



Research article

A robust alternating least squares K-means clustering approach for times series using dynamic time warping dissimilarities

J. Fernando Vera-Vera* and J. Antonio Roldán-Nofuentes

Department of Statistics and O.R., University of Granada, Faculty of Sciences, Fuentenueva s/n, 18071, Granada, Spain

* **Correspondence:** Email: jfvera@ugr.es; Tel: +34 958243157; Fax: +34-958243267.

Supplementary

S1. Simulated time series results

Table S1. Average value of similarity indices for the classifications obtained with K-means, KmALSCAL and mclust for the simulated time series. For each pair of processes (Pairs), twenty series were generated for each pair of lengths, thus ten time series per process and length. For each pair of processes, and each combination of two lengths, the twenty corresponding series were analysed. The experiment was repeated ten times.

Length Pairs	K-means					KmALSCAL (100)					mclust				
	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)
AR1-AR1	0.73	0.98	1.00	1.00	1.00	0.75	0.97	1.00	1.00	1.00	0.66	0.66	0.66	0.83	0.93
AR1-ARI	0.66	0.66	0.67	0.69	0.67	0.65	0.68	0.67	0.68	0.67	0.66	0.66	0.66	0.66	0.66
AR2-MA2	0.63	1.00	1.00	1.00	1.00	0.62	1.00	1.00	1.00	1.00	0.66	0.66	0.66	0.69	0.66
ARF-ARI	0.60	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	0.66	0.66	0.66	0.66	0.66
ARM-ARI	0.62	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	0.66	0.66	0.66	0.66	0.66
Length Pairs						KmALSCAL (200)									
(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	
AR1-AR1	0.73	0.83	0.99	1.00	1.00	0.78	0.87	0.99	1.00	1.00	0.66	0.66	0.66	0.66	0.90
AR1-ARI	0.67	0.67	0.67	0.66	0.67	0.69	0.66	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.66
AR2-MA2	1.00	0.66	0.88	1.00	1.00	1.00	0.69	0.85	1.00	1.00	0.66	0.66	0.66	0.66	0.66
ARF-ARI	1.00	0.65	1.00	1.00	1.00	1.00	0.64	1.00	1.00	1.00	0.66	0.66	0.66	0.66	0.66
ARM-ARI	1.00	0.59	0.97	1.00	1.00	1.00	0.59	0.96	1.00	1.00	0.66	0.66	0.66	0.66	0.66

Continued on next page

Length		(300)														
Pairs	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	
AR1-ARI	0.78	0.81	0.92	0.99	1.00	0.81	0.85	0.94	0.98	1.00	0.66	0.66	0.66	0.66	0.69	
AR1-ARI	0.67	0.67	0.67	0.67	0.67	0.69	0.68	0.67	0.68	0.68	0.66	0.66	0.66	0.66	0.66	
AR2-MA2	1.00	1.00	0.69	0.73	0.99	1.00	1.00	0.70	0.72	0.99	0.69	0.66	0.66	0.65	0.65	
ARF-ARI	1.00	0.99	0.61	0.95	1.00	1.00	0.99	0.61	0.94	1.00	0.66	0.66	0.66	0.65	0.66	
ARM-ARI	1.00	0.98	0.60	0.95	1.00	1.00	0.98	0.59	0.96	1.00	0.66	0.66	0.66	0.66	0.66	
Length		(400)														
Pairs	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	
AR1-ARI	0.83	0.89	0.91	0.97	1.00	0.86	0.90	0.91	0.97	1.00	0.66	0.66	0.66	0.66	0.66	
AR1-ARI	0.72	0.71	0.72	0.72	0.72	0.74	0.73	0.73	0.73	0.73	0.65	0.66	0.66	0.66	0.66	
AR2-MA2	1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.00	0.72	0.66	0.72	0.66	0.66	0.66	0.66	
ARF-ARI	1.00	1.00	0.94	0.62	0.84	1.00	1.00	0.95	0.61	0.89	0.66	0.66	0.66	0.66	0.66	
ARM-ARI	1.00	1.00	0.90	0.63	0.87	1.00	1.00	0.94	0.61	0.89	0.66	0.66	0.66	0.66	0.66	
Length		(500)														
Pairs	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	
AR1-ARI	0.89	0.94	0.92	0.97	0.99	0.87	0.94	0.92	0.97	1.00	0.66	0.66	0.66	0.66	0.66	
AR1-ARI	0.68	0.65	0.65	0.65	0.65	0.73	0.67	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
AR2-MA2	1.00	1.00	1.00	1.00	0.68	1.00	1.00	1.00	1.00	0.75	1.00	0.66	0.66	0.65	0.65	
ARF-ARI	1.00	1.00	1.00	0.85	0.62	1.00	1.00	1.00	0.85	0.63	0.66	0.66	0.66	0.66	0.66	
ARM-ARI	1.00	1.00	1.00	0.85	0.61	1.00	1.00	1.00	0.88	0.62	0.66	0.66	0.66	0.66	0.66	

