

ABSTRACT

Type 2 diabetes mellitus (T2DM) is a metabolic disease with a significantly increasing prevalence and potential to cause serious complications. Dipeptidyl Peptidase-4 (DPP-4) enzyme inhibitors are an effective alternative therapy to control blood glucose levels in T2DM patients. However, accurate prediction of DPP- 4 inhibitor activity remains challenging due to the complexity of molecular data, which is difficult to handle with conventional methods. This study implements a Long Short-Term Memory (LSTM) model optimized using the Monarch Butterfly Optimization (MBO) algorithm to predict the activity of DPP-4 inhibitor compounds. The dataset used consists of 108 compounds divided into training and testing sets, with parameter optimization conducted via MBO to improve model performance. Evaluation on the testing data showed that the optimized model achieved an accuracy of 70.37%, precision of 72.35%, recall of 70.88%, and F1-score of 70.00%. These findings confirm the effectiveness of combining LSTM and MBO in improving the accuracy of DPP-4 inhibitor predictions, which can contribute significantly to the development of more efficient and targeted computational-based diabetes mellitus therapies.

Keywords: *Diabetes Mellitus, DPP-4 Inhibitor, Long Short-Term Memory, Monarch Butterfly Algorithm, Prediction, Antidiabetic Agent*