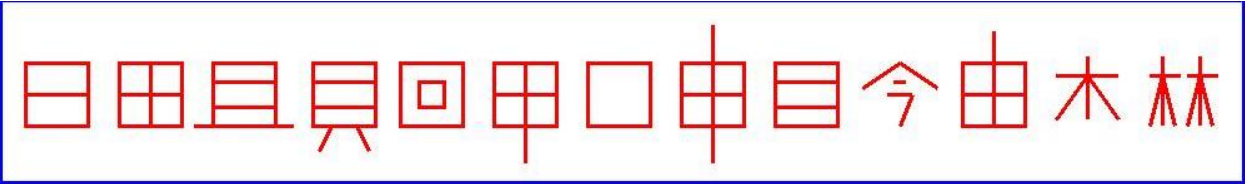


Clustering of Japanese 13 charachters



Here is the table of similarity percentage of Japanese charachters:

	日	田	且	貝	回	甲	口	申	目	今	由	木	林
日	1	0.95	0.7	0.7	0.75	0.80	0.90	0.50	0.65	0.1	0.80	0.1	0.1
田	0.95	1	0.55	0.55	0.7	0.90	0.85	0.9	0.6	0.1	0.95	0.1	0.1
且	0.7	0.55	1	0.95	0.5	0.5	0.6	0.6	0.95	0.1	0.6	0.1	0.1
貝	0.7	0.55	0.95	1	0.4	0.4	0.5	0.5	0.95	0.1	0.6	0.15	0.15
回	0.75	0.7	0.5	0.4	1	0.5	0.9	0.6	0.6	0.1	0.65	0.1	0.1
甲	0.80	0.90	0.5	0.4	0.5	1	0.7	0.85	0.75	0.1	0.95	0.1	0.1
口	0.90	0.85	0.6	0.5	0.9	0.7	1	0.65	0.6	0.1	0.75	0.1	0.1
申	0.50	0.9	0.6	0.5	0.6	0.85	0.65	1	0.6	0.1	0.90	0.1	0.1
目	0.65	0.6	0.95	0.95	0.6	0.75	0.6	0.6	1	0.1	0.8	0.1	0.1
今	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5	0.5
由	0.80	0.95	0.6	0.6	0.65	0.95	0.75	0.90	0.8	0.1	1	0.1	0.1
木	0.1	0.1	0.1	0.15	0.1	0.1	0.1	0.1	0.1	0.5	0.1	1	0.5
林	0.1	0.1	0.1	0.15	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.5	1

Final table, after Calculate a max-min similarity-relation and Set $a_{ij} = 0$ for all $a_{ij} < \alpha$ and $i = j$ and where all values less than $\alpha=0,55$

														
		1	2	3	4	5	6	7	8	9	10	11	12	13
	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
	3	0.8	0.8	0	0.95	0.8	0.8	0.8	0.8	0.95	0	0.8	0	0
	4	0.8	0.8	0.95	0	0.8	0.8	0.8	0.8	0.95	0	0.8	0	0
	5	0.9	0.9	0.8	0.8	0	0.9	0.9	0.9	0.8	0	0.9	0	0
	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
	7	0.9	0.9	0.8	0.8	0.9	0.9	0	0.9	0.9	0	0.9	0	0
	8	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0	0.8	0	0.9	0	0
	9	0.8	0.95	0.95	0.95	0.8	0.8	0.9	0.8	0	0	0.8	0	0
	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0	0	0

First, set $I = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$ and $C1 = \{ \}$.

First iteration

$a_{1\ 2} = a_{1\ 6} = a_{1\ 11} = a_{2\ 6} = a_{2\ 11} = a_{3\ 4} = a_{3\ 9} = a_{4\ 9} = a_{6\ 11} = \dots = 0.95$ are maximum and 1,6 is randomly selected. Then C1= {1, 6}.

														
		1	2	3	4	5	6	7	8	9	10	11	12	13
	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
Sum		0.95	1.9	1.6	1.6	1.8	0.95	1.8	1.8	1.6	0	1.9	0	0

$a_{1\ 2} + a_{6\ 2} = a_{1\ 11} + a_{6\ 11} = 1,9$ are maximum. Select 11 Then C1= {1, 6, 11}

														
		1	2	3	4	5	6	7	8	9	10	11	12	13
	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
Sum		1.9	2.85	2.4	2.4	2.7	1.9	2.7	2.7	2.4	0	1.9	0	0

$a_{1\ 2} + a_{6\ 2} + a_{11\ 2} = 2,85$ are maximum. Select 2-- Then C1= {1, 6 , 11, 2}.

