Comments for computers-2922494

# REVIEWER 1

## 1. Comment

Page 1, since the search algorithm applied with GE is a GA, then we must be cautious using the word 'genetic', because it could bring a misunderstanding to the reader, particularly when at the beginning in the introduction it is said that GE comes from a GA and later GA is referenced as a dependent tool used by GE.

## Response

## 2. Comment

Page 3 , In Table 1, in the 8th step, the output says:

"in this step must be: String: (x2+cos()); Chromosome: 23,8,14; Operation: 23 mod 2 = 1",

must say:

"in this step must be: String: (x2+cos()); Chromosome: 23,8,14; Operation: 23 mod 3 = 2",

## Response

## 3. Comment

Explain that the given example helps to understand how instead of using just the raw data (features) (x1, x2, ..., xN), with GE they are transformed into new data (new features) input to be applied in a given NN.

## Response

## 4. Comment

Page 4,  "an Radial Basis Function" "**a** Radial Basis Function"

## Response

## 5. Comment

Explain the seleceted fitness function and its importance related to the objective problem.

## Response

## 6. Comment

Please, in line 110, explain how C being a NN can be subtracted from t\_j and then squared.

## Response

## 7. Comment

Page 5, the mutation procedure explains how an element from the chromosome is selected to apply the mutation operation, but it is not explained how in fact the mutation happens in this element selected.

## Response

## 8. Comment

It is recommended that the example given for the chromosome be used in the following examples, for instance to explain the crossover operation.

## Response

## 9. Comment

Page 6,

In the incise (a) "Set **as** IC as the total number ...", (a), correct the phrase "Set IC as the total number ..."

"as IG the number of generations", correct to: "IG **as** the number of generations", please review similar cases.

## Response

## 10. Comment

Please, introduce the concept of "margin"  (initial margin, set of margins, etc.) is used in the algorithm proposed and why it is needed.

## Response

## 11. Comment

Please, review the phrase "Every chromosome contains a set for intervals randomly initialized in N\_M", if the intention is to explain that each element of the chromosome is brought alive from a pool of possible elements contained in a certain interval, then the phrase could be rewritten in order to bring the right understanding to the reader.

## Response

## 12. Comment

Please, review the concept of chromosome , for instance, when speaking about the "elements for the chromosomes" it sounds that those elements are the genes, then it could be related to the genotype. Now, it could be said that each gene lives in a defined region which its limits depends on the nature of the given features.

## Response

## 13. Comment

In Algorithm 1, in the evaluation step: "iv. Denote by Emin(g\_i) the maximum train error obtained by the Feature Construction procedure", it seems that the right function name must be "Emax(g\_i)."

## Response

## 14. Comment

Usually a fitness score is a single value, please explain why an interval is used instead: fi = [Emin(gi), Emax(gi)], particularly when "the chromosomes are sorted with respect to their fitness values."

## Response

## 15. Comment

Please, state the tournament size used in the tournament selection.

## Response

## 16. Comment

In Equation (3), N is not defined.

## Response

## 17. Comment

In Algorithm 2, the explanation about how to get an offspring is not clear, it seems that the selection is considering just only the indexes and not the values themselves, then the index selected acts as a point where to apply the scissors to cut the chromosome.

## Response

## 18. Comment

Please, explain if the library OPTIMUS contains an implementation of GE or it is an original implementation.

## Response

## 19. Comment

It is recommended to introduce early any concept in order to ease the understanding for the reader, for instance, the ML methods.

## Response

## 20. Comment

Results does not show a comparison between standard methods against the proposed one.

## Response

## 21. Comment

The conclusions are not related to the abstract and not properly related in the introduction: "In the current work, an efficient technique was proposed to identify the bounding box 266 of the values of chromosomes in Grammatical Evolution."

## Response

# REVIEWER 2

## 1. Comment

The article is well written, but contains some minor errors and inaccuracies.

## Response

## 2. Comment

The abbreviation BNF must be spelled out when first mentioned.

## Response

## 3. Comment

The explanation of artificial features should be expanded. What types of features are used.

