Udacity - Data Analytics Nano Degree

Project 1 : Exploring Weather Trends

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Introduction :

Global Warming had risen the topic of discussing about the current temperature trends and analysis is being performed to analyse the temperature increments. In this publication, global temperature's are analyzed with respect to local temperatures's to determine whether or not temperatures are climbing over time.Local and global temperatures are analysed and compare the local temperature trends with global temperature trends.

Method :

The data that was being used in this analysis are being retrieved from database using Structured Query Language and then analysed using Google Spreadsheets. The data was analysed using 10 year Moving Average to make trends more clear.

Retreiving Data from Database :

Data was retrieved from the database using SQL - Structured Query Language.

Visualizing data to assure that we are going to retrieve the actual data that we should perform analysis from various data available in multiple tables in the database.

- To see the available nearby city whose temperature data is available :

```
SELECT *
  FROM city_list
    WHERE country = ‘India’;
```

- To visualize the local city_data

```
SELECT *
  FROM city_data
    WHERE city = ‘Hyderabad’ AND country = ‘India’
      LIMIT 10;
```

- To visualize the global_data

```
SELECT *
  FROM global_data;
```

- To retrieve the final data from database from multiple tables

- To rename the column names

```
ALTER TABLE city_data RENAME COLUMN avg_temp to local_avg_temp;

ALTER TABLE global_data RENAME COLUMN avg_temp to global_avg_temp;

SELECT global_data.year,city_data.city,global_data.global_avg_temp,city_data.local_avg_temp
  FROM global_data,city_data
```

```
    WHERE(global_data.year = city_data.year) AND
(city_data.city = 'Hyderabad' AND city_data.country =
'INDIA');
```

- Download the .csv file and open it in Google Spreadsheets.
- Moving Average's for 10 years are calculated for global_avg_temp and local_avg_temp to smooth out data and make it easier to observe long term trends after plotting the line chart.
- Line chart's are plotted using spreadsheets inbuilt features for Global temperatures versus Local temperatures with respect to year.

