Chapter 6
Semiring of Generalized Interval–Valued Intuitionistic Fuzzy Matrices

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ABSTRACT

In this paper, the concept of semiring of generalized interval-valued intuitionistic fuzzy matrices are introduced and have shown that the set of GIVIFMs forms a distributive lattice. Also, prove that the GIVIFMs form an generalized interval valued intuitionistic fuzzy algebra and vector space over [0, 1]. Some properties of GIVIFMs are studied using the definition of comparability of GIVIFMs.

INTRODUCTION


The structure of this chapter is organized as follows. At first, contains the preliminaries and some backgrounds in this study. Then, define distributive lattice over GIVIFMs and some results are given. After that some algebric structure of GIVIFMs are defined followed by some properties of GIVIFMs.

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PRELIMINARIES

Here some preliminaries, definitions of IVIFMs and GIVIFMs are recalled and presented some operations on GIVIFMs.

Definition 1

A semiring is an algebraic structure \((R,+,.)\) such that \((R,+\) is an abelian monoid (identity 0), \((R,.)\) is a monoid (identity 1). distributes over + from either side, \(r0=0r=0\) for all \(r\in R\) and \(0\neq 1\).

Definition 2

A fuzzy matrix (FM) of order \(m\times n\) is defined as \( A = \left\langle a_{ij}, a_{ij}' \right\rangle \) where \( a_{ij} \) is the membership value of the \( ij \)-element in \( A \). Let \( F_{m\times n} \) denote the set of all fuzzy matrices of order \( m\times n \). If \( m=n \), in short, we write \( F_n \), the set of all square matrices of order \( n \).

Definition 3

An intuitionistic fuzzy matrix (IFM) of order \( m\times n \) is defined as \( A = \left\langle a_{ij}, a_{ij}' \right\rangle \) where \( a_{ij} \) and \( a_{ij}' \) are the membership value and non membership value of the \( ij \)-element in \( A \) satisfying the condition \( 0 < 1 \leq a_{ij} + a_{ij}' < 1 \) for all \( i,j \).

Definition 4

An interval-valued intuitionistic fuzzy matrix (IVIFM) of order \( m\times n \) is denoted by \( A \) and is defined by

\[
A = \left\langle \left[x_{ij}, [M_{A_{ij}}(x), N_{A_{ij}}(x)] \right] \right\rangle
\]

where

\[
M_{A_{ij}}(x) : x \rightarrow [I] \text{ and } N_{A_{ij}}(x) : x \rightarrow [I],
\]

\([I]\) be the set of all closed sub interval of \([0,1]\). The interval

\[
M_{A_{ij}} = [M_{A_{ij}}, M_{A_{ij}}']
\]

\(M_{A_{ij}} \) and \( M_{A_{ij}}' \)

are lower and upper membership value respectively of the \( ij \)th element of IVIFMA. Similarly the interval
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