

Chapter 2

Adjustable Multigranulation SVN Probabilistic Rough Sets With Application to Teamwork Evaluations

Wenhui Bai

Shanxi University, China

Juanjuan Ding

Shanxi University, China

Chao Zhang


 <https://orcid.org/0000-0001-6248-9962>

Shanxi University, China

Yanhui Zhai

Shanxi University, China

Deyu Li

 <https://orcid.org/0000-0003-2489-9404>

Shanxi University, China

Said Broumi

 <https://orcid.org/0000-0002-1334-5759>

*Laboratory of Information Processing, Faculty
of Science Ben M'Sik, University Hassan II,
Casablanca, Morocco & Regional Center for the
Professions of Education and Training (CRMEF),
Morocco*

ABSTRACT

In the community of generalized fuzzy sets, the notion of single-valued neutrosophic sets (SVNSs) enables individuals to express their preferences by processing the indeterminate information, thus it plays a significant role in intelligent information processing. For addressing teamwork assessment tasks in the education setting, this chapter concentrates on exploring a viable teamwork assessment method via multi-attribute group decision-making (MAGDM). After revisiting basic notions of SVNSs and multigranulation probabilistic rough sets (MG PRSs), this chapter first puts forth a new model named adjustable multigranulation (MG) single-valued neutrosophic (SVN) probabilistic rough sets (PRSs), which integrates the advantages of SVNSs in information descriptions and multi-granularity computing in information fusion. Then in the setting of teamwork assessments, this chapter constructs a valid MAGDM method by means of adjustable MG SVN PRSs and decision-theoretic rough sets (DTRSs). Finally, a case study analysis is conducted by virtue of a UCI data set in the education setting.

DOI: 10.4018/978-1-6684-7836-3.ch002

INTRODUCTION

Problem Background

Education refers to a special activity of training human beings, which has existed since the beginning of human societies, and its function is to transmit the experience of social production and life, to promote the development of human beings, and to develop the human resources needed by society in accordance with the requirements of diverse societies. Modern education owns the features of lifelong, democratization, diversification and modernization. Moreover, education is the basis of a country's personnel fostering systems, which has a long academic tradition. The value of education, both for individuals and for society, is unlimited, and it can give generations of children the warmth of education, the enlightenment of humanity, the confidence of growth, and even a change of life. Additionally, teamwork is the ability of team members to work together for accomplishing something in a cooperative manner and mobilizing all the resources and talents of team members to better accomplish their tasks. Teamwork is a fundamental and essential skill in engineering disciplines, especially for software engineering professionals. Thus, the teamwork assessment is a vital part of various educational processes and needs to be studied in depth in this day and age.

A Brief Review of SVNSs

In order to express uncertain information in real life, Zadeh (Zadeh, 1965) initiated the notion of fuzzy sets in 1965, which extended the value of feature functions in terms of information descriptions from 0 or 1 to an interval of 0 to 1. Classic fuzzy sets can solve the problem that the traditional and precise mathematical theory cannot depict the "not this is the other" phenomenon. It also eliminates the imprecision of computers that cannot handle fuzzy information and creates a research field of fuzzy mathematics. Afterwards, Bellman and Zadeh (Bellman & Zadeh, 1970) combined the fuzzy set theory with the decision-making theory to form a field of fuzzy decision-making. Then, lots of scholars have promoted many types of generalized fuzzy sets based on classic fuzzy sets, such as intuitionistic fuzzy sets (IFSs) (Atanassov, 1986), interval-valued fuzzy sets (IVFSs) (Turksen, 1986), hesitant fuzzy sets (HFSs) (Torra, 2010), Pythagorean fuzzy sets (PFSs) (Peng & Selvachandran, 2019), etc.

Smarandache (Smarandache, 1999) pioneered the theory of neutrosophy, which served as a branch of philosophy and studied the origins, nature, and scope of neutralities, as well as their interactions with different ideational spectra. What it considers are proposition, theory, event, concept, or entity and some corresponding relationships. Additionally, the neutrosophy has been combined with various theories to develop new theories and applications, such as neutrosophic, neutrophilic probability, neutrosophic set, and neutrosophic statistics. The neutrosophic set is an extension of the combination of the neutrosophy with the set theory, the elements of this set are represented as $x(T, I, F)$, where t indicates the truth in the set, i indicates the indetermination in the set, and f indicates the falsity in the set, where t , i , and f are real numbers taken from the sets T , I , and F with no restriction on T , I , F , nor on their sum $n=t+i+f$.

In 2005, Wang and Smarandache (H. Wang et al., 2010) expanded the theory of neutrosophy according to the characteristics of fuzzy information in reality, and initiated the notion of SVNSs, and they also gave several basic operational laws. As an extension of fuzzy sets, SVNSs add independent uncertainties based on IFSs, which are more in line with human thinking habits. SVNSs can better describe the information with inaccuracy and inconsistency existed in the objective world with higher practicality,

20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/adjustable-multigranulation-svn-probabilistic-rough-sets-with-application-to-teamwork-evaluations/324790

Related Content

An Intuitionistic Fuzzy Entropy Measure and Its Application in Multi-Attribute Decision Making With Incomplete Weights Information

Reeta Bhardwaj, Amit Sharma, Naveen Maniand Kamal Kumar (2022). *Handbook of Research on Advances and Applications of Fuzzy Sets and Logic* (pp. 324-338).

www.irma-international.org/chapter/an-intuitionistic-fuzzy-entropy-measure-and-its-application-in-multi-attribute-decision-making-with-incomplete-weights-information/299647

A New Clustering Method with Fuzzy Approach Based on Takagi-Sugeno Model in Queuing Systems

Farzaneh Gholami Zanjanbarand Inci Sentarli (2013). *International Journal of Fuzzy System Applications* (pp. 32-54).

www.irma-international.org/article/new-clustering-method-fuzzy-approach/77861

Supply Chain Model with Two Storage Facility for Stock Dependent Demand Incorporating Learning and Inflationary Effect under Crisp and Fuzzy Environment

Chaman Singhand Shiv R. Singh (2017). *International Journal of Fuzzy System Applications* (pp. 82-109).

www.irma-international.org/article/supply-chain-model-with-two-storage-facility-for-stock-dependent-demand-incorporating-learning-and-inflationary-effect-under-crisp-and-fuzzy-environment/179322

Blockchain Concepts on Computer Vision With Human-Computer Interaction and Secured Data-Sharing Framework

Priyadharshini K.and R. Aroul Canessane (2022). *International Journal of Fuzzy System Applications* (pp. 1-21).

www.irma-international.org/article/blockchain-concepts-on-computer-vision-with-human-computer-interaction-and-secured-data-sharing-framework/312240

Application of Neutrosophic Sets to Assessment of Student Learning Skills

Michael G. Voskoglou (2023). *Handbook of Research on the Applications of Neutrosophic Sets Theory and Their Extensions in Education* (pp. 89-110).

www.irma-international.org/chapter/application-of-neutrosophic-sets-to-assessment-of-student-learning-skills/324793