Swarm_MultiAgents_Financial_analyst_framework

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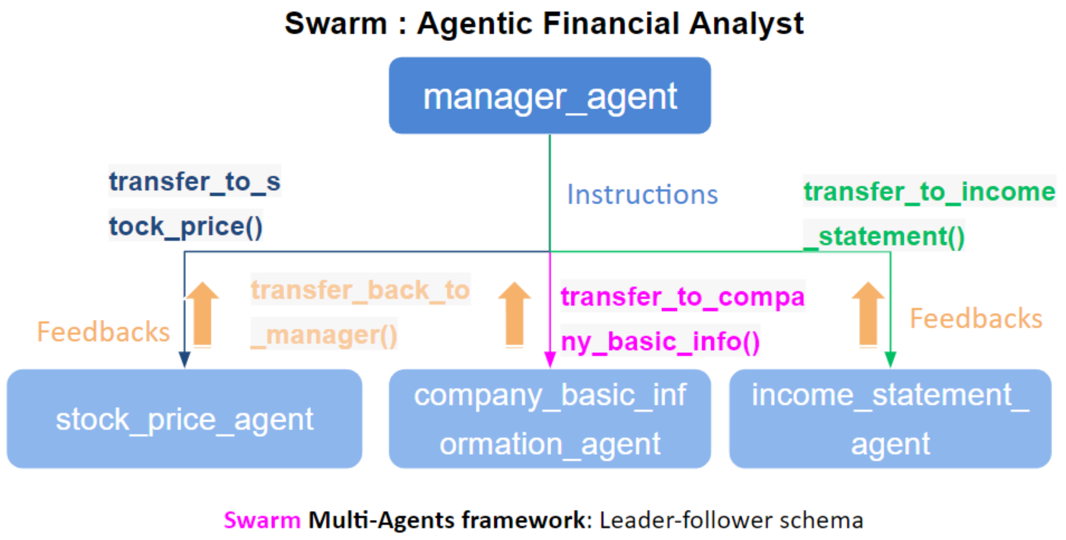
```
[4]: from IPython.display import Image, display
     display(Image(filename=image_path)) #local path
```


Swarm : Agentic Financial Analyst
manager_agent
transfer_to_s tock_price()
Instructions
transfer_to_income _statement()
Feedbacks
transfer_back_to _manager()
transfer_to_compa ny_basic_info()
Feedbacks
stock_price_agent
company_basic_inf ormation_agent
income_statement_ agent
Swarm Multi-Agents framework: Leader-follower schema

1 How to set up the Swarm (OpenAI) multi-agent framework for financial analysis?

Swarm is a multi-agent orchestration framework developed by OpenAI. Currently, it serves as an experimental framework designed to explore user-friendly interfaces for multi-agent systems. It's not intended for production use and lacks official support.

Pros and Cons:

- **Pros**: Swarm is designed to be lightweight, scalable, and easy to customize. You can add and manage many independent tasks and instructions that are hard to fit into a single prompt. Each agent can be assigned unique instructions and functions, allowing it to specialize in specific tasks.
- **Cons**: Swarm requires manual memory management by the user, in contrast to the Assistant AI API, which provides fully hosted threads and integrated memory management.

So, How to set up the Swarm multi-agent framework for financial analysis purpose?

I created 4 agents:

- **manager_agent**: This agent will handle determning and switching between agents to transfer the user's request to the best suited agent.
- **stock_price_agent**: This agent is responsible of fetching the last available price, volume, average price 50d, 200d, EPS, PE, and the next earnings annoucement.
- **company_basic_information_agent**: This agent is responsible of collecting the company basic data like description market capitalization, sector, industry…
- **income_statement_agent**: This agent is responsible of gathering the last income statement data such as revenue, gross profit, net income, EBITDA, EPS.
- For each sub-agent, I define a set of functions to handle collecting the appropriate data.
- The manager agent will manage functions that distribute the request to the various agents.
- Each sub-agent will have a function to transfer request back to the manager.

