Name:Islam,Rafiqul   Id:17-34438-1   Sec:A

K-means Clustering

The data was obtained from 20 different perfumes by using a handheld odor meter (OMX-GR sensor). Names of these perfumes are: Ajayeb, Ajmal, Amreaj, Aood, Asgar_Ali, Bukhoor, Burberry, Dehenalaod, Junaid, Kausar, Rose, Solidmusk, Teatreeoil, Raspberry, Rosemusk, Strawberry, Constrected2, Carolina_Herrera, Oudh_Ma'alattar, Constrected.

Use K value 3.

Name	M1	M2	M3	M4	SL
Ajayeb	646	639	633	627	1
Ajmal	605	599	603	587	2
Amreaj	570	565	559	564	3
Aood	711	714	697	690	4
Asgar_Ali	682	675	669	662	5
Bukhoor	710	703	697	690	6
Burberrry	611	605	589	583	7
Dehenalaod	681	685	678	662	8
Junaid	716	709	702	695	9
Kausar	746	739	732	725	10
Rose	630	624	618	612	11
Solidmusk	460	456	451	447	12
Teatreeoil	824	816	808	800	13
Raspberry	790	782	775	767	14
Rosemusk	851	842	834	826	15
Strawberry	720	713	706	689	16
Constrected2	668	652	645	649	17
Carolina_Herrera	631	624	628	622	18
Oudh_Ma'alattar	672	665	659	653	19
Constrected	652	655	649	642	20

Round 01: (Main Table)

Name	M1	M2	M3	M4	Distance 01	Distance 02	Distance 03	class
Ajayeb	646	639	633	627	0	76.03288762	143.8645196	1
Aood	711	714	697	690	133.8469275	209.5375861	277.4923422	1
Asgar_Ali	682	675	669	662	71.50524456	147.2616719	215.2858565	1
Bukhoor	710	703	697	690	127.5029411	203.1895667	271.2268423	1
Dehenalaod	681	685	678	662	81.18497398	156.2753979	224.6908988	1
Junaid	716	709	702	695	138.5099274	214.2101772	282.2445748	1
Kausar	746	739	732	725	198.5069268	274.1641844	342.2016949	1
Rose	630	624	618	612	30.5122926	45.82575695	113.4283915	1
Teatreeoil	824	816	808	800	351.5209809	427.1346392	495.1908723	1
Raspberry	790	782	775	767	284.5153774	360.1360854	428.1985521	1
Rosemusk	851	842	834	826	404.0247517	479.6321507	547.6851285	1
Strawberry	720	713	706	689	141.8626096	217.3338446	285.7236427	1
Constrected2	668	652	645	649	35.79106034	111.2924076	178.308721	1
Carolina_Herrera	631	624	628	622	22.36067977	56.1337688	123.8022617	1
Oudh_Ma'alattar	672	665	659	653	52	127.8162744	195.7677195	1
Constrected	652	655	649	642	27.80287755	102.4011719	170.3173508	1
Ajmal	605	599	603	587	76.03288762	0	69.61321714	2
Burberrry	611	605	589	583	79.07591289	16.85229955	67.39436178	2
Amreaj	570	565	559	564	143.8645196	69.61321714	0	3
Solidmusk	460	456	451	447	365.5256489	290.1344516	222.1125841	3

Old Table

Here, we took randomly three perfumes. We took Ajayeb, Ajmal, Amreaj

Old Table	M1	M2	M3	M4
c1(Ajayeb)	646	639	633	627
c2(Ajmal)	605	599	603	587
c3(Amreaj)	570	565	559	564

To measure distance: Distance =

$$\sqrt{(M1\ main\ table\ - M1\ old\ table)^2 + (M2\ main\ table\ - M2\ old\ table)^2 + (M3\ main\ table\ - M3\ old\ table)^2 + (M4\ main\ table\ - M4\ old\ table)^2}$$

At first, we measure the distance from each row (c1, c2, c3) to each perfume row (m1, m2, m3, m4) and we put them in the column Distance 01, Distance 02, Distance 03 in the main table for each distance value.