Results and Discussions

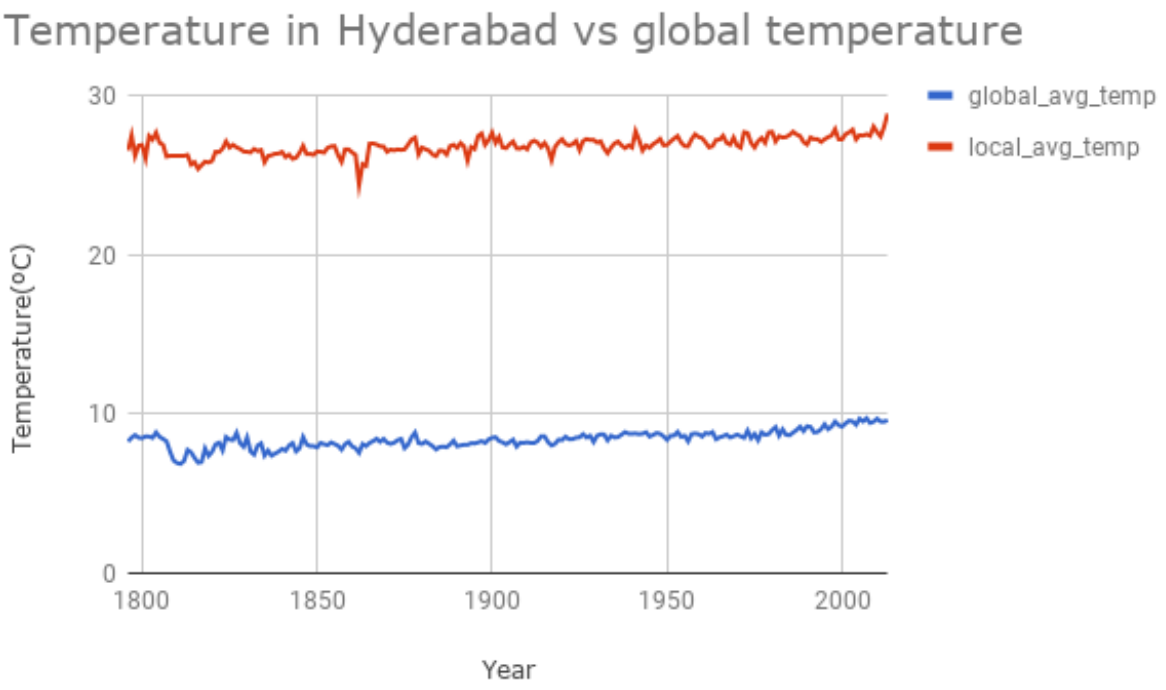

Figure 1: Before Moving Average's Average temperature in celsius over time in years with Global values in blue and Hyderabad in red.

It was found that average global temperature is increasing over time. Global temperature trends were depicted in blue where as Hyderabad temperature were depicted in red.
From 1796 the average global temperature was increasing and from 1804 it starts decreasing unto some years.
Hyderabad's average temperature was slightly high when compared to global temperature because global temperature includes various such parameter's unlike hyderabad's trends.

For smoother and clear analysing the longer trends we will transform the line chart into Moving Average's Line chart.

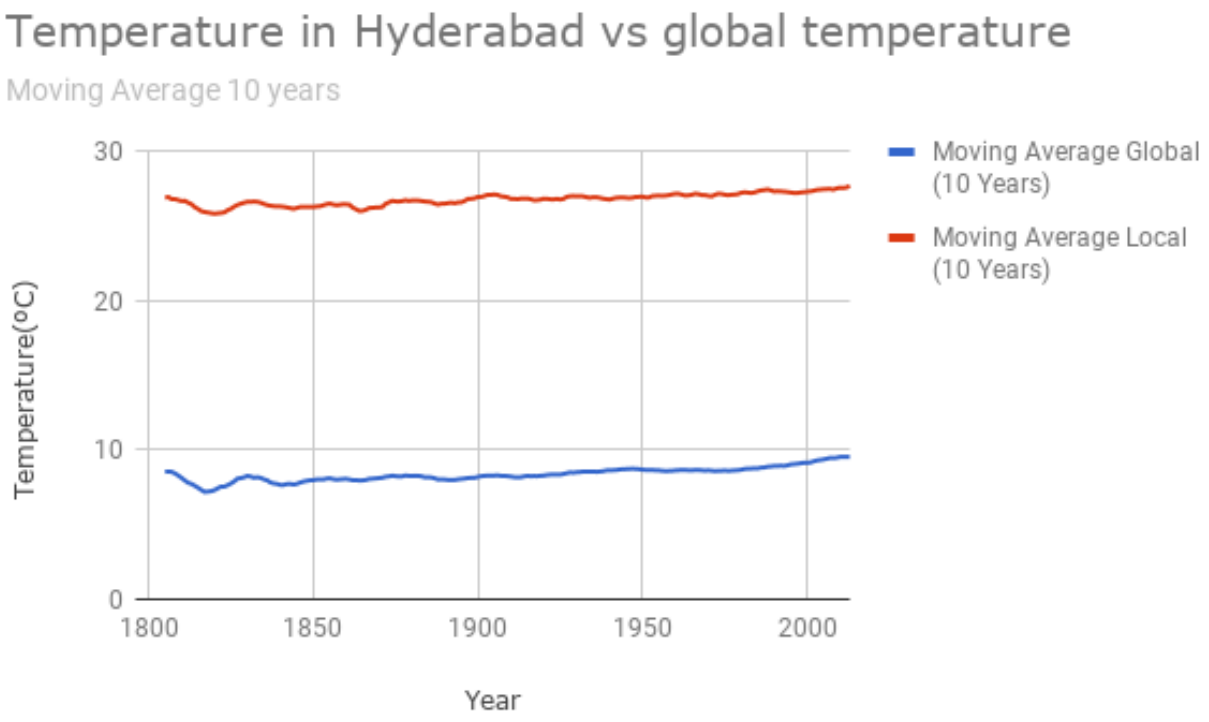

Figure 2: Average temperature in celsius over time in years with Global values in blue and Hyderabad in red in Moving Averages for 10 Years.

