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Efficient Energy-Efficient Resource Allocation in Cognitive Radio Networks Using Particle Swarm Optimization Compared Over Grasshopper Optimization

INTRODUCTION

- This research aims to contribute energy resource allocation to the field of cognitive radio using Particle Swarm Optimization (PSO) compared over Grasshopper Optimization (GHO) with improved accuracy.
- Grasshopper optimization is a type of metaheuristic optimization algorithm inspired by the swarming behavior of grasshoppers. It belongs to the category of nature-inspired optimization techniques, which are designed to solve complex optimization problems by simulating the behavior of natural systems.
- This study aims to compare the performance of Particle Swarm Optimization and Grasshopper Optimization in efficiently allocating resources in Cognitive Radio networks while optimizing energy efficiency.
- In this study, I compared Particle swarm optimization with Grasshopper optimization. Particle swarm optimization produce best accuracy compared with Grasshopper Optimization.
- The objective of this study is to investigate and compare the efficacy of Particle Swarm Optimization (PSO) and Grasshopper Optimization Algorithm (GOA) in efficiently allocating resources in Cognitive Radio Networks (CRNs) while optimizing energy efficiency.

MATERIALS AND METHODS

Input Dataset : Dataset is divided into small overlapping or either non-overlapping blocks.

→ **Pre-Processing :** Pre process the data to remove class Imbalance Both PSO and GO can be used to preprocess the data if necessary. This may involve data cleaning, normalization, and other data preparation steps.

→ **Clustering :** PSO and GO can be utilized for clustering the data to group similar data points together. This step can help identify patterns in the data and facilitate further analysis.

→ **Feature Extraction :** Both PSO and GO can be applied for feature extraction, where relevant features are extracted from the data to reduce dimensionality and focus on the most informative aspects of the data.

→ **Feature Selection :** PSO and GO can be employed for feature selection, aiming to select the most relevant subset of features that contribute most to the performance of the system.

→ **Classification :** PSO and GO can be used for optimizing the parameters of classification models such as support vector machines, neural networks, or decision trees. They can help in finding the optimal set of parameters that maximize classification accuracy.

→ **Output Prediction :** Both PSO and GO can be used for predicting outputs based on the trained classification models. They can optimize the parameters to improve the accuracy of the predictions.

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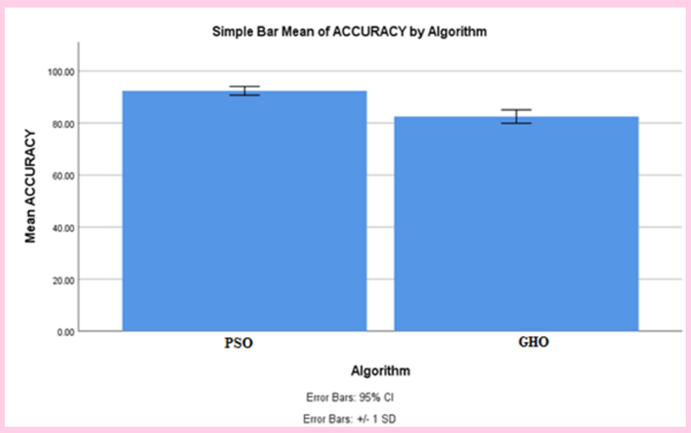
RESULTS



Group		N	Mean	Standard Deviation	Standard Error Mean
Accuracy	PSO	20	92.28	1.66960	0.37333
	GHO	20	82.15	2.57103	0.57490

Particle Swarm Optimization is compared over the Grasshopper Optimization, In this comparison Particle Swarm Optimization gives more accuracy when compared with Grasshopper Optimization.

Fig :- Comparison the accuracy data values of Particle Swarm Optimization over Grasshopper Optimization

DISCUSSION AND CONCLUSION

- The Particle swarm optimization technique is statistically significant since its significance value is $p=0.055$ ($p<0.05$) from the independent sample T-test analysis.
- The results of the energy efficient study for Cognitive Radio revealed a clear and consistent trend. The Particle Swarm Optimization (PSO) algorithm consistently outperformed the Grass Hopper Optimization (GHO) algorithm in terms of accuracy across given datasets. The mean accuracy for PSO was notably higher at 92.28%, while GHO achieved an average accuracy of 82.15%
- Based on the analysis, Particle swarm optimization outperformed the existing models in terms of Accuracy and F1 score.
- These findings emphasize the potential of Computer Networks, specifically Particle Swarm Optimization helped in more resource allocation with improved accuracy.
- PSO-based energy efficient cognitive radio demonstrates superior performance. The statistical analysis further substantiates this finding, indicating a significant difference between the two algorithms ($p<0.05$).

BIBLIOGRAPHY

- Asoke Nath & Triparna Mukherjee - 2020, "Cognitive Radio-Trends, Scope, and Challenges in Radio Network Technology", International Journal of Advance Research in Computer Science and Management, vol. 3, No. 6.
- D. Seema Dev Aksatha - 2021, “Improving the Energy Efficiency of Cognitive Radio Wireless Network Using Coverset Prediction “, Turkish Journal of Computer and Mathematics Education TURCOMAT Vol. 12 No. 13.
- Gyanendra Prasad Joshi, Seung Yeob Nam & Sung Won Kim - 2022, “Cognitive Radio Wireless Sensor Networks: Applications, Challenges and Research Trends“, Sensors Basel., Vol. 13, No. 9.
- Muhammad Naeem, Kandasamy Illanko, Ashok Karmokar, Alagan Anpalagan & Muhammad Jaseemuddin - 2020, “Energy-Efficient Cognitive Radio Sensor Networks: Parametric and Convex Transformations “, Sensors Basel. Vol. 13, No. 8.
- Xueqing Huang, Tao Han, & Nirwan Ansari - 2021, “On Green Energy Powered Cognitive Radio Networks”, *EEE Communications Surveys & Tutorials*, vol. 17, no. 2.