

Advances in Intelligent Systems and Computing 1125

Vijender Kumar Solanki  
Manh Kha Hoang  
Zhonghyu (Joan) Lu  
Prasant Kumar Pattnaik *Editors*

# Intelligent Computing in Engineering

Select Proceedings of RICE 2019

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# Advances in Intelligent Systems and Computing

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Zhonghyu (Joan) Lu · Prasant Kumar Pattnaik  
Editors

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# Preface

The 4th International Conference on Research in Intelligent and Computing in Engineering, popularly known as RICE 2019, was held on August 08–09, 2019 in Hanoi University of Industry (HaUI), Hanoi, Vietnam.

The Fourth edition of RICE 2019, organized by the Electronic Engineering Faculty of the HaUI, provides an international forum which brings together the researchers as well as the industry practitioners, who are actively involved in the research in fields of intelligent computing, data science, or any other emerging trends related to the theme covered by this conference. RICE 2019 provided an opportunity to account state-of-the-art works, to exchange ideas with other researchers, and to gather knowledge on advancements in informatics and intelligent systems, technologies, and applications.

This conference has technical paper sessions, invited talks, and panels organized around the relevant theme. RICE 2019 was the event where the author had the opportunity to meet some leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science and Technology.

RICE 2019 received a huge response in terms of submission of papers across the countries. RICE 2019 received papers from various countries outside Vietnam such as India, China, Russia, Australia, New Zealand, and many more. The Organizing Committee of RICE 2019 constituted a strong international program committee for reviewing papers. A double-blind review process has been adopted. The decision system adopted by EasyChair has been employed and 118 papers have been selected after a thorough double-blind review process. The proceedings of the conference will be published as one volume in *Advances in Intelligent Systems and Computing*, Springer, indexed by ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar, and Springerlink.

We convey our sincere gratitude to the authority of Springer for providing the opportunity to publish the proceedings of RICE 2019.

To realize this conference in 2019, we really appreciate Hanoi University of Industry to host the conference and to be continuously supporting the organization team during the preparation as well as 2 days of the conference. In addition, we

would like to give a special thanks to Vintech City, a member of Vingroup, that has supported the conference as a diamond sponsor. We would also like to thank the financial support of ASIC Technologies to RICE 2019. Without their support, this conference would have not been successful as the first time being held in Vietnam.

Our sincere gratitude to all keynote address presenters, invited speakers, session chairs, and high officials in India and Vietnam for their gracious presence in the campus on the occasion.

We would like to thank the keynote speaker as Prof. Vijender Kumar Solanki, CMR Institute of Technology, Hyderabad, TS, India; Dr. Le Hoang Son, VNU, Hanoi Vietnam; Dr. Kumbesan, Australia; Dr. P K Pttanaik, KIIT Bhubaneswar, Odisha, India; Dr. Rashmi Agarwal, MRIIS, Haryana, India for giving their excellent knowledge in the conference.

We would like to thank the reviewers for completing a big reviewing task in a short span of time.

We would also like submit our sincere thanks to the program committee members such as Dr. Le Van Thai, Dr. Hoang Manh Kha, Dr. Nguyen Thi Dieu Linh, Dr. Phan Thi Thu Hang, Dr. Tong Van Luyen—Electronic Engineering Faculty of the HaUI; Prof. Tran Duc Tan—Phenikaa University, Vietnam; and Dr. Raghvendra Kumar, GIET University, Gunupur, Odisha, India for their efforts to make congress success.

Moreover, we would like to thank all the authors who submitted papers to RICE 2019 and made a high-quality technical program possible. Finally, we acknowledge the support received from the faculty members, scholars of Electronic Engineering Faculty of the HaUI, officers, staffs, and the authority of Hanoi University of Industry.

We hope that the articles will be useful for the researchers who are pursuing research in the field of computer science, information technology, and related areas. Practicing technologists would also find this volume to be a good source of reference.

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Ha Noi, Vietnam  
Huddersfield, UK  
Bhubaneswar, India

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# Contents

<b>Assessment of the Heart Disease Using Soft Computing Methodology</b> . . . . .	1
Dharmpal Singh, Sudipta Sahana, Souvik Pal, Ira Nath and Sonali Bhattacharyya	
<b>The Reasons for Rail Accident in India Using the Concept of Statistical Methods: An Analytical Approach</b> . . . . .	9
Dharmpal Singh, Sudipta Sahana, Souvik Pal, Ira Nath, Sonali Bhattacharyya and Srabanti Chakraborty	
<b>Automatic Music Genre Detection Using Artificial Neural Networks</b> . . . . .	17
Pratanu Mandal, Ira Nath, Nihal Gupta, Madhav Kumar Jha, Dev Gobind Ganguly and Souvik Pal	
<b>Role of Ad Hoc and Sensor Network for Effective Business Communication</b> . . . . .	25
Ishu Varshney and Sunny Prakash	
<b>Implementation of Integrated Security System by Using Biometric Function in ATM Machine</b> . . . . .	33
Pushpa Choudhary, Ashish Tripathi, Arun Kumar Singh and Prem Chand Vashist	
<b>DTSS and Clustering for Energy Conservation in Wireless Sensor Network</b> . . . . .	43
Arpana Mishra, Shubham Shukla, Akhilesh Kumar Singh and Anika Gupta	
<b>Load Distribution Challenges with Virtual Computing</b> . . . . .	51
Neha Tyagi, Ajay Rana and Vineet Kansal	
<b>Mobile Ad Hoc Network and Wireless Sensor Network: A Study of Recent Research Trends in Worldwide Aspects</b> . . . . .	57
Ishu Varshney	

