

Wildfire Impact Prediction

electricity usage, weather and structural damage

Team Members: Maureen Zhang, Faycal Chaouqui, Marco Lopez, Malik Tuerkoen, Junhui Shi.

Motivation: Impact of Wildfires on Human Civilization

Human and Economic Toll:

- Loss of life, property, and livelihoods.
- Displacement of millions and economic losses in affected areas.

Environmental and Health Effects:

- Damage to ecosystems and air quality issues.
- Long-term health costs from respiratory and mental health impacts.

Strain on Infrastructure:

- Destruction of power grids, roads, and communication systems.
- High reconstruction costs for affected regions.



Electricity Use Predicts Wildfire Occurrence/Strength

Overview of Problem:

- Investigating how electricity usage patterns correlate with wildfire occurrences and their intensity.
- Conversely, can also investigate how weather impact seasonal usage of electricity

Data Sources:

- **Electricity Use Data (CA):** Analyze energy consumption trends, usage spikes, and consumption behavior.
- **Wildfire Data (Kaggle, WildfireDB):** Review historical wildfire reports, including occurrence, strength, and seasonal patterns.

Key Analysis Focus:

- Compare electricity consumption trends with wildfire events.
- Identify potential correlations or patterns that could indicate wildfire risk based on electricity use (e.g., sudden surges in demand, unusual energy usage patterns).



Wildfire Damage & Recovery Estimation

Metrics for Damage Estimation:

- **Fire Damage Metrics:**
 - Total number of structures affected.
 - Total area of human habitats (cities, towns) impacted by wildfire.
- **Recovery Expenditure:**
 - Estimate reconstruction and recovery costs (e.g., homes, infrastructure, roads).
 - Use damage reports from US and LA wildfire incidents.

Data Sources for Recovery Cost Estimation:

- Damage reports, city zoning data, OpenStreetMaps (for affected areas), housing dataset.
- Focus on costing components like rebuilding houses, roads, and utilities.



Optimization Model for Minimizing Reconstruction Costs

Optimization Goal:

- Leverage predictive modeling to build an automaton which minimizes costs to damage based on electricity consumption patterns.

Key Model Metrics:

- **Reconstruction cost reduction** based on reduced electricity use during high-risk wildfire seasons.
- **Predictive Planning System:**
 - Recommend electricity use reduction strategies to minimize future wildfire-related damages.
 - Link reduced electricity usage to lower wildfire intensity and damage severity.

Outcome:

- Create a predictive/planning system that can help mitigate the financial impact of wildfires through better electricity usage management.



Summary

- Wildfires cause significant human, environmental, and economic damage.
- Analyzing electricity usage can help predict wildfire risks.
- Optimizing electricity use can reduce wildfire damage and recovery costs.