Table S2. Average value of the resulting similarity indices for K-means, KmALSCAL and mclust, for the simulated pairs of time series in the dimensions that explain 60%, 70%, 80%, 90% and 100% of the variability according to classical MDS. The length of the first process is set to 100.

		K-means					KmALSCAL					mclust				
Length		(100)														
Pairs	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	
AR1-ARI																
60%	0.73	0.97	1.00	1.00	1.00	0.76	0.97	1.00	1.00	1.00	0.86	0.96	0.97	0.98	1.00	
70%	0.73	0.97	1.00	1.00	1.00	0.75	0.97	1.00	1.00	1.00	0.72	0.92	0.97	1.00	1.00	
80%	0.73	0.97	1.00	1.00	1.00	0.75	0.97	1.00	1.00	1.00	0.65	0.72	0.97	0.97	1.00	
90%	0.72	0.98	1.00	1.00	1.00	0.75	0.97	1.00	1.00	1.00	0.66	0.68	0.90	0.97	1.00	
100%	0.73	0.98	1.00	1.00	1.00	0.75	0.97	1.00	1.00	1.00	0.67	0.72	0.69	0.83	0.93	
AR1-ARI																
60%	0.64	0.67	0.67	0.69	0.68	0.64	0.67	0.67	0.67	0.67	0.65	0.65	0.68	0.78	0.72	
70%	0.64	0.67	0.67	0.68	0.66	0.65	0.67	0.67	0.67	0.67	0.65	0.66	0.65	0.66	0.65	
80%	0.64	0.67	0.66	0.67	0.66	0.64	0.68	0.68	0.68	0.67	0.66	0.66	0.65	0.66	0.66	
90%	0.65	0.68	0.67	0.68	0.68	0.64	0.69	0.69	0.69	0.68	0.66	0.66	0.66	0.66	0.66	
100%	0.66	0.66	0.67	0.69	0.67	0.65	0.68	0.67	0.68	0.67	0.66	0.66	0.66	0.66	0.66	
AR2-MA2																
60%	0.62	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	0.64	0.77	0.99	1.00	1.00	
70%	0.63	1.00	1.00	1.00	1.00	0.64	1.00	1.00	1.00	1.00	0.64	0.67	0.92	0.98	0.99	
80%	0.62	1.00	1.00	1.00	1.00	0.63	1.00	1.00	1.00	1.00	0.65	0.66	0.72	0.79	0.90	
90%	0.63	1.00	1.00	1.00	1.00	0.63	1.00	1.00	1.00	1.00	0.65	0.66	0.66	0.66	0.72	
100%	0.62	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	0.65	0.69	0.66	0.69	0.69	

