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Methodology of Data Science
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In this research project, the aim was to compare the amount of rainfall in Seattle and St. Louis, two major cities in the United States, with different climates and geographic locations. Our research questions are: In each city, how many days had no rainfall during the time period studied? What was the highest amount of precipitation recorded in each city for a given month? How does the average monthly precipitation for each city compare to the other city?

Using historical rainfall data from NOAA, we aim to gain insights into rainfall patterns and trends in Seattle and St. Louis through the use of graphs. The data was analyzed and visualized in Python using pandas and matplotlib libraries. After loading and exploring the data sets, date strings were converted to datetime format, and relevant subsets of data were selected by renaming columns and grouping data by year. Missing values were dealt with appropriately. The resulting tidy data frame was used to create graphs comparing the rainfall in the two cities over time, providing a visual representation of their differences and allowing for insights and conclusions to be drawn.

Firstly, we generated a graph to visualize the number of rainless days in each city during the study period.
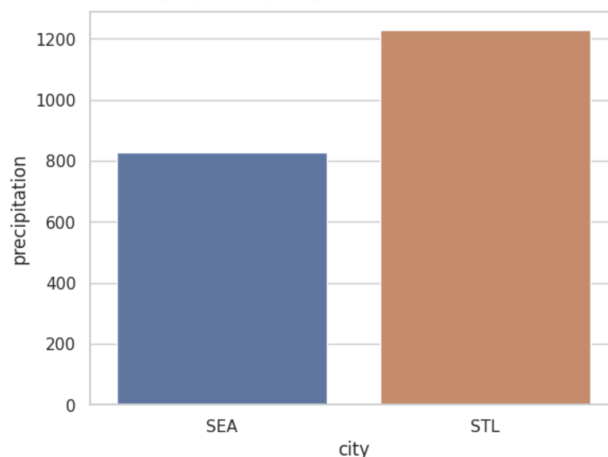
Looking at the first graph we created, our analysis reveals that, although St. Louis has a higher overall average rainfall, it recorded more days without precipitation than Seattle. This finding suggests that the rainfall patterns in St. Louis may be more variable and unpredictable than Seattle's. St. Louis may have experienced periods of heavy rainfall interspersed with longer dry spells, while Seattle may have had more regular and uniform precipitation throughout the year. Furthermore, the higher average precipitation in St. Louis may have been influenced by a few heavy rainfall events, whereas Seattle's average is likely more indicative of consistent precipitation throughout the year.

Secondly, we generated a graph to compare the maximum amount of precipitation recorded in each city for each month during the study period.
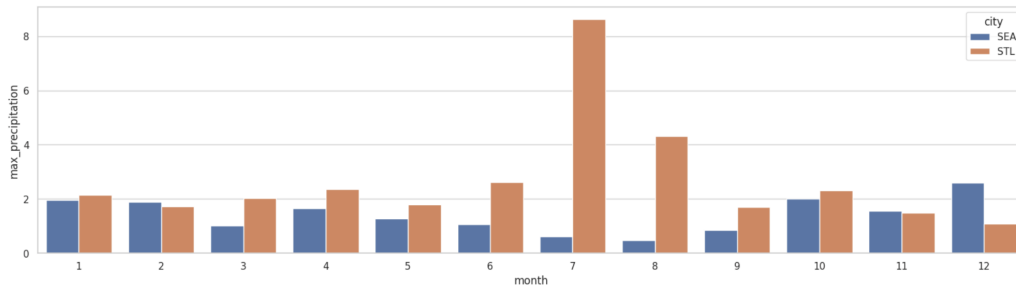
Looking at our second graph, comparing the maximum amount of precipitation recorded in each city for each month during the study period shows that St. Louis had a higher average rainfall intensity on rainy days than Seattle. This suggests that St. Louis may experience more heavy rainfall events than Seattle, leading to a higher average maximum precipitation.

Lastly, we generated a graph to compare the average monthly precipitation between Seattle and St. Louis during the study period.
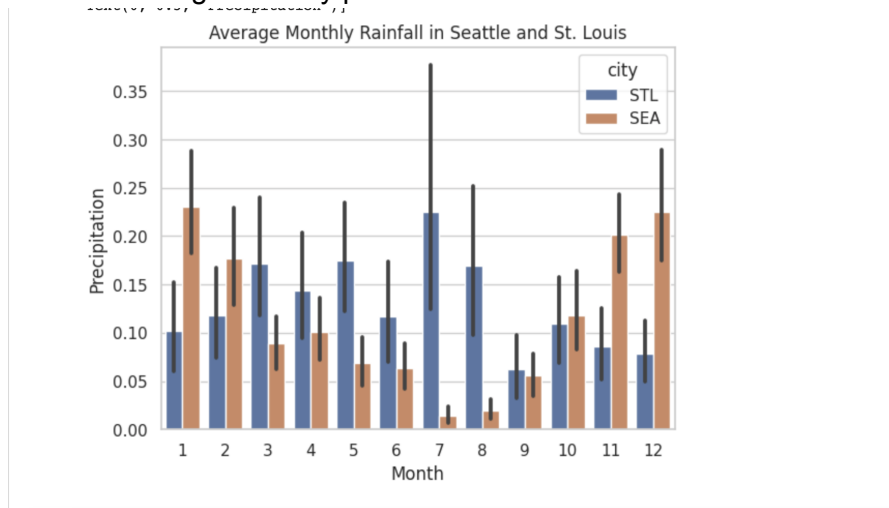
Looking at our third graph, while St. Louis had a higher average rainfall intensity than Seattle, it is important to note that the two cities display unique seasonal precipitation patterns. Seattle typically experiences greater rainfall averages during the winter months, with the highest amounts from November to February. Conversely, St. Louis exhibits higher rainfall averages in the spring and summer months, specifically from March to August.

In conclusion, our analysis of the rainfall data for Seattle and St. Louis using Python and graphing techniques has provided valuable insights into the rainfall patterns and trends in these two cities. Although St. Louis has a higher overall average rainfall than Seattle, it experienced more days without precipitation, indicating more variable and unpredictable weather. St. Louis also had a higher average rainfall intensity on rainy days, potentially due to more heavy rainfall events. Meanwhile, Seattle experienced greater rainfall averages during the winter months, while St. Louis exhibited higher rainfall averages during the spring and summer months. These differences highlight the unique climate patterns of each city and provide insight into their respective weather systems.