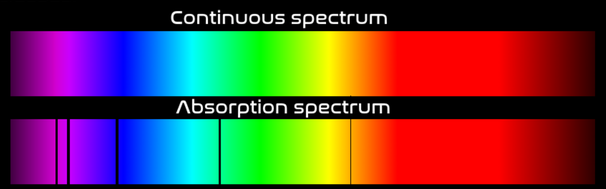
Morgan-Keenan Stellar Classification

Star classification is taking similar properties of stars and grouping them into categories.
There are several systems for doing this but the most common is the Morgan-Keenan system.

First, stars are classified into letter classes based on their absorption lines. These absorption lines are caused by a material, often some element, in between a star and the destination absorbing wavelengths of light. Coincidentially, these absorption lines, and their intensity, directly relate to the temperature of a star which we can denote in 7 different classes.

* O >= 30,000 Kelvin [5]
* B 10,000-30,000 Kelvin
* A 7,500-10,000 Kelvin
* F 6,000-7,500 Kelvin
* G 5,200-6,000 Kelvin
* K 3,700-5,200 Kelvin
* M 2,400-3,700 Kelvin

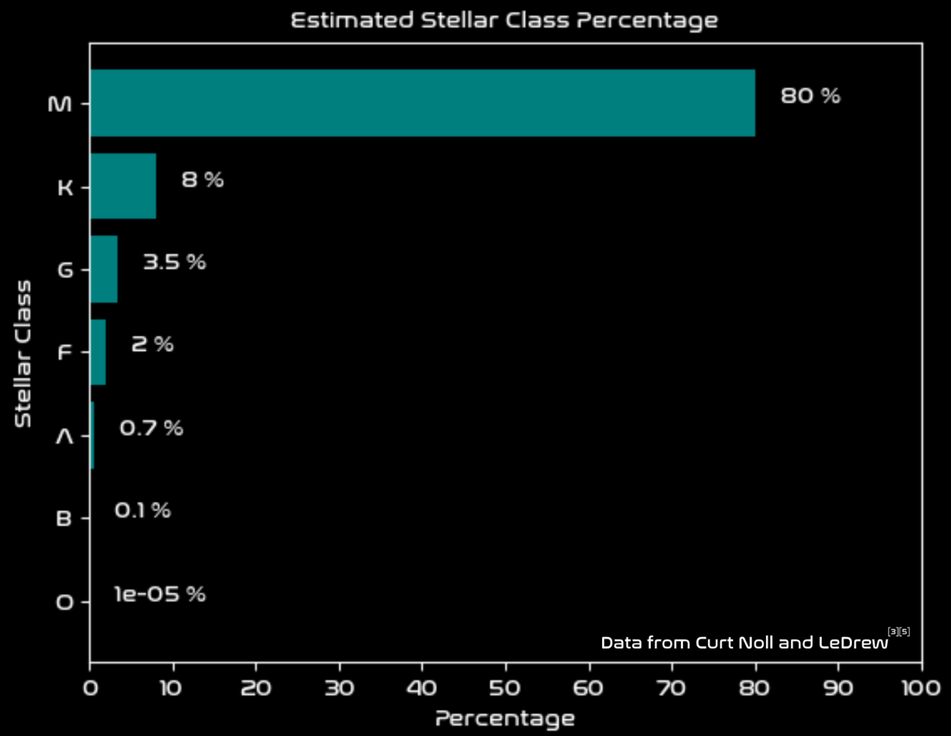


The above is an example of what absorption lines would look like.

Secondly, stars are further subdivided into with a number from 0 to 9 further indicating how hot or cold a star is. 0 is the hottest, while 9 is the coldest.

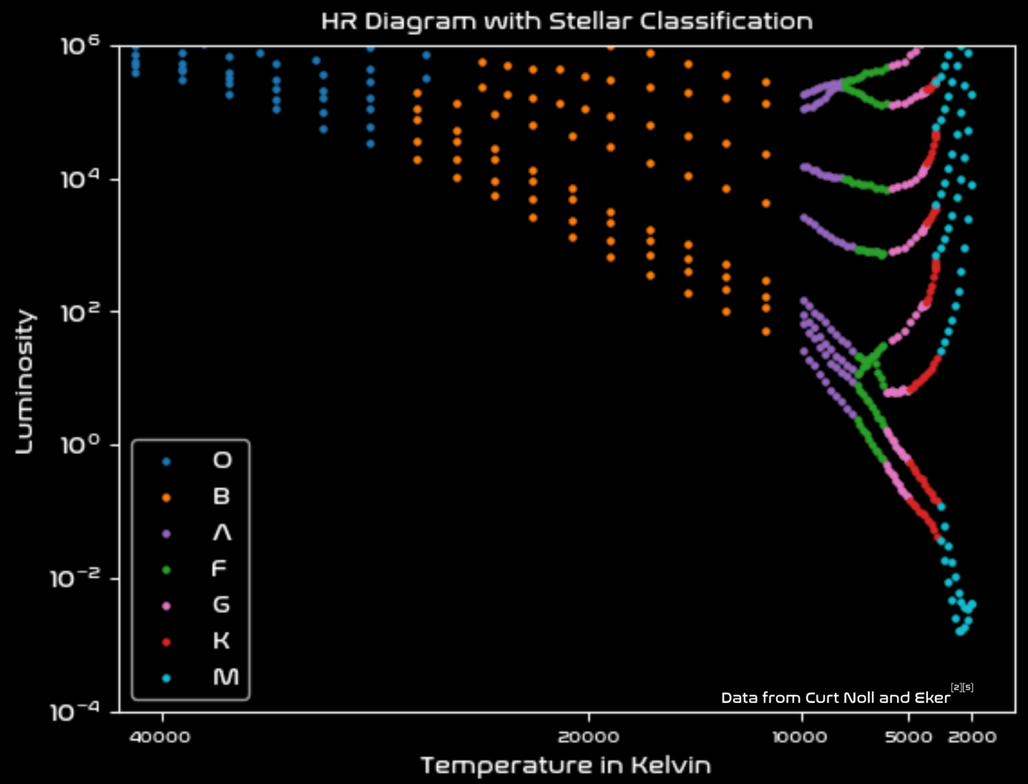
Lastly, there is a roman numeral that denotes luminoisty class.