<b>Comparative Analysis of Clustering Algorithm for Wireless Sensor Networks</b> .....	63
Smriti Sachan, Mudita Vats, Arpana Mishra and Shilpa Choudhary	
<b>Concept of Cancer Treatment by Heating Methodology of Microwave</b> .....	73
Awanish Kumar Kaushik, Smriti Sachan, Shradha Gupta and Shilpa Choudhary	
<b>Novel Approach to Detect and Extract the Contents in a Picture or Image</b> .....	81
Awanish Kumar Kaushik, Shilpa Choudhary, Shashank Awasthi and Arun Pratap Srivastava	
<b>LEACH with Pheromone Energy Efficient Routing in Wireless Sensor Network</b> .....	91
Arpana Mishra, Shilpa Choudhary, Mudita Vats and Smriti Sachan	
<b>Industrialization of IoT and Its Impact on Biomedical Life Sciences</b> .....	99
Aritra Bhuiya and Sudan Jha	
<b>Parts of Speech Tagging for Punjabi Language Using Supervised Approaches</b> .....	107
Simran Kaur Jolly and Rashmi Agrawal	
<b>Development of Decision Support System by Smart Monitoring of Micro Grid</b> .....	117
Laxmi Kant Sagar and D. Bhagwan Das	
<b>Gender Recognition from Real-Life Images</b> .....	127
Apoorva Balyan, Shivani Suman, Najme Zehra Naqvi and Khyati Ahlawat	
<b>Applications of Raspberry Pi and Arduino to Monitor Water Quality Using Fuzzy Logic</b> .....	135
Padmalaya Nayak, Chintakindi Praneeth Reddy and Devakishan Adla	
<b>Developing a Smart and Sustainable Transportation Plan for a Large-Sized City: An Approach to Smart City Modeling</b> .....	145
Sushobhan Majumdar and Bikramjit Sarkar	
<b>Improved Data Dissemination Protocol for VANET Using Whale Optimization Algorithm</b> .....	153
Bhoopendra Dwivedy and Anoop Kumar Bhola	
<b>A Novel IoT-Based Approach Towards Diabetes Prediction Using Big Data</b> .....	163
Riya Biswas, Souvik Pal, Nguyen Ha Huy Cuong and Arindam Chakrabarty	

<b>Technical Solutions to Build Technology Infrastructure for Applications in Smart Agricultural Models</b> .....	171
Nguyen Ha Huy Cuong, Souvik Pal, Sonali Bhattacharyya, Nguyen Thi Thuy Dien and Doan Van Thang	
<b>Edge Detection Through Dynamic Programming in Ultrasound Gray Scale Digital Images</b> .....	177
Anju Mishra, Ramashankar Yadav and Lalan Kumar	
<b>Impact of Heterogeneous IoT Devices for Indoor Localization Using RSSI</b> .....	187
Bhagwan Sahay Meena, Sujoy Deb and K. Hemachandran	
<b>Indoor Localization-Based Office Automation System Using IOT Devices</b> .....	199
Bhagwan Sahay Meena, Ramin Uddin Laskar and K. Hemachandran	
<b>Ensemble Based Approach for Intrusion Detection Using Extra Tree Classifier</b> .....	213
Bhoopesh Singh Bhati and C. S. Rai	
<b>Fourth Industrial Revolution: Progression, Scope and Preparedness in India—Intervention of MSMEs</b> .....	221
Arindam Chakrabarty, Tenzing Norbu and Manmohan Mall	
<b>Call Admission Control in Mobile Multimedia Network Using Grey Wolf Optimization</b> .....	229
Sanjeev Kumar and Madhu Sharma Gaur	
<b>Feature Classification and Analysis of Acute and Chronic Pancreatitis Using Supervised Machine Learning Algorithm</b> .....	241
R. Balakrishna and R. Anandan	
<b>RUDRA—A Novel Re-concurrent Unified Classifier for the Detection of Different Attacks in Wireless Sensor Networks</b> .....	251
S. Sridevi and R. Anandan	
<b>Health-Care Paradigm and Classification in IoT Ecosystem Using Big Data Analytics: An Analytical Survey</b> .....	261
Riya Biswas, Souvik Pal, Bikramjit Sarkar and Arindam Chakrabarty	
<b>Human Activity Recognition from Video Clip</b> .....	269
Rajiv Kumar, Laxmi Kant Sagar and Shashank Awasthi	
<b>A Framework for Enhancing the Security of Motorbike Riders in Real Time</b> .....	275
Yash Khandelwal, Sajid Anwar, Samarth Agarwal, Vikas Tripathi and Priyank Pandey	

