RAMCO INSTITUTE OF TECHNOLOGY

(APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO ANNA UNIVERSITY, CHENNAI)
(ACCREDITED BY NAAC, ISO 9001:2015 CERTIFIED INSTITUTION)

RESEARCH BULLETIN 2023 - 2024
(MARCH 2023 - DEC 2024)

Gen AI Lab
NVIDIA Server-RTX600 48GB-128 GB DDR6-4TB SSD

ML/DL Lab
Intel i9 12th Gen - 32 GB RAM - 512 SSD - WiFi-Bluetooth

Research Lab
Intel i7 12th Gen - 32 GB RAM - 512 SSD - WiFi-Bluetooth

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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MANTRA
FOR THE STUDENTS, BY THE STUDENTS, BY THE FACULTY

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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RESEARCH BULLETIN
2023-2024

Vision

To impart international quality education, promote collaborative research and graduate industry-ready engineers in the domain of Artificial Intelligence and Data Science to serve the society.

Mission

- Excel in Teaching-Learning process and collaborative Research by the use of modern infrastructure and innovative components.

- Establish an Artificial Intelligence and Data Science based centre of excellence to prepare professional technocrats for solving interdisciplinary industry problems in various applications

- Motivate students to emerge as entrepreneurs with leadership qualities in a societal centric programme to fulfil Industry and community needs with ethical standards.

Program Educational Objectives (PEOs)

After successful completion of the degree, the students will be able to

- **PEO 1.** Apply Artificial Intelligence and Data Science techniques with industrial standards and pioneering research to solve social and environment-related problems for making a sustainable ecosystem.

- **PEO 2.** Excel with professional skills, fundamental knowledge, and advanced futuristic technologies to become Data Scientists, Data Analyst Managers, Data Science leaders AI Research Scientists, or Entrepreneurs.

Program Specific Outcomes (PSOs)

After successful completion of the degree, the students will be able to:

- **PSO 1:** To apply analytic technologies to achieve at meaningful insight and observation from data to solve engineering problems

- **PSO 2:** To create and apply Artificial Intelligence and Data Science techniques to forecast future trends in the domain of Healthcare, Education, Agriculture, Manufacturing, Automation, Robotics, and Transport, etc

- **PSO 3**: To enrich the critical thinking skills in emerging technologies such as Hybrid Mobile application development, cloud technology stack, and cyber-physical systems with mathematical aid to foresee the research findings and provide the solutions

Advisory Board

1. **Dr.Prabhat Kumar**
   Professor& Head, Department of Computer science
   NIT Patna
2. **Dr. ManjuKhari,**
   Associate Professor , School of Computer and System Sciences,
   Jawaharlal Nehru University, New Delhi
3. **Dr. JanmenjoyNayak,**
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   Maharaja Sriram Chandra BhanjaDeo(MSCB) University
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   IIEST Shibpur, Howrah, India
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   Chung-Ang University,
   Seoul, Korea
6. **Dr. Mohammad S Khan,**
   Director of Network Science and Analysis Lab (NSAL)
   East Tennessee State University
   Johnson City, USA
7. **Dr. Victor Hugo C. de Albuquerque**
   Professor
   University of Fortaleza (UNIFOR), Brazil
8. **Dr. AlirezaSouri**
   Halic University
   Turkey
9. **Dr.HosseinAnisi,**
   Professor &Head of the Internet of Everything (IoE) Laboratory
   University of Essex, UK
10. **Dr. Ruben Gonzalez Crespo**
    Professor of Computer Science and Artificial Intelligence,
    International University of La Rioja
    Spain
11. **Dr Noor Zaman Jhanji**
    Director Center for Smart Society 5.0 [CSS5]
    Associate Professor, Dept of CS,
    Taylor's University
    Malaysia

International Collaboration
1.Publications

Institute/University	Country	No. of Publication
Noroff university college, Kristiansand Shaqra University	Norway	7
University ofTeramo, Teramo,	Italy	2
Asia University, China Medical University, Foshan University,Foshan, Nanjing University of Information Science and Technology, Nanjing, China	China	6
ChulalongkornUniversity,Bangkok	Thailand	1
KingSaudUniversity,Taif University, University of Sfax, Sfax, Tunisia, University of Jeddah, Qassim University	SaudiArabia	8
Papua New Guinea University of Technology	Papua New Guinea	1
Taylor's University, Xiamen University	Malaysia	5
Sejong University,Soonchunhyang University, Chung-Ang University,Sun Moon University, Zhujiaffiliatedhospital of Shaoxing University, Hanshin University, Hanshin University, Kyungpook National University, Chung-Ang University, Chung-Ang University	South Korea	17
Lebanese French University, Erbil,	Iraq	6
InternationalUniversityofLaRioja	Spain	3
RMIT University	Australia	2
University of Central Punjab, Lahore	Pakistan	1
Hamad Bin Khalifa University, Doha,	Qatar	1
Cairo University, University of Tartu	Egypt	2
Science and Research Branch, Islamic Azad University, Tehran,	Iran	1
Hamad Bin Khalifa University, Doha	Qatar	1
Halic University	Turkey	1
University of Maryland, Baltimore County	USA	1

2. MOU

1. Ubiquitous Computing and Security (UCS) Lab Seoul National University of Science and Technology, Korea

2. MOBILE GRID AND CLOUD COMPUTING LAB, Department of Information Communication Engineering, Hankuk University of Foreign Studies, Korea

Scope

- Collaborative publication, Joint projects, organizing bilateral programmes

UCS lab

UCS lab team

Taylor's University, Malaysia

Dr. Noor ZamanJhanjhi, Associate Professor, School of Computer Science and Engineering, Faculty of Innovation and Technology, |Director Center for Smart Society 5.0 and Cluster Head for Cyber security cluster, Taylor's University, Malaysia.

Scope

- Collaborative publication, joint projects, organizing bilateral programmes

	Dr.M.Kaliappan **Professor and Head** Area of Interest: Artificial Intelligence , Data Analytics Journal Publication: SCIE : 25, SCOPUS:03 Conference Publications: 15 Book Chapter: 05 Patent: 04 H-Index:17 **Pursuing Post-Doctoral - Federal University of Ceara, Brazil** IEI sponsored project completed: 01 Theme: Deep learning
	HONORARY PROFESSOR **Dr. Tu Nguyen,** **Director of Intelligence System lab, Department of Computer Science, Kennesaw State University, Georgia, USA** **Scope** • Promote collaboration in research and academic activities

Anna University, Chennai Recognized Supervisors

The Department has applied for Research Centre Recognition under Anna University in Dec 2022(Ref.No:16IR2331)

Sl.NO	Name	Supervisor Number
1.	Dr.M.Kaliappan	2740025
2.	Dr.E.Mariappan	2940087

4. JOURNAL PUBLICATIONS

1.	Vimal.S ,et.al.,Self Adaptive Memetic Firefly Algorithm and CatBoost based Security Framework for IoT Healthcare Environment , Journal of Engineering Mathematics, Springer, Oct 2023, IF1.3 accepted for Publication.
2.	Rajesh Kumar Garg, Surender Kumar Soni, S. Vimal, Gaurav Dhiman,3-D Spatial Correlation Model for Reducing the Transmitting Nodes in Densely Deployed WSN , Microprocessors and Microsystems,? Oct 2023, IF 2.6 Rajesh Kumar Garg, Surender Kumar Soni, S. Vimal, Gaurav Dhiman,3-D Spatial Correlation Model for Reducing the Transmitting Nodes in Densely Deployed WSN , Microprocessors and Microsystems,? Oct 2023, IF 2.6.
3.	Pradeepa S, Niveda Gaspar, Vimal.S, Subbulakshmi.P, Ahmed Alkhayyat, Kaliappan.M,Classifying Promoters by Interpreting the Hidden Information of DNA Sequences for disease prediction in clinical laboratories using Gaussian Decision Boundary Estimation Intelligent Decision Technologies, IOS Press, Oct 2023,IF 1.0.
4.	N. Sasikaladevi, A. Revathi, S. Pradeepa, S.Vimal, Gaurav Dhiman,Anti-diabetic therapeutic medicinal plant identification using Deep fused Discriminant Subspace Ensemble(D2SE), International Journal of Interactive Multimedia and Artificial Intelligence, SCIE Indexed, Impact Factor: 3.6, Sep 2023.
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6.	Mufala Khan; Rakesh Kumar; Arwa N. Aledaily; Elham Kariri; Wattana Viriyasitavat; Kusum Yadav; Gaurav Dhiman; Amandeep Kaur; Ashutosh Sharma; S Vimal,A Systematic Survey on Implementation of Fuzzy Regression Models for Real Life Applications Archives of Computational Methods in Engineering, Springer, JUNE 2023,SCIE Indexed, IF 10.
7.	Sitharthan R, Rajesh M, Vimal S, Saravana Kumar E, Yuvaraj S, Abhishek Kumar, Jacob Raglend I, Vengatesan K, A novel autonomous irrigation system for smart agriculture using AI and 6G enabled IoT network, Microprocessors and Microsystems, Elsevier, Volume 101,2023,104905,ISSN 0141-9331,https://doi.org/10.1016/j.micpro.2023.104905,SCIE,IF 2.6.
8.	Mohit Kumar, Priya Mukherjee ,Sahil Verma ,Kavita ,NZ Jhanjhi, S Vimal , Bandar Almutain ,A Novel SDN Based Security Framework for Wireless Sensor Networks Using TDCNN And PGF-ECC, Human-centric Computing and Information Sciences, June 2023, SCIE Indexed ,IF 6.558.
9.	Shailendra Pratap Singh, Gaurav Dhiman, Wattana Viriyasitavat; S Vimal, Ketan Kotechan, Venkatesan Rajinikanth,Cyber Security and 5G-assisted Industrial Internet of Things using Novel Artificial Adaption based Evolutionary Algorithm Mobile Networks and Applications Springer, June 2023,SCIE Indexed, IF 3.8.
10.	Neha Singh, Deepali Virmani, Gaurav Dhiman, S Vimal Multi to binary class size based imbalance handling technique in wireless sensor networks, International Journal of Nanotechnology,Inderscience, June 2023, SCIE Indexed, IF: 0.5.
11.	Sasikaladevi N, Pradeepa S, Revathi A, Vimal. S,Ruben Gonzalez crespo, Diagnosis of kidney cyst, tumor and stone from CT scan images using feature fusion hypergraph convolutional neural network (F2HCN2), "International Journal for Multiscale Computational Engineering", Begel House, May 2023, SCIE Indexed, IF:1.5
12.	Kusum Yadav , Kawther A. Al-Dhlan , Hamad A. Alreshidi , Gaurav Dhiman, Wattana Golf Viriyasitavat Abdullah Zaid Almankory , Kadiyala Ramana, S Vimal, Venkatesan Rajinikanth,A Novel Coarse-to-fine computational method for threedimensional landmark detection to perform hard-tissue cephalometric analysis, Expert Systems, Wiley, May 2023, SCIE Indexed, IF: 2.812.
13.	Muhammad Ali Jamshed, Yazdan Ahmad Qadri, Malik Saad; Muhammad Bilal, S. Vimal, Sung Won Kim, Injecting cognitive intelligence into beyond-5G networks: A MAC layer perspectiveComputer and Electrical Engineering, Elsevier , April 2023, IF 4.152.

