

Murad Khan · Bilal Jan · Haleem Farman

# Deep Learning: Convergence to Big Data Analytics

 Springer

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
	Bilal Jan, Haleem Farman and Murad Khan	
1.1	Machine Learning	1
1.1.1	Supervised Learning	2
1.1.2	Unsupervised Learning	2
1.2	Deep Learning	3
1.3	Conventional Data Processing Techniques	4
1.4	Data Mining Techniques: A Big Data Analysis Approach	5
1.5	Big Data Analytics	7
1.6	Deep Learning in Big Data Analytics	10
	References	11
<b>2</b>	<b>Big Data Analytics</b>	<b>13</b>
	Bhagya Nathali Silva, Muhammad Diyan and Kijun Han	
2.1	Overview	14
2.2	Characteristics of Big Data	17
2.3	Big Data Processing	18
2.4	Data Analysis Problems in Big Data	21
2.5	Applications of Big Data	23
2.5.1	Healthcare	23
2.5.2	Manufacturing	23
2.5.3	Government	24
2.5.4	Internet of Things	24
2.6	Data Types of Big Data	24
2.7	Big Data Tools	26
2.8	Opportunities and Challenges	27
	References	29

<b>3</b>	<b>Deep Learning Methods and Applications</b> .....	31
	Jamil Ahmad, Haleem Farman and Zahoor Jan	
3.1	Background .....	32
3.2	Categorization of Deep Learning Networks .....	32
3.3	Deep Networks for Supervised Learning .....	33
3.4	Deep Networks for Unsupervised Learning .....	35
3.5	Hybrid Approach .....	36
3.6	Transfer Learning Techniques .....	36
	3.6.1 Homogenous Transfer Learning .....	37
	3.6.2 Heterogeneous Transfer Learning .....	37
3.7	Applications of Deep Learning .....	37
	3.7.1 Computer Vision .....	38
	3.7.2 Information Retrieval .....	38
	3.7.3 Natural Language Processing .....	39
	3.7.4 Multitask Learning .....	40
	References .....	41
<b>4</b>	<b>Integration of Big Data and Deep Learning</b> .....	43
	Muhammad Talha, Shaukat Ali, Sajid Shah, Fiaz Gul Khan and Javed Iqbal	
4.1	Machine Learning in Big Data Analytics .....	43
	4.1.1 Machine Learning and Big Data Applications .....	44
4.2	Efficient Deep Learning Algorithms in Big Data Analytics .....	44
4.3	From Machine to Deep Learning: A Comparative Approach .....	46
	4.3.1 Performance on Data Size .....	46
	4.3.2 Hardware Requirements .....	47
	4.3.3 Feature Selection .....	47
	4.3.4 Problem-Solving Approach .....	47
	4.3.5 Execution Time .....	47
4.4	Applications of Deep and Transfer Learning in Big Data .....	47
	4.4.1 Healthcare .....	48
	4.4.2 Finance .....	49
4.5	Deep Learning Challenges in Big Data .....	49
	4.5.1 Internet of Things (IoT) Data .....	49
	4.5.2 Enterprise Data .....	50
	4.5.3 Medical and Biomedical Data .....	50
	References .....	51
<b>5</b>	<b>Future of Big Data and Deep Learning for Wireless Body Area Networks</b> .....	53
	Fasee Ullah, Ihtesham Ul Islam, Abdul Hanan Abdullah and Atif Khan	
5.1	Introduction .....	54
5.2	Feed-Forward Network Model .....	56
	5.2.1 Deep Learning Frameworks .....	58

- 5.3 Future of Deep Learning . . . . . 59
- 5.4 Introduction to Wireless Body Area Networks . . . . . 59
- 5.5 Applications of Wireless Body Area Networks . . . . . 62
  - 5.5.1 Future Applications of Wireless Body Area Networks . . . . . 63
  - 5.5.2 Use of Biomedical Sensors in Wireless Body Area Networks . . . . . 64
- 5.6 Existing Challenges in Wireless Body Area Networks . . . . . 65
  - 5.6.1 Routing Protocols . . . . . 65
- 5.7 MAC Protocols . . . . . 67
  - 5.7.1 Superframe Structure of IEEE 802.15.4 . . . . . 67
  - 5.7.2 Superframe Structure of IEEE 802.15.6 . . . . . 69
- 5.8 Introduction to Big Data . . . . . 69
- 5.9 Applications of Big Data in WBAN . . . . . 70
  - 5.9.1 Monitoring of Vital Signs and Analysis . . . . . 71
  - 5.9.2 Early Detection of Abnormal Conditions of Patient . . . . . 71
  - 5.9.3 Daily Basis Activity Monitoring of a Patient Using BMSs . . . . . 72
- 5.10 Open Issues of WBAN . . . . . 72
  - 5.10.1 Resource-Constraint Architecture of BMS . . . . . 72
  - 5.10.2 Hotspot Paths . . . . . 72
  - 5.10.3 QoS in WBAN . . . . . 73
  - 5.10.4 Path Loss in WBAN . . . . . 73
  - 5.10.5 Data Protection in WBAN . . . . . 73
  - 5.10.6 Step-Down in Energy Consumption . . . . . 73
  - 5.10.7 Channel Access Allocation and Its Complexity . . . . . 73
  - 5.10.8 Permission- and Preemption-Based Channel Assignment . . . . . 73
- 5.11 Open Issues of Big Data . . . . . 74
  - 5.11.1 Varieties of Data . . . . . 74
  - 5.11.2 Increased Amount of Data Storage . . . . . 74
  - 5.11.3 Integration of Data from Different Sources . . . . . 74
  - 5.11.4 Allocation of Channel, Processing, and Management of Data . . . . . 74
  - 5.11.5 Cost-Effective Business Model . . . . . 74
  - 5.11.6 Delay-Aware Models for Quick Solutions . . . . . 75
  - 5.11.7 Automation in Allocation of Services . . . . . 75
- References . . . . . 75
- Index . . . . . 79**