<b>Fisherman Communication at Deep Sea Using Border Alert System</b> . . . . .	283
N. R. Rajalakshmi and K. Saravanan	
<b>Promoting Green Products Through E-Governance Ecosystem: An Exploratory Study</b> . . . . .	297
Arindam Chakrabarty, Mudang Tagiya and Shyamalee Sinha	
<b>Intervention of Smart Ecosystem in Indian Higher Education System: Inclusiveness, Quality and Accountability</b> . . . . .	305
Arindam Chakrabarty, Mudang Tagiya and Shyamalee Sinha	
<b>A Study of Epidemic Approach for Worm Propagation in Wireless Sensor Network</b> . . . . .	315
Shashank Awasthi, Naresh Kumar and Pramod Kumar Srivastava	
<b>Adaptive Super-Twisting Sliding Mode Controller-Based PMSM Fed Four Switch Three Phase Inverter</b> . . . . .	327
K. Balaji and R. Ashok Kumar	
<b>Design of Multiplier and Accumulator Unit for Low Power Applications</b> . . . . .	339
J. Balamurugan and M. Gnanasekaran	
<b>Design and Implementation of IoT-Based Wireless Sensors for Ecological Monitoring System</b> . . . . .	349
G. Santhosh, Basava Dhanne and G. Upender	
<b>Enhancing Security in Smart Homes-A Review</b> . . . . .	361
Bhuvana Janita, R. Jagadeesh Kannan and N. Kumaratharan	
<b>Accident Detection Using GPS Sensing with Cloud-Offloading</b> . . . . .	371
D. Srilatha, B. Papachary and N. Sai Akhila	
<b>Non-linear Correction of Transient Authentication System for Cloud Security</b> . . . . .	379
S. Shanthi and R. Jagadeesh Kannan	
<b>Automatic Nitrate Level Recognition in Agriculture Industry</b> . . . . .	387
Md. Ankushavali, G. Divya and N. sai Akhila	
<b>Edge Detection-Based Depth Analysis Using TD-WHOG Scheme</b> . . . . .	397
P. Epsiba, G. Suresh and N. Kumaratharan	
<b>Friend List-Based Reliable Routing in Autonomous Mobile Networks</b> . . . . .	409
C. Sivasankar and T. Kumanan	
<b>Construction of Domain Ontology for Traditional Ayurvedic Medicine</b> . . . . .	417
M. Gayathri and R. Jagadeesh Kannan	

**Systolic FIR Filter with Reduced Complexity SQRT CSLA Adder . . . . .** 427  
M. Gnanasekaran and J. Balamurugan

**Design of Digital FIR Filters for Low Power Applications . . . . .** 433  
Gunasekaran and G. P. Ramesh

**Reduced Frequency and Area Efficient for Streaming Applications  
Using Clock Gating and BUFGCE Technology . . . . .** 441  
N. Lavanya, B. Harikrishna and K. Kalpana

**Survey on Modular Multilevel Inverter Based on Various Switching  
Modules for Harmonic Elimination . . . . .** 451  
Varaparla Hari Babu and K. Balaji

**ANFIS-Based MPPT Control in Current-Fed Inverter for AC Load  
Applications . . . . .** 459  
Shaik Mohammad Irshad and G. P. Ramesh

**Dynamic Load Balancing Using Restoration Theory-Based Queuing  
Model for Distributed Networks . . . . .** 471  
P. Sheeba Ranjini and T. Hemamalini

**Design of Tree-Based MAC for High-Speed Applications . . . . .** 483  
Joseph Prabhakar Williams, M. Madan and Narendra Prasad

**A Survey of Workload Management Difficulties in the Public  
Cloud . . . . .** 491  
K. Baskar, G. K. D. Prasanna Venkatesan and S. Sangeetha

**A Review on Multiple Approaches to Medical Image  
Retrieval System . . . . .** 501  
Lakshmi R. Nair, Kamalraj Subramaniam  
and G. K. D. Prasannavenkatesan

**Efficient FPGA-Based Design for Detecting Cardiac Dysrhythmias . . . . .** 511  
S. Kripa and J. Jebastine

**Light Fidelity System . . . . .** 521  
N. Noor Alleema, Aadil Khatri, Ankur Gupta and Devika Senapatil

**Link Quality and Energy-Aware Metric-Based Routing Strategy  
in WSNS . . . . .** 533  
Vijayabaskar and T. Kumanan

**Genetic Algorithm-Based PCA Classification for Imbalanced  
Dataset . . . . .** 541  
Mylam Chinnappan Babu and Sangaralingam Pushpa

**Radix-2/4 FFT Multiplierless Architecture Using MBSLS in OFDM  
Applications . . . . .** 553  
G. Manikandan and M. Anand

