**Project Part 1: Common Analysis**

Figure 1: Number of fires vs Distance in Gillette, Wyoming

A graph of a number of fires

Description automatically generated

The figure above represents a histogram that displays the number of fires occurring at different distances from Gillette, Wyoming up to a maximum specified distance of 1250 miles. The X-axis represents the distance in miles from Gillette, Wyoming. Each bin on the X-axis represents a range of distances, with labels at the bin edges (e.g., 0-50, 50-100, 100-150 miles, and so on). The Y-axis represents the number of fires that occurred within each distance range. It shows the count of fires falling within each bin.

The underlying data used for this visualization is a dataset of fire occurrences. The data is filtered to include only fires that fall within a specified maximum distance from the city (in this case, 1250 miles). The data is then grouped into bins based on the distance from the city. Each bin represents a 50-mile range.

The histogram offers insight into the relationship between the distance from Gillette, Wyoming and the number of fires that have occurred over the years. It is evident that the most significant concentration of fires, numbering approximately 14,000 incidents, has transpired in regions situated around 850 to 900 miles away from Gillette, Wyoming. In contrast, areas within a 100-mile radius of the city have experienced fewer than 2,000 fires. It's worth noting that Gillette, Wyoming, is a relatively small city with a population of less than 34,000 residents. This observation suggests that the city's relatively remote location from fire-prone regions is a potential factor contributing to the lower frequency of fires in closer proximity to the city.

Figure 2: Total Acres Burned per Year within 1250 miles of Gillette Wyoming

A graph with purple lines and numbers

Description automatically generated

The figure above presents a time series plot that visualizes the total acres burned each year within 1250 miles from Gillette, Wyoming.

The viewer interprets the figure by examining the trends in total acres burned over the years. The x-axis represents the years from 1963 to 2020, displaying each year at five-year intervals, which provides a clear view of the long-term trends. The y-axis shows the total acres burned, illustrating the scale of wildfires' impact on the area.

The underlying data has been processed by filtering the dataset to include only fire incidents within the specified distance from the city. Then, the data is grouped by 'Fire\_Year,' and the total acres burned in each year are calculated. This processed data is used to create the time series plot.

The time series plot reveals a pattern of wildfire activity that is not continuous but rather characterized by fluctuations from year to year. While the total acres burned display a general upward trend over the analyzed years, the data exhibits distinct periods of increase and decrease in wildfire impact.

The time series plot reveals distinct patterns in wildfire activity over the years. During some years, such as 2011 and 2017, there are noticeable spikes in the total acres burned, signifying periods of elevated wildfire activity. Conversely, there are years, like 2010 and 2019, when the total acres burned decrease, indicating a reduction in wildfire impact.

This variability strongly suggests that Gillette, Wyoming, is not consistently prone to being 1250 miles away from large fires. Instead, the region experiences intermittent periods of heightened wildfire risk, with some years witnessing more significant wildfire events while others enjoy relative respite. This fluctuating pattern underscores the dynamic nature of the wildfire threat in the area.

Visualization 3: Fire Smoke Estimate and AQI Over Time

A graph of a graph showing the number of smokes

Description automatically generated with medium confidence

The figure above displays a time series graph representing the Fire Smoke Estimate and Air Quality Index (AQI) for a given city over several years. This visualization enables viewers to understand how these two variables have evolved over time and whether there is any potential relationship between them.

The X-axis represents time, with each year labeled from left to right. This allows viewers to track changes and trends in Fire Smoke Estimate and AQI Estimate across different years. The Y-axis represents the value of the two variables being measured. The scale of the Y-axis corresponds to the values of the Fire Smoke Estimate and AQI Estimate which is from 0 – 500.

The line and markers for Fire Smoke Estimate show how the estimated impact of smoke from fires in the city has varied over the years. An upward trend indicates an increase in the smoke's impact, while a downward trend suggests a decrease. The line and markers for AQI Estimate reveal how the Air Quality Index, a measure of air quality, has changed over time. Higher AQI values indicate worse air quality, while lower values signify better air quality.

The underlying data comprises records for various years, with associated values for Fire Smoke Estimate and AQI Estimate. Fire Smoke Estimate is calculated based on some factors, including distance, the area burned, and the number of fires. AQI Estimate represents air quality data, and its values reflect air pollution levels, which are usually measured using a standardized index.

viewers analyze the trends in Fire Smoke Estimate and AQI Estimate over time. Generally, there is a correlation of 0.45.

Reflection Statement

Working on this assignment was a valuable experience that resulted in a deeper understanding of air quality monitoring and factors affecting air quality. Moreover, through collaboration on the assignment underscored the significance of engaging in discussions when addressing complex data-related questions.

Throughout this assignment, I gained insights into how air quality data is monitored and calculated. The process involved working with historical data to estimate the impact of smoke on air quality in a city. This experience emphasized the importance of air quality monitoring for assessing public health and environmental impacts.

The assignment also encouraged a critical examination of the various factors that influence air quality. It highlighted the significance of considering variables like distance from fires, areas burned, and the number of fires in estimating the impact of smoke on air quality. This recognition of complexity and multiple contributing factors underlined the intricacies involved in air quality assessments.

Collaboration played a crucial role in this assignment by enabling discussions and the sharing of diverse ideas on how to derive smoke estimates. These exchanges provided opportunities to explore different perspectives and approaches, ultimately leading to more robust and well-informed analyses.

Additionally, the collaboration allowed for comparative analyses. By examining how fire impacts differed for other cities, I gained a broader perspective on the geographical and environmental factors influencing air quality. This insight expanded my understanding of the unique challenges that different locations face concerning air quality and fire impacts.

While collaboration offered numerous advantages, it also presented challenges. Differing viewpoints and approaches sometimes added complexity to decision-making and analysis. However, these challenges were valuable as they encouraged critical thinking and the consideration of alternative methods.

This assignment underscored the importance of continuous learning in fields related to environmental assessments and air quality. Staying updated and adaptable is essential to accurately address complex questions, such as the impact of smoke on air quality over time. As datasets and research methodologies evolve, a commitment to ongoing learning is paramount.

In conclusion, the collaborative experience of addressing the research question and analyzing the estimated smoke impacts on a city over the past 60 years deepened my understanding of air quality monitoring, the complexities of factors influencing air quality, and the advantages of collaboration in tackling intricate environmental challenges. It reinforced the importance of adaptability, open-mindedness, and the power of diverse perspectives in research and problem-solving.