

# Contents

<b>1</b>	<b>Introduction</b>	1
1.1	Brain Signals Processing (EEG)	1
1.2	Research Background	2
1.3	The Necessity for Automated Classification	5
1.4	EEG Artifacts and Their Prevention	5
1.5	EEG Classification Methods (Literature Survey)	7
1.6	Key Problems in EEG Classification Methods	8
1.7	A New Framework for Handling Uncertainty and—Artefacts in EEG Classification	9
	References	11
<b>2</b>	<b>Analysis of Electroencephalogram (EEG) Using ANN</b>	13
2.1	Introduction	13
2.2	Proposed System and Specification	14
2.2.1	Digital Signal Transformation and Denoising	14
2.2.2	Data Hiding and Retrieval	14
2.2.3	Signal Compression	16
2.2.4	Recognition of Brain Signals Using Neural Network	18
2.3	Literature Review	19
2.3.1	History	19
2.3.2	Artificial Neural Network	22
2.3.3	Neural Network Software	23
2.3.4	Current Research	25
2.4	System Architecture	26
2.5	The Inspiration	27
2.6	Problem Description	27

2.7	System Implementation . . . . .	28
2.7.1	Using Back Propagation Network . . . . .	28
2.7.2	The Pre-processing . . . . .	29
2.8	Summary . . . . .	30
	References . . . . .	31
<b>3</b>	<b>Classification and Analysis of EEG Using SVM and MRE . . . . .</b>	<b>33</b>
3.1	Introduction . . . . .	33
3.2	Resources and Techniques . . . . .	34
3.2.1	Attainment of EEG Data . . . . .	34
3.2.2	Fuzzy System as a Pre Classifier . . . . .	35
3.2.3	Fuzzy Membership Functions . . . . .	36
3.2.4	Fuzzy Rule Set . . . . .	36
3.2.5	Estimation of Risk Level in Fuzzy Outputs . . . . .	37
3.2.6	Binary Representation of Risk Level Patterns . . . . .	38
3.2.7	Support Vector Machine as Post Classifier . . . . .	39
3.3	Support Vector Mechanism for Optimization of Fuzzy Outputs . . . . .	41
3.3.1	Minimum Relative Entropy (MRE) for Optimization of Fuzzy Outputs . . . . .	42
3.3.2	Algorithm for MRE Optimization . . . . .	43
3.4	Result and Discussion . . . . .	44
3.4.1	Performance Index . . . . .	44
3.4.2	Quality Value . . . . .	45
3.5	Summary . . . . .	45
	References . . . . .	46
<b>4</b>	<b>Intelligent Technique to Identify Epilepsy Captures Using Fuzzy System . . . . .</b>	<b>47</b>
4.1	Introduction . . . . .	47
4.2	Related Work . . . . .	48
4.2.1	Feature Extraction . . . . .	49
4.2.2	Average Amplitude . . . . .	50
4.2.3	Rhythmicity . . . . .	50
4.2.4	Entropy . . . . .	51
4.2.5	Domain Frequency . . . . .	51
4.3	Fuzzy C-Means Clustering . . . . .	52
4.4	Firefly Algorithm . . . . .	52
4.5	Fuzzy Firefly Algorithm . . . . .	55
4.6	Results and Discussion . . . . .	56
4.6.1	Sensitivity . . . . .	58
4.6.2	Motivation and Advantage of Using Fuzzy Logic . . . . .	59
4.7	Summary . . . . .	60
	References . . . . .	60

<b>5 Analysis of EEG to Find Alzheimer's Disease Using Intelligent Techniques</b>	61
5.1 Introduction	61
5.2 Techniques and Resources	63
5.2.1 Signal Attainment and EEG Database	63
5.2.2 Preprocessing	64
5.2.3 Segmentation	65
5.2.4 Feature Extraction	66
5.2.5 Neural Network Classifier	67
5.2.6 Validation	68
5.3 Summary	69
References	69