Chapter 10
Rise of the Self-Driven Machine:
Inside the World of Agentic AI

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ABSTRACT

AI refers to ability of machines to perform tasks that typically require human mind to perform such as learning, problem solving and decision making an agentic AI has been considered in large category. These systems depend on AI agents with purpose of independent entities that are capable of recognizing environment, learning & then performing the processes in multiple steps of workflow. Agentic AI accommodates LLM-based veracity. Through this classification strategy, AI agents are having the ability to seek real time data on fly and keep evolving with changes in world around them in sectors including healthcare, cybersecurity, logistics & personal services. In this chapter, we explore recent advancement in Agentic AI by analysing architecture, capabilities and real-world application of multi agent systems. These systems integrate LLMs to enable self-reliant decision making & task performing.

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We cover key methods such as retrieval–augmented generation, chain of thought promoting, increase learning with human feedback. It highlights how Agentic AI helps a machine to become autonomous.

1. INTRODUCTION

1.1. Artificial Intelligence (AI)

Artificial intelligence (AI) refers to machines performing multiple tasks like thinking, learning, problem-solving, and decision-making. First, it was created as a technology that can imitate human intelligence. Artificial intelligence has been developed in a way that exceeds its original concept of AI (Russell & Norvig, 2022). With advances in data collection, data processing, and computational power, artificial intelligence systems can now take on multiple tasks across different domains and increase productivity. Artificial intelligence abilities have rapidly increased, and so has their utility in growing numbers of fields (Russell & Norvig, 2022). Agentic AI presents the next step in artificial intelligence. In this, the technology can make decisions autonomously and act deliberately without the need for human acknowledgement. Not like traditional AI, which requires a set of instructions, agentic AI can make its own decisions and set its goals, evaluate outcomes, and adapt according to the environment. The term used for self-driven machines as AI, is changing from requiring constant human observation to becoming autonomous and making decisions with the help of agentic AI; similarly, autonomous vehicles are handling traffic and following traffic rules in scenarios. The shift towards agentic AI represents both technical advancement and a conceptual shift, which shifts towards systems that have persistent, proactive, and self-regulating behaviours (Capgemini Research Institute, 2025).

1.2. AI vs. Agentic AI

Artificial intelligence is very instruction-oriented, which means the AI performs tasks with a set of instructions. The task of these AI models is to optimize within predefined boundaries or problem statements; these systems lack the flexibility and adaptability that define dynamic intelligent behaviour in the real world (Hosseini & Seilani, 2025). Thus, the role of agentic AI comes into play; the concept and development of artificial intelligence have been completely developed at the next level with the introduction of agentic AI. The role of agentic AI is that it can act autonomously and make decisions on its own to complete the task, as opposed to traditional AI systems, focused on prediction and classification, which are designed