Creating trend functions for weather and related keyword searches

Damien Marius M. Estacio

Background

Heat Stroke

Heat Exhaustion

Symptoms as stated by the CDC and National Institute for Occupational Safety and Health (NIOSH)

- Confusion, altered mental status, slurred speech
- Loss of consciousness (coma)
- Hot, dry skin or profuse sweating
- Seizures
- Very high body temperature
- Fatal if treatment delayed

- Headache
- Nausea
- Dizziness
- Weakness
- Irritability
- Thirst
- Heavy sweating
- Elevated body temperature
- Decreased urine output

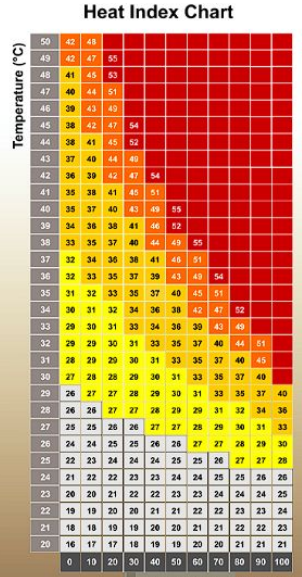
https://www.cdc.gov/niosh/topics/heatstress/heatrelillness.html#:~:text=Heat%20stroke%20is%20the%20most,within%2010%20to%2015%20minutes.

Gaano ba kainit ang panahon?

Payong PAGASA sa tag-init

Ang init na nararamdaman ng katawan ng tao *(apparent temperature)* ay hindi akmang nasusukat gamit lamang ang temperatura ng hangin *(air temperature)*. Ito ay mas tamang naitataya kung isasama ang datos ng alinsangan o halumigmig *(relative humidity)*. Ang impormasyon na ito ay tinatawag na **Heat Index** at ito ay matutukoy gamit ang Heat Index Chart na nasa kanan.

Mula Marso hanggang Mayo, ang DOST-PAGASA ay nagbibigay ng *Heat Index monitoring and forecast information* na makikita online sa sumusunod na URL:
http://bagong.pagasa.dost.gov.ph/climate/climate-heat-index



Effect-based classification	Effect on the body
27–32°C Caution	Fatigue is possible with prolonged exposure and activity. Continuing activity could lead to heat cramps.
33–41°C Extreme Caution	Heat cramps and heat exhaustion are possible. Continuing activity could lead to heat stroke.
42–51°C Danger	Heat cramps and heat exhaustion are likely; heat stroke is probable with continued exposure.
52°C and beyond Extreme Danger	Heat stroke is imminent.

Note: heat index values adapted from Steadman, 1979; classification threshold adapted from National Weather Services, National Oceanic and Atmospheric Administration (NWS-NOAA).

Important survival information about heat-related illnesses*:

Causes :
- Prolonged exposure to hot temperatures
- Exhausting activities in a warm weather
- Age (the elderly and infants)
- Weak immune system
- High humidity
- Obesity
- Chronic alcoholism

Symptoms :
- Sweating heavily
- Exhaustion or fatigue
- Dizziness or light headedness
- Blacking out or feeling dizzy when standing
- Weak but fast pulse
- Feeling of nausea
- Vomiting

Prevention :
- Limit the time spent outdoors
- Drink plenty of water
- Avoid tea, coffee, soda and liquor
- Wear umbrellas, hats, and sleeved clothing outdoors
- Schedule heavy-duty activities for the beginning or end of the day, when it's cooler

Emergency response:
- Move the person to a shady spot and lie him/her down with legs elevated. If conscious have them sip cool water.
- Remove clothing, apply cool water to the skin and provide ventilation.
- Apply ice packs to the armpits, wrists, ankles, and groin.
- Bring to a hospital immediately

