Test the membership Reality of quartet Tempel groups of galaxies

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Abstract: Groups of galaxies are usually defined as a small number of galaxies in the small region in the sky cataloged by different selection criteria and techniques. There are many problems in galaxy groups catalogues because of most of selection criteria depend on the member's distance from the center of the groups and the radii of the members too. Later studies on some of these catalogues showed that some of the galaxies in the groups don't belong to their groups and were discarded that in turn could lead to removing the group from the catalog. The aim of this study is to test the membership of the galaxies in their groups by applying a clustering analysis technique (The Euclidean Separation Distance Coefficients) to test the physical reality (similarity or dissimilarity) of quartet galaxy groups taken from Temple et al (2012) Catalogue. The results shows that, there are 2844 groups have one discordant galaxies (have different astrophysical attributes) should be discard from the catalogue and should recomputed the astrophysical main properties in these group.

Keywords: galaxies: general, galaxies: groups: general-galaxies: statistics –catalogues, galaxies: clustering

1- Introduction

A group of galaxies (GGs) is a collection of a small number of galaxies which are likely to be physically and dynamically associated. The majority of galaxies are belonging to aggregate of galaxies of different richness and size (de Vaucoulaurs 1975; Tully 1987). Groups of galaxies are very important for studying the development of galaxy clustering, the interactions between individual galaxies and their environment and understanding the interactions and merging between members within group (Dressler 1980; McGlynn and Ostriker 1980: Geller and Postman 1983, Mezzetti et al. 1983).

Groups are usually denser than clusters of galaxies and have low velocity dispersions with a median of 250 km/s. GGs can range from loose to compact groups. The loose groups are not dense because members are separated by distances exceed the galaxy's diameter and have a small number of galaxies While compact groups (CGs) are so dense (denser than cores of clusters) and have only a few galaxy members that are so close together and encounter collisions and mergers.

GGs are usually selected on the basis of close values of redshift and enhanced frequencies of galaxies relative to that of the background, so there are many catalogues of galaxy groups differ from each other by various selection criteria of members (e.g., de Vaucoulaurs 1975, Turner and Gott 1976a, b, Rose 1977, Karachentsev et al. 1979, Hickson 1982, Ramella et al. 1989, Nolthenius 1993, Garcia 1995, Barton et al.1996, Allam and Tucker 2000, Focardi and kelm 2002, Iovino et al. 2003, Lee et al. 2004, deCarvalho et al. 2005; Deng et. al. 2008, McConnachie et al. 2009, Diaz-Gimenez et al 2012, Salerno et al. 2015, Tully 2015).

In these catalogues, groups were defined using some criteria depend on compactness (high surface density), isolation of possible members from field galaxies and the brightest of members.

The aim of this work is test the reality of membership by using similarity technique between each member in the same group.

This paper is organized as follows. In section 2, the data sample described. In Section 3, the cluster analysis method used in this study explained with the criteria used to test the membership in each groups. Section 4 describes the results of the study. The conclusions are given in section5.

2- The data sample.

In this work, I used a catalogue presented by Temple et al (2012) and updated version in (2014). Temple presented a catalogue of groups and clusters of galaxies for the SDSS (Sloan Digital Sky Survey) data release 8. They used a modified friends-of-friends (FoF) algorithm with a variable linking length in the transverse and radial directions to eliminate selection

effects and to find reliably as many groups as possible. The final sample contains 588193 galaxies and 82458 groups. In Temple et al (2014), the updated version of catalogue is provided based on a spectroscopic sample of SDSS data release 10. The flux-limited catalogue incorporates galaxies down to apparent magnitude in r-band, m_r = 17.77 mag. It includes 588193 galaxies and 82458 groups. They completed the volume limited catalogues for absolute magnitudes down to $M_{r,lim}$ = -18.0, -18.5, -19.0, -19.5, -20.0, -20.5, and -21.0. The catalogue consists of several tables: two tables are the galaxies used to generate the catalogue, and the second describes the group properties. The flux limited galaxy table includes all the relevant parameters for galaxies.

The data sample used in this study is the quartet galaxy groups. The Tempel catalogue has 24831 quartet groups. The astrophysical properties, the magnitude in u band, color index (g-r) and color index (g-i) are used as attributes in this study.

3- Method and Criteria.

