Who Am I?

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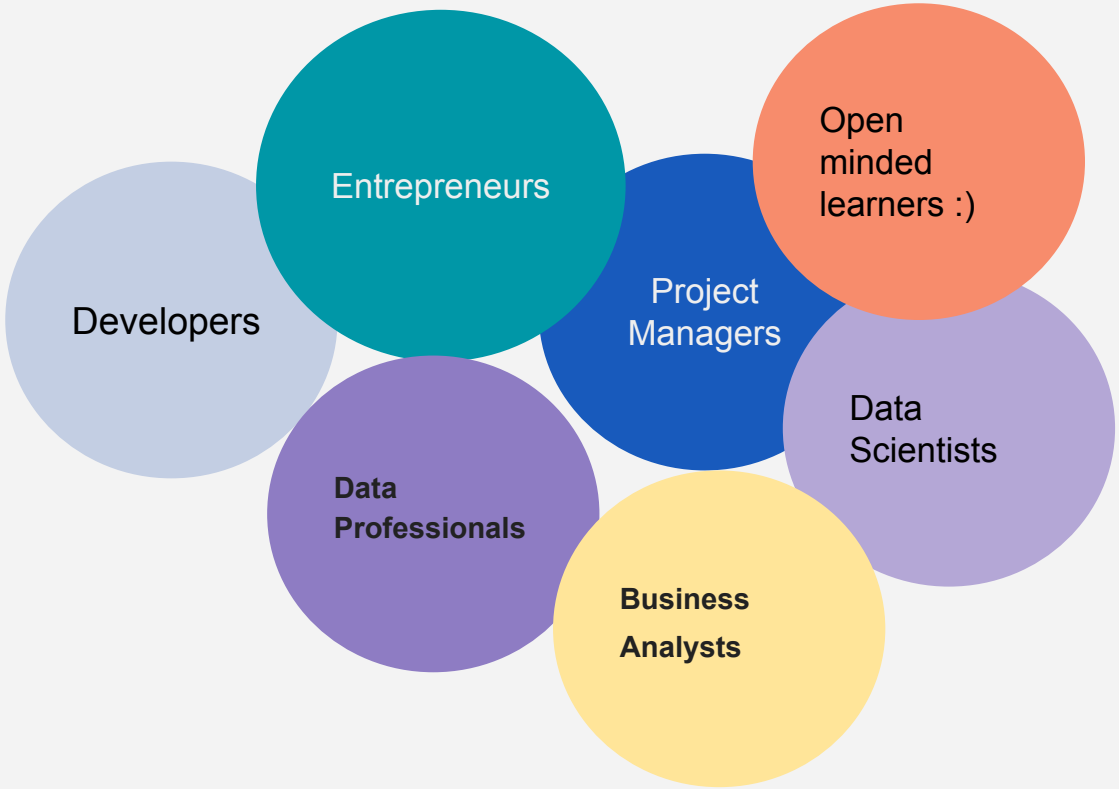
and Instructor

What Is This Course About?

- Building Database (AI) Agents -
  - Develop AI agents that interact with tabular data and SQL Databases
  - Function calls
  - OpenAI Assistants API with SQL databases and AI Agents

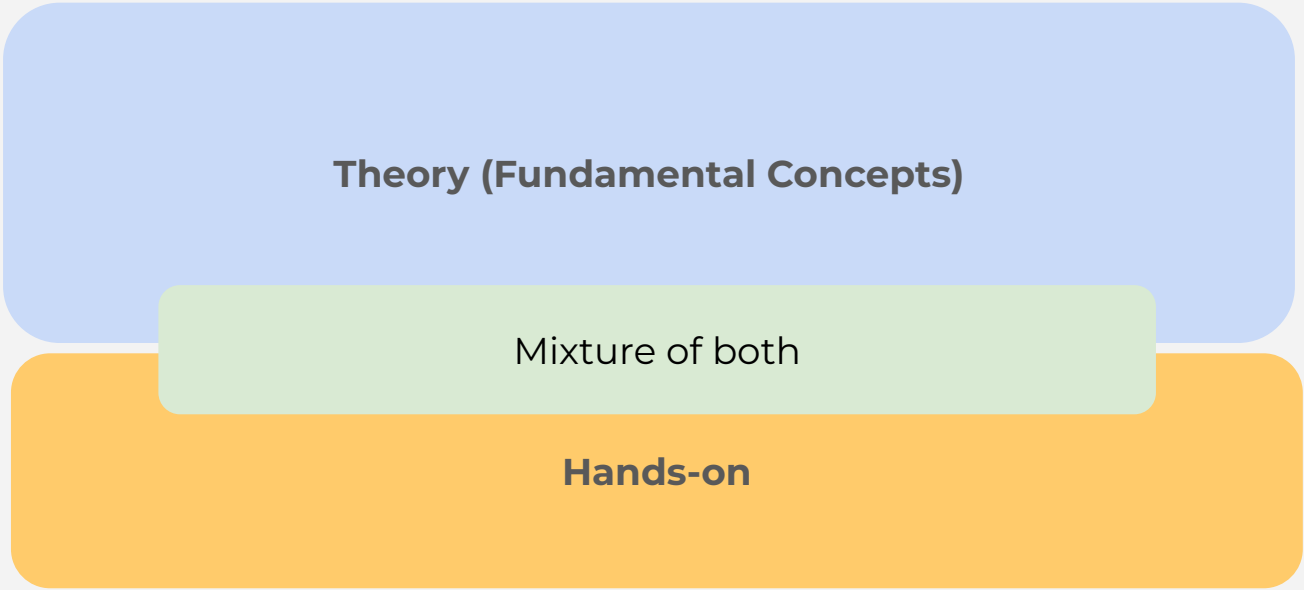
Who Is This Course For



Course Prerequisites

1. Know Programming (highly *preferred… at least the basics)*
    a. *There will be Python code*
2. *This is not a programming course*
3. Willingness to learn :)

Course Structure



Development Environment setup

- Python
- VS Code (or any other code editor)
- OpenAI API Account and API Key

Set up OpenAI API Account

*** Please note** that you will need an API key to use OpenAI services, and there may be some costs associated with using the API. However, these costs should be minimal.

