1. Perform an SQL query at (<http://skyserver.sdss.org/dr17/SearchTools/sql>) to find potential binary stars

* binaryStar = apogeeStar where nvisits >= 8, vscatter > 10 verr
* Tutorials: <https://www.sdss4.org/dr17/irspec/use-radial-velocities/>

**-- This query finds binary stars from apogeeStar**

**SELECT star.apogee\_id, star.apstar\_id, star.ra, star.dec, star.nvisits,**

**star.snr, star.vscatter, star.verr**

**FROM apogeeStar as star**

**WHERE star.nvisits >= 8 AND star.vscatter > 10\*star.verr AND star.snr >= 5**

1. Find the period of those stars

* Use SQL to find the visits associated with the above binary stars: JOIN binaryStar AND apogeeStarVisit WHERE star.id = starVisit.id

**-- leave out those who have bitmask #4, #19, #22,**

**-- caution with those who have bitmask #3, #18, #21, #0**

**SELECT TOP 1000**

**star.apogee\_id, star.apstar\_id, star.ra, star.dec, star.nvisits,**

**star.snr as starSNR, star.vscatter, star.verr,**

**starVisit.visit\_id,**

**visit.vhelio, visit.vrelerr, visit.snr as visitSNR, visit.starflag**

**FROM apogeeStar as star**

**JOIN apogeeStarVisit as starVisit on star.apstar\_id = starVisit.apstar\_id**

**JOIN apogeeVisit as visit on starVisit.visit\_id = visit.visit\_id**

**WHERE star.nvisits >= 8 AND star.vscatter > 10\*star.verr AND star.snr >= 5**

**AND visit.starflag % POWER(2,5) < POWER(2,4) --Condition for 4th to be 0**

**AND visit.starflag % POWER(2,20) < POWER(2,19) --Condition for 19th bit to be 0**

**AND visit.starflag % POWER(2,23) < POWER(2,22) --Condition for 22th bit to be 0**

**order by star.apogee\_id ASC**

* Build the Lomb-Scargle Periodograms using AstroPy’s library function (<https://docs.astropy.org/en/stable/timeseries/lombscargle.html>)
* The period is the time value at max power.
* Compile a file containing: star.id; period.

1. Apply the program to allStar file
2. Write a report