Cluster analysis collect data objects based the common properties and information in the data that describes the object and their relationships. Most cluster analysis methods used to measure the similarities and dissimilarities between pairs of objects in a set. The clustering technique starts with a data matrix which contains the objects and their attributes (properties). The second step is to build the resemblance matrix by finding the similarity or dissimilarity between different objects. Using the resemblance coefficient, that is the Euclidean distance coefficient to compute the dissimilarities between objects. The large value of the Euclidean distance coefficient, the more dissimilar are the objects and the smaller the value, the more similar are the objects.

In this method, the average distance between all pairs of galaxies within same group is calculated. This method is called Unweighted pair-group method using arithmetic averages (UPGAMA) (Sneath and Sokal 1973).

The average Euclidean distance coefficient e_{jk} is defined as the square root of the sum of the squares of the differences of the values of the n attributes (Astrophysical parameters) expressed as eq (1),

$$e_{jk} = \sqrt{\frac{\sum_{i=1}^{n}(X_{ij} - X_{ik})^2}{N}} \qquad (1)$$

Where X is the galaxy parameters, N is the number of the total calculated Euclidean coefficients

in the group. I, j and k is the arrays takes the number of galaxies in each groups.

The combined euclidean coefficients written by (eq.2)

$$e_{i(j,k)} = \frac{(e_{ij} + e_{ik})}{2} \qquad (2)$$

Galaxies in the same group are supposed to have similar properties that connect them together. The method makes use of the physical attributes of the galaxies to find whether each galaxy in the same group is a real member or should be discarded from the group. By calculating the Euclidian distance coefficient between each two galaxies, one can find the similarities and dissimilarities in astrophysical parameters between the galaxies.

The UPGMA method is used to reanalyze 4 members groups in Tempel catalogue (Tempel et al. 2012, 2014) to compute the similarity or dissimilarity between any two galaxies in each group (Sokal and Michener 1958, William and Edelsbuner 1984, Mutagh 1984, Romesburg 1984).

The following criteria are used to determine the relation (degree of similarity) between each two galaxies (Sabry et al. 2009, Sabry et. al. 2012):

1. If $e_{jk} < e_{av}$? σ The two galaxies are a Twin (T)

2. If $e_{jk} < e_{av}$ The two galaxies are a Pair (P)

3. If $e_{av} \leq e_{jk} \leq e_{av} + \sigma$ The two galaxies are Members of the same group (M)

4. If $e_{jk} > e_{av} + \sigma$ The two galaxies have a high degree of dissimilarity and one of them has a Discordant Attribute (AD)

4-   Results and Discussion

The UPGAMA method was applied on 24831 quartet galaxy groups taken from Tempel catalogue. The astrophysical attributes includes absolute magnitude in u-band with color index (g-r) in the first and absolute magnitude in u-band with color index (g-i) in the second are used to get the euclidean coefficients. The Euclidean coefficients measured for all members in each groups to compute the degree of similarity or dissimilarity between members.

The following result shows how we use the UPGAMA method in one group taken from temple catalogue. The astrophysical properties in galaxy groups ID no. 5 shows in table (1) which include the magnitude in u band and color index (g-r) of all group members.

Table (1): The attributes (Astrophysical parameters) of 4 members in Tempel Group No.5

Object	Galaxy No.1	Galaxy No.2	Galaxy No.3	Galaxy No.4
Magnitude (u)	-17.3	-17.25	-16.52	-18.96
Color index (g-r)	0.9	0.83	0.93	0.46

Applying the method, we get the resemblance matrix coefficients to measure the overall resemblance, the degree of similarity-between each pair of galaxies. Its value is computed by entering for a given pair of objects, the values from their columns in the data matrix listed in table 2.

Table 2: Resemblance Matrix of Tempel Groups ID 5

	Galaxy No.1	Galaxy No.2	Galaxy No.3
Galaxy No.1			
Galaxy No.2	0.0860		
Galaxy No.3	0.78058	0.73682	
Galaxy No.4	1.71732	1.74957	2.48485

This matrix enables the determination of similarity or dissimilarity between individual galaxies that may form a group. If the attributes are close to each other, we may expect clustering. If the attributes are very close or nearly equal we can expect compact clustering in its real sense. The astrophysical euclidean coefficients is the best choice for the distance metric, because inter-point distances between the samples can be computed directly, it measures how big the similarity or dissimilarity between the attributes of objects regardless of the number. By applying the criteria to define the euclidean coefficients we get the results in table (3).

