Redshift analysis of Sersic n

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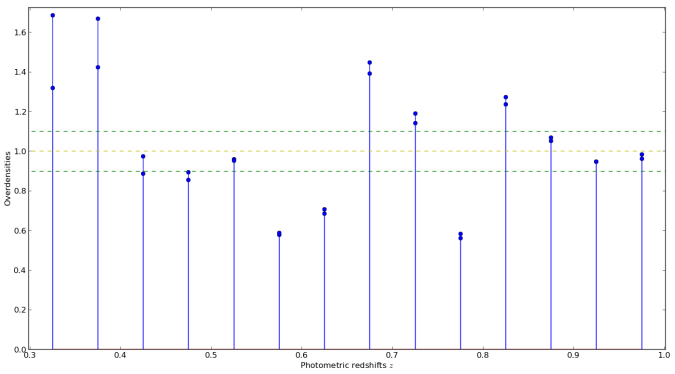
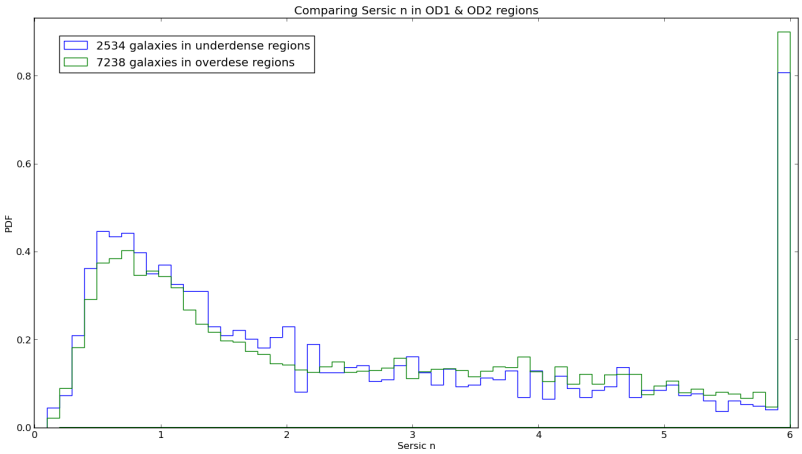
It is good to have this overdensity vs redshift plot handy and hence I attach it here.

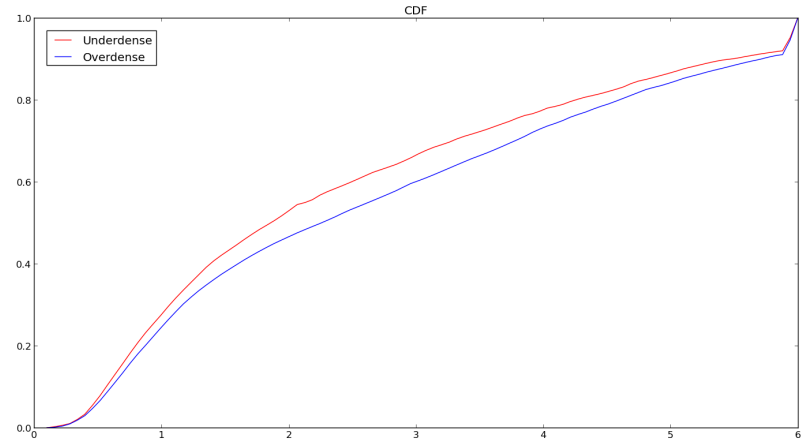
In all the plots that follow, I have both the histogram and the CDF obtained from the histogram plotted so that we can easily see where the difference comes from. It also explains why truncation of Sersic n values at 6 doesn't affect our analysis much.



1 All overdense and underdense regions

Here is a comparison of Sersic n of all overdense regions i.e. $z = [0.3 - 0.4] \cup [0.65 - 0.75] \cup [0.80 - 0.85]$ and all underdense regions i.e. $z = [0.55 - 0.65] \cup [0.75 - 0.80]$.





2 Nearby overdense regions

Here we compare the two nearby overdense regions $z = 0.65 - 0.70$ and $0.70 - 0.75$.