| 14.	P.Subbulakshmi, S.Vimal, Harold Robin, Janmenjoy Nayak Amit Verma, Comparative Evaluation of Attribute-enabled Supervised Classification in Predicting the Air quality, Spatial Information Research, Springer, ESCI indexed, Feb 2023, IF 2.4.
15.	Tarik A. Rashid, Bryar A. Hassan, Abeer Alsadoon, Shko Qader, S. Vimal, Amit Chhabra Zaher Mundher Yaseen, Awareness requirement and performance management for adaptive systems: a survey The Journal of Supercomputing https://doi.org/10.1007/s11227-022-05021-1,IF 2.557, Jan 2023.
16.	Maryam T. Abdulkhaleq , Tarik A. Rashid , Bryar A. Hassan, Abeer Alsadoon, Nebojsa Bacanin , Amit Chhabra , S.Vimal, Fitness Dependent Optimizer with Neural Networks for COVID-19 patients, Computer Methods and Programs in Biomedicine-Update, Elsevier, Jan 2023,Scopus Indexed.
17.	Sitharthan,S Vimal, Amit Verma, Madurakavi Karthikeya,Shanmuga Sundar Dhanabalan, Nataraja, Prabaharan M Rajesh, T Eswaran, Smart microgrid with the internet of things for adequate energy management and analysis, Computer and Electrical Engineering, https://doi.org/10.1016/j.compeleceng.2022.108556, Jan 2023, IF 4.152.
18.	SohailSaif, PriyaDas, SuparnaBiswas, Manju Khari, VimalShanmuganathan, HIIDS: Hybrid intelligent intrusion detection system empowered with machine learning and metaheuristic algorithms for application in IoT based healthcare Microprocessors and Microsystems, Available online 12 August 2022, 104622, Elesevier,IF 3.503.
19.	Priyanka chugh Meenu Gupta, S. Indu, Gopal Chaudhary, Manju Khari, Vimal Shanmuganathan, ADVANCED ENERGY EFFICIENT PEGASIS BASED ROUTING PROTOCOL FOR IoT APPLICATIONS, Microprocessors and Microsystems ,Available online 21 November 2022, 104727, Elesevier,IF 3.503.
20.	Azhagu Jaisudhan Pazhani.A, P. Gunasekaran, Vimal Shanmuganathan, Sangsoon Lim, Kaliappan Madasamy, Rajesh M, Amit Verma,Peer-Peer communication using Novel Slice Handover Algorithm for 5G Wireless Networks, Journal of Sensor and Actuator Networks, MDPI, ESCI Indexed, Dec 2022.
21.	Janmenjoy Nayak , H. Swapnarekha , Bighnaraj Naik , Vimal Shanmuganathan, Gaurav Dhiman ,25 YEARS OF PARTICLE SWARM OPTIMIZATION: FLOURISHING VOYAGE OF TWO DECADES, Archives of Computational Methods in Engineering, Springer, , Oct 2022,SCIE Indexed, IF 8.171
22.	Bighnaraj Naik, Janmenjoy Nayak,Pandit Byomakesha Dash , S. Vimal, Seifidine Kadry Hybrid Bayesian Optimization Hypertuned Catboost Approach for Malicious Access and Anomaly Detection in IoT Framework ? , Sustainable Computing: Informatics and Systems, Elsevier, Oct 2022,SCIE Indexed, IF 4.923-ACCEPTED.
23.	Antony Taurshia , Jaspher W Kathrine , Alireza Souri , S E Vinodh, S Vimal, Kuan-Ching Li, S Sudhakar Ilango Software-Defined Network aided Lightweight Group Key Management for resource-constrained Internet of Things devices?, Sustainable Computing: Informatics and Systems, Elsevier, Oct 2022,SCIE Indexed, IF 4.923-ACCEPTED.
24.	Debasmita Mishra , Bighnaraj Naik, Janmenjoy Nayak , Alireza Souri , Pandit Byomakesha Dashe, S.Vimal ,Light gradient boosting machine with optimized hyperparameters for identification of malicious access in IoT network, Digital Communications and Networks, Elsevier, Oct 2022,SCIE Indexed, IF 6.348.
25.	Rebin M. Ahmed,polla Fattah, Abeer Alsadoon, Nebojsa Bacanin, Seyedali Mirjalili, S. Vimal, Amit Chhabra, Kurdish Handwritten Character Recognition using Deep Learning Techniques, Gene Expression Patterns, Elsevier, Sep 2022, SCIE Indexed, IF1.448.
26.	L Ganesan, C.Umarani, M.Kaliappan, S.Vimal, Seifedine Kadry, Yunyoung Nam, Texture Image Analysis for Larger Lattice Structure using Orthogonal Polynomial framework, Information Technology and Control, Journal of Kaunas University of Technology, Sep 2022, IF:1.228.
27.	Muhammad Bilal, Raja Majid Mehmood; S Vimal; Seong-Whan Lee, EEG-based Affective State Recognition from Human Brain Signals by Using Hjorth-Activity, Measurement, Elsevier, Aug 2022, IF 5.131.

28.	K. Lakshmi Narayanan, R. Santhana Krishnan, Y. Harold Robinson, E. Golden Julie, S. Vimal, V. Saravanan,M. Kaliappan, Banana Plant Disease Classification using Hybrid Convolutional Neural Network, Computational Intelligence and Neuroscience, Hindawi, Vol.2022, Article ID 9153699, Feb.2022, https://doi.org/10.1155/2022/9153699, SCI, IF 3.633.
29.	Xu, Xiaolong; Liu, Zhongjian, Bilal, Muhammad; Vimal, S; Song, Housing, Computation Offloading and Service Caching for Intelligent Transportation Systems with Digital Twin,", IEEE Intelligent Transportation Systems Transactions, IEEE, SCIE Indexed, July 2022, Impact Factor-9.5.
30.	Yongzhao Xu, Paulo C. S. Barbosa, Joel S. da Cunha Neto , Lijuan Zhang d , S.Vimal, Victor Hugo C. de Albuquerque, Subbulakshmi p. , Development of intelligent and integrated technology for pattern recognition in EMG signals for robotic prosthesis command, Expert Systems , Wiley Publication, SCIE Indexed, July 2022.
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32.	Farhana Ajaz and Mohd Naseem, Sparsh Sharma, Gaurav Dhiman, Mohammad Shabaz, S. Vimal, Architecture and routing protocols for internet of vehicles: a review Int. J. Ad Hoc and Ubiquitous Computing, Vol. 40, Nos. 1/2/3, 2022.
33.	Barzan Hussein Tahir, Tarik A. Rashid, Hafiz Tayyab Rau, Nebojsa Bacanin,Amit Chhabra,S. Vimal,Zaher Mundher Yaseen, Improved Fitness Dependent Optimizer for Solving Economic Load Dispatch Problem Computational Intelligence and Neuroscience,Impact Factor-3.6, SCIE Indexed, June 2022.
34.	Akhtar Badshah, Muhammad Waqas, Ghulam Abbas, Fazal Muhammad, Ziaul Haq Abbas, Dr. Muhammad Bilal S Vimal, LAKE-BSG: Lightweight Authenticated Key Exchange Scheme for Blockchain-enabled Smart Grids, Sustainable Energy Technologies and Assessments, Volume 52, Part C, August 2022, 102248, SCIE Indexed, Impact Factor 5.3, May 2022.
35.	A.AlfredRajaMelvin, G.JaspherWKathrine, Subbulakshmi Pasupathi, S. Vimal, R.Naganathan An AI Powered System Call Analysis with Bag of Word Approaches for the detection of Intrusions and Malware in ADFA and VMM Malware Attack Dataset Expert Systems ,Wiley Publication, SCIE Indexed , May2022.
36.	G. Karpagarajesh,R. Santhana Krishnan , Y. Harold Robinson, S. Vimal, S. Thamizharasan, P.Subbulakshmi ,M. Kaliappan Comparative analysis of FSO, OFC and diffused channel links in Photonics using Artificial Intelligence based S-BAND,C-BAND and L-BAND of the attenuation metrics, Sustainable Energy Technologies and Assessments, Elsevier, IF: 5.35, May 2022.
37.	Xu, Xiaolong, Liu, Zhongjian ; Bilal, Muhammad; Vimal, S; Song, Housing, Task Offloading and Caching with Decision Theory for Intelligent Transportation with Digital Twin, IEEE Transactions on Intelligent Transportation Systems, IF 6.492, April 2022.
38.	Revathi, B., Usharani, C., Elizabeth, S. K., Nagaraj, P., & Nithya, D. (2024, April). Deep Learning Classification Techniques on Detecting Diabetic Retinopathy Dataset. In *2024 International Conference on Inventive Computation Technologies (ICICT)* (pp. 663-668). IEEE.
39.	I. Anantraj, B. Umarani, C. Karpagavalli, C. Usharani and S. J. Lakshmi, "Quantum Computing's Double-Edged Sword Unravelling the Vulnerabilities in Quantum Key Distribution for Enhanced Network Security," *2023 Internationa Conference on Next Generation Electronics (NEleX)*, Vellore, India, 2023, pp. 1-5, doi: 10.1109/NEleX59773.2023.10420896.
40	C. Karpagavalli; Nelson A; R. Raja; Saranya E; Manzoore Elahi M. Soudagar; Christu Paul Ramaian. (2024)." Incorporating Transfer Learning in Engine Health Assessment for Accurate Remaining Useful Life Prediction", IEEE Xplore, DOI: 10.1109/ICSADL61749.2024.00081. https://ieeexplore.ieee.org/document/10601462

