TABLE OF CONTENTS

CHAPTER NO	TITLE	PAGE NO
I	1.1 Human Activity Recognition	1
	1.2 HAR in Videos	1
	1.2.1 Basic Properties of Videos	1
	1.3 Importance of HAR	2
	1.4 Challenges in HAR	3
	1.5 Different Types of Human Activities	6
	1.6 Types of Human Action Recognition	8
	1.6.1 Vision-based HAR	8
	1.6.2 Acoustic HAR	9
	1.6.3 Interaction-Based Sensor HAR	10
	1.6.4 Action Based HAR	11
	1.6.5 Motion Based HAR	14
	1.7 Applications of Human Activity Recognition	15
	1.8 Overview of HAR Approaches	18
	1.8.1 Machine Learning Based Human Activity Recognition	18
	1.8.2 Deep Learning Based Human Activity Recognition	19
	1.9 Research Motivation	22
	1.10 Problem Statement	22
	1.11 Objective of The Thesis	23
	1.12 Contribution of The Research	23
	1.13 Scope of The Research Work	24
	1.14 Organisation of Thesis	25
	1.15 Chapter Summary	26

П	Background Study	27
	2.1 Reviews of Related Works	27
	2.1.1 Skeleton-Based Human Activity	27
	Recognition Methods	
	2.1.2 Human activity recognition using deep leaning methods	33
	2.1.3. Human Activity Recognition Using Spatio and	45
	Temporal Features	
	2.1.4. Human Activity Recognition Using Graph	51
	Convolutional Network	
	2.2 Research Gap	54
	2.3 Chapter Summary	55
III	Research Methodology	56
	3.1 Proposed Framework	59
	3.2 Dataset Description	59
	3.2.1 Penn Action Dataset	59
	3.3 Performance Metrics	60
	3.3.1 Accuracy	60
	3.3.2 Precision	61
	3.3.3 Recall	61
	3.3.4 F-Measure	61
	3.4 Chapter Summary	61
IV	Body Joints and Trajectory Guided 3D Deep Convolutional Descriptors for Human Activity Identification	62
	4.1 Proposed Methodology	63
	4.1.1 Joints and Trajectory-Pooled 3D Deep Convolutional	63
	Descriptors	
	4.1.1.1 Body Joints and Optical Flow Mapping Schemes	63

	4.1.1.2 Aggregation of Body Joint Points and Optical Flow	65
	4.1.2 Two-Stream Bilinear C3D Model Using Body Joints and Optical Flow	67
	4.2 Results and Discussions	69
	4.3 Chapter Summary	75
V	Deep Positional Attention-Based Bidirectional RNN With 3D Convolutional Video Descriptors for Action Recognition	76
	5.1 Proposed Methodology	78
	5.1.1 PABRNN Model	80
	5.1.2 Position-Aware Guidance Propagation	82
	5.1.3 Position-Aware Guidance Vector	82
	5.1.4 Positional Attention	83
	5.2 Experimental Results	85
	5.3 Chapter Summary	92
VI	Deep Positional Attention-Based Hierarchical Bidirectional RNN With CNN-Based Video Descriptors for Human Action Recognition	93
	6.1 Proposed Methodology	96
	6.1.1 Positional Attention-Based Hierarchical BRNN	97
	6.2 Experimental Results	101
	6.3 Chapter Summary	107
VII	An Enhancement of Deep Positional Attention-Based Human Action Recognition By Using Geometric Positional Features	108
	7.1 Proposed Methodology	110
	7.1.1 Representation of Primitive Geometries From	111
	Skeleton Information	
	7.1.2 Recognition of Human Activities	114

	7.2 Results And Discussion	115
	7.3 Chapter Summary	122
VIII	An Improvement of Deep Learning-Based Human Activity Recognition with the aid of Graph Convolution Features	123
	8.1 Proposed Methodology	125
	8.1.1 Graph Convolutional Network for Spatial- Temporal Feature Learning	125
	8.1.2 Search Strategy for Dynamic Graph Generation in GCN	126
	8.1.3 Effective Video Descriptor Generation and Human Action Recognition	130
	8.2 Experimental Results	130
	8.3 Chapter Summary	137
IX	Results And Discussion	138
	9.1 Summary of Result and Discussion	138
	9.2 Chapter Summary	142
X	Research Findings	143
	10.1 Conclusion	144
	10.2 Future Work	145
	References	146
	Publications	