Discover how this framework works in this notebook:

Hanane DUPOUY

2 Install Swarm

[ ]:
```
pip install git+https://github.com/openai/swarm.git -q
```

[3]:
```
from google.colab import userdata
OPENAI_API_KEY = userdata.get('OPENAI_API_KEY')

import os
os.environ["OPENAI_API_KEY"] = OPENAI_API_KEY

import requests

FINANCIAL_MODELING_PREP_API_KEY = userdata.
 ↪get('FINANCIAL_MODELING_PREP_API_KEY')
```

3 Define the functions:

By using **Financial Modeling PREP API**, I created these 3 functions to fetch different financial data for a given company symbol:

get_stock_price, **get_company_financials**, **get_income_statement**

[7]:
```
def get_stock_price(symbol):
    """
    Fetch the current stock price for the given symbol, the current volume, the␣
 ↪average price 50d and 200d, EPS, PE and the next earnings Announcement.
```

```
    """
    url = f"https://financialmodelingprep.com/api/v3/quote-order/{symbol}?
↪apikey={FINANCIAL_MODELING_PREP_API_KEY}"
    response = requests.get(url)
    data = response.json()
    try:
        price = data[0]['price']
        volume = data[0]['volume']
        priceAvg50 = data[0]['priceAvg50']
        priceAvg200 = data[0]['priceAvg200']
        eps = data[0]['eps']
        pe = data[0]['pe']
        earningsAnnouncement = data[0]['earningsAnnouncement']
        return {"symbol": symbol.upper(), "price": price, "volume":
↪volume,"priceAvg50":priceAvg50, "priceAvg200":priceAvg200, "EPS":eps, "PE":
↪pe, "earningsAnnouncement":earningsAnnouncement }
    except (IndexError, KeyError):
        return {"error": f"Could not fetch price for symbol: {symbol}"}

def get_company_financials(symbol):
    """
    Fetch basic financial information for the given company symbol such as the␣
↪industry, the sector, the name of the company, and the market capitalization.
    """
    url = f"https://financialmodelingprep.com/api/v3/profile/{symbol}?
↪apikey={FINANCIAL_MODELING_PREP_API_KEY}"
    response = requests.get(url)
    data = response.json()
    try:
        results = data[0]
        financials = {
            "symbol": results["symbol"],
            "companyName": results["companyName"],
            "marketCap": results["mktCap"],
            "industry": results["industry"],
            "sector": results["sector"],
            "website": results["website"],
            "beta":results["beta"],
            "price":results["price"],
        }
        return financials
    except (IndexError, KeyError):
        return {"error": f"Could not fetch financials for symbol: {symbol}"}

def get_income_statement(symbol):
    """
    Fetch last income statement for the given company symbol such as revenue,␣
↪gross profit, net income, EBITDA, EPS.
    """
    url = f"https://financialmodelingprep.com/api/v3/income-statement/{symbol}?
↪period=annual&apikey={FINANCIAL_MODELING_PREP_API_KEY}"
    response = requests.get(url)
    data = response.json()
    try:
        results = data[0]
        financials = {
            "date": results["date"],
            "revenue": results["revenue"],
            "gross profit": results["grossProfit"],
            "net Income": results["netIncome"],
            "ebitda": results["ebitda"],
            "EPS": results["eps"],
            "EPS diluted":results["epsdiluted"]
        }
        return data, financials
    except (IndexError, KeyError):
        return {"error": f"Could not fetch financials for symbol: {symbol}"}
```

4 Specify the Agents

- **manager_agent**: This agent will handle determning and switching between agents to transfer the user's request to the best suited agent.
- **stock_price_agent**: This agent is responsible of fetching the last available price, volume, average price 50d, 200d, EPS, PE, and the next earnings annoucement.
- **company_basic_information_agent**: This agent is responsible of collecting the company basic data like description market capitalization, sector, industry…
- **income_statement_agent**: This agent is responsible of gathering the last income statement data such as revenue, gross profit, net income, EBITDA, EPS.
- For each sub-agent, I define a set of function to handle collecting the adequate data.
- The manager agent will handle function that transfer the request to the different agents.
- Each sub-agent will have a function that the transfer back tho the manager.