5. CONFERENCE PUBLICATIONS

1.	S.Selva Birundha,"Crop Yield Analysis and Prediction on Indian Agriculture using Hybrid Deep Learning Model" in the"National Conference on Recent Trends in Computer Science Engineering – NCRTS 2024",SRM Madurai College of Engineering and Technology on 16th April 2024.
2	M. Ramnath and C. Y. Rubavathi, "Recommendations of Smartphone Applications According to Customer Reviews and Capabilities," 2023 Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS), Trichy, India, 2023, pp. 821-825, doi:10.1109/ICAISS58487.2023.10250487.
3	Kaliappan Madasamy, Vimal Shanmuganathan, Nithish, Vishakan, Vijayabhaskar, Muthukumar, Balamurali Ramakrishnan, Ramnath.M, Benign and Malignant Cancer Prediction using Deep Learning and Generating Pathologist Diagnostic Report, Second International Conference on Internet of Things and Health (IoTHIC-2023), October 20-21 2023, Hali University, Istanbul, Turkey, Engineering Cyber-Physical Systems and Critical Infrastructures (Scopus).
4	Karpagavalli. C; Kaliappan. M; Amuthachenthiru. K, Radial Basis Function Neural Network for Intrusion Detection and Feed Forward Artificial Neural Network for Attack Mitigation in IoT, 2023 Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS), 23-25 August 2023, Trichy, India, Publisher: IEEE, DOI: 10.1109/ICAISS58487.2023.10250458.Scopus Indexed
5.	Saubhik Bandyopadhyay Pushan Kumar Dutta, Abdul Rehman Javed,Kassian T.T. Amesho, Abhimanyu Bhowmick, Rahul P, Madhushree Sannigrahi , Vimal Shanmuganathan ,A new type of audio steganography with increased privacy using different ratios of LSB embedding, 6th IET Smart Cities Symposium, IET, 6-9 December 2022 Zain – e-Learning Center – University of Bahrain, Bahrain.
6.	Dr.S.Sumathi, Mr.R.Rajesh, S.Vimal, ,MACHINE LEARNING ALGORITHMS FOR DATA SECURITY IN INTERNET BASED SERVICES ,11TH ICCET 2023, ELEVENTH INTERNATIONAL CONFERENCE ON CONTEMPORARY ENGINEERING AND TECHNOLOGY, Prince Shri Venkateshwara Padmavathy Engineering College Collaboration with Samarkand State University Uzbekistan ,MAY 1ST – 2ND, 2023.
7.	Birunda, S. S., Nagaraj, P., Jebamani, B. J. A., Revathi, B., & Muneeswaran, V. (2023, January). A Structured Analysis on IPL 2022 matches by approaching various Data Visualization and Analytics. In 2023 International Conference on Computer Communication and Informatics (ICCCI) (pp. 1-9). IEEE.
8.	Revathi, B., Elizabeth, S. K., Nagaraj, P., Birunda, S. S., & Nithya, D. (2023, February). Particle Swarm Optimization based Detection of Diabetic Retinopathy using a Novel Deep CNN. In 2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS) (pp. 998-1003). IEEE.
9.	C.Karpagavalli, Dr.R.Suganya DdoS attack detection in IoT environment using Crystal Optimized Deep Neural Network in the International conference Artificial Intelligence of Things(ICAIoT 23) organized by National Institute of Technical Teacher Training & Research(NITTTR), chandigarh.
10.	C.Usharani, B.Revathi, A.Selvapandian, S.K.Kezial Elizabeth ,"Lung Cancer Detection in CT Images Using Deep Learning Techniques: A Survey Review" , in the International Conference on Intelligent Computing and Next Generation Wireless Networks (ICNGWN – 2023) organized by Sri Venkateswara College of Engineering, Sriperumbudur, Oct 2023.
11.	Sumit Kushwaha; K. Amuthachenthiru;Geetha. K;Jonnadula Narasimharao;Dileep Kumar M;Sai Sudha Gadde," Development of Advanced Noise Filtering Techniques for Medical Image Enhancement", 2024 5th International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV)

6. BOOK/BOOK CHAPTER PUBLICATIONS

1.	Pradeepa Sampath, Vimal Shanmuganathan, JanmenjoyNayak, Prasun Chakrabarti, Kaliappan Madasamy , A Knowledge Discovery framework for Coronavirus Disease 2019 (COVID -19) disease from PubMed Abstract using Association Rule Hypergraph (AR-Hypergraph)- Elsevier book chapter Data Science in medical field Accepted Scopus- Jan 2024.
2.	P. Suresh Kumar, Pandit Byomakesha Dash, B. Kameswara Rao, S. Vimal & Khan Muhammad ,Early Detection of Chronic Obstructive Pulmonary Disease Using LSTM-Firefly Based Deep Learning Model, pp 247267, DOIhttps://doi.org/10.1007/978-3-031-17544-2_11, Nature-Inspired Optimization Methodologies in Biomedical and Healthcare. Intelligent Systems Reference Library, vol 233. Springer, Cham. https://doi.org/10.1007/978-3-031-17544-2_11, Nov 2022, Scopus Indexed.
3.	Das, S., Swapnarekha, H., Vimal, S. (2023). Integration of Blockchain Technology with Renewable Energy for Sustainable Development: Issues, Challenges and Future Direction. In: Das, A.K., Nayak, J., Naik, B., Vimal, S., Pelusi, D. (eds) Computational Intelligence in Pattern Recognition. CIPR 2022. Lecture Notes in Networks and Systems, vol 725. Springer, Singapore. https://doi.org/10.1007/978-981-99-3734-9_48
4.	Asit Kumar Das, Janmenjoy Nayak, Bighnaraj Naik, S. Vimal, Danilo Pelusi ,Series Title Lecture Notes in Networks and Systems, Book Title : Computational Intelligence in Pattern Recognition, Book Subtitle : Proceedings of CIPR 2023, DOI: https://doi.org/10.1007/978-981-99-3734-9, Publisher Springer Singapore, eBook Packages : Intelligent Technologies and Robotics, Intelligent Technologies and Robotics (R0)
5.	Reddy, Hanumanthu, Behera, Vimal. S, Das, Pelusi, Issues and Future Challenges in Cancer prognosis : (Prostate cancer : A case study) Book Title:Computational intelligence in Cancer Diagnosis, ISBN:978-0-323- 85240-1, Elsevier, Scopus Indexed, June 2023.
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7.	Asit Kumar Das, Janmenjoy Nayak, Bighnaraj Naik, S. Vimal, Danilo Pelusi , Book Title: Computational Intelligence in Pattern Recognition,Book Subtitle Proceedings of CIPR 2022, Lecture Notes in Networks and Systems,DOI: https://doi.org/10.1007/978-981-19-3089-8 , Publisher: Springer Singapore, Scopus Indexed, June 2023
8.	D. Vetrithangam, Komala C. R., D. Sugumar, Y. Mallikarjuna Rao,C. Karpagavalli, B. Kiruthiga,(2024), "AI's Role in 6G Security Machine Learning Solutions Unveiled", Source Title: Security Issues and Solutions in 6G Communications and Beyond, Pages: 19,DOI: 10.4018/979-8-3693-2931-3.ch003.
9.	Ms.S.Selva Birunda published a paper titled "Detection and Prevention of Fake News and Hate Speech through Machine Learning and Natural Language Processing" in the book "Text and Social Media Analytics for Fake News and Hate Speech Detection" by Taylor and Francis Publishers. https://doi.org/10.1201/978100340951
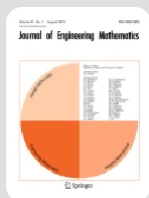
Journal of Engineering Mathematics

Pandit Byomokesha Dash ✉, Manas Ranjan Senapati, H. S. Behera, Janmenjoy Nayak & S. Vimal

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Abstract

The Internet of Things (IoT), which has had a revolutionary in uence on human existence, has become a topic of signi cant attention among the scienti c and industrial communities. Smart healthcare, smart cities, smart devices, smart industry, smart grid, and smart cities are just a handful of the many IoT ideas that have altered human life due to the rapid progress of this IoT technology. Security issues involving IoT devices have come up as a signi cant issue in recent years with special emphasis on the healthcare sector. This increased emphasis is mostly due to the exposure of serious vulnerabilities in IoT security with recent hacking activities. There is signi cant proof that conventional

Rajesh Kumar Garg , Surender Kumar Soni , S. Vimal , Gaurav Dhiman

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Abstract

In Wireless Sensor Networks, a large number of sensor nodes are distributed in the monitoring area to increase fault tolerance, coverage and communication range. In highly dense network, many nodes belong to common sensing region and record almost similar data of the event. Base station, however, can also identify the event features from data of a few representative nodes of the sensing region. The battery power of some sensor nodes may be saved by not sending multiple copies of the sensed information. In order to reduce transmitting nodes from the sensing region, an analytical model is presented to segregate the whole network into group of correlated regions. The minimum number of transmitting nodes are selected from probability based deployment of sensor nodes in 3D scenario and rest of the nodes are operated in sleep mode for saving the battery power. Effectiveness of proposed models is demonstrated with established technique of CHEF i.e. Cluster Head Election using Fuzzy Logic. Results show that number of nodes transmitting data from sense region can be reduced considerably with respect to threshold correlation value (ξ), which results in the energy saving of additional nodes and enhancement of network life. With implementation of proposed models, at $\xi \leq 0.5$, maximum transmitting nodes are 87% which saves battery power of at least 13% nodes.

q=author%3A%28%22M, Kaliappan%22%29)[b]

6/22/24, 4:00 PM　　　Classifying promoters by interpreting the hidden information of DNA sequences for disease prediction in clinical laboratories us…

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Abstract: A promoter is a brief stretch of DNA (100–1,000 bp) where RNA polymerase starts to transcribe a gene. A DNA (Deoxyribonucleic Acid) base pair is a fundamental unit of DNA structure and represents the pairing of two complementary nucleotide bases within the DNA double helix. The four DNA nucleotide bases are adenine (A), thymine (T), cytosine (C), and guanine (G). DNA base pairs are the building blocks of the DNA molecule, and their complementary pairing is central to the storage and transmission of genetic information in all living organisms. Normally, a promoter is found at the 5′ end of the transcription initiation site or immediately upstream. Numerous human disorders, particularly diabetes, cancer, and Huntington's disease, have been shown to have DNA promoter as their root cause. The scientific community has long been interested in learning crucial information about protein-coding genes. Finding the promoters is therefore the first step in finding genes in DNA sequences. The scientific world has always been attracted by the effort to glean crucial knowledge about protein-coding genes. Consequently, identifying promoters has emerged as an intriguing challenge that has caught the interest of numerous researchers in the field of bioinformatics. We proposed Gaussian Decision Boundary Estimation in machine learning models to detect transcription start sites (promoters) in the DNA sequences of a common bacteria, Escherichia coli. The best features are identified through a score-based function to select relevant nucleotides that are directly responsible for promoter recognition, in order maximise the models' performance. The Gaussian Decision Boundary Estimation based support-vector-machine model is trained with these features and finds the best hyperplane that separates the data into different classes. Throughout this study, promoter regions could be identified with high accuracy 99.9% which is better compared to other state of art algorithms. The comparison of machine learning classification models is another major emphasis of this paper in order to identify the model that most accurately predicts DNA sequence promoters. It provides analysis for further biological research as well as precision medicine.

