Chapter 1
Introduction to AI in Robotics and Drones

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ABSTRACT

This chapter introduces the revolutionary impact of artificial intelligence (AI) on industrial robotics and drones, providing a foundation for understanding the integration of AI technologies in these fields. It covers the evolution of AI-driven systems, highlighting significant milestones and projecting future trends. The chapter aims to set the stage for the ensuing discussion by presenting the broad applications of AI in enhancing the capabilities of robots and drones, from manufacturing and logistics to surveillance and agriculture. It also addresses the societal and economic implications of widespread AI adoption in industrial robotics and drones, underscoring the potential for transformative change across various sectors.

INTRODUCTION

Artificial intelligence (AI) is a rapidly evolving field that has garnered significant attention in recent years. The concept of AI revolves around the development of computa- tional systems that possess the ability to interpret external data accurately, learn from such data, and utilize these learnings to accomplish specific goals and tasks through flexible adaptation (Haenlein and Kaplan 2019; Nhi, Le et al. 2022). This involves the capacity of machines to think, reason, comprehend, and understand human intellect, enabling them to perform tasks that are typically associated with human intelligence, such as recognizing patterns, planning, and critical analysis based on collected data (Nabi and Xu 2021). Furthermore, AI encompasses the study and development of the- oretical methods and techniques for simulating and

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expanding human intelligence, as well as the imitation of certain human functions and behaviors through computers or electronic devices (Cao 2017; Bisht and Vampugani 2022; Cao et al. 2021).

The integration of AI into various domains, including healthcare, education, and industry, has been a significant area of focus. In the medical field, AI has shown potential in revolutionizing patient care and administrative tasks, with the capability to aid healthcare providers in diagnosis and treatment decisions (Anwar et al. 2022; Okafor et al. 2022). Similarly, in the education sector, AI has gradually been integrated into major aspects of schooling and academic learning, leveraging breakthroughs in algorithmic machine learning to enhance educational processes (Toncic 2021; Kumb- hojkar and Menon 2022). Moreover, the tourism industry has also been impacted by AI, with scholars highlighting the transformative potential of AI in shaping the future of tourism through the rapid development of computer technology (Tuo, Ning, and Zhu 2021; Colace et al. 2022).

The historical perspective of AI is crucial in understanding its evolution. The emergence of expert systems has been identified as a major advance in the field of AI, transforming the enterprise of AI and shaping its trajectory over the years (Brock 2018; Liao et al. 2024). Additionally, the intertwined histories of AI and education have been evident since the early days of AI, signifying the deep connection between these two fields (Doroudi 2022). Furthermore, the role of AI in shaping the future of various industries, including healthcare, radiology, and mental health, has been a subject of extensive research, with a focus on the potential for AI to enhance medical practice and improve patient care (Sorantin et al. 2021) (Shazly et al. 2022; Kumari et al. 2024; Milne-Ives et al. 2022).

The definition of AI has been a topic of extensive analysis, with scholars emphasizing the importance of establishing a clear and comprehensive definition that aligns with its common usage, draws a sharp boundary, leads to fruitful research, and is as simple as possible (Wang 2019). The concept of AI has also been explored in the context of legal systems, with discussions on the challenges of developing a legal definition of AI that meets the requirements of modern technological development and can be effectively used in the process of legal regulation (Minbaleev 2022; Mishra, Kong, and Gupta 2024; Arkhipov 2022).

Artificial intelligence (AI) has significantly impacted the field of robotics and drone technology (Table 1). The integration of AI in unmanned aerial vehicles (UAVs) has enhanced their capabilities and applications. AI-enabled IoT-based drone-aided health- care services have been developed, allowing for tasks such as sample collection and medical supply delivery Wazid et al. (2020); Sharma et al. (2024). Additionally, the application of AI and IoT has increased the popularity of drones globally, indicating the widespread adoption of AI in drone technology (Yaramala et al. 2022). Furthermore, AI has been utilized in real-time autonomous drone operations, demonstrating its role in enhancing the intelligence and autonomy of drones (Kovari and Ebeid 2021; Chui et al. 2024). The use of AI algorithms in solving various problems related to drones has been a focus of the research community, highlighting the integration of intelligence at the core of UAV networks (Lahmeri, Kishk, and Alouini 2021). Moreover, AI applications in AgriTech drones have been recognized as effective tools for smart farming, providing precision evaluations and enhancing food security (Spanaki et al. 2021). In the context of robotics, AI technology has been effectively utilized in critical places such as clinics, hospitals, and logistics, contributing to the diagnosis and prevention of the spread of diseases, including the COVID-19 pandemic (Mahdi 2021).

Additionally, the fusion of blockchain and AI has been proposed to secure drone communication, highlighting the potential for advanced security and intelligent com- munication architecture in drone networks (Gupta, Kumari, and Tanwar 2020). The development of machine-learning techniques for UAV-based communications has fur- ther demonstrated the integration of AI in drone technology, emphasizing