Fuzzy-Machine Learning Models for the Prediction of Fire Outbreak: A Comparative Analysis

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Abstract : This paper compares fuzzy-machine learning algorithms such as Support Vector Machine (SVM), and K-Nearest Neighbor (KNN) for the predicting cases of fire outbreak. The paper uses the fire outbreak dataset with three features (Temperature, Smoke, and Flame). The data is pre-processed using Interval Type-2 Fuzzy Logic (IT2FL) algorithm. Min-Max Normalization and Principal Component Analysis (PCA) are used to predict feature labels in the dataset, normalize the dataset, and select relevant features respectively. The output of the pre-processing is a dataset with two principal components (PC1 and PC2). The pre-processed dataset is then used in the training of the aforementioned machine learning models. K-fold (with K=10) cross-validation method is used to evaluate the performance of the models using the matrices – ROC (Receiver Operating Curve), Specificity, and Sensitivity. The model is also tested with 20% of the dataset. The validation result shows KNN is the better model for fire outbreak detection with an ROC value of 0.99878, followed by SVM with an ROC value of 0.99753.

Keywords : Machine Learning Algorithms , Interval Type-2 Fuzzy Logic, Fire Outbreak, Support Vector Machine, K-Nearest Neighbour, Principal Component Analysis

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