Keywords: Promoter, DNA, Bioinformatics, machine learning, gaussian decision boundary estimation

Anti-Diabetic Therapeutic Medicinal Plant Identification Using Deep Fused Discriminant Subspace Ensemble (D²SE)

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AbSTRACT

About 422 million people worldwide have diabetes, the majority living in low-and middle-income countries, and 1.5 million deaths are directly attributed to diabetes each year. According to the Botanical Survey of India, India is home to more than 8,000 species of medicinal plants. Natural medications with antidiabetic activity are widely formulated because they have better compatibility with human body, are easily available and have less side effects. They may act as an alternative source of antidiabetic agents. The fused deep neural network (DNN) model with Discriminant Subspace Ensemble is designed to identify the diabetic plants from VNPlant200 data set. Here, the deep features are extracted using DenseNet201 and the matrix-based discriminant analysis is adopted to learn the discriminative feature subspace for classification. To further improve the performance of discriminative subspace, a nearest neighbors technique is used to produce a subspace ensemble for final diabetic therapeutic medicinal plant image classification. The developed model attained the highest accuracy of 97.5% which is better compared to other state of art algorithms. Finally, the model is integrated into a mobile app for robust classification of anti-diabetic therapeutic medicinal plant with real field images.

KEYwoRDS

Next generation WDM-radio over fiber passive optical network: deep neural network based performance analysis

JJ Lawrence, V Shanmuganathan, R Manoharan, S Ramachandran, MH Aly, P Chakrabarti

Abstract

This paper presents the performance of an Orthogonal Frequency Division Multiplexing (OFDM) system using intensity modulation with the modern equalizer in Wavelength-Division Multiplexing-Radio Over Fiber-Passive Optical Network (WDM-ROF-PON). The WDM-ROF-PON is considered for its high capacity and more extended optical reach, where the multiplexing and de-multiplexing are used at optical line terminal and optical network unit. First, the performance of the OFDM-based system with wired and wireless access is analyzed. We introduce an advanced equalizer namely, Deep Neural Network-Nonlinear Equalizer (DNN-NLE). The analysis is performed in the downlink by introducing a fiber Bragg grating and an equalizer with various fiber lengths. The system with DNN-NLE provides a better bit error rate of 10^{-9} and optical signal to noise ratio (OSNR) of 14.7 dB.

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ⓘ A Correction to this article was published on 14 February 2024

ⓘ This article has been updated

Abstract

Regression analysis is a statistical method employed to establish the relationship between "independent variables" and "dependent variables." This widely utilized analysis technique is capable of addressing numerous issues. Given the complexity and imprecision of real-world events, simplistic models often prove inadequate. Consequently, many researchers have turned to fuzzy set theory to enhance the accuracy of statistical regression analysis. These endeavors have bolstered the adaptability of various analysis doctrines. This paper offers a comprehensive and well-structured review of the literature, theory, and practice pertaining to fuzzy regression analysis. Furthermore, a straightforward and efficient method for retrieving data from wine databases is presented herein. The data is further elucidated through the use of charts and tables. The regression model leverages this data to provide a precise representation of wine quality. Additionally, we examine the assumptions underlying regression analysis.

Access this article

A novel autonomous irrigation system for smart agriculture using AI and 6G enabled IoT network

Sitharthan R [a] ⊠, Rajesh M [b], Vimal S [c], Saravana Kumar E [d], Yuvaraj S [e], Abhishek Kumar [f], Jacob Raglend I [g], Vengatesan K [b]

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Highlights

- Agriculture is crucial for human development and depends heavily on irrigation. This paper presents an autonomous irrigation system using AI and 6G-IoT.

- The system uses a prediction algorithm based on weather history data to anticipate rainfall patterns and climate changes.

- It creates an intelligent system that irrigates the fields according to environmental conditions.

- The developed system achieved an accuracy of 86.34%, sensitivity of 89.28%, and precision of 91%.

Abstract

Agriculture plays a vital role in the growth of humankind. The total world depends upon the agricultural contribution, and wherein the agriculture purely depends upon the necessity of irrigation. This paper develops an autonomous <u>irrigation system</u> using Artificial Intelligence (AI) and the 6G enabled <u>Internet of Things</u> (6G-IoT) transforming to create a hassle-free smart agriculture model. The developed autonomous <u>irrigation system</u> is purely based on prediction algorithm which is mount in a <u>microprocessor</u>, which uses weather history data using IoT to identify and predict rainfall patterns and any climatic changes; hence it creates an intelligent system which irrigates the field depending upon the outer environment. The developed system not only checks the environmental condition, but it also measures the <u>moisture content</u> of the soil to supply the required amount of water to the crops. The developed autonomous AI and 6G-IoT based smart <u>agricultural irrigation</u> system has been tested under control environment with an accuracy of 86.34%, sensitivity of 89.28% and precision of 91%. Hence, the proposed methodology could be the possible solution for autonomous irrigation of crops in future.

Keywords

1. Introduction

<u>Agriculture</u> is probably the greatest worry to all humanity since the vast majority of food is created by farming. As of now, numerous individuals still experience the ill effects of yearning because of the absence of food in certain nations, particularly in Africa. Exceptionally, hunger caused the persistent undernourishment of in excess of 800 million individuals on the planet in 2016. All the more remarkably, in excess of 10 million people has been left to die from hunger every year [1]. Clearly, expanding food creation is without a doubt a viable method for destroying yearning and destitution. But it's not that easy, the agriculture is a long way from modernization in a large portion of agricultural nations, prompting low food creation [2].

In recent days, Smart Agriculture (SA) is an arising idea that alludes to overseeing ranches utilizing present day <u>Information and Communication Technologies</u> to expand the amount and nature of items while advancing the human work required [3]. Especially, the SA frameworks bring together several advanced computer and

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A Novel SDN-Based Security Framework for Wireless Sensor Networks Using TDCNN and PGF-ECC

Mohit Kumar[1], Priya Mukherjee[2], Sahil Verma[3], Kavita[3], N. Z. Jhanjhi[4,*], S. Vimal[5], and Bandar Almutain[6]

Abstract

Wireless sensor networks (WSN) comprise a huge number of stationary or mobile sensor nodes that considerably support multi-hop communication. Intruder attacks such as wormholes, spoofing, etc., make it more susceptible in turn influence WSN's confidentiality. Therefore, utilizing tanh activation function centered deep convolution neural network (TDCNN) and polynomial Galois field elliptical curve cryptography (PGF-ECC), a novel approach named malicious node detection and privacy preservation of software-defined WSN is conceptualized in this work. Many measures have been taken in the work for assuring security. Utilizing taxicab metric centered KMedoid (TM-KMedoid) algorithm, the sensor nodes of the network are initially sorted into clusters. After that, using the Horse optimization algorithm (HOA), the cluster head (CH) selection is performed where the best node in the cluster is selected as the CH. Next, the data packets are transferred by the CH to the base station (BS) via the software-defined networking (SDN) controller. The SDN controller is applied with a TDCNN classifier that predicts the node's trustworthiness for detecting whether the node is malicious or not. The data is transferred to BS if the node is a trusted one else, the node gets rejected. The PGF-ECC algorithm is employed for ensuring the data's secure transmission to the BS. The proposed method's performance is contrasted with the existent systems in an experimental evaluation. It exhibits superior performance when analogized to top-notch techniques, and highly assures the network's authenticity.

1. Introduction

Wireless sensor network (WSN) plays a major role in our day-to-day lives [1]. It is capable of physical and environmental data acquisition along with wireless communications [2]. It comprises numerous nodes that can gather information from the scenario, namely temperature, sound, pressure, light, motions, etc. [3, 4]. Battery-powered along with resource-constrained (concerning processing, memory, along with communication) nodes are usually present in a WSN, and they participate in a multi-hop ad hoc network

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Cyber security and 5G-assisted industrial internet of things using novel artificial adaption based evolutionary algorithm

SP Singh, G Piras, W Viriyasitavat, E Kariri, K Yadav, G Dhiman, S Vimal, SB Khan

Abstract

The Industrial Internet of Things (IIoT) evolved quickly at the start of the twenty-first century. Various services, such as quality of service (QoS) for smart cyber security management from the industrial domain, are complicated for us. It is challenging to select the optimal malicious nodes by taking into account QoS criteria, including information communication, and network coverage regions. Numerous constrained evolutionary optimization strategies are known to address these problems. This study proposes a broader definition of differential evolution (DE) that uses a quick adaptation strategy and an optimization-based design. It combines DE with a unique mutation approach to broaden the range of viable answers. This research also suggests a novel fitness function for energy harvesting in IoT-based applications. Both on the IIoT-service architecture and in IIoT-based applications, the suggested method is assessed. The outcomes are then contrasted using state-of-the-art algorithms. It is discovered that the proposed approach produces better results in terms of cyber security of QoS, fitness cost, and detection of IIoT nodes from the IIoT service network.

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Multi to binary class size based imbalance handling technique in wireless sensor networks

N Singh, D Virmani, G Dhiman, S Vimal

International Journal of Nanotechnology, 2023 • inderscienceonline.com

Wireless sensor network (WSN) has entered various disciplines including healthcare, banking, transportation, ocean and wildlife monitoring, earthquake monitoring, and numerous military applications. Now days, there is escalation in size of data which makes it unfeasible to analyse it with accuracy. There are numerous problems that are faced when detecting a pattern between structured and unstructured data which are unworkable by humans, so to make computation fast, easy and accurate, Machine Learning came in existence. Machine Learning is extensively used in WSNs. To make a machine learn, a training dataset is required and output is predicted by testing the dataset. A dataset in WSN has multi-class in its dependent variable. This multiclass classification causes class imbalance problem. The paper proposes multi to binary class size based imbalance handling technique in wireless sensor networks (MBSCIH) technique to solve class imbalance problem in multi-class classification. The technique MBSCIH converts multi-class classification into binary-class classification. The proposed technique MBSCIH is applied on WSNDS, NSL-KDD and KDD-cup 99 datasets and is tested with five major machine learning algorithm: Naive Bayes, Random Forest, decision tree, support vector machine (SVM) and k-nearest neighbour (KNN). The test method used for testing is 10-fold cross validation. Results infer that the proposed method increases the existing efficiency by 15.13%, 0.28%, 0.01%, 0.01%, 0.12% for Naïve Bayes, Decision Tree, SVM, Random Forest and KNN Algorithms respectively for KDD Cup99 dataset. The proposed method increases the efficiency by 43.1%, 2.79%, 0.01%, 0.53% for Naïve Bayes, decision tree, SVM and KNN algorithms respectively for NSL-KDD dataset. Also, the proposed method increases the efficiency by 0.13%, 0.08%, 0.29%, 0.29% for Naïve Bayes, decision tree, SVM and KNN algorithms respectively for WSN-DS dataset.Further the experimental analysis proves that solving multiclass problem through algorithm has enhanced the detection of intrusions in WSNs.