[8]:
```
from swarm import Agent

manager_agent = Agent(
    name="Manager Agent",
    instructions="Determine which agent is best suited to handle the user's␣
↪request, and transfer the conversation to that agent.",
)
```

```python
stock_price_agent = Agent(
    name="Stock Price Agent",
    instructions="Fetch Hsitorical prices for a given stock symbol, the current␣
↪volume, the average price 50d and 200d, EPS, PE and the next earnings␣
↪Announcement.",
    functions=[get_stock_price],
)

company_basic_information_agent = Agent(
    name="Company basic information Agent",
    instructions="Fetch basic financial information for the given company␣
↪symbol such as the industry, the sector, the name of the company, and the␣
↪market capitalization.",
    functions=[get_company_financials],
)

income_statement_agent = Agent(
    name="Income Statement Agent",
    instructions=" Fetch last income statement for the given company symbol␣
↪such as revenue, gross profit, net income, EBITDA, EPS.",
    functions=[get_income_statement],
)


def transfer_back_to_manager():
    """Call this function if a user is asking about a topic that is not handled␣
↪by the current agent."""
    return manager_agent


def transfer_to_stock_price():
    return stock_price_agent

def transfer_to_company_basic_info():
    return company_basic_information_agent

def transfer_to_income_statement():
    return income_statement_agent


manager_agent.functions = [transfer_to_stock_price,␣
↪transfer_to_company_basic_info, transfer_to_income_statement]
stock_price_agent.functions.append(transfer_back_to_manager)
company_basic_information_agent.functions.append(transfer_back_to_manager)
income_statement_agent.functions.append(transfer_back_to_manager)
```

5 Chating with the Agents:

I asked different questions:

- What is the current stock price of Amazon and Nvidia
- What is their market capitalization?
- What is the EPS of Apple?
- When will the next earnings announcement be?
- What is the revenue of Amazon?

You can see the different calls and communications between the manager agent and the different sub-agents:

[15]:
```
# You can get this code from "from swarm.repl import run_demo_loop"==>I've␣
↪extracted here to add "exit" to break the loop.
import json

from swarm import Swarm

def process_and_print_streaming_response(response):
    content = ""
    last_sender = ""

    for chunk in response:
        if "sender" in chunk:
            last_sender = chunk["sender"]

        if "content" in chunk and chunk["content"] is not None:
            if not content and last_sender:
                print(f"\033[94m{last_sender}:\033[0m", end=" ", flush=True)
                last_sender = ""
            print(chunk["content"], end="", flush=True)
            content += chunk["content"]

        if "tool_calls" in chunk and chunk["tool_calls"] is not None:
            for tool_call in chunk["tool_calls"]:
                f = tool_call["function"]
                name = f["name"]
                if not name:
                    continue
                print(f"\033[94m{last_sender}: \033[95m{name}\033[0m()")

        if "delim" in chunk and chunk["delim"] == "end" and content:
            print()  # End of response message
            content = ""

        if "response" in chunk:
```

```python
            return chunk["response"]


def pretty_print_messages(messages) -> None:
    for message in messages:
        if message["role"] != "assistant":
            continue

        # print agent name in blue
        print(f"\033[94m{message['sender']}\033[0m:", end=" ")

        # print response, if any
        if message["content"]:
            print(message["content"])

        # print tool calls in purple, if any
        tool_calls = message.get("tool_calls") or []
        if len(tool_calls) > 1:
            print()
        for tool_call in tool_calls:
            f = tool_call["function"]
            name, args = f["name"], f["arguments"]
            arg_str = json.dumps(json.loads(args)).replace(":", "=")
            print(f"\033[95m{name}\033[0m({arg_str[1:-1]})")


def run_demo_loop(
    starting_agent, context_variables=None, stream=False, debug=False
) -> None:
    client = Swarm()
    print("Starting Swarm CLI  ")

    messages = []
    agent = starting_agent

    while True:
        user_input = input("\033[90mUser\033[0m: ")
        if user_input.lower() == "exit":
            break
        messages.append({"role": "user", "content": user_input})

        response = client.run(
            agent=agent,
            messages=messages,
            context_variables=context_variables or {},
            stream=stream,
            debug=debug,
        )

        if stream:
            response = process_and_print_streaming_response(response)
        else:
            pretty_print_messages(response.messages)

        messages.extend(response.messages)
        agent = response.agent
```

