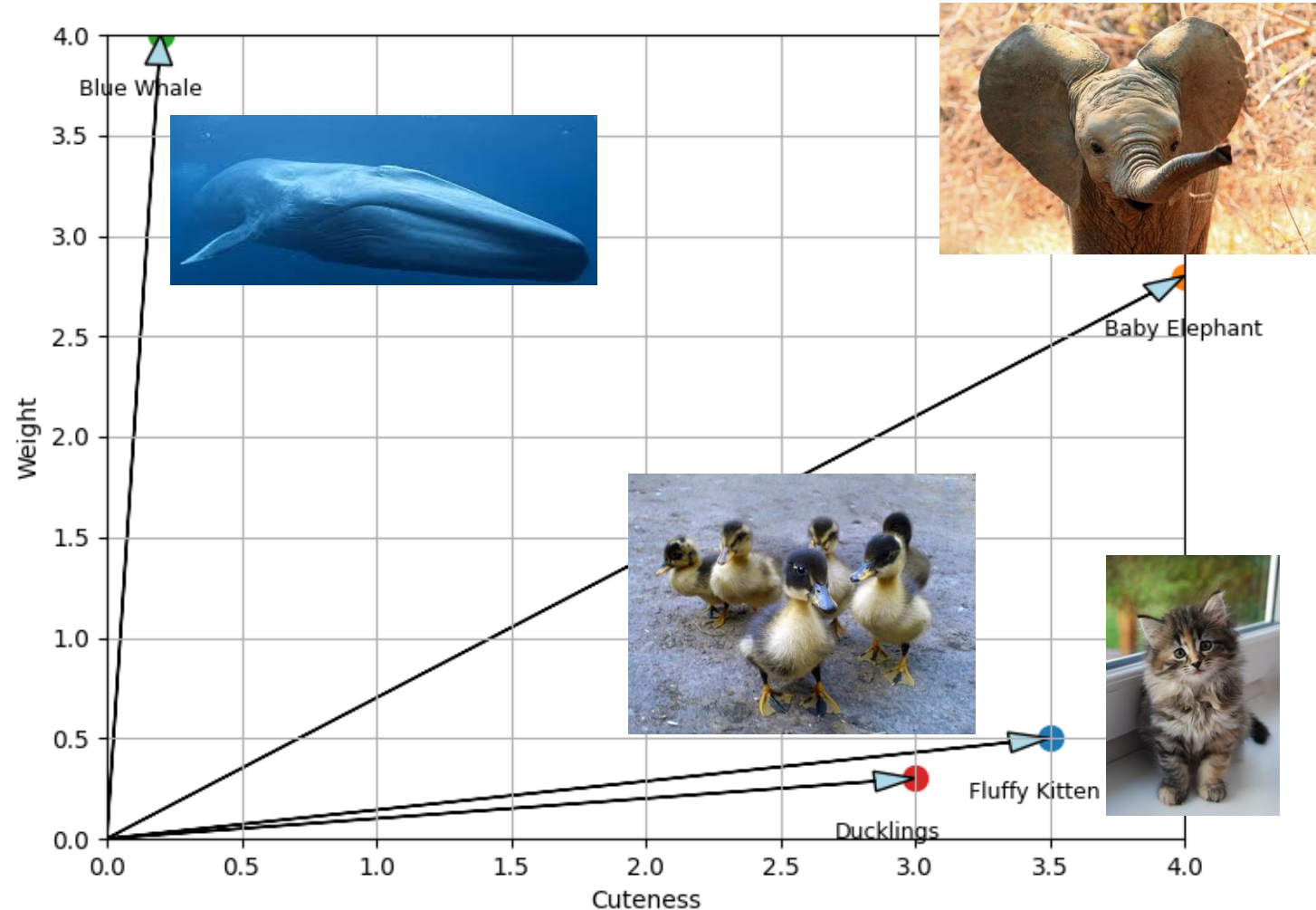
Tokens

"Cen", "ter", "for", "Compu",
"tational", "Life", "Scien", "ces"

Embedding

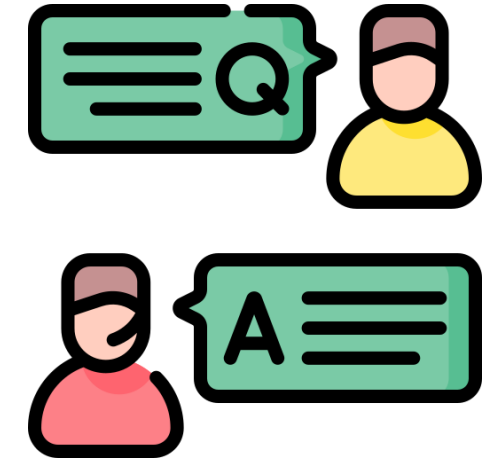
Embeddings

[0.016539961, -0.025933826,
0.048515484, 0.03760145, -
0.04732014, -0.002327353, ...]