Table 3: Shows the results of applying method on the group 5 as a sample where:

Column (1) is the Galaxies, column (2) is the magnitude of the first object in the u band, column (3) is the magnitude of the second object in the u band, column (4) is the color index (g-r) of the first object, column (5) is the color index (g-r) of the second object, column (6) is the calculated Euclidean coefficient, column (7) is the average Euclidean coefficient, column (8) is the standard deviation, column (9) is the classification (Type) of every two galaxies regarding each other and column (10) is the Comments.

Galaxies	$(U\text{-mag})_i$	$(U\text{-mag})_j$	$(g\text{-r})_i$	$(g\text{-r})_j$	e_{ij}	e_{av}	σ	Type	Comments
G_{12}	-17.30	-17.25	0.90	0.83	0.0860	1.25919	0.79905	T	
G_{13}	-17.30	-16.52	0.90	0.93	0.78058			P	G_{12} make a twin.
G_{14}	-17.30	-18.96	0.90	0.46	1.71732			M	G_{23} make a pair.
G_{23}	-17.25	-16.52	0.83	0.93	0.73682			P	Galaxy 4 is AD (attribute
G_{24}	-17.25	-18.96	0.83	0.46	1.74957			M	discordant)
G_{34}	-16.52	-18.96	0.93	0.46	2.48485			AD	

The results obtained shows that galaxies 1 and 2 share a large value of similarity than with the other two galaxies. Galaxies 1 and 4, 2 and 4, 3 and 4 have the largest value of dissimilarity in the group because of galaxy 4 make a disturbance in the result. The last step to assure that the galaxies appeared as AD (galaxies that show a large value of dissimilarity) are both members of the group is to apply the combined Euclidean coefficient. We found the galaxy ID no. 4 is the AD galaxy and should exclude from the group.

When the same method applying between other astrophysical properties, magnitude in u band and color index (g-i) we get the same result which indicated that galaxy 4 is discordant galaxy.

By applying the same techniques over all quartets Tempel groups of galaxies (24831 groups). The final results are the common attribute discordant galaxies list get from u-magnitude with color index (g-r) and u-magnitude with color index (g-i). The criteria of Sabry et al. (2009) were used to classify the relation between each pair galaxies within same group. To be assuring that the attribute discordant (AD) are truly discordant galaxies and not member in the group, the combined euclidean coefficients is calculated for all AD galaxies.

Table 4: show that the final AD list from quartet Tempel groups. Columns: (1, 4, 7, 10, 13, 16) are the Group ID; Columns (2, 5, 9, 12, 15) are the Galaxy ID.

Table4: The discordant galaxies list from quartet Tempel groups of galaxies.

