# A novel Picture fuzzy linguistic Muirhead Mean aggregation operators and their application to Multiple Attribute Decision Making

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**Research Article**

**Keywords:** Picture fuzzy linguistic set, Muirhead Mean (MM) operator, Linguistic scale functions, Multiple attribute decision making

**Posted Date:** May 10th, 2021

**DOI:** https://doi.org/10.21203/rs.3.rs-418738/v1



**Version of Record:** A version of this preprint was published at Soft Computing on August 20th, 2021. See the published version at https://doi.org/10.1007/s00500-021-06121-5.

# Abstract

The Picture fuzzy linguistic set (PFLS) is an extension of intuitionistic fuzzy set (IFS) and linguistic variables (LVs), which has been applied successfully in the process of decision making. Considering the lack of closeness of extant PFLS operations and the interrelationship among input attributes do not considered. In this paper, for the sake of addressing those limitations, we firstly redefine some novel operational laws for PFLS by introducing linguistic scale functions and the related properties are studied. Then, new score function and accuracy function are also defined to compare PFLSs. Subsequently, in consideration of the superiority of Muirhead Mean (MM) operator in capturing the interaction relationship between the input parameters, we extend the MM operator to the picture fuzzy linguistic context, and then propose picture fuzzy linguistic weighted MM operator and its dual form in a new light. After that, we have adopted these operators to build two novel models to solve multiple attribute decision making (MADM) problems. Finally, a practical example for the selection of the innovative Mobike" sharing bike design is provided to illustrate the practicality and effectiveness of our developed approaches.


# Full Text

This preprint is available for download as a PDF.

# Figures

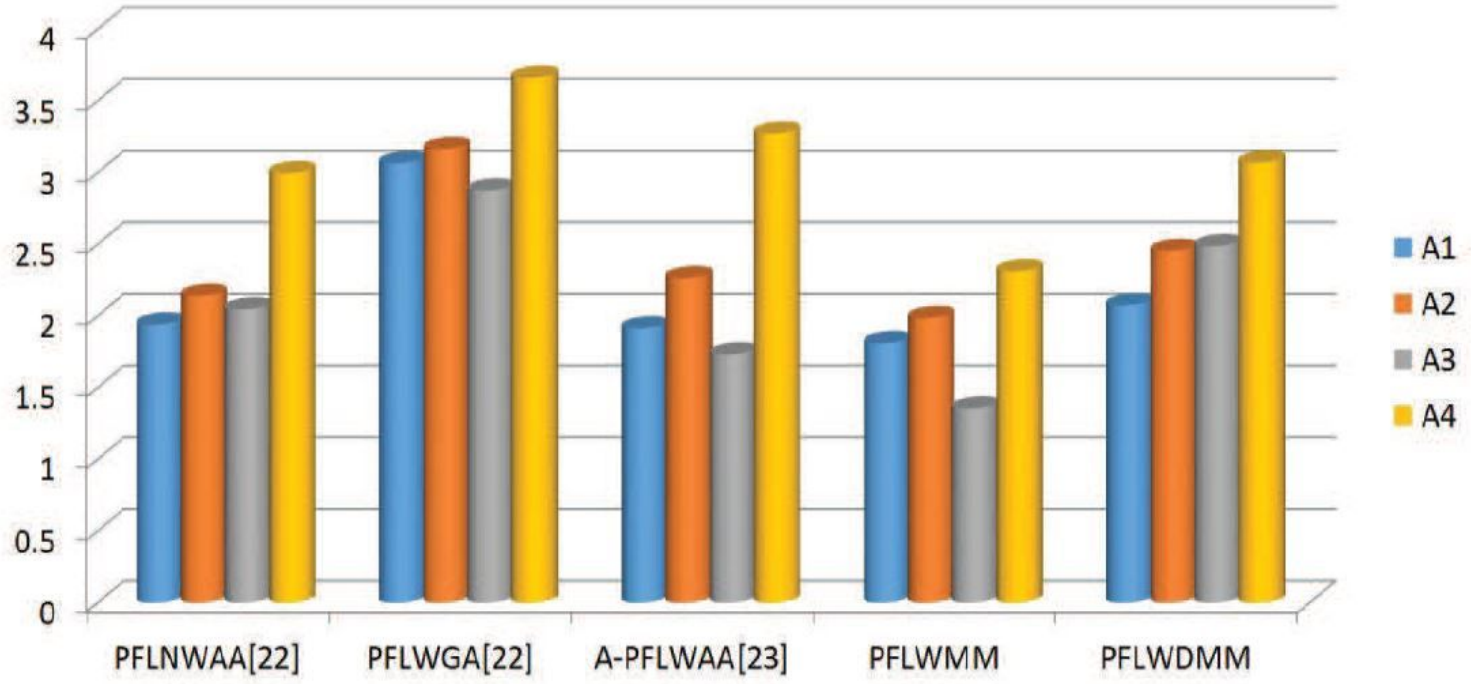
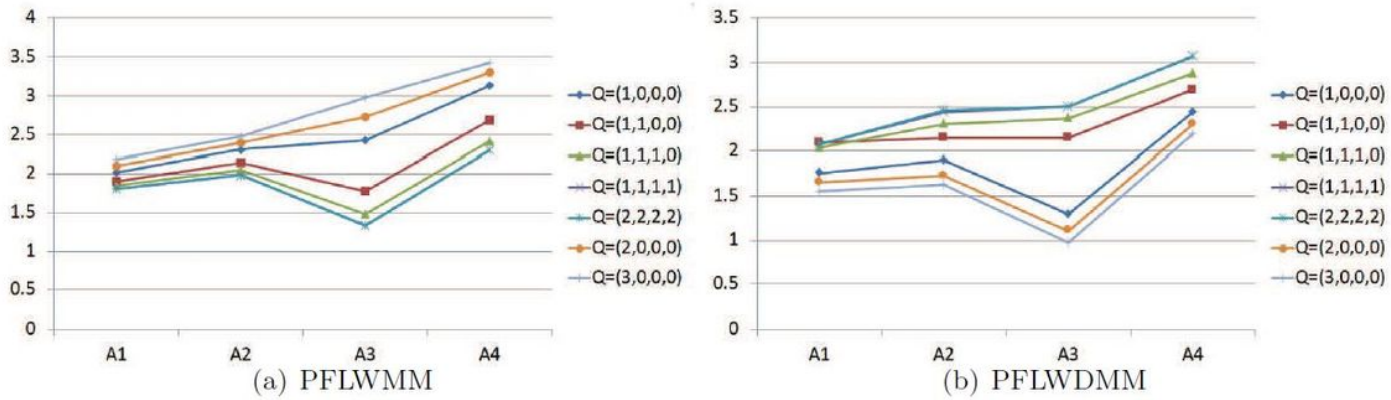



**Figure 1**




## Figure 2

Ranking results by utilizing different values of Q in the proposed operators