Lecture Notes in Networks and Systems 100

Rajesh Kumar Shukla ·
Jitendra Agrawal · Sanjeev Sharma ·
Narendra S. Chaudhari ·
K. K. Shukla *Editors*

Social Networking and Computational Intelligence

Proceedings of SCI-2018

Springer

Lecture Notes in Networks and Systems

Volume 100

Series Editor

Janusz Kacprzyk, Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland

Advisory Editors

Fernando Gomide, Department of Computer Engineering and Automation—DCA, School of Electrical and Computer Engineering—FEEC, University of Campinas—UNICAMP, São Paulo, Brazil
Okyay Kaynak, Department of Electrical and Electronic Engineering, Bogazici University, Istanbul, Turkey
Derong Liu, Department of Electrical and Computer Engineering, University of Illinois at Chicago, Chicago, USA; Institute of Automation, Chinese Academy of Sciences, Beijing, China
Witold Pedrycz, Department of Electrical and Computer Engineering, University of Alberta, Alberta, Canada; Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland
Marios M. Polycarpou, Department of Electrical and Computer Engineering, KIOS Research Center for Intelligent Systems and Networks, University of Cyprus, Nicosia, Cyprus
Imre J. Rudas, Óbuda University, Budapest, Hungary
Jun Wang, Department of Computer Science, City University of Hong Kong, Kowloon, Hong Kong

The series "Lecture Notes in Networks and Systems" publishes the latest developments in Networks and Systems—quickly, informally and with high quality. Original research reported in proceedings and post-proceedings represents the core of LNNS.

Volumes published in LNNS embrace all aspects and subfields of, as well as new challenges in, Networks and Systems.

The series contains proceedings and edited volumes in systems and networks, spanning the areas of Cyber-Physical Systems, Autonomous Systems, Sensor Networks, Control Systems, Energy Systems, Automotive Systems, Biological Systems, Vehicular Networking and Connected Vehicles, Aerospace Systems, Automation, Manufacturing, Smart Grids, Nonlinear Systems, Power Systems, Robotics, Social Systems, Economic Systems and other. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution and exposure which enable both a wide and rapid dissemination of research output.

The series covers the theory, applications, and perspectives on the state of the art and future developments relevant to systems and networks, decision making, control, complex processes and related areas, as embedded in the fields of interdisciplinary and applied sciences, engineering, computer science, physics, economics, social, and life sciences, as well as the paradigms and methodologies behind them.

**** Indexing: The books of this series are submitted to ISI Proceedings, SCOPUS, Google Scholar and Springerlink ****

More information about this series at http://www.springer.com/series/15179

Rajesh Kumar Shukla · Jitendra Agrawal ·
Sanjeev Sharma · Narendra S. Chaudhari ·
K. K. Shukla
Editors

Social Networking and Computational Intelligence

Proceedings of SCI-2018

Springer

Editors
Rajesh Kumar Shukla
Department of Computer Science
and Engineering
Sagar Institute of Research and Technology
Bhopal, Madhya Pradesh, India

Sanjeev Sharma
School of Information Technology
Rajiv Gandhi Technical University
(State Technological University)
Bhopal, Madhya Pradesh, India

K. K. Shukla
Department of Computer Science
and Engineering
Indian Institute of Technology BHU
Varanasi, Uttar Pradesh, India

Jitendra Agrawal
Department of Computer Science
and Engineering, University Teaching
Department
Rajiv Gandhi Technical University
(State Technological University)
Bhopal, Madhya Pradesh, India

Narendra S. Chaudhari
Department of Computer Science
and Engineering
Indian Institute of Technology Indore
Indore, Madhya Pradesh, India

Visvesvaraya National Institute
of Technology
Nagpur, Maharashtra, India

ISSN 2367-3370 ISSN 2367-3389 (electronic)
Lecture Notes in Networks and Systems
ISBN 978-981-15-2070-9 ISBN 978-981-15-2071-6 (eBook)
https://doi.org/10.1007/978-981-15-2071-6

© Springer Nature Singapore Pte Ltd. 2020
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Contents

Cloud Computing

An Efficient Honey Bee Approach for Load Adjusting in Cloud Environment 3
Sangeeta Kumari and Shailendra Singh

A Novel Approach of Task Scheduling in Cloud Computing Environment 13
Nidhi Rajak and Diwakar Shukla

Development and Design Strategies of Evidence Collection Framework in Cloud Environment 27
Yunus Khan and Sunita Varma

A Systematic Analysis of Task Scheduling Algorithms in Cloud Computing 39
Nidhi Rajak and Diwakar Shukla

A Survey on Cloud Federation Architecture and Challenges 51
Lokesh Chouhan, Pavan Bansal, Bimalkant Lauhny and Yash Chaudhary

Multi-tier Authentication for Cloud Security 67
Kapil Dev Raghuwanshi and Puneet Himthani

Investigations of Microservices Architecture in Edge Computing Environment 77
Nitin Rathore, Anand Rajavat and Margi Patel

Improving Reliability of Mobile Social Cloud Computing using Machine Learning in Content Addressable Network 85
Goldi Bajaj and Anand Motwani

Data De-duplication Scheme for File Checksum in Cloud 105
Jayashree Agarkhed, Apurva Deshpande and Ankita Saraf

A Survey on Cloud Computing Security Issues and Cryptographic Techniques 119
Vidushi Agarwal, Ashish K. Kaushal and Lokesh Chouhan

Machine Learning

Features Identification for Filtering Credible Content on Twitter Using Machine Learning Techniques 137
Faraz Ahmad and S. A. M. Rizvi

Perspectives of Healthcare Sector with Artificial Intelligence 151
Mohammed Sameer Khan and Shadab Pasha Khan

A Novel Approach for Stock Market Price Prediction Based on Polynomial Linear Regression 161
Jayesh Amrutphale, Pavan Rathore and Vijay Malviya

Real-Time Classification of Twitter Data Using Decision Tree Technique 173
Shivam Nilosey, Abhishek Pipliya and Vijay Malviya

Dynamic Web Service Composition Using AI Planning Technique: Case Study on Blackbox Planner 183
Lalit Purohit, Satyendra Singh Chouhan and Aditi Jain

A Study of Deep Learning in Text Analytics 197
Noopur Ballal and Sri Khetwat Saritha

