Table 54: Resul

Cluster eval.	# clusters	Optim. a
Silhouette	2	PSO GAPSO LOGAPS
	Table	e 56: Resul
Cluster eval.	# alustons	Ontin
Cluster eval.	# clusters	Optim. a
Silhouette	4	PSO GAPSO LOGAPS
	Table	e 58: Resul
Cluster eval.	# clusters	Optim. a
Silhouette	4	PSO GAPSO LOGAPS
	Table	e 60: Resul
Cluster eval.	# clusters	Optim. a
Silhouette	6	PSO GAPSO LOGAPS
	Table	e 62: Resul
Cluster eval.	# clusters	Optim. a
Xie Beni	2	PSO GAPSO LOGAPS
	Table	e 64: Resul
Cluster eval.	# clusters	Optim. a
Xie Beni	2	PSO GAPSO LOGAPS
	Table	e 66: Resul
Cluster eval.	# clusters	Optim. a
Xie Beni	4	PSO GAPSO LOGAPS
	Table	e 68: Resul
Cluster eval.	# clusters	Optim. a
Xie Beni	6	PSO GAPSO

LOGAPS

Table 70: Resul

Cluster eval.	# clusters	Optim. a
		PSO
Xie Beni	6	GAPSO
		LOGAPS

Table 1: Results of experiments

Benchmark function	$\# \ \mathrm{dims}$	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	
Ackley	50	PSO GAPSO LOGAPSO	$\begin{array}{c} 1.523837 \\ 2.485251 \\ 0.785528 \end{array}$	$\begin{array}{c} 0.341445 \\ 0.442263 \\ 0.775738 \end{array}$	100	1.49618	1.4	
	Table 2: Results of experiments							
Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	
Ackley	50	PSO GAPSO LOGAPSO	4.863639 3.229788 6.926435	1.060118 0.837676 7.743545	100	1.49618	1	

Table 3: Results of experiments

Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
Ackley	50	PSO GAPSO LOGAPSO	6.660279	$\begin{array}{c} 1.489379 \\ 1.293801 \\ 0.367091 \end{array}$	100	1	1.49618

Table 4: Results of experiments

Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
Ackley	100	PSO GAPSO LOGAPSO	10.181829 10.785233 3.347304	4.857209 3.670596 0.336459	100	1.49618	1.4
	Table 5: 1	Results of experimen	ats				
Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
Ackley	100	PSO GAPSO LOGAPSO	9.923349 10.793539 4.540176	3.279843 1.206775 0.883645	100	1.49618	1
	Table 6: 1	Results of experimen	ats				
Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2	
Ackley	100	PSO GAPSO LOGAPSO	16.281685 17.143684 9.014371	0.538781 0.568807 5.882949	100	1 1.4	9618
	Table 7:	Results of experimen	ats				
Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
Ackley	200	PSO GAPSO LOGAPSO	18.742101 19.234347 17.293138	0.898119 0.741240 4.727316	100	1.49618	1.4
	Table 8: 1	Results of experimen	ats				
Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
Ackley	200	PSO GAPSO LOGAPSO	15.555375 16.453669 13.382653	0.749348 1.045910 4.845540	100	1.49618	1
	Table 9: 1	Results of experimen	its				
Benchmark function	# dims	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2	
Ackley	200	PSO GAPSO LOGAPSO	18.473616 18.478619 18.799011	$\begin{array}{c} 0.283943 \\ 0.451928 \\ 0.267174 \end{array}$	100	1 1.4	9618