OpenAI API - Dev Environment Setup

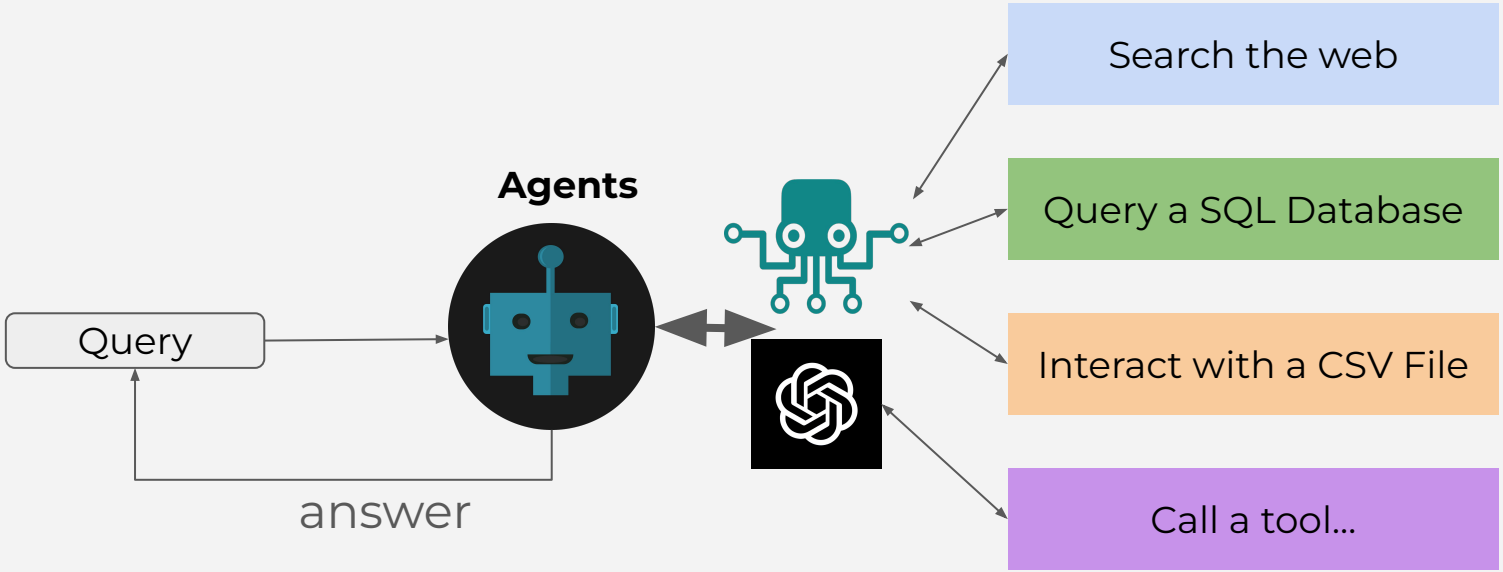
Python (Win, Mac, Linux)

https://kinsta.com/knowledgebase/install-python/

AI Agent Deep Dive

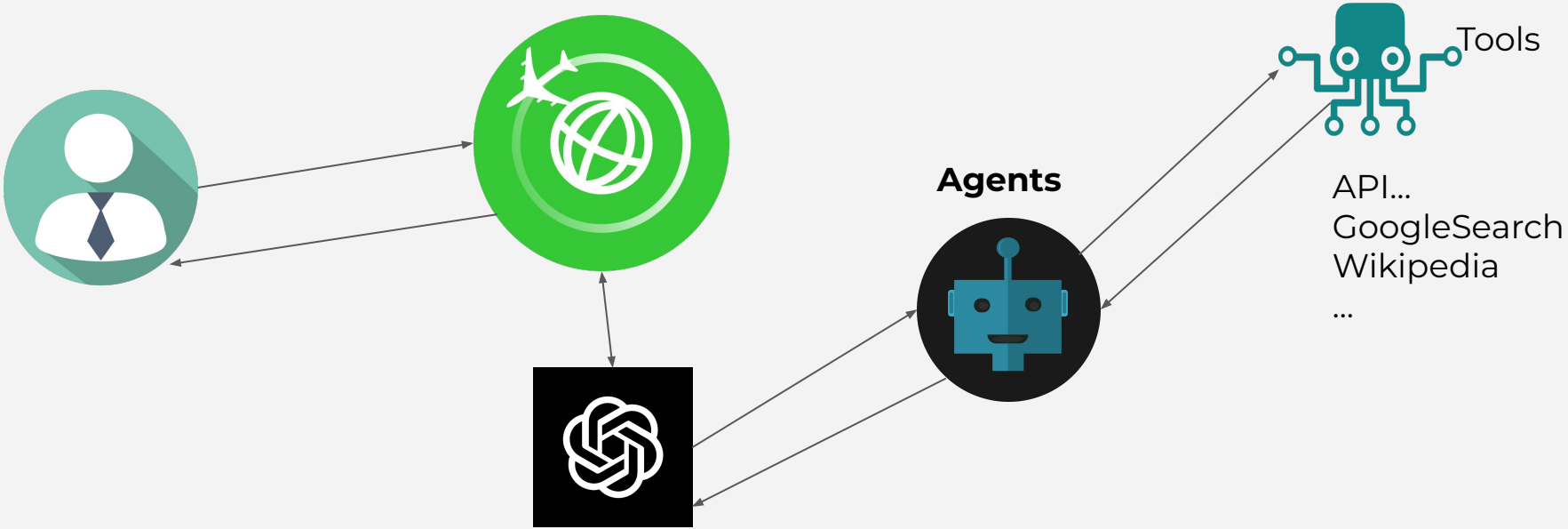
- What is it?
- Why (motivation)?
- Advantages

What is an (AI) agent?

