# EXPLORE WEATHER TRENDS

Project 1

MUDDASSAR SOHAIL

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DATA ANALYST

UDACITY

# EXPLORE WEATHER TRENDS

Tab 1

Project 1

## IN THIS REPORT:

# SQL Query to Extract Data

```
/*getting local temp data as a new table t2 */
WITH t2 as(
  /*saving extracted table as t1 to use further*/
WITH t1 as (
  /*checking my country and then my city in existing database*/
select city_list.city,city_list.country
from city_list
where city_list.country='Pakistan' and city_list.city='Lahore')

select t1.city, CD.city, CD.year, CD.avg_temp as local_avg_temp
from city_data as CD, t1
where CD.city=t1.city
)
/*joining global data with local data*/
select t2.year,/* t2.city,*/t2.local_avg_temp, global_data.avg_temp as Global_avg_temp
from global_data
join t2 on global_data.year=t2.year
```

# Data Extraction and Manipulation

| year | (MA) local_avg_temp | (MA) global_avg_temp | local_avg_temp | global_avg_temp |
|---|---|---|---|---|
| 1816 | | | 24.69 | 6.94 |
| 1817 | | | 22.74 | 6.98 |
| 1818 | | | 23.43 | 7.83 |
| 1819 | | | 22.83 | 7.37 |
| 1820 | | | 24.22 | 7.62 |
| 1821 | | | 23.71 | 8.09 |
| 1822 | | | 23.81 | 8.19 |
| 1823 | | | 24.41 | 7.72 |
| 1824 | | | | 8.55 |
| 1825 | 23.73 | 7.768 | | 8.39 |
| 1826 | 23.59285714 | 7.91 | | 8.36 |
| 1827 | 23.735 | 8.093 | | 8.81 |
| 1828 | 23.796 | 8.127 | | 8.17 |
| 1829 | 24.0375 | 8.184 | | 7.94 |
| 1830 | 23.97666667 | 8.274 | | 8.52 |
| 1831 | 24.11 | 8.229 | | 7.64 |
| 1832 | 24.41 | 8.155 | | 7.45 |
| 1833 | 23.73 | 8.184 | 23.73 | 8.01 |
| 1834 | 23.73 | 8.144 | 23.73 | 8.15 |
| 1835 | 23.44 | 8.044 | 22.86 | 7.39 |
| 1836 | 23.265 | 7.978 | 22.74 | 7.7 |
| 1837 | 23.486 | 7.835 | 24.37 | 7.38 |
| 1838 | 24.18833333 | 7.769 | 27.7 | 7.51 |
| 1839 | 24.18833333 | 7.738 | | 7.63 |
| 1840 | 24.09285714 | 7.666 | 23.52 | 7.8 |
| 1841 | 24.085 | 7.671 | 24.03 | 7.69 |
| 1842 | 24.19111111 | 7.728 | 25.04 | 8.02 |
| 1843 | 24.18888889 | 7.744 | 23.71 | 8.17 |
| 1844 | 24.13333333 | 7.694 | 23.23 | 7.65 |
| 1845 | 24.20333333 | 7.74 | 23.49 | 7.85 |
| 1846 | 24.36 | 7.825 | 24.15 | 8.55 |
| 1847 | 24.27666667 | 7.896 | 23.62 | 8.09 |
| 1848 | 23.78444444 | 7.943 | 23.27 | 7.98 |
| 1849 | 23.749 | 7.978 | 23.43 | 7.98 |
| 1850 | 23.756 | 7.988 | 23.59 | 7.9 |
| 1851 | 23.714 | 8.037 | 23.61 | 8.18 |
| 1852 | 23.566 | 8.045 | 23.56 | 8.1 |
| 1853 | 23.561 | 8.032 | 23.66 | 8.04 |
| 1854 | 23.624 | 8.088 | 23.86 | 8.21 |

