

Project 1 : Explore Weather trends

Nearest city to me : Tunis - Tunisia

steps taken to prepare the data :

-1st step I used SQL to extract the wanted data

The screenshot shows the Udacity Data Analyst interface. On the left, a sidebar lists project steps: 1. Your First Project, 2. Project Instructions, 3. Accessing Data With SQL (highlighted), 4. Moving Averages, and 5. Project: Explore Weather Trends. Below the sidebar are links for Mentor Help and Peer Chat. The main area is titled 'Accessing Data With SQL' and shows a SQL query editor. The query is: `select * from global_data gd`. The output shows 266 results with columns 'year' and 'avg_temp'. The results are as follows:

year	avg_temp
1750	8.72
1751	7.98
1752	5.78
1753	8.39
1754	8.47

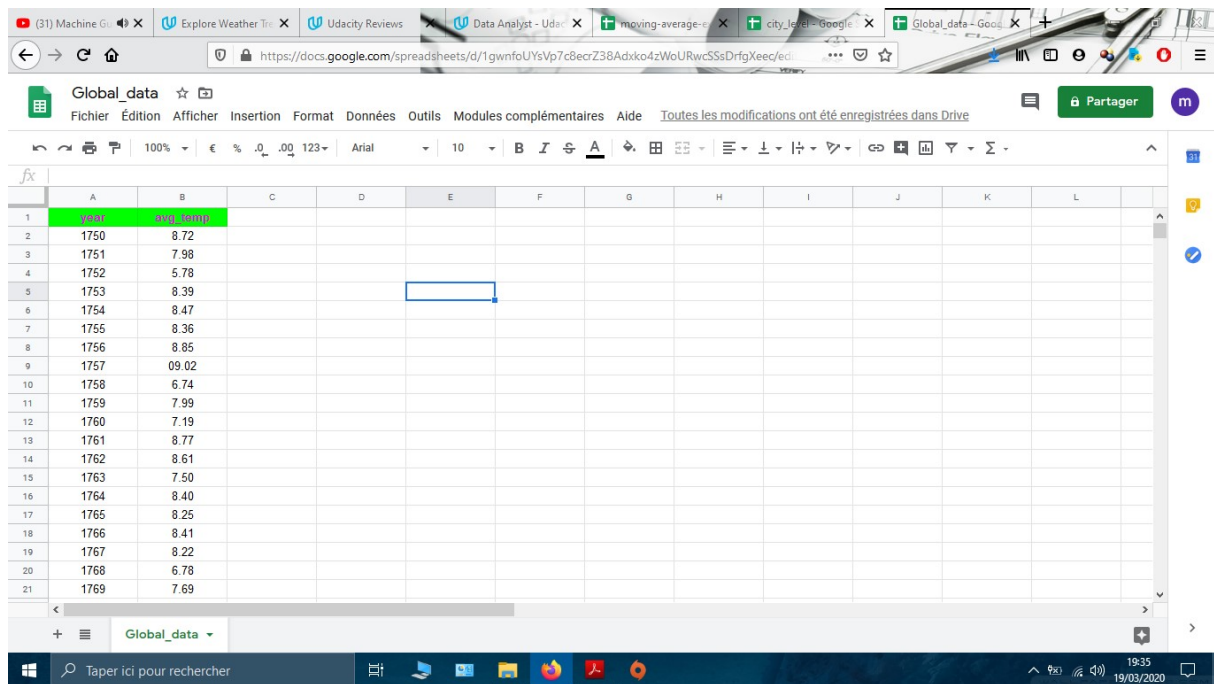
Global level Data extraction

The screenshot shows the Udacity Data Analyst interface. The SQL query editor contains the query: `select country,city,year,avg_temp from city_data cd where city = 'Tunis'`. The output shows 271 results with columns 'country', 'city', 'year', and 'avg_temp'. The results are as follows:

country	city	year	avg_temp
Tunisia	Tunis	1743	14.72
Tunisia	Tunis	1744	19.66
Tunisia	Tunis	1745	11.82
Tunisia	Tunis	1746	