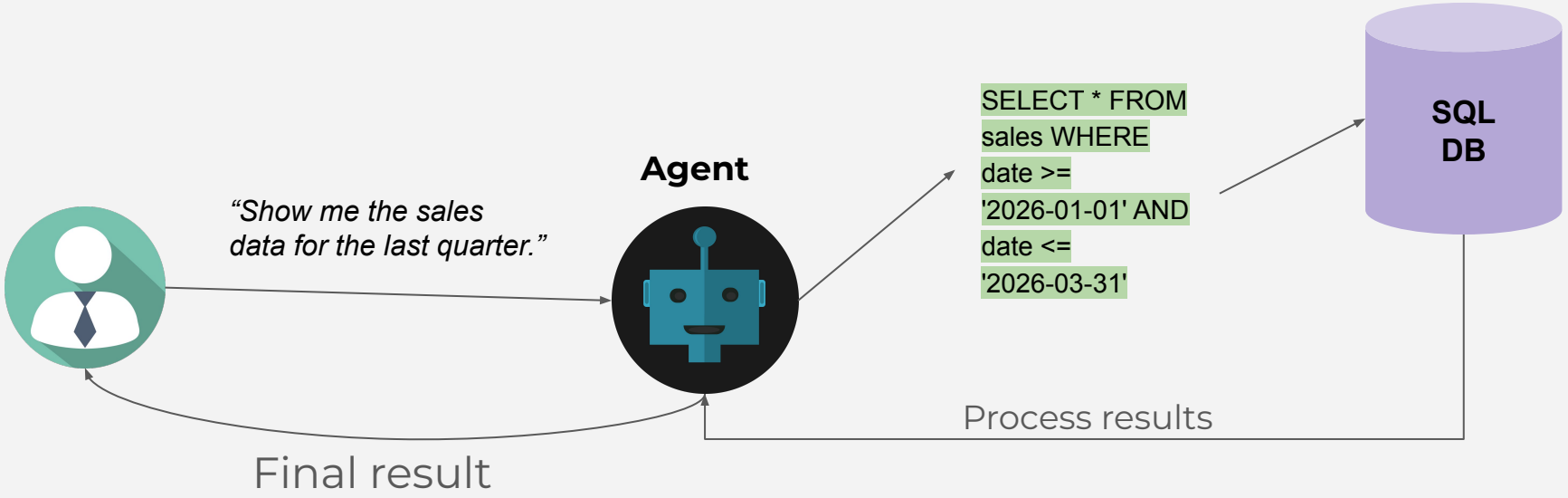


What is an agent & what they can do?

Personalized recommendations
Browse history
Previous vacations and activities...



What is an agent & what they can do?



Key characteristics

Autonomy

Learning and adaptation

Interaction

Goal-driven

Use cases

Customer service chatbots

Personal assistants

Data analysis

Smart home systems...

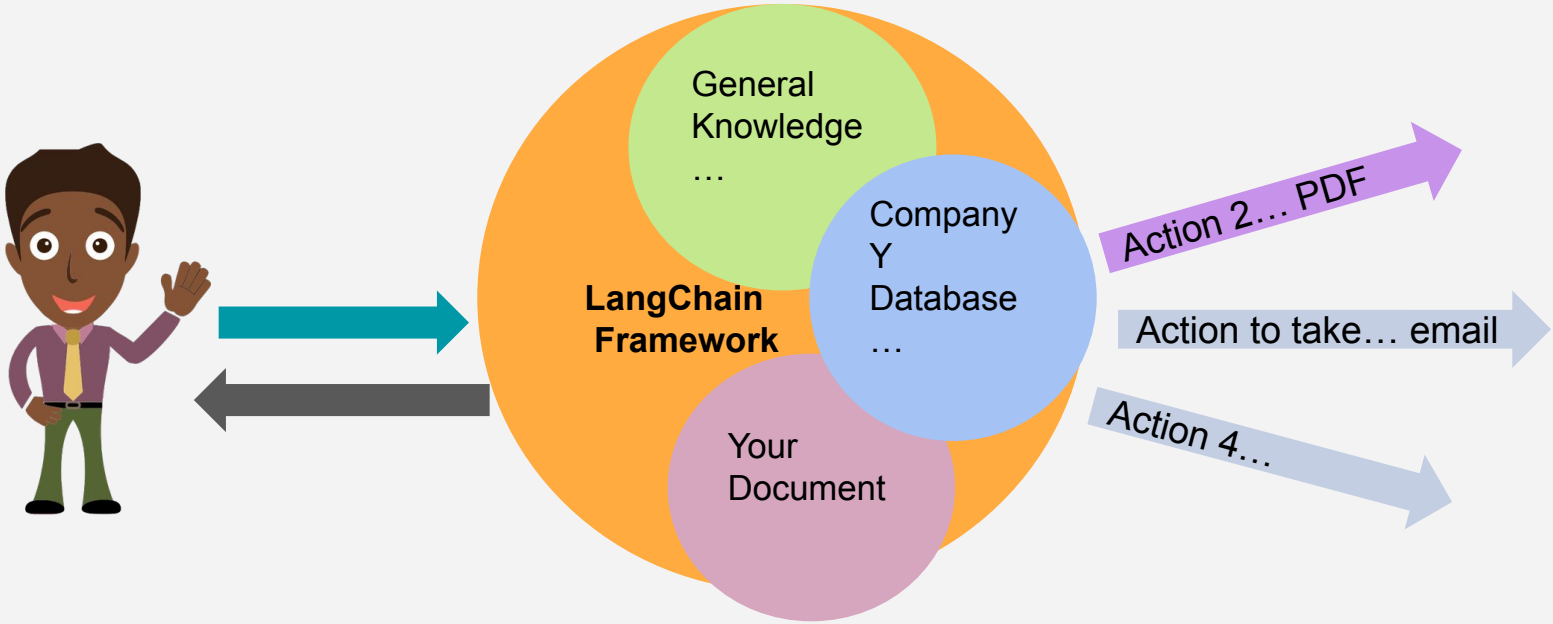
First *Agent*

Build your very first Agent

- We’ll use Langchain
- OpenAI model

LangChain

A framework (*open source)* for building applications that leverage various LLMs (Large Language Models).
Additionally - you can also use **external sources of data** combined with various LLMs!