| | | | | |
|---|---|---|---|---|
| 1855 | 23.71 | 8.114 | 24.35 | 8.11 |
| 1856 | 23.581 | 8.059 | 22.86 | 8 |
| 1857 | 23.539 | 8.026 | 23.2 | 7.76 |
| 1858 | 23.56888889 | 8.038 | | 8.1 |
| 1859 | 23.58625 | 8.065 | | 8.25 |
| 1860 | 23.58571429 | 8.071 | | 7.96 |
| 1861 | 23.58166667 | 8.038 | | 7.85 |
| 1862 | 23.586 | 7.984 | | 7.56 |
| 1863 | 23.5675 | 7.991 | | 8.11 |
| 1864 | 23.47 | 7.968 | | 7.98 |
| 1865 | 23.03 | 7.975 | | 8.18 |
| 1866 | 23.2 | 8.004 | | 8.29 |
| 1867 | | 8.072 | | 8.44 |
| 1868 | | 8.087 | | 8.25 |
| 1869 | | 8.105 | | 8.43 |
| 1870 | 23.88 | 8.129 | 23.88 | 8.2 |
| 1871 | 23.835 | 8.156 | 23.79 | 8.12 |
| 1872 | 23.85333333 | 8.219 | 23.89 | 8.19 |
| 1873 | 23.895 | 8.243 | 24.02 | 8.35 |
| 1874 | 23.776 | 8.288 | 23.3 | 8.43 |
| 1875 | 23.86166667 | 8.256 | 24.29 | 7.86 |
| 1876 | 23.82142857 | 8.235 | 23.58 | 8.08 |
| 1877 | 23.8125 | 8.245 | 23.75 | 8.54 |
| 1878 | 23.79666667 | 8.303 | 23.67 | 8.83 |
| 1879 | 23.817 | 8.277 | 24 | 8.17 |
| 1880 | 23.895 | 8.269 | 24.66 | 8.12 |
| 1881 | 23.947 | 8.284 | 24.31 | 8.27 |
| 1882 | 23.943 | 8.278 | 23.85 | 8.13 |
| 1883 | 23.92 | 8.241 | 23.79 | 7.98 |
| 1884 | 23.947 | 8.175 | 23.57 | 7.77 |
| 1885 | 23.838 | 8.181 | 23.2 | 7.92 |
| 1886 | 23.853 | 8.168 | 23.73 | 7.95 |
| 1887 | 23.861 | 8.105 | 23.83 | 7.91 |
| 1888 | 23.886 | 8.031 | 23.92 | 8.09 |
| 1889 | 23.881 | 8.046 | 23.95 | 8.32 |
| 1890 | 23.788 | 8.031 | 23.73 | 7.97 |
| 1891 | 23.694 | 8.006 | 23.37 | 8.02 |
| 1892 | 23.755 | 8 | 24.46 | 8.07 |
| 1893 | 23.668 | 8.008 | 22.92 | 8.06 |
| 1894 | 23.665 | 8.047 | 23.54 | 8.16 |
| 1895 | 23.768 | 8.07 | 24.23 | 8.15 |
| 1896 | 23.857 | 8.096 | 24.62 | 8.21 |
| 1897 | 23.855 | 8.134 | 23.81 | 8.29 |
| 1898 | 23.9 | 8.143 | 24.37 | 8.18 |

