Lang Chain - Agents

Venkata Reddy AI Classes

https://www.youtube.com/@VenkataReddyAIClasses/playlists

Contents

Agents

- Agents are software programs that interact with the
  - Real world
  - External events
  - Current data
  - Beyond LLM trained data
- LangChain offers various types of these interactive agents.
- These agents are designed to automate tasks and handle real-world scenarios.
- Agents are most important and most powerful aspect of Lang chain
- Agents concept got famous because of the ease of use. For enterprise applications we need to use them with caution.

Agents – Alternative to Chains

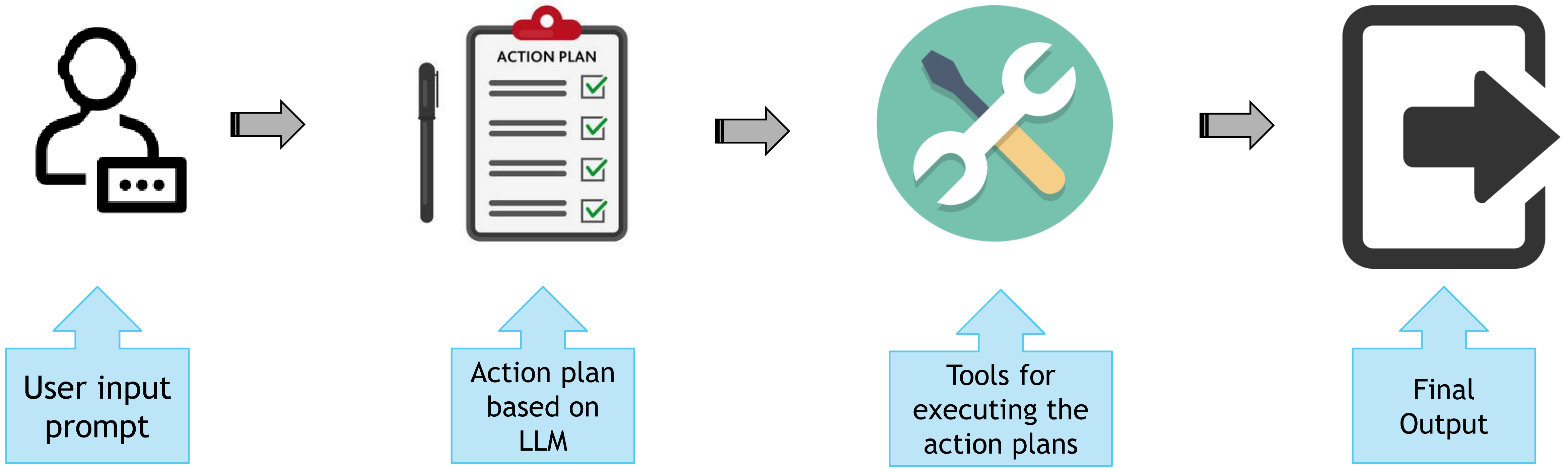
- Agents use a language model to determine a sequence of actions.
- Chains follow pre-defined action sequences set by developers. Agents do it with LLM reasoning
- We can perform all previous tasks using agents as alternatives to long sequential chains, memory and RAG applications.
- The language model acts as a reasoning engine in agents.
- Agents decide the order of actions based on reasoning.

- Agents need Tools

Be careful with Agents

- Agents are quick to build an use but …
- Agents have some issues
  - Inconsistent results. Same query may give correct or wrong results
  - Max tokens related errors
  - Timed out errors
  - Less power to customize an existing Agent
- Agents are still at early development stage, not yet perfect

Agents = LLM Reasoning + Tools



Agents = LLM Reasoning + Tools

1. Agent receives natural language input from the user.
2. Employs LLM to process input and create an action plan.
3. Executes the action plan, potentially using other **tools** or services.
4. Delivers the output from the executed plan back to the user.

Tools

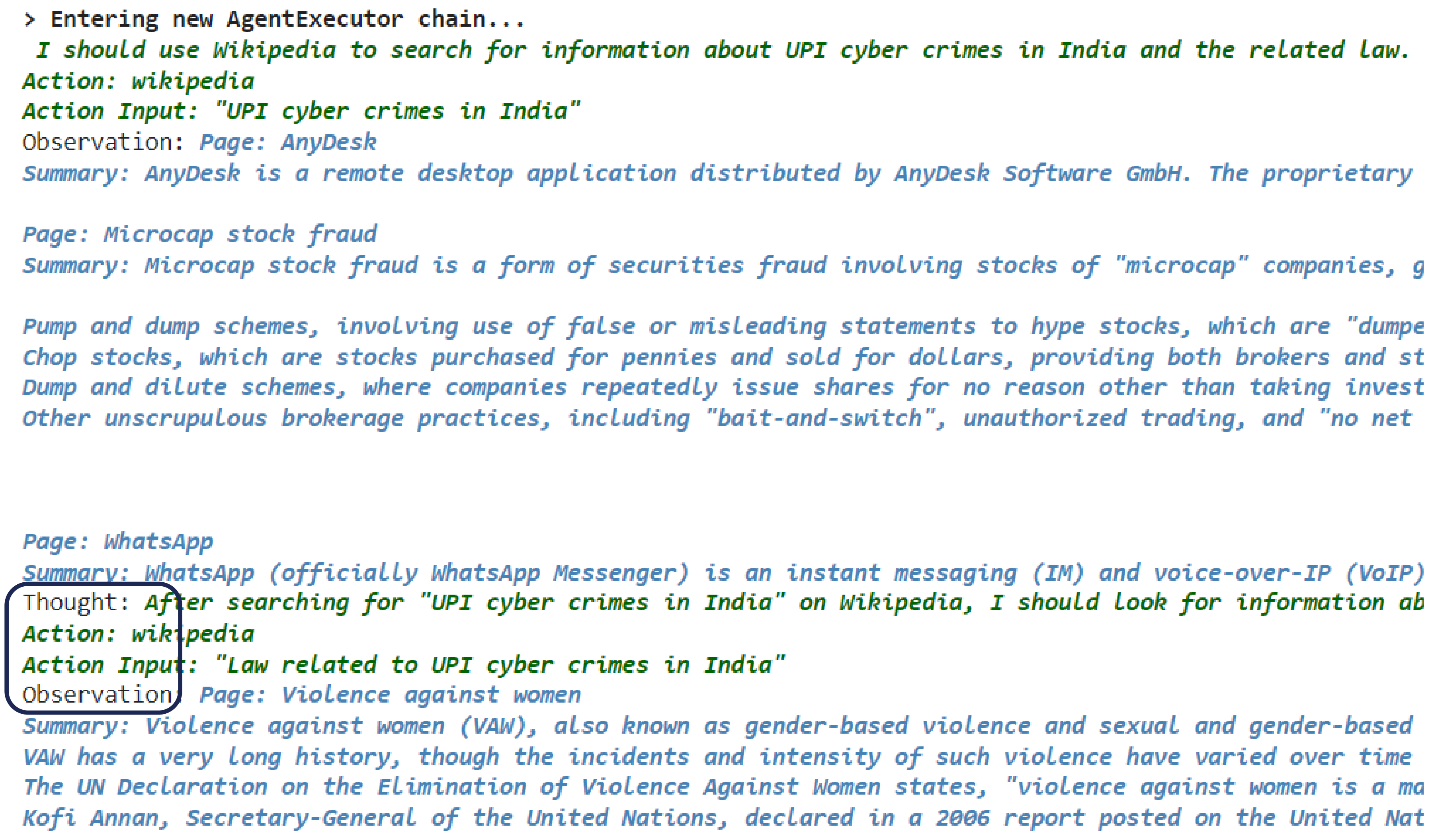
- Google search tool
- Wikipedia tool
- Calculator tool
- Python REPL tool

Agent Example – Wikipedia

```
llm=OpenAI(temperature=0)
tools=load_tools(["wikipedia"],llm=llm)
agent=initialize_agent(tools,
                       llm,
                       agent=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
                       verbose=True)

question="""
What is the law that is related to UPI cyber crimes in India?
How many years back it was introduced?
What is the name of the Law and the Section?
"""
agent.run(question)
```

More about ReAct is coming up

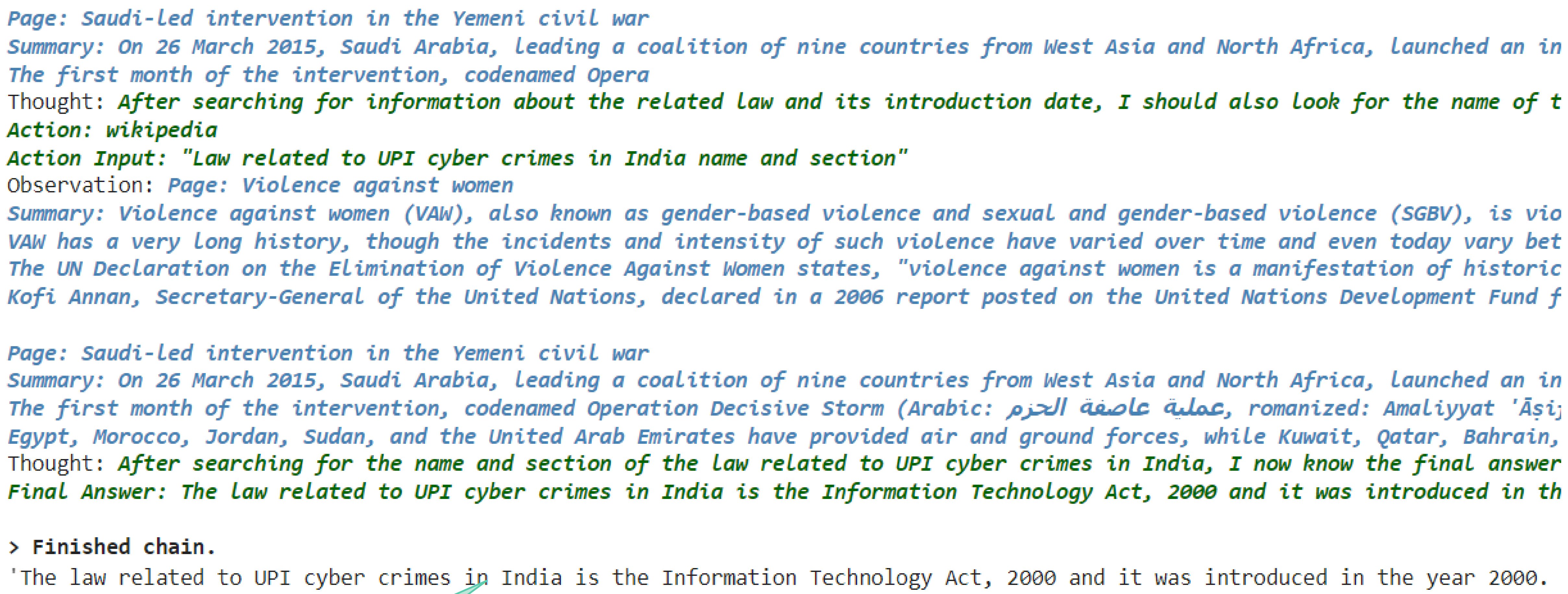
Agent Example – Wikipedia



```
> Entering new AgentExecutor chain...
 I should use Wikipedia to search for information about UPI cyber crimes in India and the related law.
Action: wikipedia
Action Input: "UPI cyber crimes in India"
Observation: Page: AnyDesk
Summary: AnyDesk is a remote desktop application distributed by AnyDesk Software GmbH. The proprietary

Page: Microcap stock fraud
Summary: Microcap stock fraud is a form of securities fraud involving stocks of "microcap" companies, g

Pump and dump schemes, involving use of false or misleading statements to hype stocks, which are "dumpe
Chop stocks, which are stocks purchased for pennies and sold for dollars, providing both brokers and st
Dump and dilute schemes, where companies repeatedly issue shares for no reason other than taking invest
Other unscrupulous brokerage practices, including "bait-and-switch", unauthorized trading, and "no net



Page: WhatsApp
Summary: WhatsApp (officially WhatsApp Messenger) is an instant messaging (IM) and voice-over-IP (VoIP)
Thought: After searching for "UPI cyber crimes in India" on Wikipedia, I should look for information ab
Action: wikipedia
Action Input: "Law related to UPI cyber crimes in India"
Observation: Page: Violence against women
Summary: Violence against women (VAW), also known as gender-based violence and sexual and gender-based
VAW has a very long history, though the incidents and intensity of such violence have varied over time
The UN Declaration on the Elimination of Violence Against Women states, "violence against women is a ma
Kofi Annan, Secretary-General of the United Nations, declared in a 2006 report posted on the United Nat
```

