Large Language Models (LLMs)

Multi-Agent LLMs

Zeham Management Technologies BootCamp

by SDAIA

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Agenda

- What are multi-agent LLMs?
- Why are multi-agent LLMs becoming popular?
- Explaining multi-agent LLMs with an example
- Multi-Agent Workflow
- Why Multi-Agent LLMs Are Better for Complex Tasks

What are multi-agent LLMs?

What are multi-agent LLMs?

Multi-agent LLMs are groups of language models that work together to solve difficult problems, with each model focusing on a specific task it's best at. They perform better than models working alone, especially for complex challenges and real-world applications. Their key advantage is teamwork, combining the strengths of different specialized models.

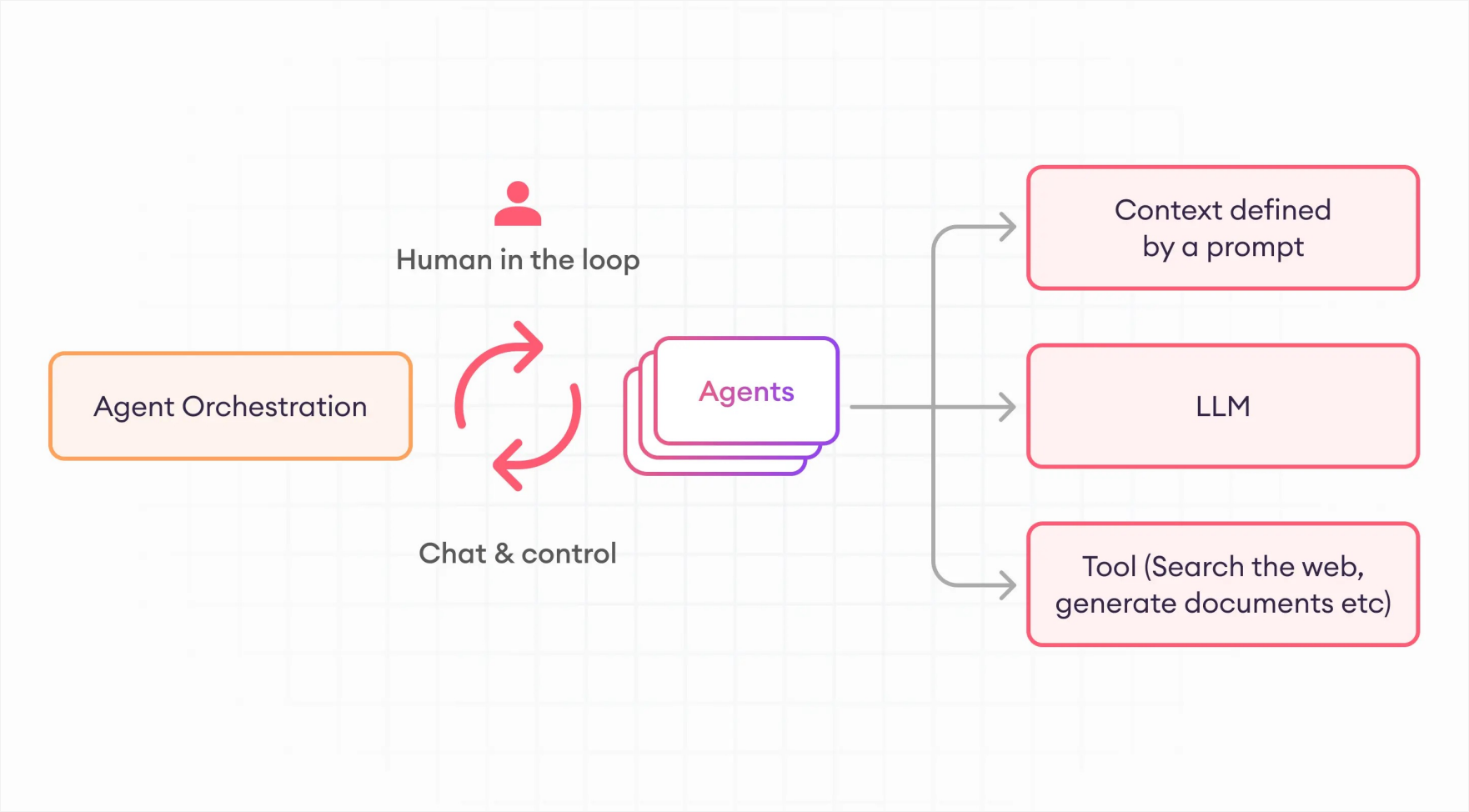
What are multi-agent LLMs?

These agents can work together as a group or individually, depending on the task at hand. Although they mostly operate independently, a human is still needed to guide their decisions and check their work.

