Crew AI System for Logistics Optimization

Objective

This project demonstrates a Crew AI system built using the CrewAI framework. The system is designed to analyze logistics data and develop optimization strategies for specific logistics industry challenges such as optimizing delivery routes and improving inventory turnover.

1. Instructions Followed

The assignment was structured around three key directives:

- Defining Roles: Creating two distinct AI agents.
- Defining Tasks: Assigning collaborative, dependent tasks for analysis and optimization.
- Building the Crew: Configuring agents and tasks into a working Crew AI system.

2. Defined Roles

Agent 1: Logistics Analyst

- Goal: Analyze current logistics operations, focusing on route efficiency and inventory turnover.
- Backstory: An experienced logistics analyst with a background in operational efficiency and supply chain data analysis.
- LLM Used: Gemini 1.5 Flash (via Google GenAI)

Agent 2: Optimization Strategist

- Goal: Develop optimization strategies based on inefficiencies identified by the Logistics Analyst.

- Backstory: A strategic thinker with deep experience in supply chain modeling and logistics improvement.

3. Tasks Assigned

Task 1: Analyze Logistics Data

- Assigned To: Logistics Analyst

- Description: Examine delivery routes and inventory turnover data to identify inefficiencies.

Input:

```
"routes": [
        {"route_id": 1, "stops": ["A", "B", "C"], "distance_km": 120,
    "avg_time_min": 90},
        {"route_id": 2, "stops": ["D", "E"], "distance_km": 80, "avg_time_min":
    60}
    ],
    "inventory": [
        {"product": "Widgets", "turnover_days": 30, "stock": 100},
        {"product": "Gadgets", "turnover_days": 45, "stock": 50},
        {"product": "Spare Parts", "turnover_days": 60, "stock": 200}
    ]
```

- Output: A report detailing route inefficiencies and inventory performance.

Task 2: Develop Optimization Strategies

- Assigned To: Optimization Strategist
- Description: Use insights from the Logistics Analyst's report to generate actionable strategies for route optimization and inventory improvement.
- Expected Output: An actionable plan detailing route improvements and inventory handling strategies.
- Dependency: This task depends on the output of Task 1.

4. Crew Setup

```
crew = Crew(
    agents=[logistics_analyst, optimization_strategist],
    tasks=[task1, task2],
    context=logistics_data,
    verbose=True
)
```

The Crew is constructed with the two defined agents and their corresponding tasks. The execution follows a logical sequence: the Logistics Analyst completes the first analysis task, and then the Optimization Strategist uses the analysis results to generate optimization strategies.

5. Final Output

The final output of the crew system (crew.kickoff()) provides a complete overview:

- Identified inefficiencies in logistics data.
- Proposed optimizations for routes and inventory management.

6. Conclusion

This Crew AI implementation showcases how multi-agent AI systems can be designed to collaborate on real-world logistics problems. The system demonstrates role-based task assignment, task dependency, and efficient execution using structured data and large language models (LLMs).

Appendix: Tools & Libraries

- Library Used: CrewAI
- LLM Provider: Google Gemini (gemini-1.5-flash)
- Environment: Python 3.11+