Agentic AI

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Agenda

1. Introduction to Agentic AI
2. History
3. Examples
4. AI Email Assistant Project Transformation

Introduction to Agentic AI

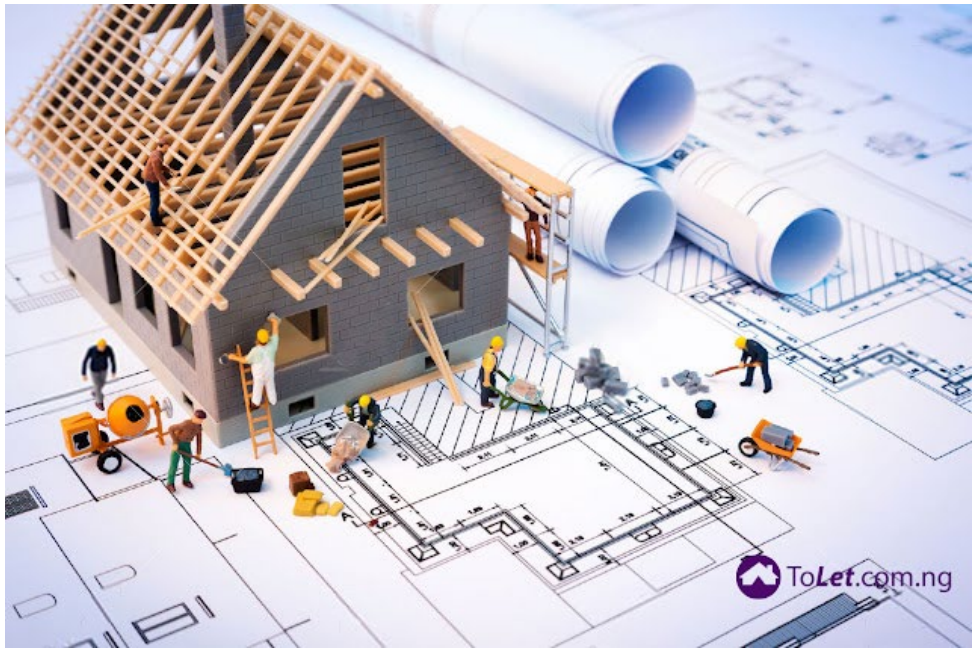
What is Agentic AI?

- AI systems that autonomously set goals, make decisions, use tools, and take actions to achieve objectives with minimal human intervention.

Why is it important?

- Enables more advanced automation in fields like robotics, finance, and research.
- Mimics humans chain of thought thinking and problem-solving.
- Moves beyond reactive AI to proactive, problem-solving systems.

Building House Analogy



https://www.olafusimichael.com/2020/01/building-my-house-should-i-build-just.html https://www.fixr.com/articles/best-paying-jobs-in-homebuilding

Kitchen Analogy

Kitchen Positions	Kitchen Roles
Chef Exécutif (Executive Chef)	They make big decisions for the restaurant and come up with the menu.
Chef de Cuisine (Kitchen Leader)	They manage the kitchen team and create recipes.
Sous Chef de Cuisine (Sous Chef)	They supervise the cooks and help with management tasks.
Commis Chef (Junior Chef)	They follow instructions and cook at their assigned station.
Garde Manger (Pantry Chef)	They make cold dishes like salads and starters.
Patissier (Pastry Chef)	They make desserts and pastries.
Chef de Partie (Line Cook)	They manage specific areas in the kitchen. They are of different types
Saucier (Sauce Chef)	They make and improve the sauces.
Boucher (Butcher)	They prepare meat and sometimes seafood.
Plongeur (Dishwasher)	They clean dishes and get them ready for the next round of serving.
Aboyeur (Expediter)	They communicate between the front-of-house staff and the kitchen team.

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What are Agents?

