IEEE PES Working Group on Modern Heuristic Optimization
Intelligent Systems Subcommittee
Power System Analysis, Computing, and Economic Committee

Competition on

"Application of Modern Heuristic Optimization Algorithms for Solving Optimal Power Flow Problems"

Panel session

Session Chair: Prof. István Erlich

Presentations

1. **Sebastian Wildenhues**:
   Competition on Application of Modern Heuristic Optimization Algorithms for Solving Optimal Power Flow Problems" – Competition test bed

2. **Vladimiro Miranda** and Leonel Carvalho:
   DEEPSO as a successful blend of evolutionary and swarm search strategies in the OPF challenge

3. **Carleton Coffrin** and Hassan Hijazi:
   Heuristic MINLP for Solving Optimal Power Flow Problems

4. Ming Niu, Youwei Jia, **Zhao Xu**, and Kit Po Wong:
   Differential Evolution Algorithm with a Modified Archiving-based Adaptive Tradeoff Model for Optimal Power Flow

5. Leonardo H. Macedo, Marcos J. Rider, **John F. Franco**, Rubén Romero and Edgar Manuel Carreño:
   A Modified Chu-Beasley's Genetic Algorithm to Solve the Optimal Power Flow Problem

6. István Erlich, **Jose Rueda Torres** and Sebastian Wildenhues:
   "Application of Mean Variance Mapping Optimization for Solving Optimal Power Flow Problems"

7. **István Erlich**: Evaluation of the results

Sebastian Wildenhues:

Competition on Application of Modern Heuristic Optimization Algorithms for Solving Optimal Power Flow Problems" – Competition test bed

Biography:

He received the B. Eng. and M. Sc. degrees in Electrical Power Engineering in Germany from University of Applied Sciences Dortmund in 2010 and University of Duisburg-Essen in 2013, respectively.

As part of the transmission system group, he is currently with Fraunhofer Institute for Wind Energy and System Technology, Kassel, Germany. He is involved in projects related to online assessment and optimization of power systems with significant share of renewable generation.

His research interests include the stability, control, and simulation of modern power systems considering uncertainties.

Vladimiro Miranda and **Leonel Carvalho**:

DEEPSO as a successful blend of evolutionary and swarm search strategies in the OPF challenge

Biography:

Vladimiro Miranda holds a Ph.D. degree (1982) in Electrical Engineering from FEUP, the Faculty of Engineering of the University of Porto, Portugal. Prof. Miranda is presently the President of INESC P&D Brazil. He was previously the President of the Board of Directors of INESC Macau, China. He is presently Director at OCEANUS – Marine Research and Innovation, at the University of Porto, Portugal, invited Guest Professor at the University of Novi Sad, Republic of Serbia and Academic Advisor of the Department of Electrical Engineering of the Hong Kong Polytechnic University. He is also member of the Scientific Council of IRESEN, the Agency of the Government of Morocco for research in renewable energies. Prof. Miranda is recognized as an international expert in Computational Intelligence in Power Systems and for this motive he was elevated to the degree of Fellow of the IEEE (USA).

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Vladimiro Miranda and **Leonel Carvalho**:

DEEPSO as a successful blend of evolutionary and swarm search strategies in the OPF challenge

Biography:

Leonel de Magalhães Carvalho was born in Espinho, Portugal, in 1985. He received his B.Sc., M.Sc., and Ph.D. degrees in Electrical Engineering from the Faculty of Engineering of the University of Porto (FEUP), Portugal, in 2006, 2008, and 2013, respectively. In 2011 he was a Visiting Researcher at the Institute of Electric Systems and Energy of the Federal University of Itajubá (UNIFEI), Brazil. Currently, he is a postdoctoral researcher at INESC TEC (formerly INESC Porto). His research interests include Power System Reliability Assessment and the application of Computational Intelligence to power systems.

Carleton Coffrin and Hassan Hijazi:

Heuristic MINLP for Solving Optimal Power Flow Problems

Biography:

Carleton Coffrin has a background in computer science, and received a PhD from Brown University under the supervision of Professor Pascal Van Hentenryck in 2012. During his PhD, Carleton worked closely with Russell Bent at Los Alamos National Laboratory developing algorithms for prioritizing power system repairs in response to natural disasters, such as, hurricane Sandy.

Presently, Carleton is a staff researcher in the Optimization Research Group at National ICT Australia, NICTA, and his research focuses on how Artificial Intelligence can be used to enhance the design and operation of power systems.

Ming Niu, Youwei Jia, **Zhao Xu**, and Kit Po Wong:

Differential Evolution Algorithm with a Modified Archiving-based Adaptive Tradeoff Model for Optimal Power Flow

Biography:

Zhao Xu received his Ph.D from The University of Queensland, Australia, in 2006. He is now Associate Professor with The Hong Kong Polytechnic University. He was previously with Centre for Electric Power and Energy, Technical University of Denmark. His research interest includes demand side, grid integration of renewable energies and EVs, electricity market planning and management, and AI applications in power engineering. He is an Editor of *Electric Power Components and Systems* journal

Leonardo H. Macedo, Marcos J. Rider, **John F. Franco**, Rubén Romero and Edgar Manuel Carreño:

A Modified Chu-Beasley's Genetic Algorithm to Solve the Optimal Power Flow Problem

Biography:

John Fredy Franco received the B.Sc. and M.Sc. degrees in 2004 and 2006, respectively, from the Universidad Tecnológica de Pereira Colombia, and his Ph.D. degree in Electrical Engineering in 2012 from the Universidade Estadual Paulista, Ilha Solteira, Brazil. His areas of research are the development of methodologies for the optimization, planning and control of electrical power systems, and applications of artificial intelligence in power systems. Currently, he is a Post-Doctoral Researcher at the Universidade Estadual Paulista, Ilha Solteira, Brazil.

