

**Abstract**

**This study employs the Bat Algorithm and Artificial Neural Network (ANN) to predict drug side effects associated with disorders of nutrition and metabolism, utilizing a dataset from the SIDER database. The conventional reliance on clinical trials or post-market surveillance for side effect identification has limitations, leading to late or missed detections. Recognizing the need for robust strategies, machine learning methodologies, particularly deep learning, are incorporated to enable a more nuanced analysis of data. Despite recent advancements, deep learning is underutilized, and manual tuning prevails. The Bat Algorithm, known for its efficiency, is employed for architectural optimization of the ANN models. Three different architectures are optimized, and results indicate that the best-performing model achieves an accuracy value of 0.8160. The study highlights the potential of combining the Bat Algorithm and ANN for early and efficient prediction of drug side effects, thereby reducing costs and time associated with drug development. Further validation on diverse datasets and real-world scenarios is essential for assessing the generalizability of the proposed models and their implications in advancing drug side effect prediction.**

**Keywords: Bat Algorithm, Artificial Neural Network, Side Effect, Fingerprint-Based.**