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DIAGNOSIS OF KIDNEY CYST, TUMORAND STONE FROM CT SCAN IMAGESUSING FEATURE FUSION HYPERGRAPH CONVOLUTIONAL NEURAL NETWORK (F2HCN2)

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ABSTRACT

The development of a computational tool to diagnose kidney disorders in their early stages is necessary due to the rise in chronic kidney diseases (CKDs) and the global shortage of nephrologists. The three common renal disorders covered in this study are kidney stones, cysts, and tumors. Early diagnosisof these diseases from the computed tomography (CT) imagesis a challenging task. Yet, present graph convolutional neural network (GCNN) approaches have the issue of overdependence on the adjacency matrix. Moreover, comparedto deep convolutional neural network (CNN) models, a single modal feature results in low accuracy and robustness. In this paper, we proposed the feature fusion hypergraph CNN

(F2HCN2) to accurately diagnose kidney diseases in the early

stage based on CT scan images. The discriminative features ofthe images are extracted using DarkNet19 and residual features are extracted using ResNet50. The extracted features are classified using feature fusion hypergraph CNN. The proposed model is trained with 12,446 CT whole urogram and abdomen images. The hypergraph representation learning is performed to train the network with the fused features. Deep learning metrics including accuracy, F1 score (F1), recall, positive predictive value (PPV), receiver operating characteristic curve, and area under curve (AUC) are used to validate the proposed model. It outperforms compared to otherstate-of-the-art algorithms with accuracy of 99.71%. The

proposed F2HCN2 is a robust computer-aided tool for the early diagnosis of kidney diseases. It will assist the radiologist for better prognosis for kidney related abnormalities.

KEY WORDS: kidney diseases, feature fusion, hypergraph learning, graph convolution networks (GCNs), representationallearning, deep learning

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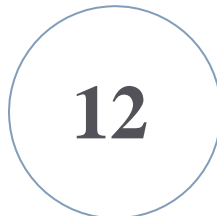
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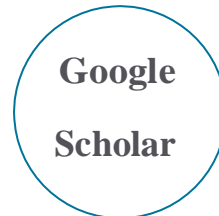
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ORIGINAL ARTICLE

A novel coarse-to-fine computational method for three-dimensional landmark detection to perform hard-tissue cephalometric analysis

Kusum Yadav, Kawther A. Al-Dhlan, Hamad A. Alreshidi, Gaurav Dhiman, Wattana Golf Viriyasitavat, Abdullah Zaid Almankory, Kadiyala Ramana, S. Vimal, Venkatesan Rajinikanth

Abstract

Cephalometric analysis has an important and essential role to treat the patients with craniofacial and dentofacial deformities. Cephalometric analysis is a relationship of human geometry which can be quantified and derived from the linear and angular measurements. To treat any patient, such analysis is required to be performed on the Head X-ray image of the patient. The objective of the proposed work is to detect cephalometric landmarks automatically on CT (computational tomography) images. Twenty cephalometric landmarks were automatically localized on 100 CT scans using hybrid coarse-to-fine computational method. The mean error for landmark detection was computed as 2.88 mm and standard deviation of 1.85 mm. The highest detection rate for cephalometric landmarks was received as 100% for Nasion landmark under 4-mm error and the highest detection rate was received as 99% for Nasion landmark under 3-mm error. The less number of datasets were used for the training and higher number of datasets were used for the testing. Compared to the literature methods, our method used higher number of datasets to demonstrate the accuracy of the proposed method.

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DATA AVAILABILITY STATEMENT

Injecting cognitive intelligence into beyond-5G networks: A MAC layer perspective ☆, ☆☆

Ali Nauman [a] ✉, Muhammad Ali Jamshed [b] ✉, Yazdan Ahmad [a] ✉, Malik Saad [c] ✉, Muhammad Bilal [d] ✉, Vimal Shanmuganathan [e] ✉, Sung Won Kim [a] ✉

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Highlights

- This article presents in detail the new vertical, their applications, and requirements of beyond-5G and 6G communication.

- This article provides in detail the issues raised by structural changes in the frame of New Radio and presents the open research challenges.

- This article presents how artificial intelligence can be used to provide a self-sustainable and self-organizable network by resolving open research problems.

- This article provides future research directions in Beyond-5G and 6G networks.

Abstract

The rapid rise of heterogeneous data traffic exposes the shortcomings of fifth-generation (5G) technology, which was initially designed to form self-organizing and self-sustaining networks to facilitate the adoption of the Internet-of-Everything (IoE). This study presents the applications and service requirements of future communication networks. This study details flexible design agreements of the Medium Access Control (MAC) layer of Beyond-5G (B5G) from the current $3rd$ Generation Partnership (3GPP) study and highlights the current open research issues and challenges which are yet to be optimized. To ensure that the network is self-sustaining and self-organized for B5G paradigm, an intelligent network design is required. Artificial Intelligence (AI) is revolutionizing every aspect of life, therefore, this article provides an overview of how AI plays an important role in improving future-generation communication by solving MAC-related issues.

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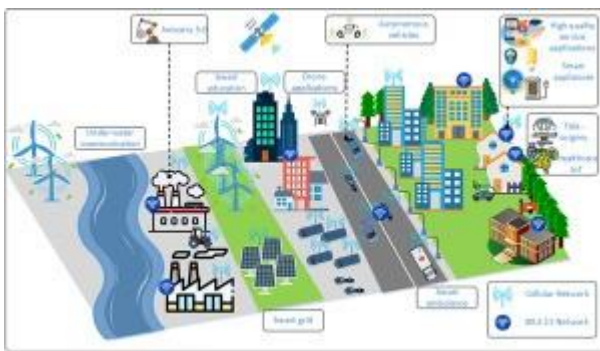
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Introduction

The Internet-of-Everything (IoE) is shifting the focus from high-data rate services like the enhanced mobile broadband (eMBB) and massive machine-type-communication (mMTC) to delay-centric ultra-reliable low latency communication (URLLC). With a $1000x$ increase in data rate and network capacity, the fifth-generation (5G) of mobile

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RETRACTED ARTICLE: Comparative Evaluation of Attribute-Enabled Supervised Classification in Predicting the Air Quality

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P. Subbulakshmi ✉, S. Vimal ✉, Y. Harold Robinson ✉, Amit Verma ✉ & Janmenjoy Nayak ✉

ℹ This article was retracted on 12 February 2024

ℹ This article has been updated

Abstract

Air pollution demonstrates the appearance of toxins into the air which is blocking human prosperity and the earth. It will portray as potentially the riskiest threats that humanity anytime faced. It makes hurt animals, harvests to thwart these issues in transportation

territories need to expect air quality from pollutions utilizing AI systems and IoT. Along these lines, air quality evaluation and assumption has become a huge target for human health factors and also affect internal organs related to respiratory. The accuracy of Air Pollution prediction has been involved with the machine learning techniques and the best accuracy model is identi ed. The air quality prediction dataset is used for identifying the meteorology air pollution data while the predicted model is involved the decision tree computation for predicting the toxin contents in the region, the Air quality indicator is used to assess the pollution level and monitoring the air quality. The performance analysis shows that the decision tree technique has produced the better results in the performance metrics of Accuracy, precision, recall, and F1-score with the minimized error values while the comparative evaluation of Attribute-enabled classi cation has identi ed the best technique for predicting the air quality.

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Awareness requirement and performance management for adaptive systems: a survey

TA Rashid, BA Hassan, A Alsadoon, S Qader, S Vimal, A Chhabra, ZM Yaseen

The Journal of Supercomputing, 2023 • Springer

Abstract

Self-adaptive software can assess and modify its behavior when the assessment indicates that the program is not performing as intended or when improved functionality or performance is available. Since the mid-1960s, system adaptivity has been extensively researched, and during the last decade, many application areas and technologies involving self-adaptation have gained prominence. All of these efforts have in common the introduction of self-adaptability through software. Thus, it is essential to investigate systematic software engineering methods to create self-adaptive systems that may be used across different domains. The primary objective of this research is to summarize current advances in awareness requirements for adaptive strategies and their performance management based on an examination of state-of-the-art methods described in the literature. This paper reviews self-adaptive systems in the context of requirement awareness and summarizes the most common methodologies applied. At first glance, it examines the previous surveys and works about self-adaptive systems. Afterward, it classifies the current self-adaptive systems based on six criteria. Then, it presents performance management in the current adaptive systems and then evaluates the most common self-adaptive approaches. Lastly, the self-adaptive models are evaluated based on four concepts (requirements description, monitoring, relationship, dependency/impact, and tools).