<b>Multipath Routing Strategy for Reducing Congestion in WSNS</b> . . . . .	561
M. Jothish Kumar and Baskaran Ramachandran	
<b>Cascaded Multilevel Inverter-Fed Soft-Start Induction Motor Using DTFC</b> . . . . .	569
R. Murugesan and R. Karthikeyan	
<b>Analysis of Digital FIR Filter Using RLS and FT-RLS</b> . . . . .	579
N. C. Sendhilkumar Prasad and G. P. Ramesh	
<b>Analysis of Interline Dynamic Voltage Restoration in Transmission Line</b> . . . . .	587
M. Padmarasan and R. Samuel Rajesh Babu	
<b>Polariton Modes in Dispersive and Absorptive One-Dimensional Structured Dielectric Medium</b> . . . . .	597
N. Chandrasekar and G. P. Ramesh	
<b>QoS-Based Multi-hop Reverse Routing in WSNs</b> . . . . .	607
G. Elangovan and T. Kumanan	
<b>Mitigation of Power Quality in Wind DFIG-Fed Grid System</b> . . . . .	615
P. T. Rajan and G. P. Ramesh	
<b>Detection and Avoidance of Single and Cooperative Black Hole Attacks Using Packet Timeout Period in Mobile Ad hoc Networks</b> . . . . .	625
S. G. Rameshkumar and G. Mohan	
<b>Brain Image Classification Using Dual-Tree M-Band Wavelet Transform and Naïve Bayes Classifier</b> . . . . .	635
A. Ratna Raju, Suresh Pabboju and R. Rajeswara Rao	
<b>Comparative Analysis of Cascaded Multilevel Inverter with Switched Capacitor-Fed Single-Phase Multilevel Inverter for Improving Voltage Gain</b> . . . . .	643
Shaik Nagulmeeravali and K. Balaji	
<b>Review on Induction Motor Control Strategies with Various Converter and Inverter Topologies</b> . . . . .	653
Meera Shareef Sheik and K. Balaji	
<b>EROI Analysis of 2 KW PV System</b> . . . . .	665
Harpreet Kaur Channi and Inderpreet Kaur	
<b>Suggesting Alternate Traffic Mode and Cost Optimization on Traffic-Related Impacts Using Machine Learning Techniques</b> . . . . .	673
M. S. Manivannan, R. Kavitha, R. Srikanth and Veena Narayanan	
<b>Rare Lazy Learning Associative Classification Using Cogeneity Measure for Heart Disease Prediction</b> . . . . .	681
S. P. Siddique Ibrahim and M. Sivabalakrishnan	

**Intensify of Metrics with the Integration of Software Testing Compatibility** ..... 693  
 S. Vaithyasubramanian, P. M. S. S. Chandu and D. Saravanan

**Petri Nets for Pasting Tiles** ..... 701  
 M. I. Mary Metilda and D. Lalitha

**Ad Hoc Wireless Networks as Technology of Support for Ubiquitous Computation** ..... 709  
 Amjed Abbas Ahmed

**An Experimental Study on Optimization of a Photovoltaic Solar Pumping System Used for Solar Domestic Hot Water System Under Iraqi Climate** ..... 717  
 Mahmoud Maustafa Mahdi and A. Gaddoa

**A Novel Technique for Web Pages Clustering Using LSA and K-Medoids Algorithm** ..... 727  
 Nora Omran Alkaam, Noor A. Neamah and Faris Sahib Al-Rammahi

**Enhancement in S-Box of BRADG Algorithm** ..... 737  
 Ahmed J. Oabid, Salah AlBermany and Nora Omran Alkaam

**A SECURITY Sketch-Based Image Retrieval System Using Multi-edge Detection and Scale Inverant Feature Transform Algorithm** ..... 747  
 Alaa Qasim Rahima and Hiba A. Traish

**Smart Photo Clicker** ..... 755  
 N. Noor Alleema, Ruchika Prasad, Akkudalai Priyanka and Archit Bhandari

**Design of VLSI-Architecture for 128 Bit Inexact Speculative** ..... 767  
 Peddi Ramesh, M. Sreevani and G. Upender

**Investigation of Solar Based SL-QZSI Fed Sensorless Control of BLDC Motor** ..... 779  
 A. Sundaram and G. P. Ramesh

**Design of Hybrid Electrical Tricycle for Physically Challenged Person** ..... 789  
 S. Swapna and K. Siddappa Naidu

**Intravascular Ultrasound Image Classification Using Wavelet Energy Features and Random Forest Classifier** ..... 803  
 A. Swarnalatha and M. Manikandan

