# Are UFOs Really Airplanes?

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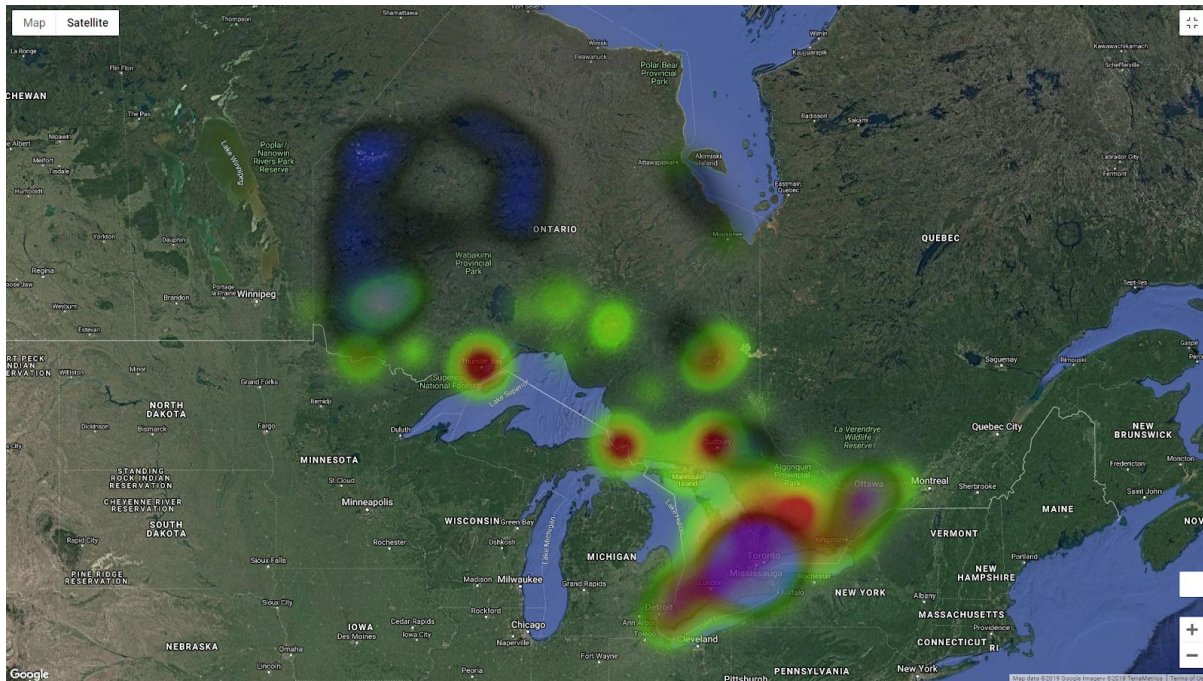
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## Introduction:

The visiting of extraterrestrial beings has been a subject of popular debate for over a century. When the Soviet Union first launched Sputnik into orbit the inevitable question followed: If we can reach space, why can't beings from other planets. This began a period of numerous unexplained phenomenon the most common of which is the sighting of Unidentified Flying Object (UFO's) which many have attributed to the visiting of earth by Aliens. While it  is not possible to prove that these sightings are in fact Aliens we can explore if they have more world-bound explanations. The most obvious explanation for theses UFOs is that the witnesses have mistaken human aircrafts for something they did not recognize. It is this theory that we explore in-depth, by comparing various markers of flight activity with the sighting of UFOs.

