12-15-2024

Collaborative Intelligence through LLM-Based Agentic Workflows Enabling Role-Differentiated AI Agents for Complex Task Achievement

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Large language models (LLMs) have significantly transformed artificial intelligence by making it possible to integrate extensive knowledge through natural language (Bubeck et al., 2023). This strong capability has opened up new possibilities for LLM-based agents to tackle complex tasks. However, even with these advancements, we often find ourselves constrained by the limitation of simple AI agent systems, which perform tasks in isolation. While this can be effective for specific tasks, it doesn't fully leverage the potential intelligence that LLM-based agents can achieve.

Indeed, LLMs have demonstrated strong role-playing capacities in designated roles (Chen et al., 2023). Researchers have employed chat-powered frameworks (e.g., ChatDev), in which specialized LLM-driven agents tailored for specific roles, to effectively work together and execute complex tasks, such as software development (Qian et al., 2024). These agents engage in language-based interactions, contributing to shared goals by generating solutions through multi-turn dialogues at various stages. The results show that collaboration among agents significantly outperforms single-agent systems. Moreover, these agents follow a structured workflow that guides them in determining both what to communicate and how to communicate it, leading to a marked improvement in the task performance.

We propose that this research has great potential to advance the current GenAI landscape within Information Systems, particularly in addressing complex tasks through the intelligence of LLMs. By leveraging natural language communication as a bridge, LLM-based agents could iteratively refine their outputs to complete complex tasks with enhanced performance. This new avenue could lead to the development of more adaptive, context-aware AI systems that not only respond to complex tasks but anticipate and optimize themselves in real-time.

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