Continued on next page

ARF-ARI															
60%	0.61	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	0.62	0.68	1.00	1.00	1.00
70%	0.61	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	0.64	0.65	0.83	0.86	0.99
80%	0.59	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	0.65	0.65	0.69	0.72	0.79
90%	0.59	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	0.66	0.66	0.66	0.66	0.66
100%	0.60	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	0.66	0.72	0.66	0.66	0.69
ARM-ARI															
60%	0.64	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	0.63	0.75	1.00	1.00	0.98
70%	0.61	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	0.65	0.65	0.86	0.93	0.98
80%	0.63	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	0.66	0.65	0.72	0.76	0.83
90%	0.62	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	0.66	0.65	0.66	0.66	0.72
100%	0.62	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	0.66	0.66	0.69	0.66	0.69

Table S3. Average value of the resulting similarity indices for K-means, KmALSCAL and mclust, for the simulated pairs of time series in the dimensions that explain 60%, 70%, 80%, 90% and 100% of the variability according to classical MDS. The length of the first process is set to 200.

Length Pairs	K-means					KmALSCAL (200)					mclust				
	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)
AR1-AR1															
60%	0.73	0.84	0.99	1.00	1.00	0.76	0.87	0.99	1.00	1.00	0.96	0.99	0.97	0.98	0.99
70%	0.72	0.83	0.99	1.00	1.00	0.77	0.87	0.99	1.00	1.00	0.80	0.94	1.00	1.00	1.00
80%	0.73	0.84	0.99	1.00	1.00	0.77	0.87	0.99	1.00	1.00	0.69	0.76	0.85	0.96	0.90
90%	0.73	0.83	0.99	1.00	1.00	0.77	0.87	0.99	1.00	1.00	0.66	0.65	0.65	0.76	0.83
100%	0.71	0.83	0.99	1.00	1.00	0.76	0.84	0.99	1.00	1.00	0.68	0.66	0.66	0.66	0.90
AR1-ARI															
60%	0.67	0.66	0.64	0.65	0.66	0.68	0.65	0.66	0.65	0.65	0.65	0.71	0.75	0.71	0.79
70%	0.67	0.66	0.64	0.66	0.64	0.68	0.65	0.66	0.65	0.65	0.66	0.68	0.66	0.68	0.70
80%	0.67	0.66	0.65	0.65	0.65	0.68	0.65	0.67	0.65	0.66	0.66	0.66	0.66	0.65	0.66
90%	0.68	0.65	0.65	0.67	0.66	0.70	0.65	0.65	0.67	0.67	0.66	0.66	0.66	0.66	0.66
100%	0.67	0.67	0.67	0.66	0.65	0.69	0.66	0.67	0.67	0.65	0.66	0.66	0.67	0.66	0.70
AR2-MA2															
60%	1.00	0.65	0.87	1.00	1.00	1.00	0.66	0.86	1.00	1.00	0.87	0.64	0.69	0.87	0.91
70%	1.00	0.67	0.91	1.00	1.00	1.00	0.66	0.86	1.00	1.00	0.76	0.65	0.66	0.68	0.68
80%	1.00	0.67	0.90	1.00	1.00	1.00	0.68	0.85	1.00	1.00	0.69	0.65	0.65	0.65	0.69
90%	1.00	0.66	0.88	1.00	1.00	1.00	0.68	0.85	1.00	1.00	0.65	0.66	0.66	0.65	0.66
100%	1.00	0.66	0.88	1.00	1.00	1.00	0.69	0.85	1.00	1.00	0.76	0.66	0.65	0.72	0.69
ARF-ARI															
60%	1.00	0.62	1.00	1.00	1.00	1.00	0.64	1.00	1.00	1.00	0.70	0.63	0.68	0.79	1.00
70%	1.00	0.62	1.00	1.00	1.00	1.00	0.63	1.00	1.00	1.00	0.69	0.65	0.65	0.73	0.86
80%	1.00	0.66	1.00	1.00	1.00	1.00	0.63	1.00	1.00	1.00	0.66	0.65	0.65	0.65	0.83
90%	1.00	0.65	1.00	1.00	1.00	1.00	0.64	1.00	1.00	1.00	0.66	0.66	0.66	0.65	0.66
100%	1.00	0.65	1.00	1.00	1.00	1.00	0.64	1.00	1.00	1.00	0.66	0.66	0.66	0.66	0.66
ARM-ARI															
60%	1.00	0.62	0.97	1.00	1.00	1.00	0.60	0.96	1.00	1.00	0.65	0.63	0.65	0.69	0.95
70%	1.00	0.62	0.97	1.00	1.00	1.00	0.58	0.97	1.00	1.00	0.65	0.65	0.65	0.69	0.85
80%	1.00	0.62	0.98	1.00	1.00	1.00	0.59	0.97	1.00	1.00	0.65	0.66	0.65	0.65	0.69
90%	1.00	0.60	0.98	1.00	1.00	1.00	0.59	0.97	1.00	1.00	0.66	0.66	0.65	0.66	0.66
100%	1.00	0.59	0.96	1.00	1.00	1.00	0.59	0.96	1.00	1.00	0.66	0.66	0.69	0.66	0.66

