Multi-objective GenClust++ vs MCPSO-based algorithm vs Elbow method for K-Means clustering

Table 1. Mean and standard deviation of ARI (higher the better) measured on the outputs of MCPSO, MGenClust++ and K-Means (over 30 independent runs).

Dataset	MCPSO	MGenClust++	K-Means
Glass	0.4611 ± 0.0259	0.5309 ± 0.1856	0.7706 ± 0.0177
Wdbc	0.6291 ± 0.0666	0.6984 ± 0.0392	0.713 ± 0.0112
Flame	0.4251 ± 0.0577	0.4316 ± 0.052	0.4238 ± 0.0065
Compound	0.5404 ± 0.1482	0.7245 ± 0.0178	0.688 ± 0.103
Pathbased	0.4429 ± 0.0285	0.4486 ± 0.0169	0.4553 ± 0.0031
Jain	0.3614 ± 0.1172	0.5437 ± 0.0489	0.2803 ± 0.0
S1	0.8952 ± 0.2446	0.9588 ± 0.0316	0.7646 ± 0.0471
S3	0.5208 ± 0.0962	0.6472 ± 0.0315	0.6095 ± 0.0315
DIM064	0.9682 ± 0.1563	0.8827 ± 0.2126	0.875 ± 0.0692
DIM256	0.9999 ± 7.0E-4	0.8273 ± 0.3035	0.6225 ± 0.0789

Table 2. Mean and standard deviation of DB Index (lower the better) measured on the outputs of MCPSO, MGenClust++ and K-Means (over 30 independent runs).

Dataset	MCPSO	MGenClust++	K-Means
Glass	0.5258 ± 0.0046	0.5095 ± 0.0033	0.5121 ± 1.0E-4
Wdbc	1.4731 ± 0.2437	1.1477 ± 0.1063	1.1087 ± 0.0033
Flame	0.9274 ± 0.2459	0.8781 ± 0.1334	0.7047 ± 0.0069
Compound	1.0167 ± 0.359	0.5893 ± 0.0637	0.6004 ± 0.1682
Pathbased	0.6895 ± 0.0442	0.7474 ± 0.0537	0.7135 ± 0.0111
Jain	0.6867 ± 0.0492	0.7818 ± 0.0265	0.6388 ± 0.0
S1	0.5567 ± 0.4139	0.4627 ± 0.0755	0.5807 ± 0.1086
S3	0.7208 ± 0.06	0.7854 ± 0.0498	0.7429 ± 0.052

DIM064	0.213 ± 0.6173	0.3988 ± 0.3197	1.1892 ± 0.3649
DIM256	0.0354 ± 0.0552	0.5676 ± 0.6385	1.328 ± 0.3549

Table 3. Mean and standard deviation of Silhouette coefficient (higher the better) measured on the outputs of MCPSO, MGenClust++ and K-Means (over 30 independent runs).

Dataset	MCPSO	MGenClust++	K-Means
Glass	0.5216 ± 0.0048	0.5768 ± 0.0241	0.5793 ± 3.0E-4
Wdbc	0.2999 ± 0.0807	0.385 ± 0.0179	0.3907 ± 3.0E-4
Flame	0.3676 ± 0.1083	0.3963 ± 0.0148	0.4411 ± 0.0014
Compound	0.3585 ± 0.1302	0.5912 ± 0.0249	0.5849 ± 0.0715
Pathbased	0.5292 ± 0.0234	0.4936 ± 0.045	0.5351 ± 2.0E-4
Jain	0.5028 ± 0.0023	0.5078 ± 8.0E-4	0.5035 ± 0.0
S1	0.6346 ± 0.1812	0.6804 ± 0.0232	0.5925 ± 0.0396
S3	0.4519 ± 0.0246	0.4461 ± 0.0173	0.4495 ± 0.0198
DIM064	0.9253 ± 0.1748	0.8717 ± 0.1443	0.751 ± 0.08
DIM256	0.9812 ± 0.0084	0.8439 ± 0.2122	0.5967 ± 0.0751

Table 4. Mean and standard deviation of the average number of clusters (over 30 independent runs) for MCPSO, MGenClust++ and K-Means

