Lecture 11:

Homework #1

ASTR 511

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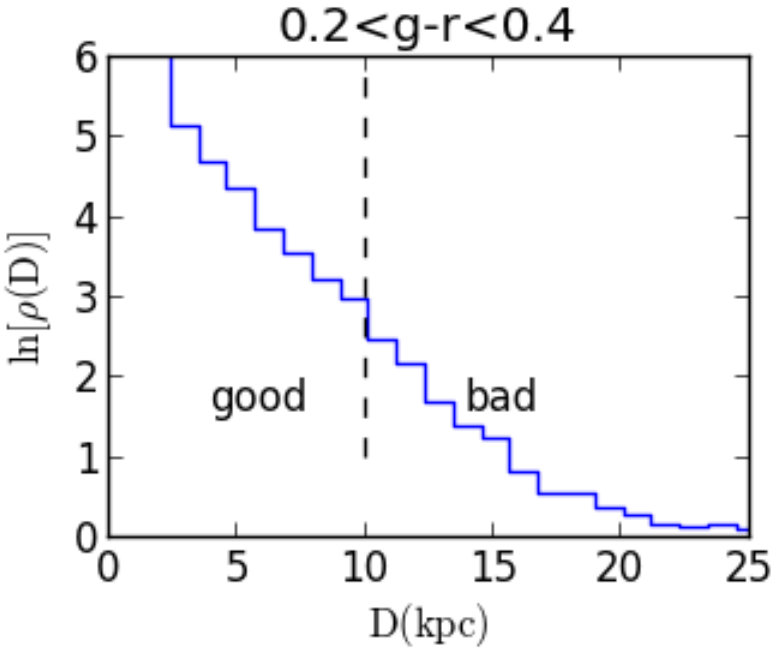
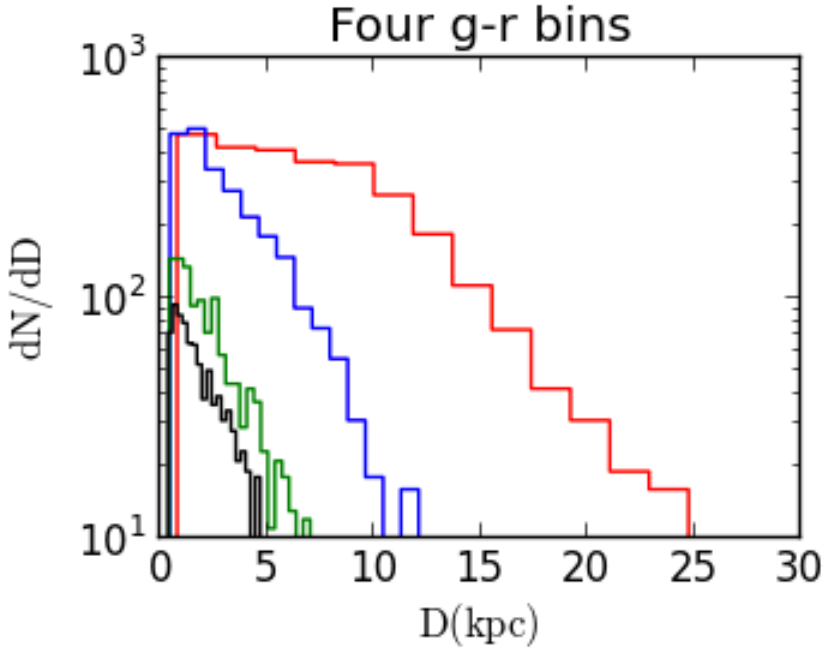
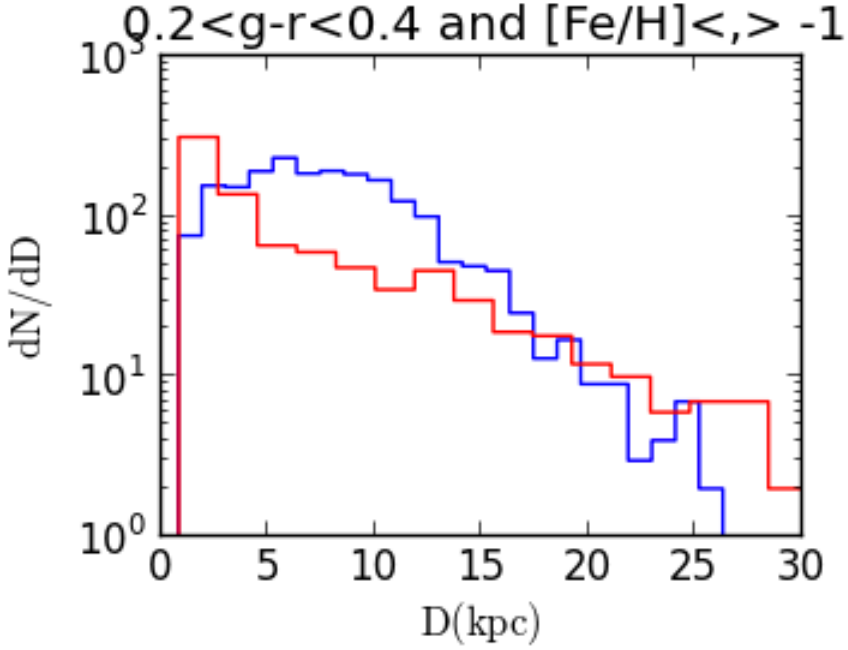
Some Statistics