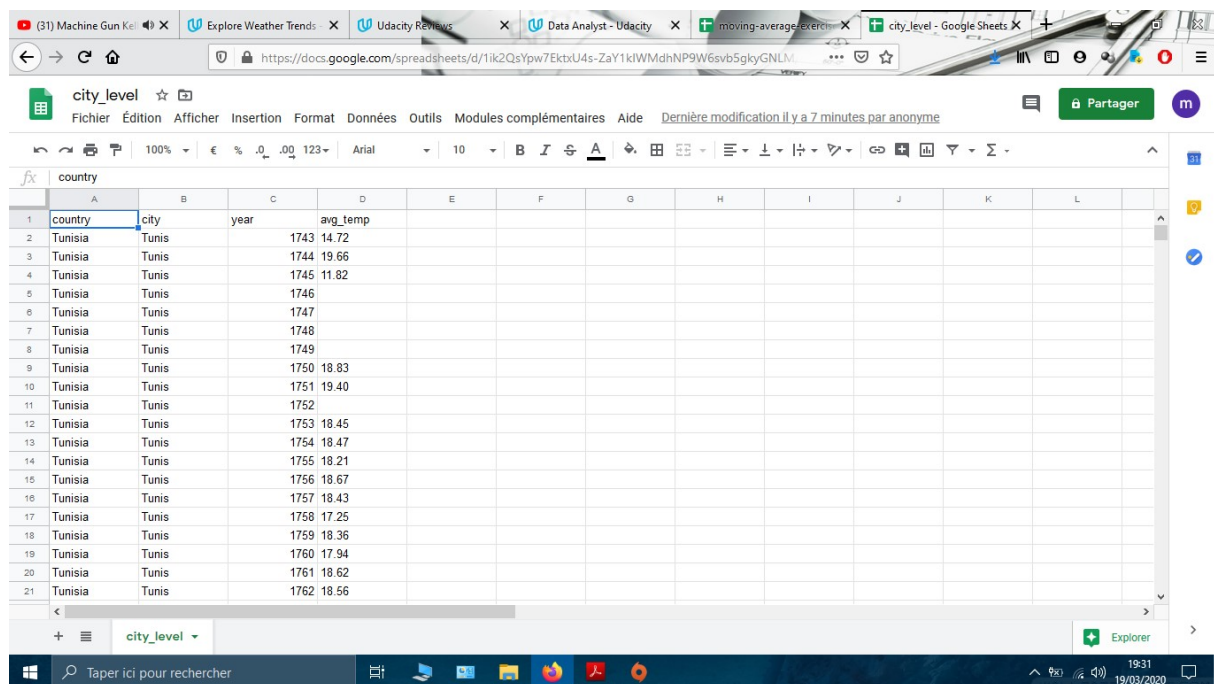
City level Data extraction

- 2nd step : I downloaded the tabs extracted (CSV) then uploaded them to Google sheets .



	A	B	C	D	E	F	G	H	I	J	K	L
1	year	avg_temp										
2	1750	8.72										
3	1751	7.98										
4	1752	5.78										
5	1753	8.39										
6	1754	8.47										
7	1755	8.36										
8	1756	8.85										
9	1757	09.02										
10	1758	6.74										
11	1759	7.99										
12	1760	7.19										
13	1761	8.77										
14	1762	8.61										
15	1763	7.50										
16	1764	8.40										
17	1765	8.25										
18	1766	8.41										
19	1767	8.22										
20	1768	6.78										
21	1769	7.69										

Global data sheet



	A	B	C	D	E	F	G	H	I	J	K	L
1	country	city	year	avg_temp								
2	Tunisia	Tunis	1743	14.72								
3	Tunisia	Tunis	1744	19.66								
4	Tunisia	Tunis	1745	11.82								
5	Tunisia	Tunis	1746									
6	Tunisia	Tunis	1747									
7	Tunisia	Tunis	1748									
8	Tunisia	Tunis	1749									
9	Tunisia	Tunis	1750	18.83								
10	Tunisia	Tunis	1751	19.40								
11	Tunisia	Tunis	1752									
12	Tunisia	Tunis	1753	18.45								
13	Tunisia	Tunis	1754	18.47								
14	Tunisia	Tunis	1755	18.21								
15	Tunisia	Tunis	1756	18.67								
16	Tunisia	Tunis	1757	18.43								
17	Tunisia	Tunis	1758	17.25								
18	Tunisia	Tunis	1759	18.36								
19	Tunisia	Tunis	1760	17.94								
20	Tunisia	Tunis	1761	18.62								
21	Tunisia	Tunis	1762	18.56								

City level sheet (Tunis)

	A	B	C	D	E	F	G	H	I	J	K	L
1	year	avg_temp	AVG_7_year									
2	1750	8,72										
3	1751	7,98										
4	1752	5,78										
5	1753	8,39										
6	1754	8,47										
7	1755	8,36										
8	1756	8,85										
9	1757	9,02										
10	1758	6,74										
11	1759	7,99										
12	1760	7,19										
13	1761	8,77										
14	1762	8,61										
15	1763	7,5										
16	1764	8,4										
17	1765	8,25										
18	1766	8,41										
19	1767	8,22										
20	1768	6,78										
21	1769	7,69										

