Integrating Artificial Intelligence for Drug Discovery: Revolutionizing Drug Delivery

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Abstract: Drug development poses significant challenges due to its high cost, time-consuming nature, and considerable failure rates. Artificial intelligence (AI) has emerged as a transformative tool in recent years, offering innovative solutions to these challenges within the pharmaceutical industry. This manuscript explores the multifaceted role of AI in drug discovery, including AI-assisted drug delivery design, new drug discovery, and novel AI techniques. Various AI methodologies, such as machine learning and deep learning, are examined, along with their applications in target identification, virtual screening, and drug design. The paper also traces the historical development of AI in medicine, emphasizing its profound impact on healthcare. Furthermore, it discusses AI's involvement in drug repositioning and the identification of drug combinations, highlighting its potential in revolutionizing drug delivery systems. A comprehensive overview of current AI programs and platforms used in drug discovery is provided, illustrating technological advancements and future directions in the field. The study not only presents the current state of AI in drug discovery but also anticipates its future trajectory, addressing the challenges and opportunities ahead.

Keywords: Artificial intelligence; drug discovery; machine learning; deep learning; drug repurposing; pharmaceutical AI