

UNIVERSITY OF WATERLOO

## PHYS 437A Assignment 6

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I created the complementary list to Ryan's list (after applying the first and third cut) which left me with 421 primaries which were within 1.5 Mpc of another member and not near Virgo, Leo, or Coma clusters (see the script called "complementary\_list\_generator.py" in Assignment\_6 folder). I added this list to my CasJobs DB so that I could query SDSS to find the primaries that are within SDSS (see Assignment 4-5 report for how I did this). Querying SDSS through CasJobs, I found that 408 of my 421 primaries were within SDSS.

Next, I queried SDSS to find all objects within a projected distance of 1 Mpc of the 315 primaries that survived the first cut (primaries not within 1.5 Mpc of another primary) and were also within SDSS. I did this to try and determine why Ryan cut the (315 - 274) 41 primaries that were in my primary list and not his final list. These 41 primaries were applied during the second cut (cut primaries that are in badly masked regions or regions of incomplete coverage). To determine what primaries were in badly masked regions or regions of incomplete coverage, I had to find the number of objects within 1 Mpc of each primary so I could generate masks and find the badly masked regions as Ryan did. The below SQL query was sent to CasJobs to find all the objects within 1 Mpc of the primaries to begin this process:

```
SELECT
    m.name, n.objid, n.distance as 'distance_(arcmin)', p2.ra as RA, p2.dec as
    DEC
from MyDB.primaries_in_sdss_315_fixed AS m
    CROSS APPLY dbo.fGetNearbyObjEq(m.ra, m.dec, 120) AS n
    JOIN PhotoObj AS p2 ON n.objid=p2.objid
    JOIN Photoz AS p1 ON p1.objid=p2.objid WHERE p1.z < .15 AND p1.z > 0
```

The output of the above SQL query was placed in the dropbox folder with filename "nearby\_objects\_to\_315\_primaries\_120\_arcseconds.csv" in the directory ./Assignment\_6/Ryans\_list/. It is 400 MB large and contains over 5 million objects. An example of the output is shown below:

Note 1: "MyTable\_1" is the table that I save the result of the above SQL query to. All the items selected are put into that newly created table. Any future queries should have a different table name as that specific table exists on my database now. The table "primaries\_in\_sdss\_315\_fixed" is the table of the 315 primaries that are in SDSS after applying the first cut which I query to find all the objects within 1 Mpc of each primary.

Note 2: The above query finds ALL objects that are within 2° of the primaries. When applying the above SQL query, I must be careful as there will be duplicate entries, as the 2° separation will have overlap between primaries. The above SQL will also include primaries within 2° of each other as nearby objects. If I instead change the 120 arcminutes in the function fGetNearbyObjEq to m.da to get nearby objects within a projected 1 Mpc distance away from each of the primaries, the query will then find all objects that are within a project 1 Mpc distance away from the primaries instead of within 2°. For Ryan's sample, this is okay as it won't output duplicates since each primary is greater than 1.5 Mpc of another (so no overlap between primaries). However, when applying such a query with the complementary list (primaries that are within 1.5 Mpc of each other), I must be careful as there will be duplicate entries, as the 1 Mpc separation will have overlap between primaries. Such a query will also include primaries within 1 Mpc of each other as nearby objects.

Next step is to create a histogram of number of nearby objects for each primary and start writing the code as detailed in Assignment\_4-5.

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