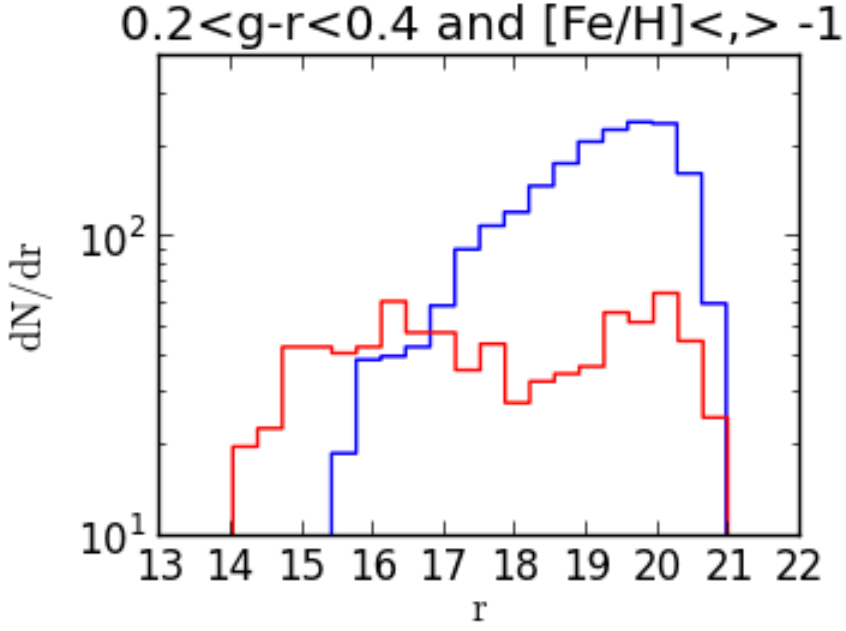
- Perfect score 12 (2 + 3 + 2 + 3 + 2)

- Mode 9
- Median 9
- Average 9.63


0.2<g-r<0.4
ln[ρ(D)]
good
bad
D(kpc)


Four g-r bins
dN/dD
D(kpc)


0.2<g-r<0.4 and [Fe/H]<,> -1
dN/dD
D(kpc)


0.2<g-r<0.4 and [Fe/H]<,> -1
dN/dr
r

Problem 1.5)

- First, we get volume for 1 deg^2 of sky and distances between 90 kpc and 100 kpc

$$\Delta V = \left(\frac{\Delta\Omega}{41,253\,\mathrm{deg}^2} \right) \frac{4\pi}{3} \left(D_2^3 - D_1^3 \right) = 27.5\,\mathrm{kpc}^3 \qquad (1)$$

- Then we get the number of stars with $0.2 < g - r < 0.4$ and (say) $4.8 < Z/\mathrm{kpc} < 5.2$: 2,624 for our area of 314 deg^2 towards NGP (the volume is 0.957 kpc^3)

- $Z = 5$ kpc is $R = 9.4$ kpc, and we assume $\rho(R) \propto R^{-3}$, which gives a number density ratio of 9.7×10^{-4}.

- So I get $N = 2,624 \times 9.7 \times 10^{-4} \times (27.5/0.957) = 73$ stars (per deg^2) (same result for $Z = 4 - 6$ kpc); if $\rho \propto R^{-2.8}$, about 100 stars.

Commonly seen mistakes

- No units on plots (e.g., is your density in stars/kpc or stars/pc)?
- Ascribing systematics to Poisson noise in bins: note that *you* choose the bin width, so that can't affect the intrinsic reliability of the data!
- Flipped x-axis when plotting magnitudes: the "astronomical convention" applies only for the y axis.
- Math mistakes, especially in Problem #5: many have found that no stars would be visible at 90-100 kpc.
- Homework submission: please use the e-mailed link to create your homework repository; e-mailing the homework is OK, but have it in the repository as well.