<b>Adaptive Thresholding Skin Lesion Segmentation with Gabor Filters and Principal Component Analysis</b> . . . . .	811
Dang N. H. Thanh, Nguyen Ngoc Hien, V. B. Surya Prasath, Uğur Erkan and Aditya Khamparia	
<b>Simple Model for Thermal Denaturing of Proteins Absorbed to Metallic Nanoparticles</b> . . . . .	821
Luong Thi Theu, Van Dung Nguyen, Pham Thi Thu Ha and Tran Quang Huy	
<b>Trajectory Tracking Sliding Mode Control for Cart and Pole System</b> . . . . .	829
Gia-Bao Hong, Mircea Nitulescu, Ionel Cristian Vladu, Minh-Tam Nguyen, Thi-Thanh-Hoang Le, Phong-Luu Nguyen, Thanh-Liem Truong, Van-Dong-Hai Nguyen and Xuan-Dung Huynh	
<b>Online Buying Behaviors on E-Retailer Websites in Vietnam: The Differences in the Initial Purchase and Repurchase</b> . . . . .	845
Nguyen Binh Minh Le and Thi Phuong Thao Hoang	
<b>Combination of Artificial Intelligence and Continuous Wave Radar Sensor in Diagnosing Breathing Disorder</b> . . . . .	853
Nguyen Thi Phuoc Van, Liqiong Tang, Syed Faraz Hasan, Subhas Mukhopadhyay and Nguyen Duc Minh	
<b>An Adaptive Local Thresholding Roads Segmentation Method for Satellite Aerial Images with Normalized HSV and Lab Color Models</b> . . . . .	865
Le Thi Thanh and Dang N. H. Thanh	
<b>Flexible Development for Embedded System Software</b> . . . . .	873
Phan Duy Hung, Le Hoang Nam and Hoang Van Thang	
<b>Trajectory Tracking Pid-Sliding Mode Control for Two-Wheeled Self-Balancing Robot</b> . . . . .	885
Anh Khoa Vo, Hong Thang Nguyen, Van Dong Hai Nguyen, Minh Tam Nguyen and Thi Thanh Hoang Le	
<b>Evaluating Blockchain IoT Frameworks</b> . . . . .	899
Le Trung Kien, Phan Duy Hung and Kieu Ha My	
<b>An Improved Approach for Cluster Newton Method in Parameter Identification for Pharmacokinetics</b> . . . . .	913
Thang Van Nguyen, Tran Quang Huy, Van Dung Nguyen, Nguyen Thi Thu and Tran Duc Tan	

**An Efficient Procedure of Multi-frequency Use for Image Reconstruction in Ultrasound Tomography** ..... 921  
 Tran Quang Huy, Van Dung Nguyen, Chu Thi Phuong Dung, Bui Trung Ninh and Tran Duc Tan

**Intelligent Rule-Based Support Model Using Log Files in Big Data for Optimized Service Call Center Schedule**..... 931  
 Hai Van Pham and Long Kim Cu

**Hybrid Random Under-Sampling Approach in MRI Compressed Sensing** ..... 943  
 Thang Van Nguyen, Tran Quang Huy, Van Dung Nguyen, Nguyen Thi Thu, Gian Quoc Anh and Tran Duc Tan

**Dynamics of Self-guided Rocket Control with the Optimal Angle Coordinate System Combined with Measuring Target Parameters for Frequency Modulated Continuous Wave Radar** ..... 951  
 Le Hai Ha, Nguyen Quang Vinh and Nguyen Tang Cuong

**An Approach of Utilizing Binary Bat Algorithm for Pattern Nulling** ..... 963  
 V. L. Tong, Manh Kha Hoang, T. H. Duong, T. Q. T. Pham, V. T. Nguyen and V. B. G. Truong

**An Application of WSN in Smart Aquaculture Farming** ..... 975  
 Thong Nguyen Huy, Khanh Nguyen Tuan and Thanh Tran Trung

**A Newly Developed Approach for Transmit Beamforming in Multicast Transmission** ..... 985  
 T. D. Thong, D. D. Vien and L. T. Hai

**Post-quantum Commutative Deniable Encryption Algorithm**..... 993  
 Nguyen Hieu Minh, Dmitriy Nikolaevich Moldovyan, Nikolay Andreevich Moldovyan, Quang Minh Le, Sy Tan Ho, Long Giang Nguyen, Hai Vinh Nguyen and Cong Manh Tran

**Indoor Positioning Using BLE iBeacon, Smartphone Sensors, and Distance-Based Position Correction Algorithm** ..... 1007  
 Anh Vu-Tuan Trinh, Thai-Mai Thi Dinh, Quoc-Tuan Nguyen and Kumbesan Sandrasegaran

**Assessing the Transient Structure with Respect to the Voltage Stability in Large Power System** ..... 1017  
 Luu Huu Vinh Quang

**Cellular Automata Approach for Optimizing Radio Coverage: A Case Study on Archipelago Surveillance**..... 1027  
 Tuyen Phong Truong, Toan Hai Le and Binh Thai Duong

