Summary of the Article

The article focuses on surface deformation prediction in high mountain canyon areas using time-series InSAR technology combined with an improved Elman neural network model. The authors propose two optimization methods for the Elman network: Cuckoo Search (CS) and Grey Wolf Optimization (GWO). The study uses SBAS-InSAR and PS-InSAR technologies to monitor surface deformation and incorporates 13 evaluation factors related to terrain and environmental conditions. These factors, such as DEM, slope, and rainfall, are filtered through grey relational and correlation analysis to select optimal inputs for the Elman models. The CS-Elman model outperforms the GWO-Elman model in terms of mean square error, mean absolute error (MAE), and mean absolute percentage error (MAPE). Results show the CS-Elman model to be more effective and accurate in predicting surface deformation, especially when compared to traditional models like SVM and LSTM.

Reviewer's Comments (Major Revision Required)

1. **Abstract**
    - The abstract is informative, but it needs refinement for clarity and conciseness. For example, mentioning the specific results of MAE and MAPE for other methods such as LSTM and SVM etc. would enhance understanding.
    - The abstract should also briefly mention the significance of the problem, i.e., why improving surface deformation predictions in high mountain canyon areas is important for hazard prevention (the motivation of doing this study like three or four lines of introduction section).
    - This type of writing for Abstract is not common 'Results indicates' near 10 lines.
2. **Introduction**
    - The introduction adequately establishes the context but is verbose and could benefit from restructuring for clarity. Sentences like "China is a country prone to geological disasters" could be simplified.
    - The literature review is extensive, but it lacks a critical discussion of the limitations of the current approaches. More emphasis should be placed on how the proposed model fills these gaps in the literature.
    - The problem statement should be more focused. While the paper acknowledges the non-linearity of surface deformation in high mountain canyon areas, the rationale for choosing CS and GWO as optimization techniques should be more explicitly linked to these challenges.

- The introduction presentation is generally unsuitable, comprehensive, and in order. First, you start from InSAR and jump to prediction, and then you come back, bring references from SBAS and PSI, and go to prediction again. It is not very readable and does not convey useful information. The paragraphs should be in order and use a mix of old and new references. Use various and new references; for example, Khalili et al. 2023 and Sun et al. 2024 have up-to-date studies with high accuracy on landslide prediction by InSAR and Hybrid AI model.

3. **Methodology**
    - The methodology is detailed but lacks clarity in several places. The flowchart in Figure 1 is helpful, but more explanation is needed to connect the steps logically.
    - The choice of 13 factors is justified through grey relational and correlation analysis, but the explanation of these techniques is somewhat technical for a general audience. Simplifying or expanding explanations for readers unfamiliar with these statistical methods would be beneficial. Also, open the part related to lines 133 to 139 and explain more.
    - If I am not mistaken you want to use cumulative deformation and predict it, however this type of data is temporal and the conditioning factors are spatial, how did you address it?
    - The explanation of the Elman neural network, CS, and GWO algorithms is overly technical without enough context on why these models were chosen practically. The mathematical models are fine for specialists but could be overwhelming for broader audiences. Consider providing a more intuitive explanation of how CS and GWO optimize the Elman network.
    - As the authors mentioned the primary references in detail, there are many studies in this field that have fundamentally explained these SBAS and PSI methods. It is enough to include parameters that are effective in your processing in the methodology section. In addition to the expression of its software. Additional explanations are not necessary.

4. **Case Study and data sets**
    - The study area section lacks essential explanations, such as about the geological setting. Also, a figure should be given for these explanations. The phenomenon under investigation and prediction is landslides, so a landslide inventory map with

full explanations can be provided in this section. We are looking for a reliable prediction, and this detail is important for us in interpreting the results.

5. **Results**
    - The results section provides quantitative evidence of the model's performance, but it could be better structured. For example, the comparison of SBAS-InSAR and PS-InSAR data should be presented with a clearer connection to the model's predictions.
    - Figures 6 and 7 are visually effective, but the discussion around them lacks depth. It would be helpful to explicitly link these figures to the overall goals of the study. For instance, explaining how the deformation trends in these figures correlate with predictions made by the CS-Elman model.
    - Cross-validation results (Figure 9) are important but are not discussed thoroughly. Why is the correlation coefficient of 0.85 significant? Does this meet a specific threshold for accuracy in similar studies?
    - The discussion of error metrics like MAE and MAPE (Figure 11 and 12) is technical, and the benefits of the CS-Elman model should be articulated more clearly. The practical implications of reducing the error by this margin should be highlighted.
    - **Major point:**
    - you were working and processing on Descending orbit, the words of Subsidence and uplift are correct? (Lines 292-293). Also, lines 286 to 287 must go to the methodology section.
    - The processing techniques are different and have different details, but both inputs are the same. How do you evaluate the results obtained from SBAS with the results obtained from PSI? If the S1A images have errors or problems, it is for both. You need another source of data to do this evaluation. This validation seems to be useless and does not stamp approval or rejection on SBAS outputs.
    - The result needs to be visualized. These statistical graphs are not enough.
6. **Comparison with Other Models**
    - The paper compares CS-Elman with GWO-Elman, but the comparison with other models like SVM, LSTM, and PSO-BP is relatively weak. There needs to be a deeper discussion of how these models perform in different scenarios (e.g., different types of terrain). Also, there are some studies that out perform these type of

traditional DLMs, may be for evaluation you need to compare with GCN-LSTM, CNN-LSTM, and other hybrid model.

- The section should address why the CS-Elman model outperforms traditional models and what specific features make it better suited for surface deformation prediction. Simply mentioning that the CS-Elman model is superior without a clear analysis of the causes of this superiority is insufficient.

7. **Figures and Tables**
    - Many figures (e.g., Figures 6-12) are effective but require more thorough descriptions in the text. For example, the deformation maps (Figures 6 and 7) should be more directly linked to the points discussed in the results section.
    - Table 5 shows correlation coefficients, but the discussion is overly technical. A clearer explanation of why certain factors was excluded would improve readability.
    - All your Figures need the coordinate system, correct all the figures and check them.
8. **Discussion and Conclusion**
    - The discussion lacks depth and should more clearly articulate the implications of the findings. For instance, while the paper shows that CS-Elman is superior in prediction accuracy, the practical implications for geological hazard monitoring in high mountain canyon areas should be emphasized.
    - The conclusion is weak. It should restate the significance of the findings more strongly and suggest future research directions based on the limitations of the study. For example, the study might explore additional influencing factors or further improve the model by hybridizing CS with other optimization techniques.
9. **Language and Grammar**
    - The paper contains some grammatical errors and awkward phrasing. For example, phrases like "the Elman network optimized by CS algorithm exhibits better performance" could be reworded to "the CS-optimized Elman network performs better."
    - The tone is quite technical and might be difficult for some readers. Simplifying the language in certain sections would improve accessibility.
10. **Additional Points**
    - **Limitations**: The limitations of the study are not discussed enough. For example, the issue of vegetation interference is briefly mentioned but not explored in terms of how it could be mitigated in future research.

- **Reproducibility**: The steps for constructing the CS-Elman and GWO-Elman models are well detailed, but more information on the data preprocessing (especially normalization techniques) is needed to ensure that others can replicate the study.

Final Recommendation: Major Revision

The article is well-researched and tackles a significant problem in surface deformation prediction. However, the manuscript needs substantial revision in terms of clarity, depth of discussion, and comparison with other models. The paper should also better connect its findings to the broader implications for geological hazard monitoring.