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# Preface

This proceedings contains the papers presented at the 2nd International Conference on Computational Intelligence (ICCI 2021) organized by Indian Institute of Information Technology, Pune, India, and technically supported by Soft Computing Research Society during 27–28 December 2021. ICCI 2021 invited ideas, developments, applications, experiences, and evaluations in the broad area of computational intelligence from academicians, research scholars, and scientists and had served as a platform for the researchers to exchange research evidence, personal scientific views, and innovative ideas on the issues related to the broad area of computational intelligence.

The topics covered include artificial intelligence, neural network, deep learning techniques, fuzzy theory and systems, rough sets, self-organizing maps, machine learning, chaotic systems, multi-agent systems, computational optimization ensemble classifiers, reinforcement learning, decision trees, support vector machines, hybrid learning, statistical learning, metaheuristics algorithms: evolutionary and swarm-based algorithms like genetic algorithms, genetic programming, differential evolution, particle swarm optimization, firefly algorithm, memetic algorithms, machine vision, Internet of Things, robotics and control, vehicular systems, medical imaging, digital solutions to combat COVID-19 like pandemic, image processing, image segmentation, data clustering, sentiment analysis, big data, blockchain technology, computer networks, signal processing, supply chain management, web and text mining, distributed systems, bioinformatics, embedded systems, expert system, forecasting, pattern recognition, planning and scheduling, system modelling, time series analysis, human–computer interaction, web mining, natural language processing, multimedia systems, and quantum computing.

The conference had received an excellent response from the scientific and research community and had witnessed the submission of a large number of research papers with authors from different countries in diverse application fields of computational intelligence. In order to maintain the highest technical quality of the research papers, a rigorous peer-review process had been followed in true spirit that resulted in around 30% acceptance rate of papers. The accepted papers were categorized so as to fit into four different technical tracks, which include robotics and control, machine learning, signal/image processing and IoT, and modelling and simulation.

ICCI 2021 is a flagship event of the Soft Computing Research Society, India. The two-day International Conference on Computational Intelligence 2021 started with the inaugural function. Mr. Vikas Chandra Rastogi, IAS, Principal Secretary, Department of Higher and Technical Education, Government of Maharashtra, was the Chief Guest in the inaugural session, and Prof. Rajendra Sahu, Director, ABV-IITM Gwalior, was the Guest of Honour in the session. Other eminent dignitaries present in the inaugural ceremony include Dr. Anupam Shukla, Director, IIIT Pune, and Honorary Chair of ICCI 2021; Prof. J. C. Bansal, General Secretary, SCRS; Prof. S. N. Sapali, Registrar, IIIT Pune; Prof. Ritu Tiwari, General Chair, ICCI 2021; Dr. Mario F. Pavone, General Chair, ICCI 2021; and Dr. Ranjith Ravindranathan Nair, General Chair, ICCI 2021.

The conference witnessed keynote addresses from eminent speakers, namely Prof. Valentina Emilia Balas, Aurel Vlaicu University of Arad, Romania; Prof. Satyandra K. Gupta, University of Southern California, USA; Prof. Tomohiro Shibata, Kyushu Institute of Technology, Japan; Dr. Xin-She Yang, Middlesex University, London; Prof. Amit Konar, Jadhavpur University; and Dr. Krishnanand Kaipa, Old Dominion University, Virginia, USA.

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# Contents

<b>1</b>	<b>Visually Guided UGV for Autonomous Mobile Manipulation in Dynamic and Unstructured GPS-Denied Environments</b> .....	<b>1</b>
	Mohit Vohra and Laxmidhar Behera	
<b>2</b>	<b>Neural Network-Based Motion Control Algorithm for Perching Nano-Quadrotor on Outdoor Vertical Surface</b> .....	<b>15</b>
	Sandeep Gupta and Laxmidhar Behera	
<b>3</b>	<b>An Intelligent Game Theory Approach for Collision Avoidance of Multi-UAVs</b> .....	<b>27</b>
	Heera Lal Maurya, Padmini Singh, Subhash Yogi, Laxmidhar Behera, and Nishchal K. Verma	
<b>4</b>	<b>Dynamics and Control of Quadrapedal Robot</b> .....	<b>41</b>
	Shashank Kumar, Shubham Shukla, Ishank Agarwal, Arjit Jaitely, Ketan Singh, Vishwaratna Srivastava, and Vibhav Kumar Sachan	
<b>5</b>	<b>Disturbance Observer-Based Sliding Mode Controller with Mismatched Disturbance for Trajectory Tracking of a Quadrotor</b> .....	<b>57</b>
	Vibhu Kumar Tripathi, Anuj Nandanwar, and Laxmidhar Behera	
<b>6</b>	<b>Multi-robot Formation Control Using Integral Third-Order Super-Twisting Controller in Cyber-Physical Framework</b> .....	<b>71</b>
	Anuj Nandanwar, Vibhu Kumar Tripathi, and Laxmidhar Behera	
<b>7</b>	<b>RFE and Mutual-INFO-Based Hybrid Method Using Deep Neural Network for Gene Selection and Cancer Classification</b> .....	<b>85</b>
	Samkit Jain, Rashmi Maheshwari, and Vinod Kumar Jain	
<b>8</b>	<b>Biased Online Media Analysis Using Machine Learning</b> .....	<b>99</b>
	Arpit Gupta, Anisha Kumari, Ritik Raj, Akanksha Gupta, Raj Nath Shah, Tanmay Jaiswal, Rupesh Kumar Dewang, and Arvind Mewada	

