Natalia Jauregui
SID: 3039043373

Python Decal Final Project Report

With this project, I originally set out to compare the relationship between the distance of a planet from the sun to said planet's equilibrium temperature, using ten Goldilocks planets as a case study. I soon realized that the data set I was intending to use, the NASA exoplanet archive of confirmed planets, did not have available information on the distance between a planet's star and the planet itself, not to mention many of the confirmed exoplanets existed in a multi-sun solar system. I instead chose to focus on finding a relationship, or lack thereof, between a sun's luminosity and a planet's equilibrium temperature.

In order to achieve a dataset I could work with, I created a CSV file with every confirmed exoplanet that had one sun and edited out all other information besides the planet name, number of suns, planet equilibrium temperature, and sun's luminosity. However, I did run into an issue with the fact that there were gaps in the information for the sun's luminosity and planet equilibrium temperature. Using a data frame function, I took out any rows that were missing a piece of information in any column.

Another issue I ran into with the CSV file was that because I downloaded it off of the NASA website, the file included at least 200 lines at the top that summarized the copyright, dating, and company information that could not be read by the functions I was trying to do. To fix this, I had to go into the file and manually delete the top 200 rows leaving only the CSV file information I needed. With that, I had my final, workable CSV file.

After that, I found which planets have equilibrium temperatures between 255 and 300 Kelvins, which is the relative range of temperatures that humans can survive in. This filter resulted in 24 planets that I could use in my case study on the relationship between a sun's luminosity and a planet's equilibrium temperature.

I plotted these planet's information on a graph with the sun's luminosity as the independent variable affecting a planet's equilibrium temperature as the dependent variable. My initial theory was that the sun's luminosity, as it increases, would cause the planet's equilibrium temperature to increase as well.

After I model-fitted my data, which was very difficult on account of figuring out how to best display my data that would result in the clearest possible display of information, my theory was disproved as the line, instead of heading up and to the right, dipped. According to the model-fit, a sun's luminosity, as it increases, causes planet equilibrium temperature to slightly decrease.

I could attribute this disproven theory to many factors, such as the mass of these stars, the distance between the star and planet, if the planet can absorb heat as readily as the next, and so on. Although I set out to prove a theory with only the sun's luminosity and a planet's equilibrium temperature, I learned that the elements that go into a planet's temperature are much more complicated than one factor and cannot be explained in that way.

As for the python part of this project, I learned much more about proper syntax and my ability to search up and find out what functions will help me accomplish my goals. Finding the correct functions from my notes and the pages in the Python Decal bCourses and then correctly applying them to my project was unexpectedly time consuming, albeit worthwhile of course.

In order to extend this project, I would do more research on each planet to find their distance from the sun because I believe that only using the sun's luminosity does not completely capture a relationship between a sun and planet. I would find a way to plot both relationships either on one plot or right next to each to show that a sun's luminosity and distance between a star and planet do not, contrary to what some might initially think, have the same effect on a planet's temperature.

All in all, this project taught me a lot more about hands-on python programming in relation to real world scenarios where all factors have to be taken into account as well as what I could think about the next time I am faced with this kind of problem.