[18]:
```
# write "exit" to exit the loop
run_demo_loop(manager_agent, debug=False)
```

```
Starting Swarm CLI
User: What is the current stock price of Amazon and Nvidia?
Manager Agent:
transfer_to_stock_price()
transfer_to_stock_price()
Stock Price Agent:
get_stock_price("symbol"= "AMZN")
get_stock_price("symbol"= "NVDA")
Stock Price Agent: The current stock information is as follows:

**Amazon (AMZN)**:
- Current Price: $191.23
- Volume: 15,906,252
- Average Price (50 days): $182.20
- Average Price (200 days): $178.90
- Earnings Per Share (EPS): $4.20
- Price to Earnings Ratio (PE): 45.53
- Next Earnings Announcement: October 31, 2024

**Nvidia (NVDA)**:
- Current Price: $143.91
- Volume: 166,377,366
- Average Price (50 days): $122.37
- Average Price (200 days): $100.89
- Earnings Per Share (EPS): $2.14
- Price to Earnings Ratio (PE): 67.25
- Next Earnings Announcement: November 21, 2024
User: What is their market capitalization?
Stock Price Agent: transfer_back_to_manager()
Manager Agent:
transfer_to_company_basic_info()
transfer_to_company_basic_info()
Company basic information Agent:
get_company_financials("symbol"= "AMZN")
get_company_financials("symbol"= "NVDA")
Company basic information Agent: Here are the market capitalizations
for the companies:

- **Amazon.com, Inc. (AMZN)**
  - Market Capitalization: $2.01 Trillion
  - Industry: Specialty Retail
  - Sector: Consumer Cyclical

- **NVIDIA Corporation (NVDA)**
  - Market Capitalization: $3.53 Trillion
  - Industry: Semiconductors
  - Sector: Technology
User: What is the EPS of Apple?
Company basic information Agent: transfer_back_to_manager()
Manager Agent: transfer_to_company_basic_info()
Company basic information Agent:
get_company_financials("symbol"= "AAPL")
Company basic information Agent: The Earnings Per Share (EPS)
information is not available in the data I retrieved for Apple Inc. (AAPL).
Please check a financial news website or stock market service for the most up-
to-date EPS figures.
User: check again
Company basic information Agent: transfer_back_to_manager()
Manager Agent: transfer_to_stock_price()
Stock Price Agent: get_stock_price("symbol"= "AAPL")
Stock Price Agent: The Earnings Per Share (EPS) for Apple Inc. (AAPL)
is $6.57.
User: When will the next earnings announcement be?
Stock Price Agent: The next earnings announcement for Apple Inc. (AAPL)
is scheduled for October 31, 2024.
User: What is the revenue of Amazon?
Stock Price Agent: transfer_back_to_manager()
Manager Agent: transfer_to_income_statement()
Income Statement Agent: get_income_statement("symbol"= "AMZN")
Income Statement Agent: Amazon's revenue for the fiscal year ending on
December 31, 2023, was approximately $574.79 billion.
User: exit
```

6 Key Takeaways:

- A highly customizable framework: Each agent is equipped with specific instructions to ensure clarity and optimal outcomes.
- The implementation is broken down to the most granular level, allowing you to build your agent exactly as you desire.
- There is no built-in memory management like the Assistant AI API provides.