A Comparative Analysis of Machine Learning Models for Wildfire Prediction

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Amid the increasing threat of wildfires driven by extreme weather events, the imperative development of rapid and efficient fire prediction models becomes evident for successful evacuation, suppression efforts, and air quality forecasts. This paper thoroughly analyzes ten popular machine learning models to evaluate their effectiveness in distinguishing meteorological and topographical data as conducive or non-conducive to fire occurrence. To overcome the limitation of a restricted dataset, a Conditional Tabular Generative Adversarial Network (CTGAN) is employed to enhance the dataset by generating synthetic samples. Detailed assessments are conducted on the original and augmented datasets. Across varying data quantities and distributions, CatBoost and AutoGluon consistently demonstrated exceptional performance, establishing themselves as robust models for wildfire prediction. The noteworthy predictive accuracy displayed by these two models underscores their suitability for real-world fire forecasting applications, particularly in the high-risk regions of California and Canada.

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