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On API Programing:

A Special Report of a PANDAS_PYTHON program
using API on linking different Data Bases.

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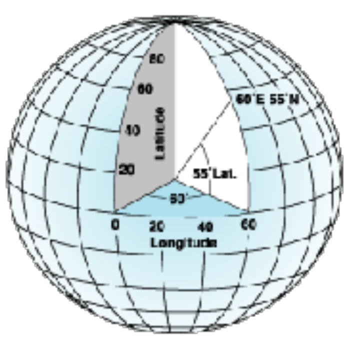
December 14th, 2019

Alemi's API program now on GITHUB was a challenging program that captures the power of API programing applicable in other fields, such as Health systems, Banking, Financials and other data science disciplines. A brief report of its findings follows:

The objective of the program was to capture randomly selected world cities and find their longitude and latitude values and link their corresponding coordinates with 3 key weather attributes: Wind, Temperature & Cloud (Humidity), which resides on a different data base.

Longitude and latitude are angles measured from the earth's center to a point on the earth's surface. The angles often are measured in degrees (or in grads). The following illustration shows the world as a globe with longitude and latitude values, as noted by the following link for a better understanding of GCS system:

https://desktop.arcgis.com/en/arcmap/10.3/guide-books/map-projections/about-geographic-coordinate-systems.htm



The globe is divided in 4 quadrants. North and south are above and below the equator. Latitude values are measured in North – South, relative to the equator, with -90^{0} degrees latitude to the south of pole and +90 degrees latitude to the north pole. The lines of latitude are parallel to the equator line, that highlight something like the Y-values in an Y-X coordinate system, except as noted these are measured in degrees of angles.

The longitudes on the other hand measure in from -180 degrees when moving west, to +180 degrees when moving east. As we move towards the poles, the longitude converges towards zero. The line of a zero longitude passing through Greenwich, England is called the prime meridian.

Based on an API, our program had to find the coordinates of a given city, and link those coordinates to cities temperature and other variables, and draw its own conclusions that follows:

Our first task•was to study the openweathermap API: https://openweathermap.org/api

1. In this case we found:
    a. Where is the API key?
    b. What url end points the API required, as each site has its own specifications
    c. How to hide / ignore the API in the configuration file, when this program was uploaded to Github.

2. The significance of working with APIs cannot be emphasized enough. By bringing or combining API applications from very different sites, a specialist in PYTHON programing or a Data Scientist, can make new discoveries. In fact so important is API programing that many startups are newly created solely on the basis of synthesizing new services out of seemingly disparate services, unthinkable before.

3. Our program is a simple exercise of API application, that can be generalized to other APIs, in other fields, from Banking and Finance to Government and real politics of campaign finance. From demographics to voting patterns. This has already been demonstrated through our group projects.
   see: https://www.mulesoft.com/platform/api/anypoint-analytics

4. For brevity, here we report solely on three observable trends that the Pandas_Python program and its corresponding API research by Alemi, now available on GITHUB captured:

We may assume the following simple model of temperature and wind and see if our data supports its assumptions, noted in: https://openweathermap.org/api

In this simple model, the heat of earth's surface is a function of sun and the angle of its rays that creates the circulation of air that exists. Because of the curvature of the earth, most sun rays hits closer to the equator than the poles, where the rays of sun hot the earth obliquely. Col air in the pole sinks and hot air in the equator rises.

The rising heat however does not traverse directly towards the poles, as the earth also rotates. The simple model expects to see a narrow band of jet streams in the higher levels of the atmosphere, and our data supports the expected hypothesis of this relation, only for selected high range of winds speed, towards north pole.

Segmenting the data, for wind speed below, say 8 mph, no definitive trend can be detected. The data seems random, but above speeds of 8 mph, a positive relation between wind and latitude is detectable. The pressure points seem to be between + and – 50 latitudes, and not +30 as the model expects.

a. Figure 1 provides a sample of 502 world cities scatter gram of wind speed by latitude.

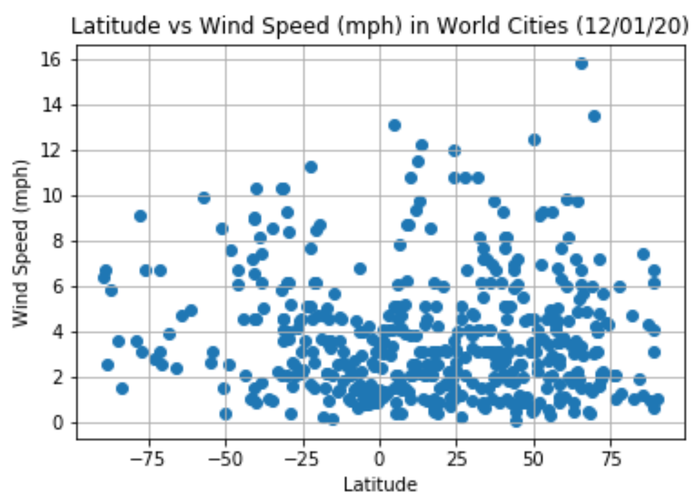


Figure 1

b. Figure 2 below, captures the relation of Humidity to that of Latitude. The cluster appears regular/random across latitudes, with a relative absence of humidity near the equator, though relative to past studies the humidity is more so around the equator, in addition global warming may have also contributed to more humidity in north / south poles, which past studies did not show much of humidity. These also could be differences in sample size and timing of different studies.
See: https://khmccurdy.github.io/weatherpy/humidity.html

