

Outline

In order to complete this project, I followed the next steps:

1. Gather data
2. Decide on the interval to analyze
3. Analyze and smooth the data
4. Draw conclusions

I make a quick summary of each of the steps above.

1. Gather data

For this step, I queried the database schemas located in the Workshop for this project in the Udacity's website.

I used a few queries:

First, I wanted to know if my city (Guadalajara) was included in the dataset:

```
SELECT * FROM city_list WHERE country='Mexico';
```

Second, once I verified that Guadalajara was indeed in the dataset, I queried for the average temperatures for it:

```
SELECT * FROM city_data WHERE city='Guadalajara';
```

Finally, I queried for the world temperatures:

```
SELECT * FROM global_data;
```

So the main tool here were the schemas themselves and the SQL language. In this stage, I also exported the datasets as CSV files.

You can find the dataset at the end of this document.

2. Decide on the interval to analyze

This was the most difficult part. Because the datasets for my city and the one for the entire world have different starting years: for the world dataset, the starting year is 1750, but for Guadalajara is 1838. Also, some years were missing in the dataset for Guadalajara.

So I decided to create a common dataset, with years starting in 1838, and ending in 2015.

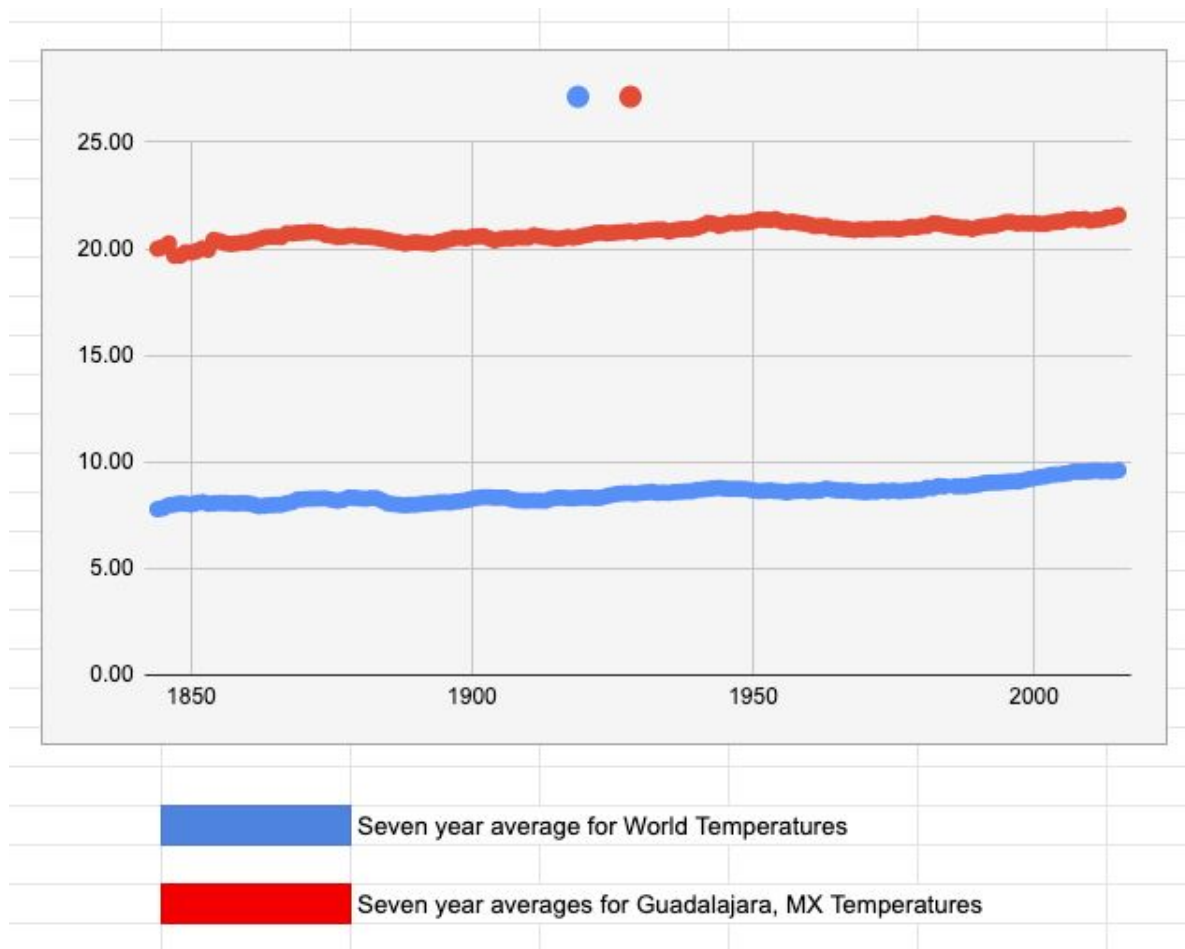
The second thing I had to decide at this stage was: how many years to average? In the end, I decided for 7-year averages so that I would not be losing any short-term insights. So I calculated the moving average by including the previous seven years.