First *Agent*

Build your very first Agent

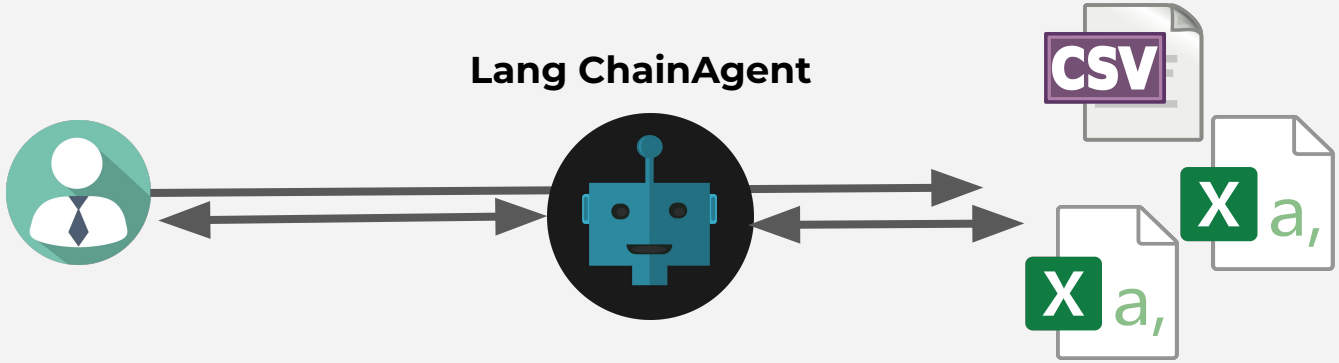
- Computer scientist agent
- Interact with the agent
- Langchain

CSV
Agent

Interacting with CSV data

- Extract CSV file data
- OpenAI model
- Langchain

Interacting with tabular data (CSV)



CSV
Agent

Interacting with CSV data

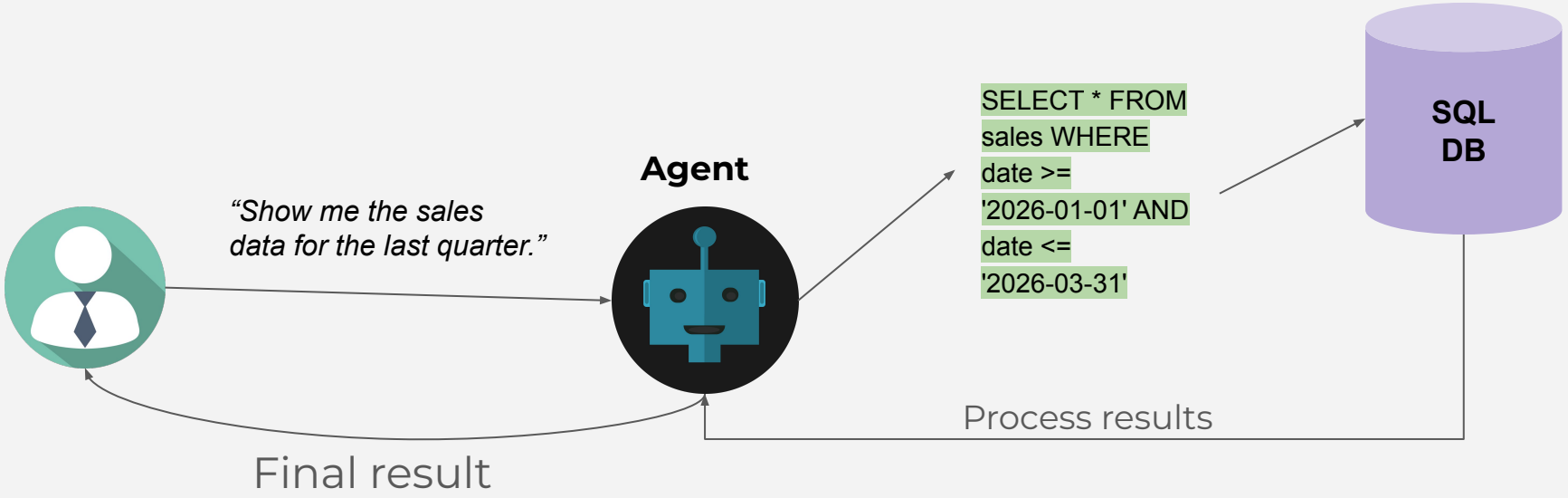
- Extract CSV file data
- OpenAI model
- Langchain
  - Added custom prompts to refine our CSV agent

Database *Agent*

Interacting with SQL Database

- Transform CSV file into SQL database
- OpenAI model
- Langchain

What is an agent & what they can do?



Database *Agent*

Interacting with SQL Database

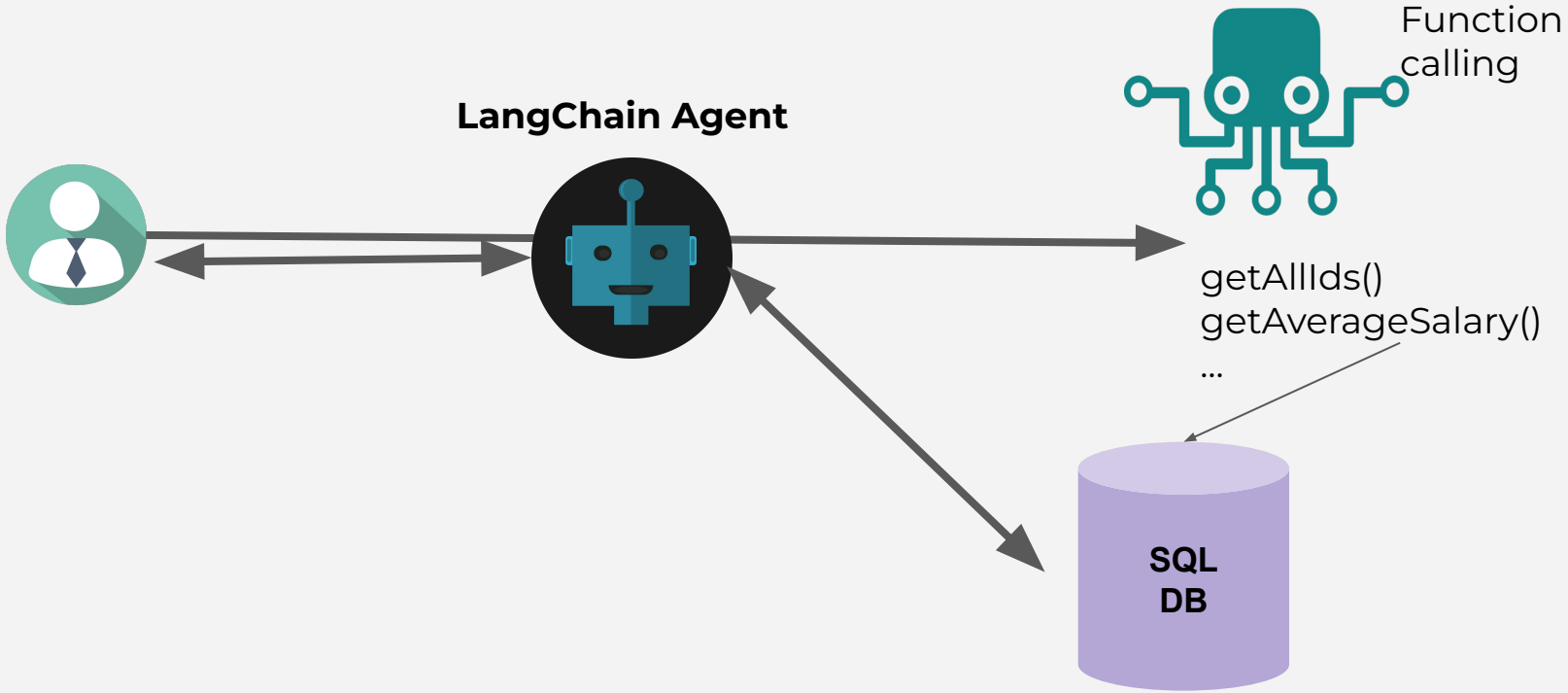
- Transform CSV file into SQL database
- OpenAI model
- Langchain
    - UI with streamlit