Table 10: Results of experiments

# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
2	PSO GAPSO LOGAPSO	-133.822794 -131.376948 -137.748238	5.585608 14.490870 2.804973	100	1.49618	1.4961
Table	e 11: Results of exper	riments				
# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2 w
2	PSO GAPSO LOGAPSO	-131.826658 -134.515013 -139.710656	6.300066 5.701793 0.056465	100	1.49618	1 0
Table	e 12: Results of exper	riments				
# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2	W
2	PSO GAPSO LOGAPSO	-135.745516 -136.148794 -139.710656	6.141988 5.824246 0.056465	100	1 1.49	618 0
Table	e 13: Results of exper	riments				
# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
4	PSO GAPSO LOGAPSO	-159.161550 -155.746994 -160.246477	3.391232 6.769352 2.404263	100	1.49618	1.4961
Table	e 14: Results of exper	iments				
# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2 w
4	PSO GAPSO LOGAPSO	-159.362141 -160.599179 -161.061210	2.500361 3.378386 1.692394	100	1.49618	1 0
Table	e 15: Results of exper	riments				
# alustors	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2	W
# Clusters	o I	_				
	Table # clusters 2 Table # clusters 2 Table # clusters 4 Table # clusters 4	PSO GAPSO LOGAPSO Table 11: Results of experiments # clusters Optim. algorithm PSO GAPSO LOGAPSO Table 12: Results of experiments # clusters Optim. algorithm PSO GAPSO LOGAPSO Table 13: Results of experiments # clusters Optim. algorithm PSO GAPSO LOGAPSO Table 14: Results of experiments # clusters Optim. algorithm PSO GAPSO LOGAPSO Table 14: Results of experiments # clusters Optim. algorithm PSO GAPSO LOGAPSO Table 15: Results of experiments # clusters Optim. algorithm PSO GAPSO LOGAPSO Table 15: Results of experiments	PSO	PSO	PSO	PSO

Table 16: Results of experiments

Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	
		PSO	-123.085820	6.816223				
Fuku Sugeno	6	GAPSO	-123.043487	4.985750	100	1.49618	1.49	61
		LOGAPSO	-125.016680	4.182138				
	Table	e 17: Results of exper	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	w
		PSO	-124.676490	5.084901				
Fuku Sugeno	6	GAPSO	-124.622912	5.771525	100	1.49618	1	0.
		LOGAPSO	-122.294269	5.095494				
	Table	e 18: Results of exper	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2		w
		PSO	-119.011632	5.154652				
Fuku Sugeno	6	GAPSO	-120.757291	9.881012	100	1 1.49	0618	0.
		LOGAPSO	-126.436266	2.608925				
	Table	e 19: Results of exper	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	
		PSO	0.515634	0.0				
Silhouette	2	GAPSO	0.515634	0.0	100	1.49618	1.49	618
		LOGAPSO	0.515634	0.0				
	Table	e 20: Results of exper	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	w
		Dao	0.515004	0.0				
		PSO	0.515634	0.0				
Silhouette	2	PSO GAPSO	0.515634 0.515634	$0.0 \\ 0.0$	100	1.49618	1	0.
Silhouette	2				100	1.49618	1	0.
Silhouette		GAPSO	0.515634 0.515634	0.0	100	1.49618	1	0.
Silhouette Cluster eval.		GAPSO LOGAPSO	0.515634 0.515634	0.0	100 Pop. size	1.49618 $\phi_1 \phi_2$	1	0.
	Table	GAPSO LOGAPSO e 21: Results of exper	0.515634 0.515634 riments	0.0			1	
	Table	GAPSO LOGAPSO 21: Results of experion of the Appendix Ap	0.515634 0.515634 riments Avg. fitness	0.0 0.0 Std. dev.				