<b>9</b>	<b>Coverless Information Hiding: A Review</b> .....	109
	Nitin Kanzariya, Dhaval Jadhav, Gaurang Lakhani, Uttam Chauchan, and Lokesh Gagani	
<b>10</b>	<b>A Review on Transliterated Text Retrieval for Indian Languages</b> .....	137
	Sujeet Kumar, Siddharth Kumar, and Jayadeep Pati	
<b>11</b>	<b>Learning-Based Smart Parking System</b> .....	147
	S. Sajna and Ranjith Ravindranathan Nair	
<b>12</b>	<b>Automated Identification of Tachyarrhythmia from Different Datasets of Heart Rate Variability Using a Hybrid Deep Learning Model</b> .....	159
	Manoj Kumar Ojha, Sulochana Wadhvani, Arun Kumar Wadhvani, and Anupam Shukla	
<b>13</b>	<b>Automatic Pathological Myopia Detection Using Ensemble Model</b> .....	169
	Rajeshwar Patil, Yogeshwar Patil, Yatharth Kale, Ashish Shetty, and Sanjeev Sharma	
<b>14</b>	<b>Revolutionary Solutions for Comprehensive Assessment of COVID-19 Pandemic</b> .....	183
	Shradha Suman Panda, Dev Sourav Panda, and Rahul Dixit	
<b>15</b>	<b>Application of Complex Network Principles to Identify Key Stations in Indian Railway Network</b> .....	197
	Ishu Garg, Ujjawal Soni, Sanchit Agrawal, and Anupam Shukla	
<b>16</b>	<b>Text Classification Using Deep Learning: A Survey</b> .....	205
	Samarth Bhawsar, Sarthak Dubey, Shashwat Kushwaha, and Sanjeev Sharma	
<b>17</b>	<b>Significance of Artificial Intelligence in COVID-19 Detection and Control</b> .....	217
	Abhishek Shrivastava and Vijay Kumar Dalla	
<b>18</b>	<b>Anomalous Human Activity Detection Using Stick Figure and Deep Learning Model</b> .....	231
	P. D. Rathika, G. Subashini, S. Nithish Kumar, and S. Ram Prakash	
<b>19</b>	<b>Noise Removal in ECG Signals Utilizing Fully Convolutional DAE</b> .....	243
	Arun Sai Narla, Shalini Kapuganti, and Hathiram Nenavath	
<b>20</b>	<b>Performance Investigation of RoF Link in 16 Channel WDM System Using DPSK Modulation Technique</b> .....	257
	Balram Tamrakar, Krishna Singh, and Parvin Kumar	

<b>21</b>	<b>A Comprehensive Study on Automatic Emotion Detection System Using EEG Signals and Deep Learning Algorithms</b> .....	<b>267</b>
	T. Abimala, T. V. Narmadha, and Lilly Raamesh	
<b>22</b>	<b>Sensor-Based Secure Framework for IoT-Based Smart Homes</b> .....	<b>283</b>
	Nidhi Dandotiya, Pallavi Khatri, Manjit Kumar, and Sujendra Kumar Kachhap	
<b>23</b>	<b>Manipulating Muscle Activity Data from Electromyography for Various Applications Using Artificial Intelligence</b> .....	<b>291</b>
	Piyush Agrawal, Apurva Joshi, and Shailesh Bendale	
<b>24</b>	<b>A Framework for Automatic Wireless Alert System for Explosive Detection</b> .....	<b>303</b>
	Ankita Chandavale, C. Anjali, Sunita Jahirbadkar, and Niketa Gandhi	
<b>25</b>	<b>IoT and Deep Learning-Based Weather Monitoring and Disaster Warning System</b> .....	<b>309</b>
	Chandra Kant Dwivedi	
<b>26</b>	<b>Sketch-Based Face Recognition</b> .....	<b>321</b>
	M. Maheesha, S. Samiksha, M. Sweety, B. Sathyabama, R. Nagarathna, and S. Mohamed Mansoor Roomi	
<b>27</b>	<b>Aerial Object Detection Using Different Models of YOLO Architecture: A Comparative Study</b> .....	<b>333</b>
	Vinat Goyal, Rishu Singh, Aveekal Kumar, Mrudul Dhawley, and Sanjeev Sharma	
<b>28</b>	<b>Video Anomaly Classification Using DenseNet Feature Extractor</b> .....	<b>347</b>
	Sanskar Hasija, Akash Peddaputha, Maganti Bhargav Hemanth, and Sanjeev Sharma	
<b>29</b>	<b>Empirical Analysis of Novel Differential Evolution for Molecular Potential Energy Problem</b> .....	<b>359</b>
	Pawan Mishra, Pooja, and Shubham Shukla	
<b>30</b>	<b>Sign Language versus Spoken English Language—A Study with Supervised Learning System Using RNN for Sign Language Interpretation</b> .....	<b>371</b>
	Sampada S. Wazalwar and Urmila Shrawankar	
<b>31</b>	<b>Hidden Markov Modelling for Biological Sequence</b> .....	<b>383</b>
	K. Senthamarai Kannan and S. D. Jeniffer	