| | | | | |
|---|---|---|---|---|
| 1899 | 23.974 | 8.151 | 24.69 | 8.4 |
| 1900 | 24.025 | 8.204 | 24.24 | 8.5 |
| 1901 | 24.094 | 8.256 | 24.06 | 8.54 |
| 1902 | 24.106 | 8.279 | 24.58 | 8.3 |
| 1903 | 24.18 | 8.295 | 23.66 | 8.22 |
| 1904 | 24.244 | 8.288 | 24.18 | 8.09 |
| 1905 | 24.18 | 8.296 | 23.59 | 8.23 |
| 1906 | 24.12 | 8.313 | 24.02 | 8.38 |
| 1907 | 24.111 | 8.279 | 23.72 | 7.95 |
| 1908 | 24.057 | 8.28 | 23.83 | 8.19 |
| 1909 | 23.939 | 8.258 | 23.51 | 8.18 |
| 1910 | 23.868 | 8.23 | 23.53 | 8.22 |
| 1911 | 23.869 | 8.194 | 24.07 | 8.18 |
| 1912 | 23.821 | 8.181 | 24.1 | 8.17 |
| 1913 | 23.816 | 8.189 | 23.61 | 8.3 |
| 1914 | 23.768 | 8.239 | 23.7 | 8.59 |
| 1915 | 23.891 | 8.275 | 24.82 | 8.59 |
| 1916 | 23.888 | 8.26 | 23.99 | 8.23 |
| 1917 | 23.832 | 8.267 | 23.16 | 8.02 |
| 1918 | 23.849 | 8.261 | 24 | 8.13 |
| 1919 | 23.884 | 8.281 | 23.86 | 8.38 |
| 1920 | 23.909 | 8.295 | 23.78 | 8.36 |
| 1921 | 24.01 | 8.334 | 25.08 | 8.57 |
| 1922 | 24.017 | 8.358 | 24.17 | 8.41 |
| 1923 | 24.028 | 8.37 | 23.72 | 8.42 |
| 1924 | 24.029 | 8.362 | 23.71 | 8.51 |
| 1925 | 23.92 | 8.356 | 23.73 | 8.53 |
| 1926 | 23.867 | 8.406 | 23.46 | 8.73 |
| 1927 | 23.916 | 8.456 | 23.65 | 8.52 |
| 1928 | 23.944 | 8.506 | 24.28 | 8.63 |
| 1929 | 23.959 | 8.492 | 24.01 | 8.24 |
| 1930 | 23.946 | 8.519 | 23.65 | 8.63 |
| 1931 | 23.846 | 8.534 | 24.08 | 8.72 |
| 1932 | 23.876 | 8.564 | 24.47 | 8.71 |
| 1933 | 23.873 | 8.556 | 23.69 | 8.34 |
| 1934 | 23.907 | 8.568 | 24.05 | 8.63 |
| 1935 | 23.904 | 8.567 | 23.7 | 8.52 |
| 1936 | 23.969 | 8.549 | 24.11 | 8.55 |
| 1937 | 23.998 | 8.567 | 23.94 | 8.7 |
| 1938 | 24.01 | 8.59 | 24.4 | 8.86 |
| 1939 | 24.029 | 8.642 | 24.2 | 8.76 |
| 1940 | 24.099 | 8.655 | 24.35 | 8.76 |
| 1941 | 24.212 | 8.66 | 25.21 | 8.77 |
| 1942 | 24.199 | 8.662 | 24.34 | 8.73 |

| | | | | |
|---|---|---|---|---|
| 1943 | 24.267 | 8.704 | 24.37 | 8.76 |
| 1944 | 24.229 | 8.726 | 23.67 | 8.85 |
| 1945 | 24.236 | 8.732 | 23.77 | 8.58 |
| 1946 | 24.33 | 8.745 | 25.05 | 8.68 |
| 1947 | 24.469 | 8.755 | 25.33 | 8.8 |
| 1948 | 24.467 | 8.744 | 24.38 | 8.75 |
| 1949 | 24.476 | 8.727 | 24.29 | 8.59 |
| 1950 | 24.363 | 8.688 | 23.22 | 8.37 |
| 1951 | 24.271 | 8.674 | 24.29 | 8.63 |
| 1952 | 24.298 | 8.665 | 24.61 | 8.64 |
| 1953 | 24.356 | 8.676 | 24.95 | 8.87 |
| 1954 | 24.424 | 8.647 | 24.35 | 8.56 |
| 1955 | 24.458 | 8.652 | 24.11 | 8.63 |
| 1956 | 24.372 | 8.612 | 24.19 | 8.28 |
| 1957 | 24.184 | 8.605 | 23.45 | 8.73 |
| 1958 | 24.215 | 8.607 | 24.69 | 8.77 |
| 1959 | 24.215 | 8.621 | 24.29 | 8.73 |
| 1960 | 24.321 | 8.642 | 24.28 | 8.58 |
| 1961 | 24.271 | 8.659 | 23.79 | 8.8 |
| 1962 | 24.211 | 8.67 | 24.01 | 8.75 |
| 1963 | 24.168 | 8.669 | 24.52 | 8.86 |
| 1964 | 24.111 | 8.654 | 23.78 | 8.41 |
| 1965 | 24.099 | 8.644 | 23.99 | 8.53 |
| 1966 | 24.079 | 8.676 | 23.99 | 8.6 |
| 1967 | 24.125 | 8.673 | 23.91 | 8.7 |
| 1968 | 24.045 | 8.648 | 23.89 | 8.52 |
| 1969 | 24.082 | 8.635 | 24.66 | 8.6 |
| 1970 | 24.125 | 8.647 | 24.71 | 8.7 |
| 1971 | 24.187 | 8.627 | 24.41 | 8.6 |
| 1972 | 24.192 | 8.602 | 24.06 | 8.5 |
| 1973 | 24.174 | 8.611 | 24.34 | 8.95 |
| 1974 | 24.21 | 8.617 | 24.14 | 8.47 |
| 1975 | 24.175 | 8.638 | 23.64 | 8.74 |
| 1976 | 24.153 | 8.613 | 23.77 | 8.35 |
| 1977 | 24.194 | 8.628 | 24.32 | 8.85 |
| 1978 | 24.234 | 8.645 | 24.29 | 8.69 |
| 1979 | 24.207 | 8.658 | 24.39 | 8.73 |
| 1980 | 24.221 | 8.686 | 24.85 | 8.98 |
| 1981 | 24.243 | 8.743 | 24.63 | 9.17 |
| 1982 | 24.235 | 8.757 | 23.98 | 8.64 |
| 1983 | 24.176 | 8.765 | 23.75 | 9.03 |
| 1984 | 24.214 | 8.787 | 24.52 | 8.69 |
| 1985 | 24.352 | 8.779 | 25.02 | 8.66 |
| 1986 | 24.383 | 8.827 | 24.08 | 8.83 |