Table S4. Average value of the resulting similarity indices for K-means, KmALSCAL and mclust, for the simulated pairs of time series in the dimensions that explain 60%, 70%, 80%, 90% and 100% of the variability according to classical MDS. The length of the first process is set to 300.

Length Pairs	K-means					KmALSCAL (300)					mclust				
	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)
AR1-AR1															
60%	0.79	0.79	0.93	0.99	1.00	0.81	0.85	0.94	0.98	1.00	0.95	0.98	1.00	0.98	0.99
70%	0.79	0.81	0.93	0.99	1.00	0.81	0.85	0.94	0.98	1.00	0.87	0.97	0.99	0.97	0.99
80%	0.78	0.81	0.92	0.99	1.00	0.81	0.85	0.94	0.98	1.00	0.72	0.85	0.75	0.91	0.90
90%	0.79	0.81	0.92	0.99	1.00	0.81	0.85	0.94	0.98	1.00	0.66	0.66	0.66	0.65	0.69
100%	0.78	0.80	0.92	0.99	1.00	0.81	0.83	0.94	0.98	1.00	0.66	0.65	0.66	0.66	0.72
AR1-ARI															
60%	0.66	0.65	0.65	0.65	0.65	0.67	0.65	0.65	0.67	0.67	0.67	0.67	0.72	0.68	0.75
70%	0.66	0.65	0.65	0.65	0.65	0.68	0.66	0.65	0.67	0.67	0.67	0.66	0.66	0.65	0.66
80%	0.66	0.67	0.65	0.65	0.65	0.67	0.67	0.65	0.67	0.67	0.66	0.66	0.66	0.66	0.66
90%	0.67	0.66	0.65	0.65	0.65	0.69	0.66	0.66	0.68	0.69	0.66	0.66	0.66	0.66	0.66
100%	0.66	0.67	0.67	0.67	0.66	0.67	0.68	0.65	0.68	0.68	0.70	0.66	0.71	0.66	0.69
AR2-MA2															
60%	1.00	1.00	0.72	0.76	0.99	1.00	1.00	0.72	0.75	0.99	1.00	0.72	0.67	0.67	0.89
70%	1.00	1.00	0.70	0.75	0.99	1.00	1.00	0.70	0.76	0.99	0.97	0.65	0.66	0.65	0.68
80%	1.00	1.00	0.70	0.76	0.99	1.00	1.00	0.70	0.74	0.98	0.83	0.65	0.65	0.65	0.65
90%	1.00	1.00	0.71	0.72	0.99	1.00	1.00	0.70	0.70	0.98	0.72	0.66	0.66	0.66	0.66
100%	1.00	1.00	0.68	0.73	0.99	1.00	1.00	0.68	0.72	0.99	0.72	0.66	0.65	0.65	0.65
ARF-ARI															
60%	1.00	0.99	0.61	0.96	1.00	1.00	0.99	0.60	0.96	1.00	1.00	0.67	0.66	0.63	0.64
70%	1.00	0.99	0.61	0.94	1.00	1.00	0.99	0.59	0.95	1.00	0.91	0.65	0.65	0.65	0.65
80%	1.00	0.99	0.59	0.95	1.00	1.00	0.99	0.60	0.95	1.00	0.69	0.65	0.65	0.65	0.66
90%	1.00	0.99	0.61	0.94	1.00	1.00	0.99	0.59	0.95	1.00	0.66	0.66	0.65	0.66	0.66
100%	1.00	0.99	0.60	0.95	1.00	1.00	0.99	0.61	0.94	1.00	0.79	0.66	0.66	0.65	0.66
ARM-ARI															
60%	1.00	0.98	0.59	0.94	1.00	1.00	0.98	0.59	0.94	1.00	1.00	0.66	0.62	0.64	0.66
70%	1.00	0.98	0.58	0.96	1.00	1.00	0.98	0.59	0.96	1.00	0.86	0.65	0.65	0.65	0.65
80%	1.00	0.98	0.59	0.95	1.00	1.00	0.98	0.58	0.96	1.00	0.72	0.66	0.65	0.66	0.65
90%	1.00	0.98	0.58	0.94	1.00	1.00	0.98	0.59	0.96	1.00	0.66	0.65	0.66	0.66	0.65
100%	1.00	0.98	0.60	0.95	1.00	1.00	0.98	0.59	0.96	1.00	0.72	0.66	0.66	0.66	0.69