What are multi-agent LLMs?

To complete their tasks, agents use different tools, such as searching the internet or handling documents, all powered by the strong language models they are based on.

What are multi-agent LLMs?



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Why are multi-agent LLMs becoming popular?

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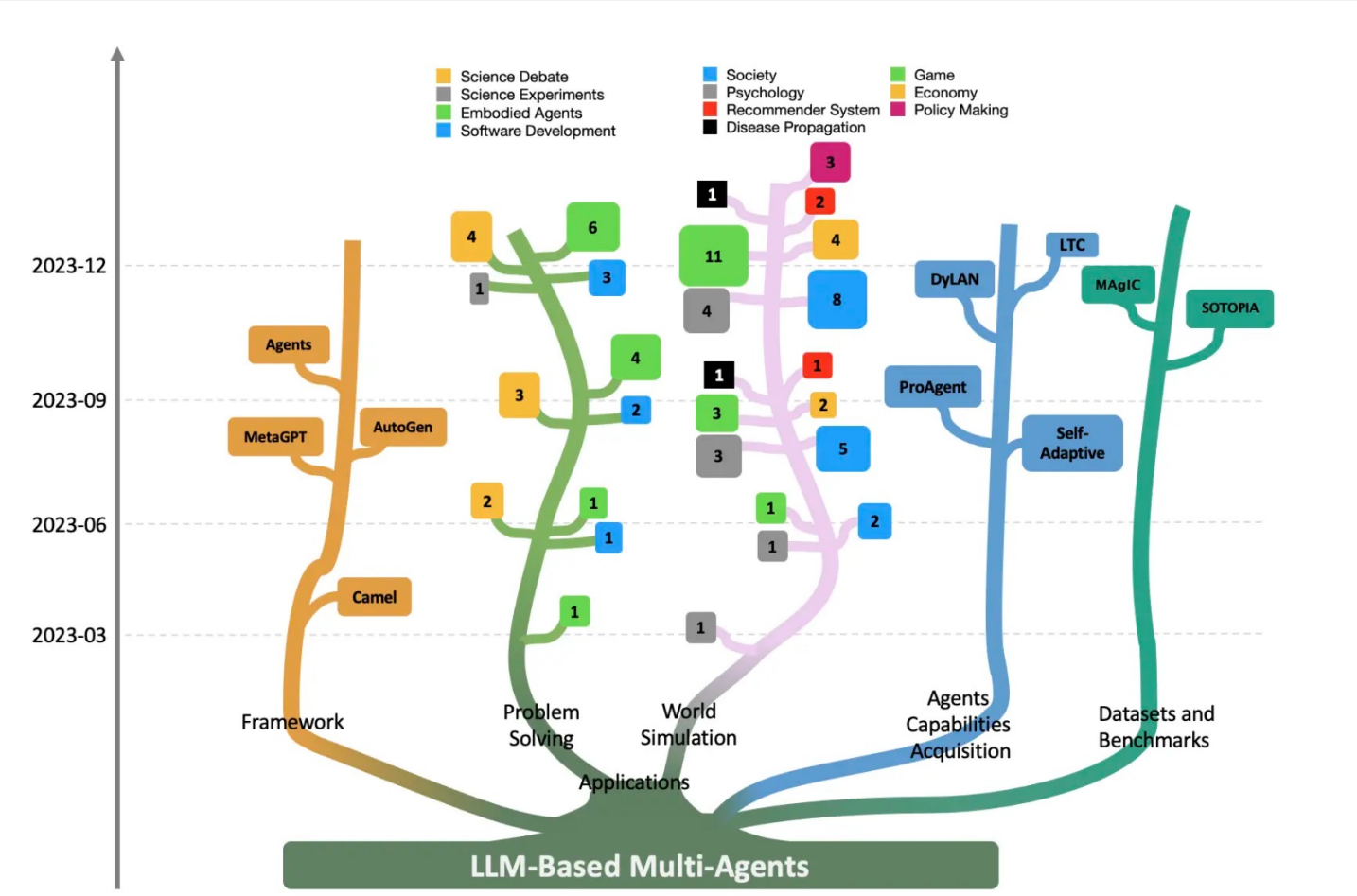
Multi-agent LLMs are gaining a lot of attention lately, and the chart in the next slide helps explain why.

Why are multi-agent LLMs becoming popular?



Source

Explaining multi-agent LLMs with an example

Explaining multi-agent LLMs with an example

Using multi-agent systems in real life Imagine having a smart assistant that can plan your entire trip from start to finish. Here's how a multi-agent system can make things easier for people who love to travel.

multi-agent example (travel planning team)

The multi-agent travel planning team A multi-agent system for travel planning has several smart agents, each focused on a specific part of your trip:

Flight agent: This agent finds and books your flights.