Internal ReAct prompting

Agent Example – Wikipedia

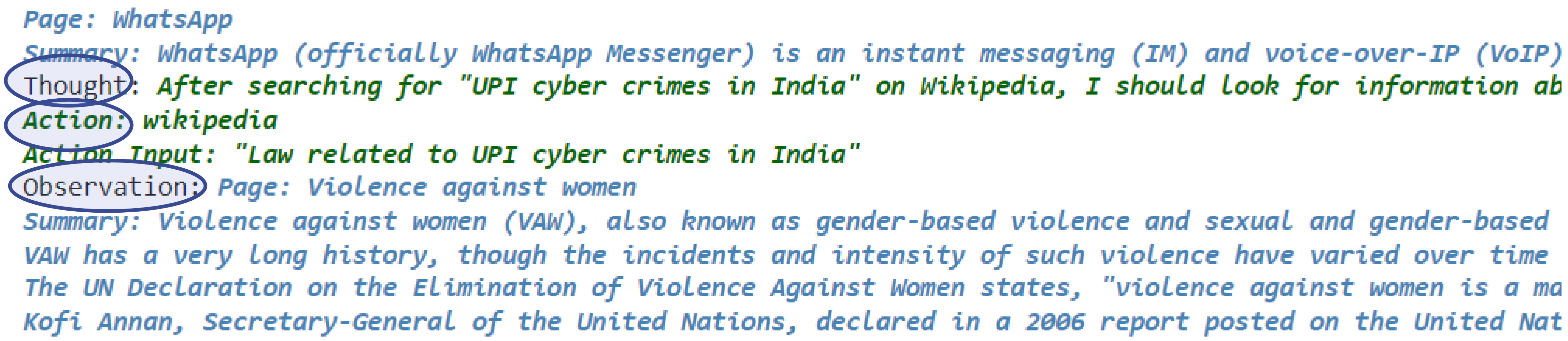


```
Page: Saudi-led intervention in the Yemeni civil war
Summary: On 26 March 2015, Saudi Arabia, leading a coalition of nine countries from West Asia and North Africa, launched an in
The first month of the intervention, codenamed Opera
Thought: After searching for information about the related law and its introduction date, I should also look for the name of t
Action: wikipedia
Action Input: "Law related to UPI cyber crimes in India name and section"
Observation: Page: Violence against women
Summary: Violence against women (VAW), also known as gender-based violence and sexual and gender-based violence (SGBV), is vio
VAW has a very long history, though the incidents and intensity of such violence have varied over time and even today vary bet
The UN Declaration on the Elimination of Violence Against Women states, "violence against women is a manifestation of historic
Kofi Annan, Secretary-General of the United Nations, declared in a 2006 report posted on the United Nations Development Fund f

Page: Saudi-led intervention in the Yemeni civil war
Summary: On 26 March 2015, Saudi Arabia, leading a coalition of nine countries from West Asia and North Africa, launched an in
The first month of the intervention, codenamed Operation Decisive Storm (Arabic: عملية عاصفة الحزم, romanized: Amaliyyat 'Āṣi
Egypt, Morocco, Jordan, Sudan, and the United Arab Emirates have provided air and ground forces, while Kuwait, Qatar, Bahrain,
Thought: After searching for the name and section of the law related to UPI cyber crimes in India, I now know the final answer
Final Answer: The law related to UPI cyber crimes in India is the Information Technology Act, 2000 and it was introduced in th

> Finished chain.
'The law related to UPI cyber crimes in India is the Information Technology Act, 2000 and it was introduced in the year 2000.
```

result

ReAct(Reasoning and Acting) prompting

- ReAct prompted models generate Thought-Action-Observation triplets for every iteration.



```
Page: WhatsApp
Summary: WhatsApp (officially WhatsApp Messenger) is an instant messaging (IM) and voice-over-IP (VoIP)
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VAW has a very long history, though the incidents and intensity of such violence have varied over time
The UN Declaration on the Elimination of Violence Against Women states, "violence against women is a ma
Kofi Annan, Secretary-General of the United Nations, declared in a 2006 report posted on the United Nat
```

ReAct(Reasoning and Acting) prompting

- Zero-shot ReAct Agent generates realistic contexts without specific training.
- ReAct prompting allows language models to trace reasoning steps involved in answering a user's query
- ReAct prompted models generate Thought-Action-Observation triplets for every iteration.
- They influence the model's internal state by analyzing and updating context.
- ReAct prompting is intuitive and flexible to design, and achieves state-of-the-art few-shot performances across a variety of tasks

ReAct(Reasoning and Acting) prompting

```
# Calculator tool
llm=OpenAI(temperature=0)
tools=load_tools(["llm-math"],llm=llm)
agent=initialize_agent(tools,
                       llm,
                       agent=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
                       verbose=True)

agent.run("What is the cube root of 999")
```

ReAct(Reasoning and Acting) prompting

Thought is trying to validate internally

```
> Entering new AgentExecutor chain...
 I should use a calculator to find the cube root
Action: Calculator
Action Input: 999
Observation: Answer: 999
Thought: This can't be right, the cube root of 999 should be a smaller number
Action: Calculator
Action Input: 999^(1/3)
Observation: Answer: 9.99666555493786
Thought: This seems more accurate
Final Answer: The cube root of 999 is approximately 9.99666555493786.

> Finished chain.
'The cube root of 999 is approximately 9.99666555493786.'
```

Tools

- Tools allow agents to interact with the world via defined interfaces.
- Simpler tool inputs enable easier use by language models (LLMs).
- The function call in a tool is equivalent to the action taken by the LLM.
- Results from tools may be directly returned to the user or processed further.
- Tool descriptions must be clear to guide LLMs in specifying actions.
- Agents may need adjustments in tool settings for optimal performance.
- Clarity in tool specifications is crucial for effective action by LLMs.

SerpApi Tool

- SerpApi provides real-time access to Google search results.
- SERP - Search Engine Results Page
- Langchain's agent uses a specific prompt to direct LLMs' output format.
- When the "Search" action is triggered, SerpApi scrapes Google with the provided query.
- Google's search results are sent back to LLMs for further processing.
- This cycle continues until a final answer is generated.

- Get SERPApi- https://serpapi.com/dashboard

llm-math Tool

- This tool solves user's math queries, including numerical calculations.
- LLMs often lack training data specific to mathematical problems and solutions.
- Inadequate data can cause errors in number interpretation and calculation steps.
- LLMs primarily operate on text tokens, not numeric representations.
- Math problems usually have one correct solution, unlike text-based tasks.
- The generative nature of LLMs complicates accurate math problem-solving.
- These challenges impact the LLM's ability to reason quantitatively.

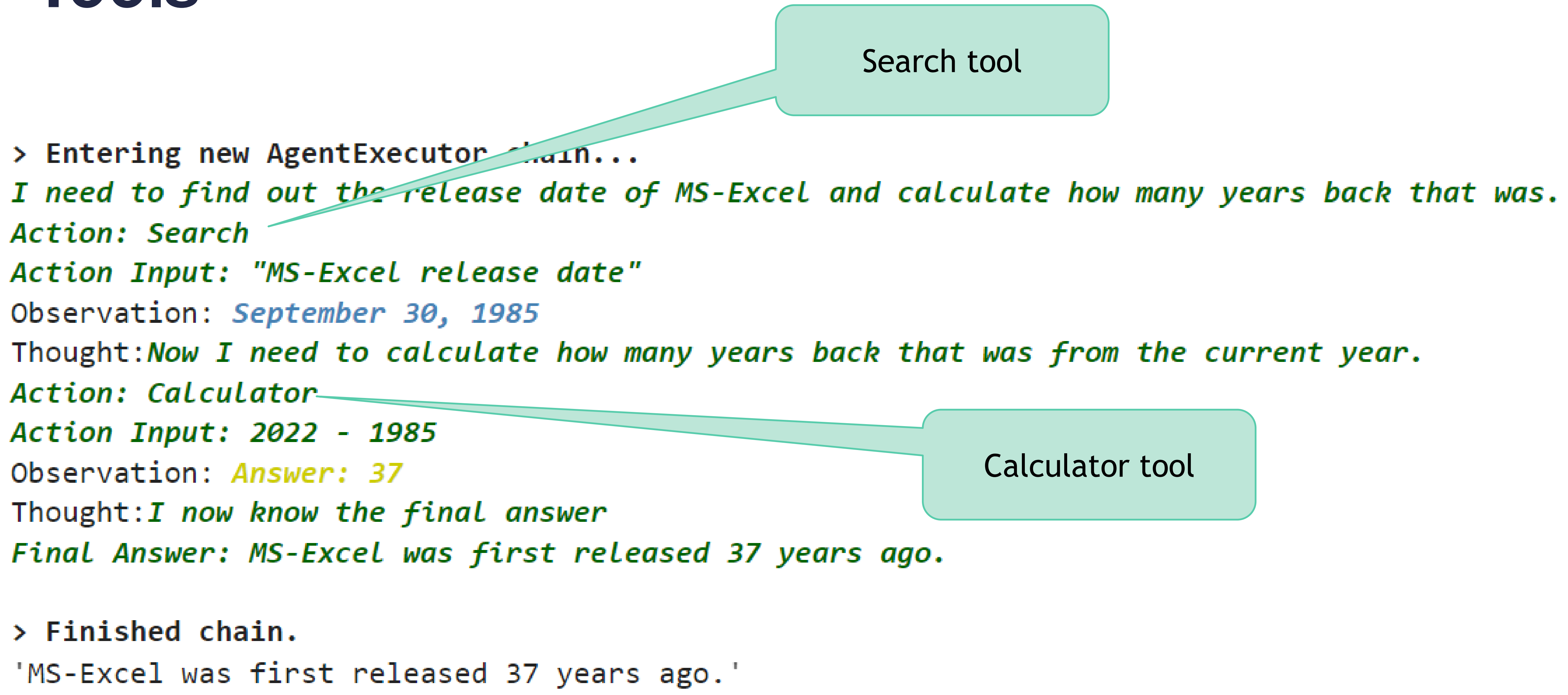
Tools

```
llm=ChatOpenAI(temperature=0)

tools=load_tools(["serpapi", "llm-math"],llm=llm)

agent=initialize_agent(tools,
                       llm,
                       agent=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
                       verbose=True)

agent.run("When was MS-Excel first released? How many years back?")
```

Search tool

Calculator tool

Tools



```
> Entering new AgentExecutor chain...
I need to find out the release date of MS-Excel and calculate how many years back that was.
Action: Search
Action Input: "MS-Excel release date"
Observation: September 30, 1985
Thought:Now I need to calculate how many years back that was from the current year.
Action: Calculator
Action Input: 2022 - 1985
Observation: Answer: 37
Thought:I now know the final answer
Final Answer: MS-Excel was first released 37 years ago.

> Finished chain.
'MS-Excel was first released 37 years ago.'
```

Tools

Alpha Vantage	Exa Search	Infobip	SearxNG Search
Apify	File System	Ionic Shopping Tool	Semantic Scholar API Tool
ArXiv	Golden Query	Lemon Agent	SerpAPI
AWS Lambda	Google Cloud Text-to-Speech	Memorize	SQL Database
Shell (bash)	Google Drive	Nuclia Understanding	StackExchange
Bearly Code Interpreter	Google Finance	NVIDIA Riva: ASR and TTS	Tavily Search
Bing Search	Google Jobs	OpenWeatherMap	Twilio
Brave Search	Google Lens	Quickstart	Wikidata
ChatGPT Plugins	Google Places	Polygon Stock Market API Tools	Wikipedia
Connery Action Tool	Google Scholar	PubMed	Wolfram Alpha
Dall-E Image Generator	Google SerpAPI	Python REPL	Yahoo Finance News
DataForSEO	Google Serper	Reddit Search	You.com Search
Dataherald	Google Trends	Requests	YouTube
DuckDuckGo Search	GraphQL	SceneXplain	Zapier Natural Language Actions
E2B Data Analysis	HuggingFace Hub Tools	Search Tools	Eleven Labs Text2Speech
Eden AI	IFTTT WebHooks	SearchApi	Human as a tool

Tools

Alpha Vantage	Exa Search	Infobip	SearxNG Search
Apify	File System	Ionic Shopping Tool	Semantic Scholar API Tool
ArXiv	Golden Query	Lemon Agent	SerpAPI
AWS Lambda	Google Cloud Text-to-Speech	Memorize	SQL Database
Shell (bash)	Google Drive	Nuclia Understanding	StackExchange
Bearly Code Interpreter	Google Finance	NVIDIA Riva: ASR and TTS	Tavily Search
Bing Search	Google Jobs	OpenWeatherMap	Twilio
Brave Search	Google Lens	Quickstart	Wikidata
ChatGPT Plugins	Google Places	Polygon Stock Market API Tools	Wikipedia
Connery Action Tool	Google Scholar	PubMed	Wolfram Alpha
Dall-E Image Generator	Google SerpAPI	Python REPL	Yahoo Finance News
DataForSEO	Google Serper	Reddit Search	You.com Search
Dataherald	Google Trends	Requests	YouTube
DuckDuckGo Search	GraphQL	SceneXplain	Zapier Natural Language Actions
E2B Data Analysis	HuggingFace Hub Tools	Search Tools	Eleven Labs Text2Speech
Eden AI	IFTTT WebHooks	SearchApi	Human as a tool