Table S5. Average value of the resulting similarity indices for K-means, KmALSCAL and mclust, for the simulated pairs of time series in the dimensions that explain 60%, 70%, 80%, 90% and 100% of the variability according to classical MDS. The length of the first process is set to 400.

Length Pairs	K-means					KmALSCAL (400)					mclust				
	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)
AR1-AR1															
60%	0.83	0.89	0.90	0.97	1.00	0.86	0.89	0.90	0.97	1.00	0.99	0.99	0.99	0.99	1.00
70%	0.83	0.90	0.91	0.97	1.00	0.86	0.90	0.90	0.97	1.00	0.89	0.97	0.99	0.99	1.00
80%	0.83	0.91	0.91	0.97	1.00	0.86	0.90	0.91	0.97	1.00	0.79	0.89	0.82	0.89	0.78
90%	0.83	0.89	0.91	0.97	1.00	0.86	0.90	0.91	0.97	1.00	0.65	0.69	0.66	0.65	0.69
100%	0.81	0.89	0.91	0.97	1.00	0.83	0.90	0.91	0.97	1.00	0.67	0.66	0.66	0.69	0.76

Continued on next page

ARI-ARI															
60%	0.73	0.73	0.69	0.68	0.68	0.75	0.73	0.73	0.71	0.70	0.79	0.68	0.65	0.72	0.68
70%	0.73	0.73	0.69	0.69	0.68	0.75	0.73	0.73	0.71	0.70	0.65	0.68	0.65	0.66	0.65
80%	0.74	0.73	0.69	0.69	0.69	0.76	0.72	0.73	0.70	0.70	0.66	0.66	0.66	0.66	0.66
90%	0.74	0.73	0.69	0.68	0.68	0.74	0.73	0.73	0.72	0.71	0.66	0.66	0.66	0.66	0.66
100%	0.72	0.71	0.71	0.72	0.71	0.74	0.73	0.72	0.73	0.71	0.65	0.66	0.67	0.67	0.71
AR2-MA2															
60%	1.00	1.00	1.00	0.70	0.68	1.00	1.00	1.00	0.72	0.68	1.00	0.91	0.70	0.71	0.79
70%	1.00	1.00	1.00	0.65	0.65	1.00	1.00	1.00	0.72	0.68	1.00	0.76	0.65	0.67	0.65
80%	1.00	1.00	1.00	0.69	0.67	1.00	1.00	1.00	0.72	0.68	0.86	0.72	0.65	0.65	0.66
90%	1.00	1.00	1.00	0.68	0.66	1.00	1.00	1.00	0.71	0.67	0.76	0.66	0.65	0.65	0.65
100%	1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.00	0.72	0.66	0.79	0.66	0.69	0.66	0.66
ARF-ARI															
60%	1.00	1.00	0.93	0.60	0.84	1.00	1.00	0.94	0.59	0.88	1.00	0.71	0.65	0.64	0.64
70%	1.00	1.00	0.94	0.62	0.86	1.00	1.00	0.95	0.62	0.89	1.00	0.68	0.65	0.65	0.65
80%	1.00	1.00	0.95	0.62	0.86	1.00	1.00	0.95	0.61	0.87	0.72	0.65	0.66	0.65	0.65
90%	1.00	1.00	0.94	0.62	0.86	1.00	1.00	0.94	0.60	0.90	0.66	0.65	0.66	0.66	0.66
100%	1.00	1.00	0.94	0.62	0.84	1.00	1.00	0.95	0.61	0.89	0.72	0.69	0.66	0.65	0.66