For example, the distance between c1 to Ajayeb is put into Distance 01, the distance between c2 to Ajayeb is put into Distance 02, the distance between c3 to Ajayeb is put into Distance 03.

Secondly, we compare three distance values (distance 01, distance 02, distance 03) and give a class name to each perfume row according to the smallest number among these three values.

For example, for Aood perfume distance 01 value is lesser than the other two (distance 02, distance 03). So, Aood is in class 01.

Finally, we make a new table of average M1 values that belongs to class 01 in table 01. Like that, we got M2, M3, M4 values.

New Table

	M1	M2	M3	M4
c1	708.125	702.3125	695.625	688.1875
c2	608	602	596	585
c3	515	510.5	505	505.5

Round 02: (Main Table)

Name	M1	M2	M3	M4	D1	D2	D3	Class
Aood	711	714	697	690	12.24904	184.8756	388.2428	1
Asgar_Ali	682	675	669	662	53.13346	129.3638	326.0943	1
Bukhoor	710	703	697	690	3.02722	177.8511	382.0805	1
Dehenalaod	681	685	678	662	45.07676	134.7145	335.3021	1
Junaid	716	709	702	695	13.92081	187.6539	393.0935	1
Kausar	746	739	732	725	73.88362	239.6122	453.0811	1
Teatreeoil	824	816	808	800	226.8965	372.395	606.0945	1
Raspberry	790	782	775	767	159.8919	314.0844	539.0914	1
Rosemusk	851	842	834	826	279.4026	418.0084	658.5966	1
Strawberry	720	713	706	689	19.0667	188.8968	396.3641	1
Constrected2	668	652	645	649	90.77397	100.9802	289.1773	1
Oudh_Ma'alattar	672	665	659	653	72.64151	112.6499	306.5803	1
Constrected	652	655	649	642	98.46656	89.41476	281.1005	1
Ajayeb	646	639	633	627	124.6346	67.66092	254.5967	2
Ajmal	605	599	603	587	200.3161	4.795832	179.3837	2
Amreaj	570	565	559	564	268.3695	57.05261	111.0563	2
Burberrry	611	605	589	583	203.3133	4.795832	176.6593	2
Rose	630	624	618	612	155.1339	41.2068	224.0948	2
Carolina_Herrera	631	624	628	622	145.0346	48.81598	234.605	2
Solidmusk	460	456	451	447	490.1517	249.5296	111.0563	3

Here,

We took the values from the Round 01-New Table instead random values as we took in Round 01.

Old Table

	M1	M2	M3	M4
c1	708.125	702.3125	695.625	688.1875
c2	608	602	596	585
c3	515	510.5	505	505.5

We follow the procedure as before we did in the Round 01 and we get a New Table

New Table

	S1	S2	S3	S4
c1	724.8462	719.2308	711.6154	703.8462
c2	615.5	609.3333	605	599.1667
c3	460	456	451	447

Round 03: (Main Table)

Name	M1	M2	M3	M4	D1	D2	D3	Class
Aood	711	714	697	690	24.98804	191.8073	499.1292	1
Asgar_Ali	682	675	669	662	85.78651	129.5314	437.0286	1
Bukhoor	710	703	697	690	29.81898	185.5219	493.0254	1
Dehenalaod	681	685	678	662	77.30023	138.8982	446.1345	1
Junaid	716	709	702	695	18.80514	196.5368	504.0337	1
Kausar	746	739	732	725	41.24713	256.5282	564.0301	1
Teatreeoil	824	816	808	800	194.2455	409.5441	717.0453	1
Raspberry	790	782	775	767	127.2439	342.5377	650.04	1
Rosemusk	851	842	834	826	246.7522	462.048	769.5499	1
Strawberry	720	713	706	689	17.72706	199.8451	507.1864	1
Oudh_Ma'alattar	672	665	659	653	105.2967	110.023	417.5225	1
Ajayeb	646	639	633	627	157.2876	58.04357	365.5256	2
Ajmal	605	599	603	587	232.9568	19.21082	290.1345	2
Amreaj	570	565	559	564	301.0197	85.95574	222.1126	2
Burberrry	611	605	589	583	235.8982	23.5879	287.3012	2
Rose	630	624	618	612	187.7878	27.55096	335.0194	2
Constrected2	668	652	645	649	123.2768	93.05942	400.15	2
Carolina_Herrera	631	624	628	622	177.6691	38.80364	345.5705	2
Constrected	652	655	649	642	131.0641	84.78437	392.0383	2
Solidmusk	460	456	451	447	522.8042	307.5094	0	3