Agents

Function calling

Give agents more tools to work with

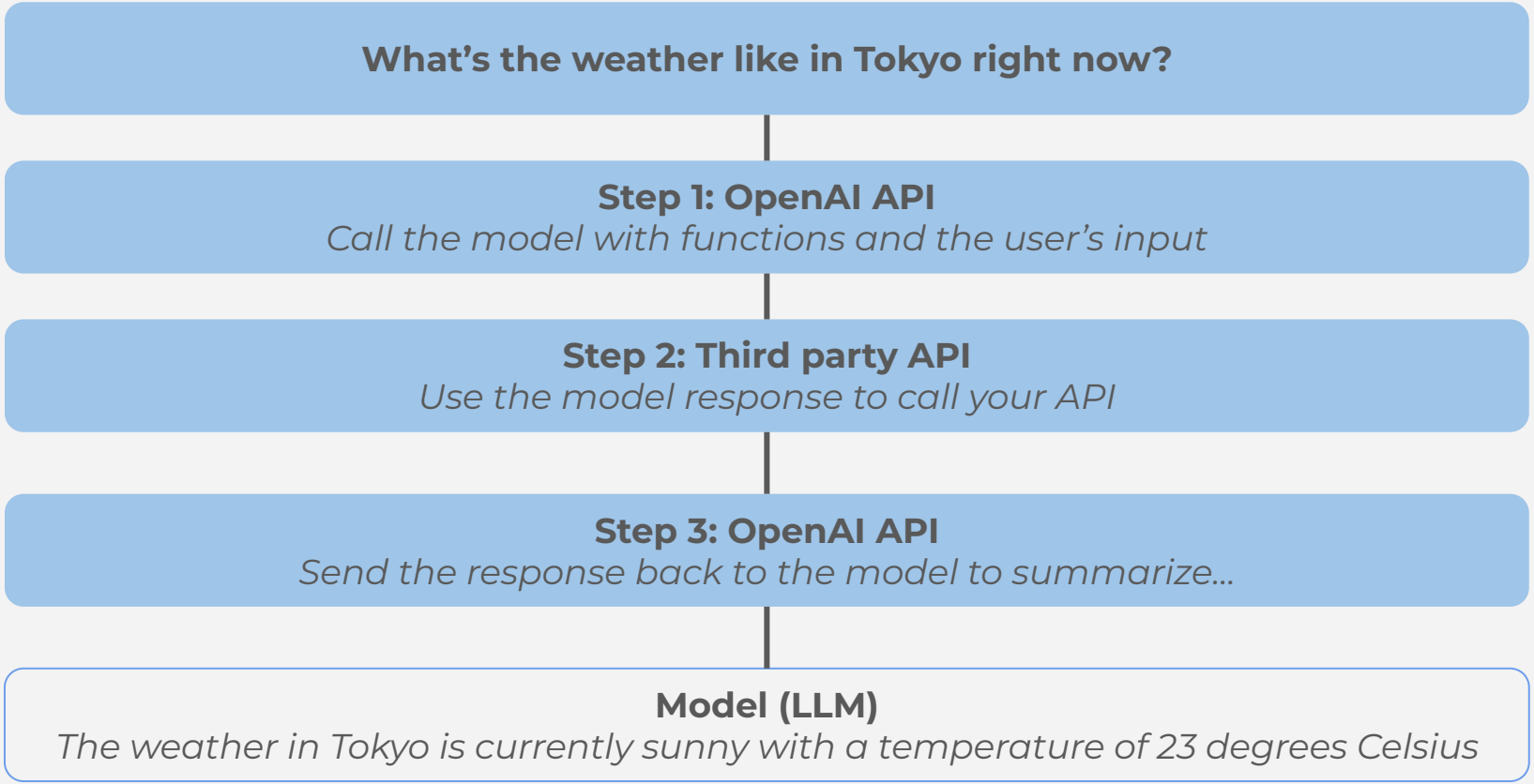
Agents and Function-calling



Function-calling Benefits

- Task specialization
  - Provide specific instructions for finding information needed
- Improved accuracy and efficiency
  - Prioritize queries for precise results & desired format
    - AI models can call predefined functions
- Security and control
  - Add control and encapsulate queries for better structure and predictable behavior
  - Sensitive operations can be restricted to specific function, enhancing security