Image Segmentation of Breast Cancer Histopathology Images Using PSO-Based Clustering Technique 207
Vandana Kate and Pragya Shukla

Survey of Methods Applying Deep Learning to Distinguish Between Computer Generated and Natural Images 217
Aiman Meenai and Vasima Khan

SVM Hyper-Parameters Optimization using Multi-PSO for Intrusion Detection 227
Dhruba Jyoti Kalita, Vibhav Prakash Singh and Vinay Kumar

A Survey on SVM Hyper-Parameters Optimization Techniques 243
Dhruba Jyoti Kalita, Vibhav Prakash Singh and Vinay Kumar

Review of F0 Estimation in the Context of Indian Classical Music Expression Detection 257
Amit Rege and Ravi Sindal

Classification and Detection of Breast Cancer Using Machine Learning 269
Rekh Ram Janghel, Lokesh Singh, Satya Prakash Sahu and Chandra Prakash Rathore

Data and Web Mining

Couplets Translation from English to Hindi Language 285
Anshuma Yadav, Rajesh Kumar Chakrawarti and Pratosh Bansal

A Novel Approach for Predicting Customer Churn in Telecom Sector 295
Ankit Khede, Abhishek Pipliya and Vijay Malviya

An Advance Approach for Spam Document Detection Using QAP Rabin-Karp Algorithm 305
Nidhi Ruthia and Abhigyan Tiwary

A Review on Enhancement to Standard K-Means Clustering 313
Mohit Kushwaha, Himanshu Yadav and Chetan Agrawal

A Review on Benchmarking: Comparing the Static Analysis Tools (SATs) in Web Security 327
Rekha Deshlahre and Namita Tiwari

Farmer the Entrepreneur—An Android-Based Solution for Agriculture End Services 339
Jayashree Agarkhed, Lubna Tahreem, Summaiya Siddiqua and Tayyaba Nousheen

Face Recognition Algorithm for Low-Resolution Images 349
Monika Rani Golla, Poonam Sharma and Jitendra Madarkar

A Cognition Scanning on Popularity Prediction of Videos 363
Neeti Sangwan and Vishal Bhatnagar

Review on High Utility Rare Itemset Mining 373
Shalini Zanzote Ninoria and S. S. Thakur

A Study on Impact of Team Composition and Optimal Parameters Required to Predict Result of Cricket Match 389
Manoj S. Ishi and J. B. Patil

Using Analytic Hierarchal Processing in 26/11 Mumbai Terrorist Attack for Key Player Selection and Ranking 401
Amit Kumar Mishra, Nisheeth Joshi and Iti Mathur

A Comprehensive Study of Clustering Algorithms for Big Data Mining with MapReduce Capability 427
Kamlesh Kumar Pandey, Diwakar Shukla and Ram Milan

Parametric and Nonparametric Classification for Minimizing Misclassification Errors 441
Sushma Nagdeote and Sujata Chiwande

IoT

A Review on IoT Security Architecture: Attacks, Protocols, Trust Management Issues, and Elliptic Curve Cryptography 457
Lalita Agrawal and Namita Tiwari

A Comprehensive Review and Performance Evaluation of Recent Trends for Data Aggregation and Routing Techniques in IoT Networks 467
Neeraj Chandnani and Chandrakant N. Khairnar

An Efficient Image Data Encryption Technique Based on RC4 and Blowfish Algorithm with Random Data Shuffling 485
Dharna Singhai and Chetan Gupta

IoT Devices for Monitoring Natural Environment—A Survey 495
Subhra Shriti Mishra and Akhtar Rasool

Suspicious Event Detection in Real-Time Video Surveillance System 509
Madhuri Agrawal and Shikha Agrawal

Time Moments and Its Extension for Reduction of MIMO Discrete Interval Systems 517
A. P. Padhy and V. P. Singh

Human Activity Recognition Using Smartphone Sensor Data 533
Sweta Jain, Sadare Alam and K. Shreesha Prabhu

Novel Software Modeling Technique for Surveillance System 543
Rakesh Kumar, Priti Maheshwary and Timothy Malche

An Investigation on Distributed Real-Time Embedded System 555
Manjima De Sarkar, Atrayee Dutta and Sahadev Roy

Real-Time Robust and Cost-Efficient Hand Tracking in Colored Video Using Simple Camera 565
Richa Golash and Yogendra Kumar Jain

Communication and Networks

A State of the Art on Network Security 577
Vinay Kumar, Sairaj Nemmaniwar, Harshit Saini and Mohan Rao Mamidkar

A Survey on Wireless Network 585
Vinay Kumar, Aditi Biswas Purba, Shailja Kumari, Amisha, Kanishka and Sanjay Kumar

Jaya Algorithm Based Optimal Design of LQR Controller for Load Frequency Control of Single Area Power System 595
Nikhil Paliwal, Laxmi Srivastava and Manjaree Pandit

A Review on Performance of Distributed Embedded System 605
Atrayee Dutta, Manjima De Sarkar and Sahadev Roy

A Comparative Study of DoS Attack Detection and Mitigation Techniques in MANET 615
Divya Gautam and Vrinda Tokekar

Prediction of Software Effort Using Design Metrics: An Empirical Investigation 627
Prerana Rai, Shishir Kumar and Dinesh Kumar Verma

Recent Advancements in Chaos-Based Image Encryption Techniques: A Review 639
Snehlata Yadav and Namita Tiwari

Image Fusion Survey: A Comprehensive and Detailed Analysis of Image Fusion Techniques 649
Monica Manviya and Jyoti Bharti

Some New Methods for Ready Queue Processing Time Estimation Problem in Multiprocessing Environment 661
Sarla More and Diwakar Shukla

Review of Various Two-Phase Authentication Mechanisms on Ease of Use and Security Enhancement Parameters 671
Himani Thakur and Anand Rajavat

An Efficient Network Coded Routing Protocol for Delay Tolerant Network 679
Mukesh Sakle and Sonam Singh

Hybrid Text Illusion CAPTCHA Dealing with Partial Vision Certainty 687
Arun Pratap Singh, Sanjay Sharma and Vaishali Singh

"By Using Image Inpainting Technique Restoring Occluded Images for Face Recognition" 697
Usha D. Tikale and S. D. Zade