ARM-ARI															
60%	1.00	1.00	0.87	0.61	0.84	1.00	1.00	0.89	0.61	0.88	1.00	0.85	0.67	0.65	0.63
70%	1.00	1.00	0.88	0.59	0.84	1.00	1.00	0.89	0.59	0.88	0.97	0.71	0.64	0.65	0.65
80%	1.00	1.00	0.88	0.60	0.86	1.00	1.00	0.92	0.60	0.87	0.83	0.65	0.65	0.65	0.65
90%	1.00	1.00	0.91	0.62	0.83	1.00	1.00	0.92	0.61	0.90	0.66	0.65	0.66	0.66	0.66
100%	1.00	1.00	0.90	0.61	0.87	1.00	1.00	0.94	0.61	0.89	0.69	0.66	0.66	0.64	0.66

Table S6. Average value of the resulting similarity indices for K-means, KmALSCAL and mclust, for the simulated pairs of time series in the dimensions that explain 60%, 70%, 80%, 90% and 100% of the variability according to classical MDS. The length of the first process is set to 500.

Length Pairs	K-means					KmALSCAL (500)					mclust				
	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)	(100)	(200)	(300)	(400)	(500)
ARI-ARI															
60%	0.88	0.94	0.92	0.97	0.99	0.87	0.94	0.92	0.97	0.99	0.99	1.00	1.00	1.00	0.99
70%	0.89	0.94	0.92	0.97	0.99	0.87	0.94	0.91	0.97	1.00	0.96	1.00	1.00	0.99	1.00
80%	0.89	0.94	0.92	0.97	0.99	0.87	0.94	0.92	0.97	1.00	0.86	0.93	0.83	0.87	0.83
90%	0.89	0.94	0.92	0.97	0.99	0.87	0.94	0.92	0.97	1.00	0.66	0.69	0.69	0.69	0.66
100%	0.89	0.94	0.92	0.97	0.99	0.87	0.94	0.91	0.96	1.00	0.66	0.68	0.68	0.72	0.66
AR1-ARI															
60%	0.68	0.65	0.64	0.64	0.64	0.72	0.67	0.66	0.66	0.66	0.70	0.71	0.75	0.77	0.71
70%	0.68	0.66	0.64	0.64	0.64	0.72	0.67	0.66	0.66	0.66	0.65	0.71	0.68	0.67	0.71
80%	0.67	0.65	0.65	0.65	0.64	0.72	0.68	0.66	0.66	0.65	0.66	0.66	0.65	0.65	0.68
90%	0.67	0.66	0.65	0.64	0.64	0.73	0.67	0.66	0.67	0.66	0.66	0.66	0.66	0.66	0.66
100%	0.68	0.65	0.65	0.65	0.65	0.73	0.67	0.66	0.67	0.66	0.66	0.66	0.68	0.65	0.67
AR2-MA2															
60%	1.00	1.00	1.00	1.00	0.69	1.00	1.00	1.00	1.00	0.73	1.00	0.99	0.80	0.74	0.74
70%	1.00	1.00	1.00	1.00	0.70	1.00	1.00	1.00	1.00	0.74	1.00	0.96	0.71	0.69	0.68
80%	1.00	1.00	1.00	1.00	0.70	1.00	1.00	1.00	1.00	0.73	1.00	0.76	0.65	0.65	0.65
90%	1.00	1.00	1.00	1.00	0.68	1.00	1.00	1.00	1.00	0.70	0.97	0.72	0.66	0.65	0.65
100%	1.00	1.00	1.00	1.00	0.68	1.00	1.00	1.00	1.00	0.75	1.00	0.72	0.66	0.65	0.65

