

Artificial Intelligence and Machine Learning Approaches for Predicting Drug–Drug Interactions in Clinical Practice

Sayan Chatterjee and Dr Vijay Kumar

Scholar, OPJS University, Churu, Rajasthan.

Assistant Professor, OPJS University, Churu, Rajasthan.

Abstract: *Drug–drug interactions (DDIs) represent a major challenge in clinical medicine and pharmacotherapy, often leading to adverse drug reactions, therapeutic failure, hospitalisation, and increased healthcare costs. Traditional methods of detecting DDIs rely heavily on clinical trials, post-marketing surveillance, and spontaneous reporting systems, which are often time-consuming and limited in predictive capability. Recent advancements in Artificial Intelligence (AI) and Machine Learning (ML) have transformed the field of drug safety by enabling accurate prediction, early detection, and risk assessment of DDIs. This article reviews the role of AI and ML techniques in predicting DDIs, including deep learning, natural language processing, neural networks, and data mining approaches. The study further discusses data sources, predictive models, clinical applications, advantages, limitations, and future directions of AI-driven DDI prediction systems. The integration of AI technologies into healthcare systems can significantly improve patient safety, optimise therapeutic outcomes, and support precision medicine.*

Keywords: Artificial Intelligence, Machine Learning, Drug–Drug Interactions, Clinical Pharmacology, Deep Learning, Pharmacovigilance, Precision Medicine