Average global temperature calculus

	A	B	C	D	E	F	G	H	I	J	K	L
1	country	city	year	avg_temp	AVG_7_year							
2	Tunisia	Tunis	1743	14,72								
3	Tunisia	Tunis	1744	19,66								
4	Tunisia	Tunis	1745	11,82								
5	Tunisia	Tunis	1746	NA								
6	Tunisia	Tunis	1747	NA								
7	Tunisia	Tunis	1748	NA								
8	Tunisia	Tunis	1749	NA	15,4							
9	Tunisia	Tunis	1750	18,83	16,77							
10	Tunisia	Tunis	1751	19,4	16,68333333							
11	Tunisia	Tunis	1752	NA	19,115							
12	Tunisia	Tunis	1753	18,45	18,89333333							
13	Tunisia	Tunis	1754	18,47	18,7875							
14	Tunisia	Tunis	1755	18,21	18,672							
15	Tunisia	Tunis	1756	18,67	18,67166667							
16	Tunisia	Tunis	1757	18,43	18,605							
17	Tunisia	Tunis	1758	17,25	18,24666667							
18	Tunisia	Tunis	1759	18,36	18,26285714							
19	Tunisia	Tunis	1760	17,94	18,19							
20	Tunisia	Tunis	1761	18,62	18,21142857							
21	Tunisia	Tunis	1762	18,56	18,26142857							

Average city temperature calculus

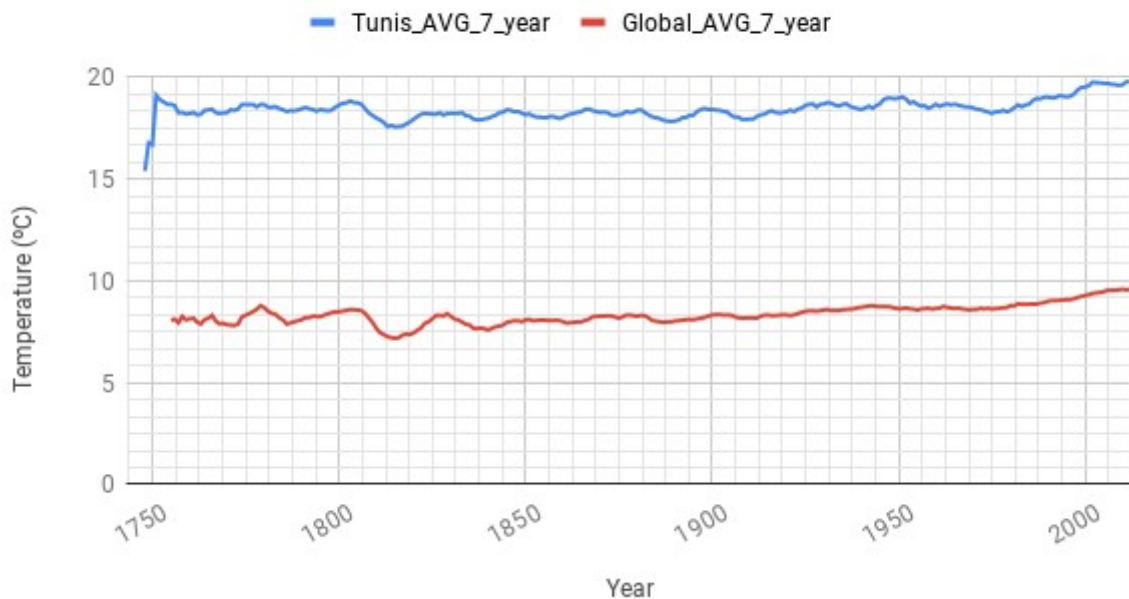
Method of calculating the average :

I created a new column (“AVG_7_year”) , which is where the moving average field will be stored. Went down to the seventh year (1749) and used the AVERAGE() function to calculate the average. Then I dragged the the formula to the end of the tab to get the 7-year moving average temperatures.

➔ Same method for Global average

Visualization :

Tunis vs Global Temp



Method :

I created a line chart with Google sheets and used both 7_year_average temperature columns from the two tabs and the year column

- X axis represents “ Year “
- Y axis represents “ Tunis_AVG_7_year “ and “ Global_AVG_7_year “

Observations of the chart :

1. Since 1750, local temperatures have remained stable or have they risen?

Since 1750, temperatures in Tunis didn't remain stable , they had remarkably risen .

2. How much did they go up?

They go up by about 3 degrees Celsius .