<b>Smart Bicycle: IoT-Based Transportation Service</b> .....	1037
Vikram Puri, Sandeep Singh Jagdev, Jolanda G. Tromp and Chung Van Le	
<b>LNA Nonlinear Distortion Impacts in Multichannel Direct RF Digitization Receivers and Linearization Techniques</b> .....	1045
Ngoc-Anh Vu, Thi-Hong-Tham Tran, Quang-Kien Trinh and Hai-Nam Le	
<b>Modified Biological Model of Meat in the Frequency Range from 50 Hz to 1 MHz</b> .....	1055
Kien Nguyen Phan, Vu Anh Tran and Trung Thanh Dang	
<b>A Research on Clustering and Identifying Automated Communication in the HTTP Environment</b> .....	1069
Manh Cong Tran, Nguyen Quang Thi, Nguyen The Tien, Nguyen Xuan Phuc and Nguyen Hieu Minh	
<b>Sequential All-Digital Background Calibration for Channel Mismatches in Time-Interleaved ADC</b> .....	1081
Van-Thanh Ta and Van-Phuc Hoang	
<b>Comparison BICM-ID to Turbo Code in Wide Band Communication Systems in the Future</b> .....	1091
Do Cong Hung, Nguyen Van Nam and Tran Van Dinh	
<b>A Design of a Vestibular Disorder Evaluation System</b> .....	1105
Hoang Quang Huy, Vu Anh Tran, Nguyen Thu Phuong, Nguyen Khai Hung, Do Dong Son, Dang Thu Huong and Bui Van Dinh	
<b>About Model Separation Techniques and Control Problems of Wheeled Mobile Robots</b> .....	1119
Dao Phuong Nam, Nguyen Hoang Ha, Vu Anh Tran, Do Duy Khanh, Nguyen Dinh Khue and Dang Van Trong	
<b>Fuzzy Supply Chain Performance Measurement Model Based on SCOR 12.0</b> .....	1129
Debasish Majumder, Rupak Bhattacharjee and Mrinmoy Dam	
<b>Lightweight Convolution Neural Network Based on Feature Concatenate for Facial Expression Recognition</b> .....	1141
Xiaohong Cai, Zheng Yan, Fang Duan, Di Hu and Jiaming Zhang	
<b>Design and Issues for Recognizing Network Attack Intention</b> .....	1149
Anchit Bijalwan and Satenaw Sando	
<b>Web-Based Learning: A Strategy of Teaching Gender Violence</b> .....	1157
Jyotirmayee Ojha and Deepanjali Mishra	
<b>A Deep Neural Network Approach to Predict the Wine Taste Preferences</b> .....	1165
Sachin Kumar, Yana Kraeva, Radoslava Kraveva and Mikhail Zymbler	

**A Global Distributed Trust Management Framework** ..... 1175  
Son Doan Trung

**Single-Phase Smart Energy Meter—IoT Based on Manage Household Electricity Consumption Service** ..... 1185  
Thi Dieu Linh Nguyen, Ngoc Duc Tran and Thi Hien Tran

**Survey on Machine Learning-Based Clustering Algorithms for IoT Data Cluster Analysis** ..... 1195  
Sivadi Balakrishna, Vijender Kumar Solanki, Raghvendra Kumar and M. Thirumaran

# Health-Care Paradigm and Classification in IoT Ecosystem Using Big Data Analytics: An Analytical Survey



Riya Biswas, Souvik Pal, Bikramjit Sarkar and Arindam Chakrabarty

**Abstract** The Indian healthcare system is in a dilapidated state. Healthcare is important to society because people get ill. Healthcare is defined as the diagnosis, treatment, prevention and management of disease, illness and preservation of physical and mental well-being in humans. In our paper we have done healthcare surveys to analyze the aspects. In this paper some aspects of IoT healthcare and big data analytics are discussed. Big data can be used for better health planning. Its methodology can be used for healthcare data analytics which helps in better decision making. IoT is the fast developing wireless and web technologies sensors are used to predict the disease supported on IoT are used to develop the healthcare sector. Hence it is assertive that we do, various classifications in IOT are discussed. Hence it is assertive that we do initial surveys on the concept of Big Data, on Healthcare aspects and IoT ecosystem as how we can manage to handle large data files.

**Keywords** Big data · IoT · Healthcare device · IoT ecosystems

## 1 Introduction

Cumbrous amount of structured and unstructured data it is used to describe by Big data which is a buzzword. Some characteristics of Big data [1, 2]. As healthcare sector is expanding extremely. The volume of produced data is rapidly expanding every year

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due to existence of unique technologies, appliance and transmission [3]. In the current analysis of smart phones and wearable devices, endless figure of health data folder of patient from various challenges continue featured by healthcare industry [4]. Mostly complication arise where system proceed through divergent data sets [5, 6]. Various aspects of IoT is being discussed in this paper i.e Cancer which is a unchecked expansion unusual unit in any place in a body. Heart disease which is a dominating to conditions to that action area that influenced our heart and affect diminish or clog blood vessels. HIV/AIDS is a germ that mark and alter exempt system. Asthma is one of the most common chronic diseases that has a intelligent impact on people's well-being and in our society. Diabetes is a scheme of metabolic diseases consist of high blood sugar levels concluded lengthy season. For tracking the disease IoT are implemented. IOT basically a model for interconnecting sensor which track, sensing, process and diagnosis [7]. IOT basically composite of physical objects and domain where enclosed device content across the internet [8, 9]. IoT assist self management of disease. Over internet areas like health, Logistics, industry, security, agriculture and environment etc are basically empowered by the IOT appliances [10].

