

Improving Hazard Assessment Through the Integration of Weather Forecasting and Machine Learning Algorithms: A Review

HT Sewwandini[#], LP Kalansooriya¹, and DU Vidanagama¹

¹Faculty of Computing, General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka

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

Abstract

In order to improve the accuracy of hazard assessment, this research study explores the application of machine learning algorithms to weather forecasting, focusing on rainfall data in particular. The increasing unpredictability of natural hazards, such as floods, landslides, and urban inundation, which are primarily caused by climate change, is causing our world to struggle. This highlights the critical need for rigorous hazard assessments and early warning systems in order to effectively prepare for and respond to disasters. A thorough review of the literature is done with an emphasis on how machine learning techniques can be applied to improve hazard assessment, specifically focusing on precipitation forecasting. A thorough conceptual framework, a list of hypotheses, and an explanation of the methodology which includes regression models, deep learning models, hybrid models, feature engineering, comparative analyses, data assimilation, and ensemble methods—are all presented in this paper. To validate the potential of this integrated approach, the study makes use of an extensive 10-year dataset of daily rainfall records. The investigation goes deeper into an autocorrelation function analysis, providing information about how accurate and fast this methodology can assess hazards. The study highlights the significant implications of this synergy between machine learning and weather forecasting, not only in supporting the field of hazard assessment but also in reducing the extensive effects of natural disasters caused by rainfall. This study highlights the exciting opportunities that exist at the nexus of machine learning and weather forecasting, imagining a time when hazard assessment adopts a more comprehensive and knowledgeable approach.

Keywords: *Hazard assessment, Machine learning, Weather forecasting, Rainfall data*