Dataset	MCPSO	MGenClust++	K-Means
Glass	6.7667 ± 0.423	3.3 ± 0.781	3.0 ± 0.0
Wdbc	2.8 ± 0.4	2.1 ± 0.3	2.0 ± 0.0
Flame	2.9 ± 0.5972	2.7333 ± 0.4422	4.0 ± 0.0
Compound	7.3333 ± 4.1899	3.2667 ± 0.5121	3.0 ± 0.0
Pathbased	2.7333 ± 0.4422	3.5333 ± 0.5617	3.0 ± 0.0
Jain	2.8 ± 0.4	2.0333 ± 0.1795	3.0 ± 0.0
S1	14.4667 ± 3.3539	15.7 ± 0.9713	12.0 ± 0.0
S3	9.6 ± 2.2301	19.2667 ± 2.0645	13.0 ± 0.0

DIM064	15.8333 ± 1.5074	15.1667 ± 2.5701	17.3667 ± 1.2243
DIM256	16.0333 ± 0.1795	15.1 ± 2.8792	10.8 ± 0.8327
Average difference between the real and the detected numbers of clusters	8.1267 ± 1.3723	1.5367 ± 1.0168	7.1167 ± 0.2057

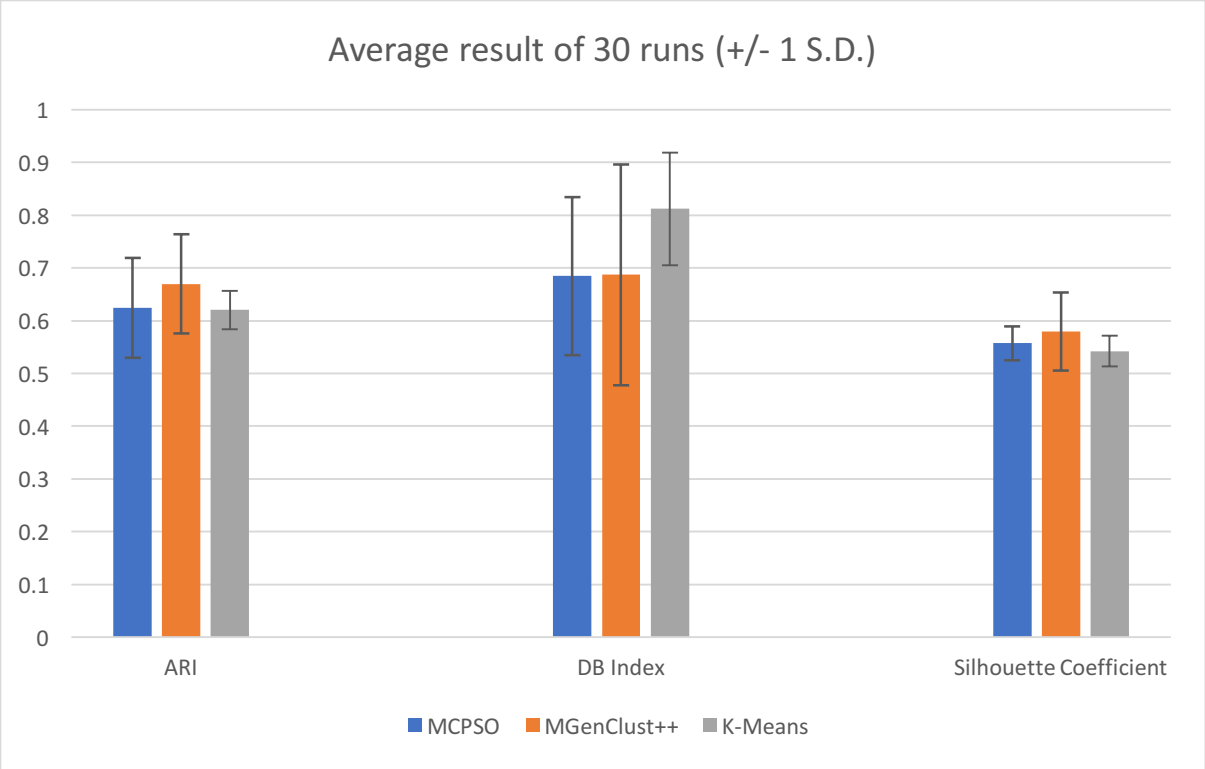

Fig. 1. Comparative average results between MCPSO, MGenClust++ and K-Means on 10 datasets based on ARI, DB Index and Silhouette Coefficient