1. Introduction

1.1 Motivation for Selecting Greece

Greece has faced a significant increase in the frequency and intensity of wildfires in recent years, exacerbated by extreme weather conditions. Understanding the relationship between weather patterns and wildfire occurrences is crucial for developing effective mitigation strategies and improving resilience against such natural disasters.

1.2 Research Questions

To investigate the impact of weather conditions on wildfires in Greece, this project focuses on the following key questions:

1. What are the patterns in weather conditions in Greece, and how do they correlate with wildfire occurrences?
2. How do specific weather variables, such as temperature and wind speed, influence the frequency and severity of wildfires?

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2. Datasets

Two datasets were identified to fulfill the research objectives: one containing daily weather data and the other capturing wildfire occurrences. Both datasets were processed and filtered to ensure relevance and accuracy for the analysis.

2.1 Daily Weather Data

The dataset provides comprehensive weather data for Greece, including temperature, wind speed, and other relevant variables. It was filtered to include data from week 41 of 2018 to week 41 of 2022.

- Data Source: Daily Weather Data (https://www.kaggle.com/datasets/balabaskar/historical-weather-data-of-all-country-capitals?select=daily_weather_data.csv)
- Data Type: CSV
- License: CC BY-SA 3.0

2.2 Wildfire Occurrences

This dataset contains records of wildfire occurrences, including the number of fire alerts per week. It was filtered to match the same time frame as the weather data.

- Data Source: Global Forest Watch (https://www.globalforestwatch.org/dashboards/country/GRC/?category=fires&location=WyJjb3VudHJ5IiwiR1JDIl0%3D)
- Data Type: CSV

- License: Not specified

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3. Methodology

A structured approach was followed to process the datasets and integrate them for analysis.

3.1 Data Processing Steps

The methodology involved the following steps to ensure clean, consistent, and analyzable data:

1. **Data Extraction**: Download datasets from the identified sources.
2. **Data Cleaning and Transformation**:
    - Filter the weather data and wildfire data to include only the relevant records.
    - Aggregate the weather data by week to match the granularity of the wildfire data.
    - Ensure the datasets covered the same time period (week 41 of 2018 to week 41 of 2022).
3. **Data Integration and Storage**: Save the cleaned and aggregated datasets for further analysis.

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4. Results and Analysis

4.1 Weather Data Processing

The weather dataset was filtered to include data from week 41 of 2018 to week 41 of 2022. The data was aggregated to provide weekly averages for temperature, wind speed, and other relevant variables.

4.2 Wildfire Data Processing

The wildfire dataset was similarly filtered and aggregated to provide weekly counts of fire alerts.

4.3 Merging the Datasets

The processed weather and wildfire datasets were merged based on the year and week columns to facilitate correlation analysis.

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5. Results and Limitations

5.1 Correlation Analysis

Merging the datasets allowed for correlation analysis to identify the relationships between weather variables and wildfire occurrences. The analysis revealed a strong correlation between high temperatures and increased wildfire alerts, highlighting temperature as a significant factor in wildfire occurrences.

5.2 Limitations

- **Data Gaps**: Some weeks had missing data, potentially affecting the analysis.
- **Temporal Resolution**: Weekly aggregation might not capture daily variations in weather and wildfire patterns.
- **Geographical Scope**: The analysis is specific to Greece and may not be applicable to other regions.
- **Dataset Disparity**: The weather data pertains to the capital city of Greece, while the wildfire data covers the entire country. This discrepancy can limit the comparability of the datasets.
- **Sample Size**: The number of observations (N) is relatively low, especially after filtering and merging the datasets, which could impact the robustness of the findings.

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6. Conclusion

This project highlights the importance of understanding weather patterns in relation to wildfire occurrences. The findings suggest that extreme weather conditions, particularly high temperatures, significantly impact wildfire frequency and severity. Further research could expand the geographical scope and improve temporal resolution for more detailed insights.

References

1. Daily Weather Data: Kaggle Dataset (https://www.kaggle.com/datasets/balabaskar/historical-weather-data-of-all-country-capitals?select=daily_weather_data.csv)
2. Global Forest Watch: VIIRS Fire Alerts (https://www.globalforestwatch.org/dashboards/country/GRC/?category=fires&location=WyJjb3VudHJ5IiwiR1JDIl0%3D)