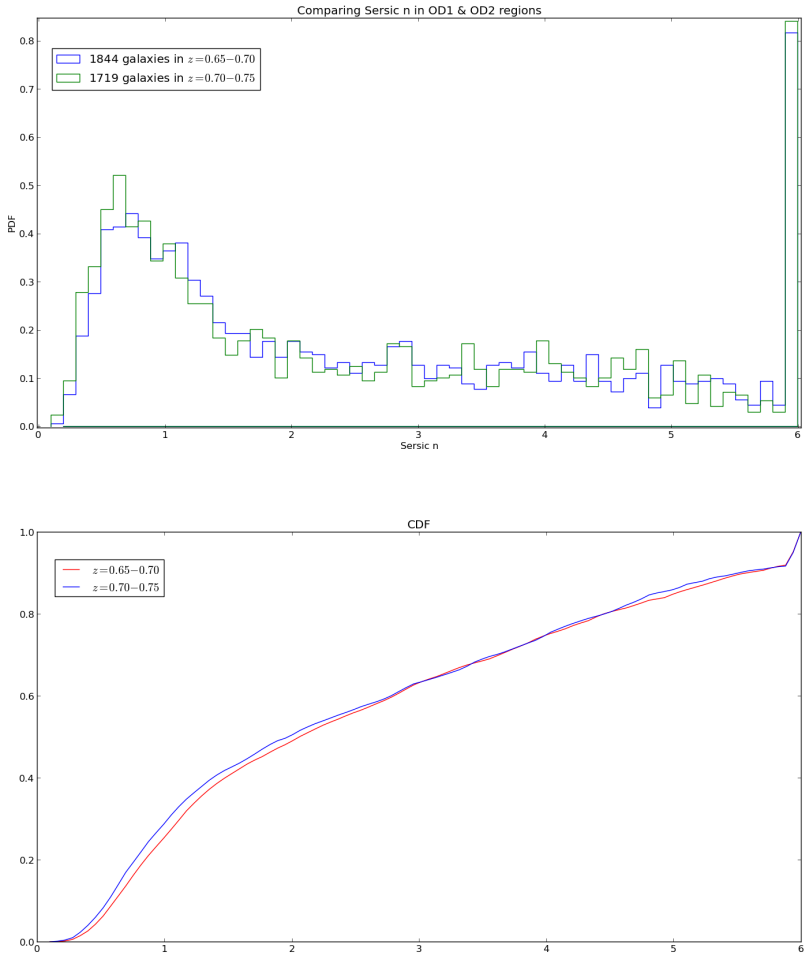


Figure 1: KS p-value = 0.1397 & AD p-value = 0.07405

3 Nearby overdense and underdense regions

Here we compare the overdense region $z = 0.65 - 0.75$ and its neighbouring underdense region $z = 0.55 - 0.65$. Note that the overdensity values of these regions significantly differ.