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Fitness dependent optimizer with neural networks for COVID-19 patients

Maryam T. Abdulkhaleq [a], Tarik A. Rashid [a] ✉, Bryar A. Hassan [b c], Abeer Alsadoon [d e], Nebojsa Bacanin [f], Amit Chhabra [g], S. Vimal [h]

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Abstract

The Coronavirus, known as COVID-19, which appeared in 2019 in China, has significantly affected the global health and become a huge burden on health institutions all over the world. These effects are continuing today. One strategy for limiting the virus's transmission is to have an early diagnosis of suspected cases and take appropriate measures before the disease spreads further. This work aims to diagnose and show the probability of getting infected by the disease according to textual clinical data. In this work, we used five machine learning techniques (GWO_MLP, GWO_CMLP, MGWO_MLP, FDO_MLP, FDO_CMLP) all of which aim to classify Covid-19 patients into two categories (Positive and Negative). Experiments showed promising results for all used models. The applied methods showed very similar performance, typically in terms of accuracy. However, in each tested dataset, FDO_MLP and FDO_CMLP produced the best results with 100% accuracy. The other models' results varied from one experiment to the other. It is concluded that the models on which the FDO algorithm was used as a learning algorithm had the possibility of obtaining higher accuracy. However, it is found that FDO has the longest runtime compared to the other algorithms. The link to the Covid 19 models is found here: https://github.com/Tarik4Rashid4/covid19models ↗

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Smart microgrid with the internet of things for adequate energy management and analysis

R Sitharthan [a] ✉, S Vimal [b], Amit Verma [c], Madurakavi Karthikeyan [d],
Shanmuga Sundar Dhanabalan [e], Natarajan Prabaharan [f], M Rajesh [g], T Eswaran [h]

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Abstract

Smart microgrid sounds familiar in recent days for their advanced electrification in rural/urban areas without the support of a grid network. Energy management and control can provide stability to the microgrid when there is a sudden change in loads. In this paper, the Internet of Things (IoT) has been used with the microgrid for energy management and analysis. The obtained result identifies the performance and operation of the IoT-based energy management and analysis in the smart microgrid. The proposed system identifies the demand pattern and allows the microgrid to supply power accordingly. In case of uncertain demand, the proposed system initiates the user to isolate and protects the microgrid. The experimental setup has been developed with PV/Wind and Piezo based 2.5kW hybrid power generation system and the obtained results have been compared with competitive technologies. TheIoT assessment has been carried out using Thinkspeak and MATLAB tools.

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HIIDS: Hybrid intelligent intrusion detection system empowered with machine learning and metaheuristic algorithms for application in IoT based healthcare

Sohail Saif [1] ✉ , Priya Das [1] ✉ , Suparna Biswas [1] ✉ , Manju Khari [2] ⚲ ✉ ,
Vimal Shanmuganathan [3] ⚲ ✉

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Abstract

This paper presents machine learning and metaheuristic algorithms based hybrid intelligent Intrusion Detection System (HIIDS) for Internet of Things based applications such as healthcare. In IoT based smart healthcare, biomedical sensors sense vital health parameters which are sent to the cloud server for storage and analysis. Health data saved as Electronic Health Record (EHR) is privacy and security sensitive. This work focuses on the detection of security attacks on cloud servers through anomaly based intrusion detection. Popular NSL-kDD dataset containing 41 features with 125,973 samples have been utilized for performance evaluation of proposed HIIDS.To reduce computation cost, metaheuristic algorithms such as Particle Swarm Optimization (PSO), Genetic Algorithm (GA), and Differential Evaluation (DE) are used for best feature selection and supervised learning algorithms such as Known Nearest Neighbor (kNN), Decision Tree (DT) are used for accurate classification of normal and attack class based on selected features. Also a hybrid approach has been presented for feature selection and classification. After dataset pre-processing using python, MATLAB 2019b is used to implement six variants of

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Advanced energy efficient pegasis based routing protocol for IoT applications

Priyanka Chugh [a], Meenu Gupta [b], S. Indu [c], Gopal Chaudhary [d], Manju Khari [e] 👤 ✉,
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Abstract

The Scientific betterments in Wireless Sensor Networks (WSNs) technology have paved
the way for the advancement of lower sized, reduced-cost, and highly-powered sensor
nodes. The sensor nodes are consistently expected to work with limited power batteries,

Peer-peer communication using novel slice handover algorithm for 5G wireless networks

AJ Pazhani. A, P Gunasekaran, V Shanmuganathan, S Lim, K Madasamy, R Manoharan…

Journal of Sensor and Actuator Networks, 2022 • mdpi.com

The goal of 5G wireless networks is to address the growing need for network services among users. User equipment has progressed to the point where users now expect diverse services from the network. The latency, reliability, and bandwidth requirements of users can all be classified. To fulfil the different needs of users in an economical manner, while guaranteeing network resources are resourcefully assigned to consumers, 5G systems plan to leverage technologies like Software Defined Networks, Network Function Virtualization, and Network Slicing. For the purpose of ensuring continuous handover among network slices, while catering to the advent of varied 5G application scenarios, new mobility management techniques must be adopted in Sliced 5G networks. Users want to travel from one region of coverage to another region without any fading in their network connection. Different network slices can coexist in 5G networks, with every slice offering services customized to various QoS demands. As a result, when customers travel from one region of coverage to another, the call can be transferred to a slice that caters to similar or slightly different requirements. The goal of this study was to develop an intra- and inter-slice algorithm for determining handover decisions in sliced 5G networks and to assess performance by comparing intra- and inter-slice handovers. The proposed work shows that an inter-slice handover algorithm offers superior quality of service when compared to an intra-slice algorithm.

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25 Years of Particle Swarm Optimization: Flourishing Voyage of Two Decades

Archives of Computational Methods in Engineering

Aims and scope

Submit manuscript

Janmenjoy Nayak ✉, H. Swapnarekha, Bighnaraj Naik, Gaurav Dhiman & S. Vimal

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Abstract

From the past few decades many nature inspired algorithms have been developed and gaining more popularity because of their effectiveness in solving problems of distinct application domains. Undoubtedly, Particle swarm optimization (PSO) algorithm is the most successful optimization algorithm among the available nature inspired algorithms such as simulated annealing, genetic algorithm, differential evolution, re y, cuckoo etc., because of its high ef ciency and capability to adjust in different dynamic environments. This year marks its 25th anniversary of PSO, one of the base inspirations for many modern-day metaheuristics development. Because of its simple structure and few number of algorithmic parameters, PSO from its origin has acquired widespread popularity amongst researchers, technocrats and practitioners and has been proven to

Hybrid Bayesian optimization hypertuned catboost approach for malicious access and anomaly detection in IoT nomalyframework

Janmenjoy Nayak [a] ✉ , Bighnaraj Naik [b] 👤 ✉ , Pandit Byomakesha Dash [c] ✉ , S. Vimal [d] ✉ , Seifidine Kadry [e f g] ✉

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Highlights

- Proposed an optimized Catboost model for identifying malicious IoT activities.

- Bayesian optimization is used to find optimal set of hyper-parameters of Catboost.

- A new ToN-IoT dataset is used, which is generated from a large scale IoT network

- Proposed Method Performance Compared with four standard Machine Learning methods

Abstract

The successful applications and diversified popularity of the Internet of Things (IoT) present various advantages and opportunities in broad characteristics of our lives. However, unfortunately, the IoT is allied with several types of defenseless attacks and illegitimate exploits. Security specialists specify voluminous threats imposed by the IoT devices in various aspects. Therefore, security and intrusion detection have constantly been growing areas of distress for any field of IoT research. This paper introduces a new hybrid ensemble hyper-tuned model (i.e., Catboost) that efficiently recognizes IoT sensor attacks and anomalies. The hyper-parameters are optimized with Bayesian optimization to develop security-based models effectively. The significant contributions of this work are the design of an intelligent model-based security framework based on the advanced ensemble learning Catboost model for detecting malicious IoT activities in the IoT network, the use of a Bayesian optimization approach to find an optimal set of Catboost hyper-parameters, and evaluate the model with a new real dataset (DOS2DOS) from a large-scale IoT network. The performance of the proposed model is compared with other state-of-the-art approaches, and the experimental results are evident towards a high detection rate of 99.9%.

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Software-defined network aided lightweight group key management for resource-constrained Internet of Things devices

Antony Taurshia [a] ✉ , G. Jaspher Willsie Kathrine [a] ✉ , Alireza Souri [b] ✉ , S.E. Vinodh [a] ✉ ,
S. Vimal [c] 👤 ✉ , Kuan-Ching Li [d] ✉ , S. Sudhakar Ilango [e] ✉

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Highlights

- Resistance to man-in-the-middle-attack, and replay attack in group communication.

- Lightweight in terms of computation and communication cost.

- Data traffic is made more reliable using packet keys using IoT.

- The scheme is scalable with sustainable energy monitoring.

Abstract

Software-Defined Network (SDN) and Network Function Virtualization (NFV) are key enablers for provisioning dynamic, virtual security services on demand. This article, presents a novel Group Key Management scheme for Low-Resource Devices (GKM-LRD)

with SDN aided trusted key management server as a central server to provide key management service to groups formed in Internet of Things (IoT) applications. In addition to the group key management scheme, a lightweight packet key-based communication system is proposed to make the data traffic reliable. Packet keys are short sized keys acquiring the lifetime of a packet. Even though the key is short sized, the security strength comes from its short lifetime. The proposed GKM-LRD is evaluated in terms of computation load, communication load, storage and scalability in comparison with the existing group key management schemes. The computation load, communication load and storage load is reduced by 80%, 17.25% and 20% respectively in comparison with the existing system assuring the scheme as lightweight and applicable for IoT devices. The proposed packet key-based communication scheme is compared with an existing Diffie-Hellman based packet key system. The results show the system is comparatively lightweight with computation load reduced by 74.8%. The security analysis of the proposed scheme proves that the scheme ensures forward secrecy, backward secrecy and resistance to man-in-the-middle and replay attacks.

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Introduction

The ubiquitous IoT applications demands the services of fog and cloud service providers to perform cost effective tasks [1]. In healthcare application cloud and fog services are leveraged for application partitioning and scheduling tasks to minimize energy consumption and application enhancement [2], [3]. In Internet of Vehicular Things (IoVT), the fog, cloud service is leveraged to provide mobility-aware services based on containers [4]. The fog cloud services are further enhanced with the inclusion of technologies like SDN and Intelligent Reflecting Surface (IRS) [5]. SDN is an emerging platform that uses software to program the network. With its logically centralized control SDN is able to attain bird's eye view of the network [6]. The features of SDN include dynamic rerouting of traffic, dynamic reconfiguration capabilities, optimized use of virtual services, real-time attack or failure detection and resilience [7]. The heterogeneous network of IoT uses several lightweight communication protocols like ZigBee, Z-wave, BLE, Sigfox, LoRaWAN for connectivity [8] and the data generation is vast. SDN centered security service management to IoT traffic is essential to tackle heterogeneity by providing centralized control as well as to provide optimized service.

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Light gradient boosting machine with optimized hyperparameters for identification of malicious access in IoT network

Debasmita Mishra [a] ✉ , Bighnaraj Naik [a] ✉ , Janmenjoy Nayak [b] ✉ , Alireza Souri [c] ✉ ,
Pandit Byomakesha Dash [d] ✉ , S. Vimal [e] ✉

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Abstract

In this paper, an advanced and optimized Light Gradient Boosting Machine (LGBM) technique is proposed to identify the intrusive activities in the Internet of Things (IoT) network. The followings are the major contributions: i) An optimized LGBM model has been developed for the identification of malicious IoT activities in the IoT network; ii) An efficient evolutionary optimization approach has been adopted for finding the optimal set of hyper-parameters of LGBM for the projected problem. Here, a Genetic Algorithm (GA) with k-way tournament selection and uniform crossover operation is used for efficient exploration of hyper-parameter search space; iii) Finally, the performance of the proposed model is evaluated using state-of-the-art ensemble learning and machine learning-based model to achieve overall generalized performance and efficiency. Simulation outcomes reveal that the proposed approach is superior to other considered methods and proves to be a robust approach to intrusion detection in an IoT environment.