| | | | | |
|---|---|---|---|---|
| 1987 | 24.456 | 8.841 | 25.05 | 8.99 |
| 1988 | 24.551 | 8.892 | 25.24 | 9.2 |
| 1989 | 24.535 | 8.911 | 24.23 | 8.92 |
| 1990 | 24.531 | 8.936 | 24.81 | 9.23 |
| 1991 | 24.506 | 8.937 | 24.38 | 9.18 |
| 1992 | 24.539 | 8.957 | 24.31 | 8.84 |
| 1993 | 24.668 | 8.941 | 25.04 | 8.87 |
| 1994 | 24.694 | 8.976 | 24.78 | 9.04 |
| 1995 | 24.65 | 9.045 | 24.58 | 9.35 |
| 1996 | 24.685 | 9.066 | 24.43 | 9.04 |
| 1997 | 24.556 | 9.087 | 23.76 | 9.2 |
| 1998 | 24.523 | 9.119 | 24.91 | 9.52 |
| 1999 | 24.65 | 9.156 | 25.5 | 9.29 |
| 2000 | 24.701 | 9.153 | 25.32 | 9.2 |
| 2001 | 24.781 | 9.176 | 25.18 | 9.41 |
| 2002 | 24.911 | 9.249 | 25.61 | 9.57 |
| 2003 | 24.878 | 9.315 | 24.71 | 9.53 |
| 2004 | 24.955 | 9.343 | 25.55 | 9.32 |
| 2005 | 24.963 | 9.378 | 24.66 | 9.7 |
| 2006 | 25.037 | 9.427 | 25.17 | 9.53 |
| 2007 | 25.177 | 9.48 | 25.16 | 9.73 |
| 2008 | 25.175 | 9.471 | 24.89 | 9.43 |
| 2009 | 25.162 | 9.493 | 25.37 | 9.51 |
| 2010 | 25.178 | 9.543 | 25.48 | 9.7 |
| 2011 | 25.158 | 9.554 | 24.98 | 9.52 |
| 2012 | 25.084 | 9.548 | 24.87 | 9.51 |
| 2013 | 25.208 | 9.556 | 25.95 | 9.61 |
| avg= | 24.1 | 8.44 | 24.15 | 8.44 |
| dev= | 0.39 | 0.43 | 0.67 | 0.52 |
| max = | 25.208 | 9.556 | 27.7 | 9.73 |
| min = | 23.03 | 7.666 | 22.74 | 6.94 |
| range= | 2.178 | 1.89 | 4.96 | 2.79 |