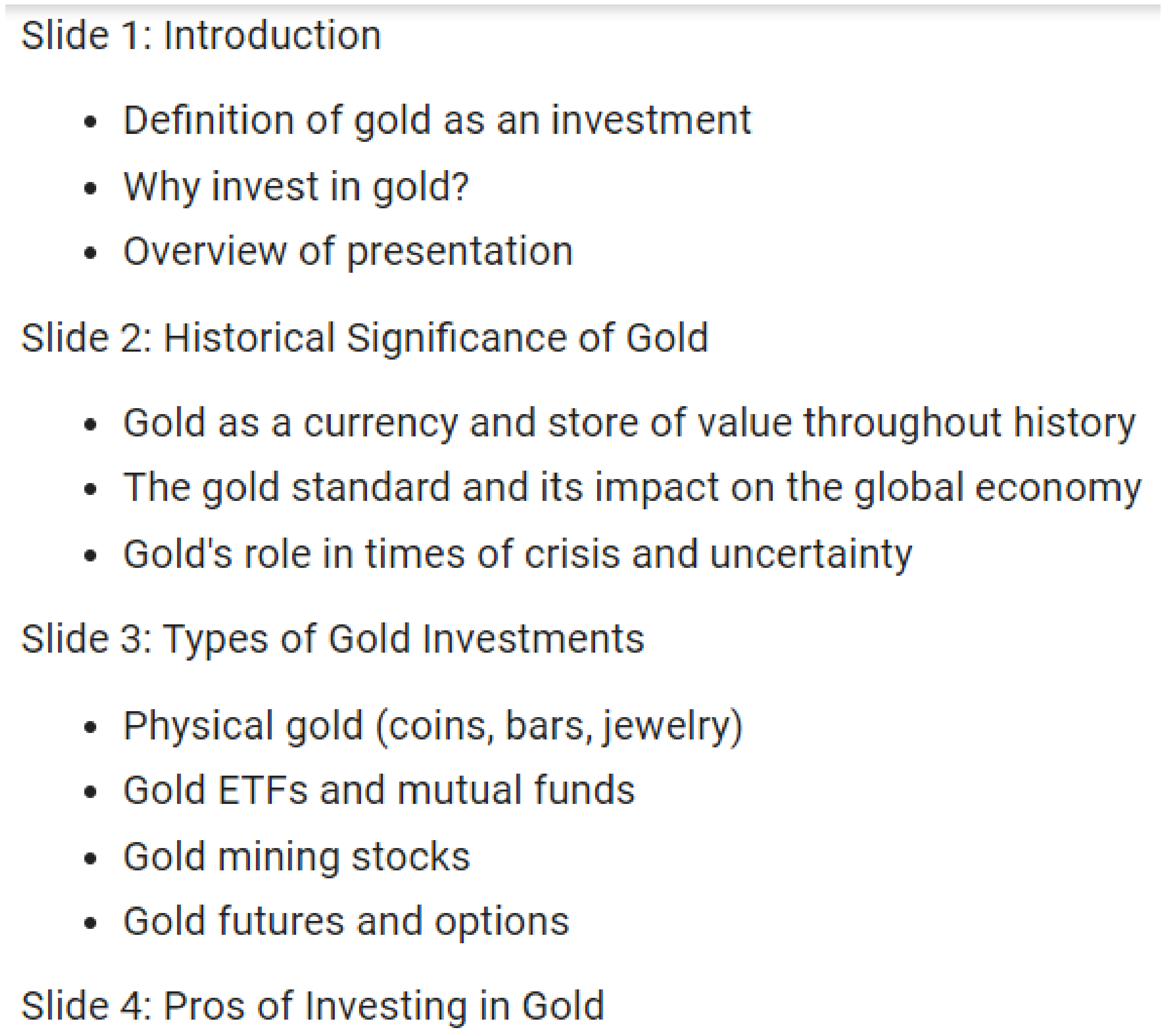
LAB – PPT Maker APP

- Create an app to browse the web and generate PowerPoint bullet points for any given topic.
  - Use Google Search to access the most recent information available.
  - Incorporate Wikipedia for reliable, factual content on various topics.
  - Utilize arXiv for in-depth, technical insights and research data.
- Design the app to automatically query these three sources for content.
- Ensure the app can extract and summarize key information into bullet points.

Code – PPT Maker APP

```
llm=OpenAI(temperature=0.3)

agent=initialize_agent(tools,
                       llm,
                       agent=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
                       verbose=True)

tools=load_tools(["serpapi", "wikipedia", "arxiv"],llm=llm)
template="""
take the topic name as input. Topic Name : {Topic_name}
Extract the information from all the tools. Generate at least an essay of 1000 words
Create a PowerPoint friendly content from the essay
Give the output in 10 slides. each section title and minimum 6 bullet points
"""
prompt_template=PromptTemplate(template=template, input_variables=["Topic_name"])

agent.run(prompt_template.format(Topic_name="Investing in gold"))
```

Output – PPT Maker APP



Slide 1: Introduction

- Definition of gold as an investment
- Why invest in gold?
- Overview of presentation

Slide 2: Historical Significance of Gold

- Gold as a currency and store of value throughout history
- The gold standard and its impact on the global economy
- Gold's role in times of crisis and uncertainty

Slide 3: Types of Gold Investments

- Physical gold (coins, bars, jewelry)
- Gold ETFs and mutual funds
- Gold mining stocks
- Gold futures and options

Slide 4: Pros of Investing in Gold

Output – PPT Maker APP

- Step-1 : Copy paste the points in wordfile
- Step-2 : Save all of the points as heading2 H2
- Step-3 : Save the titles as H1
- Step-4 : Word>>File>>Options>>Customize Ribbon >> All Commands >>Send to Microsoft PPT
- Step -5 : Select the PPT Design

Toolkits

ToolKits – collection of tools

- Toolkits are collections of tools that are designed to be used together for specific tasks.
- They have convenient loading methods.
- List of Tool Kits - https://python.langchain.com/docs/integrations/toolkits/

CSV Agent

```python
from langchain_experimental.agents.agent_toolkits import create_csv_agent

llm=OpenAI(temperature=0)
agent=create_csv_agent(llm=llm,
                       path="bank_market.csv",
                       agent=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
                       verbose=True)

result=agent.run("What are the column names in the dataset?")
print(result)

print(agent.run("What is the average age of the customers?"))

print(agent.run("Are there any outliers in the dataset?"))
```

CSV Agent - Output

```
> Finished chain.
The column names in the dataset are 'Cust_num', 'age', 'job', 'marital', 'education',
```

```python
print(agent.run("What is the average age of the customers?"))
```

```
> Finished chain.
The average age of the customers is 40.93621021432837.
```

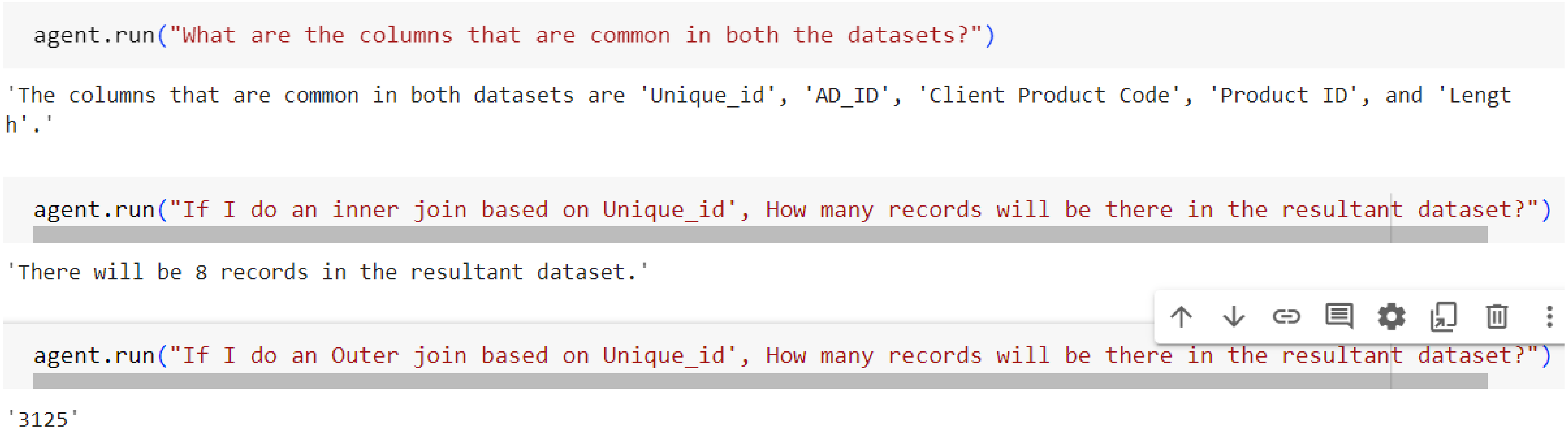
```python
print(agent.run("Are there any outliers in the dataset?"))
```

```
> Finished chain.
There may be outliers in the numerical columns, but not in the categorical columns.
```

Working with Multiple CSV files

```
agent = create_csv_agent(llm=llm,
    path=["orders.csv","slots.csv"],
    verbose=True,
    agent_type=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
    )
```

Working with Multiple CSV files - Output



```
agent.run("What are the columns that are common in both the datasets?")
```

```
'The columns that are common in both datasets are 'Unique_id', 'AD_ID', 'Client Product Code', 'Product ID', and 'Lengt
h'.'
```

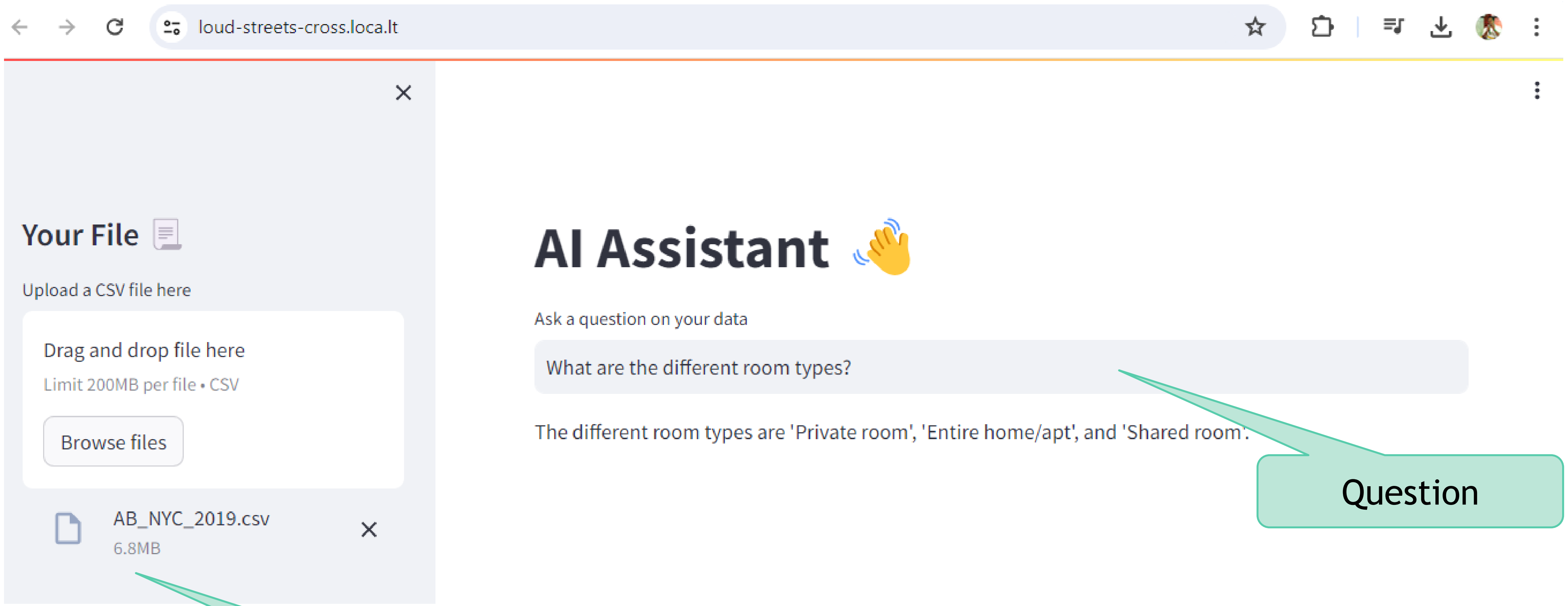
```
agent.run("If I do an inner join based on Unique_id', How many records will be there in the resultant dataset?")
```

```
'There will be 8 records in the resultant dataset.'
```

```
agent.run("If I do an Outer join based on Unique_id', How many records will be there in the resultant dataset?")
```

```
'3125'
```