Kurdish Handwritten character recognition using deep learning techniques

Rebin M. Ahmed [a] ✉, Tarik A. Rashid [b] ⍟ ✉, Polla Fattah [c] ✉, Abeer Alsadoon [d e f] ✉, Nebojsa Bacanin [g] ✉, Seyedali Mirjalili [h i] ✉, S. Vimal [j] ✉, Amit Chhabra [k] ✉

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Abstract

Handwriting recognition is regarded as a dynamic and inspiring topic in the exploration of pattern recognition and image processing. It has many applications including a blind reading aid, computerized reading, and processing for paper documents, making any handwritten document searchable and converting it into structural text form. High accuracy rates have been achieved by this technology when recognizing handwriting recognition systems for English, Chinese Arabic, Persian, and many other languages. However, there is not such a system for recognizing Kurdish handwriting. In this paper, an attempt is made to design and develop a model that can recognize handwritten characters for Kurdish alphabets using deep learning techniques . Kurdish (Sorani) contains 34 characters and mainly employs an Arabic/Persian based script with modified alphabets. In this work, a Deep Convolutional Neural Network model is employed that has shown exemplary performance in handwriting recognition systems. Then, a comprehensive database has been created for handwritten Kurdish characters which contain more than 40 thousand images. The created database has been used for training the Deep Convolutional Neural Network model for classification and recognition tasks. In the proposed system the experimental results show an acceptable recognition level. The testing results reported an 83% accuracy rate, and training accuracy reported a 96% accuracy rate. From the experimental results, it is clear that the proposed deep learning model is performing well and comparable to the similar to other languages handwriting recognition systems.

Introduction

Currently, handwritten character recognitions are increasing in demand and popularity as a result of their potential application areas, which would reduce the data entry tasks and save an unimaginable time when filling and searching for the form in handwritten documents and much more. The work of this study shows the consideration of the following problems:

1) Character recognition is a challenging and broad area for research, and still, improvement is required because the accuracy of the existing models is nowhere near the human capabilities. Handwriting character recognition is even more complex and challenging to be processed due to the nature of handwriting itself (Zhang et al., 2017).

Texture Image Analysis for Larger Lattice Structure using Orthogonal Polynomial framework

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Yunyoung Nam

Soonchunhyang University; Asan; Republic of Korea

Abstract

An Orthogonal Polynomial Framework using 3 x 3 mathematical model has been proposed and attempted for the textureanalysis by L.Ganesan and P.Bhattacharyya during 1990. They proposed this frame work which was unified to address both edgeand texture detection. Subsequently, this work has been extended for different applications by them and by different authors overa period of time. Now the Orthogonal Polynomial Framework has been shown effective for larger grid size of (5 x 5) or (7 x 7) orhigher, to analyze textured surfaces. The image region (5 x 5) under consideration is evaluated to be textured or untextured usinga statistical approach. Once the image region is concluded to be textured, it is proposed to be described by a local descriptor,called pro5num, computed by a simple coding scheme on the individual pixels based on their computed significant variances. Thehistogram of all the pro5nums computed over the entire image, called pro5spectrum, is considered to be the global descriptor.The novelty of this scheme is that it can be used for discriminating the

EEG-based affective state recognition from human brain signals by using Hjorth-activity

Raja Majid Mehmood [a] [b] ✉ , Muhammad Bilal [c] ✉ , S. Vimal [d] ✉ , Seong-Whan Lee [e] 👤 ✉

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Highlights

- This study provides detailed analysis of well-known datasets for EEG-based human emotions in arousal-valence domain.

- The proposed method extracts the EEG feature-sets by using Hjorth-parameters under a frequency range between 4–45 Hz, and further selected optimal features by using the bagged-decision trees.

- Hjorth-activity with random-forest were shown the best emotion recognition rates of approx. 69%, 76%, 85%, 59%, 87% for DEAP, SEED-IV, DREAMER, SELEMO, ASCERTAIN, respectively.

- This study helps researchers to further analyze internal brain states and the external context-sensitive understandings of human emotions.

Abstract

EEG-based emotion recognition enables investigation of human brain activity, which is recognized as an important factor in brain-computer interface. In recent years, several methods have been studied to find optimal features from brain signals. The main limitation of existing studies is that either they consider very few emotion classes or they employ a large feature set. To overcome these issues, we propose a novel Hjorth-feature-based emotion recognition model. Unlike other methods, our proposed method explores a wider set of emotion classes in the arousal-valence domain. To reduce the dimension of the feature set, we employ Hjorth parameters (HPs) and analyze the parameters in the frequency domain. At the same time, our study was focused to maintain the accuracy of emotion recognition for four emotional classes. The average accuracy was approximately 69%, 76%, 85%, 59%, and 87% for DEAP, SEED-IV, DREAMER, SELEMO, and ASCERTAIN, respectively. Results show that the features from HP activity with random forest outperforms all the classic methods of EEG-based emotion recognition.

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Introduction

Emotions play a key role in human daily life. For example, emotions are directly influenced by the learning and decision-making processes. They can affect the moods and emotional states psychologically [1]. Emotions may affect human behavior and subjective experiences [2]. Current trends show the significance of emotion recognition in people's daily activities [3], [4], [5]. Brain signals are one of the best sources to identify human affective states [6], [7], [8].

To understand affective states, the main challenge is how to minimize the barriers between humans and computers. It would be possible only by developing emotion-oriented systems that understand and respond to human emotions intelligently [4]. To induce feelings in the human brain, stimulating the subject through visual or audio interfaces is recommended. To record emotion-based brain signals, researchers employed either invasive or non-invasive methods. Electroencephalography (EEG) is a non-invasive method. Due to its better performance in accuracy and objective evaluation, it is regularly useful for the recording of human brain signals [9], [10], [11].

 Back

Banana Plant Disease Classification Using Hybrid Convolutional Neural Network

K. Lakshmi Narayanan, R. Santhana Krishnan, Y. Harold Robinson, E. Golden Julie, S. Vimal,
V. Saravanan , M. Kaliappan

Abstract

Banana cultivation is one of the main agricultural elements in India, while the common problem of cultivation is that the crop has been influenced by several diseases, while the pest indications have been needed for discovering the infections initially for avoiding the financial loss to the farmers. This problem will affect the entire banana productivity and directly affects the economy of the country. A hybrid convolution neural network (CNN) enabled banana disease detection, and the classification is proposed to overcome these issues guide the farmers through enabling fertilizers that have to be utilized for avoiding the disease in the initial stages, and the proposed technique shows 99% of accuracy that is compared with the related deep learning techniques.

1. Introduction

Agriculture is the crucial resource of food for mankind, and it is one of the important factors that decide the economy of a country. Agriculture is considered the main source of income for most developing countries. One of the important parts of the global agro-business is the banana cultivation or banana industry because bananas are rich in minerals such as calcium, manganese, potassium, magnesium, and iron. As this particular crop is having these many vitamins, they are consumed by people all over the world as banana is considered an instant energy booster. As per the statistics from Wikipedia, about 15% of the global banana productions are exported to western countries for consumption. As per the production and export statistics of bananas, about 25.7% of the global banana production is from India, and other major producers of bananas are the Philippines, Ecuador, Indonesia, and Brazil giving a combined contribution of about 20% of the global banana production. The United States is the leading importer of bananas of about 18% of the global imports.

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ADVANCED SEARCH

Computation Offloading and Service Caching for Intelligent Transportation Systems With Digital Twin

Publisher: IEEE   **Cite This**   📄 **PDF**

Xiaolong Xu   ; Zhongjian Liu   ; Muhammad Bilal   ; S. Vimal   ; Houbing Song   **All Authors** •••

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Abstract

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Mobile edge computing (MEC) provides a novel computing paradigm to satisfy the increasing computation requirements of mobile applications. In MEC-enabled intelligent tran... **View more**

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Abstract:
Mobile edge computing (MEC) provides a novel computing paradigm to satisfy the increasing computation requirements of mobile applications. In MEC-enabled intelligent transportation systems (ITS), the latency-sensitive computing tasks are offloaded to RSUs for execution, reducing the transmission latency compared with the cloud solutions. However, the repetitive executions of the same tasks whose outputs are dependent on the inputs lead to the extra system latency, an alternative is to cache the required services on RSUs in advance. The service requirements of latency-sensitive computing tasks are satisfied by jointly considering computation offloading and service caching. Besides, the digital twin (DT) is utilized to construct the virtual world reflecting the physical world in real-time to efficiently make offloading strategies. In this paper, a computation offloading and service caching method using decision theory in ITS with DT, named CODT, is proposed. Specifically, the computation offloading and service caching in ITS is modeled first with DT. Then, a mixed-integer nonlinear programming (MINLP) problem is formulated to minimize the system latency. Afterward, the decision theory is used to analyze the utilities of offloading strategies in different states of RSUs and make the optimal strategy. Finally, extensive simulations based on the real-world datasets demonstrate that the proposed CODT outperforms other baselines.