Social Networking

Personality Prediction and Classification Using Twitter Data 707
Navanshu Agarwal, Lokesh Chouhan, Ishita Parmar, Sheirsh Saxena, Ridam Arora, Shikhin Gupta and Himanshu Dhiman

A Novel Adaptive Approach for Sentiment Analysis on Social Media Data 717
Yashasvee Amrutphale, Nishant Vijayvargiya and Vijay Malviya

Sentiment Analysis and Prediction of Election Results 2018 727
Urvashi Sharma, Rattan K. Datta and Kavita Pabreja

Toward the Semantic Data Inter-processing: A Semantic Web Approach and Its Services 741
Anand Kumar and B. P. Singh

A Big Data Parameter Estimation Approach to Develop Big Social Data Analytics Framework for Sentiment Analysis 755
Abdul Alim and Diwakar Shukla

A Novel Approach of Vertex Coloring Algorithm to Solve the *K*-Colorability Problem 765
Shruti Mahajani, Pratyush Sharma and Vijay Malviya

Predicting the Popularity of Rumors in Social Media Using Machine Learning 775
Pardeep Singh and Satish Chand

Optimizing Memory Space by Removing Duplicate Files Using Similarity Digest Technique 791
Vedant Sharma, Priyamwada Sharma and Santosh Sahu

Sentiment Analysis to Recognize Emotional Distress Through Facebook Status Updates 799
Swarnangini Sinha, Kanak Saxena and Nisheeth Joshi

Editors and Contributors

About the Editors

Dr. Rajesh Kumar Shukla is the Dean (R&D) and Head of the Department of Computer Science and Engineering, Sagar Institute of Research and Technology, Bhopal. He holds B.E. (CSE), M.Tech. (CSE), and Ph.D. (CSE) degrees, and has served as the Head of Department, Dean, and Vice-Principal of various institutions. He is authored several books, including Analysis and Design of Algorithms (A beginners Approach), Data structure and Files, Basics of Computer Engineering, Data Structure using C and C++, Object Oriented Programming in C++ (all published with Wiley India) and Theory of Computation and Formal Languages and Automata Theory (Published with Cengage Learning). His research interests include recommendation systems, social networking, machine learning, computational intelligence, and data mining, and he has published over 40 papers in international journals and conferences. He has received several awards, including the Chapter Patron Award by the Computer Society of India in 2018, Significant Contribution Award under CSI Service Award by CSI India in 2017, ISTE U.P. Government National Award in 2015, and Bharat Excellence Award in 2015. He has also been active a number of professional societies, and is currently the Chairman of ACM and CSI Bhopal Chapter.

Dr. Jitendra Agrawal works at the Department of Computer Science & Engineering at the Rajiv Gandhi Proudyogiki Vishwavidyalaya, MP, India. He is a teacher, researcher, and consultant in the field of computer science and information technology. His research interests include databases, data structure, data mining, soft computing, and computational intelligence. He has published more than 60 papers in international journals and conferences along with two books entitled "Data Structures" and "Advanced Database Management System".

Dr. Sanjeev Sharma works as a Professor and the Head of the School of Information Technology at Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India, and has received the World Education Congress's Best Teacher Award in Information Technology. He graduated in Electrical & Electronics from Samrat Ashok Technical Institute, India, and holds a postgraduate qualification in Microwave and Millimeter from Maulana Azad College of Technology, India. He completed his Doctorate in Information Technology at Rajiv Gandhi Proudyogiki Vishwavidyalaya. He has over 29 years' teaching and research experience and his areas of interest include mobile computing, ad hoc networks, data mining, image processing, and information security. He has edited the proceedings of several national and international conferences and published more than 150 research papers in respected journals.

Dr. Narendra S. Chaudhari is an established researcher in Computer Science and Engineering, and has made significant contributions to engineering education as an institute developer and to professional societies. As a Dean of the Faculty of Engineering Sciences, Devi Ahilya Vishwavidyalaya (DAVV), Indore, from 1995 to 1998, he initiated the Institute of Engineering and Technology, which is now the leading engineering institute in central India. At VNIT Nagpur, he promoted institute-wide research with multi-disciplinary projects, student mentorship programs, and involvement of alumni in entrepreneurship among students. He also founded the innovation center at VNIT Nagpur and led product development that resulted in patents and technology transfer for engineering products. He has also been involved in technical education at national level as: (i) chairman of the Central Regional Committee, AICTE, MHRD, Government of India and (ii) co-convener and secretary of the standing council of NITs, MHRD, Government of India. His research contributions are in the areas of network security and mobile computing, game AI, novel neural network models like binary neural nets and bidirectional nets, context-free grammar parsing, optimization, and graph isomorphism problems.

Dr. Narendra S. Chaudhari was a member of the academic delegation for the Honorable President of India's state visits to Sweden and Belarus in 2015, and to the People's Republic of China in 2016. He was also part of FICCI's higher education delegation to Germany, France, and the Netherlands for in 2015. He represented VNIT, Nagpur, at the first BRICS-Network University (NU) Conference at Yekaterinburg, Russia.

He has published more than 340 papers in journals and conferences, and completed eight R&D projects, funded by DST, UGC, AICTE, and MHRD. He has been a reviewer for DST and UGC projects and has contributed collaborative research for other pilot projects on computing techniques and industry interaction funded by ST-Engg, DSTA, and A*STAR in Singapore.

Dr. K. K. Shukla is a Professor of Computer Science and Engineering and Dean (Faculty Affairs), Indian Institute of Technology, BHU, Varanasi. He has 35 years of research and teaching experience. Professor Shukla has published more than 160 research papers in leading journals and conferences. He has written 5 books, and

contributed chapters to or edited many other books. He holds 24 intellectual property rights in the area of socially relevant computing.

