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1 C:\Users\nguye\.virtualenvs\lab4_clustering\Scripts\
  python.exe "C:/Users/nguye/OneDrive/Documents/
  HpSepctrex360/GeneralClassDownloads/CSC 466/
  lab4_clustering/clustering/hclustering.py" ./data/
  mammal_milk.csv 0
2 Cluster 0:
3 2 points:
4 Point: 21          Water    Protein      Fat    Lactose
      Ash
5 21  0.725951  0.837607  0.456098  0.376812  0.590909
6 Point: 22          Water    Protein      Fat    Lactose
      Ash
7 22  0.713647  0.863248  0.470732  0.362319  0.590909
8 Cluster 1:
9 2 points:
10 Point: 8           Water    Protein      Fat    Lactose
      Ash
11 8  0.907159  0.452991  0.168293  0.681159  0.309091
12 Point: 16          Water    Protein      Fat    Lactose
      Ash
13 16  0.90604  0.42735  0.131707  0.681159  0.368182
14 Cluster 2:
15 2 points:
16 Point: 6           Water    Protein      Fat    Lactose
      Ash
17 6  0.969799  0.247863  0.058537  0.695652  0.277273
18 Point: 15          Water    Protein      Fat    Lactose
      Ash
19 15  0.95302  0.205128  0.092683  0.768116  0.272727
20 Cluster 3:
21 3 points:
22 Point: 11          Water    Protein      Fat    Lactose
      Ash
23 11  0.901566  0.512821  0.119512  0.710145  0.377273
24 Point: 8           Water    Protein      Fat    Lactose
      Ash
25 8  0.907159  0.452991  0.168293  0.681159  0.309091
26 Point: 16          Water    Protein      Fat    Lactose
      Ash
27 16  0.90604  0.42735  0.131707  0.681159  0.368182
28 Cluster 4:

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29 2 points:
30 Point: 2      Water      Protein      Fat      Lactose
      Ash
31 2  0.978747  0.068376  0.060976  0.869565  0.063636
32 Point: 3      Water      Protein      Fat      Lactose
      Ash
33 3  0.977629  0.136752  0.041463  0.927536  0.036364
34 Cluster 5:
35 2 points:
36 Point: 7      Water      Protein      Fat      Lactose
      Ash
37 7  0.96085   0.358974  0.017073  0.826087  0.363636
38 Point: 12     Water      Protein      Fat      Lactose
      Ash
39 12 0.956376  0.282051  0.053659  0.811594  0.318182
40 Cluster 6:
41 3 points:
42 Point: 4      Water      Protein      Fat      Lactose
      Ash
43 4  0.998881  0.094017  0.009756  0.898551  0.136364
44 Point: 2      Water      Protein      Fat      Lactose
      Ash
45 2  0.978747  0.068376  0.060976  0.869565  0.063636
46 Point: 3      Water      Protein      Fat      Lactose
      Ash
47 3  0.977629  0.136752  0.041463  0.927536  0.036364
48 Cluster 7:
49 4 points:
50 Point: 13     Water      Protein      Fat      Lactose
      Ash
51 13 0.995526  0.119658  0.019512  0.797101  0.168182
52 Point: 4      Water      Protein      Fat      Lactose
      Ash
53 4  0.998881  0.094017  0.009756  0.898551  0.136364
54 Point: 2      Water      Protein      Fat      Lactose
      Ash
55 2  0.978747  0.068376  0.060976  0.869565  0.063636
56 Point: 3      Water      Protein      Fat      Lactose
      Ash
57 3  0.977629  0.136752  0.041463  0.927536  0.036364
58 Cluster 8:

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59 2 points:
60 Point: 17          Water  Protein          Fat   Lactose
    Ash
61 17  0.842282  0.74359  0.207317  0.434783  0.5
62 Point: 20          Water  Protein          Fat   Lactose
    Ash
63 20  0.799776  0.735043  0.282927  0.478261  0.590909
64 Cluster 9:
65 4 points:
66 Point: 6          Water  Protein          Fat   Lactose
    Ash
67 6  0.969799  0.247863  0.058537  0.695652  0.277273
68 Point: 15          Water  Protein          Fat   Lactose
    Ash
69 15  0.95302  0.205128  0.092683  0.768116  0.272727
70 Point: 7          Water  Protein          Fat   Lactose
    Ash
71 7  0.96085  0.358974  0.017073  0.826087  0.363636
72 Point: 12          Water  Protein          Fat   Lactose
    Ash
73 12  0.956376  0.282051  0.053659  0.811594  0.318182
74 Cluster 10:
75 5 points:
76 Point: 1          Water  Protein  Fat   Lactose      Ash
77 1  0.996644  0.17094  0.0    1.0  0.113636
78 Point: 13          Water  Protein          Fat   Lactose
    Ash
79 13  0.995526  0.119658  0.019512  0.797101  0.168182
80 Point: 4          Water  Protein          Fat   Lactose
    Ash
81 4  0.998881  0.094017  0.009756  0.898551  0.136364
82 Point: 2          Water  Protein          Fat   Lactose
    Ash
83 2  0.978747  0.068376  0.060976  0.869565  0.063636
84 Point: 3          Water  Protein          Fat   Lactose
    Ash
85 3  0.977629  0.136752  0.041463  0.927536  0.036364
86 Cluster 11:
87 2 points:
88 Point: 9          Water  Protein          Fat   Lactose
    Ash

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89	9	0.904922	0.581197	0.15122	0.391304	0.340909
90	Point: 14		Water	Protein	Fat	Lactose
	Ash					
91	14	0.914989	0.555556	0.1	0.536232	0.454545
92	Cluster 12:					
93	7 points:					
94	Point: 11		Water	Protein	Fat	Lactose
	Ash					
95	11	0.901566	0.512821	0.119512	0.710145	0.377273
96	Point: 8		Water	Protein	Fat	Lactose
	Ash					
97	8	0.907159	0.452991	0.168293	0.681159	0.309091
98	Point: 16		Water	Protein	Fat	Lactose
	Ash					
99	16	0.90604	0.42735	0.131707	0.681159	0.368182
100	Point: 6		Water	Protein	Fat	Lactose
	Ash					
101	6	0.969799	0.247863	0.058537	0.695652	0.277273
102	Point: 15		Water	Protein	Fat	Lactose
	Ash					
103	15	0.95302	0.205128	0.092683	0.768116	0.272727
104	Point: 7		Water	Protein	Fat	Lactose
	Ash					
105	7	0.96085	0.358974	0.017073	0.826087	0.363636
106	Point: 12		Water	Protein	Fat	Lactose
	Ash					
107	12	0.956376	0.282051	0.053659	0.811594	0.318182
108	Cluster 13:					
109	4 points:					
110	Point: 17		Water	Protein	Fat	Lactose
	Ash					
111	17	0.842282	0.74359	0.207317	0.434783	0.5
112	Point: 20		Water	Protein	Fat	Lactose
	Ash					
113	20	0.799776	0.735043	0.282927	0.478261	0.590909
114	Point: 9		Water	Protein	Fat	Lactose
	Ash					
115	9	0.904922	0.581197	0.15122	0.391304	0.340909
116	Point: 14		Water	Protein	Fat	Lactose
	Ash					
117	14	0.914989	0.555556	0.1	0.536232	0.454545