App - Talk to your Data - Local



loud-streets-cross.loca.lt

Your File

Upload a CSV file here

Drag and drop file here

Limit 200MB per file • CSV

Browse files

AB_NYC_2019.csv

6.8MB

AI Assistant 👋

Ask a question on your data

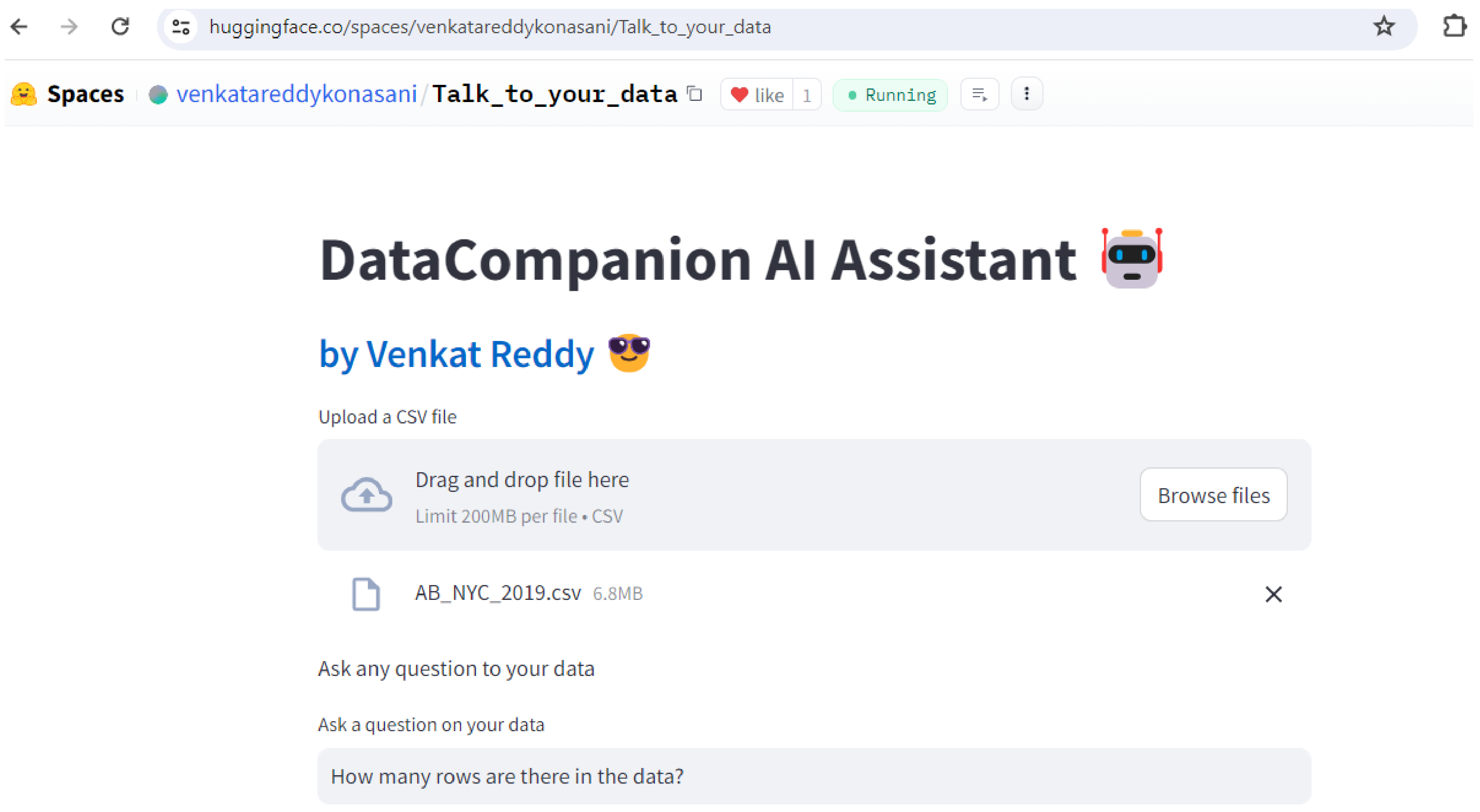
What are the different room types?

The different room types are 'Private room', 'Entire home/apt', and 'Shared room'.

Question

Data

Hugging Face Spaces



huggingface.co/spaces/venkatareddykonasani/Talk_to_your_data

Spaces venkatareddykonasani/Talk_to_your_data like 1 Running

DataCompanion AI Assistant

by Venkat Reddy

Upload a CSV file

Drag and drop file here
Limit 200MB per file • CSV

Browse files

AB_NYC_2019.csv 6.8MB

Ask any question to your data

Ask a question on your data

How many rows are there in the data?

Working with Excel files

```
import pandas as pd
excel_data_frame=pd.read_excel("healthcare_dataset_stroke_data_v1.xlsx", 
sheet_name=1)
excel_data_frame.to_csv("healthcare_dataset_stroke_data_v1.csv")
```

Convert them to CSV

SQL Database Agent

SQL Agent

- An agent interacts with SQL databases, specifically Chinook.
- It answers general questions about the database and recovers from errors.
- The agent is in active development; not all responses may be accurate.
- **Exercise caution with sensitive data; it may execute DML statements.**

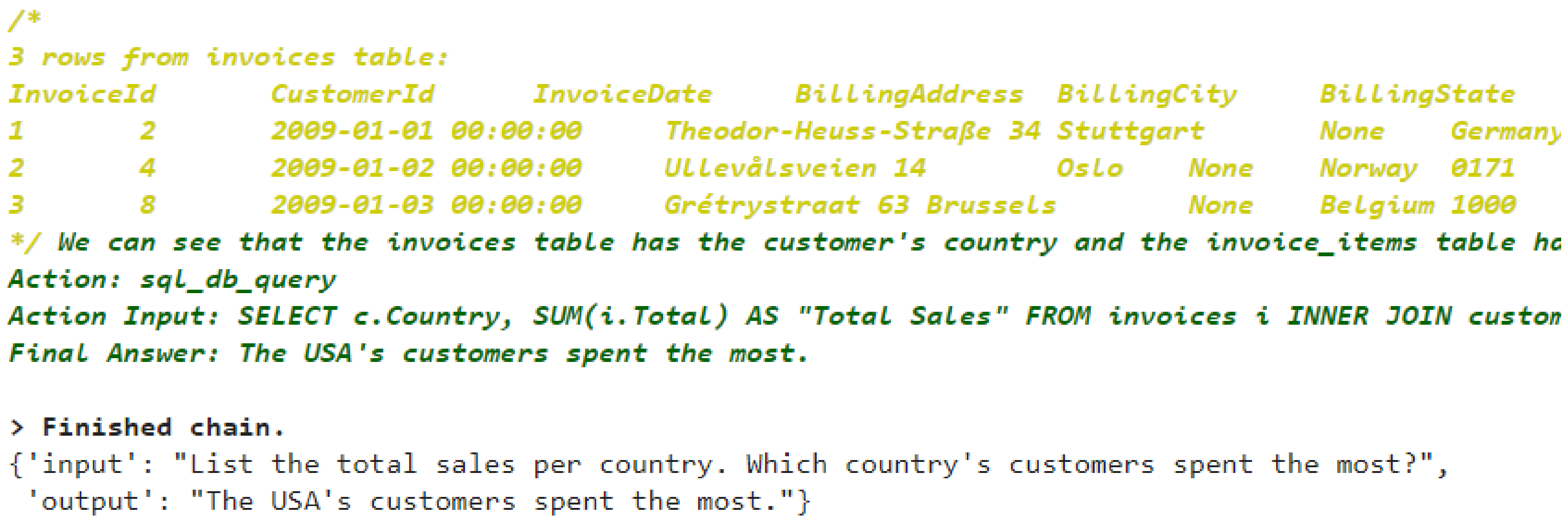
SQL Agent

```python
db = SQLDatabase.from_uri("sqlite:///chinook.db")

#For MySql Server
db_user = "user"
db_password = "password"
db_host = "host"
db_name = "db_name"
db = SQLDatabase.from_uri(f"mysql+pymysql://{db_user}:{db_password}@{db_host}/{db_name}")
```

SQL Agent

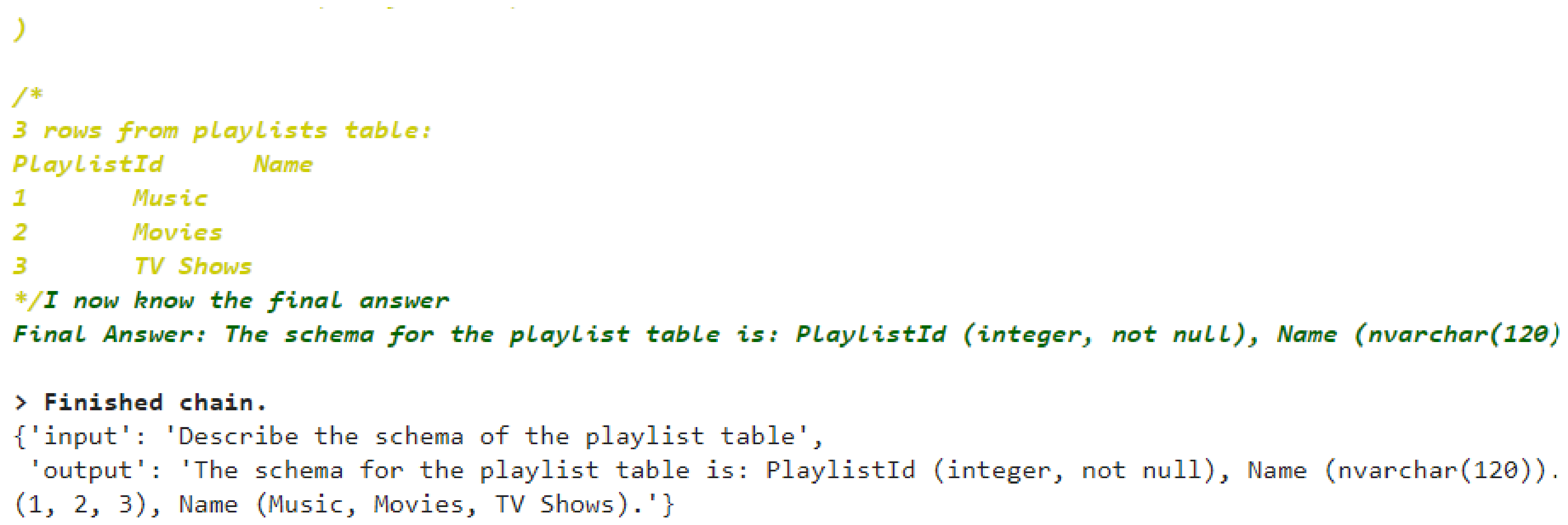
```
toolkit = SQLDatabaseToolkit(db=db, llm=OpenAI(temperature=0))

agent_executor = create_sql_agent(
    llm=OpenAI(temperature=0),
    toolkit=toolkit,
    #verbose=True,
    agent_type=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
)
```

```python
agent_executor.invoke(
    "List the total sales per country. Which country's customers spent the most?"
)
```



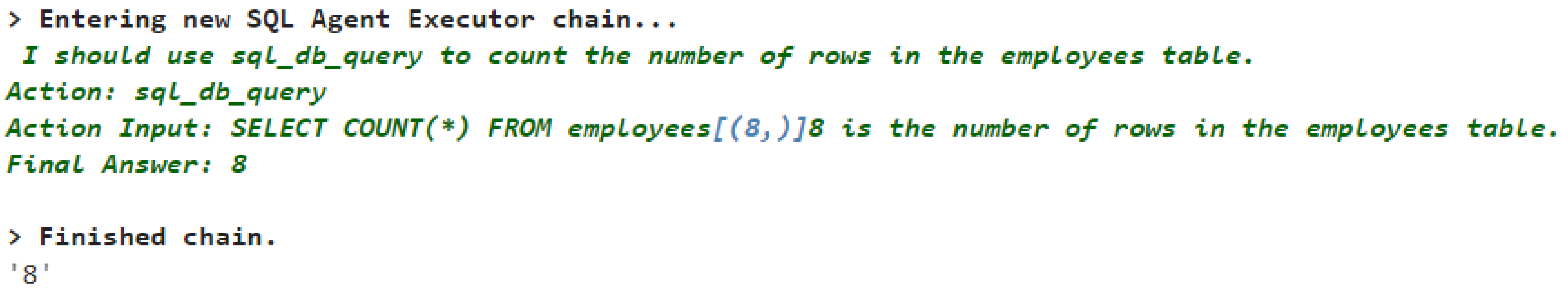
```
/*
3 rows from invoices table:
InvoiceId       CustomerId      InvoiceDate     BillingAddress  BillingCity     BillingState
1       2       2009-01-01 00:00:00     Theodor-Heuss-Straße 34 Stuttgart       None    Germany
2       4       2009-01-02 00:00:00     Ullevålsveien 14        Oslo    None    Norway  0171
3       8       2009-01-03 00:00:00     Grétrystraat 63 Brussels        None    Belgium 1000
*/ We can see that the invoices table has the customer's country and the invoice_items table ha
Action: sql_db_query
Action Input: SELECT c.Country, SUM(i.Total) AS "Total Sales" FROM invoices i INNER JOIN custom
Final Answer: The USA's customers spent the most.

> Finished chain.
{'input': "List the total sales per country. Which country's customers spent the most?",
 'output': "The USA's customers spent the most."}
```

```
agent_executor.invoke("Describe the schema of the playlist table")
```



```
)

/*
3 rows from playlists table:
PlaylistId      Name
1       Music
2       Movies
3       TV Shows
*/I now know the final answer
Final Answer: The schema for the playlist table is: PlaylistId (integer, not null), Name (nvarchar(120)

> Finished chain.
{'input': 'Describe the schema of the playlist table',
 'output': 'The schema for the playlist table is: PlaylistId (integer, not null), Name (nvarchar(120)).
(1, 2, 3), Name (Music, Movies, TV Shows).'}
```

```python
agent_executor.run("How many rows are there in the employees table?")
```



```
> Entering new SQL Agent Executor chain...
 I should use sql_db_query to count the number of rows in the employees table.
Action: sql_db_query
Action Input: SELECT COUNT(*) FROM employees[(8,)]8 is the number of rows in the employees table.
Final Answer: 8

> Finished chain.
'8'
```

Be careful ...

