Description of research group

Fernando Lobo is Associate Professor at the Department of Informatics Engineering and Electronics at the University of Algarve and is affiliated with the *Center for Environmental and Sustainability Research* (CENSE), a research group that promotes interdisciplinary research in environmental sciences and engineering, focusing on the interaction between human and ecological systems, to promote sustainable development.

CENSE includes researchers from the NOVA School of Science and Technology, and from a number of affiliated organizations, including the University of Algarve. Within this center, Fernando Lobo is a member of the *Computation for Sustainability* area. CENSE was recently evaluated with Excellent by *Fundação para a Ciência e Tecnologia*, the Portuguese public agency that supports science, technology and innovation, under responsibility of the Ministry for Science, Technology and Higher Education.

More information about CENSE can be found at https://www.cense.fct.unl.pt/

Short CV / Biographical Information

Fernando G. Lobo

Fernando Lobo is Associate Professor at the Department of Informatics Engineering and Electronics at the University of Algarve (Portugal). He has been doing research in evolutionary algorithms since 1995. He was involved in some of the early work on Estimation of Distribution Algorithms (EDAs) and is one of the co-authors of the compact genetic algorithm. He has also worked with multivariate EDAs, namely the extended compact genetic algorithm, and the Bayesian Optimization Algorithm, where he and co-authors investigated the use of local search informed by problem structure learned by those EDAs. Fernando Lobo also made major contributions in automated parameter selection strategies for Genetic Algorithms, having co-edited the book *Parameter Setting in Evolutionary Algorithms*. His publications received over 4600 citations and an h-index of 25 according to google scholar.

Fernando Lobo obtained a Masters degree in Computer Science from the University of Illinois at Urbana-Champaign (USA) in 1997 and a Ph.D. degree is Environmental Engineering from Universidade Nova de Lisboa (Portugal) in 2000.

He was co-track chair of the Genetic Algorithms track at the ACM GECCO conference in 2008 (with Martin Pelikan) and 2012 (with Daniel Tauritz), co-organized with Thomas Jansen the workshop *Bridging the Gap Between Theory and Practice in Nature-Inspired Optimisation* at PPSN 2018, and has been involved in the EU COST Action *Improving Applicability of Nature-Inspired Optimisation by Joining Theory and Practice* (ImAppNIO), where he is the vice-leader of the Theory-Driven Applications group.

Automating parameter selection in local search algorithms (Work plan for SPECIES scholarship)

Fernando Lobo

Stochastic local search algorithms usually involve a tradeoff between running time and solution quality: practitioners would like to obtain a good solution quickly, but the longer the algorithm runs the higher chance it has to reach a better quality solution.

The ability of search algorithms to reach good solutions is often related to their parameter configuration. For example, in general an Evolutionary Algorithm (EA) with a large population has a better chance, given sufficient time, to reach a better quality solution than the same EA with a smaller population. On the other hand, all other configuration being equal, an EA with a large population is slower than the same EA with a smaller population. This observation led Harik and Lobo to propose an effective method to automate population sizing in GAs [5], and they call it the *parameter-less* Genetic Algorithm (parameter-less GA). The method makes use of exponentially increasing population sizes that are created in an intelligent way throughout the search process.

Variants of the mentioned above parameter-less method have been used successfully with other evolutionary algorithms such as the Covariance Matrix Adaptation Evolution Strategy (CMA-ES) [1], the Hierarchical Bayesian Optimization Algorithm (hBOA) [7], the Gene-pool Optimal Mixing EA (GOMEA) family of algorithms [6, 3, 4], and more recently with a one-point stochastic local search method, i.e., the Late Acceptance Hill Climbing (LAHC) algorithm [2]. In the latter, the sole parameter, the *history length*, plays a role in the algorithm akin to the population size in EAs.

The work plan for this scholarship will explore further variants of the parameter-less technique in the context of one-point stochastic local search algorithms.

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