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118 Cluster 14:
119 2 points:
120 Point: 24      Water  Protein  Fat  Lactose
    Ash
121 24  0.50783  0.777778  1.0    0.0  0.340909
122 Point: 25      Water  Protein      Fat  Lactose
    Ash
123 25  0.491051  0.854701  0.826829  0.130435  0.195455
124 Cluster 15:
125 3 points:
126 Point: 23      Water  Protein      Fat  Lactose
    Ash
127 23  0.713647  0.897436  0.492683  0.231884  0.340909
128 Point: 21      Water  Protein      Fat  Lactose
    Ash
129 21  0.725951  0.837607  0.456098  0.376812  0.590909
130 Point: 22      Water  Protein      Fat  Lactose
    Ash
131 22  0.713647  0.863248  0.470732  0.362319  0.590909
132 Cluster 16:
133 5 points:
134 Point: 10      Water  Protein      Fat  Lactose
    Ash
135 10  0.901566  0.811966  0.129268  0.637681  0.295455
136 Point: 17      Water  Protein      Fat  Lactose
    Ash
137 17  0.842282  0.74359  0.207317  0.434783  0.5
138 Point: 20      Water  Protein      Fat  Lactose
    Ash
139 20  0.799776  0.735043  0.282927  0.478261  0.590909
140 Point: 9       Water  Protein      Fat  Lactose
    Ash
141 9  0.904922  0.581197  0.15122  0.391304  0.340909
142 Point: 14      Water  Protein  Fat  Lactose
    Ash
143 14  0.914989  0.555556  0.1  0.536232  0.454545
144 Cluster 17:
145 6 points:
146 Point: 5      Water  Protein      Fat  Lactose  Ash
147 5      1.0      0.0  0.085366  0.637681  0.0
148 Point: 1      Water  Protein  Fat  Lactose

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148 Ash
149 1 0.996644 0.17094 0.0 1.0 0.113636
150 Point: 13 Water Protein Fat Lactose
    Ash
151 13 0.995526 0.119658 0.019512 0.797101 0.168182
152 Point: 4 Water Protein Fat Lactose
    Ash
153 4 0.998881 0.094017 0.009756 0.898551 0.136364
154 Point: 2 Water Protein Fat Lactose
    Ash
155 2 0.978747 0.068376 0.060976 0.869565 0.063636
156 Point: 3 Water Protein Fat Lactose
    Ash
157 3 0.977629 0.136752 0.041463 0.927536 0.036364
158 Cluster 18:
159 8 points:
160 Point: 18 Water Protein Fat Lactose
    Ash
161 18 0.779642 0.25641 0.404878 0.811594 0.240909
162 Point: 11 Water Protein Fat Lactose
    Ash
163 11 0.901566 0.512821 0.119512 0.710145 0.377273
164 Point: 8 Water Protein Fat Lactose
    Ash
165 8 0.907159 0.452991 0.168293 0.681159 0.309091
166 Point: 16 Water Protein Fat Lactose
    Ash
167 16 0.90604 0.42735 0.131707 0.681159 0.368182
168 Point: 6 Water Protein Fat Lactose
    Ash
169 6 0.969799 0.247863 0.058537 0.695652 0.277273
170 Point: 15 Water Protein Fat Lactose
    Ash
171 15 0.95302 0.205128 0.092683 0.768116 0.272727
172 Point: 7 Water Protein Fat Lactose
    Ash
173 7 0.96085 0.358974 0.017073 0.826087 0.363636
174 Point: 12 Water Protein Fat Lactose
    Ash
175 12 0.956376 0.282051 0.053659 0.811594 0.318182
176 Cluster 19:

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177 14 points:

Point	Water	Protein	Fat	Lactose	Ash
178 Point: 5	0.0	0.085366	0.637681	0.0	
179 5 1.0					
180 Point: 1	0.17094	0.0	1.0	0.113636	
181 1 0.996644					
182 Point: 13	0.119658	0.019512	0.797101	0.168182	
183 13 0.995526					
184 Point: 4	0.094017	0.009756	0.898551	0.136364	
185 4 0.998881					
186 Point: 2	0.068376	0.060976	0.869565	0.063636	
187 2 0.978747					
188 Point: 3	0.136752	0.041463	0.927536	0.036364	
189 3 0.977629					
190 Point: 18	0.25641	0.404878	0.811594	0.240909	
191 18 0.779642					
192 Point: 11	0.512821	0.119512	0.710145	0.377273	
193 11 0.901566					
194 Point: 8	0.452991	0.168293	0.681159	0.309091	
195 8 0.907159					
196 Point: 16	0.42735	0.131707	0.681159	0.368182	
197 16 0.90604					
198 Point: 6	0.247863	0.058537	0.695652	0.277273	
199 6 0.969799					
200 Point: 15	0.205128	0.092683	0.768116	0.272727	
201 15 0.95302					
202 Point: 7	0.358974	0.017073	0.826087	0.363636	
203 7 0.96085					
204 Point: 12					