## Does the proximity to airports influence the number of UFO sightings?
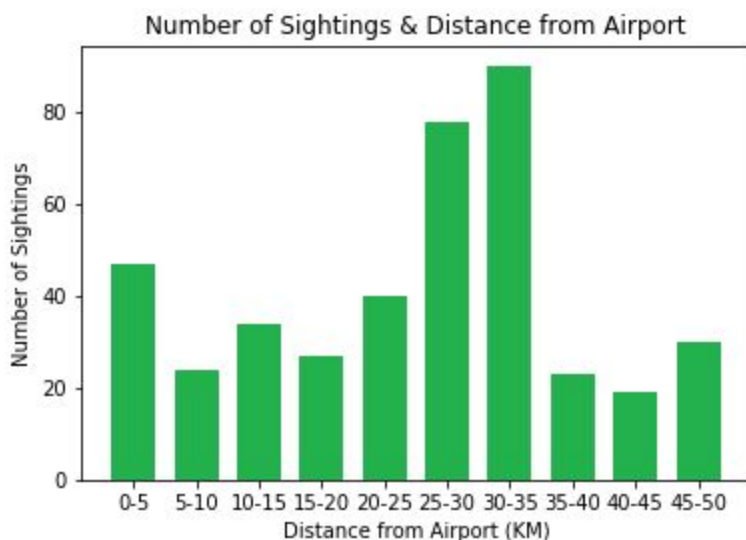


This graph does not show a clear answer to if you are closer to the airport, you most likely saw an airplane.  The largest number of sightings were between 25-35KM away from the airport.  It may be a possibility to say that an airplane looks more like a UFO at this range and if you were closer to the airport, you would know it is an airplane.  The third largest amount of sightings are 0-5KM away from the airport which is worth mentioning.  In general, there is no clear relationship between airport distance and sighting.

       The Figure above shows a heatmap of the sightings in Ontario. The markers represent the locations of Ontario's most popular airports. We can see that there is a clear correlation as the sightings cluster around airports. The sightings are also mostly seen in southern Ontario. This is because of higher densities of population and airports. We can make this correlation because we assume airport placements and airport density are in direct relation to population density.

# Does local flight traffic contribute to the number of UFO sightings?



In the Figure above, A heatmap of departures per airport (black and blue) was placed on top of the UFO sightings heatmap. The weight placed was based on the log scale of the departures per airport. This was done to normalise the data. While Toronto and Ottawa see close to 3,000,000 and 1,600,000 departures respectively, most of the other airports see less than 50,000 a year. Looking at Ottawa and Toronto we can see that there are a lot of departures and a lot of sightings as well. There are however other locations such as Thunder Bay where they experience many UFO sightings but not as many airport departures. Here we do not see a correlation between the number of airport departures and alien sightings.

# Does the change in flight traffic over time influence the number of UFO sightings over that same time period?



Flights in Years - (Size = Sightings)
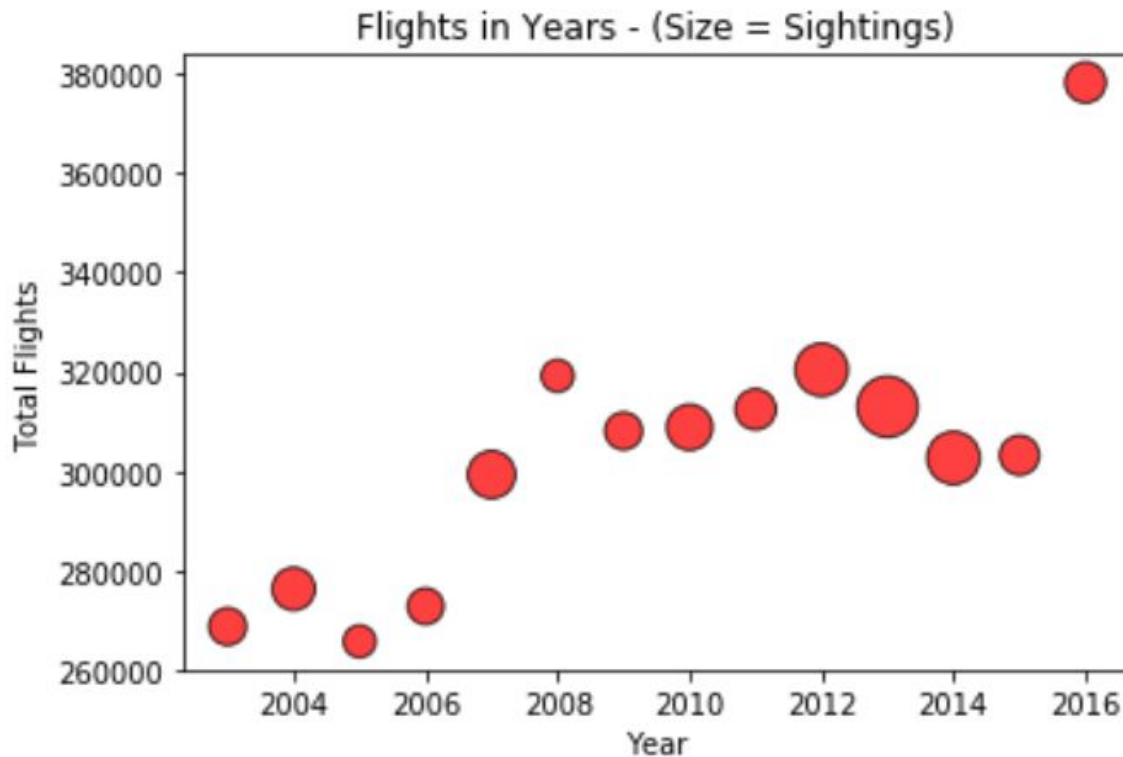
The bubble chart presents x as the years covered in the analysis, y as the number of flights and the bubbles are showing sightings for specific period. The volume of flights, both departures and connections, in Ontario steadily rose over the years. A sharp increase was registered in 2016, the period when the number of sightings was noticeably low. There is neither an increase pattern nor a decrease pattern in the level of reported sightings from 2004 to 2016. The number of sightings reached its peak in 2013, when the number of flights recorded a modest decline from the previous year.

