

CONTENTS

FOREWORD	v
PREFACE	vii
ACKNOWLEDGMENTS	ix
1 FUZZY SUBSETS	1
1.1 Fuzzy Relations	6
1.2 Operations on Fuzzy Relations	8
1.3 Reflexivity, Symmetry and Transitivity	11
1.4 Pattern Classification Based on Fuzzy Relations	12
1.5 Advanced Topics on Fuzzy Relations	16
1.6 References	20
2 FUZZY GRAPHS	21
2.1 Paths and Connectedness	22
2.2 Clusters	24
2.3 Cluster Analysis and Modeling of Information Networks	29
2.4 Connectivity in Fuzzy Graphs	32
2.5 Application to Cluster Analysis	39
2.6 Operations on Fuzzy Graphs	44
2.7 Fuzzy Intersection Equations	52
2.8 Fuzzy Graphs in Database Theory	58
2.9 References	61
3 FUZZY TOPOLOGICAL SPACES	67
3.1 Topological Spaces	67
3.2 Metric Spaces and Normed Linear Spaces	74

3.3	Fuzzy Topological Spaces	79
3.4	Sequences of Fuzzy Subsets	81
3.5	F -Continuous Functions	82
3.6	Compact Fuzzy Spaces	84
3.7	Iterated Fuzzy Subset Systems	85
3.8	Chaotic Iterations of Fuzzy Subsets	95
3.9	Starshaped Fuzzy Subsets	99
3.10	References	102
4	FUZZY DIGITAL TOPOLOGY	115
4.1	Introduction	115
4.2	Crisp Digital Topology	115
4.3	Fuzzy Connectedness	116
4.4	Fuzzy Components	118
4.5	Fuzzy Surroundedness	123
4.6	Components, Holes, and Surroundedness	124
4.7	Convexity	127
4.8	The Sup Projection	128
4.9	The Integral Projection	128
4.10	Fuzzy Digital Convexity	131
4.11	On Connectivity Properties of Grayscale Pictures	133
4.12	References	135
5	FUZZY GEOMETRY	137
5.1	Introduction	137
5.2	The Area and Perimeter of a Fuzzy Subset	137
5.3	The Height, Width and Diameter of a Fuzzy Subset	147
5.4	Distances Between Fuzzy Subsets	152
5.5	Fuzzy Rectangles	155
5.6	A Fuzzy Medial Axis Transformation Based on Fuzzy Disks	158
5.7	Fuzzy Triangles	163
5.8	Degree of Adjacency or Surroundedness	166
5.9	Image Enhancement and Thresholding Using Fuzzy Compactness	181
5.10	Fuzzy Plane Geometry: Points and Lines	189
5.11	Fuzzy Plane Geometry: Circles and Polygons	197
5.12	Fuzzy Plane Projective Geometry	204
5.13	A Modified Hausdorff Distance Between Fuzzy Subsets	207
5.14	References	214
6	FUZZY ABSTRACT ALGEBRA	219
6.1	Crisp Algebraic Structures	219
6.2	Fuzzy Substructures of Algebraic Structures	233
6.3	Fuzzy Submonoids and Automata Theory	238
6.4	Fuzzy Subgroups, Pattern Recognition and Coding Theory	240

6.5	Free Fuzzy Monoids and Coding Theory	245
6.6	Formal Power Series, Regular Fuzzy Languages, and Fuzzy Automata	252
6.7	Nonlinear Systems of Equations of Fuzzy Singletons	266
6.8	Localized Fuzzy Subrings	272
6.9	Local Examination of Fuzzy Intersection Equations	276
6.10	More on Coding Theory	281
6.11	Other Applications	286
6.12	References	287
LIST OF FIGURES		291
LIST OF TABLES		293
LIST OF SYMBOLS		295
INDEX		303



<http://www.springer.com/978-3-7908-1420-0>

Fuzzy Mathematics

An Introduction for Engineers and Scientists

Moderson, J.N.; Nair, P.S.

2001, XIII, 314 p., Hardcover

ISBN: 978-3-7908-1420-0

A product of Physica-Verlag Heidelberg