<b>32</b>	<b>Proposed Crowd Counting System and Social Distance Analyzer for Pandemic Situation</b> .....	405
	Mrunal Girhepunje, Simran Jain, Triveni Ramteke, Nikhil P. Wyawahare, Prashant Khobragade, and Sampada Wazalwar	
<b>33</b>	<b>A Novel Ensemble Model to Summarize Kannada Texts</b> .....	417
	S. Parimala and R. Jayashree	
<b>34</b>	<b>Parallel Computation of Probabilistic Rough Set Approximations</b> .....	431
	V. K. Hanuman Turaga and Srilatha Chebrolu	
<b>35</b>	<b>Simplified TOPSIS for MLN-MODM Problems</b> .....	447
	Kailash Lachhwani	
<b>36</b>	<b>A Comprehensive Review Analysis on PSO and GA Techniques for Mathematical Programming Problems</b> .....	461
	Kailash Lachhwani	
	<b>Author Index</b> .....	477

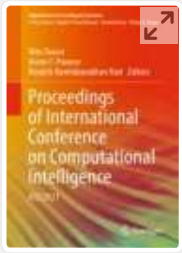
## About the Editors

**Prof. Ritu Tiwari** is currently working as a Professor in Department of Computer Science and Engineering at Indian Institute of Information Technology (IIIT) Pune. Before joining IIIT Pune, she was Associate Professor in Department of Information and Communication Technology at ABV—Indian Institute of Information Technology and Management (IIITM) Gwalior. She has 12 years of teaching and research experience. Her field of research includes Robotics, Artificial Intelligence, Soft Computing and Applications. She has published 05 books and more than 80 research papers in various national and international journals/conferences and is the reviewer for many international journals/conferences. Dr. Tiwari has received Young Scientist Award from Chhattisgarh Council of Science and Technology in the year 2006. She also received Gold Medal in her Post Graduation from NIT Raipur.

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Prof. Pavone was also Invited Speaker for several international conferences, and Editor of many special issues in: Artificial Life, Engineering Applications of Artificial Intelligence (EAAI), Applied Soft Computing (ASOC), BMC Immunology, Natural Computing, and Memetic Computing. Etc. Prof. Pavone is the co-founder of Tao Science Research center, and the Scientific Director of ANTs Lab—Advanced New Technologies research laboratory. Prof. Pavone was visiting professor at the School of Computer Science, University of Nottingham, UK and a visiting researcher at the IBM-KAIST Bio-Computing Research Center, Department of Bio and Brain Engineering, at the Korea Advanced Institute of Science and Technology (KAIST) in 2009 and 2006, respectively.


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## Automated Identification of Tachyarrhythmia from Different Datasets of Heart Rate Variability Using a Hybrid Deep Learning Model

[Manoj Kumar Ojha](#) , [Sulochana Wadhvani](#), [Arun Kumar Wadhvani](#) & [Anupam Shukla](#)

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### Abstract

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Automatic identification of abnormal and irregular heart rhythms is necessary to reduce mortality. Tachyarrhythmia is a type of abnormally fast heartbeat that can be detected using electrocardiogram (ECG) signals. In the elderly, life-threatening tachyarrhythmia such as ventricular fibrillation (VFIB), atrial fibrillation (AFIB), and atrial flutter (AFL) can lead to sudden cardiac arrest. Here,

we present a hybrid deep learning (HDL) model for automatic identification of tachyarrhythmia rhythms from heart rate variability (HRV) datasets based on a one-dimensional convolution neural network (1D CNN) and a long-term short-term memory (LSTM) model. In this study, we used the HRV database with five-second windows as input data for our HDL model. Four different statistical parameters have been used to determine the model efficiency: The average accuracy is 99.19%, the average precision is 91.75%, the recall is 93.63%, and the F1 score is 92.71%. The overall accuracy of the experiment was 98.4%. This model outperformed other state-of-the-art models. As a result, this method can be useful in clinical systems of cardiological care.

## Keywords

**AFIB**   **AFL**   **VFIB**   **HRV**   **CNN**   **LSTM**

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