

Chapter 9: AI in Drug Development and Disease Diagnosis

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Abstract: Artificial Intelligence (AI) is rapidly turning out to be one of the most effective tools in the discovery of drugs, drug design, and diagnosis of diseases. The conventional method of developing a new medicine is costly, time consuming, and unsuccessful due to various reasons; identification of the appropriate target, enhancement of the lead compound, and anticipation of side effects among others. AI can streamline the process and ensure its reliability. Through Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), Reinforcement Learning (RL), and Quantum Computing (QC), now researchers are able to screen millions of compounds, predict drug actions in the body, design novel molecules and even optimize clinical trials and post-marketing research. Besides drug discovery, the AI is also transforming the process of disease diagnosis. It will be able to analyze the medical images, patient data and genetic data and identify cancer, heart disease, brain disorders and infections much earlier and more effectively. This is in support of precision medicine which involves the treatment of patients based on a case by case basis. Although certain issues continue to be faced, such as the necessity to improve data, have AI models better comprehensible, and address ethical concerns, AI is already becoming a game-changer. It provides safer, faster and cheaper alternatives in developing the drug and also in diagnosing the disease and assists in bettering healthcare across the globe.

Keywords: Artificial Intelligence, Drug Discovery, Disease Diagnosis, Target Identification, Drug Design.

9.1 Introduction

Artificial Intelligence (AI) is a branch of computer science that focuses on creating machines that can perform tasks which normally need human intelligence, such as learning, reasoning, understanding language, problem solving, and decision making. Using powerful algorithms and large amounts of data, AI can now be applied in many fields like healthcare, transport, and finance. In healthcare, especially in pharmaceuticals, AI is bringing a major change [1]. Developing a new drug through the traditional process is very long, expensive, and complicated. It usually takes 10–15 years and costs billions of dollars to bring one drug from the research stage to the market. This