Group ID	Galaxy ID	Group ID	Galaxy ID	Group ID	Galaxy ID	Group ID	Galaxy ID	Group ID	Galaxy ID	Group ID	Galaxy ID
5	20717	13080	85837	25780	172156	38305	271829	52025	370943	65164	468778
17	75	13105	100898	25781	173246	38318	268568	52038	371749	65174	468837
36	243878	13146	86340	25806	172273	38399	269025	52069	371185	65184	575522
43	218	13211	86779	25821	172382	38402	271520	52071	371199	65207	469027
67	242008	13351	504185	25858	175793	38414	269165	52097	371408	65266	470202
96	414	13352	87870	25882	172853	38429	269317	52175	372046	65289	472583
105	244120	13359	92017	25896	172951	38453	269501	52180	372115	65297	472624
114	12614	13390	104198	25911	173088	38508	269882	52210	373129	65299	469767
128	360970	13397	105406	25939	173291	38512	269809	52278	373286	65321	469962
169	243586	13428	88313	25945	173411	38522	269874	52332	373798	65337	470255
170	223049	13453	88570	25952	173480	38573	272000	52374	379581	65373	546048
174	202157	13458	88614	25966	190663	38594	270495	52375	373739	65388	471238
222	1093	13481	88717	26017	173964	38597	271847	52442	374679	65411	470683
226	15653	13482	88729	26018	173979	38605	270552	52524	374850	65420	470725
294	15542	13544	90342	26072	174315	38623	270729	52574	375258	65432	470764
307	1475	13562	89193	26073	174312	38754	272614	52617	375538	65449	470874
410	16120	13609	298966	26131	174696	38756	573454	52641	376128	65467	472912
414	74526	13610	89441	26192	175566	38775	272036	52657	377270	65468	471010
415	245416	13615	89457	26209	175317	38783	573456	52661	377649	65475	473523
448	570527	13653	280117	26240	175524	38787	283751	52677	376906	65481	472646
501	364036	13674	89923	26270	176259	38803	272205	52700	376288	65486	471100
512	2490	13697	90486	26313	176007	38810	272252	52708	377615	65537	473075
520	2516	13722	90239	26317	176019	38822	272928	52715	376218	65542	471570
544	4620	13775	105131	26325	176073	38908	273000	52745	376526	65575	471764
565	2760	13777	90591	26341	176144	38916	273657	52757	376497	65587	474249
598	19404	13853	92405	26403	176647	38918	273017	52870	378319	65610	472060
609	2957	13863	91217	26427	282025	38957	273266	52891	377473	65682	472699
661	14282	13888	91446	26429	176812	38971	273386	52949	377778	65707	472887
662	3203	13907	91576	26472	177114	38978	273433	52965	377856	65711	473650
685	17237	13956	91830	26510	180097	38983	273467	52966	379200	65717	575556
714	3766	13987	116050	26535	179324	39056	273915	52982	377967	65721	472979
736	15246	13997	92192	26553	177653	39057	273943	53108	378977	65772	540532
759	3688	14033	571658	26561	177685	39167	274636	53113	379012	65813	473671
766	17734	14068	92934	26601	177903	39183	274740	53138	379855	65817	475492
848	18844	14082	92683	26610	193789	39188	274963	53148	387975	65836	473842
864	4244	14120	113388	26726	178910	39205	274841	53204	380009	65876	474177
926	5784	14128	363806	26815	179527	39209	274874	53213	379703	65882	474214
928	4629	14165	93269	26859	180239	39238	275151	53275	380279	65883	532024
961	10222	14167	93276	26896	180151	39261	275563	53281	387939	65906	474375
1001	8349	14169	93302	27024	181075	39270	275382	53330	380622	65943	476591
1035	5277	14212	93564	27025	181079	39282	275415	53334	380868	65953	474848
1062	5417	14265	93909	27030	181138	39323	275842	53476	381580	65964	474914
1106	17022	14276	112568	27075	181486	39391	278029	53493	381754	66002	475286
1125	5657	14278	93984	27127	199107	39480	276901	53549	382201	66041	541621
1130	248135	14300	94093	27199	199102	39482	278102	53579	382379	66063	475856
1140	410740	14301	94095	27318	199328	39486	276936	53584	382398	66067	475929
1165	5858	14327	94491	27322	182995	39510	277451	53619	383299	66096	477123
1188	7340	14397	94663	27329	196743	39518	277496	53637	382715	66101	478564
1194	6001	14428	94833	27344	183166	39537	279004	53642	387522	66135	476387
1213	247751	14436	94929	27348	198104	39547	277540	53692	383064	66186	478575
1214	6074	14534	95566	27362	184766	39598	277834	53695	383087	66257	477481
1258	6317	14583	95884	27402	183568	39651	278143	53705	384207	66267	478411
1291	6513	14603	95982	27406	530267	39652	278144	53755	383490	66274	479112
1299	6564	14661	96312	27430	185093	39663	280596	53763	383560	66292	477788
1301	7102	14664	96327	27458	183976	39693	278847	53768	384841	66352	478502
1317	6972	14689	96470	27494	184259	39701	278369	53773	385409	66401	478689
1346	6850	14710	99072	27495	184271	39704	282360	53777	559558	66403	478702
1384	22574	14730	96748	27496	184274	39711	278436	53787	384828	66434	478931
1401	7119	14734	98071	27524	199034	39712	278824	53796	383767	66508	479430
1430	19705	14776	98387	27534	184514	39732	278821	53818	414174	66532	479626
1449	7309	14777	97137	27597	185074	39793	279011	53836	384645	66611	480209
1547	7780	14791	97211	27601	185094	39844	279443	53852	384299	66639	480483
1564	249429	14794	97217	27603	185103	39852	279735	53867	384424	66680	480793
1568	7905	14819	97398	27613	185141	39879	281463	53872	385160	66729	481383
1584	7993	14831	99125	27657	572513	39933	280211	53874	384478	66782	481629
1600	22842	14838	97517	27671	201174	40147	282236	53964	385294	66797	482063
1605	8070	14848	320981	27692	186942	40157	283470	53983	385483	66841	482974
1647	251189	14895	117008	27709	185845	40190	282452	53993	385601	66843	482093