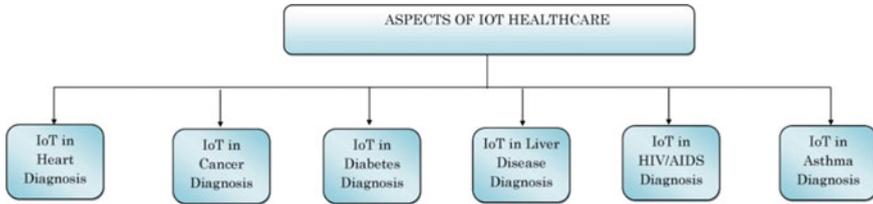
In this paper, we are going to discuss literature survey and classification in the Sect. 2. Section 3 deals with the analytical survey, table and policy design

### ***1.1 Motivation***

Big data is not only data it has turn into a entire subject, which involves different device, approach and scheme. Big data is transformative attempt in day-day-life. As in present day there is immense bulk of data, examining these acceptable sets which encompass of structure and unstructured data of various type and size; big data analytics grant the user to evaluate the impractical data to generate a faster and superior judgment. It is establish that big data is calculated to expanding rapidly in healthcare than in other sectors like manufacturing, financial services or media. Big Data and Analytics as with the Internet of Things (IoT). The term big data is one of burning technology. The big data analytics in healthcare covers assimilation and investigation of huge amount of data of complicated heterogeneous data. since Big Data can be advantage to consider user data and the prescribed assistance. It will trying to design program that will allow health care to reach those area where access to hospital was somewhat limited. IoT refers to the computerized intelligent curb and direction of connected associated devices over boundless regions via sensors and other computing capacity.

## **2 Classification and Analytical Survey**

In this section, we will discuss the IoT-based healthcare paradigm and its classification. We have also discussed the analytical survey in this related field.



**Fig. 1** Classification of IoT aspects

Figure 1 describes the different aspects of IoT-based healthcare. Chavan et al. [9] discussed for creating, acquiring, comparing some technologies like Hadoop, HDFS, Map Reduce, Pig, Hive, HBase are used here. Khan et al. [11] It describes proposed data life cycle which utilize the technologies and nomenclature of Big data management, investigating and scarceness. Nizam et al. [12] discussed that Big data is a type of dataset which is very massive and complicated that get difficultly to computing them exploiting traditional data processing applications. Chen et al. [13] discussed Big data then study about the connected technologies i.e. cloud computing, Internet Of Things, data centers and Hadoop. Archana et al. [14] deliver about the perception of how we expose newly expose surplus. Prasad et al. [15] author discussed that diabetes is one of the leading non-communicable disease. This system will prophesy exploring algorithm in Hadoop/Map Reduce environment. Huzooree et al. [16] author explains that Diabetes Mellitus (DM) is one of the starring health hindrance about the world initiating national economical concern. King et al. [17] author discussed that the asthma is characterized by hyper-responsiveness and can be avert by convenient benefit of remedial assistant to conduct asthma charge. Alpert et al. [18] author discussed that the heart failure is an developing public health complication with huge morbidity and probity. Stewart et al. [19] author describes the cardiovascular disease is a compelling and constantly-developing complication. Simon et al. [20] author describes that the HIV-1 pandemic is a complex blend of distinct contiguous. This paper brings on epidemiology. Bhatti et al. [21] author describes that the exploration of the human immunodeficiency virus (HIV) as the original organism of captured immunodeficiency disorder (AIDS). Constatine et al. [10] the author described that breast cancer is one of the biggest fatal disease of world. This paper proposed machine learning algorithm that for Big data analysis leading of an map reduce and mahout. Priya et al. [22] author describes that in first phase, min max normalization algorithm is enforced. Second phase by need of pso character choice. In fourth phase the efficiency will be determined accepting root men square value. Nahar et al. [23] initial forecast of liver disease is very crucial to deliver life and holding appropriate step to curb the disease. Shandilya et al. [24] in the current age automation medical field has develop into one of the favored affair of researcher and cancer. This paper generate survey of such current research study that cause usage of online and offline data for cancer classification. Alharam et al. [25] author describes. The main aim of this paper is for conserving healthcare industry from attack of cyber. Kumar et al. [26] author describes that traditional health center based

approach healthcare is identified with the arrival of large precision sensors and IOT. Kumbi et al. [27] author describes that the IOT is the leading network infrastructure of shipment of connectivity, transportation Technology which is proposed healthcare by the IOT.

### 3 Analysis of IoT Devices for Healthcare

See Table 1.

### 4 Policy Design and Constraints in Implementing in India

India seriously needs for reforms in their policy mix particularly in the field of health sector. The world is preparing them to welcome and grab the opportunity matrix that is emerging through the incorporation of 4th Industrial revolution. This is the high time to prepare for optimal participation of Indian firms. The following policy interventions may be exercised.

