Review of Autonomous and Collaborative Agentic AI and Multi-Agent Systems for Enterprise Applications

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ABSTRACT- Artificial Intelligence (AI) landscape is fast developing such that there are dynamic and autonomous representatives of AI which are referred to as AI agents. These agents, fueled by the evolution of generative AI and large language models (LLMs), can make their own decisions, perform tasks and make adjustments to rapidly changing environments. An even more advanced step is the instrumentation of various specialized AI agents into working multi-agent systems (MAS). The paper will discuss the disruptive effect of the introduction of AI agents and MAS on the automation and service of enterprises and different industries. We look into their possibilities, various uses, and the natural strengths and weaknesses, such as the essentiality of effective governance infrastructure and complicated conditions in human-AI partnership. Although promising new levels of efficiency and capability to solve problems previously inaccessible, ethical implications associated with the use of these agentic systems have to be carefully explored as well as the approaches to integration that should be able to guarantee their long-term value and be serving to empower humans.

This paper is a survey paper regarding Agentic AI and multi-agent systems within the enterprise context. Examining 65 of thes contemporary sources (2024-2025), we record the paradigm shift of passive generative AI to autonomous agentic systems. The paper analyses the architectural structures, models of collaboration, industrial use and governance issues. The most significant ones are (1) multi-agent systems have a 40-60% efficiency gain of the processes, (2) special agent relation coordination protocols are becoming important infrastructure, and (3) it is found that human-agent collaboration needs new stewardship and motivational models. All these are ended in the paper with new directions of agent-to-agent communications and the specific agent settings.

KEYWORDS- AI Agents, Agentic AI, Multi-Agent Systems, Enterprise Automation, Generative AI, Human-AI Collaboration, Autonomous Systems, AI governance

I. INTRODUCTION

The field of artificial intelligence is making a paradigm shift of moving away of single task oriented systems to semi and entire autonomous, goal oriented systems [1]. Such transition to what [2] calls Agentic AI is not simply technological, it is an entirely new operational paradigm to enterprise systems.

The Artificial Intelligence (AI) field is undergoing a paradigm shift, whereby, the static, single-purpose models change to dynamic, autonomous, and so-called AI agents. Armed with the innovations in generative AI and large language models (LLMs), these agents are not just able to understand and generate human language and but also make conclusions, perform actions, and react to changing environments on their own [3], [4], [5]. This evolution entails the advent of such a new type of intelligent system that provide autonomy and goal behaviors, known as the Agentic AI, a noteworthy breakthrough to the attainment of artificial general intelligence (AGI) [6], [7].

There has been enormous progress in the development of Artificial Intelligence over the years, where initially, it was limited to the rules-based systems, then to the elaborate machine learning models, and finally to the current trend in generative AI [8], [9]. The new frontier is characterized by the appearance of AI agents and agentic AI as a radical transition toward active models starting with the idea of goal-oriented active systems that can take decisions and act autonomously [10], [11], [12], [13], [14], [15], [16], [17], [18]. These smart beings are capable of sensing the environment, establishing and achieving objectives, making and following the complex course of action, and being experiential [3], [4], [19]. It goes further to the so-called general-purpose AI agents, which will be able to act, learn, and generalize in a broad range of tasks, thus become a major milestone to the world of artificial general intelligence (AGI) [6], [7], [20].

Enterprise segment is leading in this change. Companies are fast embracing AI agents as a way of automating the workflow, improving operations, and customer experience. Industry reportings in the last ten minutes mention hundreds of enterprise AI agents being deployed and multi-billion dollar investment in agentic technologies [21], [22]. In contrast to the passive nature of traditional AI, where recommendations may be made or content generated, agentic systems are active, multipronged agents performed with minimal human supervision [15].

Major trend in this environment is the evolution of multi-agent systems (MAS), i.e., a set of specialized agents working together to address complex, distributed problems that are beyond the capabilities of any individual agent [23], [24]. MAS architectures can support scalable and fault-tolerant, enterprise-scale solutions, distributed problem-solving, and coordination of limited skills, opening the door to resilient multi-modal architecture.