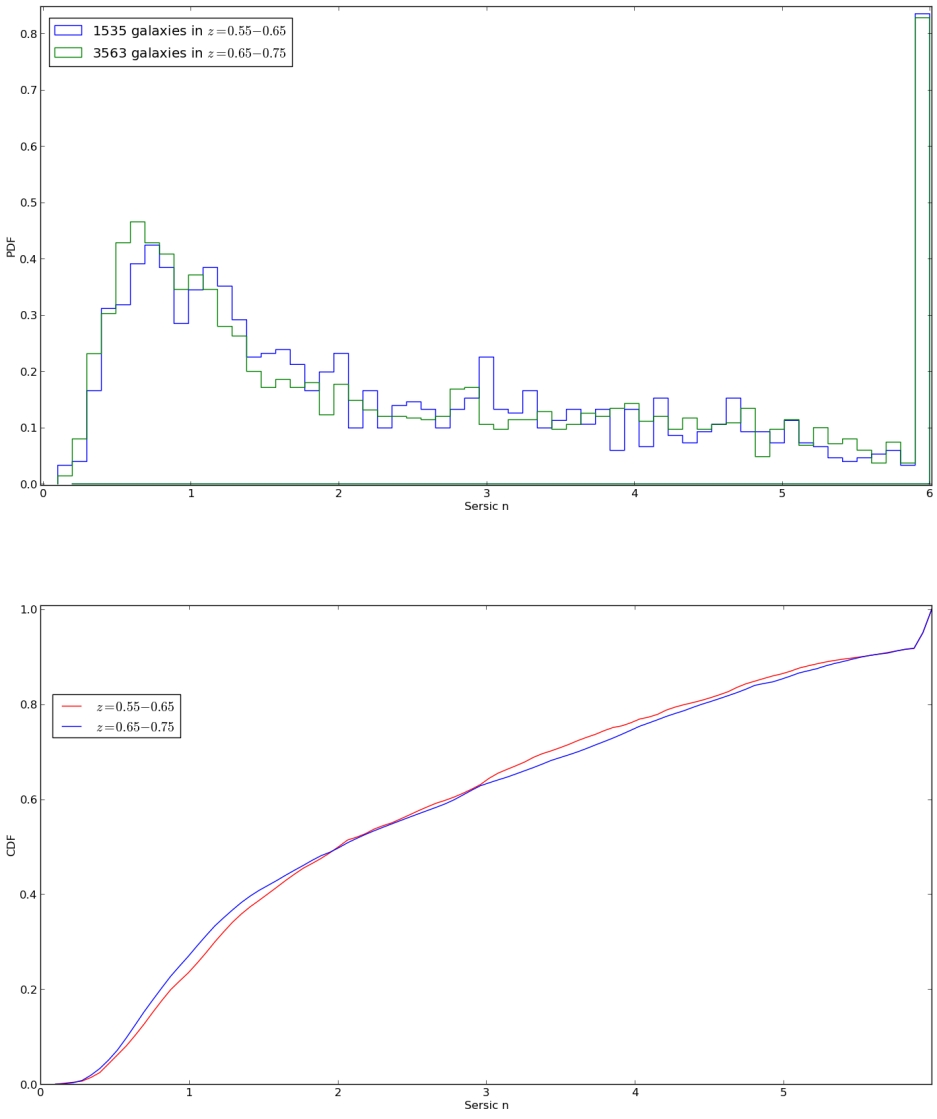


Figure 2: KS p-value = 0.0606 & AD p-value = 0.0402

If we narrow our redshift ranges and look at the underdense $z = 0.60 - 0.65$ and the overdense $z = 0.65 - 0.70$ bins