Continued on next page

ARF-ARI															
60%	1.00	1.00	1.00	0.79	0.60	1.00	1.00	1.00	0.82	0.61	1.00	0.90	0.68	0.64	0.64
70%	1.00	1.00	1.00	0.85	0.62	1.00	1.00	1.00	0.85	0.61	0.97	0.79	0.64	0.65	0.65
80%	1.00	1.00	1.00	0.85	0.61	1.00	1.00	1.00	0.82	0.64	0.83	0.66	0.66	0.66	0.66
90%	1.00	1.00	1.00	0.85	0.61	1.00	1.00	1.00	0.85	0.62	0.69	0.66	0.66	0.66	0.66
100%	1.00	1.00	1.00	0.85	0.62	1.00	1.00	1.00	0.85	0.63	0.69	0.69	0.66	0.66	0.66
ARM-ARI															
60%	1.00	1.00	1.00	0.83	0.60	1.00	1.00	1.00	0.88	0.62	1.00	0.95	0.65	0.65	0.62
70%	1.00	1.00	1.00	0.84	0.59	1.00	1.00	1.00	0.88	0.64	1.00	0.79	0.66	0.66	0.65
80%	1.00	1.00	1.00	0.85	0.62	1.00	1.00	1.00	0.89	0.61	0.79	0.69	0.66	0.66	0.66
90%	1.00	1.00	1.00	0.83	0.61	1.00	1.00	1.00	0.88	0.62	0.69	0.66	0.66	0.66	0.66
100%	1.00	1.00	1.00	0.85	0.62	1.00	1.00	1.00	0.88	0.63	0.76	0.66	0.66	0.66	0.65

S2. Analysis of ProximalPhalanxOutlineAgeGroup data set

"A robust alternating least squares K-means clustering approach for times series using dynamic time warping dissimilarities".

Mathematical Biosciences and Engineering.

Version 0.1

The program and data can be downloaded from,

<http://www.ugr.es/local/jfvera/PPOAG.zip>

The zip file contains:

"PPOAG.R" is the main script for the model.

"dtwPPOAG.RData" R data file with the ProximalPhalanxOutlineAgeGroup data set, and the dynamic time warping dissimilarities.

"ExampleResults.RData" are the given results.

"Readme.txt" This file.

This program gives only text output, and the only related documentation apart from this file is the original paper:

"A robust alternating least squares K-means clustering approach for times series using dynamic time warping dissimilarities".

Mathematical Biosciences and Engineering.

This is a working program, and although it seems to be quite stable, you will have to use it at your own risk.

From the working directory at R, follows the PPOAG.R script code.
See the paper for further details.



©2024 the Author(s), licensee AIMS Press. This is an open access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>)