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Development of the FCM Method to Improve Clustering Accuracy in Big Data

Hadis Changizi[1], Mohammad Ali Afshar Kazemi[2*], Alireza Pourebrahimi[3], Reza Radfar[4]

[1] Department of Information and Communication Technology Management, Qeshm Branch, lslamic Azad, Uuniversity, Qeshm, Iran
[2] Department of Industrial Manegment, Tehran Branch, Islamic Azad University, Tehran, Iran
[3] Department of Industrial Manegment, Karaj Beanch, Islamic Azad University, Karaj, Iran
[4] Department of Industrial Manegment, Science and Research Branch, Islamic Azad University,Tehran, Iran

*** Corresponding author email address**: drmafshar@gmail.com

1. Round 1

1.1 Reviewer 1

Reviewer:

The statement, "However, it is sensitive to initial value selection and is prone to getting trapped in local optima," lacks quantitative evidence. Cite specific studies or metrics (e.g., error rates from prior FCM implementations) to substantiate these limitations.

The Sørensen–Dice coefficient is mentioned, but its equation is omitted. Include the formula and clarify how it was weighted against other metrics (e.g., Jaccard Index) during evaluation.

The caption for Figure 1 ("Sample Segmentation Results") lacks critical details (e.g., dataset origin, ground truth source, performance metrics for the shown samples). Revise to include these specifics.

The post-processing steps (e.g., "morphological operations such as dilation") are described without quantitative impact analysis. Provide ablation studies showing how each operation affects segmentation accuracy (e.g., Dice score before/after hole filling).

The comparison between CNNs and fully connected networks (Figure 2) lacks empirical validation. Include a table comparing training time, accuracy, and parameter count for both architectures on the same dataset.

Figure 4 ("Implementation of FCM in Medical Image Segmentation") is not referenced in the text. Discuss how this figure demonstrates the workflow of FCM-LCAOA integration and its advantages over standalone FCM.

The transition between exploration and exploitation in LCAOA is described as dependent on MoAc, but the equation for MoAc(t) is missing. Provide the mathematical expression and explain how MoAc(t) dynamically adjusts during iterations.

The claim that Lévy/Cauchy distributions "dynamically adjust μ" is unsupported. Include a plot or table showing μ values over iterations and their correlation with exploration/exploitation phases.

Author revised the manuscript and uploaded the updated document.

1.2 Reviewer 2

Reviewer:

The phrase, "the proposed algorithm can identify key features of the lesion and assess malignancy risk with greater accuracy," is vague. Specify the accuracy metrics (e.g., AUC, sensitivity) and compare them explicitly to existing methods in this section.

The integration of "fuzzy logic and LCAOA" is ambiguously described. Provide a mathematical formulation or pseudocode illustrating how fuzzy logic modifies the fitness function of FCM and how LCAOA interacts with the optimization process.

Parameters like "Inertia weight = 0.6 / 0.4 / 0.2" are listed without justification. Explain the rationale for selecting these specific values and how they were optimized during experimentation.

The statement, "the computational complexity of LCAOA is derived accordingly," lacks derivation details. Provide asymptotic analysis (e.g., O(n^2)) and compare it to classical AOA.

The reported "Jaccard Index of 78.59%" lacks context. Compare this value to benchmarks (e.g., state-of-the-art methods like U-Net) and provide statistical significance (e.g., p-values) for the improvement.

The conclusion states "superior robustness against local noise" but does not quantify this. Include metrics like noise tolerance thresholds (e.g., SNR levels) or comparative results on noisy vs. clean datasets.

Author revised the manuscript and uploaded the updated document.

2. Revised

Editor’s decision after revisions: Accepted.

Editor in Chief’s decision: Accepted.

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