ISDA 2011

(1569474013): *Sampling Strategies in Ordinal Regression for Surrogate Assisted Evolutionary Optimization*

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Conference and *track*		**11th International Conference on Intelligent Systems Design and Applications** - *SS16 - Special Session on Ordinal Regression*

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Title		*Sampling Strategies in Ordinal Regression for Surrogate Assisted Evolutionary Optimization*
Abstract		In evolutionary optimization surrogate models are commonly used when the evaluation of a fitness function is computationally expensive. Here the fitness of individual points are indirectly estimated by modelling their rank with respect to the current population using ordinal regression. The paper focuses on how to validate the goodness of fit for surrogate models during search and introduces a novel validation and updating policy for surrogate models. The approach is illustrated on two classical numerical optimization functions. A simple one-point cross validation is used to estimate the quality of the ranking. Moreover, we show that it is sufficient that potential parent points are ranked consistently. The new validation approach reduces the number of fitness evaluation needed, without a loss in performance.
Keywords	Only the chairs (isda2011-chairs@edas.info) can edit	surrogate models; ordinal regression; sampling; evolutionary optimization
Topics		
Presenter(s)		Helga Ingimundardottir (bio)
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Status		published

	Document (show)	Pages	File size	Changed	Delete
Review manuscript (Could upload until June 26, 2011 23:59:00 EDT.)		6	308,841	June 17, 2011 23:25:24 EEST	
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Final manuscript (Could upload until September 30, 2011 00:00:00 EDT.)		6	337,222	September 28, 2011 14:47:52 EEST	

Personal notes

You are the creator and an author for this paper.

Reviews

3 Reviews

Review 1 (Reviewer D)

None of the scores are visible in your role.

Comments for the Authors (Please provide constructive comments to the author(s).)

- Review the English and the writing of the paper for a better understanding. Review punctuation marks.

- In Evolutionary Computation is better talk about "individuals" and not "points".
Ej: Line 2 -> "methods where a population of points...". Change in all document.

- Section "II. Ordinal Regression".
Say what is "l" in the first mathematical expresion. It is not defined.

- Page 2, first column.
Say what is "w" in the mathematical expresion (2).

-Page 2. Section "III.Sampling methods and improvements".
Section III would be more readable if it was divided into two subsections, it is too long.
It is also possible two sections.
Secong paragraph -> Say what is "ES" in its first use and put a reference.
Secong paragraph -> Say what is "CMA-ES" in its first use and put a reference.

Secong paragraph -> What is Kriging surrogate model?. Brief description and reference.

-Section "IV. Experimental Study"
In Sphere model, define "n" in the mathematical expresion (7).
It would be good to mention that in future works will be studied other fitness measures or metrics.
Please, put some reference to other metrics in the literature.

-Section "V. Summary and conclusion".
Change "...figure 3" by ... Figure 3".

-References.
References are incomplete, e. g. missing the year in references [5], [14] [16], [17] [18]. Check the format of all references.

Review 2 (Reviewer B)

None of the scores are visible in your role.

Comments for the Authors (Please provide constructive comments to the author(s).)

The paper discusses an alternative fitness evaluation procedure for evolution strategies, based on ordinal regression models. This is an interesting application, so I think that this paper fits within the scope of the special session.

My main remarks are the following ones:

- the paper is somewhat confusing in several directions:
(1) I am not an expert in evolutionary computation, but it still remained unclear to me how ordinal regression models are exactly applied in this context, for example, how do you compose the training dataset? The presentation could be improved in that regard.

(2) one should be careful with using the term surrogate modeling, because it has a totally different meaning in machine learning.

- the authors use the method of Herbrich et al. Many software packages with extensions and improvements of this approach exist, e.g.

Chu et al. Support Vector Ordinal Regression, Neural Computation, 2007.
Pahikkala et al. Learning intransitive reciprocal relations with kernel methods, European Journal of Operational Research, 2010.

Many ordinal regression methods that are not based on kernels have been presented as well in recent years. The authors should motivate better their preference for using the method of Herbrich et al.

- The quality of the paper would largely improve by including experimental results for an optimization problem that cannot be solved by traditional optimization software. So, to convince me of the need for the method of the authors, I would like to see results for real-world optimization problems where the objective function is not convex and not differentiable, such as combinatorial optimization problems, and where ordinal regression models are needed for evaluating the fitness in an efficient manner. The current results are preliminary and solely based on "toy" problems.

Review 3 (Reviewer A)

None of the scores are visible in your role.

Comments for the Authors (Please provide constructive comments to the author(s).)

The paper presents an extension of a previous work regarding the use of ordinal regression for replacing costly or unknown fitness functions by an individuals rank in order to select the best ones for the next generation in evolutionary optimization algorithms. Simulations validate the proposals.

However, some aspect of the work are not clear for me. My main remarks are the following:

1. It is not clear what the search point are, and how they are consider in the ordinal regression, i.e., how the solutions generated to the optimization problem are introduced as input variables of the ordinal regression. If space is a problem, and considering the purpose if the special session, it seems more interesting to understand this than the sampling methods.

2. Regarding \tau at Figure 2, from the reader point of view, I don't understand why \tau values between 0.9999 and 1 are the only ones with can stop the the addition of new points to the surrogate model. Talking with no experience in surrogate assisted evolution, it seems a narrow interval which can deal into an excessive addition of points to the surrogate model.

3. In general, I do not understand the difference between selection and pruning of the training set. Please, clarify this difference.

4. In general, I think that referring the candidate solutions to as points can be confusing because often when there is a training dataset, the items are referred also to as points. I think that the using term "individuals" or "solutions" may clarify the article.

Minor remarks and typos are:

- Page 1, column 2, paragraph 2: "need not be that accurate" -> "need not TO be that accurate"
- Page 2, column 2, the third paragraph may be divided into several paragraphs.
- Page 3, column 1, paragraph 1: "if the relative ranks (...) is the same" -> "if the relative ranks (...) ARE the same"
- Page 3, column 1, paragraph 2: "the validation policy had to successfully rank (...) and pruned" -> "to prune"
- Page 3, column 2, paragraph 3: "1) the setup presented in [1] (...) namely: 2)" -> I think ":" may be a semicolon omitting
- Figure 6: the Y-axis should show the metric regarding the fitness value (RMSE, MAE...)
- References: please, check references, specially the year of some references is missed.