Table 22: Results of experiments

Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1		ϕ_2	
		PSO	0.515634	0.0					
Silhouette	4	GAPSO	0.515634	0.0	100	1.4	9618	1.49	961
		LOGAPSO	0.515634	0.0					
	Table	e 23: Results of expe	riments						
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1		ϕ_2	w
		PSO	0.515634	0.0					
Silhouette	4	GAPSO	0.515634	0.0	100	1.4	9618	1	0.
		LOGAPSO	0.515634	0.0					
	Table	e 24: Results of expe	riments						
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2		w
		PSO	0.515634	0.0					
Silhouette	4	GAPSO	0.515634	0.0	100	1	1.49	9618	0.
		LOGAPSO	0.515634	0.0					
	Table	e 25: Results of expe	riments						
Cluster eval.	Table # clusters	e 25: Results of expe	Avg. fitness	Std. dev.	Pop. size	ϕ_1		ϕ_2	w
Cluster eval.				Std. dev. 0.0	Pop. size	$e \phi_1$		ϕ_2	w
Cluster eval. Silhouette		Optim. algorithm	Avg. fitness		Pop. size	· · ·	9618	ϕ_2	w 0.
	# clusters	Optim. algorithm PSO	Avg. fitness 0.515634	0.0		· · ·	9618	<u> </u>	
	# clusters	Optim. algorithm PSO GAPSO	Avg. fitness 0.515634 0.515634 0.515634	0.0 0.0		· · ·	9618	<u> </u>	
	# clusters	Optim. algorithm PSO GAPSO LOGAPSO	Avg. fitness 0.515634 0.515634 0.515634	0.0 0.0		1.4	9618 \$\phi_2\$	<u> </u>	
Silhouette	# clusters 6 Table	Optim. algorithm PSO GAPSO LOGAPSO 26: Results of expe	Avg. fitness 0.515634 0.515634 0.515634 riments	0.0 0.0 0.0	100	1.4		<u> </u>	0.
Silhouette	# clusters 6 Table	Optim. algorithm PSO GAPSO LOGAPSO 26: Results of expe	Avg. fitness 0.515634 0.515634 0.515634 riments Avg. fitness 0.515634	0.0 0.0 0.0 0.0 Std. dev.	100	1.4	ϕ_2	1	0.
Silhouette Cluster eval.	# clusters 6 Table # clusters	Optim. algorithm PSO GAPSO LOGAPSO 26: Results of expe	Avg. fitness 0.515634 0.515634 0.515634 riments Avg. fitness	0.0 0.0 0.0	100 Pop. size	1.4	ϕ_2	<u> </u>	0. w
Silhouette Cluster eval.	# clusters 6 Table # clusters 6	Optim. algorithm PSO GAPSO LOGAPSO 26: Results of expe Optim. algorithm PSO GAPSO	Avg. fitness 0.515634 0.515634 0.515634 riments Avg. fitness 0.515634 0.515634 0.515634	0.0 0.0 0.0 0.0 Std. dev. 0.0 0.0	100 Pop. size	1.4	ϕ_2	1	0.
Silhouette Cluster eval.	# clusters 6 Table # clusters 6	Optim. algorithm PSO GAPSO LOGAPSO e 26: Results of expe Optim. algorithm PSO GAPSO LOGAPSO	Avg. fitness 0.515634 0.515634 0.515634 riments Avg. fitness 0.515634 0.515634 0.515634	0.0 0.0 0.0 0.0 Std. dev. 0.0 0.0	100 Pop. size	1.4 $\theta = \phi_1$ $\theta = \phi_1$	ϕ_2	1	0.
Silhouette Cluster eval. Silhouette	# clusters 6 Table # clusters 6 Table	Optim. algorithm PSO GAPSO LOGAPSO 26: Results of expe Optim. algorithm PSO GAPSO LOGAPSO 27: Results of expe Optim. algorithm	Avg. fitness 0.515634 0.515634 0.515634 riments Avg. fitness 0.515634 0.515634 0.515634 riments Avg. fitness	0.0 0.0 0.0 0.0 Std. dev. 0.0 0.0 0.0 Std. dev.	100 Pop. size	1.4 $\theta = \phi_1$ $\theta = \phi_1$	ϕ_2	0618	0. w
Silhouette Cluster eval. Silhouette	# clusters 6 Table # clusters 6 Table	Optim. algorithm PSO GAPSO LOGAPSO e 26: Results of experimate algorithm PSO GAPSO LOGAPSO LOGAPSO e 27: Results of experimate algorithm	Avg. fitness 0.515634 0.515634 0.515634 riments Avg. fitness 0.515634 0.515634 0.515634 riments	0.0 0.0 0.0 0.0 Std. dev. 0.0 0.0 0.0	100 Pop. size	1.4 $\frac{1}{1}$ $\frac{1}{1}$	ϕ_2	0618	0. w

