

Contents

Chapter 1	Introduction, Literature Review and Organization	1
1.1	Introduction	1
1.1.1	Game problems and its different types	2
1.1.2	Several uncertain environments	3
1.1.3	Solution methodologies	5
1.2	Literature Review	6
1.3	Organization of the thesis	10
1.3.1	Motivation	10
1.3.2	Objective	12
1.3.3	Organization of the thesis	12
Chapter 2	Two-person zero-sum game in triangular intuitionistic fuzzy environment	15
2.1	Motivation	15
2.2	Introduction	15
2.3	Basic Concepts	16
2.4	Mathematical Model	17
2.4.1	Robust ranking technique	17
2.4.2	Two-person zero-sum game in crisp environment	18
2.4.3	Two-person zero-sum game in triangular intuitionistic fuzzy environment	18
2.4.4	Reasonable solutions and strategies	19
2.4.5	Algorithm for solving TIFMG	21
2.5	Numerical Illustrations	21
2.5.1	Strike policy problem	21
2.5.2	Online shopping-marketing problem	23
2.6	Result and Discussion	24
2.7	Conclusion	25

Chapter 3	Two-person zero-sum game in triangular type-2 intuitionistic fuzzy environment	27
3.1	Motivation	27
3.2	Introduction	27
3.3	Basic Concepts	29
3.4	Triangular Type-2 Intuitionistic Fuzzy Number (TT2IFN)	31
3.5	Ranking Function	32
3.6	Mathematical Model	33
3.6.1	Triangular Type-2 Intuitionistic Fuzzy Matrix Game (TT2IFMG)	33
3.6.2	Pragmatic solutions and strategies	35
3.6.3	Algorithm for solving TT2IFMG	35
3.7	Numerical Illustration	35
3.7.1	Water Management Problem	36
3.8	Discussion	40
3.9	Conclusion	40
Chapter 4	Two-person zero-sum game in linguistic neutrosophic environment	43
4.1	Motivation	43
4.2	Introduction	43
4.3	Basic Concepts	44
4.4	Linguistic Neutrosophic Set	47
4.5	Mathematical Model	49
4.5.1	Matrix game in crisp environment	49
4.5.2	Matrix game in linguistic neutrosophic environment	50
4.6	Computative Example	50
4.6.1	Problem description: From medical diagnoses phenomena	51
4.6.2	Problem environment 1: linguistic single-valued neutrosophic	52
4.6.3	Solution through algorithmic steps with results	53
4.6.4	Problem environment 2: linguistic interval-valued neutrosophic	53
4.6.5	Solution through algorithmic steps with results	54
4.7	Conclusion	54
Chapter 5	Two-person zero-sum game through artificial neural network structures	57
5.1	Motivation	57
5.2	Introduction	57
5.3	Basic Concepts	58
5.4	Mathematical Model	59
5.4.1	Classical matrix game	60
5.4.2	Neural network model	61
5.4.3	Logic-gate switching circuit	62
5.4.4	Fuzzy logic-gate switching circuit oriented artificial neural network (FLGSCANN) model	63
5.4.5	ANN based fuzzy matrix game	63
5.5	Computative Example	66
5.6	Result and Discussion	69
5.7	Conclusion	69

CONTENTS

Chapter 6	Two-person non-zero-sum game in hesitant fuzzy-linguistic term set	71
6.1	Motivation	71
6.2	Introduction	71
6.3	Basic Concepts	72
6.3.1	IFS, HFS, LTS, HFLTS, HIFLTS	72
6.3.2	HIVIFLTS	74
6.4	Mathematical Model	75
6.4.1	Two-person non-zero-sum game in HIVIFLTS based environment	75
6.4.2	TOPSIS in classical environment	76
6.4.3	TOPSIS in HIVIFLTS environment	76
6.5	Prisoners' Dilemma	79
6.6	Numerical Simulation	80
6.6.1	A case study on Human-trafficking	80
6.6.2	PD via TOPSIS and the solution	82
6.7	Conclusion	84
Chapter 7	Two-person non-zero-sum game in neutrosophic environment	87
7.1	Motivation	87
7.2	Introduction	87
7.3	Basic Concepts	88
7.3.1	Single-valued triangular neutrosophic numbers	88
7.3.2	Values and Ambiguities indices for SVTNNs	91
7.4	Ranking approach on SVTNNs	92
7.5	Mathematical Model	93
7.6	Numerical Simulation	95
7.7	Conclusion	98
Chapter 8	Conclusions and Future Research Directions	101
8.1	Conclusions	101
8.2	Future research directions	102
Bibliography	105	
List of Publications	119	