Contributors

Jayashree Agarkhed P.D.A College of Engineering, Kalaburagi, Karnataka, India

Navanshu Agarwal Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Vidushi Agarwal Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Chetan Agrawal Computer Science and Engineering, RITS Bhopal, Bhopal, India

Lalita Agrawal Maulana Azad National Institute of Technology, Bhopal, India

Madhuri Agrawal UIT, RGPV, Bhopal, Madhya Pradesh, India

Shikha Agrawal UIT, RGPV, Bhopal, Madhya Pradesh, India

Faraz Ahmad Department of Computer Science, Jamia Millia Islamia, New Delhi, India

Sadare Alam Maulana Azad National Institute of Technology, Bhopal, India

Abdul Alim Department of Computer Science and Applications, Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh, India

Amisha National Institute of Technology Jamshedpur, Jamshedpur, India

Jayesh Amrutphale Malwa Institute of Technology, Indore, India

Yashasvee Amrutphale Malwa Institute of Technology, Indore, India;
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India

Ridam Arora Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Goldi Bajaj Sardar Vallabhbhai Polytechnic College, Bhopal, India

Noopur Ballal Department of Computer Science and Engineering, Maulana Azad National Institute ofTechnology, Bhopal, India

Pavan Bansal National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Pratosh Bansal Department of Information Technology, IET DAVV, Indore, Madhya Pradesh, India

Jyoti Bharti Maulana Azad National Institute of Technology, Bhopal, India

Vishal Bhatnagar Ambedkar Institute of Advanced Communication Technologies and Research, New Delhi, India

Rajesh Kumar Chakrawarti Department of Computer Engineering, IET, DAVV, Indore, Madhya Pradesh, India

Satish Chand School of Computer and Systems Sciences, Jawaharlal Nehru University, New Delhi, India

Neeraj Chandnani Devi Ahilya University, Indore, Madhya Pradesh, India; Military College of Telecommunication Engineering, Mhow, Madhya Pradesh, India

Yash Chaudhary National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Sujata Chiwande Department of Electronics and Telecommunication Engineering, YCCE, Nagpur, Nagpur, India

Lokesh Chouhan Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Satyendra Singh Chouhan Shri Govindram Seksaria Institute of Technology and Science, Indore, India

Rattan K. Datta Mohyal Educational and Research Institute of Technology, New Delhi, India

Manjima De Sarkar Department of Electronics and Communication Engineering, National Institute of Technology Arunachal Pradesh, Yupia, Arunachal Pradesh, India

Rekha Deshlahre Maulana Azad National Institute of Technology, Bhopal, Madhya Pradesh, India

Apurva Deshpande P.D.A College of Engineering, Kalaburagi, Karnataka, India

Himanshu Dhiman Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Atrayee Dutta Department of Electronics and Communication Engineering, National Institute of Technology Arunachal Pradesh, Yupia, Arunachal Pradesh, India

Divya Gautam Amity University Madhya Pradesh, Gwalior, India

Richa Golash E&I Department, Samrat Ashok Technological Institute, Vidisha, Madhya Pradesh, India

Monika Rani Golla Department of Computer Science and Engineering, Visvesvaraya National Institute of Technology, Nagpur, India

Chetan Gupta Department of Computer Science and Engineering, SIRTS, Bhopal, India

Shikhin Gupta Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Puneet Himthani Department of Computer Science and Engineering, TIEIT (TRUBA), Bhopal, India

Manoj S. Ishi Department of Computer Engineering, R. C. Patel Institute of Technology, Shirpur, Maharashtra, India

Aditi Jain Shri Govindram Seksaria Institute of Technology and Science, Indore, India

Sweta Jain Maulana Azad National Institute of Technology, Bhopal, India

Yogendra Kumar Jain E&I Department, Samrat Ashok Technological Institute, Vidisha, Madhya Pradesh, India

Rekh Ram Janghel National Institute of Technology Raipur, Raipur, India

Nisheeth Joshi Department of Computer Science and Engineering, Banasthali Vidyapith, Vanasthali, Rajasthan, India

Dhruba Jyoti Kalita Gaya College of Engineering, Gaya, India

Kanishka National Institute of Technology Jamshedpur, Jamshedpur, India

Vandana Kate Institute of Engineering and Technology, Indore, India

Ashish K. Kaushal Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Chandrakant N. Khairnar Faculty of Communication Engineering, Military College of Telecommunication Engineering, Mhow, Madhya Pradesh, India

Mohammed Sameer Khan Department of Computer Science and Engineering, Oriental Group of Institutes, Bhopal, India

Vasima Khan SIRT, Bhopal, India

Yunus Khan Shri Govindram Seksaria Institute of Technology and Science, Indore, Madhya Pradesh, India

Ankit Khede Malwa Institute of Technology, Indore, India

Anand Kumar Department of Computer and Information Sciences, J. R. Handicapped University, Chitrakoot, Uttar Pradesh, India

Rakesh Kumar Computer Science and Engineering, Rabindranath Tagore University, Bhopal, India

Sanjay Kumar National Institute of Technology Jamshedpur, Jamshedpur, India

Shishir Kumar Computer Science and Engineering, Jaypee University of Engineering and Technology, Guna, India

Vinay Kumar National Institute of Technology Jamshedpur, Jamshedpur, India

Amit Kumar Mishra Department of Computer Science and Engineering, Banasthali Vidyapith, Vanasthali, Rajasthan, India

Sangeeta Kumari National Institute of Technology Raipur, Raipur, Chhattisgarh, India

Shailja Kumari National Institute of Technology Jamshedpur, Jamshedpur, India

Mohit Kushwaha Computer Science and Engineering, RITS Bhopal, Bhopal, India

Bimalkant Lauhny National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Jitendra Madarkar Department of Computer Science and Engineering, Visvesvaraya National Institute of Technology, Nagpur, India

Shruti Mahajani Malwa Institute of Technology, Indore, India;
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India

Priti Maheshwary Computer Science and Engineering, Rabindranath Tagore University, Bhopal, India

Timothy Malche Computer Science and Engineering, Rabindranath Tagore University, Bhopal, India

Vijay Malviya Malwa Institute of Technology, Indore, India;
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India

Mohan Rao Mamidkar National Institute of Technology Jamshedpur, Jamshedpur, India

Monica Manviya Maulana Azad National Institute of Technology, Bhopal, India

Iti Mathur Department of Computer Science and Engineering, Banasthali Vidyapith, Vanasthali, Rajasthan, India

Aiman Meenai UIT-RGPV, Bhopal, India

Ram Milan Department of Computer Science and Applications, Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh, India

Subhra Shriti Mishra Maulana Azad National Institute of Technology, Bhopal, Madhya Pradesh, India