- (i) The 4th Industrial revolution has brought gigantic opportunities in the field of IoT, RFID led ecosystem primarily in the domain of health care sector. The larger enterprises should concentrate in the new business domain as the potential market opportunities are increasing day by day. The big firms or the consortium of large firms may invest on R & D in collaboration with the premier research organizations of the country. The govt. should encourage this mission by offering some lucrative package like tax holiday or relief for the firm for next three years. The firms may be incentivized by promoting SEZ or providing subsidy.
- (ii) The Indian MSMEs must initiate to this call of the hour. The firms may introduce their activities in the healthcare domain. As of now, there are various attempts are made to develop innovative branch of research augmenting various forms of technology with the healthcare domain. The branch of biomedical engineering, nano technology and electronic devices is being frequently used in the modern health services. The MSMEs can identify a niche market specializing any of the innovative techno-oriented direction and cutting-edge research which can be converged in modern medical system.
- (iii) The IoT based infrastructure can be conjugated with creating healthcare alarming devices. The psycho social behavioral pattern of a set of patients may be studied and the common patterns may be digitally incepted in the IoT led instruments in the line of censory device like e-nose, RFID sensors for detecting aroma or pigments and even the unnatural body movements to detect the cases that comes under broader domain of ergonomics.

**Table 1** Features and benefits of IoT devices For healthcare

Sl. No.	Disease	IoT devices	Features of IoT device	Benefits
1	Cancer	1. Electronic-nose 2. Biosensor	1. Smart device, authentic, flexibility, quality control 2. Quick, authenticate detection, decent, observing of angiogenesis, cancer metastasis	1. The give off breath of patients with lung cancer characteristics that can be with a computerized nose 2. Biosensors can catch whether a tumor is exist, whether it is favorable or cancerous
2	Heart disease	1. Smartphone 2. Heart beat sensor	1. Rapid analysis, flat cost, familiar 2. Low-cost	1. The sensor associate to a module in the smart phone over the audio jack 2. Heart attack disclosure using Heart Beat Sensor effort on Photoplethysmography (PPG) art.
3	Diabetes	1. Insulin pump 2. Gluco track	1. Flexibility, predictable, reducing wide fluctuations in blood glucose 2. Pain free, Reading history data, user friendly, easy to read data	1. It is a small, automated device that device that bear insulin continuously all over the day 2. A glucose monitoring home device sensor is used to measure the concentration blood.
4	Liver disease	1. MRI 2. e-nose	1. Images come, approach organ morphology, physiology, functions contrast 2. Alluring, ancient and marginally faecal aroma of the emit breath	1. MRI evaluate liver function, usually expressed via the Child-Pugh score 2. e-nose could be a authentic non-invasive apparatus for characterizing CLD

(continued)

(iv) In the era of big data analytics, the predictive analogy in the healthcare sector is emergent to prevent it mammoth outcome on human civilization. The growing concerns of environmental pollution have been challenging the very existence of our civilization. The IoT based ecosystem may be applied in a less expensive manner to identify whether the region are crossing the vulnerable and critical

**Table 1** (continued)

Sl. No.	Disease	IoT devices	Features of IoT device	Benefits
5	HIV	1. Photonic crystal (PC) biosensors 2. Novel BioNanoSensor	1. Rapid, sensitive, 100% efficiency, label-free, 2. Inexpensive, portable, simple, sense gases	1. Biosensors optical detection method for bimolecular, cells, and viruses 2. BNS device that employ automation to identify the existence of the HIV
6	Asthma	1. Bracelet 2. HET wristband	1. Authentic measuring and measure 2. Controlling volatile organic compounds, circulatory humidity and temperature	1. It benefit wearers anticipate a looming asthma attack 2. It is a wearable system that could record framework to forecast asthma attacks

level of pollutants so that appropriate measures can be prescribed. The device may also identify the root causes or epicenter of such pollutants so that the multiple stakeholders can intervene and address the issue.

To implement all such modern techniques, India should progress and contribute in the age of Fourth Industrial Revolution. There are several inherent constraints for its implementation particularly in Indian context.

1. The achievement in this new era of technology needs holistic, inclusive and comprehensive growth in the field of technology, its availability, ease of accessibility, technical knowhow for its use, capacity of investment and overall dynamics of its adaptability in real life practice.
2. The IoT technology is the platform to facilitate the healthcare support but the country desperately requires a basic infrastructural facility for healthcare services. The issues of malnutrition, vaccination, basic sanitation and the most importantly the awareness of people in general etc have been creating the stumbling block to achieve success in the cause of humanity.

## 5 Conclusion

In this literature survey, big data and its various concepts are included. The words big data has been coined to depict this newness. This paper also defines the characteristics of big data. With the advance of big data, we could answer questions that were beyond research in the past, extract knowledge and insight from data. it is understood that

every big data platform has its individual focus. Big data analytics in healthcare is germinating into a promising field for affording acumen from very large data sets and enhancing conclusion while compressing amount. Big Data today carry a lot of promise for the healthcare sector. So, implementing healthcare analytics with expeditious organization, and evolution of big data will make rapid and exact diagnosis which will decrease blunder and bring convenient treatment. using. IoT devices to handle their health requirements. To afford relevant cure to the patient, symptoms are determined from the excessive number of data. Aspects of IoT have been presented.

IoT can detect, determine, and accessed by devices like actuators, sensors or other smart devices. In this paper a review on big data, healthcare, IoT usage in healthcare has been presented.

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