

# Output tables for 1xN statistical comparisons.

June 6, 2025

## 1 Average rankings of Friedman test

Average ranks obtained by each method in the Friedman test.

Friedman statistic (distributed according to chi-square with 17 degrees of freedom): 323.930526.

P-value computed by Friedman Test: 0.

Iman and Davenport statistic (distributed according to F-distribution with 17 and 408 degrees of freedom): 76.92068.

P-value computed by Iman and Davenport Test: 0.

Algorithm	Ranking
BestCyclicAssignment	12.2
BestNearest	6.7
CLARA	10.12
CoefficientPropagation	9.96
CyclicAssignment	14.52
Farthest-First	3.78
KMEANS	5.1
NearestByCustomer	6
NearestByDepot	10.32
PAM	17.28
Parallel	6
RandomByElement	17.68
RandomSequentialCyclic	14.44
SequentialCyclic	14.84
Simplified	5.48
Sweep	5.5
ThreeCriteriaClustering	3.64
UPGMC	7.44

Table 1: Average Rankings of the algorithms (Friedman)

## 2 Post hoc comparison (Friedman)

P-values obtained in by applying post hoc methods over the results of Friedman procedure.

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm	Hochberg	Hommel	Holland	Rom	Finner	Li
17	RandomByElement	9.298217	0		0.002941		0.003013	0.003094	0.003013	0.003888
16	PAM	9.033311	0		0.003125		0.003201	0.003288	0.006016	0.003888
15	SequentialCyclic	7.417381	0		0.003333		0.003414	0.003507	0.009011	0.003888
14	CyclicAssignment	7.205456	0		0.003571		0.003657	0.003757	0.011996	0.003888
13	RandomSequentialCyclic	7.152475	0		0.003846		0.003938	0.004046	0.014973	0.003888
12	BestCyclicAssignment	5.668998	0		0.004167		0.004265	0.004383	0.017941	0.003888
11	NearestByDepot	4.423938	0.00001		0.004545		0.004652	0.004782	0.020899	0.003888
10	CLARA	4.291485	0.000018		0.005		0.005116	0.00526	0.023849	0.003888
9	CoefficientPropagation	4.185522	0.000028		0.005556		0.005683	0.005844	0.02679	0.003888
8	UPGMC	2.516611	0.011849		0.00625		0.006391	0.006574	0.029722	0.003888
7	BestNearest	2.026535	0.04271		0.007143		0.007301	0.007513	0.032645	0.003888
6	NearestByCustomer	1.562948	0.118065		0.008333		0.008512	0.008764	0.035559	0.003888
5	Parallel	1.562948	0.118065		0.01		0.010206	0.010515	0.038465	0.003888
4	Sweep	1.231815	0.218018		0.0125		0.012741	0.013109	0.041362	0.003888
3	Simplified	1.21857	0.223008		0.016667		0.016952	0.016667	0.04425	0.003888
2	KMEANS	0.966909	0.33359		0.025		0.025321	0.025	0.047129	0.003888
1	Farthest-First	0.092717	0.926128		0.05		0.05	0.05	0.05	0.05

Table 2: Post Hoc comparison Table for  $\alpha = 0.05$  (FRIEDMAN)

Bonferroni-Dunn's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.002941$ .

Holm's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.00625$ .

Hochberg's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005556$ .

Hommel's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.00625$ .

Holland's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.006391$ .

Rom's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.005844$ .

Finner's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.032645$ .

Li's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003888$ .

### 3 Adjusted P-Values (Friedman)

Adjusted P-values obtained through the application of the post hoc methods (Friedman).

i	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hochberg}$	$p_{Hommel}$
1	RandomByElement	0	0	0	0	0
2	PAM	0	0	0	0	0
3	SequentialCyclic	0	0	0	0	0
4	CyclicAssignment	0	0	0	0	0
5	RandomSequentialCyclic	0	0	0	0	0
6	BestCyclicAssignment	0	0	0	0	0
7	NearestByDepot	0.00001	0.000165	0.000107	0.000107	0.000098
8	CLARA	0.000018	0.000302	0.000177	0.000177	0.00016
9	CoefficientPropagation	0.000028	0.000484	0.000256	0.000256	0.000256
10	UPGMC	0.011849	0.201432	0.094792	0.094792	0.094792
11	BestNearest	0.04271	0.726071	0.29897	0.29897	0.275484
12	NearestByCustomer	0.118065	2.007101	0.708389	0.590324	0.444786
13	Parallel	0.118065	2.007101	0.708389	0.590324	0.444786
14	Sweep	0.218018	3.706309	0.872073	0.667179	0.500385
15	Simplified	0.223008	3.791128	0.872073	0.667179	0.500385
16	KMEANS	0.33359	5.671025	0.872073	0.667179	0.667179
17	Farthest-First	0.926128	15.744179	0.926128	0.926128	0.926128

Table 3: Adjusted  $p$ -values (FRIEDMAN) (I)

i	algorithm	unadjusted $p$	$p_{Holland}$	$p_{Rom}$	$p_{Finner}$	$p_L$
1	RandomByElement	0	0	0	0	0
2	PAM	0	0	0	0	0
3	SequentialCyclic	0	0	0	0	0
4	CyclicAssignment	0	0	0	0	0
5	RandomSequentialCyclic	0	0	0	0	0
6	BestCyclicAssignment	0	0	0	0	0
7	NearestByDepot	0.00001	0.000107	0.000101	0.000024	0.000
8	CLARA	0.000018	0.000177	0.000169	0.000038	0.000
9	CoefficientPropagation	0.000028	0.000256	0.000243	0.000054	0.000
10	UPGMC	0.011849	0.090952	0.090118	0.02006	0.138
11	BestNearest	0.04271	0.263276	0.284247	0.065233	0.366
12	NearestByCustomer	0.118065	0.529434	0.561393	0.163045	0.615
13	Parallel	0.118065	0.529434	0.561393	0.163045	0.615
14	Sweep	0.218018	0.626073	0.667179	0.25816	0.746
15	Simplified	0.223008	0.626073	0.667179	0.25816	0.751
16	KMEANS	0.33359	0.626073	0.667179	0.350281	0.818
17	Farthest-First	0.926128	0.926128	0.926128	0.926128	0.926

Table 4: Adjusted  $p$ -values (FRIEDMAN) (II)