




Agentic AI: Automating Analysis with CrewAI

Transforming Data into Actionable Insights

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What is Agentic AI



Autonomous AI entities that can perceive their environment, make decisions, and take actions to achieve specific goals.



Characteristics:

Autonomy:
Operates independently without constant human intervention.

Goal-Oriented:
Designed to achieve specific objectives.

Adaptive: Can learn and adjust behavior based on experience and new information.

Interactive: Can communicate and collaborate with other agents and humans.



Why Agentic AI for Complex Tasks?



Handles Complexity: Breaks down large, intricate problems into smaller, manageable tasks.



Improves Efficiency: Automates repetitive and time-consuming processes.



Enhances Accuracy: Reduces human error and bias.



Accelerates Discovery: Speeds up the process of finding insights and solutions.



Introducing CrewAI: A Framework for Agentic Systems




crewai

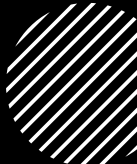

An open-source Python framework for building agentic AI systems.

Features:

- **Agent Management:** Easily create and manage multiple agents with different roles and skills.
- **Task Orchestration:** Define tasks and assign them to agents.
- **Collaboration:** Enable agents to communicate and work together.
- **Tool Integration:** Integrate external tools and APIs to extend agent capabilities.
- **Process Definition:** Define the workflow and interactions between agents.



Pilot Problem



Challenge: Analyzing Mutation Annotation Format (MAF) files to identify potential therapeutic targets for cancer treatment.



Complexity: MAF files contain vast amounts of genomic data, requiring expertise in bioinformatics, cancer biology, and drug-gene interactions.



Agentic AI Solution: Automate the analysis process with a CrewAI-powered system.



CrewAI Solution: A Team of Specialized Agents



Chief Cancer Genomics Analyst: The lead agent responsible for orchestrating the analysis.

Role: Analyzes MAF data based on natural language instructions and identifies potential therapeutic targets.


Tools: Natural Language Parser, Task Delegator, MAF Summarizer, Somatic Interactions Tool, Drug-Gene Interaction Tool.



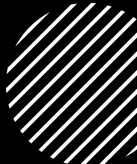

Report Agent: Compiles the analysis results into a clear and concise report.

Role: Creates a professional Markdown report summarizing the key findings and potential therapeutic targets.

Tools: Access to the outputs of the other agents.



Task Breakdown: From Instruction to Insights



Input:

Natural language instruction and MAF file path.



Parsing Task:

The Chief Analyst uses the Natural Language Parser to create a plan of action.



Summarization Task:

The Chief Analyst uses the MAF Summarizer to generate a summary of the MAF file.



Somatic Interactions Task:

The Chief Analyst uses the Somatic Interactions Tool to perform somatic interaction analysis.



Drug-Gene Interaction Task:

The Chief Analyst uses the Drug-Gene Interaction Tool to identify potential therapeutic targets.



Gather Results Task:

The Chief Analyst gathers the results from all the analysis tools.



Report Generation Task:

The Report Agent compiles the results into a Markdown report.



Output:

Markdown report with key findings and potential therapeutic targets.



Tool Integration: Extending Agent Capabilities



MAF Summarizer: Provides a concise overview of the MAF file.



Somatic Interactions Tool: Identifies significant somatic interactions between genes.



Drug-Gene Interaction Tool: Identifies potential therapeutic targets based on drug-gene interactions.



Natural Language Parser: Parses natural language instructions to create a plan of action.



Task Delegator: Delegates tasks to appropriate tools based on the plan.

Summary of
traditional vs
this
approach

Feature	Traditional Script	CrewAI/Langchain
Flexibility	Low	High
Reasoning	None	Yes
Collaboration	Difficult	Easier
Natural Language	No	Yes
Explainability	Low	High
Learning	No	Yes
Development Effort	High (coding)	High (design)

When to use a Script vs. CrewAI/Langchain

- **Script:** Use a script when you have a well-defined analysis task that is unlikely to change, and you need maximum performance and control.
- **CrewAI/Langchain:** Use CrewAI/Langchain when you need a more flexible, adaptable, and collaborative analysis workflow, and you're willing to trade some performance for those benefits.

Complexity: For very simple analyses, a script is almost always the better choice. CrewAI/Langchain adds overhead.

Reliability: LLMs can hallucinate or make incorrect inferences. Thorough testing and validation are crucial.

Cost: LLM API calls can be expensive, especially for complex workflows.

Resources

- <https://www.crewai.com/>
- <https://python.langchain.com/>
- <https://platform.openai.com/docs/models>