**Source Code Documentation for Multi-Agent System**

**1. Overview**

This multi-agent system is designed to analyze Walmart sales data and generate AI/GenAI use-case recommendations specific to the retail industry. The system is structured as a set of coordinated agents, each with a specific responsibility, working together to deliver insights and recommendations.

**Key Libraries and Dependencies**

* **LangChain**: Used to coordinate multi-agent interactions.
* **Hugging Face Transformers**: Utilized for NLP tasks, specifically for generating text insights.
* **Pandas**: For data manipulation and preprocessing.
* **Requests**: For potential data gathering and API interaction.

**2. Code Architecture**

**Key Components and Roles**

1. **Industry Research Agent**
   * **Role**: Conducts external research on the retail industry to identify relevant AI/GenAI use cases.
   * **Key Function**: gather\_industry\_insights()
   * **Process**: Uses web scraping or API calls to collect industry data, relying on requests and NLP to analyze textual content.
2. **Market Standards and Use Case Generation Agent**
   * **Role**: Generates specific AI/GenAI use cases tailored for Walmart’s retail data.
   * **Key Function**: generate\_use\_cases()
   * **Process**: Leverages Hugging Face’s NLP models to analyze sales data and generate customized recommendations based on market trends and standards.
3. **Resource Asset Collection Agent**
   * **Role**: Collects any additional resources, reports, or documents that support the AI use cases.
   * **Key Function**: collect\_resources()
   * **Process**: Uses data scraping or API integration to compile supporting assets, enriching the generated use cases.
4. **Report Compilation Agent**
   * **Role**: Organizes and structures the final report that summarizes the generated AI/GenAI use cases, research insights, and supporting resources.
   * **Key Function**: compile\_report()
   * **Process**: Formats the output as HTML, Markdown, or a structured report, making it presentable for stakeholders.

**3. Interaction Flow**

1. **Data Preparation**: Sales data from Walmart is ingested and preprocessed.
2. **Research and Use-Case Generation**:
   * The **Industry Research Agent** gathers general insights from external sources.
   * The **Market Standards Agent** then takes these insights and applies them to generate Walmart-specific use cases using NLP.
3. **Resource Collection**: Additional supporting resources are compiled by the **Resource Asset Collection Agent**.
4. **Report Compilation**: All findings are compiled into a report by the **Report Compilation Agent**, summarizing insights and providing actionable recommendations.

**4. Code Snippets and Function Documentation**

**Data Ingestion and Preprocessing**

python

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import pandas as pd

# Function to load and preprocess sales data

def load\_sales\_data(file\_path):

data = pd.read\_csv(file\_path)

# Add data cleaning and preprocessing steps here

return data

**Industry Research Agent**

python

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import requests

# Function for gathering industry insights

def gather\_industry\_insights():

# Code for web scraping or API calls to collect industry data

response = requests.get("URL\_OF\_INDUSTRY\_DATA\_SOURCE")

# Process and analyze the gathered data

return response.text

**Use Case Generation Agent**

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from transformers import pipeline

# Function to generate use cases based on market standards

def generate\_use\_cases(data):

nlp\_model = pipeline('text-generation', model="MODEL\_NAME")

insights = nlp\_model("Generate retail AI use cases based on input data")

return insights

**Resource Asset Collection Agent**

python

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# Function to collect additional resources

def collect\_resources():

# Placeholder function for collecting resources

return "List of additional resources"

**Report Compilation Agent**

python

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# Function to compile report

def compile\_report(insights, resources):

report = f"Generated Insights:\n{insights}\n\nResources:\n{resources}"

# Formatting can be further customized

return report

**Step 4: Resource Asset Collection Agent**

**Objective**: Gather supplementary resources, such as documents, articles, reports, or datasets, that provide additional context or validate the generated AI/GenAI use cases for Walmart's retail environment.

**Detailed Process**:

1. **Identify Resource Types**: The system decides which types of resources would be beneficial for the use cases. This could include:
   * **Industry Reports**: Market analysis, trends, and research papers on AI in retail.
   * **Technical Resources**: Documentation on AI/GenAI implementations, models, or APIs relevant to the use cases.
   * **Case Studies**: Examples of AI/GenAI applications in retail by other companies.
   * **Datasets**: Open-source or internal datasets that can validate or support the recommendations.
2. **Resource Retrieval**:
   * **Web Scraping/API Calls**: The system uses APIs (or web scraping if necessary) to collect data from specified sources. For instance:
     + **Market Research Sites**: Pulling relevant reports and articles.
     + **GitHub Repositories**: Searching for open-source projects or code that align with the use cases.
     + **News Websites**: Gathering current events or advancements in AI applications.
   * **Example Code for Resource Retrieval**:

import requests

def collect\_resources():

# Example: Retrieve an article from a research site

response = requests.get("URL\_OF\_RESOURCE")

if response.status\_code == 200:

resource\_text = response.text # Process or parse as needed

return resource\_text

else:

return "Resource unavailable"

1. **Processing and Storage**:
   * Once collected, the resources are stored in a structured format (e.g., JSON or CSV) to facilitate easy access and integration into the report.
   * The system may categorize resources based on relevance, source, and type.

**Output**: A structured list of resources that provide supporting evidence or additional insights into each generated AI use case.

**Step 5: Report Compilation Agent**

**Objective**: Compile all insights, generated use cases, and supplementary resources into a cohesive report, presenting the information in a structured, actionable format.

**Detailed Process**:

1. **Report Structure**:
   * The report is divided into key sections:
     + **Executive Summary**: High-level overview of the findings, including the system’s purpose and main AI/GenAI recommendations for Walmart.
     + **Industry Insights**: A summary of the Industry Research Agent’s findings, highlighting current trends and benchmarks in AI applications for retail.
     + **Generated Use Cases**: Detailed descriptions of each AI/GenAI use case, explaining how it addresses Walmart’s needs and aligns with market standards.
     + **Supporting Resources**: A list of collected resources, organized with brief descriptions of each to help readers understand their relevance.
     + **Conclusion and Next Steps**: A summary of key recommendations and potential next steps for Walmart’s AI adoption journey.
2. **Formatting and Layout**:
   * The report is formatted using Markdown, HTML, or PDF templates depending on the final output format needed. For instance:
     + **Markdown** for easy viewing in text editors or GitHub.
     + **HTML** for sharing on web portals.
     + **PDF** for a professional, shareable document.
   * The layout is designed to be readable, with headings, bullet points, and other visual aids to enhance clarity.
3. **Integration of Data and Visuals**:
   * **Data Visualization** (if applicable): Key statistics or sales data patterns identified by the system can be visualized using charts (e.g., bar charts, line graphs).
   * **Embedded Links**: Any online resources or external documents are hyperlinked within the report for easy access.
   * **Example Code for Report Formatting:**

def compile\_report(insights, use\_cases, resources):

report = f"""

# Walmart AI/GenAI Use Case Report

## Executive Summary

{insights}

## Industry Insights

{insights}

## Generated Use Cases

{use\_cases}

## Supporting Resources

{resources}

## Conclusion and Next Steps

Based on the analysis, we recommend...

"""

return report

1. **Final Review and Export**:
   * **Quality Check**: The report is reviewed for completeness, relevance, and consistency in formatting.
   * **Export**: The report is exported to the desired format and location, ready to be shared with Walmart stakeholders.

**Output**: A polished report that provides Walmart stakeholders with a comprehensive overview of AI/GenAI opportunities, backed by industry insights, generated use cases, and supporting resources.