1950s – 1960s
Early Concepts

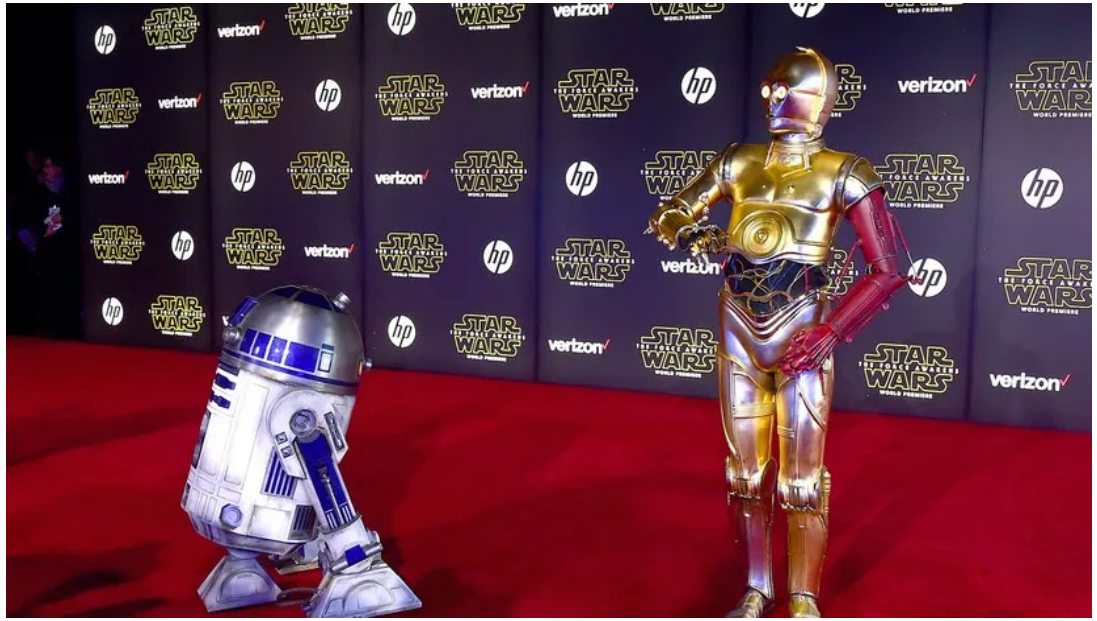
Turing does not use the term "agency", he explores concepts of learning, adapting, and performing tasks independently.

https://www.turing.ac.uk/sites/default/files/2019-05/alan_turing_header.jpg

What are Agents?

1960s – 1970s
Formal Definition

Researchers started using "agent" to emphasize autonomy, adaptability, and goal-driven behavior.
Discussion on both Software Agents and Robotic Agents.



https://www.turing.ac.uk/sites/default/files/2019-05/alan_turing_header.jpg

What are Agents?

1990s – 2000s
Intelligent Agents

Significant interest in multi-agent systems [agents interact to solve complex problems], and intelligent agent frameworks emphasizing sensing, perception, decision, and action.

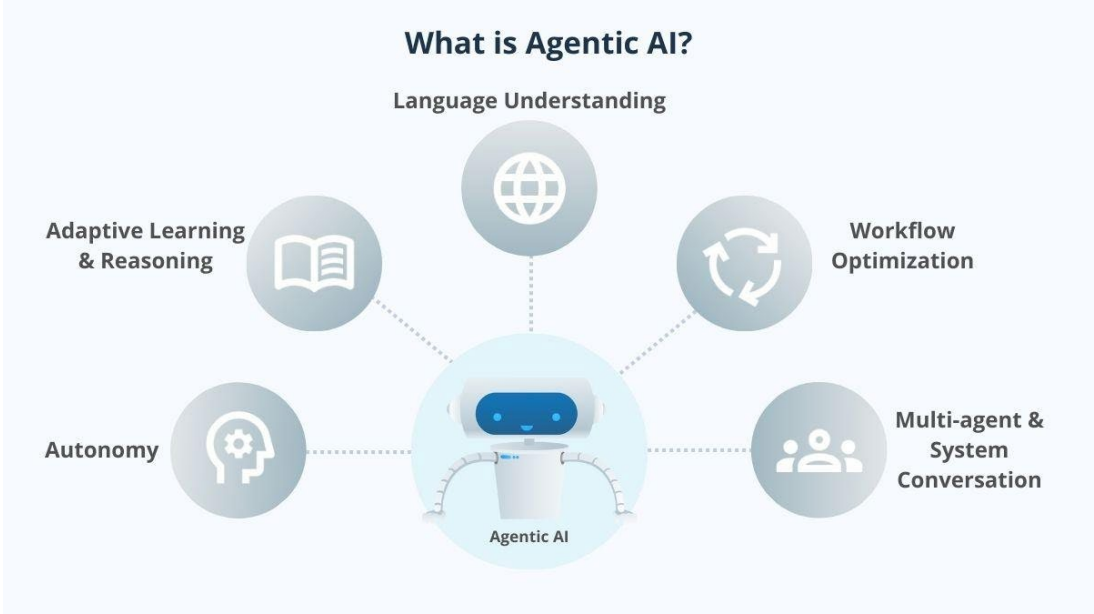
https://www.turing.ac.uk/sites/default/files/2019-05/alan_turing_header.jpg

What are Agents?