## Response

## 4. Comment

The FC method in experiments requires NG generations at the genetic stage, IFC requires IC generations at the evaluation stage, but step 2.ii in IFC also requires NG generations. It's unclear how this saves time? It should be clarified.

## Response

## 5. Comment

If the authors claim time efficiency, comparisons should also be made in terms of execution time or the total number of iterations.

## Response

## 6. Comment

In section 3.1, when describing datasets, it would be better to specify what type of data they contain. What are the inputs and what are the outputs for the algorithm in these tasks.

## Response

## 7. Comment

If the experiments were conducted 30 times and a 10-fold cross-check was used, it is worth mentioning the deviation.

## Response

## 8. Comment

Figure 5 all dots are flattened because of outline in MLP column. Is there a way to improve it? Could it be an error in experiment or bad hyperparameters that it just didn't converged? Maybe rerun the experiment or use log scale for y axis to improve it?

## Response

## 9. Comment

In Section 3.3, the authors compare their method with MLP and RBF networks. It would be appropriate to compare the proposed methods with algorithms of the same class, other genetic algorithms.

## Response

## 10. Comment

Typos:

- Line 216 - name of the column is skipped.

- lines 97 and 104, i believe N\_G and N\_g means the same.

- Algorithm 1. Check the usage of "as"

## Response

# REVIEWER 3

## 1. Comment

The introduction outlines the proposed technique and its application without explicitly stating the research objectives. Clarifying the objectives would provide a more precise roadmap for readers.

## Response

## 2. Comment

In the sentence "Any BNF grammar can be described as a set) G=(N, T, S, P)", the variable G is defined as a set, but it should be defined as a tuple.

## Response

## 3. Comment

In the sentence "The original BNF grammar is extended by enumerating the production rules", it would be more precise to mention how the production rules are enumerated or extended. In the sentence "The constant N denotes the dimension of the input data", it's unclear what N exactly represents. It should be explained more explicitly.

## Response

## 4. Comment

In Table 1, the operation for the string "<expr>" states 9 mod 3=0, but it should be 9 mod 3=0, followed by the selection of the production rule, which is not explicitly shown.

## Response

## 5. Comment

In the last row of Table 1, is there a missing step that shows the final production of the expression x2 +cos (x3) from the chromosome?

## Response

## 6. Comment

Algorithm 1 does not incorporate elitism, where the best-performing individuals from one generation are preserved in the next. Without elitism, promising solutions can be lost throughout the optimization process.

## Response

## 7. Comment

The range of the random number ai is specified as [−0.5, 1.5]. This range seems unusual for a probability or crossover parameter. Typically, probabilities are in the range [0, 1]. If this range is intentional, it should be justified or explained.

## Response

## 8. Comment

The algorithm lacks details on how the tournament selection process is conducted and how the random number ai is generated. These details are crucial for understanding and implementing the algorithm correctly.

## Response

## 9. Comment

Using a single-point crossover method may restrict offspring diversity, potentially leading to premature convergence in complex optimization problems.

## Response

## 10. Comment

In step 1.ii, "the the" appears to be a duplication of the word "the". It should likely be corrected to "the upper value".

## Response

## 11. Comment

The algorithm mentions the mutation rate (pm) without explaining its significance or how it is determined. It should clarify how pm is chosen and its effect on the mutation operation.

## Response

## 12. Comment

The experimental setup involves several parameters (e.g., number of chromosomes, number of generations, mutation rate) that are manually set. The robustness of the reported results to variations in these parameters is not explored, and the findings may be sensitive to parameter choices.

## Response

## 13. Comment

While the 10-fold cross-validation method was used to validate the experimental results, other validation techniques (e.g., leave-one-out cross-validation, bootstrapping) were not explored. The choice of validation method may affect the reliability and generalizability of the reported performance metrics.

## Response

## 14. Comment

The methodology used for statistical testing and the significance thresholds are not explicitly stated, making it difficult to assess the robustness of the reported findings.

## Response

## 15. Comment

The conclusions lack discussion on specific challenges in generalization. A brief discussion on transferability and necessary adaptations would enhance completeness.

## Response