Here,

We took the values from the Round 02-New Table.

Old Table

	M1	M2	M3	M4
c1	724.8462	719.2308	711.6154	703.8462
c2	615.5	609.3333	605	599.1667
c3	460	456	451	447

We follow the procedure as before we did in the Round 01 and we get a New Table

New Table

	M1	M2	M3	M4
c1	736.6364	731.1818	723.3636	714.4545
c2	626.625	620.375	615.5	610.75
c3	460	456	451	447

Round 04: (Main Table)

Name	M1	M2	M3	M4	D1	D2	D3	Class
Aood	711	714	697	690	47.38675	169.728	499.1292	1
Bukhoor	710	703	697	690	52.88456	163.4047	493.0254	1
Dehenalaod	681	685	678	662	100.1873	116.901	446.1345	1
Junaid	716	709	702	695	41.86618	174.4207	504.0337	1
Kausar	746	739	732	725	18.29194	234.409	564.0301	1
Teatreeoil	824	816	808	800	171.1954	387.4246	717.0453	1
Raspberry	790	782	775	767	104.1993	320.419	650.04	1
Rosemusk	851	842	834	826	223.7018	439.9279	769.5499	1
Strawberry	720	713	706	689	39.45601	177.7965	507.1864	1
Ajayeb	646	639	633	627	180.3506	35.95266	365.5256	2
Ajmal	605	599	603	587	255.9926	40.55667	290.1345	2
Amreaj	570	565	559	564	324.0927	107.9379	222.1126	2
Asgar_Ali	682	675	669	662	108.8504	107.4202	437.0286	2
Burberrry	611	605	589	583	258.9213	44.19099	287.3012	2
Rose	630	624	618	612	210.8499	5.687157	335.0194	2
Constrected2	668	652	645	649	146.3074	71.03058	400.15	2
Carolina_Herrera	631	624	628	622	200.7213	17.75088	345.5705	2
Oudh_Ma'alattar	672	665	659	653	128.3637	87.90673	417.5225	2
Constrected	652	655	649	642	154.0993	62.78211	392.0383	2
Solidmusk	460	456	451	447	545.8632	329.6321	0	3

Here,

We took the values from the Round 03-New Table.

Old Table

	M1	M2	M3	M4
c1	736.6364	731.1818	723.3636	714.4545
c2	626.625	620.375	615.5	610.75
c3	460	456	451	447

We follow the procedure as before we did in the Round 01 and we get a New Table

New Table

	M1	M2	M3	M4
c1	749.8889	744.7778	736.5556	727.1111
c2	636.7	630.3	625.2	620.1
c3	460	456	451	447

Round 05: (Main Table)