Sources:
** 1) Health Advisory on Heat Stroke.* Department of Health; 2) *https://www.webmd.com/first-aid/understanding-heat-related-illness-basics;*
Steadman, R. G. (1979). The Assessment of Sultriness. Part I: A Temperature-Humidity Index Based on Human Physiology and Clothing Science, Journal of Applied Meteorology and Climatology, 18(7), 861-873. Retrieved Mar 2, 2022, from https://journals.ametsoc.org/view/journals/apme/18/7/1520-0450_1979_018_0861_taospi_2_0_co_2.xml

https://www.pagasa.dost.gov.ph/weather/heat-index

Methods

Temperature of 2024

Taken from https://www.pimohweather.com/wxpimohAlltimeRecordsWD.php

PIMOWEATHER Station based in Caloocan City

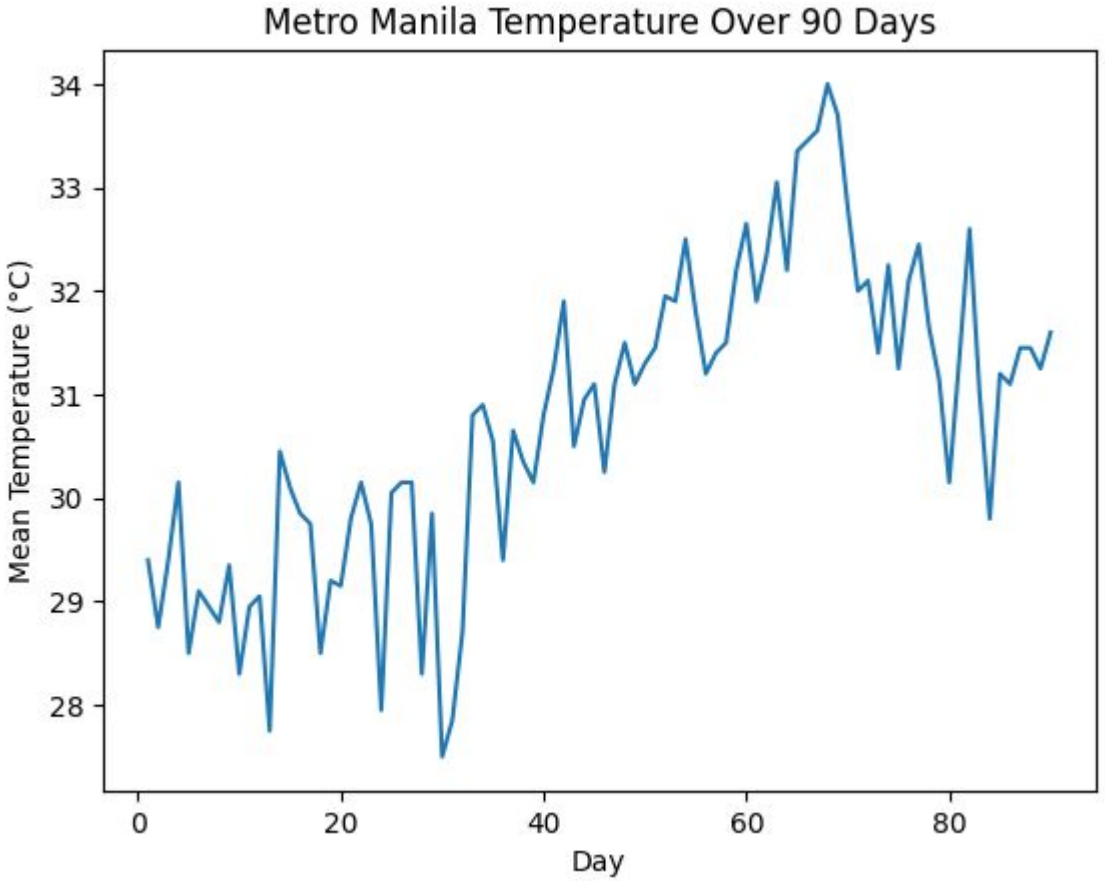
Average temperature was taken

Daily Detail | Monthly Summary | Seasonal Summary

Temperature | Rain | Wind | Wind Run | Wind Direction | Barometric Pressure | Degree Days | Sunshine Hours | Solar kWh | UV | Dew Point | Wet Bulb | ET | Humidity

