Comparative Analysis of Intelligent Solutions Searching Algorithms of Particle Swarm Optimization and Ant Colony Optimization for Artificial Neural Networks Target Dataset

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- Abraham Ayegba Alfa,
- Sanjay Misra,
- Adebayo Abayomi-Alli,
- Oluwasefunmi Arogundade,
- Oluranti Jonathan &
- Ravin Ahuja

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Abstract

The optimizations approaches of ant colony optimization (ACO) and particle swarm optimization (PSO) were targeted at improving the outcomes of artificial neural networks for finding best solution in the space. Both ACO and PSO are derived from the artificial intelligence concept that imitate the natural behaviors of animals in finding best path to foodstuff location relative and back their nest. The artificial neural networks (ANNs) are reliant on estimated research scheme in which models are generated for unspecified function in order find suitable interrelationships in input and output datasets. These are not without challenges including large time of computation, expansive hidden layer size, and poor accuracy. This paper examines the effects of pretraining dataset with ACO and PSO prior training process of ANN in order to overcome the aforementioned problems of speed and accuracy through optimization of the local and global minima. The outcomes of the study revealed that the ACO outperformed PSO in conjunction with ANN in terms of RAE, MSE, RMSE, and MAPE utilized. The error rates of ANN pretrained with ACO and PSO distinctively are 62 and 73% accordingly. Benchmarking the results against the solution optimization studies, ACO and PSO algorithms are most preferred in finding the best solution or nearest-optimal in search spaces.

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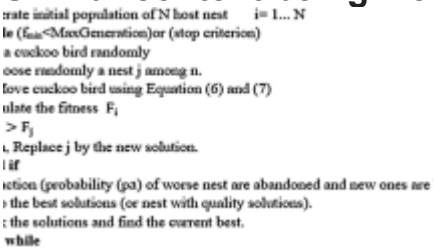

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References

1. Tian H, Shu J, Han L (2018) The effect of ICA and PSO on ANN results in approximating elasticity modulus of rock material. Eng Comput 35(1):305–314

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2. Kuntoji G, Rao S, Nava E, Reddy B (2019) Prediction of damage level of inner conventional rubble mound breakwater of tandem breakwater using swarm intelligence-based neural network (PSO-ANN) approach. In: Bansal J et al (eds) Soft computing for problem solving, advances in intelligent systems and computing, vol 817. Springer, Singapore, pp 441–453

   Google Scholar

3. Moayedi H, Mehrabi M, Mosallanezhad M, Safuan A (2019) Modification of landslide susceptibility mapping using optimized PSO-ANN technique. Eng Comput 35(3):967–984

   Article **Google Scholar**

4. Pal A, Chakraborty D (2014) Prediction of stock exchange share price using ANN and PSO. Int J Eng Sci 80(1):62–70

   Google Scholar

5. Xu C, Gordan B, Koopialipoor M, Armaghani DJ, Tahir MM, Zhang X (2019) Improving performance of retaining walls in dynamic conditions developing an optimized ANN based on ant colony optimization technique. IEEE Access 7:94692–94700

Article **Google Scholar**

6. Okewu E, Misra S (2016) Applying metaheuristic algorithm to the admission problem as a combinatorial optimization problem. In: Mizera-Pietraszko J et al (eds) Advances in digital technologies, ICADIWT 2016. IOS Press, Amsterdam, pp 53–64

   Google Scholar

7. Crawford B, Soto R, Johnson F, Misra S, Paredes F (2014) The use of metaheuristics to software project scheduling problem. In: Murgante B et al (eds) Computational science and its applications—ICCSA 2014, LNCS, vol 8583. Springer, Cham, pp 215–226

   Google Scholar

8. Crawford B, Soto R, Peña C, Riquelme-Leiva M, Torres-Rojas C, Misra S, Paredes F et al (2015) A comparison of three recent nature-inspired metaheuristics for the set covering problem. In: Gervasi O et al (eds) Computational science and its application—ICCSA 2015, LNCS, vol 9158. Springer, Cham, pp 431–443

   Google Scholar

9. Soto R, Crawford B, Galleguillos C, Misra S, Olguín E (2014) Solving Sudokus via Metaheuristics and AC3. In: 2014 IEEE 6th international conference on adaptive science and technology. IEEE, Otta, Nigeria, pp 1–3

