Comments for PSO – RBF

# Reviewer 1

## 1. Comment

Avoid using acronyms in abstract

## Response

Corrected.

## 2. Comment

Abstract is oddly short. Please expand it by describing the problem in few more details.

## Response

The abstract have changed to the following:

“*In the present work, an innovative two-phase method is presented for parameter tuning in Radial Basis Function artificial neural networks. These kinds of machine learning models find application in many scientific fields in classification problems or in function regression. In the first phase, a technique based on Particle Swarm Optimization is performed to find a promising interval of values for the network parameters. Particle swarm optimization was used as it is a highly reliable method for global optimization problems and in addition it is one of the fastest and most flexible techniques of its class. In the second phase, the network is trained within the optimal interval using a global optimization technique such as a Genetic Algorithm. Furthermore, in order to speed up the training of the network and due to the use of a two-stage method, parallel programming techniques were utilized. The new method was applied to a number of well-known classification and regression datasets, and the results were more than promising.*”

## 3. Comment

Make sure that each acronym has been defined at the first occurrence (RBF for example).

## Response

Corrected.

## 4. Comment

Elaborate in more details why PSO and GA were selected (among other, more recent metaheuristics available). These two algorithms are one of the oldest approaches.

## Response

## 5. Comment

Expand literature survey by mentioning other state-of-the-art metaheuristics that were used to tune machine learning models in general, such as:

* https://www.hindawi.com/journals/sp/2021/5540024/
* https://www.mdpi.com/2079-9292/11/22/3798
* https://link.springer.com/article/10.1007/s00521-017-2874-2
* https://ieeexplore.ieee.org/abstract/document/8678770

## Response

## 6. Comment

Figure 2 layout is broken, please address it.

## Response

Corrected.

## 7. Comment

Figures 3 and 4, caption is partly hidden by images, please address it.

## Response

Corrected.

## 8. Comment

Discussion should be more elaborate.

## Response

## 9. Comment

Other metrics should be presented as well not only the accuracy. Include precision, recall, f-score as well. These additional metrics can be significant for imbalanced datasets (such as credit card frauds dataset).

## Response

## 10. Comment

Average accuracy isn't reliable indicator when it is calculated as average of 20+ dataset, some of them imbalanced, some not, some with large number of entries, etc. Better, indicate on how many datasets out of total number of datasets the proposed approach obtained the best accuracy, for example 15 out of 24.

## Response

We have extended the AVERAGE line. Now it displays the number of times where the corresponding method achieved the best error.

## 11. Comment

Indicate future work in the conclusion.

## Response

# Reviewer 2

## 1. Comment

Page 3: Algorithms 1: Should “Do” be replaced with “do”?

## Response

Corrected.

## 2. Comment

Page 4 Line 95: The reviewer think that “do” has not been deepened.

## Response

Corrected.

## 3. Comment

Page 5: In figure 2, there should be spacing between images and captions.

## Response

Corrected.

## 4. Comment

Page 5 Line 105: It is necessary for the author to check the sequencing.

## Response

It is a format effect of LaTeX.

## 5. Comment

Page 6 Line 156-160: After the URL of the dataset, please mark the specific date of access.

## Response

Added.

## 6. Comment

Page 9 – Page 10: Relevant pictures of the experimental results should be placed in the previous section.

## Response

Fixed.

## 7. Comment

Page 11: I hope the author can adjust the formatting to improve the problem of image obscuring the title.

## Response

The article has been reformatted using the MDPI Template.

## 8. Comment

The appendix section is missing funding, statements, etc. And the title and layout of the references also need further improvement.

## Response

The article has been reformatted using the MDPI Template.

# Reviewer 3

## 1. Comment

There are already many works on the calculation of RBF network parameters. What is the reason for creating another algorithm? The main motivation is not clearly explained in the paper, please explain: What was the motivation for taking up the topic?

## Response

## 2. Comment

Which algorithm was used in the second phase? In the abstract, the authors write that the second phase uses PSO algorithm and in the "introduction" section that the second phase uses a genetic algorithm. Why? Could the authors explain this?

## Response

## 3. Comment

Line 63 - The sentence "... may not contain the global optimum of equation 3." is imprecise.

## Response

## 4. Comment

Line 64 - the author write: “In order to locate the best interval for the parameters of the network, a modified PSO algorithm [43] is used”. - Unfortunately, article [43] is a review of many PSO algorithms. Could the author explain which modified algorithm was used?

## Response

## 5. Comment

The description of the PSO method (line 65-69) is very poor and could be extended.

## Response

## 6. Comment

Figures/algorithms should be placed on the same page as close to the reference as possible.

## Response

Done.

## 7. Comment

In the text, we can refer to figures/algorithms/equations that are in earlier chapters/sections or in the current chapter/section. We should not refer to figures/algorithms/equations that have not yet been explained/are in later chapters because they make the content difficult to understand.

## Response

Corrected.

## 8. Comment

Algorithm 1 point 2 (equation) - sj2  or ẟj2 ?