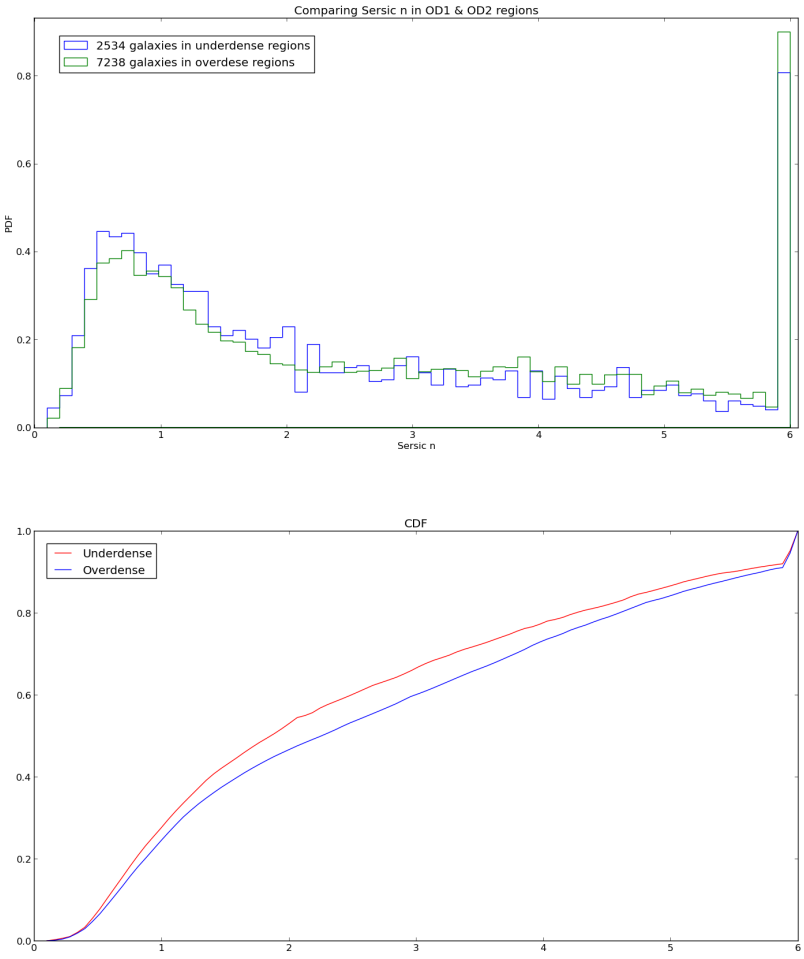


Figure 3: KS p-value = 0.3895 & AD p-value = 0.4831

The high p-values maybe are reflecting the mixing of galaxies in overdense and underdense regions due to errors in redshifts.

4 Low z and High z comparison

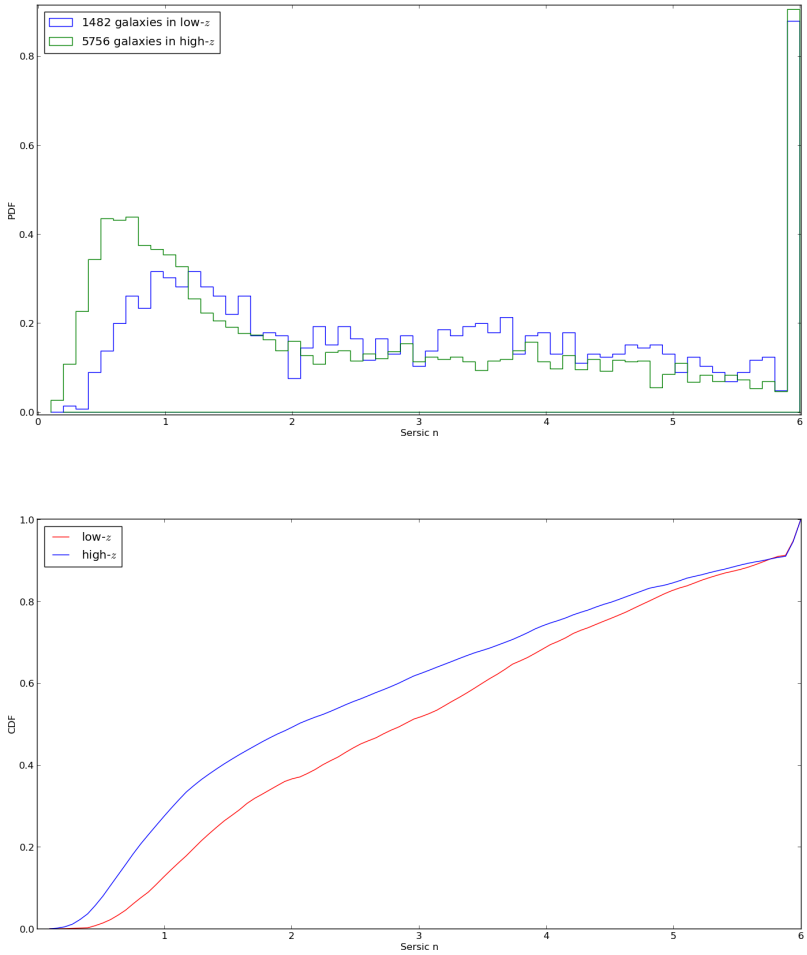


Figure 4: KS p-value = 2.6e-26 & AD p-value = 0.0
KS statistic = 0.1584 & AD statistic = 83.059

5 Comments

So we've seen earlier that the Sersic n distributions of all overdense and underdense regions put together are inconsistent and that randomly partitioning galaxies in overdense regions fairly agree with each other. From the section above, we see a clear disagreement when we consider the overdense regions in low-z region when compared to a high-z overdense region, which suggests there may be some evolution with redshift. Galaxies at larger redshifts tend to have lower Sersic n values.

The random partitioning of galaxies in overdense regions wash away any redshift dependence. But the incosistency in comparing all overdense and underdense regions might be partially due to inherent differences and partly due to redshift dependence.