		𠂇	𠂇	𠂇	𠂇	回	甲	口	申	目	今	由	木	林
		1	2	3	4	5	6	7	8	9	10	11	12	13
𠂇	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
𠂇	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
由	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
𠂇	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
Sum		2.85	2.85	3.2	3.2	3.6	2.85	3.6	3.6	3.2	0	2.85	0	0

~~$a_{1\ 5} + a_{6\ 5} + a_{11\ 5} + a_{2\ 5} = a_{1\ 7} + a_{6\ 7} + a_{11\ 7} + a_{2\ 7} = a_{1\ 8} + a_{6\ 8} + a_{2\ 8} + a_{11\ 8} = 3.6$ are maximum.~~ Select 5--- Then C1= {1, 6 , 11, 2, 5}.

		𠂇	𠂇	𠂇	𠂇	回	甲	口	申	目	今	由	木	林
		1	2	3	4	5	6	7	8	9	10	11	12	13
𠂇	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
𠂇	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
由	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
𠂇	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
回	5	0.9	0.9	0.8	0.8	0	0.9	0.9	0.9	0.8	0	0.9	0	0
Sum		3.75	3.75	4	4	3.6	3.75	4.5	4.5	4	0	3.75	0	0

~~$a_{1\ 7} + a_{6\ 7} + a_{11\ 7} + a_{2\ 7} + a_{5\ 7} = a_{1\ 8} + a_{6\ 8} + a_{2\ 8} + a_{11\ 8} + a_{5\ 8} = 4.5$ are maximum.~~ Select 7 --Then C1= {1, 6 , 11, 2,5,7}.

		𠂔	𠂔	𠂔	𠂔	回	甲	口	申	目	今	由	木	林
		1	2	3	4	5	6	7	8	9	10	11	12	13
𠂔	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
𠂔	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
由	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
𠂔	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
回	5	0.9	0.9	0.8	0.8	0	0.9	0.9	0.9	0.8	0	0.9	0	0
口	7	0.9	0.9	0.8	0.8	0.9	0.9	0	0.9	0.9	0	0.9	0	0
Sum		4.65	4.65	4.8	4.8	4.5	4.65	4.5	5.4	4.9	0	4.65	0	0

$a_{1\ 8} + a_{6\ 8} + a_{2\ 8} + a_{11\ 8} + a_{5\ 8} + a_{7\ 8} = 5,4$ are maximum. Select 8-- Then C1= {1, 6 , 11, 2,5,7,8}.

		𠂔	𠂔	𠂔	𠂔	回	甲	口	申	目	今	由	木	林
		1	2	3	4	5	6	7	8	9	10	11	12	13
𠂔	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
𠂔	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
由	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
𠂔	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
回	5	0.9	0.9	0.8	0.8	0	0.9	0.9	0.9	0.8	0	0.9	0	0
口	7	0.9	0.9	0.8	0.8	0.9	0.9	0	0.9	0.9	0	0.9	0	0
申	8	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0	0.8	0	0.9	0	0
Sum		5.55	5.55	5.6	5.6	5.4	5.55	5.4	5.4	5.7	0	5.55	0	0

$a_{1\ 9} + a_{6\ 9} + a_{2\ 9} + a_{11\ 9} + a_{5\ 9} + a_{7\ 9} + a_{8\ 9} = 5,7$ are maximum Select 9-- Then C1= {1, 6 , 11, 2,5,7,8,9}.

		𠂇	𠂇	𠂇	𠂇	回	甲	口	申	目	今	由	木	林
		1	2	3	4	5	6	7	8	9	10	11	12	13
𠂇	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
甲	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
由	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
𠂇	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
回	5	0.9	0.9	0.8	0.8	0	0.9	0.9	0.9	0.8	0	0.9	0	0
口	7	0.9	0.9	0.8	0.8	0.9	0.9	0	0.9	0.9	0	0.9	0	0
申	8	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0	0.8	0	0.9	0	0
目	9	0.8	0.95	0.95	0.95	0.8	0.8	0.9	0.8	0	0	0.8	0	0
Sum		6.35	6.5	6.55	6.55	6.2	6.35	6.3	6.2	5.7	0	6.35	0	0

$a_{1\ 3} + a_{6\ 3} + a_{2\ 3} + a_{11\ 3} + a_{5\ 3} + a_{7\ 3} + a_{8\ 3} + a_{9\ 3} = a_{1\ 4} + a_{6\ 4} + a_{2\ 4} + a_{11\ 4} + a_{5\ 4} + a_{7\ 4} + a_{8\ 4} + a_{9\ 4} = 6,55$ are maximum sum
 Select 4--- Then **C1= {1, 6 , 11, 2,5,7,8,9,4}**.