   Google Scholar

10. Crawford B, Soto R, Johnson F, Vargas M, Misra S, Paredes F (2015) A scheduling problem for software project solved with ABC metaheuristic. In: Gervasi O et al (eds) Computational science and its applications—ICCSA 2015, LNCS, vol 9158. Springer, Cham, pp 628–639

    Google Scholar

11. Chakraborty R (2010) Fundamentals of neural networks: soft computing course lecture notes. Computer Science Department, Indian Institute of Technology, Madras, India

    Google Scholar

12. Gholizadeh S, Fattahi F (2012) Serial integration of particle swarm and ant colony algorithms for structural optimization. Asian J Civ Eng (Build Hous) 13(1):127–146

Google Scholar

13. Su Y (2005) An investigation of continuous learning in incomplete environments. PhD dissertation, University of Nottingham, UK

Google Scholar

14. Hamdi H, Regaya Ben C, Zaafouri A (2018) Real-time study of a photovoltaic system with boost converter using the PSO-RBF neural network algorithms in a MyRio controller. Sol Energ 183:1–16

Google Scholar

15. Mohd Aras MS, Abdullah SS, Jaafar HI, Yusof AA, Mohd Tumari MZ, Yan HG (2019) Optimization of single input fuzzy logic controller using PSO for unmanned underwater vehicle. In: Md Zain Z et al (eds) Proceedings of the 10th national technical seminar on underwater system technology 2018, LNEE, vol 538. Springer, Singapore, pp 15–26

Google Scholar

16. Eltamaly AM, Farh HMH (2019) Dynamic global maximum power point tracking of the PV systems under variant partial shading using hybrid GWO-FLC. Sol Energ 177:306–316

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17. Manoj RJ, Preveena A, Vijayakumar K (2018) An ACO-ANN based feature selection algorithm for big data. Cluster Comput 22(2):395–3960

Google Scholar

18. Hlaing SZS, Khine MA (2011) An ant colony optimization algorithm for solving traveling salesman problem. In: International conference on information communication and management, vol 16, pp 54–59

Google Scholar

19. Rajab S, Sharma V (2017) An interpretable neuro-fuzzy approach to stock price forecasting. Soft Comput 23(3):921–936

Google Scholar

20. Pau G, Collotta M, Maniscalco V, Choo KR (2019) A fuzzy-PSO system for indoor localization based on visible light communications. Soft Comput 23(14):5547–5557

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21. Singh AK, Nasiruddin I, Sharma AK (2019) Implicit control of eddy current braking system using fuzzy logic controller (FLC) and particle swarm optimisation (PSO). J Discr Math Sci Crypt 22(2):253–275

Google Scholar

22. López MG, Ponce P, Soriano LA, Molina A, José J, Rivas R (2019) A novel fuzzy-PSO controller for increasing the lifetime in power electronics stage for brushless DC drives. IEEE Access 7:47841–47855

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23. Nguyen D (2019) Designing PSO-based PI-type fuzzy logic controllers: a typical application to load-frequency control strategy of an interconnected hydropower system. In: Proceedings of the 2019 3rd international conference on automation, control and robots. ACM, New York, USA, pp 61–66

Google Scholar

24. Alfa AA, Misra S, Ahmed KB, Arogundade O, Ahuja R (2020) Metaheuristic-based intelligent solutions searching algorithms of ant colony optimization and backpropagation in neural networks. In: Singh P et al (eds) Proceedings of 1st international conference on computing, communications, and cyber-security—IC4S 2019, LNNS, vol 121. Springer, Singapore, pp 95–106

Google Scholar

25. Bin AY, Zhong-Zhen Y, Baozhen Y (2009) An improved ant colony optimization for vehicle routing problem. Eur J Oper Res 196:171–176

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Authors and Affiliations

1. **Kogi State College of Education, Ankpa, Nigeria**
   Abraham Ayegba Alfa
2. **Covenant University, Otta, Nigeria**
   Sanjay Misra & Oluranti Jonathan
3. **Federal University of Abeokuta, PMB 2240, Abeokuta, Ogun State, Nigeria**
   Adebayo Abayomi-Alli & Oluwasefunmi Arogundade
4. **Shri VikarmShilla University, Gurgaon, India**
   Ravin Ahuja

Corresponding author

Correspondence to Sanjay Misra .

Editor information

Editors and Affiliations

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