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Optimal completion of the incomplete Pairwise Comparison Matrices using metaheuristic approaches

Communication Info

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Abstract

Analytic Hierarchy Process (AHP) is a multi-attribute decision-making methodology developed by Saaty [1].
The main problem of the AHP method in the practical application is the judgment matrix which is constructed only by decision-makers based on their experience and knowledge. Thereby, the pairwise comparison matrix could be inconsistent or incomplete due to the limitations of experience and expertise as well as the complex nature of the decision problem.
Incomplete pairwise comparison matrices (PCMs) [2] frequently arise in decision-making processes when experts are unable to provide judgments for all criteria due to time constraints, limited knowledge, or uncertainty.
In this study, we propose a comparative analysis of three metaheuristic approaches [2, 3] to estimate the missing entries in incomplete PCMs. The numerical results demonstrate highlighting their performance in reconstructing PCMs and supporting more reliable decision outcomes.

References

[1] T. L. Saaty, The Analytic Hierarchy Process. McGraw-Hill, New York, 1980.
[2] K. Ágoston, L. K.Csató, Inconsistency thresholds for incomplete pairwise comparison matrices. Omega, 2022, Vol. 108, 102576.
[3] Z. Tajani, C. Tajani, I. Khattabi, M. Sabbane, A metaheuristic approach to improve consistency of the pairwise matrix in AHP, Mathematical Modeling and Computing, 2023, Vol. 10(4), 1164–1173.
[4] Y. Karkour, C. Tajani, J. Daoudi, Particle Swarm Optimization Based-Algorithm for an optimal completion of incomplete pairwise comparison matrices, 2026, Vol. 44 (3), 1-15.