ASTR21200: Homework 1 (HW1)

1. **Slack:** Create an account on Slack.com. So that you can be added to the class Slack on stoneedgeobservatory.slack.com, what is the email associated with your Slack account?

2. **Equinox:** On the days of the equinox (day and night are equal length), at what azimuth angle does the Sun rise? Where does it set?

3. **LST and HA:** The celestial coordinates of the star Betelgeuse is approximately 5h55m,+07d24m:

   (a) What is the maximum altitude it can be seen from Sonoma, CA (i.e., near Stone Edge Observatory)?

   (b) What is its distance from the zenith then?

   (c) At a Local Sidereal Time (LST) of 3h55m, what is the hour angle of Betelgeuse? Is it to the East or to the West of the meridian?

4. **Culminate:** Orion culminates at 1am in September; at what time does it culminate 3 months later? Describe how you arrived at your answer.

5. **Observability Part-1:** We need to pick a random Right Ascension (RA) and Declination (Decl.). Take your birthday month and multiply it by two, this will be the hours in RA (e.g., January = 2h, November = 22h, December = 0h). Take the current time of day in hours and multiply it by 3 to get the Decl. (e.g., 1am = 3d, 1pm = 39d, 10pm = 66d). Note, you should make sure your declination is positive and between 0 and 90 degrees.

   (a) With this RA and Decl, look up the sky position and search for all objects within 0.5-degrees in simbad[1] or NED[2]. What is the astronomical object with the most paper *references / citations* within 0.5-degrees of the position that you choose? What is: a) this object's identifier?, b) What type of object is it? c) What are its celestial coordinates?, and d) How many paper *references* does it have?

   (b) Make a finding chart for this object using AAVSO[3]. Make the chart 15-degrees across, with North up, and the chart oriented such if you were looking at the sky with the naked eye. Include this finding chart plot in your homework submission.

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[1] https://simbad.cds.unistra.fr/simbad/
[2] https://ned.ipac.caltech.edu
[3] https://www.aavso.org/apps/vsp/

6. **Observability Part-2:** Use the ING StarAlt tool[4] to determine when your object (in the last question) is best visible from Stone Edge Observatory (SEO) (i.e., for this question *best observable* will be when its at its highest elevation in the sky). Note that SEO is not a predefined observatory in StarAlt, so you will need to enter the coordinates manually. For the following questions **make sure to include the relevant figure in your homework submission**.

   (a) What is the optimal observing date for your object? Use the "StarMult" mode to determine this.

   (b) In what months is your object higher than 40deg in the middle of the night? Use the "StarObs" mode to see how the observability changes throughout the year. When it culminates, how far away is the Moon? How much is the Moon illuminated then?

   (c) Choose a date 6 weeks later, and make another "StarAlt" plot. What changed? Are both nights good to observe your target, or is one clearly better?

   (d) *Tutorial Bonus*: You can also make a visibility plot using the python module *astropy*. For an example Jupyter notebook that you can modify see footnote [5]

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[4]https://astro.ing.iac.es/staralt/

[5]`https://docs.astropy.org/en/stable/generated/examples/coordinates/plot_obs-planning.html`