Table 28: Results of experiments

Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2		w
Xie Beni	2	PSO GAPSO LOGAPSO	0.043594 0.046769 0.045493	0.001609 0.002363 0.002251	100	1 1.49	618	0.
	Table	e 29: Results of expe	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	
Xie Beni	4	PSO GAPSO LOGAPSO	$\begin{array}{c} 0.053982 \\ 0.052249 \\ 0.053921 \end{array}$	0.011925 0.003867 0.004797	100	1.49618	1.496	318
	Table	e 30: Results of expe	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	w
Xie Beni	4	PSO GAPSO LOGAPSO	0.053259 0.051434 0.046747	0.004937 0.005082 0.002596	100	1.49618	1	0.
	Table	e 31: Results of expe	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2		w
Xie Beni	4	PSO GAPSO LOGAPSO	0.049083 0.051060 0.051349	0.003201 0.005905 0.002314	100	1 1.49	618	0.
	Table	e 32: Results of expe	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	
Xie Beni	6	PSO GAPSO LOGAPSO	0.048678 0.048045 0.045676	0.001874 0.002540 0.002487	100	1.49618	1.496	318
	Table	e 33: Results of expe	riments					
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	w
		PSO	0.047362	0.003871				

Table 34: Results of experiments

Cluster eval. # clu	sters Op	tim. algorithm A	vg. fitness	Std. dev.	Pop.	size	ϕ_1	ϕ_2		W
Xie Beni 6		O APSO GAPSO	0.054825 0.048865 0.053616	0.012615 0.003369 0.002371	100		1	1.49	618	0.
	Table 35:	Results of experim	ents							
Benchmark function	# dims	Optim. algorithm	n Avg. fitne	ss Std.	dev.	Pop	. size	ϕ_1		,
Griewank	50	PSO GAPSO LOGAPSO	0.0043 1.1335 228.5213	44 0.090	0156	100		1.4	9618	-
	Table 36:	Results of experim	ents							
Benchmark function	# dims	Optim. algorithm	a Avg. fitne	ss Std. de	ev. I	Pop. :	size	ϕ_1		ϕ_2
Griewank	50	PSO GAPSO LOGAPSO	0.0514′ 0.0055′ 0.00308	73 0.0056	32 1	100		1.490	618	1
	Table 37:	Results of experim	ents							
Benchmark function	# dims	Optim. algorithm	n Avg. fitne	ss Std. de	ev. I	Pop. :	size	ϕ_1	ϕ_2	
Griewank	50	PSO GAPSO LOGAPSO	0.06834 0.01899 0.00863	93 0.0286	303	100		1	1.49	618
	Table 38:	Results of experim	ents							
Benchmark function	# dims	Optim. algorithm	a Avg. fitne	ss Std. d	lev.	Pop.	size	ϕ_1		ϕ
Griewank	100	PSO GAPSO LOGAPSO	2.1016 ⁴ 45.32310 0.93481	00 27.502	393	100		1.49	618	1.
	Table 39:	Results of experim	ents							
Benchmark function	# dims	Optim. algorithm	n Avg. fitne	ss Std. de	ev. I	Pop. s	size	ϕ_1		ϕ_2