Sarla More Dr. Harisingh Gour University, Sagar, Madhya Pradesh, India

Anand Motwani VIT Bhopal University, Sehore, India

Sushma Nagdeote Department of Electronics Engineering, Fr. CRCE, Mumbai, India

Sairaj Nemmaniwar National Institute of Technology Jamshedpur, Jamshedpur, India

Shivam Nilosey Malwa Institute of Technology, Indore, India

Shalini Zanzote Ninoria Department of Mathematics and Computer Science, RDVV, Jabalpur, Madhya Pradesh, India;
Department of Applied Mathematics, Jabalpur Engineering College, Jabalpur, Madhya Pradesh, India

Tayyaba Nousheen P.D.A College of Engineering, Kalaburagi, Karnataka, India

Kavita Pabreja Maharaja Surajmal Institute, GGSIPU, New Delhi, India

A. P. Padhy National Institute Technology, Raipur, India

Nikhil Paliwal Madhav Institute of Technology and Science, Gwalior, Madhya Pradesh, India

Kamlesh Kumar Pandey Department of Computer Science and Applications, Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh, India

Manjaree Pandit Madhav Institute of Technology and Science, Gwalior, Madhya Pradesh, India

Ishita Parmar Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Shadab Pasha Khan Department of Information Technology, Oriental Group of Institutes, Bhopal, India

Margi Patel IIST, Indore, India

J. B. Patil Department of Computer Engineering, R. C. Patel Institute of Technology, Shirpur, Maharashtra, India

Abhishek Pipliya Malwa Institute of Technology, Indore, India

K. Shreesha Prabhu Maulana Azad National Institute of Technology, Bhopal, India

Aditi Biswas Purba National Institute of Technology Jamshedpur, Jamshedpur, India

Lalit Purohit Shri Govindram Seksaria Institute of Technology and Science, Indore, India

Kapil Dev Raghuwanshi Department of Computer Science and Engineering, TIEIT (TRUBA), Bhopal, India

Prerana Rai Computer Science and Engineering, Jaypee University of Engineering and Technology, Guna, India

Nidhi Rajak Department of Computer Science and Applications, Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh, India

Anand Rajavat Department of Computer Science and Engineering, SVIIT, SVVV, Indore, Madhya Pradesh, India

Akhtar Rasool Maulana Azad National Institute of Technology, Bhopal, Madhya Pradesh, India

Chandra Prakash Rathore National Institute of Technology Raipur, Raipur, India

Nitin Rathore IIST, Indore, India

Pavan Rathore Malwa Institute of Technology, Indore, India

Amit Rege Medicaps University, Indore, India

S. A. M. Rizvi Department of Computer Science, Jamia Millia Islamia, New Delhi, India

Sahadev Roy Department of Electronics and Communication Engineering, National Institute of Technology Arunachal Pradesh, Yupia, Arunachal Pradesh, India

Nidhi Ruthia Department of Computer Science and Engineering, SIRTS, Sagar Group of Institute, Bhopal, India

Santosh Sahu School of Information Technology, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, Madhya Pradesh, India

Satya Prakash Sahu National Institute of Technology Raipur, Raipur, India

Harshit Saini National Institute of Technology Jamshedpur, Jamshedpur, India

Mukesh Sakle Shri Govindram Seksaria Institute of Technology and Science, Indore, India

Neeti Sangwan GGS Indraprastha University, Dwarka, India;
MSIT, New Delhi, India

Ankita Saraf P.D.A College of Engineering, Kalaburagi, Karnataka, India

Sri Khetwat Saritha Department of Computer Science and Engineering, Maulana Azad National Institute of Technology, Bhopal, India

Kanak Saxena Department of Computer Application, Samrat Ashok Technological Institute, Vidisha, India

Sheirsh Saxena Department of Computer Science and Engineering, National Institute of Technology Hamirpur, Hamirpur, Himachal Pradesh, India

Poonam Sharma Department of Computer Science and Engineering, Visvesvaraya National Institute of Technology, Nagpur, India

Pratyush Sharma Malwa Institute of Technology, Indore, India;
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India

Priyamwada Sharma School of Information Technology, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, Madhya Pradesh, India

Sanjay Sharma Oriental Institute of Science & Technology, Bhopal, India

Urvashi Sharma IPS Academy, Indore, India

Vedant Sharma University Institute of Technology, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, Madhya Pradesh, India

Diwakar Shukla Department of Computer Science and Applications, Department of Mathematics and Statistics, Dr. Harisingh Gour Vishwavidyalaya, Sagar, Madhya Pradesh, India

Pragya Shukla Institute of Engineering and Technology, Indore, India

Summaiya Siddiqua P.D.A College of Engineering, Kalaburagi, Karnataka, India

Ravi Sindal IET Devi Ahilya University, Indore, India

Arun Pratap Singh The Right Click Services Pvt. Ltd., Bhopal, India

B. P. Singh Dayalbagh Educational Institute, Agra, Uttar Pradesh, India

Lokesh Singh National Institute of Technology Raipur, Raipur, India

Pardeep Singh School of Computer and Systems Sciences, Jawaharlal Nehru University, New Delhi, India

Shailendra Singh National Institute of Technical Teachers' Training & Research, Bhopal, Madhya Pradesh, India

Sonam Singh Parul Institute of Engineering and Technology, Vadodara, India

V. P. Singh National Institute Technology, Raipur, India

Vaishali Singh The Right Click Services Pvt. Ltd., Bhopal, India

Vibhav Prakash Singh Motilal Nehru National Institute of Technology, Allahabad, Prayagraj, India

Dharna Singhai Department of Computer Science and Engineering, SIRTS, Bhopal, India

Swarnangini Sinha Department of Computer Science and Engineering, Banasthali Vidyapith, Vanasthali, Rajasthan, India

Laxmi Srivastava Madhav Institute of Technology and Science, Gwalior, Madhya Pradesh, India

Lubna Tahreem P.D.A College of Engineering, Kalaburagi, Karnataka, India

Himani Thakur Department of Computer Science and Engineering, SVIIT, SVVV, Indore, Madhya Pradesh, India

S. S. Thakur Department of Mathematics and Computer Science, RDVV, Jabalpur, Madhya Pradesh, India;
Department of Applied Mathematics, Jabalpur Engineering College, Jabalpur, Madhya Pradesh, India

Usha D. Tikale PIET, Nagpur, India

Namita Tiwari Maulana Azad National Institute of Technology, Bhopal, Madhya Pradesh, India