Day	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo
1	32.4	25.3	31.5	24.1	32.4	24.2	35.4	27.1	36.7	27.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2	31.9	25.2	31.7	24.9	33.0	24.9	36.9	26.9	37.5	26.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3	32.9	25.5	34.5	24.4	33.1	25.0	34.8	26.2	35.5	27.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4	32.9	26.1	33.0	25.8	30.6	24.9	34.8	27.1	36.6	27.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5	32.5	25.9	31.8	24.2	35.2	25.7	35.6	26.6	36.0	26.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6	31.3	24.2	32.7	24.6	35.0	25.2	33.2	27.3	37.1	27.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7	31.6	25.9	33.0	24.0	33.9	25.8	36.0	26.2	37.1	27.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8	31.3	24.3	32.5	25.2	33.1	26.4	36.1	26.9	35.2	28.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
9	31.4	24.8	32.5	24.8	30.8	26.2	35.8	26.4	35.8	26.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10	32.7	25.4	31.6	24.9	32.3	26.1	35.0	27.6	34.4	25.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---
11	31.6	25.5	32.5	24.5	32.3	26.0	35.4	27.5	35.3	27.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12	30.2	25.3	31.2	24.7	33.2	26.4	36.4	27.5	37.3	27.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13	31.0	25.3	32.6	22.7	33.3	27.0	36.8	27.0	37.0	25.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14	31.0	23.7	32.3	24.9	33.9	25.6	37.2	27.8	34.6	25.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15	31.2	23.7	32.4	24.2	29.9	26.0	36.0	27.6	36.1	26.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16	31.8	25.1	32.3	24.7	33.6	26.5	35.6	26.8	35.7	26.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
17	31.3	24.5	32.2	24.9	34.1	26.2	36.2	26.6	36.4	26.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
18	30.6	22.2	33.8	24.6	33.8	26.5	36.1	26.9	36.1	26.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---
19	31.3	24.3	35.3	25.0	32.2	24.4	36.2	28.2	34.9	27.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---
20	30.0	24.5	35.1	25.3	33.4	26.3	37.6	27.7	36.4	26.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---
21	31.7	24.7	33.5	25.3	29.7	25.3	36.7	27.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
22	30.6	25.3	32.5	25.0	31.6	24.1	37.6	27.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
23	32.6	25.3	33.2	25.6	33.2	24.2	37.9	28.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
24	32.3	25.4	34.3	26.0	36.0	25.6	36.6	27.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25	31.0	24.4	31.5	25.5	35.4	26.4	37.9	28.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
26	29.9	23.8	33.5	24.7	33.6	27.5	38.1	28.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
27	29.2	22.3	33.3	24.6	34.6	24.2	39.0	28.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
28	28.5	22.6	33.2	24.4	35.4	25.9	38.1	29.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
29	31.5	23.4	34.7	24.0	34.8	25.9	37.5	29.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
30	31.2	22.9			34.2	26.1	37.6	28.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
31	30.3	23.3			36.2	25.4			---	---			---	---	---	---			---	---			---	---