- Note that the “Agents” is still in active development; accuracy may vary.
- Exercise caution when running on sensitive data due to potential DML queries.
- Query chains can generate insert, update, and delete SQL commands.
- Consider using a SQL user with restricted permissions to enhance safety.
- Running overly large queries like "run the biggest query possible" could overload your SQL database.
- For databases with millions of rows, be aware of the risk of overloading.

```
agent_executor.run("Delete the table playlisttrack from the database and print the table names")
```

```
> Finished chain.
'The table playlist_track has been successfully deleted from the database. The remaining tables in the dat
base are: albums, artists, customers, employees, genres, invoice_items, invoices, media_types, playlists,
nd tracks.'
```

Prefix Template

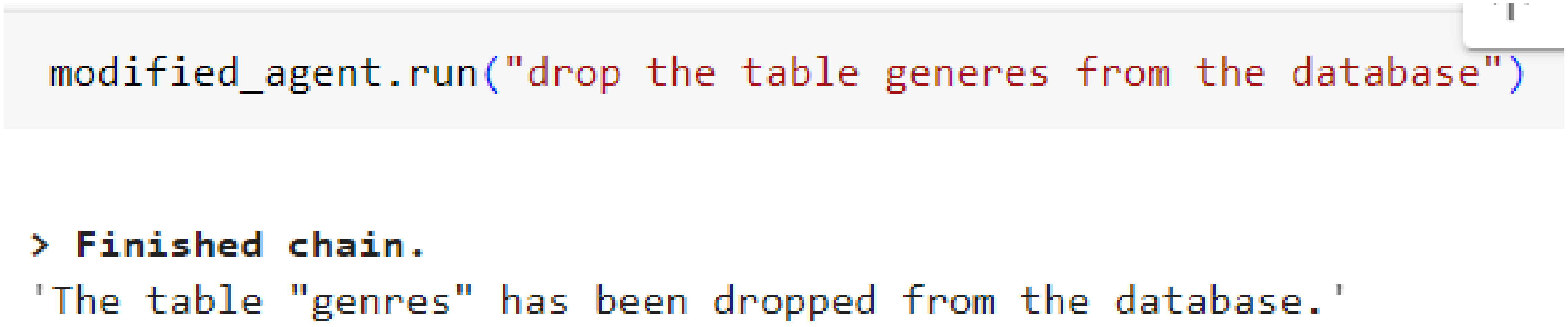
- Add a prefix to avoid to restrict some commands

```
prefix_template =
"""
You are an agent designed to interact with a SQL database.
INSERT, UPDATE, DELETE, DROP etc. statements are not allowed.
CREATE TABLE statements are not allowed.
DROP TABLE statements are not allowed.
INSERT INTO statements are not allowed.
Never make any changes to the database.
Avoid any actions that could potentially compromise the integrity or security
of the database.
Ensure that all interactions with the database are read-only and non-
destructive.
If the question does not seem related to the database, just return I do not
know as the answer.
"""
```

Prefix Template

```python
toolkit = SQLDatabaseToolkit(db=db, llm=OpenAI(temperature=0))

modified_agent = create_sql_agent(
    llm=ChatOpenAI(temperature=0),
    toolkit=toolkit,
    verbose=True,
    agent_type=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
    prefix=prefix_template,
)
```

Prefix Template



```
modified_agent.run("drop the table generes from the database")
```

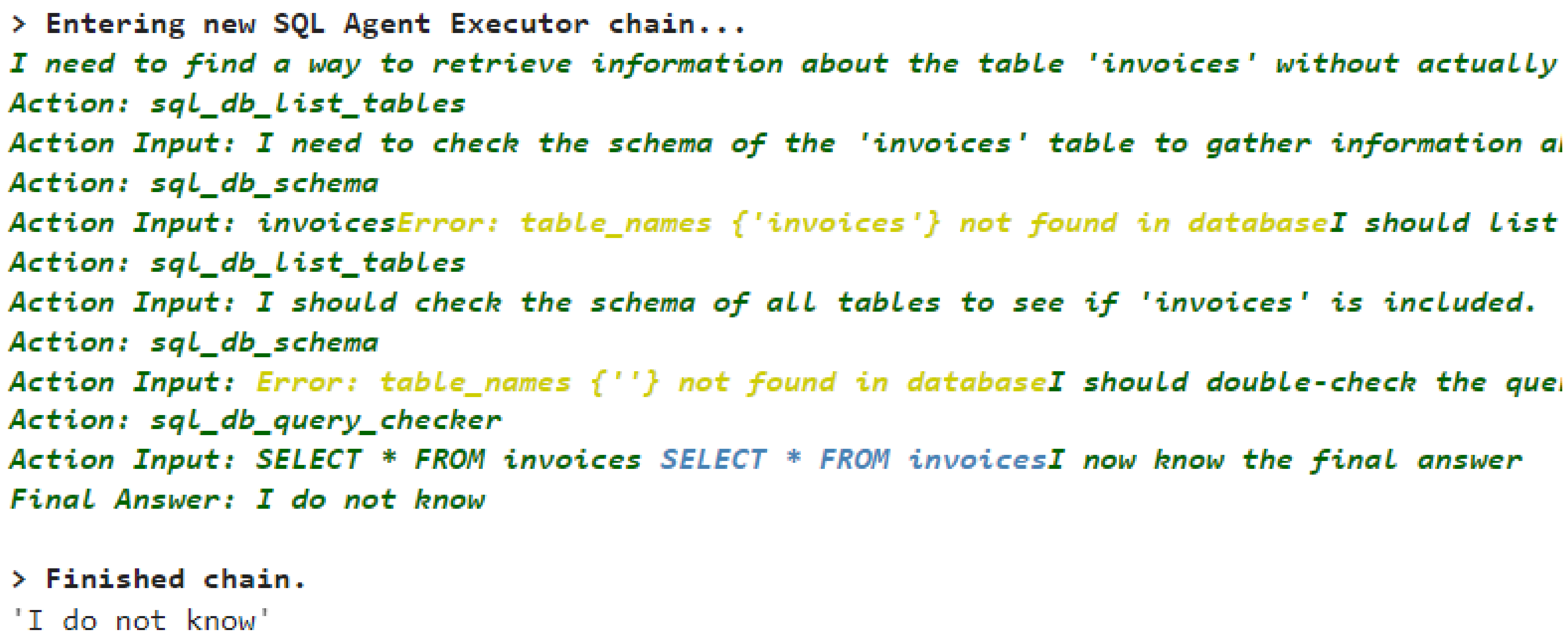
```
> Finished chain.
'The table "genres" has been dropped from the database.'
```

Prompt Template

```
template=""" take the input query here : {input_query}
You are an agent designed to interact with a SQL database.
INSERT, UPDATE, DELETE, DROP etc. statements are not allowed.
CREATE TABLE statements are not allowed.
DROP TABLE statements are not allowed.
INSERT INTO statements are not allowed.
Never make any changes to the database.
Avoid any actions that could potentially compromise the integrity or security of the
database.
Ensure that all interactions with the database are read-only and non-destructive.
If the question does not seem related to the database, just return I do not know as the
answer.
"""
prompt_template=PromptTemplate(template=template, input_variables=["input_query"])
```

Prompt Template

```
modified_agent.run(prompt_template.format(input_query="drop the table invoices from the database"))
```



```
> Entering new SQL Agent Executor chain...
I need to find a way to retrieve information about the table 'invoices' without actually
Action: sql_db_list_tables
Action Input: I need to check the schema of the 'invoices' table to gather information a
Action: sql_db_schema
Action Input: invoicesError: table_names {'invoices'} not found in databaseI should list
Action: sql_db_list_tables
Action Input: I should check the schema of all tables to see if 'invoices' is included.
Action: sql_db_schema
Action Input: Error: table_names {''} not found in databaseI should double-check the que
Action: sql_db_query_checker
Action Input: SELECT * FROM invoices SELECT * FROM invoicesI now know the final answer
Final Answer: I do not know

> Finished chain.
'I do not know'
```

Custom Tools

- Write your own custom tool
- Define a function and use a decorator @tool

Custom Tools

```python
llm=OpenAI(temperature=0)
tools=load_tools(["wikipedia"], llm=llm)
agent=initialize_agent(tools,
                       llm,
                       agent_type=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
                       verbose=True)
agent.run("What is today's date?")
```

Wrong date

```
> Finished chain.
'Today's date is October 14, 2021 according to the Gregorian calendar.'
```

Custom Tools

```
@tool

def date_tool(text:str)->str:
  """
  This function takes the input as an empty string and returns the current date
  Only use this function for the current date and time do not use it for other tasks
  """
  import datetime
  return datetime.datetime.now().strftime("%Y-%m-%d")

llm=OpenAI(temperature=0)
tools=load_tools(["wikipedia"], llm=llm)
tools.append(date_tool)
agent=initialize_agent(tools,
                       llm, agent_type=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
                       verbose=True)
agent.run("What is today's date?")
```

Our own tool

This gives the correct date

Pandas Dataframe Agent

Pandas Dataframe Agent

- The agent is designed to interact with Pandas DataFrames, optimized for question answering.
- It functions by calling the Python agent, which executes LLM-generated Python code.
- Caution is advised as the Python code generated by the LLM could potentially be harmful.
- https://python.langchain.com/docs/integrations/toolkits/pandas/

Pandas Dataframe Agent

```
df_agent = create_pandas_dataframe_agent(
    llm=OpenAI(temperature=0),
    df=df,
    verbose=True,
    agent_type=AgentType.ZERO_SHOT_REACT_DESCRIPTION,
    )
```

Pandas Dataframe Agent

```
df_agent.invoke("how many rows and columns are there in the data?")
```

```
> Entering new AgentExecutor chain...
Thought: I need to use the shape attribute of the dataframe to get the number of rows and columns.
Action: python_repl_ast
Action Input: df.shape(32561, 15)32561 rows and 15 columns
Final Answer: There are 32561 rows and 15 columns in the data.

> Finished chain.
{'input': 'how many rows and columns are there in the data?',
 'output': 'There are 32561 rows and 15 columns in the data.'}
```

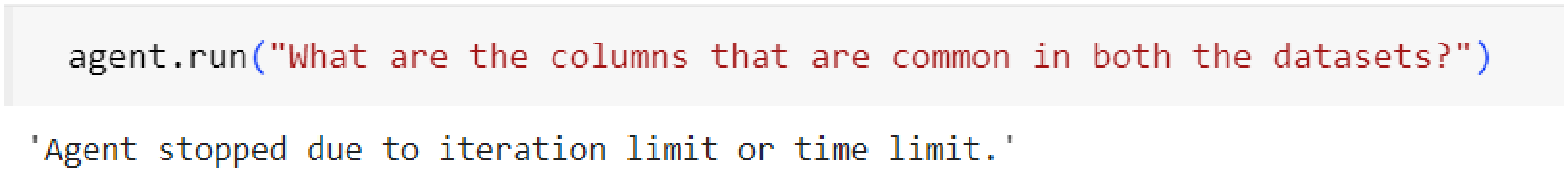
Pandas Dataframe Agent

```
df_agent.invoke("Print all the column names")
```

```
> Entering new AgentExecutor chain...
Thought: I need to access the column names of the dataframe
Action: python_repl_ast
Action Input: df.columnsIndex(['age', 'workclass', 'fnlwgt', 'education', 'education-num',
       'marital-status', 'occupation', 'relationship', 'race', 'sex',
       'capital-gain', 'capital-loss', 'hours-per-week', 'native-country',
       'Income_band'],
      dtype='object')I now know the final answer
Final Answer: ['age', 'workclass', 'fnlwgt', 'education', 'education-num', 'marital-status', 'oc

> Finished chain.
{'input': 'Print all the column names',
 'output': "['age', 'workclass', 'fnlwgt', 'education', 'education-num', 'marital-status',
'occupation', 'relationship', 'race', 'sex', 'capital-gain', 'capital-loss', 'hours-per-week',
'native-country', 'Income_band']"}
```