# Data Visualization

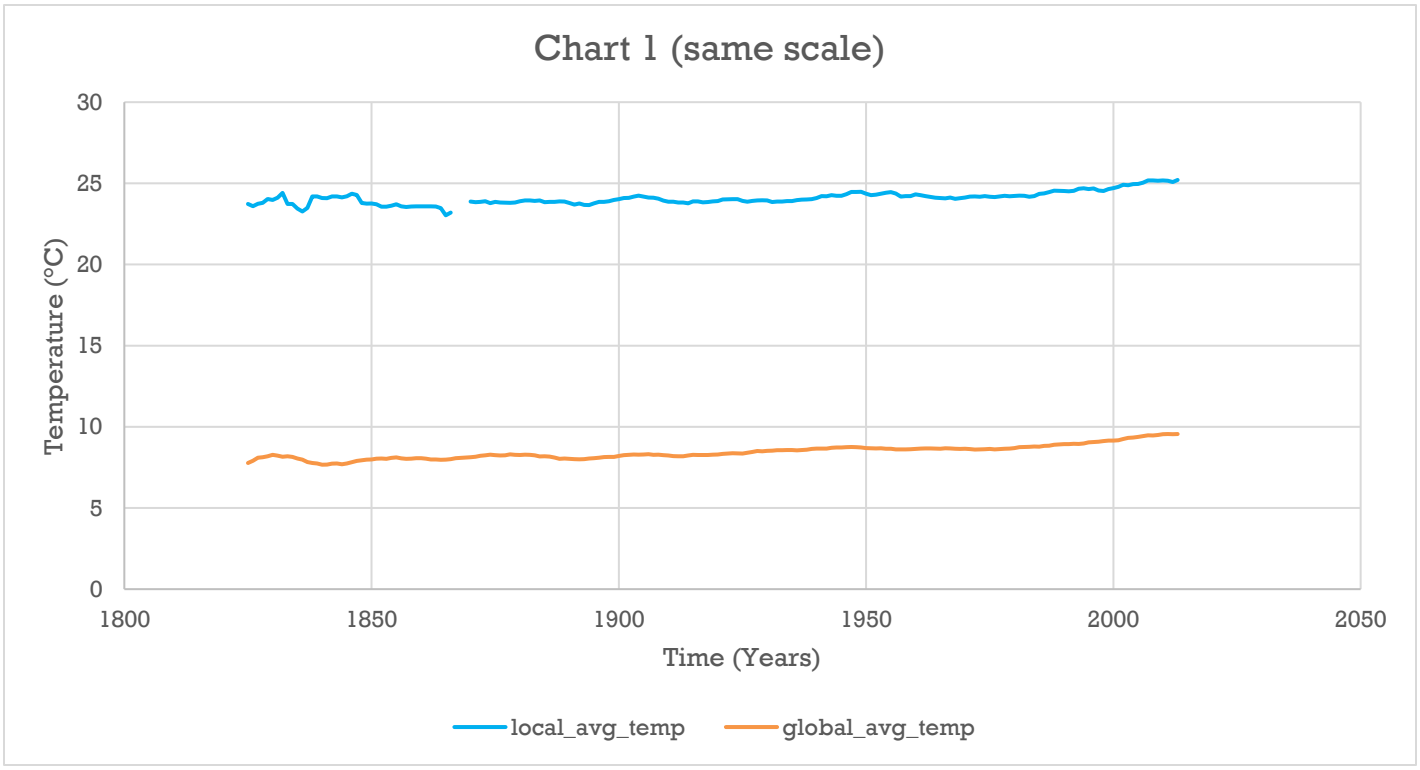


Chart 1

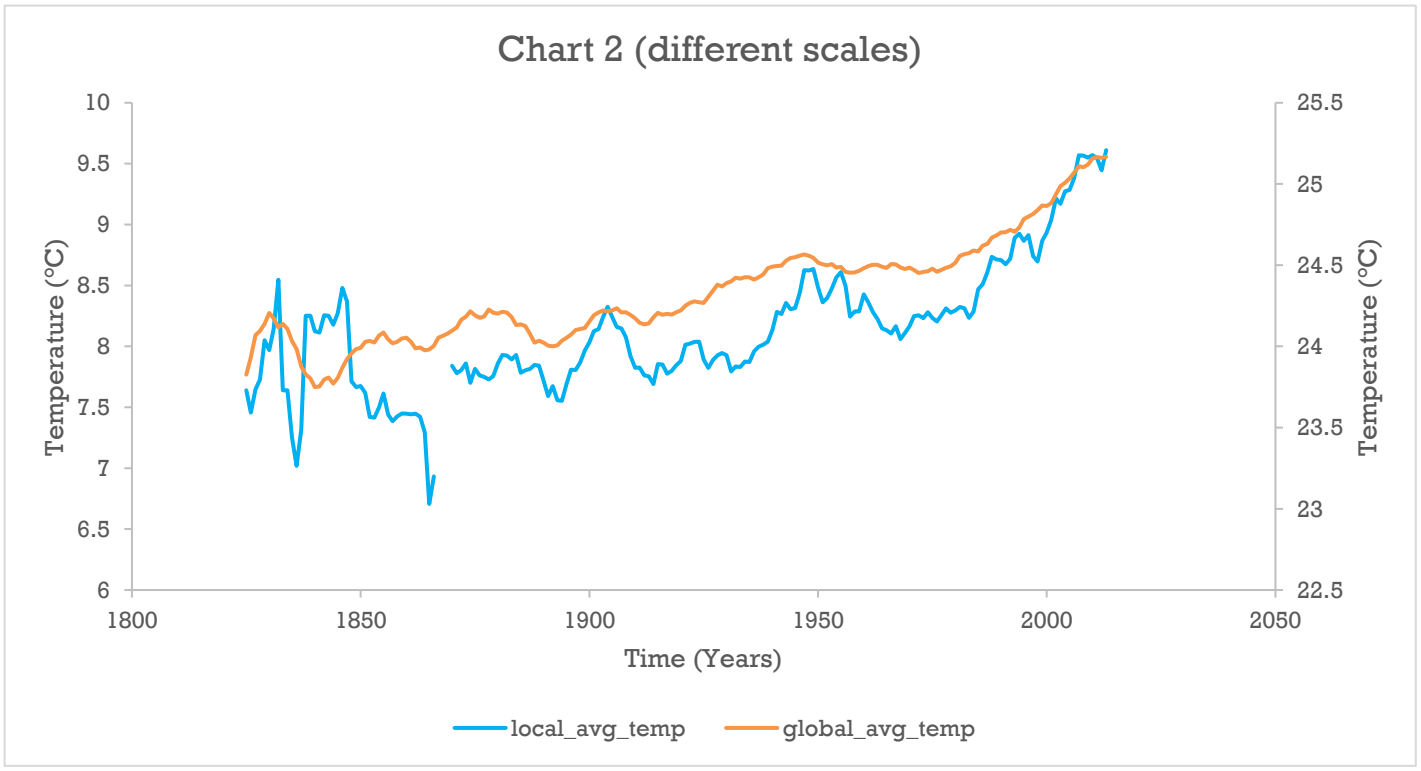


Chart 2

# Interpretation

1) The local_avg_temp is 24°C while the global_avg_temp is 8°C which depicts my city is much hotter than global average.
2) From chart 1, we can observe that difference has been consistent over the given time period.
3) From chart 2, we can see that local data fluctuates more often than global data, however standard deviation of global avg data is more than local avg data
4) From chart 1, it can be seen that world is getting hotter and it shows increasing trend consistently since 1852, and local temp though having some fluctuations also shows increasing trend overall
5) Local data has some missing values
6) We can do trials for 5,10 and15 years of periods for moving averages. While 15 years period flattens the curve, period of 5 years shows more details than required and doesn't make a comprehensive trend, so 10 years is a better choice.
7) we can see repeating bell curves in chart 2 which repeat after 20 years. I mean for 10 years temp goes up and then goes down for next 10 years and the cycle goes on. But recently the temp has been going up only not coming down so the pattern has broken in past few decades
8) I used Excel for data visualization.
9) I calculated moving averages for the period of 10 years.