**Early Detection of Forest Fire Based on Lightning Activity and Climatic Factors Using Deep Learning**

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***ABSTRACT***

Forest fires significantly threaten ecosystems, contributing to climate change and greenhouse gas emissions. Effective prediction and detection of forest fires can greatly mitigate their damage. Lightning and climate conditions are the primary factors in initiating fires. The first step in predicting forest fires involves collecting historical data on climate, lightning, and fire-prone regions. Remote sensing technology is used to gather satellite images at regular intervals. An automatic statistical learning technique is employed to develop HyperFusionNet, a deep learning classifier that predicts future lightning events based on lightning data. A regression model called ClimatePredictor is designed for climate data, incorporating factors such as temperature, humidity, and wind speed. Combining these models enables more accurate predictions of forest fires. Satellite images, collected at regular intervals, are analyzed using SymbioticNet, an image processing technique to detect early signs of forest fires, such as smoke. Integrating HyperFusionNet for lightning prediction, ClimatePredictor for climate data, and SymbioticNet for smoke detection enhances early warning systems and control measures. This integrated method leverages historical data and advanced remote sensing to effectively predict and mitigate forest fires, reducing their environmental impact.

**Keywords:** Forest fires, Lightning-ignited fire, Fire Detection, Deep Learning, SymbioticNet.