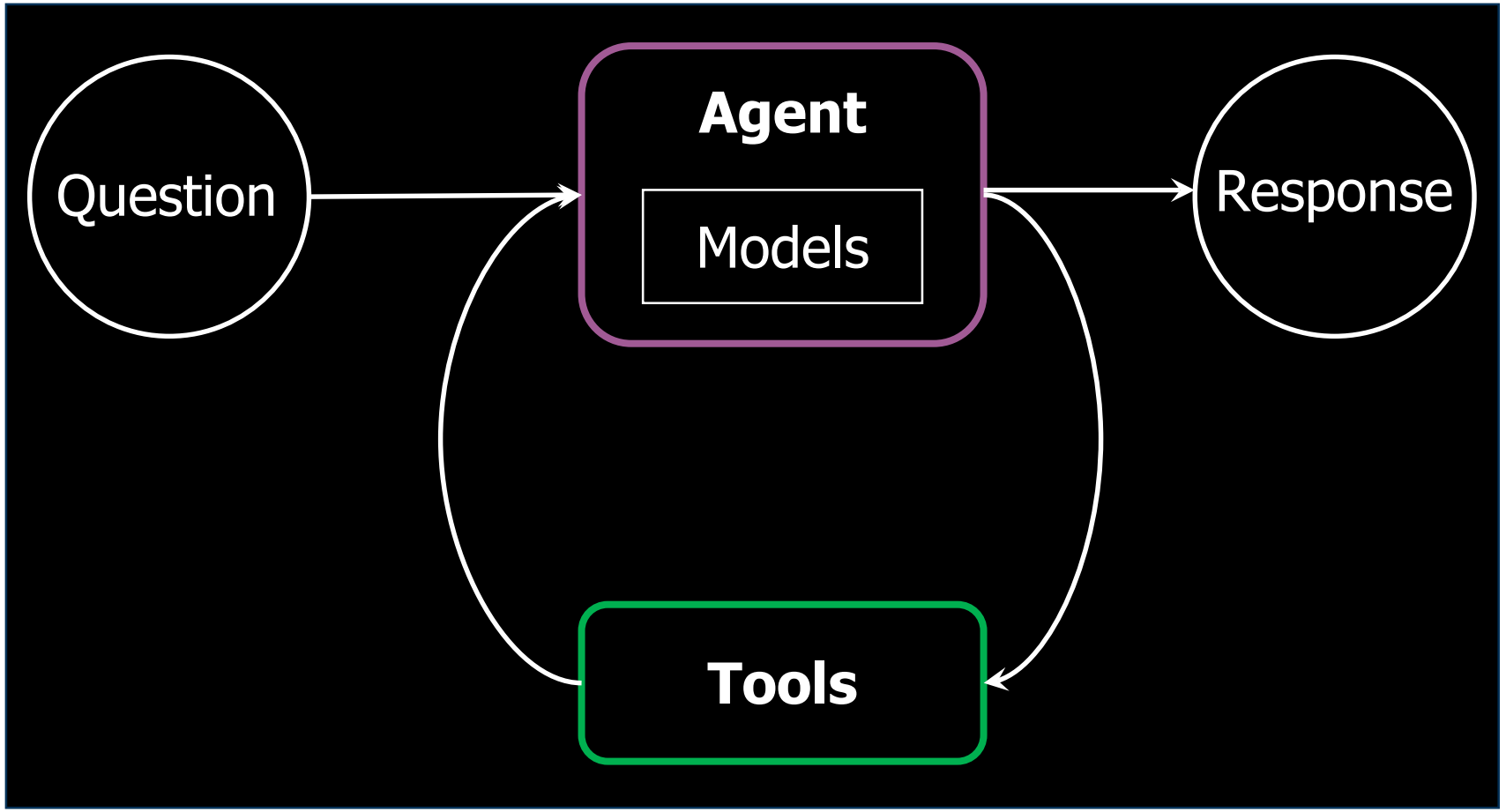
2020s
Modern Use: Agentic AI

Systems that exhibit *agency.*

GAI systems "act" by responding to user input. They often have tools allowing them to accomplish tasks. They can break-down problems, iterate, and collaborate with other agents.