Mean Temperature



Google Trends

Data from 2004 onwards

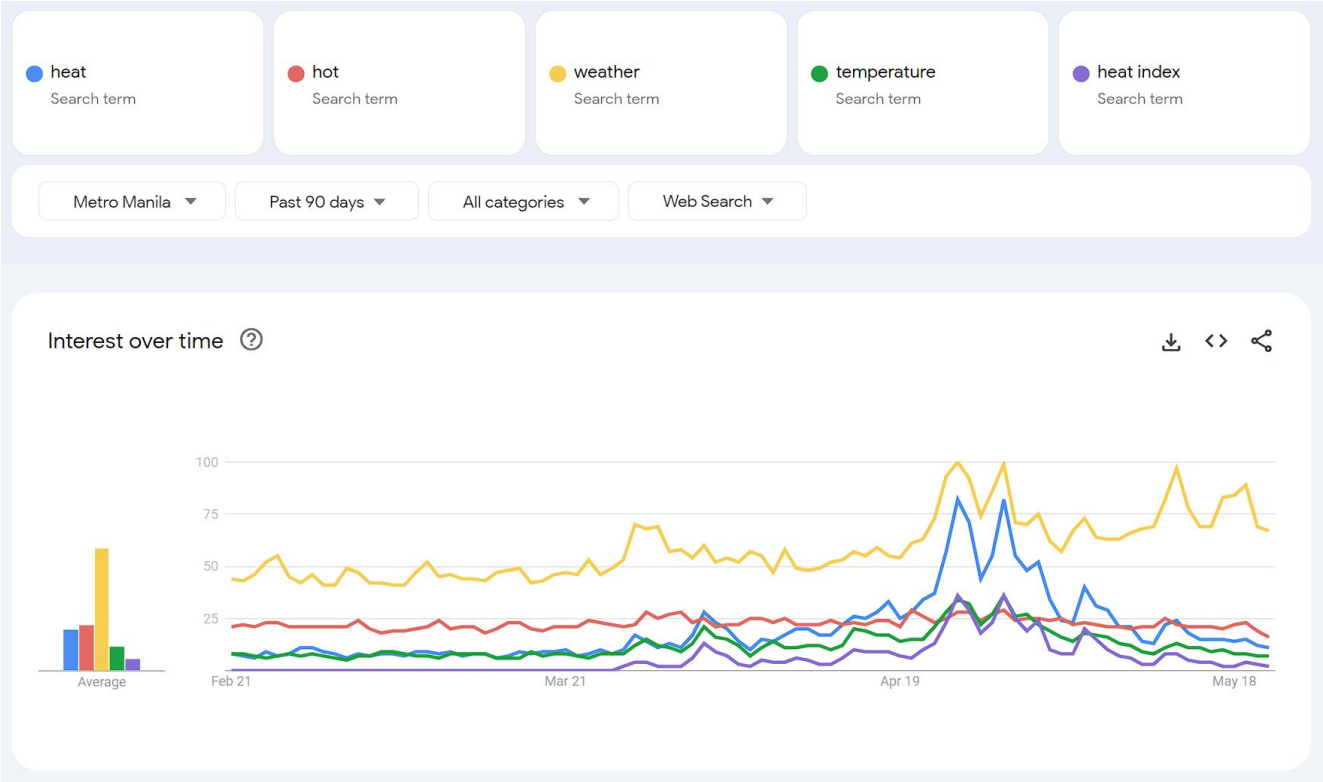
Scaled output

Returns interest in topics over time, allowing one to gauge public opinion. Peaks may correspond with seasonal trends or regional trends.

Has use for market research, niche topics, or product comparison.

May be messy.

https://www.fabrikod.com/benefits-of-using-google-trends



Related to Hot Weather

Actual search values not present

Maximum of five terms can be compared simultaneously

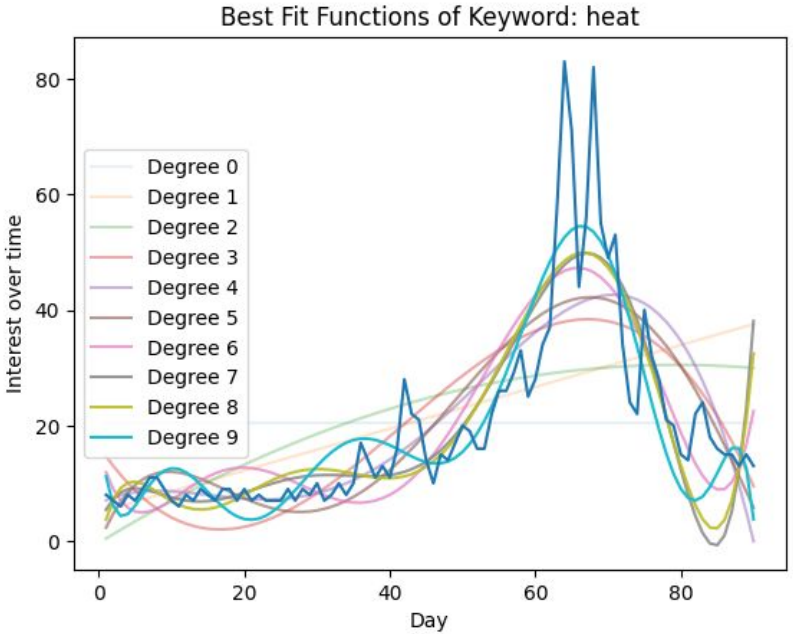
Other terms were considered, but relative interest was not high enough

