

## A Review of Machine Learning Algorithms and Weather Forecasting Integration for Enhancing Flood Prediction in the Nilwala River Basin

HT Sewwandini<sup>1#</sup>, Pradeep Kalansooriya<sup>1</sup>, and DU Vidanagama<sup>2</sup>

<sup>1</sup>Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka

<sup>2</sup>Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka

#38-bcs-0016@kdu.ac.lk

In Sri Lanka, the Nilwala River Basin is very vulnerable to severe flooding that often places local lives, property, and livelihoods at risk. The current review evaluates the integration of complex machine learning models with weather forecasting methodologies, in particular rainfall data, aiming for substantial improvements in timely and accurate predictions of floods within this very fragile region. Timing and intensity of rainfall are crucial information for flood prediction, in which traditional forecasting often fails due to incorrect predictions. This study conducted a detailed analysis of ten years of daily rainfall records and utilised multiple machine learning models such as Artificial Neural Networks (ANN), Support Vector Machines (SVM), Convolutional Neural Networks (CNN), and Long Short-Term Memory networks (LSTM) to learn which predictive algorithms ultimately outperform others. The superiority of the LSTM network for predicting flood events in comparison to other models reveals the ability of LSTM networks, detecting patterns over time and sequence data. These high-resolution weather data integrate with remote sensing technology, underpinning not only the levels of precision in rainfall forecasts but also those needed for flood dynamics. The approach promotes both prevention and response strategies of early warning and disaster preparedness to reduce the vulnerability of groups at different stages during natural disasters, particularly flooding in river basin basins as a case study. This paper highlights the enabling role of machine learning in improving flood prediction and hazard assessment by working alongside conventional constitutive weather forecasting.

**Keywords:** *machine learning, flood prediction, rainfall data, weather forecasting*