ABSTRACT

Forest and land fires in Indonesia are one of the issues with widespread impacts on various aspects such as health, environment, economy, and society. The smoke produced from forest fires can cause respiratory diseases, disrupt ecosystems, and lead to the loss of biodiversity. Forest and land fires can also cause economic losses such as increased firefighting costs and damage to agricultural land. Therefore, prevention solutions are needed to minimize the risks of forest and land fires in Indonesia. The proposed solution is to predict forest fires by utilizing machine learning, Fire Weather Index (FWI), and Geographical Information System (GIS). The algorithm used in predicting forest fires is the Extreme Learning Machine (ELM) based on existing parameters such as temperature, humidity, windspeed, and rainfall. FWI is a numerical score used to assess the potential for forest fires based on weather conditions. This system is designed as a web-based platform using the Laravel framework for the front-end and back-end, and Flask for the machine learning model. System testing was conducted using black box and usability testing methods, showing a user satisfaction rate of 83.875%. The prediction testing results using the ELM model in four regions showed fairly good accuracy. The average MAE value for the temperature parameter is 0.90, MSE is 1.34, MAPE is 2.86%, and R-Squared is 0.38. The humidity parameter achieved an average MAE value of 3.35, MSE of 21.41, MAPE of 4.62%, and R-Squared of 0.46. The rainfall parameter showed the best performance with an average MAE value of 0.27, MSE of 0.23, MAPE of 20.59%, and R-Squared of 0.99. The wind speed parameter performed poorly with an average MAE value of 1.17, MSE of 2.37, MAPE of 26.42%, and R-Squared of -0.06.

Keywords: Extreme Learning Machine, Fire Weather Index, Geographical Information System, Machine Learning.