1665	450774	14906	97899	27764	201819	40222	282984	53994	385602	66933	482739
1690	8597	14918	99115	27788	201631	40224	282713	54018	385738	66969	483113
1744	8910	14920	116461	27792	186615	40226	283965	54035	385835	66987	483145
1748	8921	14969	99872	27807	328739	40228	282745	54138	387288	67004	485544
1781	250828	15012	415156	27816	186833	40248	284640	54183	386793	67005	483276
1797	22777	15087	99154	27856	187094	40273	283468	54192	387378	67080	483851
1814	9316	15131	99473	27877	193576	40318	283343	54237	388950	67082	483861
1833	9407	15143	321026	28069	188534	40324	504578	54265	387315	67089	483898
1841	10216	15147	99626	28084	188618	40355	283669	54267	387407	67102	484021
1844	9484	15151	99625	28099	188879	40361	284261	54296	388478	67121	485661
1850	10538	15169	99735	28144	191612	40412	283971	54310	389969	67131	484236
1891	251203	15229	100114	28196	189451	40423	284066	54322	387784	67204	484703
1898	9751	15245	100217	28228	189684	40473	284435	54340	388281	67224	484841
1908	21972	15298	109651	28229	203941	40476	284444	54350	389837	67254	485139
1931	9906	15344	119010	28269	202984	40524	284853	54367	388057	67259	485180
1974	10095	15355	103884	28279	206094	40528	284877	54368	388052	67294	485551
1983	10134	15372	100920	28300	190227	40543	305505	54381	388780	67319	485792
2000	399165	15405	101083	28307	191933	40555	285051	54471	388847	67337	486595
2011	10275	15436	101195	28343	334081	40589	505922	54505	389058	67353	485979
2012	10276	15437	101192	28351	572681	40627	304790	54552	389382	67355	486744
2038	10786	15438	101191	28352	190594	40661	285964	54558	390407	67367	486445
2043	10485	15464	127696	28366	190720	40674	286540	54573	389478	67459	486941
2054	11395	15475	101525	28372	190779	40675	308082	54594	391945	67583	487840
2089	23972	15478	101551	28374	190797	40688	286072	54599	390078	67662	490004
2143	10986	15497	101706	28409	191002	40709	286107	54609	392012	67703	488697
2192	11258	15517	121918	28424	191092	40847	286965	54640	390100	67760	489043
2219	12567	15565	102169	28437	191989	40908	287881	54646	392575	67770	489095
2224	11444	15566	102185	28474	191474	40983	288107	54682	390761	67858	489723
2227	11456	15655	102730	28480	191763	41001	290168	54697	390721	67944	490316
2273	11681	15715	103108	28496	192174	41083	289605	54708	390902	67957	490949
2293	11781	15733	103218	28517	203952	41109	291677	54720	390893	67965	490491
2316	11905	15760	420016	28544	192040	41206	292539	54733	391326	67968	491678
2344	266344	15776	103475	28567	205113	41210	292561	54761	391141	67973	492162
2366	12201	15799	104072	28660	205804	41218	290281	54827	391473	68004	490723
2375	14322	15811	125124	28706	193211	41226	292277	54847	391616	68019	490778
2399	253143	15855	103956	28712	193233	41251	290213	54848	391626	68067	491221
2415	12500	15866	104046	28742	193388	41253	290197	54876	392251	68113	491625
2425	12527	15907	104263	28745	194660	41289	310869	54883	391950	68117	492630
2438	13511	15925	113606	28768	193667	41354	301373	54939	392429	68161	491982
2447	12623	16015	104964	28847	575708	41373	292251	54952	392516	68209	492376
2469	12732	16114	105771	28849	207258	41438	292454	54955	419548	68226	492694
2532	13123	16115	108587	28852	194363	41457	291740	55040	393381	68242	493459
2551	13221	16202	106377	28924	208662	41470	291891	55080	397474	68243	494147
2629	466228	16227	106537	28973	195296	41476	296726	55109	393486	68341	493521
2643	13729	16275	106859	28997	195461	41514	292118	55146	423944	68364	493725
2646	31699	16312	107125	29003	208366	41522	292185	55178	394043	68406	494053
2662	14356	16317	534845	29046	207928	41528	292221	55192	394175	68409	494072
2665	13830	16322	107155	29055	208564	41548	293339	55220	394337	68420	575841
2718	14142	16338	121038	29058	196474	41581	292640	55237	394444	68431	495632
2766	29998	16384	107603	29104	210138	41586	292667	55251	394532	68482	494788
2835	31104	16393	107661	29121	196380	41599	293161	55274	394731	68518	494772
2836	15010	16400	107688	29122	197279	41663	294113	55299	394946	68534	494870