		田	田	且	貝	回	甲	口	申	目	今	由	木	林
		1	2	3	4	5	6	7	8	9	10	11	12	13
田	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
甲	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
由	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
田	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
回	5	0.9	0.9	0.8	0.8	0	0.9	0.9	0.9	0.8	0	0.9	0	0
口	7	0.9	0.9	0.8	0.8	0.9	0.9	0	0.9	0.9	0	0.9	0	0
申	8	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0	0.8	0	0.9	0	0
目	9	0.8	0.95	0.95	0.95	0.8	0.8	0.9	0.8	0	0	0.8	0	0
貝	4	0.8	0.8	0.95	0	0.8	0.8	0.8	0.8	0.95	0	0.8	0	0
Sum		7.15	7.3	7.5	6.55	7	7.15	7.1	7	6.65	0	7.15	0	0

$a_{1\ 3} + a_{6\ 3} + a_{2\ 3} + a_{11\ 3} + a_{5\ 3} + a_{7\ 3} + a_{8\ 3} + a_{9\ 3} + a_{4\ 3} = 7,5$ are maximum sum Then C1= {1, 6 , 11, 2,5,7,8,9,4,3}.

		田	田	且	貝	回	甲	口	申	目	今	由	木	林
		1	2	3	4	5	6	7	8	9	10	11	12	13
田	1	0	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
甲	6	0.95	0.95	0.8	0.8	0.9	0	0.9	0.9	0.8	0	0.95	0	0
由	11	0.95	0.95	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0	0	0
田	2	0.95	0	0.8	0.8	0.9	0.95	0.9	0.9	0.8	0	0.95	0	0
回	5	0.9	0.9	0.8	0.8	0	0.9	0.9	0.9	0.8	0	0.9	0	0
口	7	0.9	0.9	0.8	0.8	0.9	0.9	0	0.9	0.9	0	0.9	0	0
申	8	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0	0.8	0	0.9	0	0
目	9	0.8	0.95	0.95	0.95	0.8	0.8	0.9	0.8	0	0	0.8	0	0
貝	4	0.8	0.8	0.95	0	0.8	0.8	0.8	0.8	0.95	0	0.8	0	0
且	3	0.8	0.8	0	0.95	0.8	0.8	0.8	0.8	0.95	0	0.8	0	0
Sum		7.95	8.1	7.5	7.9	7.8	7.95	7.9	7.8	7.5	0	7.95	0	0

$a_{1\ 2} + a_{6\ 2} + a_{2\ 2} + a_{11\ 2} + a_{5\ 2} + a_{7\ 2} + a_{8\ 2} + a_{9\ 2} + a_{4\ 2} + a_{3\ 2} = 8.1$ are maximum *sum* Then $C1=\{1, 6, 11, 2,5,7,8,9,4,3\}$. There are no j such is maximum. Then final $C1=\{1, 6, 11, 2,5,7,8,9,4,3\}$.

After deleting this rows and columns the table has become:

		今	木	林
		10	12	13
今	10	0	0	0
木	12	0	0	0
林	13	0	0	0

Second iteration

$I = \{10, 12, 13\}$, $C2 = \{ \}$.

Now $a_{ij} = 0$. Then $\{10\}$, $\{12\}$ and $\{13\}$ are three separated clusters.

In this way, when $\alpha = 0.55$, we have 4 clusters:

$C1 = \{1, 6, 11, 7, 2, 5, 8, 3, 4, 9\}$, $C2 = \{10\}$, $C3 = \{12\}$, $C4 = \{13\}$

OR

$\{ \{ \text{田}, \text{甲}, \text{由}, \text{口}, \text{田}, \text{回}, \text{申}, \text{且}, \text{貝}, \text{目} \}, \{ \text{今} \}, \{ \text{木} \}, \{ \text{林} \} \}$