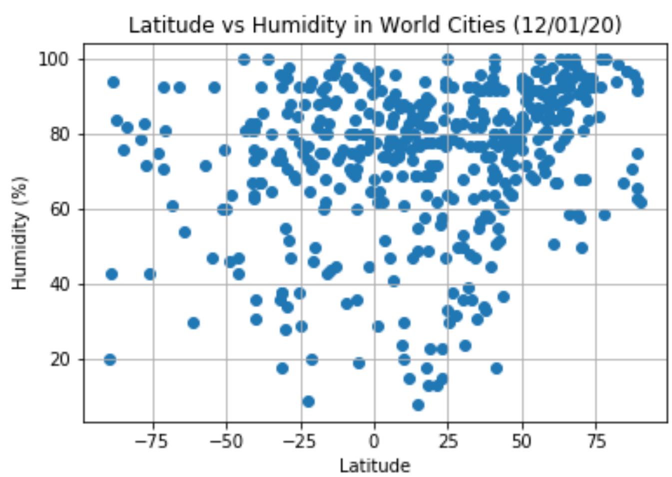


Figure 2.

A second detectable trend is the relation between Latitude and humidity for the sampled World Cities. The majority of world cities on Dec 1st, 2019 registered a humidity of more than 60%, regardless of their latitude, which is very surprising, as Latitude captures the degrees of distance from the equator, with +/-90 degrees, being the north and south poles.

c. Figure 3 captures the percentage of ALL clouds by latitude on a random sample of world cities

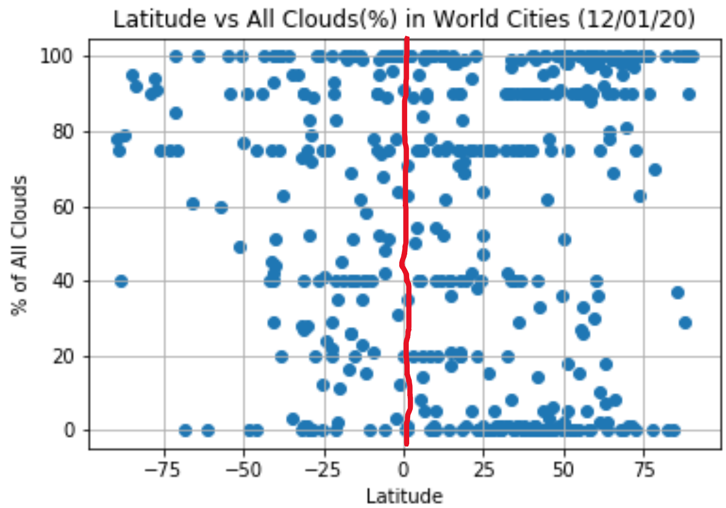


Figure 3.

In Figure 3 we detect the 3rd trend: The relation of % of all cloudy to Latitudes. Here we also find no significant relation between No Clouds (%0), with All Clouds (100%) and its ranges as we move on the latitudes, in ranges of -90 to +90. This is partly because the % of clouds could be seasonal, which the above chart does not distinguish, mixing summer with winter! Across latitudes. http://www-das.uwyo.edu/~geerts/cwx/notes/chap08/cloud_lat.html

We should expect cloudiness to be suppressed around the zero latitude, but we do not.
As we should have run the above charts on a monthly basis, which was not part of our original specifications.

Conclusion: There are many variables that need to be added to arrive at any robust conclusion, key among them could be: Different types and causes for winds as we move from different latitudes that cannot be mixed up with other types. Any weather data must consider seasons and months! Which all 3 charts ignore.

In other words Time is essential for any dynamic analysis.

Sources:

1. https://openweathermap.org/api
2. http://www-das.uwyo.edu/~geerts/cwx/notes/chap08/cloud_lat.html
3. https://khmccurdy.github.io/weatherpy/humidity.html
4. https://www.windows2universe.org/earth/Atmosphere/clouds/heights_latitude.html
5. https://earthobservatory.nasa.gov/images/85843/cloudy-earth
6. https://developers.google.com/maps/documentation/geocoding/intro