

Wildfire Detection Using Machine Learning

Vaishnavi Hedao, Priyanka Gupta, Omkar Tajane, Chinmay Navale

Department of Computer

Savitribai Phule Pune University, Pune, Maharashtra, India

vhedao1012@gmail.com, priyag8600@gmail.com omkartajane511@gmail.com chinmaynavle26@gmail.com

Abstract: Due to climate change globally Forest fire disasters are recently getting lots of attention. Because climate changes are rapidly changing the fire patterns on Earth. Prediction of fire activities in the forest guides the authorities to make optimal, efficient, and sound decisions in fire management. This paper aims to summarize recent trends in the forest fire events prediction, detection, spread rate, and mapping of the burned areas. Furthermore, fire emissions in terms of smoke also put the Earth's public health and ecological system at greater risk. Hence, future policy making can be more accurate in saving billions of dollars, improving the healthy environment and ecological cycle for the inhabitants of this Earth. This paper provides a comprehensive review of the usage of different machine learning algorithms in forest fire or wildfire management.

Keywords: Machine Learning, Wildfire, Forest Fires, Fire Susceptibility, Forecasting

REFERENCES

- [1]. Chuvieco, E.; Aguado, I.; Dimitrakopoulos, A.P. Conversion of fuel moisture content values to ignition potential for integrated fire danger assessment. *Can. J. For. Res.* 2004, 34, 2284–2293.
- [2]. Hong, H.; Jaafari, A.; Zenner, E.K. Predicting spatial patterns of wildfire susceptibility in the Huichang County, China: An integrated model to analysis of landscape indicators. *Ecol. Indic.* 2019, 101, 878– 891.
- [3]. Chang, Z.; Du, Z.; Zhang, F.; Huang, F.; Chen, J.; Li, W.; Guo, Z. Landslide Susceptibility Prediction Based on Remote Sensing Images and GIS: Comparisons of Supervised and Unsupervised Machine Learning Models. *Remote Sens.* 2020, 12, 502.
- [4]. Gholamnia, K.; Gudiyangada Nachappa, T.; Ghorbanzadeh, O.; Blaschke, T. Comparisons of Diverse Machine Learning Approaches for Wildfire Susceptibility Mapping. *Symmetry* 2020, 12, 604.
- [5]. Hodgdon, B.; Tyrrell, M. Literature review: An annotated bibliography on family forest owners. In GISF Research Paper, 2; Yale University: New Haven, CT, USA, 2003. *Geographies* 2022, 247.
- [6]. Doshi, J.; Garcia, D.; Massey, C.; Lluca, P.; Borensztein, N.; Baird, M.; Cook, M.; and Raj, D. 2019. FileNet: Real-time Segmentation of Fire Perimeter from Aerial Video.
- [7]. Nelson, R. (2020) Untamedscience.com. April 2019. [Online]. Available: <https://untamedscience.com/blog/the-environmentalimpact-of-forest-fires/>. Accessed 30 December 2020.
- [8]. Vikram, R., Sinha, D., De, D. & Das, A. K. EEFFL: Energy-efficient data forwarding for forest fire detection using localization technique in wireless sensor network (Springer, 2020).
- [9]. Zhu, H., Gao, D., Zhang, S. A perceptron algorithm for forest fire prediction based on wireless sensor networks. *Tech Science Press*, ppt. 25–31, (2019).
- [10]. McKenzie, D.; Peterson, D.L.; Agee, J.K. Fire Frequency in the Interior Columbia River Basin: Building Regional Models from Fire History Data. *Ecol. Appl.* 2000, 10, 1497–1516.
- [11]. Lozano, F.J.; Suárez-Seoane, S.; Kelly, M.; Luis, E. A Multi- Scale Approach for Modeling Fire Occurrence Probability Using Satellite Data and Classification Trees: A Case Study in a Mountainous Mediterranean Region. *Remote. Sens. Environ.* 2008, 112, 708–719.
- [12]. Rodrigues, M.; de la Riva, J. An insight into machine-learning algorithms to model human-caused wildfire occurrence. *Environ. Model. Softw.* 2014, 57, 192–201.
- [13]. Song, C.; Kwan, M.-P.; Song, W.; Zhu, J. A Comparison between Spatial Econometric Models and Random

- Forest for Modeling Fire Occurrence. Sustainability 2017, 9, 819.
- [14]. Ouedraogo, I.; Defourny, P.; Vanclooster, M. Application of random forest regression and comparison of its performance to multiple linear regression in modelling groundwater nitrate concentration at the African continent scale. Appl. Hydrogeol. 2018, 27, 1081–1098.
 - [15]. Chowdhury, E.H.; Hassan, Q.K. Use of Remote Sensing-Derived Variables in Developing a Forest Fire Danger Forecasting System. Nat. Hazards 2013, 67, 321–334.
 - [16]. Aldersley, A.; Murray, S.J.; Cornell, S. Global and regional analysis of climate and human drivers of wildfire. Sci. Total Environ. 2011, 409, 3472–3481.
 - [17]. Parisien, M.-A.; Snetsinger, S.; Greenberg, J.; Nelson, C.R.; Schoennagel, T.; Dobrowski, S.; Moritz, M.A. Spatial variability Fire 2012, 21, 313–327.