

# **Fuzzy Heuristic Approaches for Healthcare Staff Scheduling**

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## **Abstract**

Motivated by the presence of fuzzy patient expectations, staff preferences and management aspirations, this research proposes fuzzy multi-criteria heuristic approaches for solving healthcare staff scheduling problems.

The contributions of the research are threefold: First, an enhanced fuzzy simulated evolution algorithm and a novel fuzzy simulated metamorphosis algorithm are developed for the nurse scheduling problem. The algorithms combine constructive heuristics, evolutionary concepts, and fuzzy evaluation techniques to model fuzzy preferences and decision maker's choices. Second, a novel fuzzy multi-criteria grouping particle swarm optimization algorithm is proposed for the home healthcare staff scheduling problem where patient preferences, staff preferences, and management aspirations are fuzzy. Third, by viewing the healthcare task assignment problem as a job shop, based on characteristics such as earliness, tardiness, and make-span, a fuzzy grouping genetic algorithm is developed to address the problem. The algorithm uses biologically inspired grouping heuristics to iteratively permute groups of tasks and individual tasks assigned to care workers. In all these cases, the goal is to obtain high quality solutions with minimal violation of preferences and management aspirations.

Overall, comparative computational results based on benchmark problems show that the proposed fuzzy heuristic algorithms can provide superior solutions more efficiently when compared to other approaches.

## **Keywords**

Fuzziness, heuristic approaches, healthcare, staff scheduling, algorithms

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## **Biography**

**Michael Mutingi** is a Lecturer and Coordinator of the Master of Industrial Engineering at the Namibia University of Science and Technology, Namibia. He is also a Senior Visiting Research Associate at the University of Johannesburg, South Africa. He obtained his PhD in Engineering Management from the University of Johannesburg, South Africa. He also holds a MEng and a BEng in Industrial Engineering from the National University of Science and Technology, Zimbabwe, where he served as a Research Fellow and a Lecturer in Industrial Engineering. Michael Mutingi also served as a Research Associate at the National University of Singapore, Singapore, and a Lecturer at the University of Botswana, Botswana. His research interests include fuzzy multi-criteria decision

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