Data 512 Part 1 - Common Analysis

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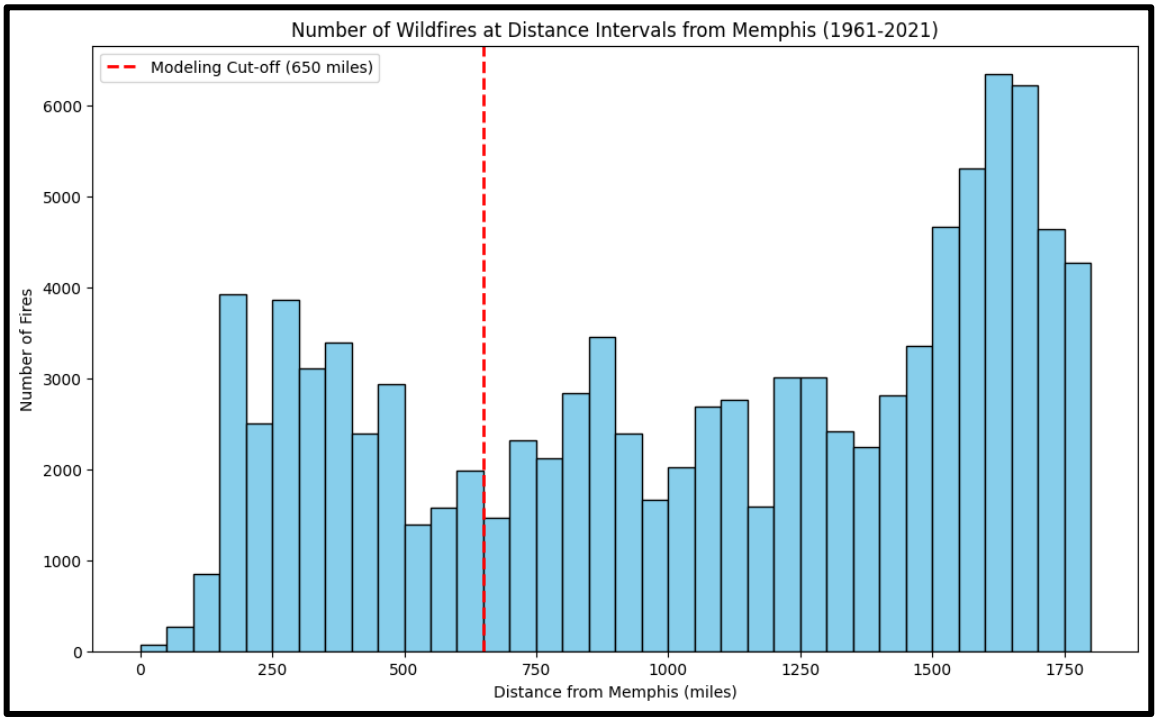
Histogram of Wildfires by Distance from Memphis



Overview: This histogram shows the frequency of wildfires by their distance from Memphis, divided into 50-mile intervals, with a particular focus on the 650-mile radius marked by the red line.