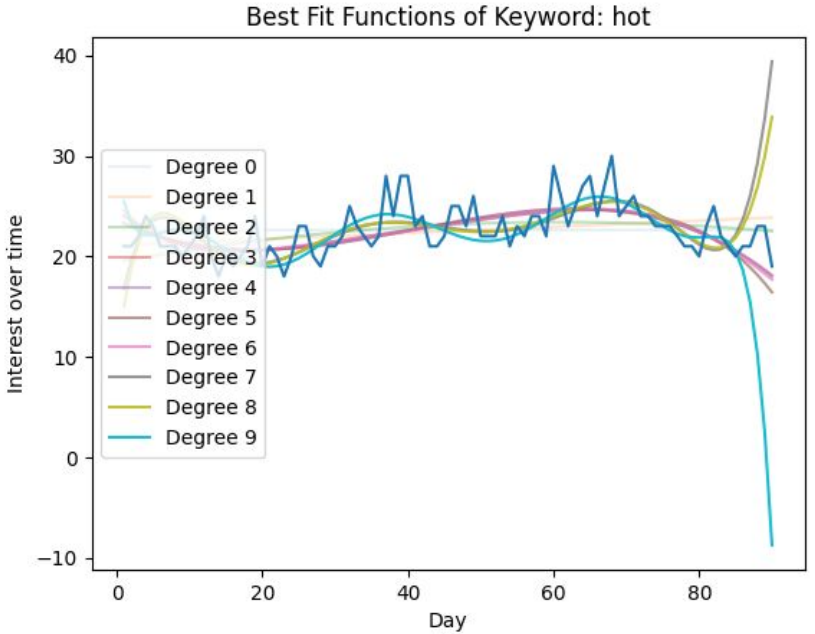
Code implemented

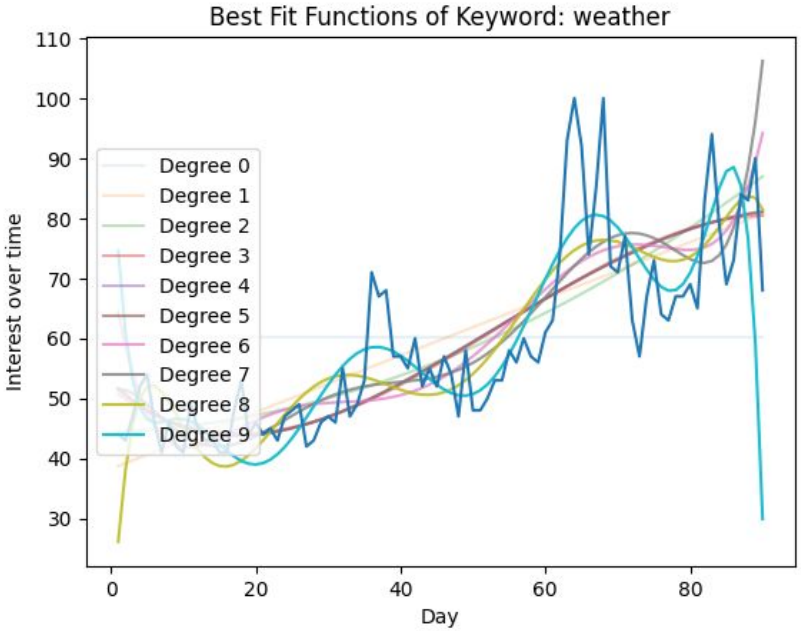
Data was saved as a .csv file.

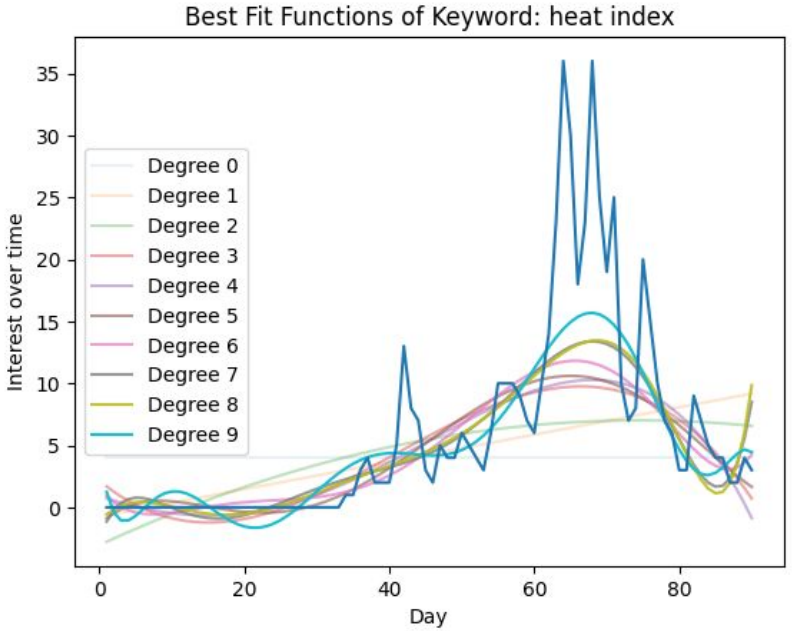
Using the pandas, sklearn, and numpy packages, the data was split and trained.