* 0 Hypergiant [5]
* Ia Supergiant
* Ib Supergiant
* II Bright Giant
* III Giants
* IV Sub-Giants
* V Dwarfs



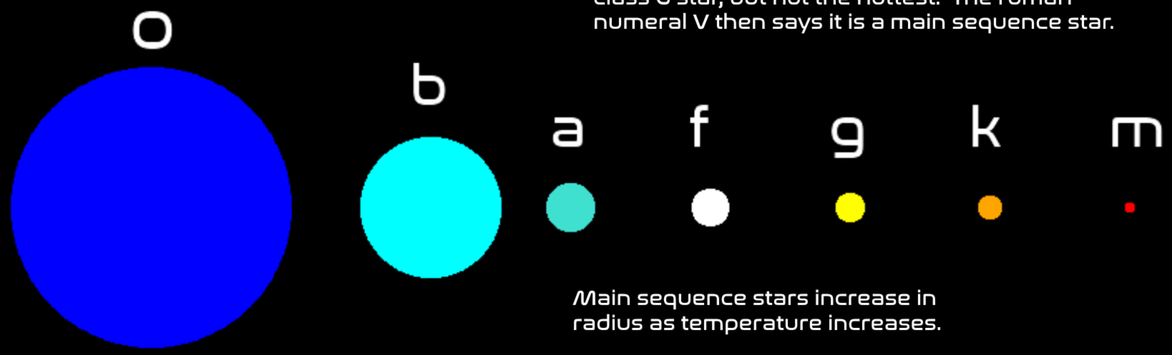
The above graph shows that most stars in the sky are M and K class.

Given this classification what can it tell us about other stars in the night sky?



This graph shows some sample data of stars as they appear on the HR diagram, and their stellar classification. On the main sequence there is a direct trend for increase in luminosity for increase in Kelvin.

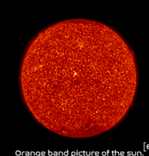
Main Sequence Star Size Comparison



Main sequence stars increase in radius as temperature increases.

The Sun

Our sun is a G2V star. and falls into the G type stars, which are the third most popular type. The 2 also tells us that the sun is a hotter class G star, but not the hottest. The roman numeral V then says it is a main sequence star.



Orange band picture of the sun.[6]

Hottest ... Coldest

This diagram gives a rough size estimate of different class stars along the main sequence. Most stars are M class, and thus tiny, while very few become larger O class stars.

Radius data from Habets and Heintze [4]

Delfosse, X. et al. "Accurate masses of very low mass stars. IV. Improved mass-luminosity relations". \aap 364. (2000): 217-224. [1]

Eker, Z., et al. "Main-Sequence Effective Temperatures From A Revised Mass–Luminosity Relation Based On Accurate Properties." The Astronomical Journal, vol. 149, no. 4, 2015, p. 131., doi:10.1088/0004-6256/149/4/131. [2]

LeDrew, Glenn. "The Real Starry Sky." Journal of the Royal Astronomical Society of Canada, vol. 95, Feb. 2001, pp. 32–33. [3]

Habets, G.M.H.J., and J.R.W. Heintze. "Empirical Bolometric Corrections for the Main-Sequence." Astronomy and Astrophysics Supplement Series, vol. 46, Nov. 1981, pp. 193–237. [4]

Curt Noll, Landon. "Stellar Classification Table - Sorted by HR Class." Isthe, www.isthe.com/chongo/tech/astro/HR-temp-mass-table-byhrclass.html. [5]

"HE II 304 A." Solar Data Analysis Center, NASA Goddard, https://umbra.nascom.nasa.gov/images/latest_aia_304.gif?t=1584853039280. [6]