**What Factors Determine a Star to be Red or Blue?**

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**What Factors Determine a Star to be Red or Blue?**

I did an analysis on a star data set. The data set was originally used for predicting star types. But I used it to find the conditions and factors that determine a star’s color. The attributes or units of measure for a star include: Temperature, radius, luminosity, magnitude, star type and spectral class. Temperature is measured using Kelvins abbreviated as K. There are six types of stars: 0, 1, 2, 3, 4, 5. There are seven spectral classes of stars: A, B, F, G, K, M, O. There are five different star colors: Red, blue, white, yellow and orange. The tools I used were Microsoft Excel and Jupyter Notebook. Within Jupyter Notebook I used the programming language called Python. Within Python I used the libraries Pandas and Matplotlib.

**What conditions need to be present for a star to be Red?**

The temperature of a red star seems to be below 10,000 K. A star can still be red even with pretty low temperatures compared to other stars. So out of the other colors, red stars are the coldest. Red stars tend to have a luminosity below 400,000 L/Lo. But, the outliers of the red stars data subset are the ones reaching around the 400,000 L/Lo level. Majority of them are in the 0-200,000 range of luminosity. So out of all the star colors, the red stars seem to have the lowest luminosity. The radius of a star seems to have no significant effect on it exuberating the color red. I determined this from the fact that the red star data subset has a wide range of radii. Magnitude seems to have no significant effect on a star exuberating the color red. The magnitude has less significance than the radius. Majority of the red star data subset is ranging from the largest to the smallest magnitude in the entire data set. Almost all red stars have the spectral class M. The only two exceptions was one having K and the other having G. Both stars were in the outlier group for their temperatures and luminosity being way high above the average range. So this shows that maybe the combination of high temperature and high luminosity can cause a star to exuberate the color red.

**What conditions need to be present for a star to be Blue?**

The temperature of the blue star data subset was on the high spectrum. The hottest stars in entire data set are the blue stars. So one key factor for a star to exuberate blue is to be extremely hot. The luminosity of the blue stars is also on the high end of the spectrum. The radius of a blue star seems to be not too significant but still an impact. Majority of the blue star data subset was below 250 R/Ro. But, about six outliers are between 1000-2000 R/Ro. Magnitude of blue stars seem to be divided into two groups. One group has their magnitude -5 and below. The other group have a magnitude between 8-15 Mv. Blue stars were one of two classes: O or B. An interesting thing I discovered was if the magnitude was in the lower group, the luminosity was high; If the magnitude was in the higher group then the luminosity was low. The combination of a low luminosity and a high magnitude maybe cause a star to exuberate blue. Also, vice versa seems to have the same effect as well.

**Conclusion**

So, the conditions that might cause a star to exuberate red are (in order of significance):

* + Low temperature
  + Low luminosity
  + (special case) High temperature and high luminosity

From the analysis it also seems that the temperature and luminosity both matching spectrum levels will cause a star to be red, but I would need more red star data of the high spectrum combination to determine that.

The conditions that might cause a star to exuberate blue are (in order of significance):

* High luminosity and low magnitude
* Low luminosity and high magnitude

So, it seems that those two attributes being on the opposite sides of their respective spectrums causes the color blue to exuberate. The shade of blue might be based off the difference between the two attributes’ spectrum levels. But, I would need more data of blue stars and the specific shade of blue that they have to determine that.

**References**

Baidya, Deepraj. “Star Dataset to Predict Star Types.” *Kaggle*, 21 Oct. 2019, www.kaggle.com/deepu1109/star-dataset.