2846	15118	16420	119633	29131	196470	41720	293881	55338	395231	68547	552548
2858	15171	16431	107875	29142	196520	41724	293646	55366	395411	68571	495628
2859	72150	16441	572018	29152	196675	41745	293686	55386	396080	68595	495293
2921	15520	16460	108594	29176	197155	41778	293904	55393	395588	68628	496596
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8840	55551	21933	147795	34456	237882	47715	339846	60980	437498	73730	536966
8843	55562	21939	173900	34468	235771	47722	338367	61013	437775	73766	537295
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9155	58012	22454	149202	34656	248444	48072	340869	61353	440108	74079	539797
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9179	72812	22491	149360	34758	573003	48084	340909	61418	440573	74098	541179
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9756	62542	22915	152047	35269	253070	48516	344014	61651	442249	74551	543337
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11326	73800	24221	160750	36635	256632	49946	355490	63163	453302	76137	556680
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12438	92111	25160	167424	37591	264617	51268	365028	64474	463596	77259	565436
12459	95301	25191	187363	37657	263507	51332	367101	64476	462861	77308	567014
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12481	81771	25224	167918	37676	263965	51391	365885	64540	463388	77403	566724
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12492	84138	25254	426276	37732	265971	51429	366142	64600	463807	77443	567054
12528	121213	25269	168298	37773	264337	51441	366213	64607	463857	77491	567388
12583	82534	25297	169355	37798	264935	51451	509007	64639	464087	77541	568311
12611	84046	25305	174582	37805	265047	51455	366267	64678	464546	77542	567923
12613	82755	25325	168637	37868	265084	51458	375099	64690	464580	77566	568501
12628	82965	25334	186111	37928	266243	51459	366299	64724	464886	77567	568498
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12658	83067	25376	169010	37978	266866	51592	367501	64756	466055	77638	568661
12729	85179	25414	169316	38045	266498	51610	574471	64780	465267	77646	568755
12731	86017	25424	186506	38092	266993	51637	367843	64792	468430	77657	568841
12738	83604	25480	169847	38100	267068	51644	367875	64807	465514	77682	569030
12767	84018	25517	170102	38107	267421	51695	368258	64835	465764	77683	569035
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12807	84949	25584	170735	38156	267551	51721	368457	64847	467123	77695	569607
12829	99227	25608	170893	38163	270058	51746	368646	64931	466607	77723	569285
12872	86289	25623	462150	38173	270442	51762	369382	64970	467062	77774	569878
12901	84580	25637	171144	38194	267783	51849	371301	64979	467219	77775	569882
12936	343156	25640	172261	38221	267946	51910	370019	64987	467806	77796	570073
12944	398587	25656	301896	38246	268166	51920	369986	64992	467404	77813	570240
12955	101406	25728	173516	38248	573422	51932	370096	65000	468041	77828	570480
13010	105474	13064	85735	38291	268986	51935	370116	65019	467702		
13078	85821	25743	172166	38304	268490	52016	371241	65056	468107		

5-   Conclusion.

In this paper, the cluster analysis method used to test the reality membership in quartet Tempel group of galaxies. The complete sample has 24831 quartet groups. The UPGAMA method used to calculate the euclidean coefficients between each pain within same groups. The astrophysical parameters u-magnitude and two color index are used as attribute to test the similarity between each pair. The final result indicates that, there are 2844 Groups have one discordant galaxy which should be excluded catalogue.

When the AD list exclude from their groups in the original catalogue, all astrophysical parameters in these groups which depends on the common astrophysical parameters will be changed such as centroid of the group, mean redshift, radial velocity, distance and combined magnitude.

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