- Searches different flight websites to find the best options.
- Knows about the best routes, times, and prices.

multi-agent example (travel planning team)

The multi-agent travel planning team A multi-agent system for travel planning has several smart agents, each focused on a specific part of your trip:

Hotel agent: Handles finding and booking your accommodations.

- Searches hotel websites to get the best deals.
- Recommends hotels based on ratings, amenities, and location.

multi-agent example (travel planning team)

The multi-agent travel planning team A multi-agent system for travel planning has several smart agents, each focused on a specific part of your trip:

Transportation agent: Takes care of renting cars, booking trains, or arranging other transport.

- Looks through various transport options to find what suits you best.
- Knows about pricing, types of vehicles, and convenient pickup locations.

multi-agent example (travel planning team)

The multi-agent travel planning team A multi-agent system for travel planning has several smart agents, each focused on a specific part of your trip:

Activity agent: Plans your activities like tours, events, and restaurants.

- Uses online platforms to book fun activities or restaurant reservations.
- Gives suggestions based on popularity, reviews, and available time slots.

multi-agent example (travel planning team)

By breaking down travel planning into these smaller tasks, each agent can focus on its job. This makes the whole process faster and more organized because they work together and share information to give you a perfect travel plan.

multi-agent example (Traffic Management Agent)

Traffic Management Agent System In cities, multi-agent systems can help improve traffic flow and make driving smoother by coordinating different parts of the transportation network.

multi-agent example (Traffic Management Agent)

Traffic Management Agent System In cities, multi-agent systems can help improve traffic flow and make driving smoother by coordinating different parts of the transportation network.

Traffic agent: This agent helps manage traffic and reduce congestion.

- Watches traffic patterns through sensors and cameras.
- Adjusts traffic lights and suggests faster routes when roads are crowded.

multi-agent example (Traffic Management Agent)

Traffic Management Agent System In cities, multi-agent systems can help improve traffic flow and make driving smoother by coordinating different parts of the transportation network.

Incident agent: Handles accidents or emergencies on the road.

- Works with emergency services to quickly clear incidents.
- Updates drivers in real-time and suggests detours to avoid delays.

multi-agent example (Traffic Management Agent)

Traffic Management Agent System In cities, multi-agent systems can help improve traffic flow and make driving smoother by coordinating different parts of the transportation network.

Public transit agent: Coordinates buses, trains, and other public transport.

- Changes schedules during busy times to meet demand.
- Gives passengers real-time updates on arrival times and delays.

Multi-Agent Workflow

How Multi-Agent LLMs Work

In a multi-agent LLM system, the process starts when a user gives a broad task or question. The system then breaks this main task into smaller parts, with each part being handled by a specialized agent based on its skills.

How Multi-Agent LLMs Work

Each agent uses its own language model (LLM) to think through its specific task, create a plan, and carry it out using tools and stored information.

How Multi-Agent LLMs Work

During this, agents communicate and share important details to complete tasks that depend on each other. Once all the agents finish, the system combines their results into the final response for the user.

Why Multi-Agent LLMs Are Better for Complex Tasks

Why Multi-Agent LLMs Are Better for Complex Tasks

Multi-agent LLM systems are seen as a great choice for handling complex tasks because they allow agents to work together efficiently.

Better Accuracy

Accuracy and Reducing Mistakes (LLM Hallucinations):

One major issue with single-agent LLMs is that they sometimes generate incorrect but convincing information, known as hallucinations. This can be a big problem in critical fields like medicine or law, where accuracy is key. In a multi-agent system, agents can check each other's work, which reduces errors and improves reliability.

Extended Contexts

Handling Large Amounts of Information (Extended Contexts):

Single-agent LLMs struggle with large documents or long conversations because they can only process a limited amount of text at a time. Multi-agent systems solve this problem by dividing the work. Each agent focuses on a smaller part of the text, and they work together to keep track of the entire conversation or document.

Multi-agent LLM frameworks

Implementing Multi-Agent can be done using various frameworks, including:

- **Microsoft's AutoGen:** It enables AI agents to collaborate, use tools, and involve humans, with flexible conversation patterns and a growing developer community.
- **LangChain:** It provides tools to connect different AI components, helping developers easily create complex AI applications by combining various features.
- **CrewAI:** It allows you to create teams of AI agents, each with specific roles and expertise. It's designed for production-ready applications, focusing on clean code and practical use.

Let's create a Multi-Agent!

Tutorial:

Multi_Agent_Tutorial.ipynb

Exercise:

Multi_Agent_Exercise.ipynb

Thank you!

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