3. Have global temperatures gone up?

The world's temperatures had slight up and downs .

4. What is the difference in degrees Celsius between global and local temperatures?

Approximately 10 degrees Celsius (about 10,6 degrees in 1756)

5. Has the world gotten hotter since 1750?

Yes , the world got hotter (from 8,72 to 9,83 between 1750-2015)

6. Did “Tunis” get hotter too?

Yes, Tunis did get hotter also (from 14,72 to 20 between 1743 -2013)

6. What's the correlation coefficient between 1753-2013 ?

Correlation Formula



$$\rho_{xy} = \frac{\text{Con}(r_x, r_y)}{\sigma_x \sigma_y}$$



<https://www.educba.com/correlation-formula/>

Variance

$$\text{Var}(X) = \frac{\sum_1^n (x_i - \bar{X})^2}{n}$$

<https://economipedia.com/definiciones/varianza.html>

	B	C	D	E	F	G	H	I	J	K
1	city	year	City_avg_temp	City_AVG_7_year	Global_avg_temp	Global_AVG_7_year	(Xi-X)city	(Xi-X)*2 city	(Xi-X)global	(Xi-X)*2 global
2	Tunis	1743	14,72	Tunis_AVG_7_year	NA	Global_AVG_7_year				
3	Tunis	1744	19,66	NA	NA	NA				
4	Tunis	1745	11,82	NA	NA	NA				
5	Tunis	1746	NA	NA	NA	NA				
6	Tunis	1747	NA	NA	NA	NA				
7	Tunis	1748	NA	NA	NA	NA				
8	Tunis	1749	NA	15,4	NA	NA				
9	Tunis	1750	18,83	16,77	8,72	NA				
10	Tunis	1751	19,4	16,68333333	7,98	NA				
11	Tunis	1752	NA	19,115	5,78	NA				
12	Tunis	1753	18,45	18,89333333	8,39	NA	0,02515038	0,000632541614	6,81484962	46,44217534
13	Tunis	1754	18,47	18,7875	8,47	NA	0,04515038	0,002038556814	6,89484962	47,53895128
14	Tunis	1755	18,21	18,672	8,36	NA	-0,21484962	0,04616035921	6,78484962	46,03418437
15	Tunis	1756	18,67	18,67166667	8,85	8,078571429	0,24515038	0,06009870881	7,27484962	52,92343699
16	Tunis	1757	18,43	18,605	9,02	8,121428571	0,00515038	0,000026526414	7,44484962	55,42578586
17	Tunis	1758	17,25	18,24666667	6,74	7,944285714	-1,17484962	1,38027163	5,16484962	26,6756716
18	Tunis	1759	18,36	18,26285714	7,99	8,26	-0,06484962	0,004205473214	6,41484962	41,15029565
19	Tunis	1760	17,94	18,19	7,19	8,088571429	-0,48484962	0,235079154	5,61484962	31,52653626
20	Tunis	1761	18,62	18,21142857	8,77	8,131428571	0,19515038	0,03808367081	7,19484962	51,76586105
21	Tunis	1762	18,56	18,26142857	8,61	8,167142857	0,13515038	0,01826562521	7,03484962	49,48910918

	B	C	D	E	F	G	H	I	J	K	L	
264	Tunis	2005	19,12	19,72	9,7	9,431428571	0,69515038	0,4832340508	8,12484962	66,01318135		
265	Tunis	2006	19,82	19,69857143	9,53	9,465714286	1,39515038	1,946444583	7,95484962	63,27963248		
266	Tunis	2007	19,71	19,69142857	9,73	9,541428571	1,28515038	1,651611499	8,15484962	66,50157232		
267	Tunis	2008	19,76	19,65142857	9,43	9,544285714	1,33515038	1,782626537	7,85484962	61,69866255		
268	Tunis	2009	19,64	19,63714286	9,51	9,535714286	1,21515038	1,476590446	7,93484962	62,96183849		
269	Tunis	2010	19,76	19,59714286	9,7	9,56	1,33515038	1,782626537	8,12484962	66,01318135		
270	Tunis	2011	19,53	19,62	9,52	9,588571429	1,10515038	1,221357362	7,94484962	63,12063548		
271	Tunis	2012	20,12	19,76285714	9,51	9,561428571	1,69515038	2,873534811	7,93484962	62,96183849		
272	Tunis	2013	20	19,78857143	9,61	9,572857143	1,57515038	2,48109872	8,03484962	64,55880842		
273	Tunis	NA	NA	NA	9,57	9,55	NA		NA			
274	Tunis	NA	NA	NA	9,83	9,607142857	NA		NA			
275												
276												
277			18,4543295		8,379467681			82,82983322		12128,11199		
278								0,3273906451		47,93720152		
279												
280												
281												
282												
283												