What does Agents do?



Agents vs. Workflows

Workflows are systems where LMs and tools are orchestrated through predefined code paths.

Both workflows and agents are described as “agentic systems” but differ in how much “agency” they actually possess.

Agentic AI Frameworks

https://www.analyticsvidhya.com/blog/2024/07/ai-agent-frameworks/

Agentic AI Frameworks

- **Agent Architecture:** Structures for defining the internal organization of an AI agent, including its decision-making processes, memory systems, and interaction capabilities.
- **Environment Interfaces:** Tools for connecting agents to their operating environments, whether simulated or real-world.
- **Task Management:** Systems for defining, assigning, and tracking the completion of tasks by agents.
- **Communication Protocols:** Methods for enabling interaction between agents and between agents and humans.
- **Learning Mechanisms:** Implementations of various machine learning algorithms to allow agents to improve their performance over time.
- **Integration Tools:** Utilities for connecting agents with external data sources.

https://www.analyticsvidhya.com/blog/2024/07/ai-agent-frameworks/

Agentic AI Frameworks

- **Accelerated Development:** By providing pre-built components and best practices, these frameworks significantly reduce the time and effort required to create sophisticated AI agents.
- **Standardization:** Frameworks promote consistent approaches to common challenges, facilitating collaboration and knowledge sharing within the AI community.
- **Scalability:** Many frameworks are designed to support the development of systems ranging from simple single-agent applications to complex multi-agent environments.
- **Accessibility:** By abstracting away many of the complexities of AI development, these frameworks make advanced AI techniques more accessible to a broader range of developers and researchers.