Table 40: Results of experiments

# dims	Optim. algorith	nm Avg. fitn	ess Std.	dev.	Pop.	size	ϕ_1	ϕ_2	
	PSO	2.2372	203 1.68	9570					
100	GAPSO	8.444	162 5.83	1066	100		1	1.496	18
	LOGAPSO	0.015'	717 0.01	0002					
Table 41:	Results of experi	ments							
# dims	Optim. algorith	nm Avg. fitn	ess Sto	l. dev.	Pop	. size	ϕ_1		(
	PSO	284.939	137 54.4	450180					
200	GAPSO	664.081	139 106.8	314945	100		1.4	19618	-
	LOGAPSO	57.427	771 8.0	079970					
Table 42:	Results of experi	ments							
# dims	Optim. algorith	nm Avg. fitn	ess Std.	dev.	Pop.	size	ϕ_1		ϕ_{2}
	PSO	46.587	754 20.51	18972					
200	GAPSO	86.741	173 16.46	67071	100		1.49	9618	1
	LOGAPSO	0.6988	894 0.10	07694					
Table 43:	Results of experi	iments							
# dims	Optim. algorith	nm Avg. fitn	ess Std.	dev.	Pop.	size	ϕ_1	ϕ_2	
	PSO	125.5208	839 52.23	32086					
200	GAPSO	229.086	522 18.31	13773	100		1	1.490	318
	LOGAPSO	0.666	744 0.05	50441					
Table 44:	Results of experi	iments							
sters Op	tim. algorithm	Avg. fitness	Std. dev	. Pop	. size	ϕ_1		ϕ_2	
PS	O	-71.614468	45.809989)					
GA	PSO	-80.613337	60.271913	1 100		1.49	9618	1.49	61
LO	GAPSO	-92.030733	29.09490	5					
Table 45:	Results of experi	iments							
	Results of experitim. algorithm	Avg. fitness	Std. dev.	Pop.	size	ϕ_1		ϕ_2	w
	tim. algorithm		Std. dev. 0.502329		size	ϕ_1		ϕ_2	w
sters Op	tim. algorithm	Avg. fitness			size	ϕ_1 1.49	0618	ϕ_2 1	w 0.
	100 Table 41: # dims 200 Table 42: # dims 200 Table 43: # dims 200 Table 44: sters Op PS GA	PSO GAPSO LOGAPSO Table 41: Results of experi # dims Optim. algorith PSO GAPSO LOGAPSO Table 42: Results of experi # dims Optim. algorith PSO GAPSO LOGAPSO Table 43: Results of experi # dims Optim. algorith PSO GAPSO LOGAPSO Table 43: Results of experi # dims Optim. algorith PSO GAPSO LOGAPSO Table 44: Results of experi	PSO	PSO 2.237203 1.68 100 GAPSO 8.444162 5.83 LOGAPSO 0.015717 0.01 Table 41: Results of experiments # dims Optim. algorithm Avg. fitness Std. PSO 284.939137 54.4 200 GAPSO 664.081139 106.8 LOGAPSO 57.427771 8.6 Table 42: Results of experiments # dims Optim. algorithm Avg. fitness Std. PSO 46.587754 20.5 200 GAPSO 86.741473 16.46 LOGAPSO 0.698894 0.16 Table 43: Results of experiments # dims Optim. algorithm Avg. fitness Std. PSO 125.520839 52.23 200 GAPSO 229.086522 18.33 LOGAPSO 0.666744 0.09 Table 44: Results of experiments sters Optim. algorithm Avg. fitness Std. dev PSO -71.614468 45.809988 GAPSO -71.614468 45.809988 GAPSO -80.613337 60.271913	PSO 2.237203 1.689570 GAPSO 8.444162 5.831066 LOGAPSO 0.015717 0.010002 Table 41: Results of experiments # dims Optim. algorithm Avg. fitness Std. dev. PSO 284.939137 54.450180 200 GAPSO 664.081139 106.814945 LOGAPSO 57.427771 8.079970 Table 42: Results of experiments # dims Optim. algorithm Avg. fitness Std. dev. PSO 46.587754 20.518972 200 GAPSO 86.741473 16.467071 LOGAPSO 0.698894 0.107694 Table 43: Results of experiments # dims Optim. algorithm Avg. fitness Std. dev. PSO 125.520839 52.232086 200 GAPSO 229.086522 18.313773 LOGAPSO 0.666744 0.050441 Table 44: Results of experiments sters Optim. algorithm Avg. fitness Std. dev. Pop PSO -71.614468 45.809989 GAPSO -80.613337 60.271911 100	PSO	PSO	PSO	PSO 2.237203 1.689570 100 GAPSO 8.444162 5.831066 100 1 1.4966 LOGAPSO 0.015717 0.010002 Table 41: Results of experiments # dims Optim. algorithm Avg. fitness Std. dev. Pop. size φ1 PSO 284.939137 54.450180 200 GAPSO 664.081139 106.814945 100 1.49618 LOGAPSO 57.427771 8.079970 Table 42: Results of experiments # dims Optim. algorithm Avg. fitness Std. dev. Pop. size φ1 PSO 46.587754 20.518972 200 GAPSO 86.741473 16.467071 100 1.49618 LOGAPSO 0.698894 0.107694 Table 43: Results of experiments # dims Optim. algorithm Avg. fitness Std. dev. Pop. size φ1 φ2 PSO 125.520839 52.232086 200 GAPSO 229.086522 18.313773 100 1 1.49618 Table 44: Results of experiments sters Optim. algorithm Avg. fitness Std. dev. Pop. size φ1 φ2 PSO -71.614468 45.809989 GAPSO -80.613337 60.271911 100 1.49618 1.49