Function-calling Deep dive



Function Calling Hands on

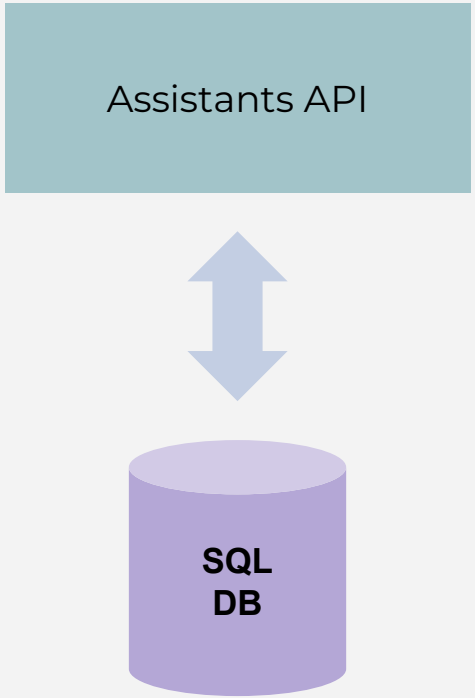
OpenAI
Function calling

Leveraging OpenAI Function calling with SQL Database

Function Calling Hands on - DB Agent

OpenAI Assistants API & SQL Databases

Leveraging the Assistants API for SQL DBs

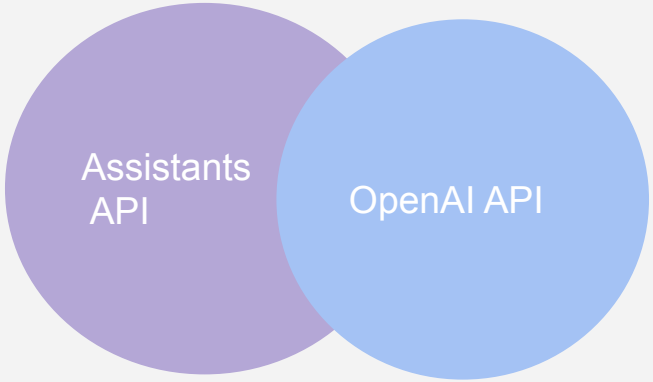


Assistants API

What is it & How it works?

Assistants API

A tool to allow developers to craft powerful AI assistants that can perform a variety of tasks.



- Assistants API extends the existing OpenAI API
  - Easier to build AI assistants
  - Bots, AI tools, etc..

Assistants API

What Problem It Solves?

Assistants API Benefits

Building Complex AI Applications is very difficult!

Developers need to:

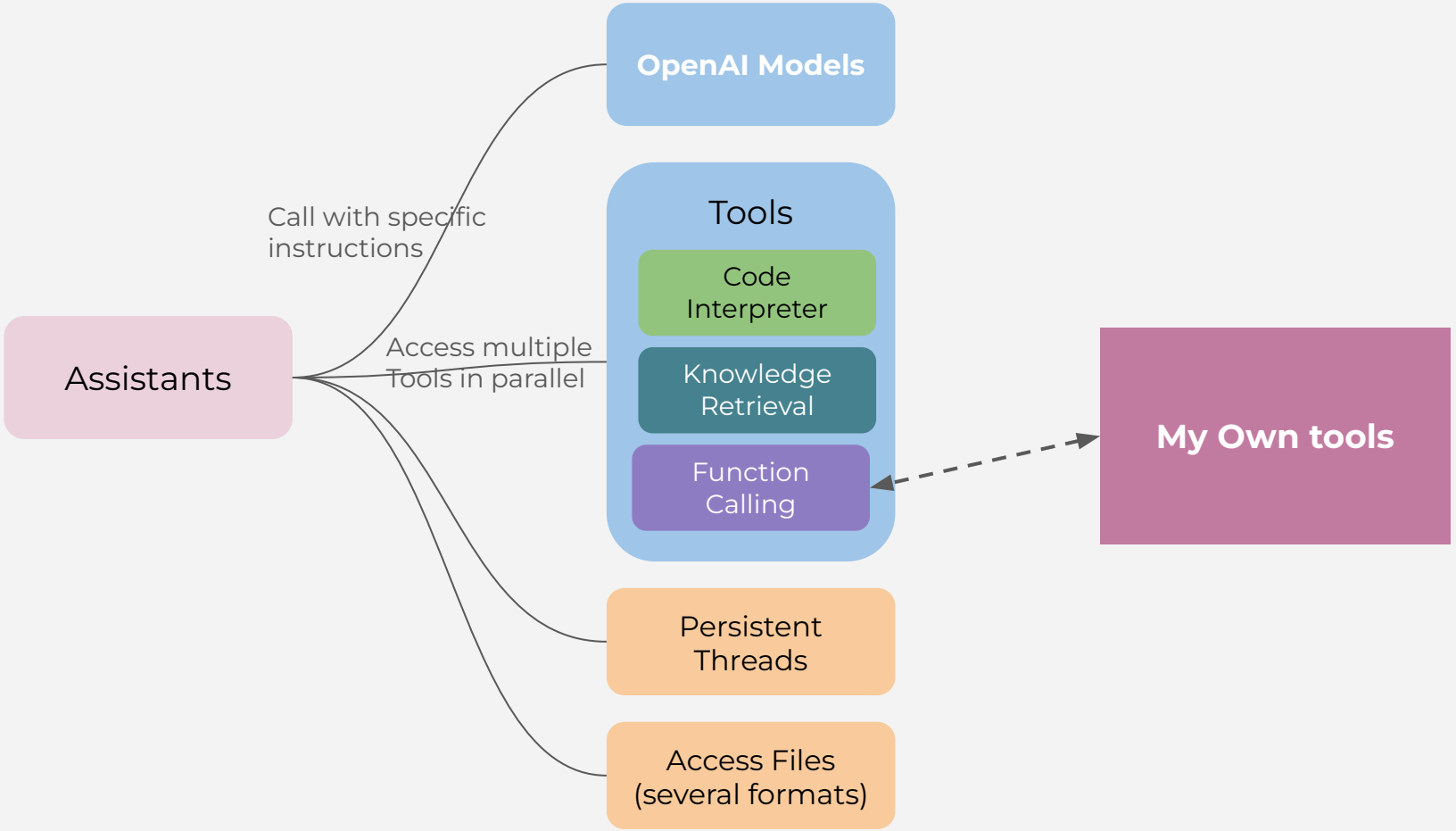
- Manage infrastructures
- Data
- Models
- Prompts
- Application state
- Embeddings,
- Storage mechanism
- ...