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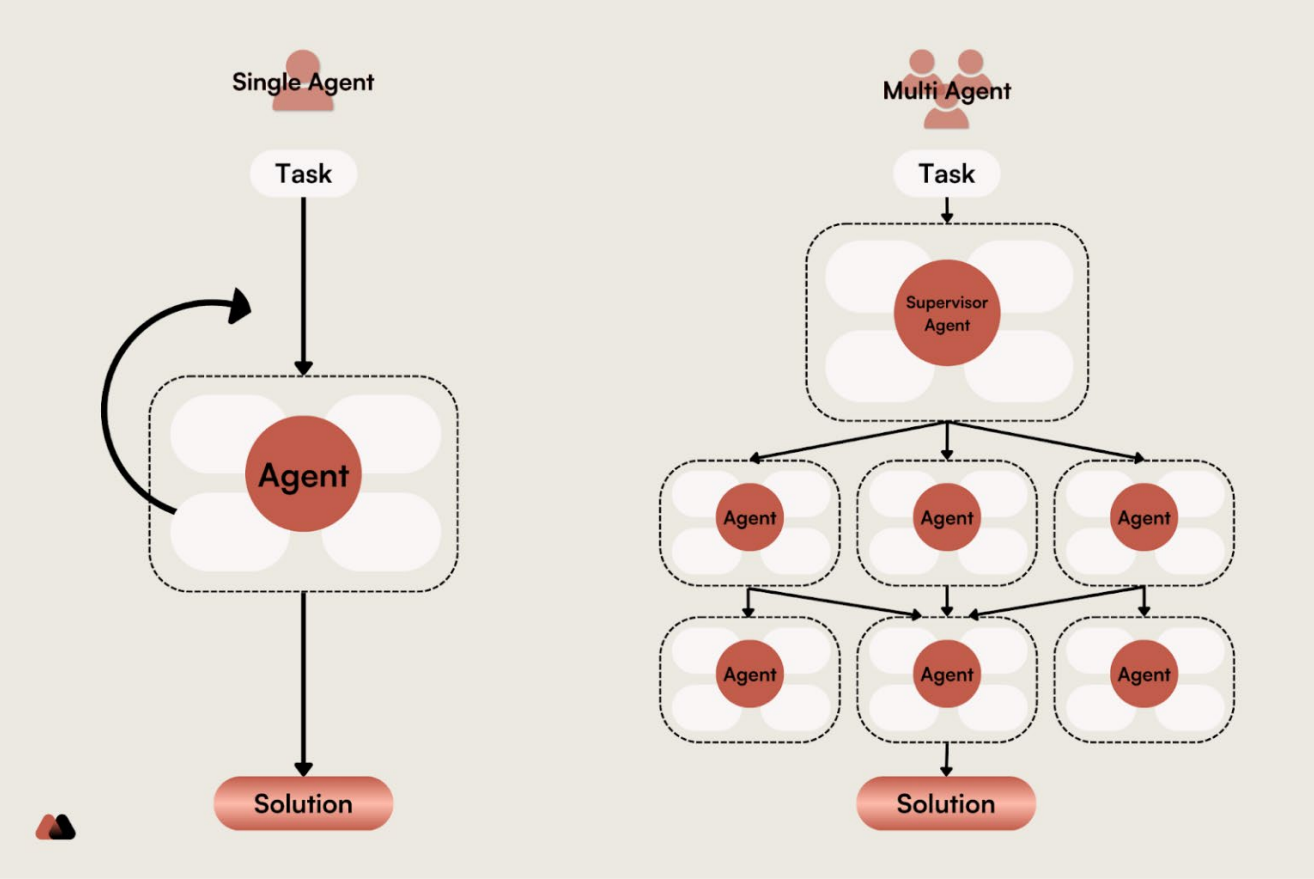
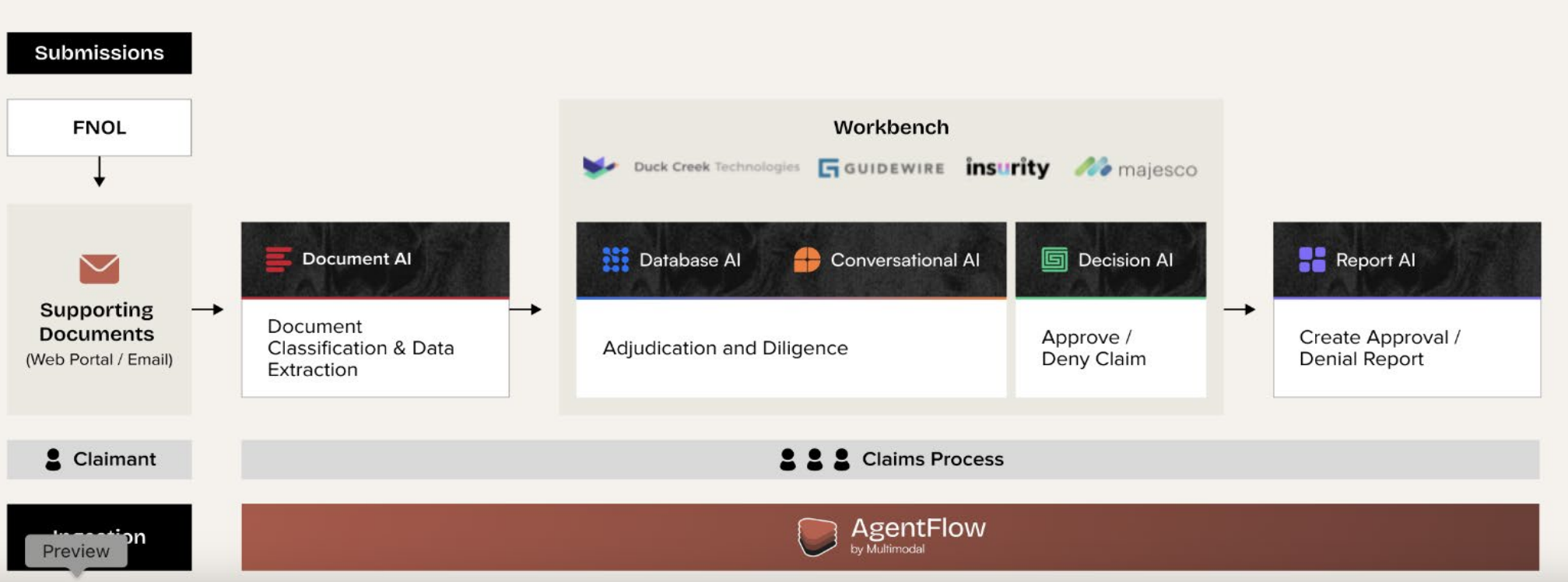
Single vs. Multi Agent System (MAS)



