

CEC 2016 Special Session on Learning-based Real-Parameter Single Objective Optimization

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July 24th 2016

Introduction

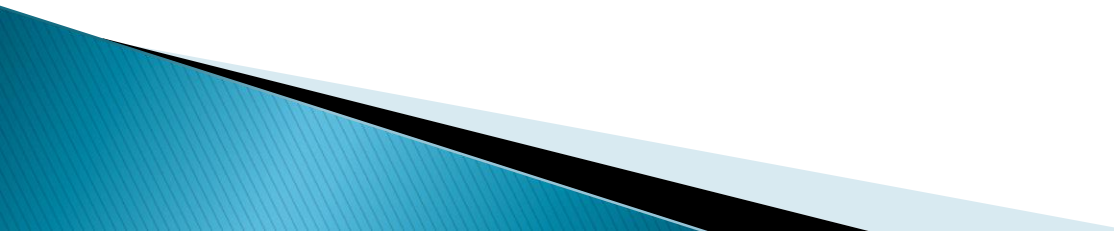
- ▶ CEC 2015 Competition on Learning-based Real-Parameter Single Objective Optimization including 15 benchmark functions
http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC2015
- ▶ J. J. Liang, B. Y. Qu, P. N. Suganthan, Q. Chen, "Problem Definitions and Evaluation Criteria for the CEC 2015 Competition on Learning-based Real-Parameter Single Objective Optimization", Technical Report, computational Intelligence Laboratory, Zhengzhou University, Zhengzhou China and Technical Report, Nanyang Technological University, Singapore, Nov 2014.

Introduction

► Unimodal Functions

- Rotated High Conditioned Elliptic Function
- Rotated Cigar Function

► Simple Multimodal Functions

- Shifted and Rotated Ackley's Function
 - Shifted and Rotated Rastrigin's Function
 - Shifted and Rotated Schwefel's Function
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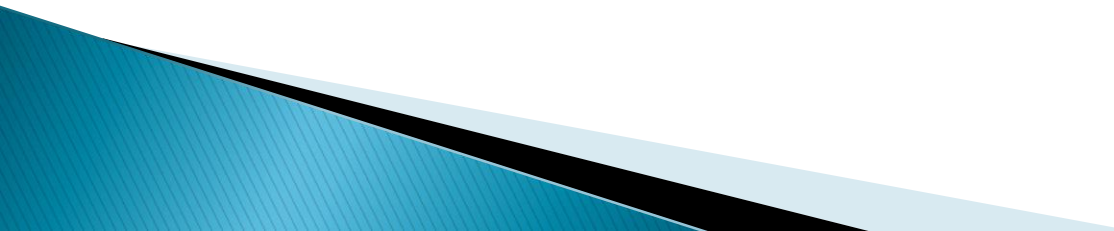
► Hybrid Functions

- Hybrid Function 1 ($N=3$)
- Hybrid Function 2 ($N=4$)
- Hybrid Function 3 ($N=5$)

► Composition Functions

- Composition Function 1 ($N=3$)
- Composition Function 2 ($N=3$)
- Composition Function 3 ($N=5$)
- Composition Function 4 ($N=5$)
- Composition Function 5 ($N=5$)
- Composition Function 6 ($N=7$)
- Composition Function 7 ($N=10$)

Algorithms

- ▶ 20 papers were submitted
 - ▶ 5 algorithms are involved in the CEC 2015 benchmark problems
 - ▶ 9 algorithms are involved in the CEC 2014 benchmark problems
 - ▶ 6 algorithms are involved in the expensive cost competition
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Algorithms

ID	Algorithm	Paper Title
-----	MVMO	Solving the CEC2016 Real-Parameter Single Objective Optimization Problems through MVMO-PHM (Technical Report)
E-16539	CCLSHADE	Cooperative Co-evolution using LSHADE with Restarts For The CEC15 Benchmarks
E-16554	LSHADE44	LSHADE with Competing Strategies Applied to CEC2015 Learning based Test Suite
E-16541	AsAMP–dD	An Asynchronous Adaptive Multi population Model for Distributed Differential Evolution
E-16621	SOMA	Competition On Learning-based Real-Parameter Single Objective Optimization by SOMA Swarm Based Algorithm with SOMARemove Strategy

Friedman Ranking

Algorithm	Ranking
SOMA	3.7500
AsAMPdD	3.9833
CCLSHADE	2.4417
LSHADE44	2.6583
MVMO	2.1667

	Best
	Second
	Third

Ranking Method– 1

Rank all the algorithms based on overall fitness summation for all the dimensions

	SOMA	AsAMP–dD	CCLSHADE	LSHADE44	MVMO
D=10	8.2752E+02	3.0772E+03	5.0833E+03	7.0448E+03	6.4631E+02
D=30	4.9992E+04	3.9158E+04	3.4581E+04	4.3470E+04	2.3868E+03
D=50	2.2369E+05	8.5913E+04	6.8460E+04	5.8696E+04	5.7325E+03
D=100	3.0760E+06	1.7741E+05	1.2021E+05	2.5500E+05	2.0087E+04
Overall	3.3505E+06	3.0556E+05	2.2833E+05	3.6421E+05	2.8852E+04
Rank	5	3	2	4	1

	Best
	Second
	Third

Ranking Method– 2 (Wilcoxon test)

- ▶ Use MVM0 as a control method and compare CCLSHADE algorithm

CCLSHADE	D=10	D=30	D=50	D=100
+ (win)	9	2	2	1
= (tie)	1	1	1	3
- (lose)	5	12	12	11
Overall	4	-10	-10	-10