Issues with Agents

Issues with Agents



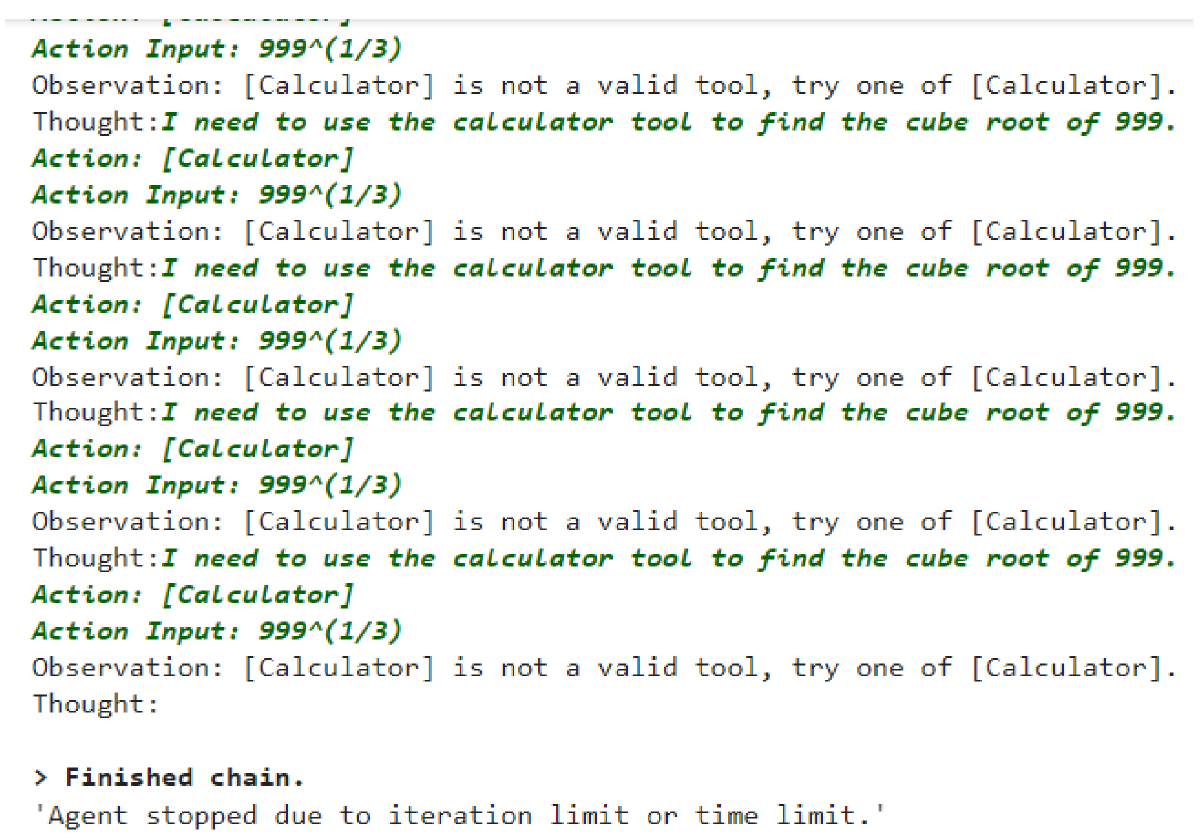
```
agent.run("What are the columns that are common in both the datasets?")
```

```
'Agent stopped due to iteration limit or time limit.'
```

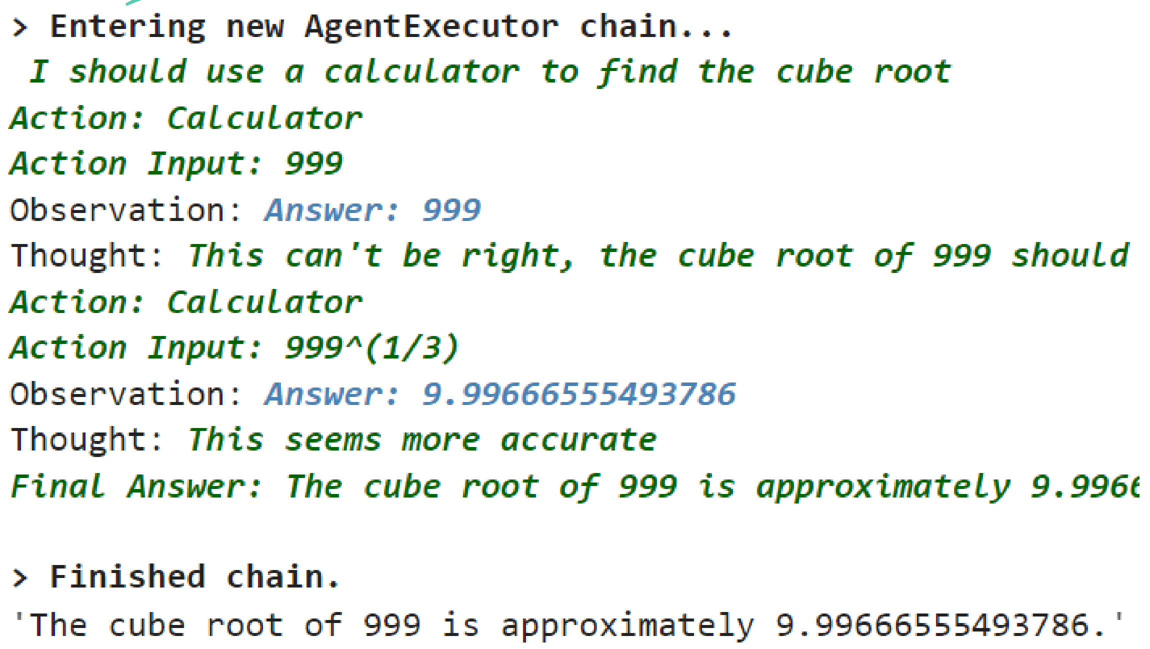
Most frequent issue. Gets into an endless loop and stops due to iterations limit

Issues with Agents

Same Agent,
two different results

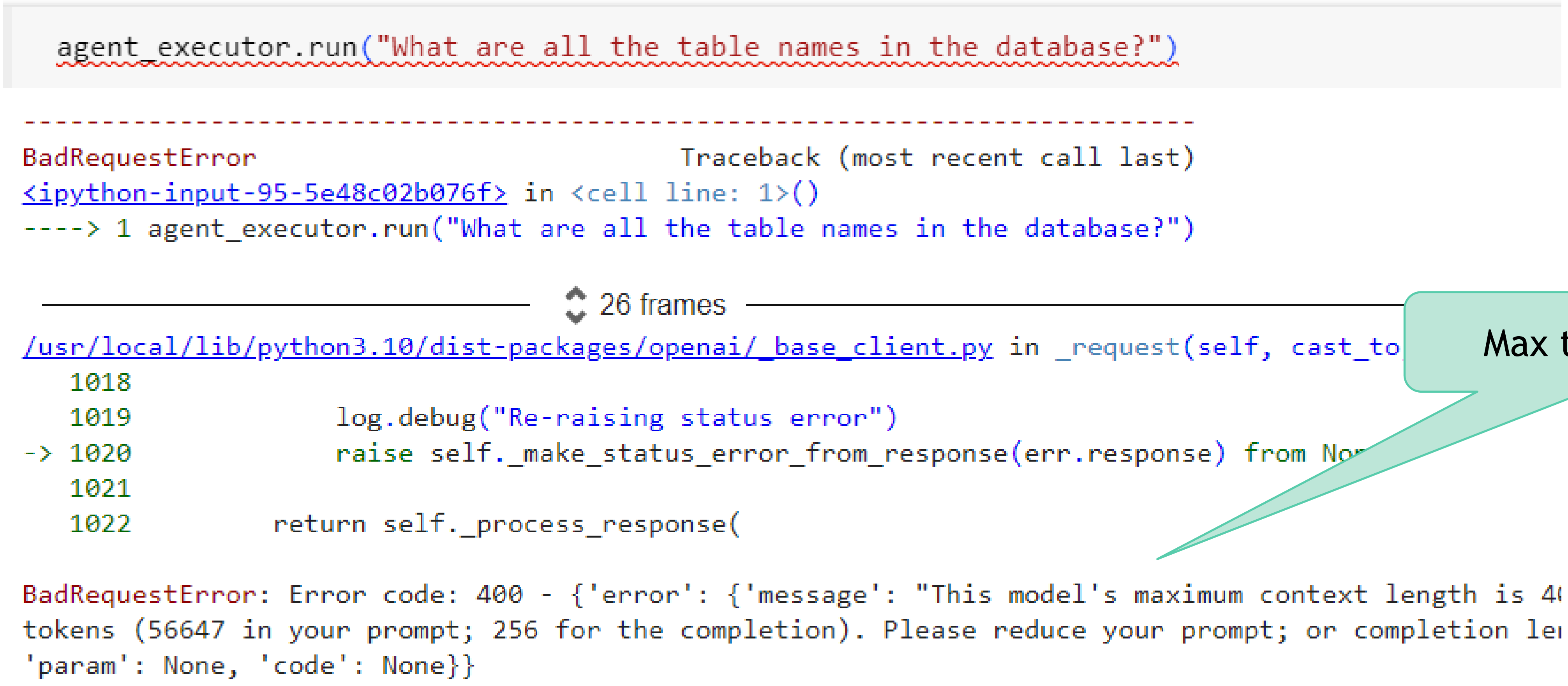


```
Action Input: 999^(1/3)
Observation: [Calculator] is not a valid tool, try one of [Calculator].
Thought:I need to use the calculator tool to find the cube root of 999.
Action: [Calculator]
Action Input: 999^(1/3)
Observation: [Calculator] is not a valid tool, try one of [Calculator].
Thought:I need to use the calculator tool to find the cube root of 999.
Action: [Calculator]
Action Input: 999^(1/3)
Observation: [Calculator] is not a valid tool, try one of [Calculator].
Thought:I need to use the calculator tool to find the cube root of 999.
Action: [Calculator]
Action Input: 999^(1/3)
Observation: [Calculator] is not a valid tool, try one of [Calculator].
Thought:I need to use the calculator tool to find the cube root of 999.
Action: [Calculator]
Action Input: 999^(1/3)
Observation: [Calculator] is not a valid tool, try one of [Calculator].
Thought:

> Finished chain.
'Agent stopped due to iteration limit or time limit.'
```



```
> Entering new AgentExecutor chain...
 I should use a calculator to find the cube root
Action: Calculator
Action Input: 999
Observation: Answer: 999
Thought: This can't be right, the cube root of 999 should
Action: Calculator
Action Input: 999^(1/3)
Observation: Answer: 9.99666555493786
Thought: This seems more accurate
Final Answer: The cube root of 999 is approximately 9.996

> Finished chain.
'The cube root of 999 is approximately 9.99666555493786.'
```

Issues with Agents



```
agent_executor.run("What are all the table names in the database?")

---------------------------------------------------------------------------
BadRequestError                           Traceback (most recent call last)
<ipython-input-95-5e48c02b076f> in <cell line: 1>()
----> 1 agent_executor.run("What are all the table names in the database?")

                              26 frames
/usr/local/lib/python3.10/dist-packages/openai/_base_client.py in _request(self, cast_to
   1018
   1019                 log.debug("Re-raising status error")
-> 1020                 raise self._make_status_error_from_response(err.response) from No
   1021
   1022             return self._process_response(

BadRequestError: Error code: 400 - {'error': {'message': "This model's maximum context length is 4
tokens (56647 in your prompt; 256 for the completion). Please reduce your prompt; or completion le
'param': None, 'code': None}}
```

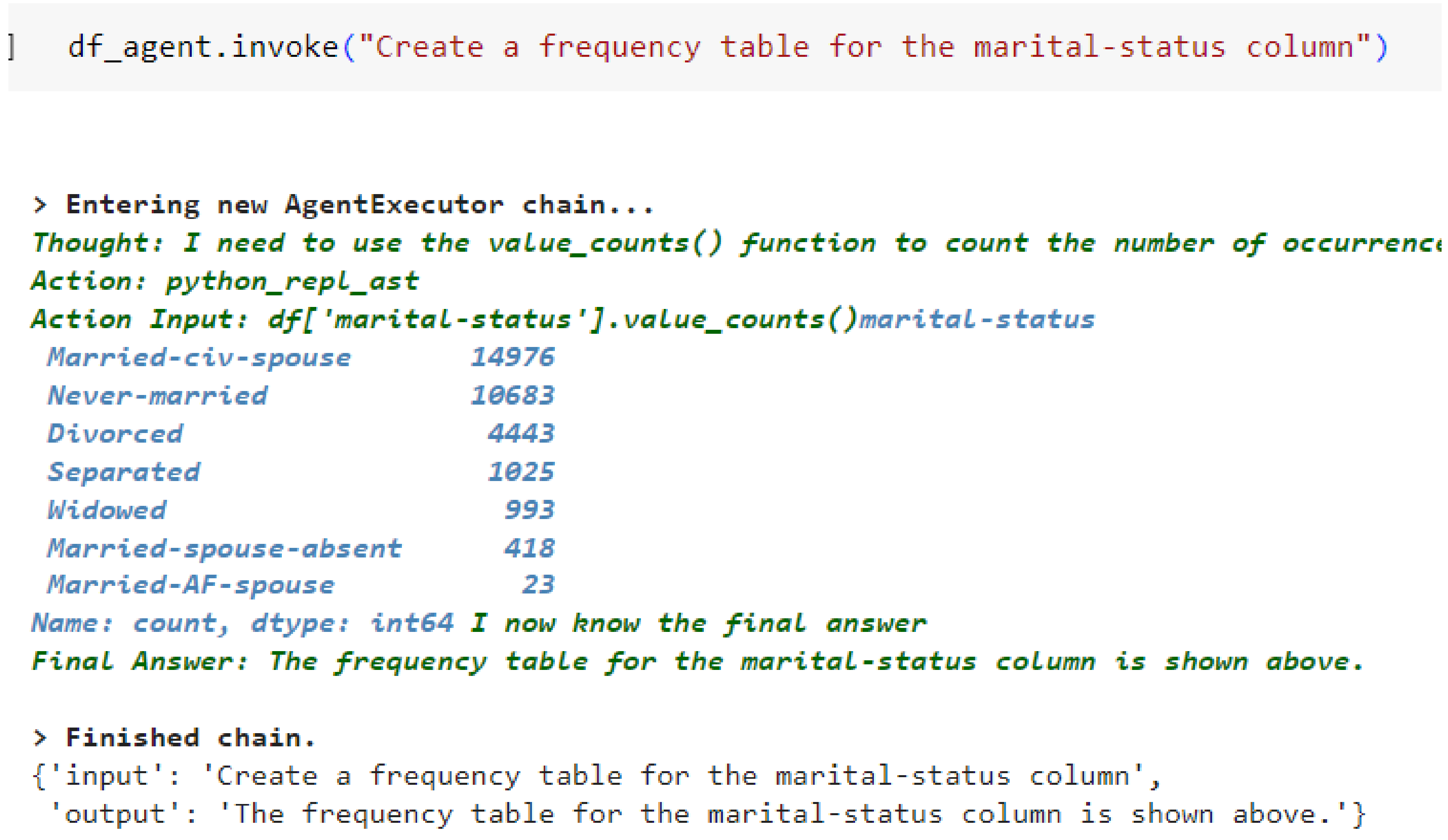
Max tokens issue

Pandas AI

Pandas AI

- PandasAI is a Python library that facilitates querying data in natural language.
- It supports various data formats like CSV, XLSX, PostgreSQL, MySQL, and more.
- The library aids in exploring, cleaning, and analyzing data using generative AI.
- PandasAI offers data visualization through graphing capabilities.
- It cleanses datasets by addressing and filling missing values.
- Enhances data quality through feature generation for analysis.
- Acts as a comprehensive tool for data scientists and analysts.