Abhigyan Tiwary Department of Computer Science and Engineering, SIRTS , Sagar Group of Institute, Bhopal, India

Vrinda Tokekar IET, DAVV, Indore, India

Sunita Varma Shri Govindram Seksaria Institute of Technology and Science, Indore, Madhya Pradesh, India

Dinesh Kumar Verma Computer Science and Engineering, Jaypee University of Engineering and Technology, Guna, India

Nishant Vijayvargiya Malwa Institute of Technology, Indore, India;
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, India

Anshuma Yadav Department of Computer Science and Engineering, SVIIT, SVVV, Indore, Madhya Pradesh, India

Himanshu Yadav Computer Science and Engineering, RITS Bhopal, Bhopal, India

Snehlata Yadav Maulana Azad National Institute of Technology, Bhopal, India

S. D. Zade PIET, Nagpur, India

Cloud Computing

An Efficient Honey Bee Approach for Load Adjusting in Cloud Environment

Sangeeta Kumari and Shailendra Singh

Abstract Cloud computing is an Internet-based approach that delivers on-demand processing resources and information to the users in a shared mode. At the serving end, there is a prerequisite of proper scheduling and load adjusting to deal with the enormous measure of data. Our algorithm aims to distribute the equal load on each server in the cloud network and additionally enhances the asset usage. With the proposed approach, the honey bee inspired load adjusting (HBI-LA) method has been used for balancing the load of the virtual machine and schedule the task with respect of their priorities. Because of over-burdening of the task on a machine, there may be a chance of CPU crash. To overcome this problem, aging is applied to gradually enhance the priority of those jobs having longer waiting time as compared to the predefined time. At last, we compared our proposed work with the existing HBB-LB in terms of CPU time, execution time and waiting time. The examination of these three parameters demonstrates that the proposed algorithm requires less CPU time, less execution time and less waiting time than existing algorithm, hence it shows better performance and less energy consumption than the existing one.

Keywords Load balancing · Aging · Honey bee behavior · Cloud computing

1 Introduction

As the quantity of cloud clients is expanding in an exponential way, the duty of the cloud benefit provider is also increased to adjust the total workload among the different hubs in the cloud. Computing services are virtualized and delivered to the customer as a service. Weinman has given a term "*Cloudonomics*" [1], which define cloud computing from an economical perspective. Virtual machine (*VM*) gives a

S. Kumari (✉)
National Institute of Technology Raipur, Raipur, Chhattisgarh 492010, India
e-mail: sangeetak2606@gmail.com

S. Singh
National Institute of Technical Teachers' Training & Research, Bhopal, Madhya Pradesh 462002, India
e-mail: ssingh@nitttrbpl.ac.in

© Springer Nature Singapore Pte Ltd. 2020

R. K. Shukla et al. (eds.), *Social Networking and Computational Intelligence*, Lecture Notes in Networks and Systems 100, https://doi.org/10.1007/978-981-15-2071-6_1

programmable framework [2]. *VMs* are allocated and deallocated to the cloud clients on interest. All the service models [3] provides the highest performance and load balancing, but the load balancing and performance is the serious parameter of cloud computing. The web is the prime prerequisite for using the cloud administrations, so an unavoidable issue is that framework bottleneck often happening when large information is exchanged over the network, it is essential to deal with every one of the assets like *CPU*, memory, in a server effectively [4]. For a proficient system, the aggregate exertion and the preparation time for all the client solicitations ought to be as low as could be expected under the circumstances, while being capable to deal with the different influencing requirements, for example, heterogeneity and high system delays [5, 6]. Specialized objectives of load adjusting for the most part manages issues identified with the registering system, i.e. all the specialized issues with respect to the figuring system.

A load balancer must ensure that the framework ought to be steady all through the calculation work in the system. To have the capacity to receive all the future adjustments in the framework, it might augment the assets in the system or it might help up the limit of effectively existing assets. A heap balancer must be fit for guaranteeing the accessibility of the administrations or assets at whatever point required by the client [7]. Commercial cloud solutions have boosted dramatically in the last few years and promoted organization reallocation from company-owned resources for peruse service-based models. Some of the most popular cloud projects are Amazon *EC2* [8], Amazon *S3* [9], Google App Engine [10], Map Reduce [11] etc. and some of the active projects include XtreemOS [12], OpenNebula [13], etc.

Load balancing is a standout amongst the most critical elements which influence the general execution of the framework. It can give client better nature of administrations and cloud specialist cooperative can have higher throughput with better asset use [14]. It is essential for each cloud specialist cooperative to make its load balancer working in the most ideal way to enhance the performance of cloud services and to reduce the load in cloud architecture. The system's focal point of consideration was on enhancing the basic execution parameters like *CPU* time, execution time, waiting time and performance of the system. In the proposed work, we consider load adjusting problem in which we applied honey bee inspired load adjusting (*HBI-LA*) method with concept of aging to balance the load between *VMs* and schedule the job with higher priorities.

The remaining work is illustrated as follows: Sect. 2, presents a brief discussion of the related work on load balancing in cloud computing. In Sect. 3, proposed work is presented. Result analysis has been discussed in Sect. 4. Section 5, conclude the proposed work. Section 6, presents future work.

2 Related Work

In this section, a brief overview of the load balancing and scheduling in cloud computing environment is discussed.

Kansal and Chana [15] focused on existing procedures went for diminishing related overhead, benefit reaction time and enhancing execution of the method. The paper gives insights about different parameters and every parameter play an essential part in overseeing the overall execution of the system. A more proficient load adjusting calculation *LB3M* [16], was proposed by Hung, et al. In [17], the thought is to locate the best cloud asset by utilizing co-operative power aware scheduled load balancing. In *PALB* [18] method, usage rates of every node are assessed. This calculation has three segments: Balancing segment decides on the premise of use rates where virtual machines will be instantiated. Upscale section power-on the extra compute nodes and downscale section shutdowns the idle calculated nodes.