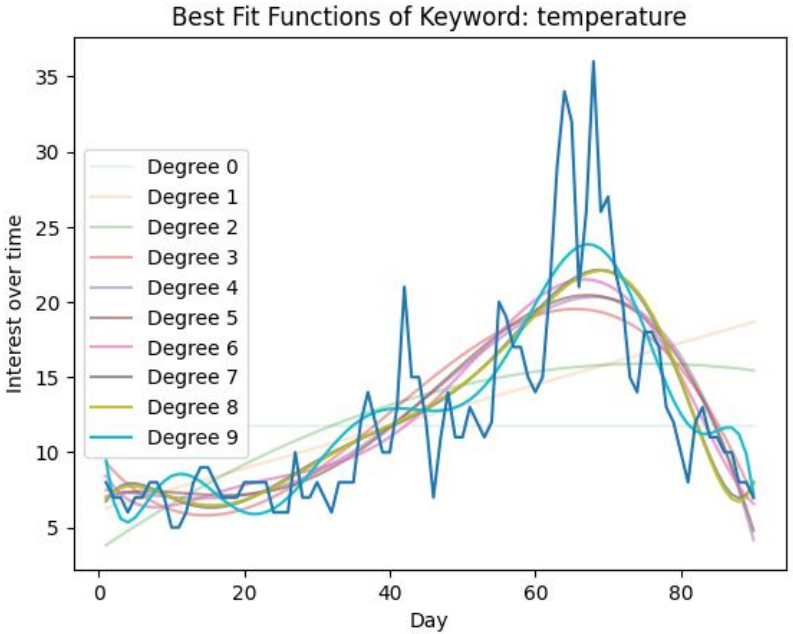
Polynomial fits of degree 0-9 were used.

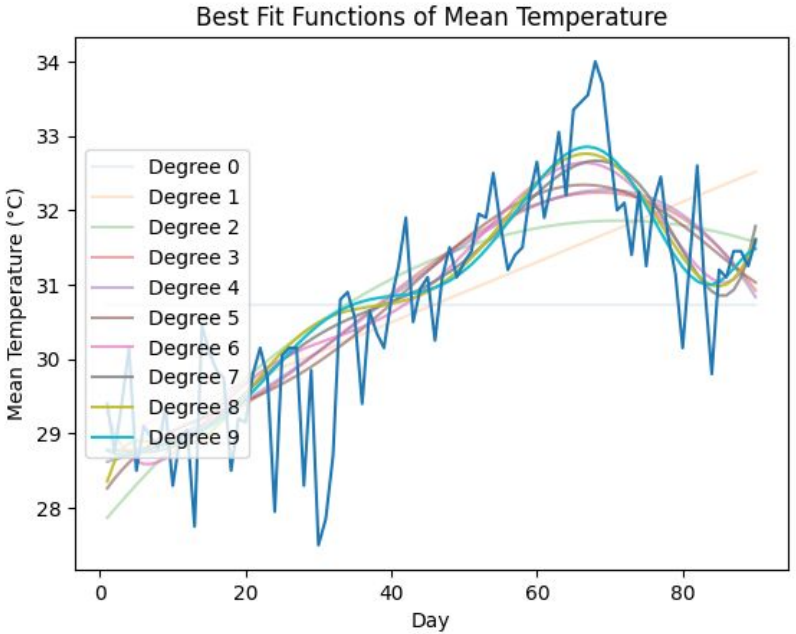

Best Fit Functions of Keyword: heat
Interest over time
Day
Degree 0
Degree 1
Degree 2
Degree 3
Degree 4
Degree 5
Degree 6
Degree 7
Degree 8
Degree 9
0
20
40
60
80


Best Fit Functions of Keyword: hot
Interest over time
Day
Degree 0
Degree 1
Degree 2
Degree 3
Degree 4
Degree 5
Degree 6
Degree 7
Degree 8
Degree 9
−10
0
10
20
30
40