**Double Regression: Number of Sightings & Number of Flight Over Time**
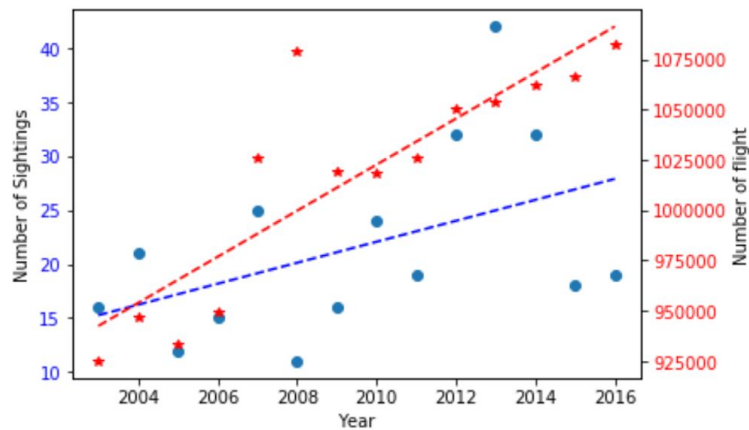
This figure compares yearly UFO sightings with yearly flight departures. While both metrics show a general trend of increasing over time, the growth in the number of flights is statistically significant (P-value = 7.5X10^-5) while the growth in sighting is ot (P-value = 0.0928). If the majority of UFOs are in fact human aircrafts you predict that both parameters should increase at a similar rate. As this is not the case we can conclude that airplanes are likely not airplanes.
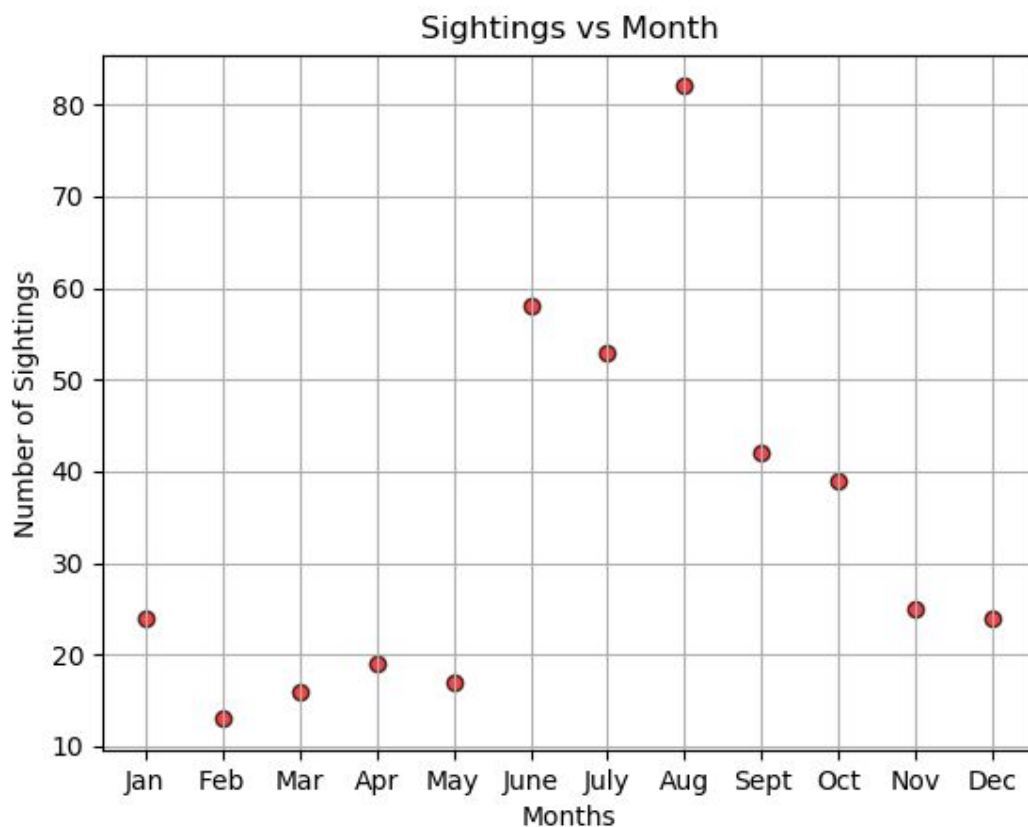
# Discussion:

**Additional questions that came up, but which you didn't have time to answer: What would you research next, if you had two more weeks?**

The unknown and intriguing nature of UFO's brings with it lots of different variables to consider. And this was visible in our discussions. If we had 2 additional weeks, we would research:

1) The weather.
   Our data allowed us to briefly map out the count of sightings against months.

## Sightings vs Month

*(Scatter plot: Number of Sightings vs Months)*

| Month | Number of Sightings |
|-------|--------------------|
| Jan | 24 |
| Feb | 13 |
| Mar | 16 |
| Apr | 19 |
| May | 17 |
| June | 58 |
| July | 53 |
| Aug | 82 |
| Sept | 42 |
| Oct | 39 |
| Nov | 25 |
| Dec | 24 |

This graph shows us that there are more sightings during months with clearer skies, and longer days of light. We would further like to explore if there is a relationship between sightings and number of flights per month, but however we were unable to find monthly flight stats.  This is but an initial graph that begins to find how human behavior affects the likelihood of ufo sightings. Other such influencers could be time of the day, and even time of week , along with weather and seasons

2) Population densities:
   Population densities of places would be worth exploring, to perhaps establish a   pattern in volume or frequency of sightings. And further lead into the landscape, light quality and

pollution, and building density to see if there is a difference in sightings in urban vs rural areas.

1) In two additional weeks, we would research populations densities, compare with weather conditions and broaden the scope from just ontario to the world, to see a larger pattern and perhaps determine if particular regions see more frequent sightings than others.
2) We would try to return to our original questions, of UFO sighting vs alcohol consumption perhaps we would be able to find liquor sales per state/country or blood alcohol consumption of those reporting sightings!

# References:

1)
 https://www.icao.int/safety/iStars/Pages/API-Data-Service.aspx
 Airport Departure Statistics - Statistics on scheduled commercial departures and connections by airport since 2003

 2)
http://ufo-api.herokuapp.com/api#home
The UFO API is a collection of UFO Sightings served through an API.
The original dataset is coming from The National UFO Reporting Center. The data has been modified and augmented with location data, to allow location based searches. Note that the returned location data is in (lon, lat) format.

3)
Google maps API
Used to get latitudes, longitudes and names of Airports