3. Analyze and Smooth the Data

Here I had to decide about the tool to use to help me complete this stage. In the end, I decided for Google Spreadsheets. I realized it was very easy to import the CSV files.

Finally, I created the chart using both sets of smoothed averages. Here again my main tool was Google Spreadsheets.

This is the chart I got. The vertical axis represents Average temperatures, and the Horizontal axis is for the years.



4. Observations and Conclusions

First, I start with a few qualitative observations:

1. Trends: For both Guadalajara and the World, it is easy to notice how the moving averages have been increasing during the entire period of time under consideration (1838 - 2015).
2. During the entire period of time under consideration, the moving averages for Guadalajara seem to be about 12.5 degrees higher than that for the entire World. We could derive a formula for it:

$$\text{Gdl_avg} = \text{World_avg} + 12.5$$

3. For both Guadalajara and the entire World, moving averages kept increasing since year 1967.
4. The rate of growth for both moving averages (the slope of the moving averages line) seem to be roughly the same, and positive. So both Guadalajara and the entire World are getting hotter over time, for the period 1838 - 2015.

From the above observations, I can draw the following conclusions:

1. For the time period under consideration, average temperatures are increasing in both Guadalajara and the entire World.
2. For the time period under consideration, Guadalajara has been warmer than the rest of the world.
3. The rate of growth for the average temperatures seems to be roughly the same.

The Dataset

year	avg_temp_world	avg_temp_gdl	7year_avg_world	7year_gdl
1838	7.51	19.56	7.51	
1839	7.63	19.9	7.57	
1840	7.8		7.65	
1841	7.69		7.66	
1842	8.02		7.73	
1843	8.17	20.57	7.80	
1844	7.65	19.98	7.78	20.00
1845	7.85	19.86	7.83	20.08
1846	8.55	20.6	7.96	20.25
1847	8.09	17.36	8.00	19.67
1848	7.98		8.04	19.67
1849	7.98	20.64	8.04	19.84
1850	7.9	20.48	8.00	19.82
1851	8.18	20.44	8.08	19.90
1852	8.1	20.58	8.11	20.02
1853	8.04	20.2	8.04	19.95
1854	8.21	20.13	8.06	20.41
1855	8.11	20.06	8.07	20.36

1856	8	19.93	8.08	20.26
1857	7.76	20.24	8.06	20.23
1858	8.1	20.6	8.05	20.25
1859	8.25	20.82	8.07	20.28
1860	7.96	20.23	8.06	20.29
1861	7.85	20.72	8.00	20.37
1862	7.56	20.53	7.93	20.44
1863	8.11	20.59	7.94	20.53
1864	7.98	20.43	7.97	20.56
1865	8.18	20.6	7.98	20.56
1866	8.29	20.74	7.99	20.55
1867	8.44	21.45	8.06	20.72
1868	8.25	20.66	8.12	20.71
1869	8.43	20.8	8.24	20.75
1870	8.2	20.62	8.25	20.76
1871	8.12	20.66	8.27	20.79
1872	8.19	20.55	8.27	20.78
1873	8.35	20.6	8.28	20.76
1874	8.43	20.61	8.28	20.64
1875	7.86	20.44	8.23	20.61
1876	8.08	20.38	8.18	20.55

1877	8.54	20.68	8.22	20.56
1878	8.83	20.99	8.33	20.61
1879	8.17	20.61	8.32	20.62
1880	8.12	20.26	8.29	20.57
1881	8.27	20.58	8.27	20.56
1882	8.13	20.31	8.31	20.54
1883	7.98	20.12	8.29	20.51
1884	7.77	20.36	8.18	20.46
1885	7.92	20.58	8.05	20.40
1886	7.95	20.28	8.02	20.36
1887	7.91	19.9	7.99	20.30
1888	8.09	20.13	7.96	20.24
1889	8.32	20.58	7.99	20.28
1890	7.97	20.31	7.99	20.31
1891	8.02	20.16	8.03	20.28
1892	8.07	20.46	8.05	20.26
1893	8.06	20.12	8.06	20.24
1894	8.16	20.43	8.10	20.31
1895	8.15	20.55	8.11	20.37
1896	8.21	21.02	8.09	20.44
1897	8.29	20.83	8.14	20.51

1898	8.18	20.19	8.16	20.51
1899	8.4	20.24	8.21	20.48
1900	8.5	20.73	8.27	20.57
1901	8.54	20.5	8.32	20.58
1902	8.3	20.64	8.35	20.59
1903	8.22	20.3	8.35	20.49
1904	8.09	20.12	8.32	20.39
1905	8.23	20.65	8.33	20.45
1906	8.38	20.51	8.32	20.49
1907	7.95	20.64	8.24	20.48
1908	8.19	20.86	8.19	20.53
1909	8.18	20.57	8.18	20.52
1910	8.22	20.31	8.18	20.52
1911	8.18	20.9	8.19	20.63
1912	8.17	20.29	8.18	20.58
1913	8.3	20.2	8.17	20.54
1914	8.59	20.46	8.26	20.51
1915	8.59	20.52	8.32	20.46
1916	8.23	20.75	8.33	20.49
1917	8.02	20.72	8.30	20.55
1918	8.13	20.66	8.29	20.51