István Erlich, **Jose Rueda Torres** and Sebastian Wildenhues:

“Application of Mean Variance Mapping Optimization for Solving Optimal Power Flow Problems”

Biography:

Jose L. Rueda received the Ph.D. degree in electrical engineering from the National University of San Juan, Argentina, in 2009. In the period of 2009 to 2014, he was a research associate at the Institute of Electrical Power Systems, University of Duisburg-Essen, Germany. Currently, he is an assistant professor for Intelligent Electrical Power Grids at the Department of Electrical Sustainable Energy, Technical University Delft, Netherlands.

His research interests include power system stability and control, system identification, power system planning, probabilistic and artificial intelligence methods.

Best mean

2nd best mean

3rd best mean

12345 control variables violation

DEEPSO: Best mean results, all rules considered

DEEPSO: Winner of the competition

NICTA: Best mean results but min/max of control variables exceeded

MVMO: Organizer of the competition

ALGORITHM RESULTS									
#			Offshore WPP		IEEE 57		IEEE 118		IEEE 300	
			Scenario		Test case		Test case		Test case	
			48	80				2	1	2
1	DE Vladim		1.4493	2.6373			68	135492.35	391.436	721377.54
			1.4493	2.6373			47	135492.21	391.4343	721377.54
		st	0	0				0	0	0
			1.5499	2.6373			36	136381.65	562.4646	736527.31
			1.4647	**2.6373**			99	**135890.72**	**414.6239**	**723041.1**
			1.4581	2.6373			76	135848.17	400.1757	722361.28
			0.021088	7.48E-08				221.991	42.036	2669.9083
2	ICDE Zhao Xu		1.4523	65566.949			18	136238.11	400.0851	722608.09
		o@fbest	1.4523	2.5692	24.6337	41702.84	123.8327	136238.09	400.0626	722608
		gvar@fbest	0	0	0	0	0	0	0	0
		worst	1.5638	754941.31	26.9132	41805.352	135.6955	173785.34	69818.834	754493.47
		mean	1.5055	**334114.72**	**25.0414**	41739.8111	**128.3549**	**154234.87**	**8669.6192**	**740112.6**
			1.5132	208404.61	24.9043	41737.559	127.9848	157412.25	2722.3004	739098.76
			0.031969	184051.6378	0.42956	27.6884	2.4535	12324.2502	15255.7135	6205.4528
3	N Carle		1.4461	2.6381	24.2881	41679.317	114.7239	134954.17	382.7098	720359.19
			1.4461	2.6381	24.2871	41679.267	114.7229	134954.09	382.6968	720358.72
		st	**3.84E-05**	**0.030528**	**0.20645**	**0.33134**	**1.8051**	**2.3409**	**3.7264**	**3.8331**
			1.4461	2.6381	24.2881	41679.317	114.7239	134954.17	382.7098	720359.19
			1.4461	2.6381	24.2881	41679.317	114.7239	134954.17	382.7098	720359.19
			1.4461	2.6381	24.2881	41679.317	114.7239	134954.17	382.7098	720359.19
			0	0	0	0	0	0	0	0
4	C John		1.4614	11190779	24.2799	41693.322	112.9507	134968.83	371.6459	720358.74
			1.4614	2.3796	24.2786	41693.317	112.9491	134968.73	371.6398	720357.97
		st	**0.23742**	0	**0.10011**	0	**3.5513**	**2.4077**	**8.0101**	**8.8484**
			1.5849	18475064	25.7796	41729.981	120.3839	137704.02	382.1322	5.306E+13
			1.4849	16314553.1	25.0349	41710.5169	115.3774	135108.498	374.4709	1.828E+13
		median	1.479	14526025	25.1036	41709.915	114.921	135013.23	374.0752	1.976E+13
			0.02387	2192622.375	0.38104	11.0583	1.7182	483.5354	2.2554	1.589E+13
5	MVM		1.4507	2.6373	24.6346	41688.998	117.2497	135004.06	385.6284	720744.04
			1.4507	2.6373	24.6308	41687.879	117.2313	135004.01	385.6256	720726.12
		st	0	0	0	0	0	0	0	0
			1.5298	2.6373	25.1296	41732.323	118.8745	135137.07	415.5391	731004.15
			1.4668	**2.6373**	**24.8172**	**41707.689**	**117.862**	**135050.21**	**394.1294**	**722763.9**
			1.457	2.6373	24.7763	41705.517	117.7669	135051.07	391.3392	721234.68
			0.021983	3.01E-08	0.12504	10.5581	0.42379	27.5014	8.2219	2706.8956