Name	M1	M2	M3	M4	Distance 1	Distance2	Distance3	Class
Aood	711	714	697	690	73.49486	150.2246	499.1292	1
Bukhoor	710	703	697	690	79.23625	143.873	493.0254	1
Junaid	716	709	702	695	68.21815	154.8884	504.0337	1
Kausar	746	739	732	725	8.585805	214.8777	564.0301	1
Teatreeoil	824	816	808	800	144.8522	367.8935	717.0453	1
Raspberry	790	782	775	767	77.86844	300.8877	650.04	1
Rosemusk	851	842	834	826	197.3577	420.397	769.5499	1
Strawberry	720	713	706	689	65.49253	158.2846	507.1864	1
Ajayeb	646	639	633	627	206.7071	16.45084	365.5256	2
Ajmal	605	599	603	587	282.3334	59.77483	290.1345	2
Amreaj	570	565	559	564	350.4444	127.4466	222.1126	2
Asgar_Ali	682	675	669	662	135.2074	87.8876	437.0286	2
Burberrry	611	605	589	583	285.2518	63.1461	287.3012	2
Dehenalaod	681	685	678	662	126.4408	97.45784	446.1345	2
Rose	630	624	618	612	237.2058	14.21373	335.0194	2
Constrected2	668	652	645	649	172.6189	51.74775	400.15	2
Carolina_Herrera	631	624	628	622	227.0561	9.144944	345.5705	2
Oudh_Ma'alattar	672	665	659	653	154.7207	68.37419	417.5225	2
Constrected	652	655	649	642	180.4222	43.47678	392.0383	2
Solidmusk	460	456	451	447	572.2171	349.1599	0	3

Here,

We took the values from the Round 04-New Table.

Old Table

	M1	M2	M3	M4
c1	749.8889	744.7778	736.5556	727.1111
c2	636.7	630.3	625.2	620.1
c3	460	456	451	447

We follow the procedure as before we did in the Round 01 and we get a New Table

New Table

	M1	M2	M3	M4
c1	758.5	752.25	743.875	735.25

	M1	M2	M3	M4
c2	640.7273	635.2727	630	623.9091
c3	460	456	451	447

Round 06: (Main Table)

Name	M1	M2	M3	M4	Distance1	Distance2	Distance3	Class
Bukhoor	710	703	697	690	94.98758	135.0655	493.0254	1
Aood	711	714	697	690	89.24203	141.3975	499.1292	1
Junaid	716	709	702	695	83.9666	146.0808	504.0337	1
Strawberry	720	713	706	689	81.21817	149.4608	507.1864	1
Kausar	746	739	732	725	24.03936	206.0705	564.0301	1
Raspberry	790	782	775	767	62.08173	292.0809	650.04	1
Teatreeoil	824	816	808	800	129.0693	359.0867	717.0453	1
Rosemusk	851	842	834	826	181.5748	411.5914	769.5499	1
Amreaj	570	565	559	564	366.1969	136.2744	222.1126	2
Ajmal	605	599	603	587	298.1135	68.43559	290.1345	2
Burberrry	611	605	589	583	301.0069	71.79626	287.3012	2
Rose	630	624	618	612	252.9731	22.97771	335.0194	2
Carolina_Herrera	631	624	628	622	242.8104	15.14394	345.5705	2
Ajayeb	646	639	633	627	222.4705	7.761954	365.5256	2
Constrected	652	655	649	642	196.2056	34.7062	392.0383	2
Constrected2	668	652	645	649	188.2967	43.33771	400.15	2
Oudh_Ma'alattar	672	665	659	653	170.4806	59.57328	417.5225	2
Dehenalaod	681	685	678	662	142.2459	88.59803	446.1345	2
Asgar_Ali	682	675	669	662	150.969	79.07978	437.0286	2
Solidmusk	460	456	451	447	587.9882	357.9649	0	3

Here,

We took the values from the Round 05-New Table.

Old Table

	M1	M2	M3	M4
c1	758.5	752.25	743.875	735.25
c2	640.7273	635.2727	630	623.9091
c3	460	456	451	447

We follow the procedure as before we did in the Round 01 and we get a New Table

New Table

	M1	M2	M3	M4
c1	758.5	752.25	743.875	735.25

c2	640.7273	635.2727	630	623.9091
c3	460	456	451	447

Finally, we can see values in the old table and new table are same.