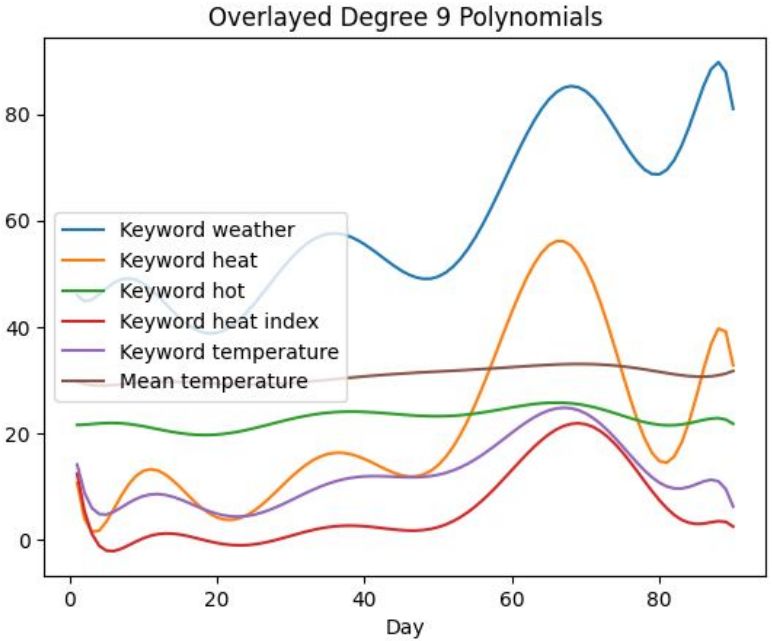

Best Fit Functions of Keyword: weather
Interest over time
Day
Degree 0
Degree 1
Degree 2
Degree 3
Degree 4
Degree 5
Degree 6
Degree 7
Degree 8
Degree 9

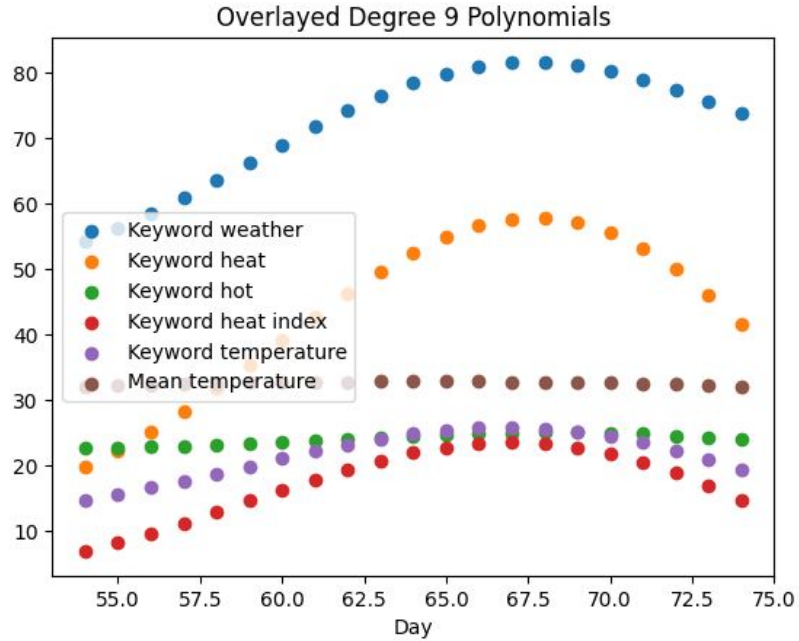

Best Fit Functions of Keyword: heat index
Interest over time
Day
Degree 0
Degree 1
Degree 2
Degree 3
Degree 4
Degree 5
Degree 6
Degree 7
Degree 8
Degree 9


Best Fit Functions of Keyword: temperature
Interest over time
Day
Degree 0
Degree 1
Degree 2
Degree 3
Degree 4
Degree 5
Degree 6
Degree 7
Degree 8
Degree 9


Best Fit Functions of Mean Temperature
Mean Temperature (°C)
Day
Degree 0
Degree 1
Degree 2
Degree 3
Degree 4
Degree 5
Degree 6
Degree 7
Degree 8
Degree 9

Which temperatures exceed 32 degrees?





Results and Discussion

There are points of the best fit curves of the keywords that coincide with hot temperatures.

Keywords “weather” and “heat” in particular had the highest search interest.

No particular correlation tests were done, as no actual search numbers were found. The use of Google Trends as a substitute for heat illness cases has not yet been explored.

No RMSE values were obtained, as there is no original “function” to compare to.

Conclusions

Google Trends may be used as a substitute for medical case numbers upon further study.

Models with a larger and more accurate data sample may be used for predictions of heat stroke cases.