1919	8.38	20.6	8.32	20.56
1920	8.36	20.68	8.33	20.63
1921	8.57	20.74	8.33	20.67
1922	8.41	21.03	8.30	20.74
1923	8.42	20.86	8.33	20.76
1924	8.51	20.5	8.40	20.72
1925	8.53	20.8	8.45	20.74
1926	8.73	20.82	8.50	20.78
1927	8.52	20.74	8.53	20.78
1928	8.63	20.99	8.54	20.82
1929	8.24	20.71	8.51	20.77
1930	8.63	21.2	8.54	20.82
1931	8.72	20.79	8.57	20.86
1932	8.71	20.95	8.60	20.89
1933	8.34	20.92	8.54	20.90
1934	8.63	20.72	8.56	20.90
1935	8.52	20.33	8.54	20.80
1936	8.55	21.2	8.59	20.87
1937	8.7	21.48	8.60	20.91
1938	8.86	20.89	8.62	20.93
1939	8.76	20.94	8.62	20.93

1940	8.76	21.32	8.68	20.98
1941	8.77	21.45	8.70	21.09
1942	8.73	21.25	8.73	21.22
1943	8.76	20.89	8.76	21.17
1944	8.85	20.78	8.78	21.07
1945	8.58	21.41	8.74	21.15
1946	8.68	21.5	8.73	21.23
1947	8.8	21.12	8.74	21.20
1948	8.75	21.6	8.74	21.22
1949	8.59	21.34	8.72	21.23
1950	8.37	21.29	8.66	21.29
1951	8.63	21.4	8.63	21.38
1952	8.64	21.29	8.64	21.36
1953	8.87	21.38	8.66	21.35
1954	8.56	21.48	8.63	21.40
1955	8.63	20.89	8.61	21.30
1956	8.28	20.93	8.57	21.24
1957	8.73	21.53	8.62	21.27
1958	8.77	21.06	8.64	21.22
1959	8.73	21.05	8.65	21.19
1960	8.58	21	8.61	21.13

1961	8.8	20.95	8.65	21.06
1962	8.75	20.95	8.66	21.07
1963	8.86	20.97	8.75	21.07
1964	8.41	20.82	8.70	20.97
1965	8.53	21.04	8.67	20.97
1966	8.6	20.88	8.65	20.94
1967	8.7	20.73	8.66	20.91
1968	8.52	20.73	8.62	20.87
1969	8.6	21.22	8.60	20.91
1970	8.7	20.9	8.58	20.90
1971	8.6	20.76	8.61	20.89
1972	8.5	21.33	8.60	20.94
1973	8.95	20.89	8.65	20.94
1974	8.47	20.79	8.62	20.95
1975	8.74	20.68	8.65	20.94
1976	8.35	21	8.62	20.91
1977	8.85	21.3	8.64	20.96
1978	8.69	21.17	8.65	21.02
1979	8.73	21.18	8.68	21.00
1980	8.98	21.25	8.69	21.05
1981	9.17	20.9	8.79	21.07

1982	8.64	21.52	8.77	21.19
1983	9.03	20.93	8.87	21.18
1984	8.69	20.88	8.85	21.12
1985	8.66	20.79	8.84	21.06
1986	8.83	20.91	8.86	21.03
1987	8.99	20.94	8.86	20.98
1988	9.2	20.91	8.86	20.98
1989	8.92	21.12	8.90	20.93
1990	9.23	21.46	8.93	21.00
1991	9.18	21.2	9.00	21.05
1992	8.84	21	9.03	21.08
1993	8.87	21.04	9.03	21.10
1994	9.04	21.46	9.04	21.17
1995	9.35	21.5	9.06	21.25
1996	9.04	21.08	9.08	21.25
1997	9.2	20.99	9.07	21.18
1998	9.52	21.38	9.12	21.21
1999	9.29	20.86	9.19	21.19
2000	9.2	21.12	9.23	21.20
2001	9.41	21.23	9.29	21.17
2002	9.57	21.5	9.32	21.17

2003	9.53	21.51	9.39	21.23
2004	9.32	21.24	9.41	21.26
2005	9.7	21.42	9.43	21.27
2006	9.53	21.5	9.47	21.36
2007	9.73	21.35	9.54	21.39
2008	9.43	21.02	9.54	21.36
2009	9.51	21.76	9.54	21.40
2010	9.7	20.9	9.56	21.31
2011	9.52	21.55	9.59	21.36
2012	9.51	21.52	9.56	21.37
2013	9.61	22.19	9.57	21.47
2014	9.57		9.55	21.49
2015	9.83		9.61	21.58