https://www.multimodal.dev/post/agentic-ai-the-vanguard-of-modern-enterprise

Insurance Company Example



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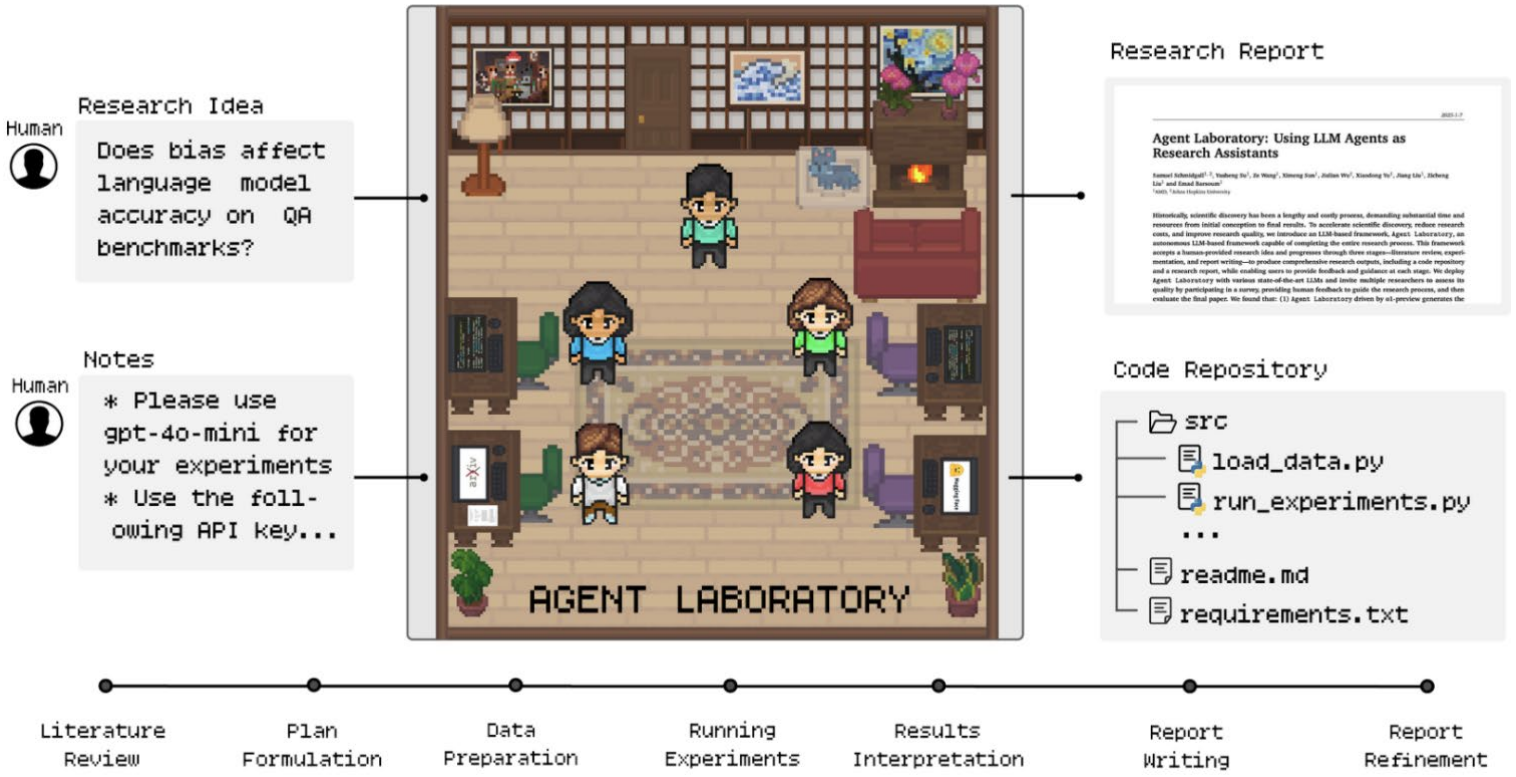
Agent Laboratory: Using LLM Agents as Research Assistant