Developers need to spend most of their time *stitching* tech together, instead of actually **solving** customer **problems**

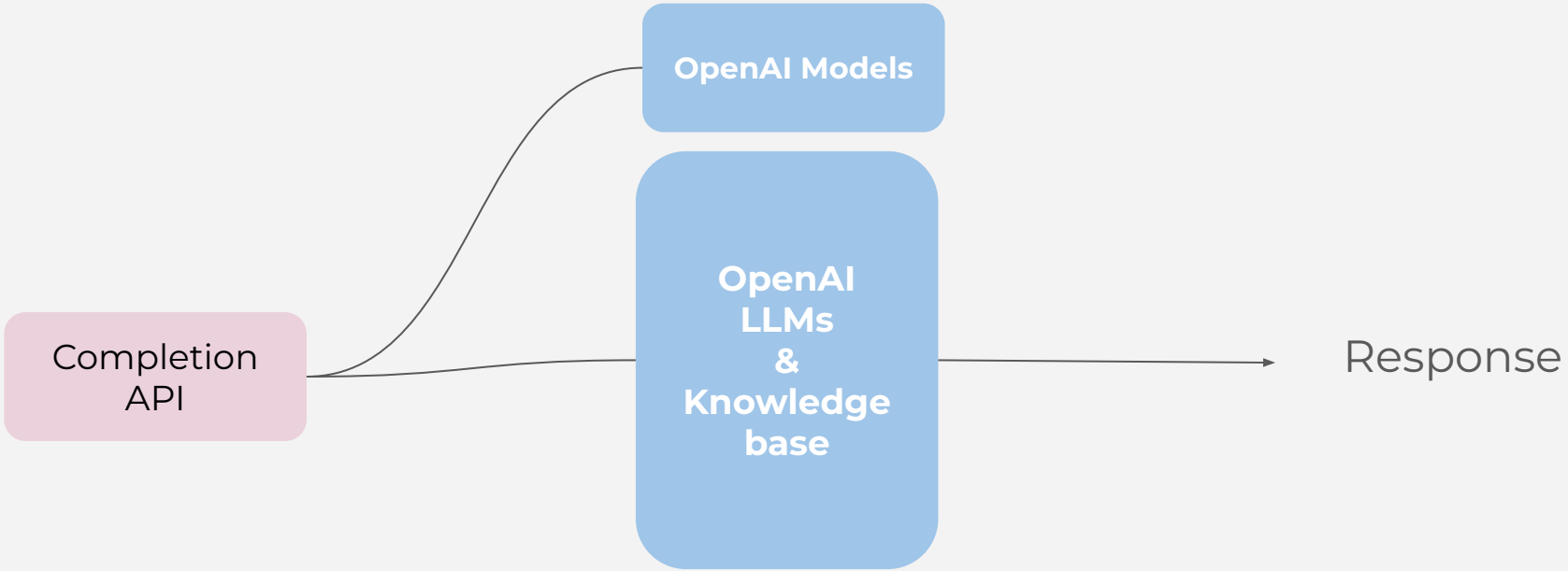
Assistants API Benefits

- Persistent threading for ongoing conversations
  - *Being able to save messages & **context** of the conversation*
- Retrieval mechanisms for digging through data
  - *Upload files for the models to use for additional knowledge-base*
- Code Interpreter
  - Write, analyze code...
- Function calling to execute custom tasks with ease