205	12	0.956376	0.282051	0.053659	0.811594	0.318182
206	Cluster 20:					
207	8 points:					
208	Point: 23		Water	Protein	Fat	Lactose
	Ash					
209	23	0.713647	0.897436	0.492683	0.231884	0.340909
210	Point: 21		Water	Protein	Fat	Lactose
	Ash					
211	21	0.725951	0.837607	0.456098	0.376812	0.590909
212	Point: 22		Water	Protein	Fat	Lactose
	Ash					
213	22	0.713647	0.863248	0.470732	0.362319	0.590909
214	Point: 10		Water	Protein	Fat	Lactose
	Ash					
215	10	0.901566	0.811966	0.129268	0.637681	0.295455
216	Point: 17		Water	Protein	Fat	Lactose
	Ash					
217	17	0.842282	0.74359	0.207317	0.434783	0.5
218	Point: 20		Water	Protein	Fat	Lactose
	Ash					
219	20	0.799776	0.735043	0.282927	0.478261	0.590909
220	Point: 9		Water	Protein	Fat	Lactose
	Ash					
221	9	0.904922	0.581197	0.15122	0.391304	0.340909
222	Point: 14		Water	Protein	Fat	Lactose
	Ash					
223	14	0.914989	0.555556	0.1	0.536232	0.454545
224	Cluster 21:					
225	9 points:					
226	Point: 19		Water	Protein	Fat	Lactose
	Ash					
227	19	0.786353	1.0	0.295122	0.275362	1.0
228	Point: 23		Water	Protein	Fat	Lactose
	Ash					
229	23	0.713647	0.897436	0.492683	0.231884	0.340909
230	Point: 21		Water	Protein	Fat	Lactose
	Ash					
231	21	0.725951	0.837607	0.456098	0.376812	0.590909
232	Point: 22		Water	Protein	Fat	Lactose
	Ash					
233	22	0.713647	0.863248	0.470732	0.362319	0.590909



234	Point: 10	Water	Protein	Fat	Lactose
	Ash				
235	10	0.901566	0.811966	0.129268	0.637681
236	Point: 17	Water	Protein	Fat	Lactose
	Ash				
237	17	0.842282	0.74359	0.207317	0.434783
238	Point: 20	Water	Protein	Fat	Lactose
	Ash				
239	20	0.799776	0.735043	0.282927	0.478261
240	Point: 9	Water	Protein	Fat	Lactose
	Ash				
241	9	0.904922	0.581197	0.15122	0.391304
242	Point: 14	Water	Protein	Fat	Lactose
	Ash				
243	14	0.914989	0.555556	0.1	0.536232
244	Cluster 22:				
245	11 points:				
246	Point: 24	Water	Protein	Fat	Lactose
	Ash				
247	24	0.50783	0.777778	1.0	0.0
248	Point: 25	Water	Protein	Fat	Lactose
	Ash				
249	25	0.491051	0.854701	0.826829	0.130435
250	Point: 19	Water	Protein	Fat	Lactose
	Ash				
251	19	0.786353	1.0	0.295122	0.275362
252	Point: 23	Water	Protein	Fat	Lactose
	Ash				
253	23	0.713647	0.897436	0.492683	0.231884
254	Point: 21	Water	Protein	Fat	Lactose
	Ash				
255	21	0.725951	0.837607	0.456098	0.376812
256	Point: 22	Water	Protein	Fat	Lactose
	Ash				
257	22	0.713647	0.863248	0.470732	0.362319
258	Point: 10	Water	Protein	Fat	Lactose
	Ash				
259	10	0.901566	0.811966	0.129268	0.637681
260	Point: 17	Water	Protein	Fat	Lactose
	Ash				
261	17	0.842282	0.74359	0.207317	0.434783

