Abstract

Title of the Thesis: Development of Some Multi-Criteria Decision Making Strategies in Uncertain Environment

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Multi-criteria decision making (MCDM) is very intuitive when considered with single criterion issue, since we only have to choose the option with the highest preferred rating. However, when decision-makers evaluate options with multiple criteria, many issues such as the weight of the criteria, the dependence on the choice, and the conflict between the criteria complicate the issues which need to be solved more sophisticatedly. Classical MCDM methods usually assume that all criteria and their respective weights are expressed in crisp values, and for that reason, the rating and the ranking of the alternatives can be carried out without any problem. In real-world decision-making situations, the application of the classical MCDM method may consider practical constraints from the criteria perhaps containing indeterminacy, or uncertainty in the information. Fuzzy set, intuitionistic fuzzy set, neutrosophic set, and Pythagorean fuzzy sets are useful and effective for presenting different types of indeterminate or uncertain information. In the thesis, we develop several MCDM models in uncertain environment to deal with various real-life decision-making problems, which include:
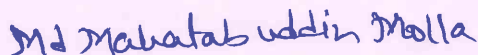
- GRA method based on single-valuedpezoidal neutrosophic number for MCDM.
- TOPSIS method based on interval trapezoidal neutrosophic number for MADM.
- TOPSIS method based on neutrosophic hesitant fuzzy sets for MCDM.
- PROMETHEE method with Pythagorean fuzzy sets for medical diagnosis problems.
- Pythagorean fuzzy DEMATEL method for supplier selection in sustainable supply chain management.
- MCDM method based on spherical neutrosophic sets.

We apply these methodologies in various practical examples and discuss with other existing methods to verify the feasibility and effectiveness of the proposed models. The outcome of the thesis can be used in a variety of fields, including data mining, clustering analysis, personal selection, software selection, e-learning management and disaster management.

Signature of the Supervisor

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