Assistants API Benefits



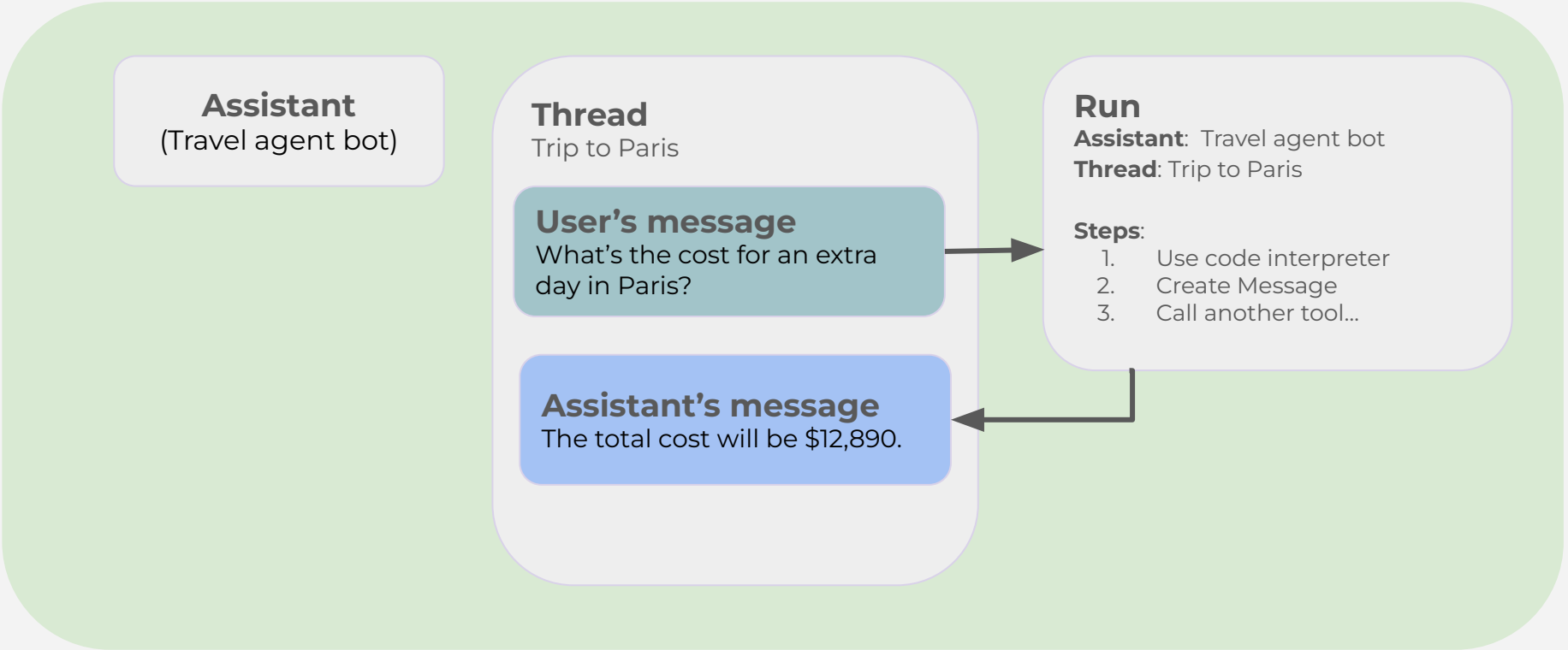
The Chat Completion API



General Comparison

Aspect	Assistants API	Chat Completions API
Initial Setup	Create an Assistant with defined capabilities.	No explicit setup of an Assistant is required.
Session Management	Initiate and manage a thread for ongoing conversations.	No explicit session or thread management; each request is independent.
Interaction Handling	Interact through the Runs API, considering the entire conversation context.	Send the entire chat history in each request, including system prompts and previous interactions.
Context Management	Persistent context through the thread, suitable for extended conversations.	Context is provided in each request; best for single interactions or where full context is included each time.
Complexity	More complex setup, offering detailed control and customization.	Simpler and more straightforward, with less granular control.
Ideal Use Cases	Best for detailed, context-heavy conversational applications.	Suited for simpler chatbots or applications where each response is standalone.
Capabilities	Advanced capabilities like integration with a code interpreter, online search for information queries, the ability to retrieve knowledge from uploaded files, and function calling.	Primarily focused on function calling, with less emphasis on extended capabilities beyond generating text responses.

Assistants API Building Blocks

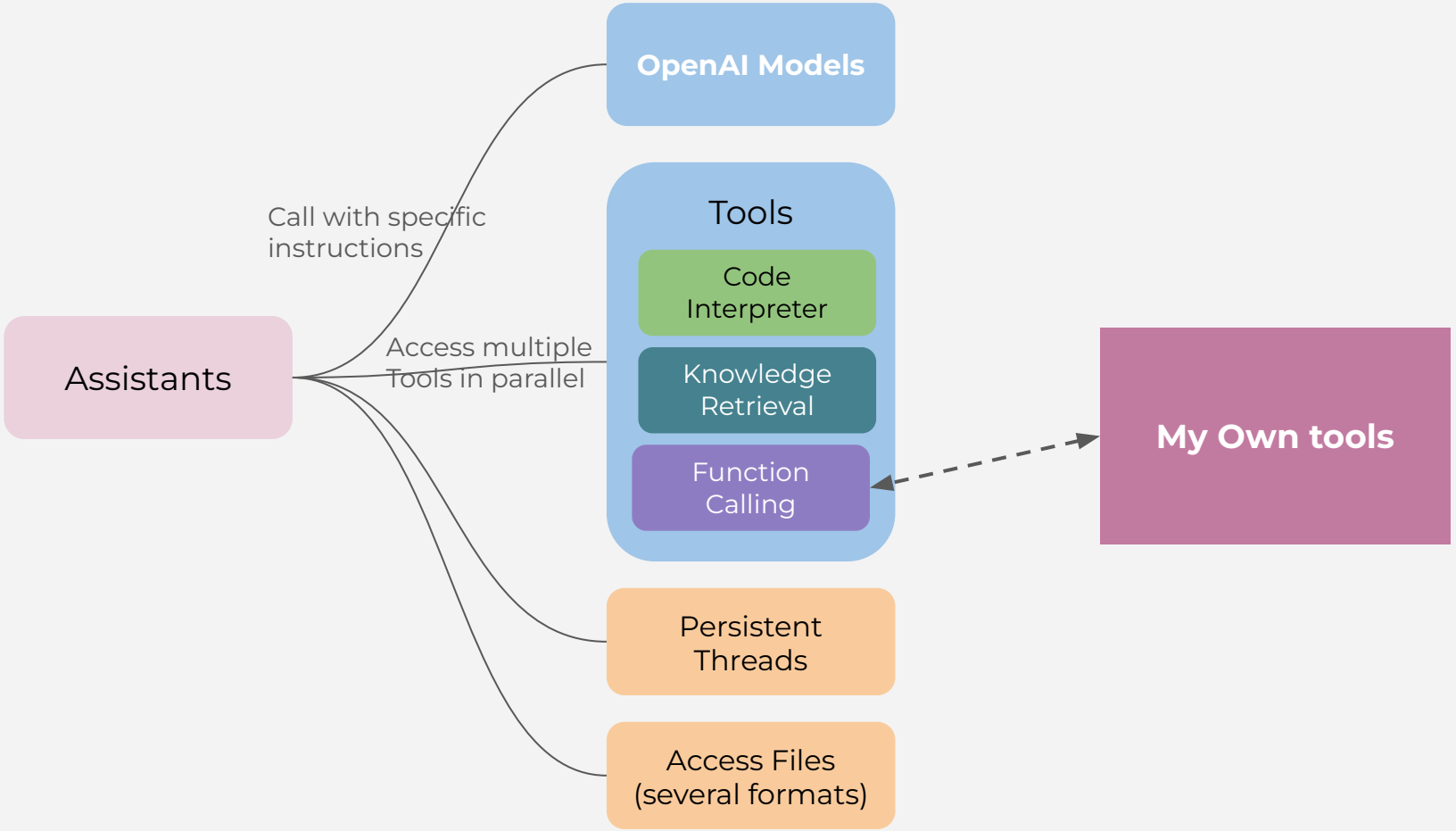


Assistants API & Agents - Benefits

Code Interpreter & Function calling are supported in the Assistants API

- Code interpreter - the assist. API can modify Python code iteratively
- Useful for complex tasks (*adjusting code until the right result is generated)*

Assistants API Benefits



Hands on

Congratulations!

You made it to the end!

- Next steps...

Course Summary

- Building Database (AI) Agents
  - Agents deep dive
  - Key characteristics
  - Agent use cases
  - Deep dive into Building Database Agents
    - Built first simple Agent (using Langchain framework)
    - Agents that interact with CSV, tabular data
    - Agents that interact with SQL databases
      - Agents take natural language queries and transform into SQL to interact with DB
  - Function calls (OpenAI) overview
  - Function calls and database agents
  - Leveraging the Assistants API for SQL DBs and Agents

Wrap up - Where to Go From Here?

- Keep learning
  - Extend the projects we worked on in this course
  - Implement your own SQL database
- Read more on Lanchain- https://python.langchain.com/v0.2/docs/tutorials/agents/
- Read the OpenAI documentation: https://platform.openai.com/docs/overview
- Challenge yourself to keep learning new skills!

Thank you!