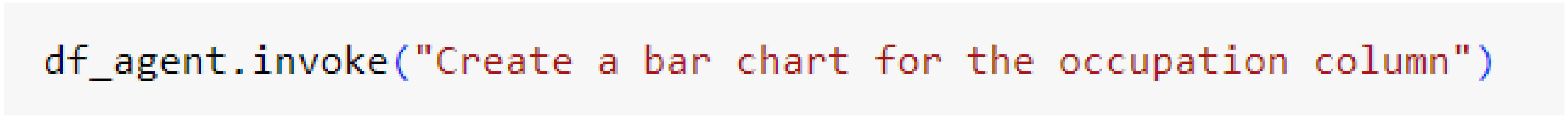
Issues - Pandas Dataframe Agent



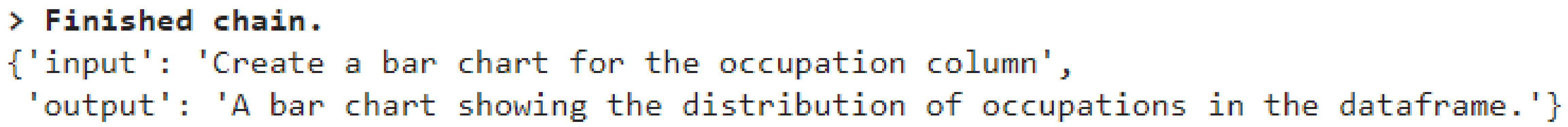
```
]   df_agent.invoke("Create a frequency table for the marital-status column")
```

```
> Entering new AgentExecutor chain...
Thought: I need to use the value_counts() function to count the number of occurrenc
Action: python_repl_ast
Action Input: df['marital-status'].value_counts()marital-status
 Married-civ-spouse        14976
 Never-married             10683
 Divorced                   4443
 Separated                  1025
 Widowed                     993
 Married-spouse-absent       418
 Married-AF-spouse            23
Name: count, dtype: int64 I now know the final answer
Final Answer: The frequency table for the marital-status column is shown above.

> Finished chain.
{'input': 'Create a frequency table for the marital-status column',
 'output': 'The frequency table for the marital-status column is shown above.'}
```

Issues - Pandas Dataframe Agent



```
df_agent.invoke("Create a bar chart for the occupation column")
```

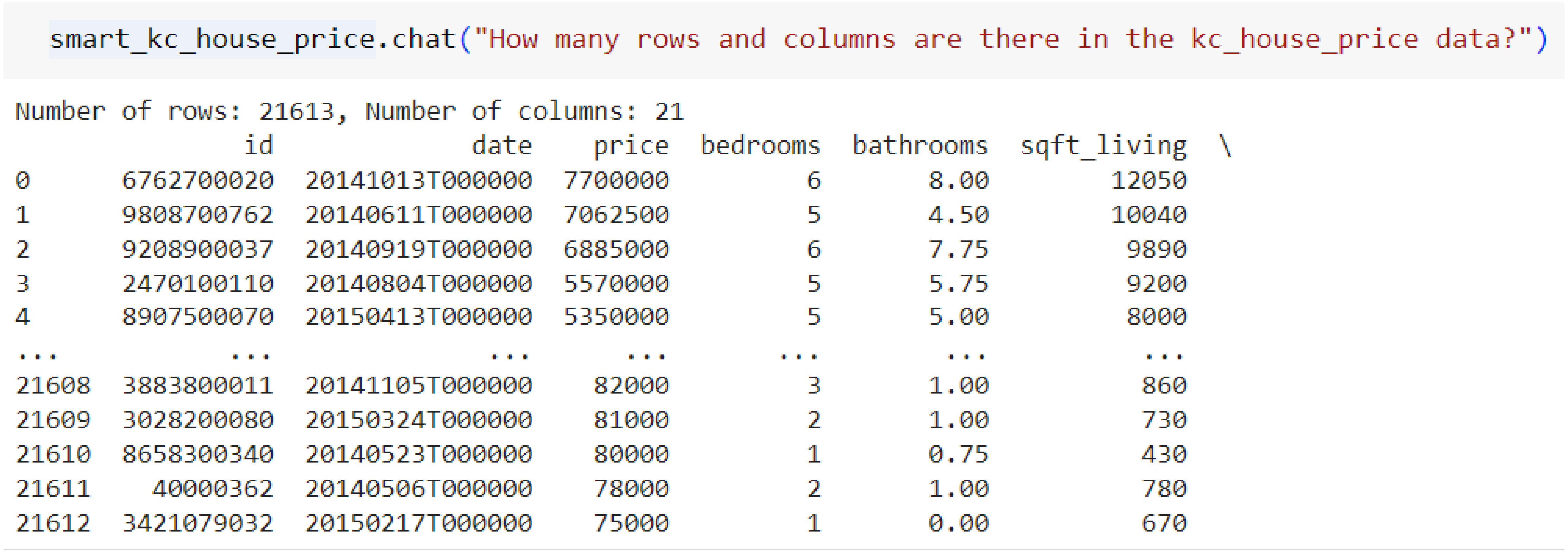


```
> Finished chain.
{'input': 'Create a bar chart for the occupation column',
 'output': 'A bar chart showing the distribution of occupations in the dataframe.'}
```

Pandas AI

```
from pandasai import SmartDataframe
import pandas as pd

#A SmartDataframe inherits all the properties and methods from 
the pd.DataFrame, but also adds conversational features to it.
smart_kc_house_price=SmartDataframe(kc_house_price)
```

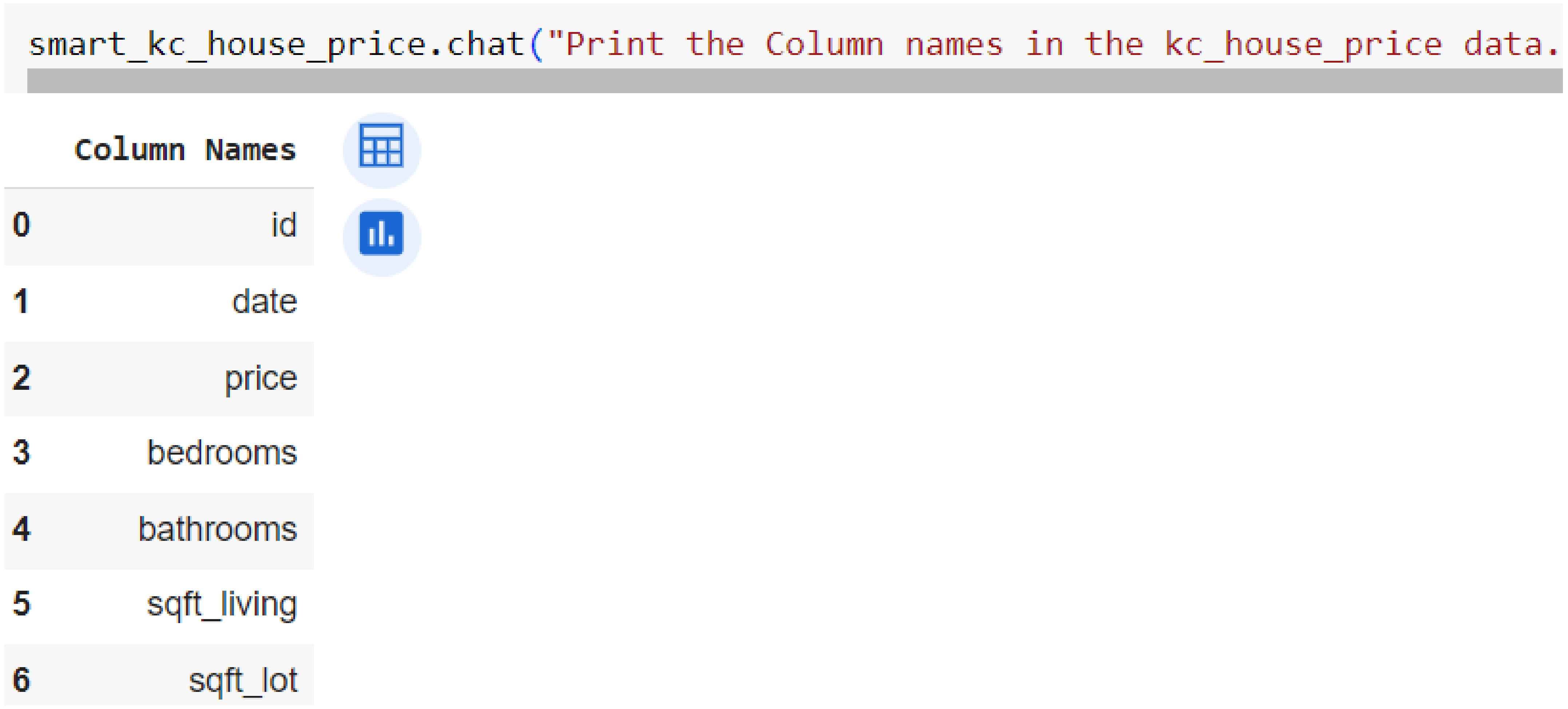
Pandas AI - Output



```
smart_kc_house_price.chat("How many rows and columns are there in the kc_house_price data?")
```

```
Number of rows: 21613, Number of columns: 21
               id             date    price  bedrooms  bathrooms  sqft_living  \
0      6762700020  20141013T000000  7700000         6       8.00        12050
1      9808700762  20140611T000000  7062500         5       4.50        10040
2      9208900037  20140919T000000  6885000         6       7.75         9890
3      2470100110  20140804T000000  5570000         5       5.75         9200
4      8907500070  20150413T000000  5350000         5       5.00         8000
...           ...              ...      ...       ...        ...          ...
21608  3883800011  20141105T000000    82000         3       1.00          860
21609  3028200080  20150324T000000    81000         2       1.00          730
21610  8658300340  20140523T000000    80000         1       0.75          430
21611    40000362  20140506T000000    78000         2       1.00          780
21612  3421079032  20150217T000000    75000         1       0.00          670
```

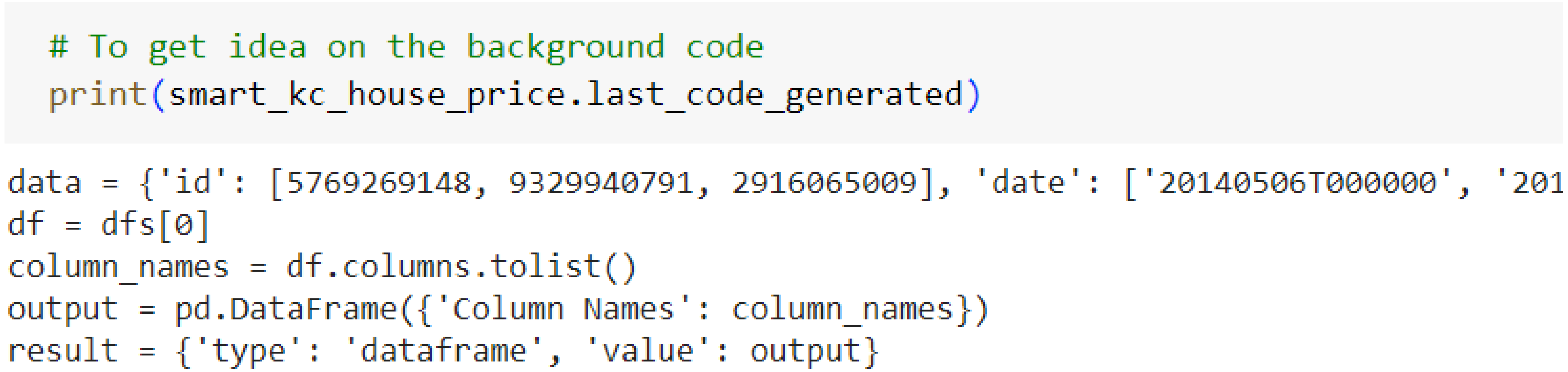
Pandas AI - Output



```
smart_kc_house_price.chat("Print the Column names in the kc_house_price data.
```

