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Review Article

REVOLUTIONIZING HEALTHCARE: EXPLORING THE ROLE OF ARTIFICIAL INTELLIGENCE IN DRUG DISCOVERY AND DEVELOPMENT

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The healthcare industry is undergoing a transformative journey fueled by Artificial Intelligence (AI) and Machine Learning (ML). These technologies have immense potential in revolutionizing various facets of healthcare, particularly in drug discovery and development. AI, encompassing machine learning, enables machines to simulate human intelligence, making predictions, and decision-making. The application of AI and ML in drug discovery holds great promise in accelerating the process, reducing costs, and enhancing precision. Traditionally, drug discovery has been a lengthy and costly endeavor, relying on trial and error. AI and ML now offer accelerated drug discovery by swiftly processing vast datasets, identifying potential drug candidates efficiently. They also enable precision medicine by tailoring treatments to individual patients based on genetic data, minimising adverse effects. Additionally, AI aids in drug repurposing, identifying new uses for existing drugs, cutting time and costs. Target identification becomes more precise with AI, selecting biological targets with high therapeutic potential. Predictive toxicology and safety assessment, powered by AI and ML, streamline safety evaluations, saving time and resources. Virtual screening identifies safer drug candidates early in development, and adverse event prediction provides early warnings. Personalized medicine, driven by genomics and AI, tailors treatments based on an individual's genetic profile. Pharmacogenomics and cancer genomics are notable examples, improving drug efficacy and targeting specific mutations. While AI shows immense promise, challenges include data quality, ethical concerns, and limitations in creativity. Overcoming biases and integrating AI with traditional methods offer potential solutions.

Keywords: Artificial Intelligence, Machine Learning, Drug Discovery, Precision Medicine, Drug Repurposing, Predictive Toxicology, Personalized Medicine, Healthcare Transformation.

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