https://agentlaboratory.github.io

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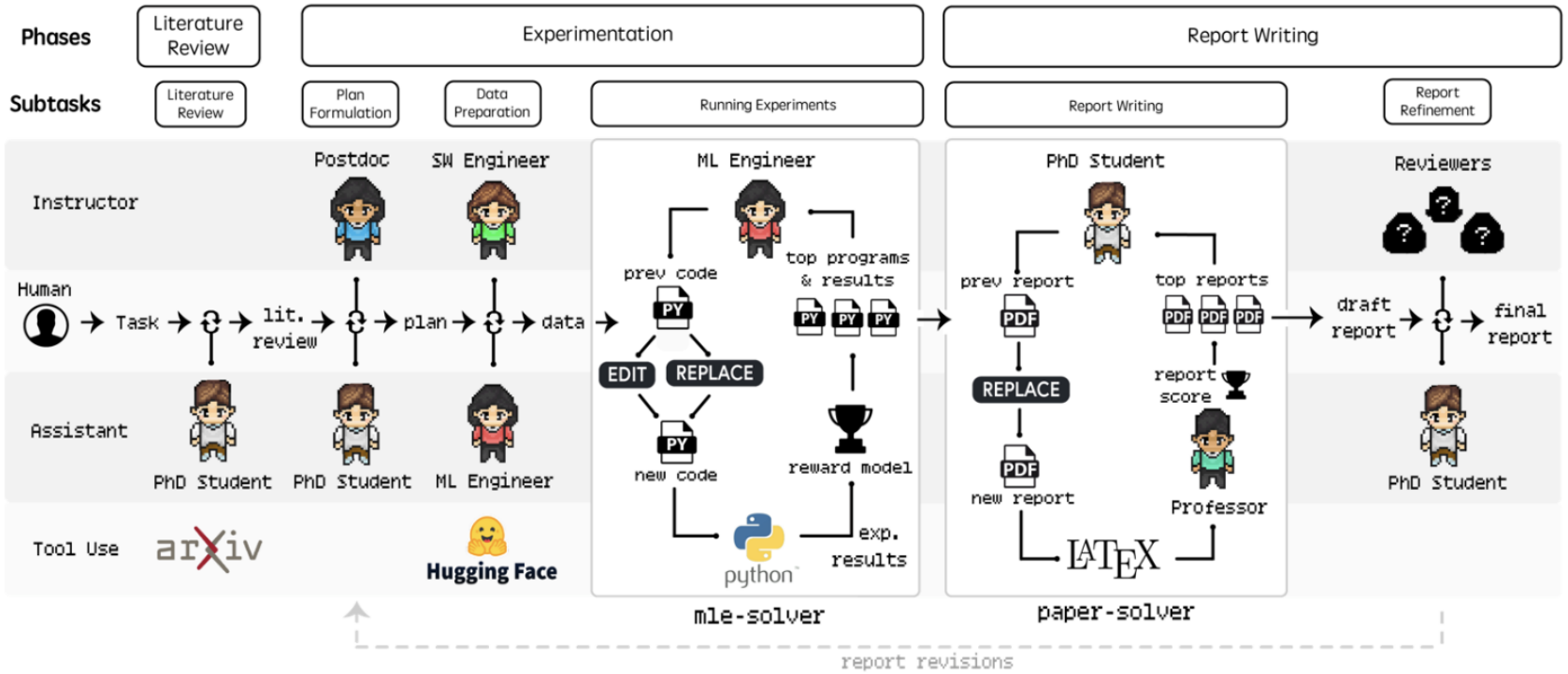
Agent Laboratory: Using LLM Agents as Research Assistant



