Application of feature construction techniques in forest fire duration prediction data

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Abstract

From early times, humanity has expressed a profound need to predict the future. In Ancient Greece, oracles held a place of high respect and influence. In modern times, the quest for accurate forecasting has shifted to the realms of research and science, empowered by advanced computational tools, provided by Artificial Intelligence, particularly Machine Learning. One of the fields where Machine Learning has established fertile ground is in the domain of forest fire management. Forest fires pose a major threat to both human and animal life, with significant economic and social impacts. A reliable prediction system is crucial for mitigating these effects, especially during summer months, dry seasons, and in high-risk areas, such as the Mediterranean. This study, explores feature construction, and selection methods, applied to forest fire data, collected over 10 years in Greece, incorporating prevailing weather conditions at ignition, and during suppression. By applying techniques like Principal Component Analysis (PCA), Minimum Redundancy Maximum Relevance (MRMR) feature selection, and Grammatical Evolution for feature construction, this research aims to identify key factors influencing fire duration. These techniques have become invaluable allies in addressing complex predictive challenges, and advancing our understanding of future events. Our approach, leverages advanced computational methods, to analyze complex datasets, providing a deeper understanding of the primary drivers of wildfire behavior, and enabling more effective mitigation strategies.

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