The temperature trends of Hyderabad are quietly high when compared with global temperatures. In 1805 the moving average of Hyderabad is 26.931 whereas for global it is 26.931. This clearly depicts that the average temperature's of Hyderabad are higher than the global average temperature's.

Hyderabad temperature trends slightly decrease from 1805 to 1820. From then it increases slightly and consistent unto 1860. In 1860, it decreases to a small extent and from 1866 it is consistent from then with small decreases/increases in temperature trends.

Global temperature trends are also similar to local temperature trends in terms of increase/decrease. In 1805, the global average temperature is 8.551 and from 1805 to 1820 it decreases slightly and then increases , it maintains consistent in nature with small decreases/increases in temperature trends.

The curve's of Hyderabad temperature trends maintain's higher variance when compared to global through out the line chart. Hence, we can conclude that "Hyderabad is hotter when compared to global average".

- The difference between the Moving Average temperature trends of Hyderabad and global in 1805 is :
26.931 - 8.551 = 18.38

- The difference between the Moving Average temperature trends of Hyderabad and global in 1820 is :
25.858 - 7.322 = 18.536

- The difference between the Moving Average temperature trends of Hyderabad and global in 1842 is :
26.279 - 7.728 = 18.551

- The difference between the Moving Average temperature trends of Hyderabad and global in 1866 is :
26.124 - 8.004 = 18.12

- The difference between the Moving Average temperature trends of Hyderabad and global in 1890 is :
26.53 - 8.031 = 18.499

- The difference between the Moving Average temperature trends of Hyderabad and global in 1930 is :
27.021 - 8.519 = 18.502

- The difference between the Moving Average temperature trends of Hyderabad and global in 1960 is :
27.193 - 8.642 = 19.162

- The difference between the Moving Average temperature trends of Hyderabad and global in 1990 is :
27.343 - 8.936 = 18.407

- The difference between the Moving Average temperature trends of Hyderabad and global in 2005 is :
27.497 - 9.378 = 18.119

- The difference between the Moving Average temperature trends of Hyderabad and global in 2010 is :
27.598 - 9.543 = 18.055

- The difference between the Moving Average temperature trends of Hyderabad and global in 2013 is :
27.719 - 9.556 = 18.163

From the above observation we can conclude that “ The Temperature differences between Hyderabad and Global temperatures increased slightly between 1805 to 1820.From

1820 to 1842 the difference remains consistent with minor increase. And from 1842 to 1866 it decreases and again 1866 to 1890 it increases. From then upto 1930 it remains consistent with minor increase.And from 1930 to 1960 it decreases and then increases unto 1990. From 1990 to 2013 it remains consistent with minor increases/decreases in temperature differences between Hyderabad and Global trends".

From the observations "The increase/decrease in Global temperature with respect to previous year has an effect on temperature trends of Hyderabad with it's previous years similar to the amount of change occurred in global".

The overall trends either global or Hyderabad are increasing gradually day by day. World is getting hotter based on the trends above.In between the trends remained consistent in some years rather than increase.

Correlation Coefficient:

It is used to measure how strong a relationship between two variables:

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\, n\Sigma x^2 - (\Sigma x)^2]\,[\, n\Sigma y^2 - (\Sigma y)^2]}}$$

correlation coefficient between global and hyderabad temperature trends :

r = (218*(49212.1054)-(1831.97*5850.03))/ sqrt(14240.5405*171631.5852)

r = 1.22

The correlation coefficient between global and hyderabad temperature trends is 1.22 which indicates strong positive relationship among them.

Conclusion:

In conclusion, we can depict that the temperature of globe has been rising exponentially and local area temperatures are also increasing at a rate similar to that of globe in the past century.