262	Point: 20	Water	Protein	Fat	Lactose	Ash
263	20	0.799776	0.735043	0.282927	0.478261	0.590909
264	Point: 9	Water	Protein	Fat	Lactose	Ash
265	9	0.904922	0.581197	0.15122	0.391304	0.340909
266	Point: 14	Water	Protein	Fat	Lactose	Ash
267	14	0.914989	0.555556	0.1	0.536232	0.454545
268	Cluster 23:					
269	25 points:					
270	Point: 5	Water	Protein	Fat	Lactose	Ash
271	5	1.0	0.0	0.085366	0.637681	0.0
272	Point: 1	Water	Protein	Fat	Lactose	Ash
273	1	0.996644	0.17094	0.0	1.0	0.113636
274	Point: 13	Water	Protein	Fat	Lactose	Ash
275	13	0.995526	0.119658	0.019512	0.797101	0.168182
276	Point: 4	Water	Protein	Fat	Lactose	Ash
277	4	0.998881	0.094017	0.009756	0.898551	0.136364
278	Point: 2	Water	Protein	Fat	Lactose	Ash
279	2	0.978747	0.068376	0.060976	0.869565	0.063636
280	Point: 3	Water	Protein	Fat	Lactose	Ash
281	3	0.977629	0.136752	0.041463	0.927536	0.036364
282	Point: 18	Water	Protein	Fat	Lactose	Ash
283	18	0.779642	0.25641	0.404878	0.811594	0.240909
284	Point: 11	Water	Protein	Fat	Lactose	Ash
285	11	0.901566	0.512821	0.119512	0.710145	0.377273
286	Point: 8	Water	Protein	Fat	Lactose	Ash
287	8	0.907159	0.452991	0.168293	0.681159	0.309091
288	Point: 16	Water	Protein	Fat	Lactose	Ash
289	16	0.90604	0.42735	0.131707	0.681159	0.368182
290	Point: 6	Water	Protein	Fat	Lactose	

290		Ash				
291	6	0.969799	0.247863	0.058537	0.695652	0.277273
292	Point: 15		Water	Protein	Fat	Lactose
		Ash				
293	15	0.95302	0.205128	0.092683	0.768116	0.272727
294	Point: 7		Water	Protein	Fat	Lactose
		Ash				
295	7	0.96085	0.358974	0.017073	0.826087	0.363636
296	Point: 12		Water	Protein	Fat	Lactose
		Ash				
297	12	0.956376	0.282051	0.053659	0.811594	0.318182
298	Point: 24		Water	Protein	Fat	Lactose
		Ash				
299	24	0.50783	0.777778	1.0	0.0	0.340909
300	Point: 25		Water	Protein	Fat	Lactose
		Ash				
301	25	0.491051	0.854701	0.826829	0.130435	0.195455
302	Point: 19		Water	Protein	Fat	Lactose
		Ash				
303	19	0.786353	1.0	0.295122	0.275362	1.0
304	Point: 23		Water	Protein	Fat	Lactose
		Ash				
305	23	0.713647	0.897436	0.492683	0.231884	0.340909
306	Point: 21		Water	Protein	Fat	Lactose
		Ash				
307	21	0.725951	0.837607	0.456098	0.376812	0.590909
308	Point: 22		Water	Protein	Fat	Lactose
		Ash				
309	22	0.713647	0.863248	0.470732	0.362319	0.590909
310	Point: 10		Water	Protein	Fat	Lactose
		Ash				
311	10	0.901566	0.811966	0.129268	0.637681	0.295455
312	Point: 17		Water	Protein	Fat	Lactose
		Ash				
313	17	0.842282	0.74359	0.207317	0.434783	0.5
314	Point: 20		Water	Protein	Fat	Lactose
		Ash				
315	20	0.799776	0.735043	0.282927	0.478261	0.590909
316	Point: 9		Water	Protein	Fat	Lactose
		Ash				
317	9	0.904922	0.581197	0.15122	0.391304	0.340909