https://agentlaboratory.github.io

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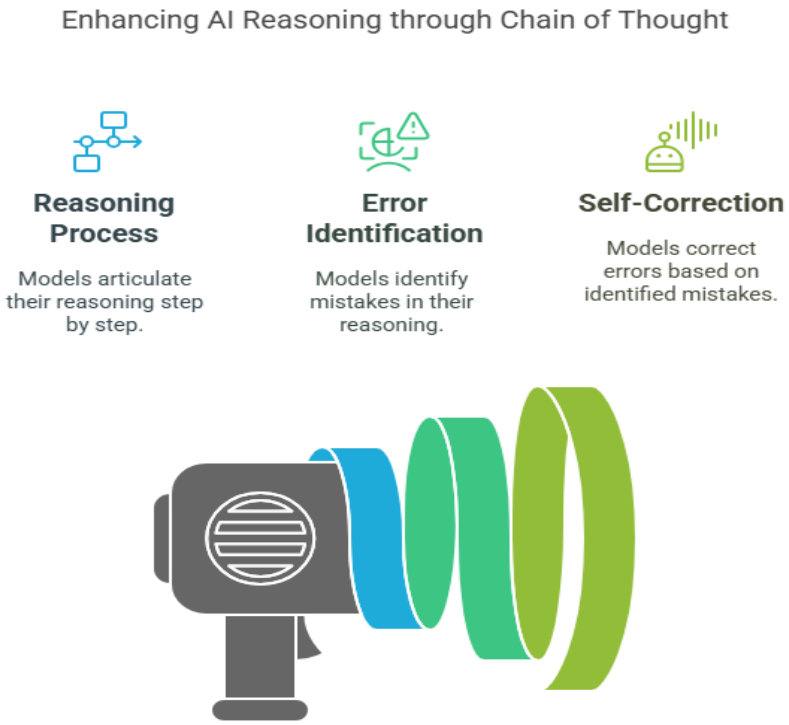
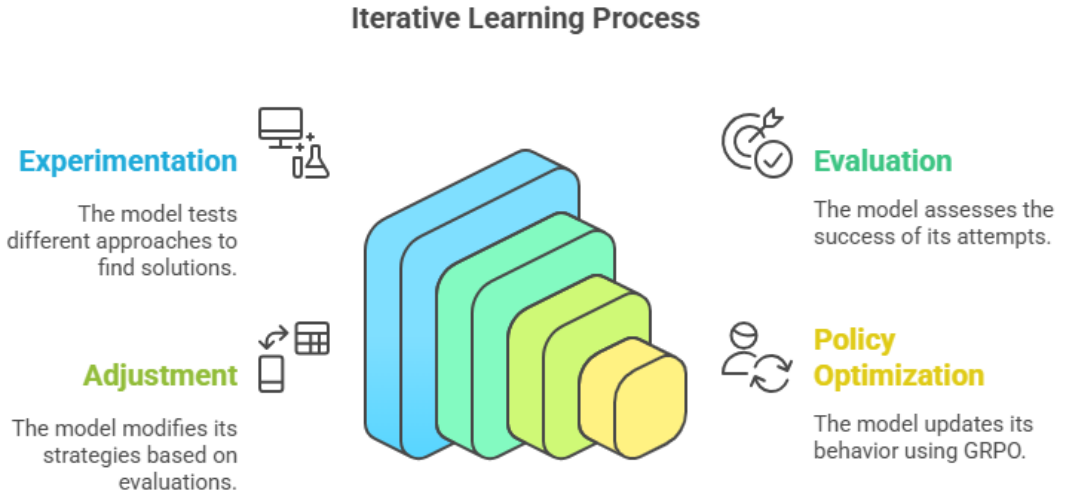
DeepSeek AI: Chain of Thought





https://medium.com/@tahirbalarabe2/deepseek-r1-explained-chain-of-thought-reinforcement-learning-and-model-distillation-0eb165d928c9

How many “R”s in strawberry?

<think>

Alright, so I need to figure out how many "r"s are in the word "strawberry." Hmm, okay, let's start by spelling out the word to make it easier to visualize. The word is S-T-R-A-W-B-E-R-R-Y.

First, I'll write it down to see each letter clearly. That way, I can count them without missing any. So, S, T, R, A, W, B, E, R, R, Y.

Now, I'll go through each letter one by one and keep a tally of how many times the letter "R" appears. Starting with S – that's not an R. Next is T – also not an R. Then we have R – that's the first R. After that is A, W, B, and E – none of those are Rs. Now, I come to another R – that's the second R. Wait, there's another R right after that – so that's the third R.

Hold on, let me double-check to make sure I didn't count any extra Rs. So, looking back: S, T, R (1), A, W, B, E, R (2), R (3), Y. Yeah, it looks like there are three Rs in "strawberry."

I think I've got it now. The word "strawberry" has three "R"s in it.

</think>

The word "strawberry" contains three "R"s.

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Use Case: AI Email Assistant

Classifier

- Prompt-tuned LLM to classify email as important or spam.

Summarizer

- Prompt-tuned LLM to provide concise summary of email.

Responder

- Fine-tuned LLM to provide possible response to email.

Reviewer

- Prompt-tuned LLM to review the accuracy and grammar of the responder.

ControlFlow

What is ControlFlow?

ControlFlow is a Python framework for building agentic AI workflows.

> An **agentic workflow** is a process that delegates at least some of its work to an LLM agent. An agent is an autonomous entity that is invoked repeatedly to make decisions and perform complex tasks. To learn more, see the **AI glossary**.

ControlFlow provides a structured, developer-focused framework for defining workflows and delegating work to LLMs, without sacrificing control or transparency:

- Create discrete, observable **tasks** for an AI to solve.
- Assign one or more specialized AI **agents** to each task.
- Combine tasks into a **flow** to orchestrate more complex behaviors.

https://controlflow.ai/welcome