## Response

We have changed to \sigma\_{j}^{2}

## 9. Comment

Line 86 – Point 8 is unclear. Why should Ng particles be initialized? Shouldn't it be: " initialize Nc particles"? Why "layout of each chromosome.."? - PSO is based on particles not on chromosomes. Could the author please explain this?

## Response

## 10. Comment

Line 97 - Why velocity uij=[-rẟ/20, rẟ/20] ? Have other velocities been considered?

## Response

## 11. Comment

There are many kinds of inertia weight w including constant inertia weight [1], linearly decreasing inertia weight [2], exponential inertia weight [3], random inertia weight [4], dynamic inertia weight [5], fuzzy inertia weight [6], It would be good to write this and then explain: What  guided the author  when choosing the kind of inertia weight?

1. Constant inertia weight: https://doi.org/10.1016/S0020-0190(02)00447-7

**2. Linearly decreasing inertia weight: doi:**10.1109/CEC.1999.785511

3. Exponential inertia weight: https://doi.org/10.1007/978-3-319-46592-0\_23

4. Random inertia weight: https://doi.org/10.1007/3-540-45105-6\_12,   **doi:**10.1109/ISCBI.2013.27

5. Dynamic inertia weight: https://doi.org/10.1007/978-3-319-70581-1\_6

6. Fuzzy inertia weight: **doi:**10.1109/CEC.2001.934377 ; **doi:**10.1109/JCAI.2009.50

## Response

## 12. Comment

Line 104 - Could the authors explain why acceleration coefficients were omitted from the velocity equation?

## Response

## 13. Comment

Part of Figure 2 is cut off. The title of figure 2 unnecessarily merges/sticks with the table.

## Response

Fixed.

## 14. Comment

The results (tables, figures) should be placed in the results section. Why are they included in the conclusion?

## Response

Fixed.

## 15. Comment

Why are references in the conclusion section?

## Response

Fixed.

## 16. Comment

The paper lacks comparative analysis of experimental results with other related methods.

## Response

Two additional methods have been added: The use of the RPROP method in an artificial neural network with 10 hidden nodes and the use of a genetic algorithm to an artificial neural network with 10 hidden nodes. Hence, two columns have been added in the experimental results (Tables 2 and 3) in subsection 3.2

## 17. Comment

Lack of discussion of results

## Response

## 18. Comment

Lack of details about the weaknesses and strengths of the proposed model

## Response

## 19. Comment

The paper contains typos and mistakes which should be improved

## Response

(edo na poume pos egine xrisi ispell kai grammar check)

## 20. Comment

References contains typos and mistakes that should be improved e.g. [28],[38], [39], etc.

## Response

Corrected.

# Reviewer 4

## 1. Comment

The article proposes a technique for training RBF NN. Although RBF is relatively known, its abbreviation should be properly introduced in the article.

## Response

Corrected.

## 2. Comment

The paper does not have a proper introduction and it does not present a section with similar attempts to identify parameters of RBF networks or at least for NN in general or even deep learning, if there are not enough recent entries in the literature, although I believe there are quite a few:

-        https://ieeexplore.ieee.org/document/7095057

-        https://www.sciencedirect.com/science/article/pii/S0307904X11006251

-        https://www.mdpi.com/1424-8220/22/11/4204

-        https://www.mdpi.com/2227-7390/9/21/2705

-        https://www.inderscienceonline.com/doi/abs/10.1504/IJAIP.2022.126695

-        https://link.springer.com/chapter/10.1007/978-3-030-39033-4\_3

## Response

## 3. Comment

The authors should elaborate on why their technique should be preferred to other similar attempts.

## Response

## 4. Comment

It is not clear why PSO is combined with a GA (why not only GAs or only PSOs).

## Response

## 5. Comment

A diagram with an overview of the methodology should be presented to give a more intuitive presentation of the proposed technique.

## Response

We have added a diagram for the proposed method at the end of subsection 2.3

## 6. Comment

Eq. (7) needs either correction or more explanations. How can an interval be equal with a sum?

## Response

This paragraph changed to “The function E( y ) (equation [eq:eqrbf](#eq_eqrbf)) is modified to an interval one [ E min ( y ) , E max ( y ) ] calculated with the procedure given in Algorithm [alg:Fitness-calculation-for](#alg_Fitness_calculation_for).”

## 7. Comment

The settings from Table 1 should be explained. Actually, all the captions from the tables and figures should contain more explanations.

## Response

## 8. Comment

A (at least one) baseline model should be included in the experiments to indicate the benefits of employing the proposed method.

## Response

Two additional methods have been added: The use of the RPROP method in an artificial neural network with 10 hidden nodes and the use of a genetic algorithm to an artificial neural network with 10 hidden nodes. Hence, two columns have been added in the experimental results (Tables 2 and 3) in subsection 3.2

## 9. Comment

Figures 3 and 4 does not bring anything new as compared to the tables. Numerical information about the running times should be presented, as well. The captions from the figures cannot be read well

## Response

(edo prepei gia kathe ena dataset na trexoun mia fora oles oi methodoi kai na katagrafoun ta sum times)