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318 Point: 14      Water  Protein  Fat  Lactose
      Ash
319 14  0.914989  0.555556  0.1  0.536232  0.454545
320 Cluster 24:
321 26 points:
322 Point: 0      Water  Protein  Fat  Lactose      Ash
323 0      0.0  0.034188  0.0  0.144928  0.409091
324 Point: 5      Water  Protein      Fat  Lactose  Ash
325 5      1.0      0.0  0.085366  0.637681  0.0
326 Point: 1      Water  Protein  Fat  Lactose
      Ash
327 1  0.996644  0.17094  0.0      1.0  0.113636
328 Point: 13     Water  Protein      Fat  Lactose
      Ash
329 13  0.995526  0.119658  0.019512  0.797101  0.168182
330 Point: 4      Water  Protein      Fat  Lactose
      Ash
331 4  0.998881  0.094017  0.009756  0.898551  0.136364
332 Point: 2      Water  Protein      Fat  Lactose
      Ash
333 2  0.978747  0.068376  0.060976  0.869565  0.063636
334 Point: 3      Water  Protein      Fat  Lactose
      Ash
335 3  0.977629  0.136752  0.041463  0.927536  0.036364
336 Point: 18     Water  Protein      Fat  Lactose
      Ash
337 18  0.779642  0.25641  0.404878  0.811594  0.240909
338 Point: 11     Water  Protein      Fat  Lactose
      Ash
339 11  0.901566  0.512821  0.119512  0.710145  0.377273
340 Point: 8      Water  Protein      Fat  Lactose
      Ash
341 8  0.907159  0.452991  0.168293  0.681159  0.309091
342 Point: 16     Water  Protein      Fat  Lactose
      Ash
343 16  0.90604  0.42735  0.131707  0.681159  0.368182
344 Point: 6      Water  Protein      Fat  Lactose
      Ash
345 6  0.969799  0.247863  0.058537  0.695652  0.277273
346 Point: 15     Water  Protein      Fat  Lactose
      Ash

```

347	15	0.95302	0.205128	0.092683	0.768116	0.272727
348	Point: 7	Water	Protein		Fat	Lactose
	Ash					
349	7	0.96085	0.358974	0.017073	0.826087	0.363636
350	Point: 12	Water	Protein		Fat	Lactose
	Ash					
351	12	0.956376	0.282051	0.053659	0.811594	0.318182
352	Point: 24	Water	Protein	Fat	Lactose	
	Ash					
353	24	0.50783	0.777778	1.0	0.0	0.340909
354	Point: 25	Water	Protein		Fat	Lactose
	Ash					
355	25	0.491051	0.854701	0.826829	0.130435	0.195455
356	Point: 19	Water	Protein		Fat	Lactose
	Ash					
357	19	0.786353	1.0	0.295122	0.275362	1.0
358	Point: 23	Water	Protein		Fat	Lactose
	Ash					
359	23	0.713647	0.897436	0.492683	0.231884	0.340909
360	Point: 21	Water	Protein		Fat	Lactose
	Ash					
361	21	0.725951	0.837607	0.456098	0.376812	0.590909
362	Point: 22	Water	Protein		Fat	Lactose
	Ash					
363	22	0.713647	0.863248	0.470732	0.362319	0.590909
364	Point: 10	Water	Protein		Fat	Lactose
	Ash					
365	10	0.901566	0.811966	0.129268	0.637681	0.295455
366	Point: 17	Water	Protein		Fat	Lactose
	Ash					
367	17	0.842282	0.74359	0.207317	0.434783	0.5
368	Point: 20	Water	Protein		Fat	Lactose
	Ash					
369	20	0.799776	0.735043	0.282927	0.478261	0.590909
370	Point: 9	Water	Protein		Fat	Lactose
	Ash					
371	9	0.904922	0.581197	0.15122	0.391304	0.340909
372	Point: 14	Water	Protein	Fat	Lactose	
	Ash					
373	14	0.914989	0.555556	0.1	0.536232	0.454545
374						

```
375 Process finished with exit code 0
376
```