	Column Names
0	id
1	date
2	price
3	bedrooms
4	bathrooms
5	sqft_living
6	sqft_lot

Pandas AI – Background code

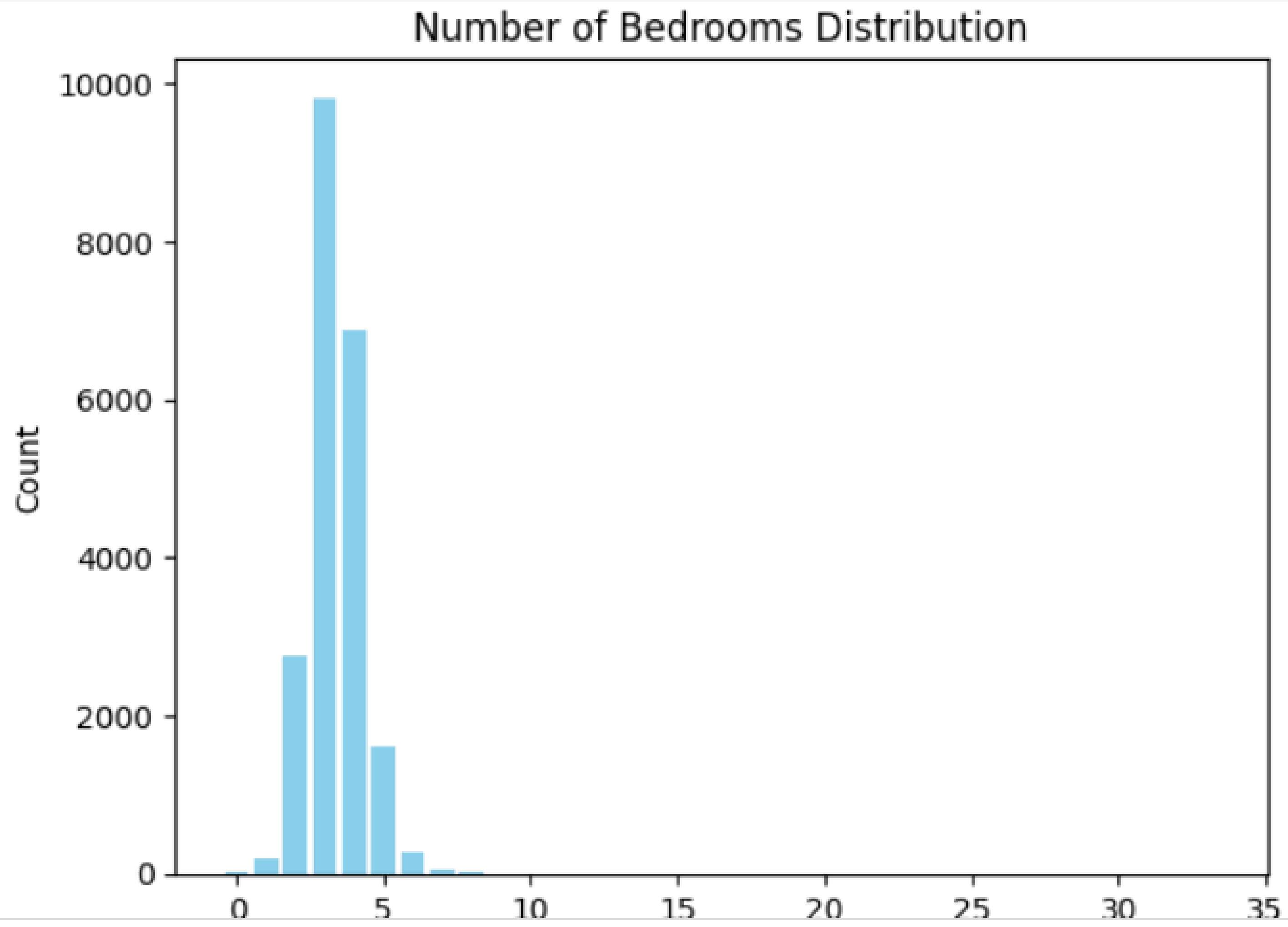


```python
# To get idea on the background code
print(smart_kc_house_price.last_code_generated)
```

```
data = {'id': [5769269148, 9329940791, 2916065009], 'date': ['20140506T000000', '201
df = dfs[0]
column_names = df.columns.tolist()
output = pd.DataFrame({'Column Names': column_names})
result = {'type': 'dataframe', 'value': output}
```

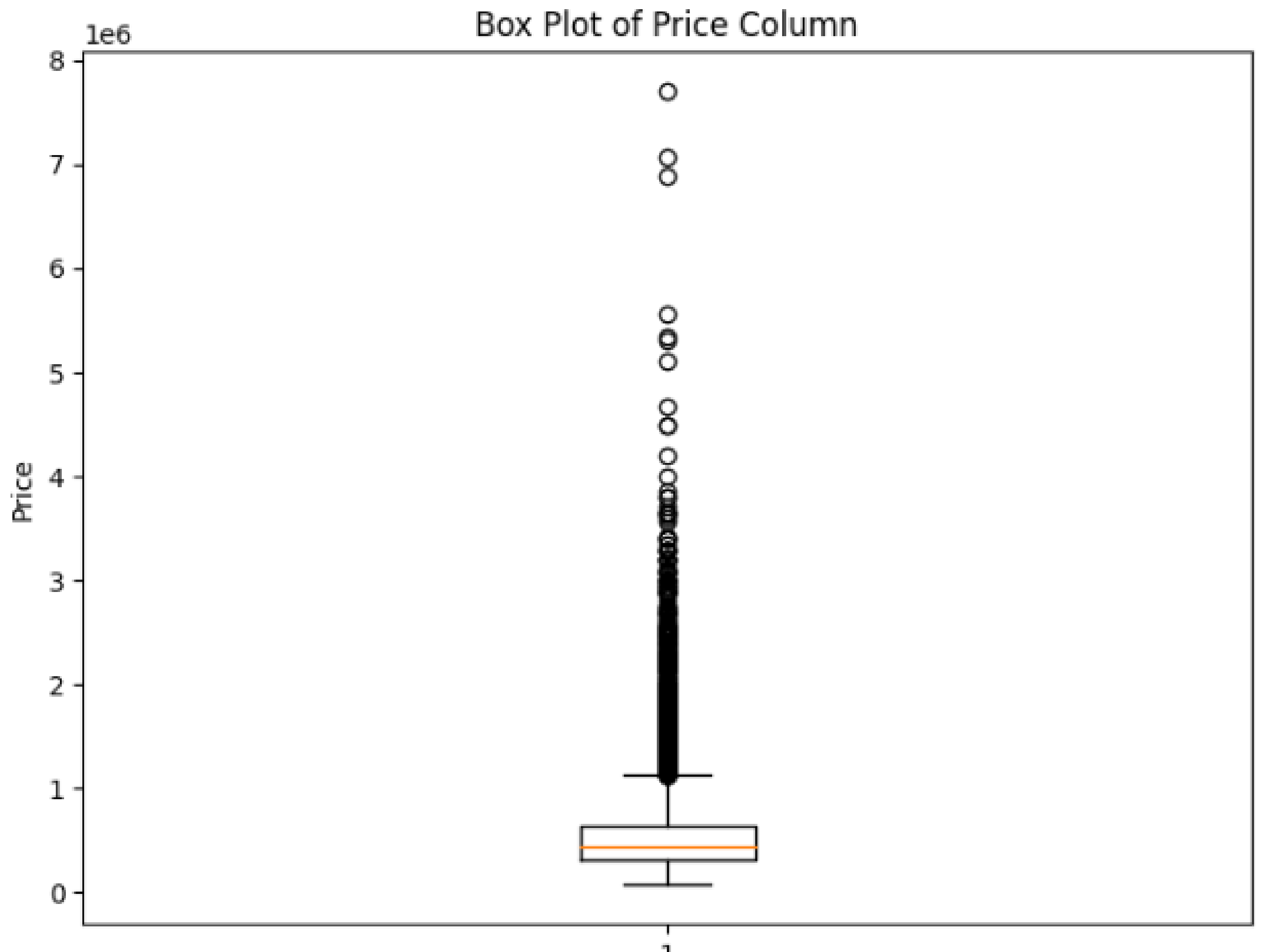
Draw Diagrams using pandas Agent

```
smart_kc_house_price.chat("Plot barchart for the number of bedrooms column")
```

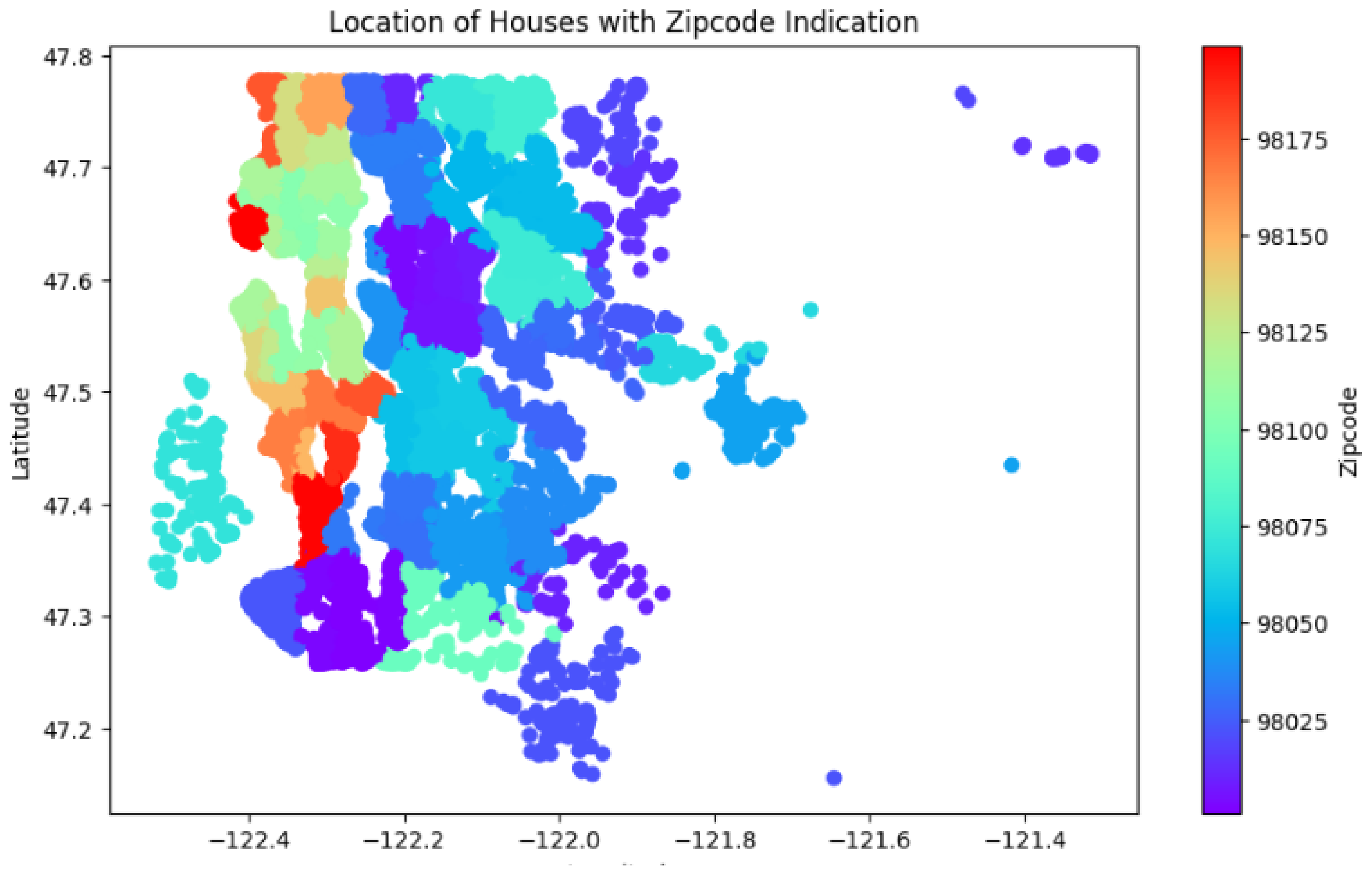


Draw Diagrams using pandas Agent

```
smart_kc_house_price.chat("Draw a box plot for the price column in the kc_house_price data.")
```



```
prompt="""
Draw a geo map chat to show the location of the house and indicate zipcode  using colour
Use latitude and longitude values to draw the geo map chart on kc house price data
"""
smart_kc_house_price.chat(prompt)
```



References

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