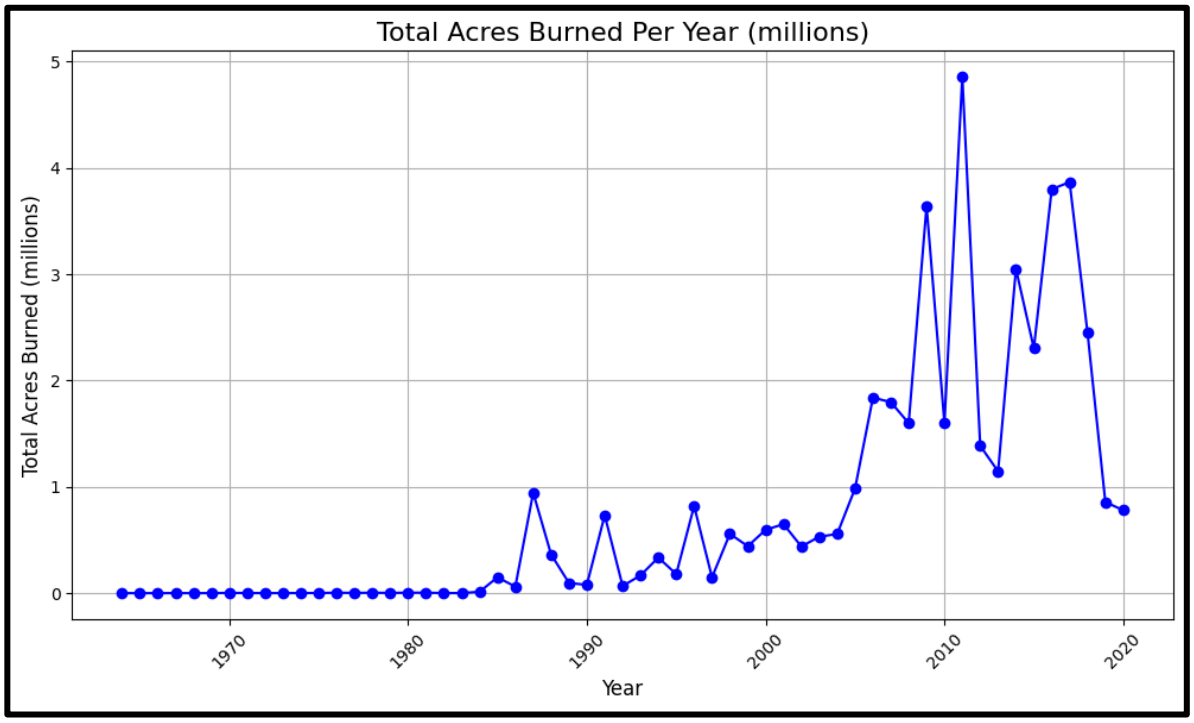
Reading the Figure:

- X-axis: Displays distance from Memphis in miles, segmented into 50-mile bins.
- Y-axis: Shows the number of wildfires within each bin, revealing distance-based wildfire frequency.
- Red Line: Marks the 650-mile cut-off used in modeling.

Data and Processing: The data includes wildfires from 1961 to 2021 from the Combined wildland fire datasets for the United States (combined wildland fire polygons) dataset, filtered to within 1800 miles of Memphis. The point used to represent Memphis was 35.11, -89.97

Pattern Observation: The distribution of wildfire occurrences within 650 miles of Memphis shows distance-based variation, with notable peaks around the 200-mile and 450-mile marks. After 450 miles, there's a general decline in frequency until about 550 miles, followed by a slight increase approaching the 650-mile boundary. Thus, the 650-mile cut-off is appropriate for modeling, capturing a broad range of potentially impactful fires.

Time Series of Total Acres Burned Per Year



Overview: This time series captures the annual total acreage burned within the 650-mile radius of Memphis.

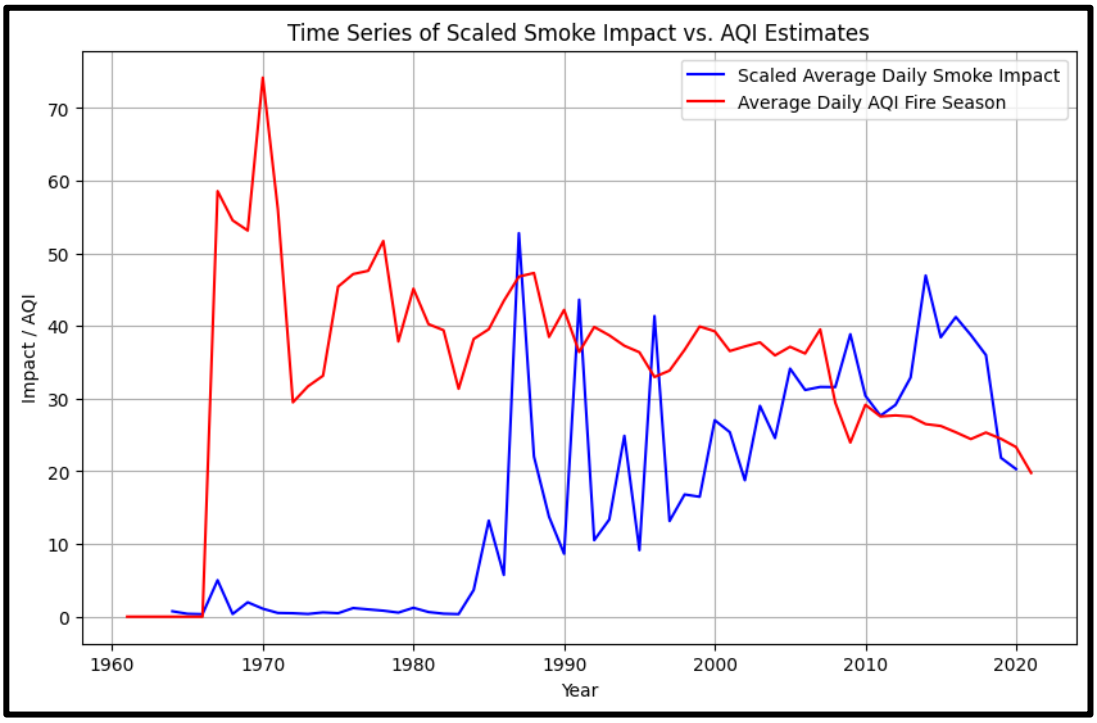
Reading the Figure:

- X-axis: Represents years from 1961 to 2021.
- Y-axis: Indicates total acres burned (in millions) each year.

Data and Processing: The data includes wildfires from 1961 to 2021 from the Combined wildland fire datasets for the United States (combined wildland fire polygons) dataset, filtered to within 650 miles of Memphis. The point used to represent Memphis was 35.11, -89.97. It's important to note that the dataset states that wildfire data was not accurate before 1984.

Pattern Observations: The graph supports the claim in the dataset that wildfire data was not reliable before 1984. Between the mid 80's and late 90's, the acreage burned was relatively low, with a sharp increase between 2000 and 2010. This pattern might reflect increased fire intensity due to climate change, land management shifts, or prolonged dry seasons. Post-2010, the acreage burned varies significantly year-to-year, with some years seeing sharp declines followed by spikes. This variability may be related to recent changes in fire management practices, climate variability, or both.

Comparison of Scaled Smoke Impact Estimates and AQI



Overview: This time series comparison shows the relationship between scaled smoke impact estimates from wildfires and recorded AQI for Memphis during peak wildfire seasons.

Reading the Figure:

- X-axis: Represents years from 1961 to 2021.
- Y-axis: Shows relative levels of smoke impact and AQI.
- Blue Line: Depicts scaled average daily smoke impact.
- Red Line: Represents annual AQI estimates for Memphis during the fire season.

Data and Processing:

This analysis uses wildfire data from 1961 to 2021, sourced from the Combined Wildland Fire Datasets for the United States (wildland fire polygons), filtered to include only fires within a 650-mile radius of Memphis, centered at coordinates 35.11, -89.97. Notably, data accuracy is limited before 1984. Daily AQI values, obtained through the Environmental Protection Agency's Air Quality System API, were averaged over peak fire season (May 1 – Oct 31) each year.

The scaled smoke impact score was calculated in several steps. Each fire's smoke impact was initially estimated based on its size (acres burned) and proximity to Memphis, with larger, closer fires contributing more. This impact score was then distributed over an estimated duration proportional to the fire's size. Finally, annual daily smoke impacts were summed and scaled to align visually with AQI values, facilitating comparison.

Pattern Observations: Starting in 1984, the scaled smoke impact (blue line) shows sharp, irregular spikes through the late 1980s and 1990s, with a general upward trend from 2000 to 2010 and a steady decline beginning around 2016. In contrast, the AQI values (red line), which are averaged over peak fire season (May 1 to Oct 31), display a more consistent downward trend from the mid-1980s onward, with fewer dramatic fluctuations. The lack of correlation between the two lines suggests that factors other than wildfire smoke, possibly local air quality regulations or non-wildfire pollution sources, may have influenced the AQI values, especially as smoke impact increased. This discrepancy emphasizes that while wildfire activity affects smoke impact, it doesn't appear to drive seasonal AQI trends directly in this dataset.

Collaboration

While collaborative activities are valuable, I approached this assignment independently, aiming to strengthen my problem-solving skills by navigating challenges independently. With my experience in the workplace, I am well-versed in collaborative practices, particularly in brainstorming sessions to troubleshoot technical issues, such as tuning hyperparameters or selecting models. In a professional setting, I've learned when to seek input from others and when to pursue independent analysis. This assignment allowed me to focus on self-reliance, an approach that I believe is beneficial in an academic context.