Accessibility of resources in a cloud domain, and additionally different components like scaling of resources and power utilization, in a distributed computing environment are one of the vital worries that needs an awesome consideration. Load adjusting strategies ought to be with the end goal that to get quantifiable upgrades in resources usage and accessibility of a distributed computing environment [19]. There are some methodologies that utilization load as a parameter for the distribution of the cloud assets, fuzzy based technique [20], *CLBDM* [21], active monitoring load balancer [22], evolution of gang scheduling [23], throttled load balancing [24], dynamic request management algorithm [25, 26]. In [27] dissected the performance of distributed computing administrations for investigative registering loads. They performed probes genuine experimental registering workloads on many-task computing (*MTC*) clients. *MTC* clients utilize loosely coupled applications including numerous errands to accomplish their technical ideas.

In [28], Bayes and clustering based scheme is applied for load adjusting which enhanced the throughput and performance of the system. In [29], dynamic weighted scheme have been considered to migrate the workload among *VMs* and also analysis the energy efficiency of the system using linear regression technique. It shows higher accuracy and more stability as compared with existing work. Chen et al. [30] have been illustrated the idea of dynamic balancing strategy to resolve the issue of static balancing approach.

Sethi et al. [31] has been developed a load adjusting technique using the concept of fuzzy logic system as a distributed computing system. In [32], ant colony optimization (*ACO*) technique have been proposed to balance the workloads between datacenters in a cloud computing system. Babu and Krishna [33] have been considered the idea of honey bee for load balancing in cloud computing environment. In this system, task is scheduled on the basis of priorities from one *VM* to another *VM*. It shows less execution time and also less overloading as compared to the existing system. In [34], priority pre-emptive scheduling with aging technique is used to overcome the starvation problem while scheduling the job from one place to another.

3 Proposed HBI-LA

The proposed load adjusting calculation goes for appropriating the aggregate workload from the diverse cloud clients among different nodes in the data center. The *VM* which are instantiated by the client are mapped onto the physical servers in the data center. A node in view of its arrangement permits a *VM* to be distributed to it. A specific *VM* allocation strategy is required to distribute the nodes to the various *VM*. At the time of allocation there might be a *CPU* crash because of overburden of the tasks, so to mitigate this issue we use the idea of honey bee which are discussed in Sect. 3.1. Further, we collaborate the *HBI-LA* with aging technique which is used to gradually increase the priority of those jobs which waits in the system longer with respect to their waiting time.

3.1 Overview of Honey Bee Method

The honey bee method depends on the behavior of the honey bees it has two sorts that are: finders and reapers. Finder first goes outside of the honeycomb and locates the honey sources, after searching they return to the honeycomb and do the waggle move to show the quality and amount of the honey sources and afterwards reapers goes outside the honeycomb and harvest the honey from those assets, in the wake of gathering the nectar they return and again, do the waggle move to demonstrate the amount of sustenance is left. For this situation, the server is gathered as a *VM* and every *VM* have a procedure queue, subsequent to handle the solicitation it computes the benefit and furthermore augments the throughput. The current workload of the *VM* is ascertained, then it chooses the *VM* status, whether it is underloaded, overloaded or adjusted by the current workload of the *VM* they are grouped. The priority of the undertaking is thought about after expelling from the over-burden *VM* which are sitting tight for the *VM*, after then the work is transferred to the underloaded *VM*. *HBI-LA* is used to adjust the load and expand the execution of the system [33]. The algorithmic steps of our proposed work are described in Sect. 3.2.

3.2 Description of Proposed HBI-LA *Scheme with Concept of Aging*

In this section, we present steps of the proposed technique for scheduling the task according to their priority.

Step 1: Estimate the capacity of a *VM* (C_k)

Capacity of a single *VM* is based on the available information that is number of cores, *mips* and bandwidth to identify the overloaded and underloaded *VMs* which is calculated using Eq. (1)

$$C_k = numP_k \times mipsP_k + ComBd_k \tag{1}$$

where C_k is the capacity of kth *VM*, $numP_k$, $mipsP_k$ are the number of cores and million instruction per second of all cores in VM_k respectively, $ComBd_k$ is the communication bandwidth of *VM*.

Step 2: Calculate the workload of a *VM* (L_k)

Number of jobs allocated to the single *VM* is known as workload, which is calculated by dividing number of jobs in a queue to the service rate of *VM* at time *ti*.

$$L_k = \frac{numJ}{S_VM_k} \tag{2}$$

where $numJ$, S_VM_k are the number of jobs and service rate of *VM* at time *ti*.

Step 3: Find the processing time of all *VM* ($PrTi$)

First, we calculated the processing time of a *VM* which is defined as the ratio of workload and capacity of single *VM*.

$$PrTi_k = \frac{L_k}{C_k} \tag{3}$$

Next, we evaluated the processing time of all *VMs* with the help of total workload and capacity. It is used to check the processing time of all *VMs* at time *ti* and identify the overloaded machine. Next, we calculate the standard deviation of a load using Eq. (5)

$$PrTi = \frac{L}{C} \tag{4}$$

$$SD = \frac{1}{Z}\sum_{i=1}^{z}(PrTi_k - PrTi)^2 \tag{5}$$

where L_k, C_k are the capacity and load of kth *VM* respectively. Z is the number of *VMs*.

Step 4: Find the overburden group

At the point when the present workload of the *VM* bunch goes beyond the extreme capacity of the *VM* then it is overburdened and load balancing is unstable and also we check the stability of the system using Eq. (6).

$$if\ SD \leq thv\ then\ system\ is\ stable$$
$$else$$

$$system\ is\ unstable \tag{6}$$

where thv is the threshold value which is in the range of [0–1].

Step 5: Apply aging concept

While scheduling jobs, priority of the recently arrived job is more than the existing job than non-pre-emptive scheduling takes the job and put it at the front of the queue, if this occurs again and again than there may be a chance of starvation. To overcome this problem, aging is applied to gradually enhance the priority of those jobs which are having longer waiting time as compared to the predefined time. Thus by applying aging it tends to enhance the priority of jobs which are idle on the system for longer time.

4 Performance Analysis

The performance of the system has been illustrated by implementing the concept in Java [35] using CloudSim [36] simulator. The simulation has been carried out to analyze the performance of two algorithms based on *CPU* time, execution time and waiting time. At first, simulation is done for the existing load balancing algorithm, namely *HBB-LB* and secondly, the proposed algorithm was simulated by varying various parameters which are *CPU* time, execution time and waiting time. Then the results of both algorithms are compared and a graphical analysis is also done in order to have a clear vision of both the schemes. The graphical analysis of both the algorithm is mentioned in Figs. 1, 2, 3, 4 and 5 in details.