Applications of RAG

Question Answering



Document Summarization



Coding Assistants



Enterprise Knowledge Management



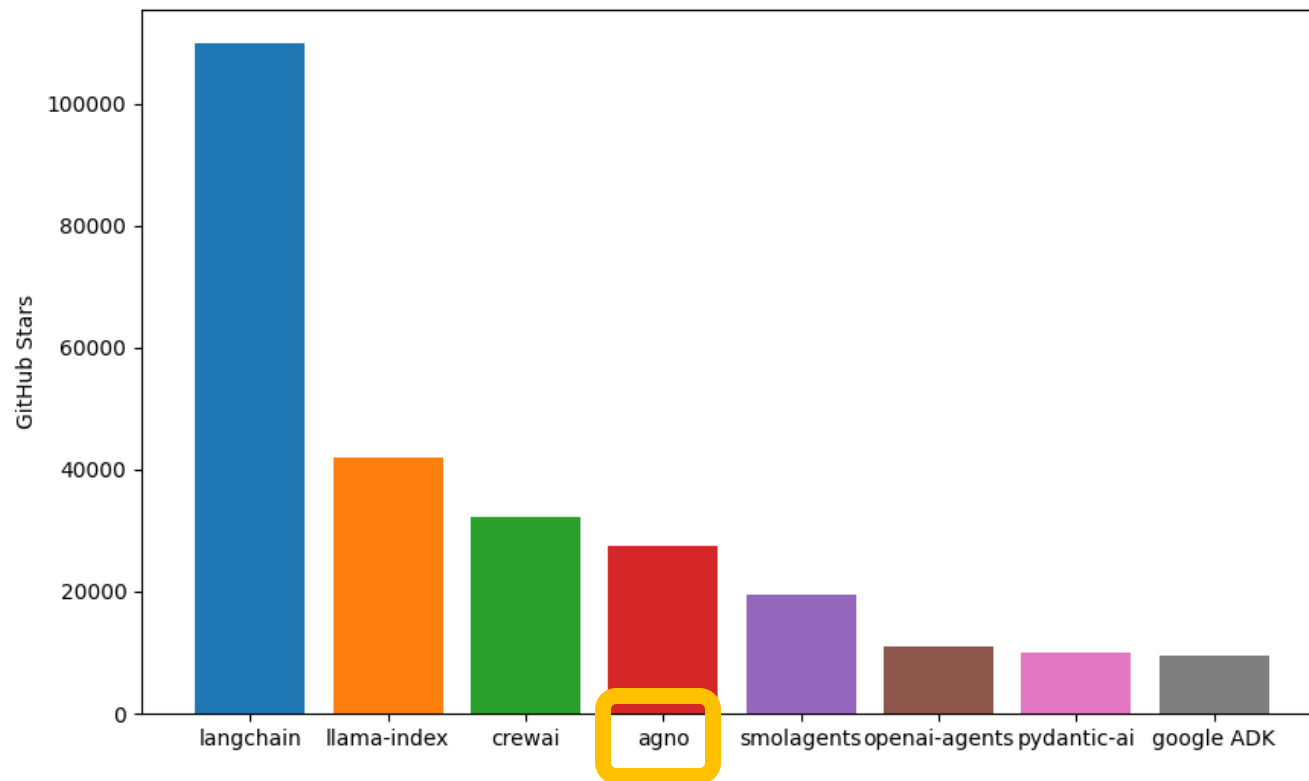
Patient Diagnostics



Scientific Research



Frameworks for LLMs, RAG and Agentic AI

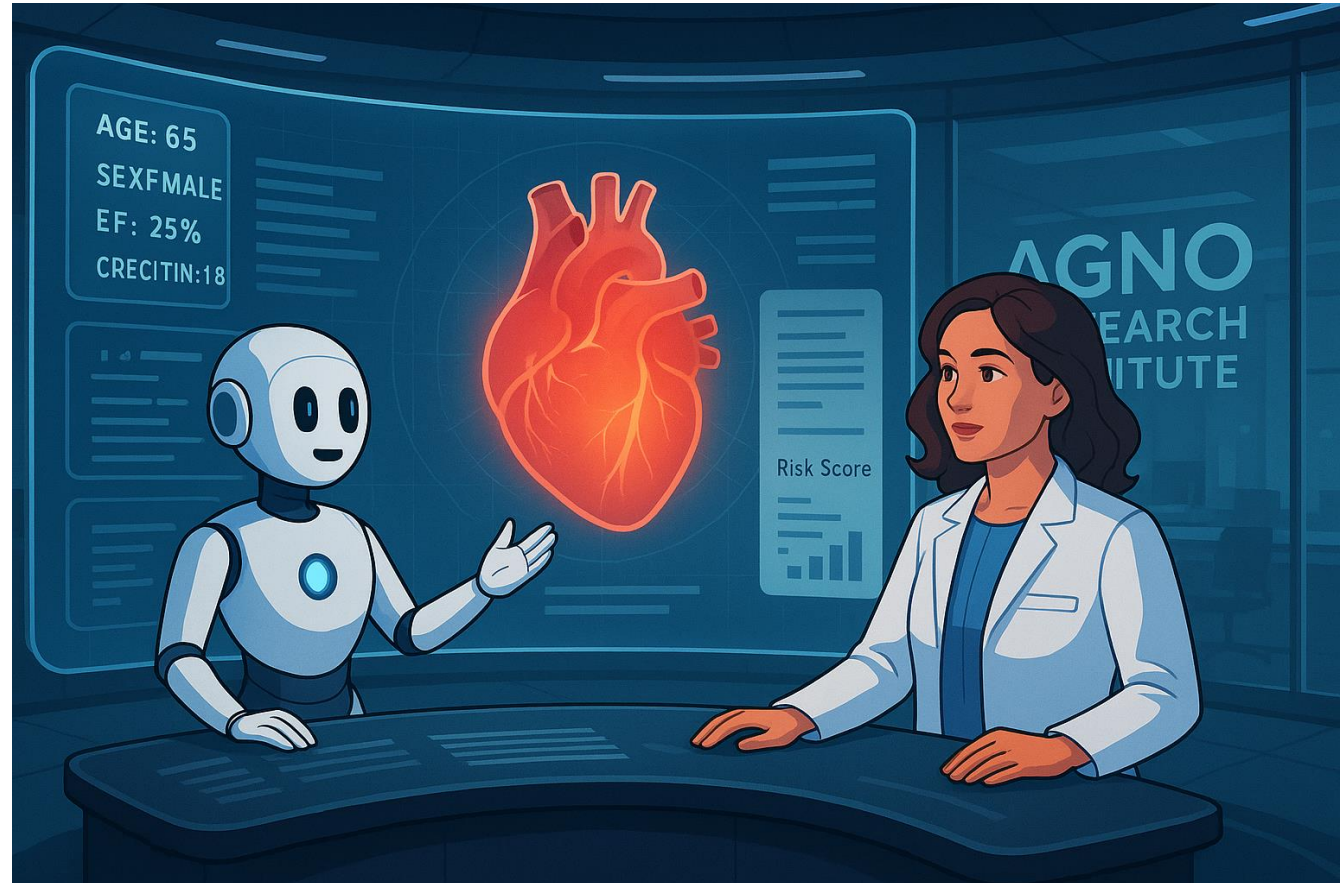


Agno

- Beginner-friendly
- Lightweight
- Fast
- Open-source
- Flexible

RAG topics

1. Embeddings
2. Vector Databases
3. Chunking strategies
4. Retrieval
5. Working with different types of data



Setting up the Python environment

1. Setting up the environment

```
(base) jwolber@Mac datathon % python3 -m venv ccls_datathon
source ccls_datathon/bin/activate
```

2. Install dependencies

```
(ccls_datathon) (base) jwolber@Mac datathon % pip install -r requirements.txt
Collecting agno
  Using cached agno-1.5.6-py3-none-any.whl (802 kB)
```

3. Set up Azure OpenAI

```
from agno.models.azure import AzureOpenAI
from agno.agent import Agent
import os

model_name = "gpt-4.1-nano"
api_version="2025-04-01-preview"
endpoint = 
api_key = 

os.environ["AZURE_OPENAI_API_KEY"] = api_key
os.environ["AZURE_OPENAI_ENDPOINT"] = endpoint
os.environ["OPENAI_API_VERSION"] = api_version
```

4. Test

```
agent = Agent(
    model=AzureOpenAI(id=model_name),
    description="You are an enthusiastic news reporter with a flair for storytelling!",
)
res = agent.run("Tell me about a breaking news story from Aachen.")
print(res.content)
```

BREAKING NEWS

MAJOR RENOVATION PROJECT SPARKS EXCITEMENT IN AACHEN

AACHEN 2030

WHAT'S HAPPENING?

The project is a refurbishment of iconic Aachen Cathedral, one of Europe's UNESCO World Heritage sites. The renovation plans include enhanced pedestrian zones, green installations, and improved accessibility.

COMMUNITY REACTIONS

A spark a wave of excitement across Aachen! Local residents Anna Schulz, a longtime Aachen resident, "exclaimed ..This will breathe new life into our city."

UPCOMING EVENTS

A series of public consultations are scheduled over the next few weeks to involve the community in shaping the final plans: The first open forum is set for this Saturday at Aachen Town Hall.