Table 46: Results of experiments

Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2	,
F.1. G	2	PSO	-129.911653	36.329327	100		010
Fuku Sugeno	2	GAPSO LOGAPSO	-121.943591 -95.705821	25.352746 49.641044	100	1 1.49	618 (
	Table	47: Results of exper		43.041044			
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
		PSO	-271.979344	33.446588			
Fuku Sugeno	4	GAPSO	-221.980260	62.351117	100	1.49618	1.496
		LOGAPSO	-308.340229	66.569315			
	Table	48: Results of exper	riments				
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2
		PSO	-369.855869	67.740479			
Fuku Sugeno	4	GAPSO	-338.448054	42.332961	100	1.49618	1 (
		LOGAPSO	-455.208472	38.720287			
	Table	49: Results of exper	riments				
Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1 ϕ_2	,
		PSO	-315.387614	95.098457			
		150	0-0.00.0				
Fuku Sugeno	4	GAPSO	-258.651281	53.057233	100	1 1.49	618
Fuku Sugeno	4			53.057233 77.378554	100	1 1.49	618 (
Fuku Sugeno		GAPSO	-258.651281 -278.716748		100	1 1.49	618 (
Fuku Sugeno Cluster eval.		GAPSO LOGAPSO	-258.651281 -278.716748		100 Pop. size	$1 1.49$ ϕ_1	$\frac{618}{\phi_2}$
	Table	GAPSO LOGAPSO 50: Results of exper	-258.651281 -278.716748 	77.378554			
Cluster eval.	Table	GAPSO LOGAPSO 50: Results of exper	-258.651281 -278.716748 Fiments Avg. fitness	77.378554 Std. dev.			
Cluster eval.	Table	GAPSO LOGAPSO 50: Results of experimental optim. algorithm PSO	-258.651281 -278.716748 riments Avg. fitness -312.954482	77.378554 Std. dev. 41.934021	Pop. size	ϕ_1	ϕ_2
Cluster eval.	Table # clusters	GAPSO LOGAPSO 50: Results of exper Optim. algorithm PSO GAPSO	-258.651281 -278.716748 riments Avg. fitness -312.954482 -243.526117 -371.999956	77.378554 Std. dev. 41.934021 61.070155	Pop. size	ϕ_1	ϕ_2
	Table # clusters	GAPSO LOGAPSO 50: Results of exper Optim. algorithm PSO GAPSO LOGAPSO	-258.651281 -278.716748 riments Avg. fitness -312.954482 -243.526117 -371.999956	77.378554 Std. dev. 41.934021 61.070155	Pop. size	ϕ_1	ϕ_2
Cluster eval. Fuku Sugeno	Table # clusters 6 Table	GAPSO LOGAPSO 50: Results of experiments of experi	-258.651281 -278.716748 riments Avg. fitness -312.954482 -243.526117 -371.999956 riments Avg. fitness	77.378554 Std. dev. 41.934021 61.070155 105.649588 Std. dev.	Pop. size	ϕ_1 1.49618	$\frac{\phi_2}{1.490}$
Cluster eval. Fuku Sugeno	Table # clusters 6 Table	GAPSO LOGAPSO 50: Results of exper Optim. algorithm PSO GAPSO LOGAPSO 51: Results of exper	-258.651281 -278.716748 riments Avg. fitness -312.954482 -243.526117 -371.999956 riments	Std. dev. 41.934021 61.070155 105.649588	Pop. size	ϕ_1 1.49618	$\frac{\phi_2}{1.490}$

Table 52: Results of experiments

Cluster eval.	# clusters	Optim. algorithm	Avg. fitness	Std. dev.	Pop. size	ϕ_1	ϕ_2	v
Fuku Sugeno	6	PSO GAPSO LOGAPSO	-386.593765 -357.502698 -359.644518	80.337570	100	1	1.49618	0