In Fig. 1, we have taken number of user is 1, number of *VM* are 20 and number of cloudlets or request (*CL*) are 40 then plotted the graph between *CPU* time and

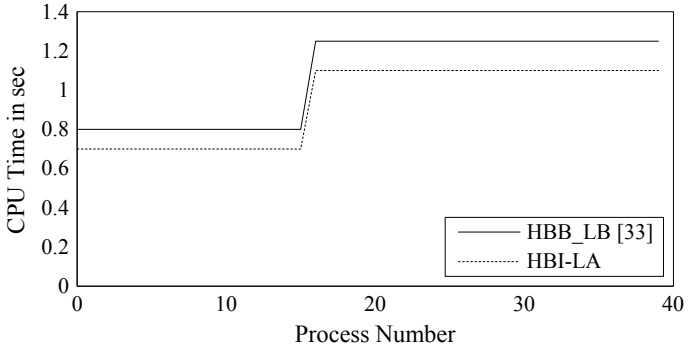

Fig. 1 *CPU* time versus process number

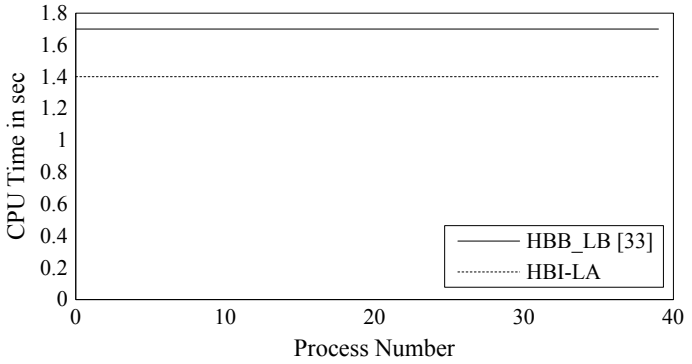

Fig. 2 *CPU* time versus process number

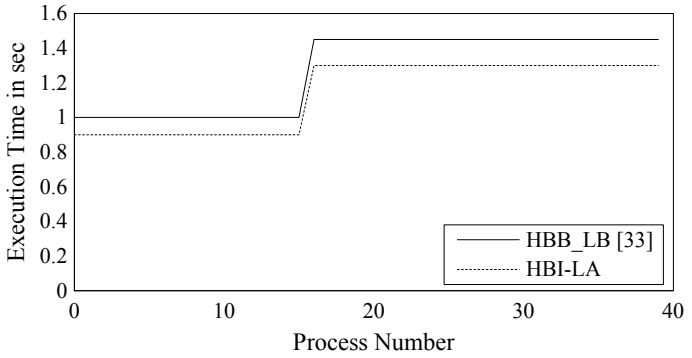

Fig. 3 Execution time versus process number

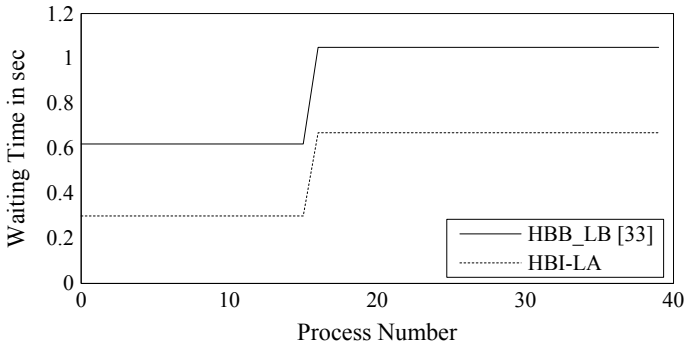

Fig. 4 Waiting time versus process number

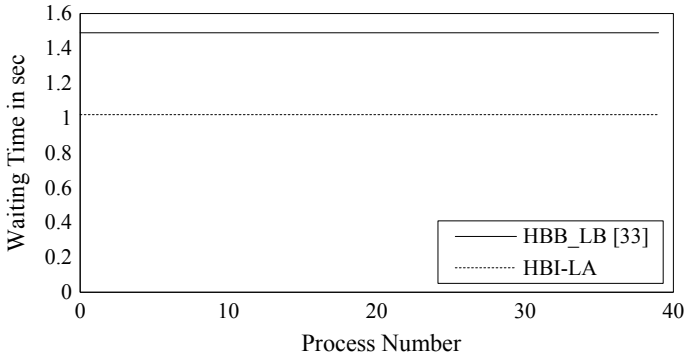

Fig. 5 Waiting time versus process number

process number where *CPU* time for existing *HBB-LB* is 43.28 s and *CPU* time for proposed *HBI-LA* is 37.04 s.

In Fig. 2, we have taken number of user is 1, number of *VM* are 10 and number of *CL* are 40 then plotted the graph between *CPU* time and process number where *CPU* time for existing *HBB-LB* is 66.8 s and *CPU* time for proposed *HBI-LA* is 57.19 s. In Fig. 3, we have analysed the performance of proposed scheme with number of user is 1, number of *VM* are 20 and number of *CL* are 40 and plotted the graph between execution time and process number where execution time for existing *HBB-LB* is 51.28 s and execution time for proposed *HBI-LA* is 45.04 s.

It can be observed from Fig. 4 that waiting time for existing *HBB-LB* is 35.28 s and waiting time for proposed *HBI-LA* is 21.04 s where number of user is 1, number of *VM* are 20 and number of *CL* are 40. In Fig. 5, waiting time for existing *HBB-LB* is 58.8 s and waiting time for proposed *HBI-LA* is 41.2 s with number of user is 1, number of *VM*, *CL* are 10 and 40 respectively then plotted the graph between them.

5 Conclusion

The request can be submitted in the form of cloudlets to the cloud datacenter. The cloudlets contain parameters that have information about the amount of resources required. CloudSim simulator is used for performing the simulation of the cloud computing environment. In our work we used the *HBI-LA* technique for energy consumption and load balancing between the *VM*. To mitigate the starvation problem, schedule the task from higher to lower priorities with the concept of aging. Also compared the proposed method with existing one in terms of three parameters that is *CPU*, execution and waiting time for 10 VMs and 20 VMs and plot the graph between these parameters and process number. After analysis of the results we found that the proposed algorithm shows better performance, while scheduling the task with priority.