V(Tunis) = 0.32739

V(global)=47,9372

Covariance

$$Cov(X,Y) = \frac{1}{N} \sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})$$

https://www.abcbourse.com/apprendre/19_variance_covariance.html

Global_data ☆											
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fx	C	D	E	F	G	H	I	J	K	L	
1	year	City_avg_temp	City_AVG_7_year	Global_avg_temp	Global_AVG_7_year	(Xi-X)city	(Xi-X)*2 city	(Xi-X)global	(Xi-X)*2 global	(Xi-X)*(Yi-Y)	
2	1743	14,72	Tunis_AVG_7_year	NA	Global_AVG_7_year						
3	1744	19,66	NA	NA	NA						
4	1745	11,82	NA	NA	NA						
5	1746	NA	NA	NA	NA						
6	1747	NA	NA	NA	NA						
7	1748	NA	NA	NA	NA						
8	1749	NA	15,4	NA	NA						
9	1750	18,83	16,77	8,72	NA						
10	1751	19,4	16,68333333	7,98	NA						
11	1752	NA	19,115	5,78	NA						
12	1753	18,45	18,89333333	8,39	NA	0,02515038	0,000632541614	6,81484962	46,44217534	0,1713960576	
13	1754	18,47	18,7875	8,47	NA	0,04515038	0,002038556814	6,89484962	47,53895128	0,3113050804	
14	1755	18,21	18,672	8,36	NA	-0,21484962	0,04616035921	6,78484962	46,03418437	-1,457722363	
15	1756	18,67	18,67166667	8,85	8,078571429	0,24515038	0,06009870881	7,27484962	52,92343699	1,783432149	
16	1757	18,43	18,605	9,02	8,121428571	0,00515038	0,000026526414	7,44484962	55,42578586	0,03834380459	
17	1758	17,25	18,24666667	6,74	7,944285714	-1,17484962	1,38027163	5,16484962	26,6756716	-6,067921613	
18	1759	18,36	18,26285714	7,99	8,26	-0,06484962	0,004205473214	6,41484962	41,15029565	-0,4160005602	
19	1760	17,94	18,19	7,19	8,088571429	-0,48484962	0,235079154	5,61484962	31,52653626	-2,722357705	
20	1761	18,62	18,21142857	8,77	8,131428571	0,19515038	0,03808367081	7,19484962	51,76586105	1,404077637	
21	1762	18,56	18,26142857	8,61	8,167142857	0,13515038	0,01826562521	7,03484962	49,48910918	0,9507625994	

Global_data ☆

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	C	D	E	F	G	H	I	J	K	L	M
264	2005	19,12	19,72	9,7	9,431428571	0,69515038	0,4832340508	8,12484962	66,01318135	5,647992301	
265	2006	19,82	19,69857143	9,53	9,465714286	1,39515038	1,946444583	7,95484962	63,27963248	11,09821147	
266	2007	19,71	19,69142857	9,73	9,541428571	1,28515038	1,651611499	8,15484962	66,50157232	10,48020809	
267	2008	19,76	19,65142857	9,43	9,544285714	1,33515038	1,782626537	7,85484962	61,69866255	10,48740545	
268	2009	19,64	19,63714286	9,51	9,535714286	1,21515038	1,476590446	7,93484962	62,96183849	9,642035531	
269	2010	19,76	19,59714286	9,7	9,56	1,33515038	1,782626537	8,12484962	66,01318135	10,84789606	
270	2011	19,53	19,62	9,52	9,588571429	1,10515038	1,221357362	7,94484962	63,12063548	8,780253577	
271	2012	20,12	19,76285714	9,51	9,561428571	1,69515038	2,873534811	7,93484962	62,96183849	13,45076335	
272	2013	20	19,78857143	9,61	9,572857143	1,57515038	2,48109872	8,03484962	64,55880842	12,65609643	
273	NA	NA	NA	9,57	9,55	NA		NA			
274	NA	NA	NA	9,83	9,607142857	NA		NA			
275											
276											
277		18,4543295		8,379467681			82,82983322		12128,11199	113,1561906	
278							0,3273906451		47,93720152	0,3173556828	
279											
280											
281											
282											
283											
284											

Cov(city,globe)=0,317356

We conclude

$$\text{Corr (Tunis,globe)} = \text{COV(tunis,globe)} / (\text{V(city)} * \text{V(globe)})$$

$$= 0,02022$$