Back

ORIGINAL ARTICLE

Development of intelligent and integrated technology for pattern recognition in EMG signals for robotic prosthesis command

Yongzhao Xu, Paulo C. S. Barbosa, Joel S. da Cunha Neto, Lijuan Zhang, Vimal Shanmuganathan 🖂,
Victor Hugo C. de Albuquerque 🖂, Subbulakshmi Pasupathi 🖂

Abstract

Prostheses play an important role in the rehabilitation of people who have suffered some type of amputation. However, due to its high-cost and high complexity in performing movements of everyday tasks, users of these prostheses may encounter many difficulties. Therefore, this work proposes the development of a future artificial intelligence technology based on a low-cost functional prosthesis prototype (manufactured in a 3D printer). In the present work, we describe an intelligent system that uses an artificial neural network to recognize patterns in muscle biopotential signals in order to control a prosthesis prototype in real time. Such a system is divided into three parts: the first that performs a human-machine integration through a graphical user interface; the second that performs the signal acquisition; the third that performs the training and generalization steps of the artificial neural network. The developed interface runs on a web application that has a database hosted in the cloud and in it the system user can: Acquisition of electromyography signals; Training phase of the artificial neural network; Sends the matrix of weights of the trained network to the microcontroller; Activates in the microcontroller, the state of action of the commands from the identified gestures. To compose the results of the present work, a search was initially carried out for the ideal parameters of the artificial neural network through signals obtained from 20 volunteers. In this step, it was possible to identify the topology that best classifies the signals of each gesture, as well as the investigation of the number of neurons in the hidden layer that causes a low generalization power due to overfitting. At the end of the project, it was possible to validate the use of the system with 15 new volunteers, and it

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Artificial Intelligence in Medicine

Harmony search: Current studies and uses on healthcare systems

Maryam T. Abdulkhaleq [a k], Tarik A. Rashid [a], Abeer Alsadoon [b c], Bryar A. Hassan [d] ,
Mokhtar Mohammadi [e], Jaza M. Abdullah [f g], Amit Chhabra [h], Sazan L. Ali [a],
Rawshan N. Othman [a], Hadil A. Hasan [a], Sara Azad [a], Naz A. Mahmood [a], Sivan S. Abdalrahman [a]
, Hezha O. Rasul [i], Nebojsa Bacanin [j], S. Vimal [j]

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Highlights

- The variants of HS, including its modifications and hybridization.

- Summary of previous review works.

- Applications of HS in healthcare systems.

- An operational framework is proposed on the applications of HS in healthcare systems.

Abstract

One of the popular metaheuristic search algorithms is Harmony Search (HS). It has been verified that HS can find solutions to optimization problems due to its balanced

exploratory and convergence behavior and its simple and flexible structure. This capability makes the algorithm preferable to be applied in several real-world applications in various fields, including healthcare systems, different engineering fields, and computer science. The popularity of HS urges us to provide a comprehensive survey of the literature on HS and its variants on health systems, analyze its strengths and weaknesses, and suggest future research directions. In this review paper, the current studies and uses of harmony search are studied in four main domains. (i) The variants of HS, including its modifications and hybridization. (ii) Summary of the previous review works. (iii) Applications of HS in healthcare systems. (iv) And finally, an operational framework is proposed for the applications of HS in healthcare systems. The main contribution of this review is intended to provide a thorough examination of HS in healthcare systems while also serving as a valuable resource for prospective scholars who want to investigate or implement this method.

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Background and introduction

Before the year 2001, several search algorithms were already introduced and applied in different fields of applications. HS is one of the search algorithms that Zong Woo Geem has introduced. His vision was to develop a better-performing algorithm as an alternative to the other predefined algorithms. The intention of designing the algorithm is to have a generalized optimization technique for continuous, constrained, and discrete optimization in several types of optimization problems. Both the…

Current trends of HS

Since its first publication in a peer-reviewed journal, HS has established itself as a well-known population-based optimization method due to its broad adoption [23]. Since then, it has received widespread acceptance in various technical and medical sectors, as shown by many publications, as seen in Fig. 1. As demonstrated by the number of papers on the technique's use since 2012 and the number of significant algorithm structure adjustments since 2006, there has been a sustained and rising…

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Farhana Ajaz, Mohd Naseem, Sparsh Sharma, Gaurav Dhiman, Mohammad Shabaz and S. Vimal

ABOUT

Abstract

Modern vehicles should be able to commute a tremendous amount of data and information within their neighbourhood. To incorporate the requirements of modern vehicles, the conventional vehicular ad hoc network (VANETs) are emerging to the internet of vehicles (IoV). IoV keeps all the smart vehicles connected with the help of sensors, GPS, entertainment system, brakes and throttles. These devices send and store their data with the help of cloud. This paper intends to contribute to the review of IoV, its challenges, characteristics and application. A detail discussion on architectures and routing protocols along with its classification is also discussed. This paper ought to guide and motivate researchers working in the area of IoV to develop scalable and efficient routing protocols.

Keywords

internet of vehicles, IoV, internet of things, IoT, routing protocols, architecture, vehicular ad hoc networks, VANETs, mobile ad hoc networks, MANETs, cloud computing, fog computing

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Improved Fitness Dependent Optimizer for Solving Economic Load Dispatch Problem

Hussein Tahir, Barzan ; **Rashid, Tarik A.** ; **Tayyab Rauf, Hafiz** ; **Bacanin, Nebojsa** ; **Chhabra, Amit** ; **Vimal, S.** ;
Mundher Yaseen, Zaher

Economic Load Dispatch depicts a fundamental role in the operation of power systems, as it decreases the environmental load, minimizes the operating cost, and preserves energy resources. The optimal solution to Economic Load Dispatch problems and various constraints can be obtained by evolving several evolutionary and swarm-based algorithms. The major drawback to swarm-based algorithms is premature convergence towards an optimal solution. Fitness Dependent Optimizer is a novel optimization algorithm stimulated by the decision-making and reproductive process of bee swarming. Fitness Dependent Optimizer (FDO) examines the search spaces based on the searching approach of Particle Swarm Optimization. To calculate the pace, the fitness function is utilized to generate weights that direct the search agents in the phases of exploitation and exploration. In this research, the authors have carried out Fitness Dependent Optimizer to solve the Economic Load Dispatch problem by reducing fuel cost, emission allocation, and transmission loss. Moreover, the authors have enhanced a novel variant of Fitness Dependent Optimizer, which incorporates novel population initialization techniques and dynamically employed sine maps to select the weight factor for Fitness Dependent Optimizer. The enhanced population initialization approach incorporates a quasi-random Sabol sequence to generate the initial solution in the multi-dimensional search space. A standard 24-unit system is employed for experimental evaluation with different power demands. Empirical results obtained using the enhanced variant of the Fitness Dependent Optimizer demonstrate superior performance in terms of low transmission loss, low fuel cost, and low emission allocation compared to the conventional Fitness Dependent Optimizer. The experimental study obtained 7.94E-12.

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LAKE-BSG: Lightweight authenticated key exchange scheme for blockchain-enabled smart grids

Akhtar Badshah [a], Muhammad Waqas [b f], Ghulam Abbas [a c], Fazal Muhammad [d], Ziaul Haq Abbas [a e], S. Vimal [g], Muhammad Bilal [h]

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Abstract

The Smart grid employs information and communication networks to collect data on energy production and consumption, and then utilize it to improve efficiency, reliability, economic benefit, power generation, and distribution sustainability. However, in SG networks the components communicate over insecure public channels, raising severe security concerns. Likewise, the security challenge is growing more difficult with the introduction of virtual solutions in SG networks. Thus, we devise a new scheme, named lightweight authenticated key exchange scheme for a blockchain-enabled SG environment (LAKE-BSG), which permits secure communication among smart meters (SMs) and service providers (SPs). In the proposed scheme, data is kept secured in a blockchain network. SPs are liable for verifying new blocks in the private blockchain through a consensus algorithm. We provide a detailed security analysis of LAKE-BSG through informal security analysis, formal security analysis using the real oracle model, and formal security verification using the Scyther tool. The results demonstrate that the devised scheme is resilient towards various security attacks in an SG environment. Furthermore, an exhaustive comparative analysis reveals that LAKE-BSG is efficient in

⟨ Back

ORIGINAL ARTICLE

An AI powered system call analysis with bag of word approaches for the detection of intrusions and malware in Australian Defence Force Academy and virtual machine monitor malware attack data set

Appu Alfred Raja Melvin ⬚, Gnanaraj Jaspher W. Kathrine, Subbulakshmi Pasupathi, Vimal Shanmuganathan, Rajalingam Naganathan

Abstract

This study propose the use of AI enabled machine learning algorithms with the Bag-of-Word (BoW) methods for the detection of intrusions by analysing the system call patterns. Host based Intrusion Detection System can make use of system call patterns to differentiate between normal and anomalous program behaviours. First, the system call patterns are pre-processed with different approaches like BoW, BoW with Boolean value, BoW with Probability value and BoW with TF-IDF. Next machine learning algorithms are used to evaluate the performance of classifier models. We used J48 (C4.5), Random Forrest, RIPPER, KNN, SVM, and NaiveBayes ML algorithms. This process was carried out on ADFA-LD and on our proposed virtual machine monitor (VMM) malware attack data set for analysis. The proposed work is evaluated based on detection accuracy and false alarm rate metrics. Random Forrest algorithm performs better compared with other ML algorithms in terms of intrusion detection accuracy and false alarm rate on ADFA and VMM malware data set. The proposed data set provide better results compared with ADFA-LD analysed using ML algorithms. The classifier model trained with ADFA and VMM

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Abstract

Optical communication system is preferred over microwave and radio frequency communication system because of license free operation. Simulative analysis of 10gbps Optical Communication using different optical bands of L–Band S–Band, E–Band and C–Band under different attenuation condition has been performed in this paper. The Free Space Optics system has been analyzed with transmission distance of 1 km using Optical Wireless Communication channel and the effect of variation in attenuation value in the scenario of different weather conditions (clear, haze, rain and fog) were also examined. The Optical Fiber Communication is also examined under conditions of attenuations due

Computation Offloading and Service Caching for Intelligent Transportation Systems With Digital Twin

Xiaolong Xu , *Member, IEEE*, Zhongjian Liu, *Graduate Student Member, IEEE*,
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Abstract— Mobile edge computing (MEC) provides a novel computing paradigm to satisfy the increasing computation requirements of mobile applications. In MEC-enabled intelligent transportation systems (ITS), the latency-sensitive computing tasks are offloaded to RSUs for execution, reducing the transmission latency compared with the cloud solutions. However, the repetitive executions of the same tasks whose outputs are dependent on the inputs lead to the extra system latency, an alternative is to cache the required services on RSUs in advance. The service requirements of latency-sensitive computing tasks are satisfied by jointly considering computation offloading and service caching. Besides, the digital twin (DT) is utilized to construct the virtual world reflecting the physical world in real-time to efficiently make offloading strategies. In this paper, a <u>c</u>omputation <u>o</u>ffloading and service caching method using <u>d</u>ecision theory in ITS with D<u>T</u>, named CODT, is proposed. Specifically, the computation offloading and service caching in

ITS is modeled first with DT. Then, a mixed-integer nonlinear programming (MINLP) problem is formulated to minimize the system latency. Afterward, the decision theory is used to analyze the utilities of offloading strategies in different states of RSUs and make the optimal strategy. Finally, extensive simulations based on the real-world datasets demonstrate that the proposed CODT outperforms other baselines.

Index Terms— Computation offloading, digital twin, intelligent transportation systems, decision theory, service caching.

I. INTRODUCTION

THE development of Intelligent Transportation Systems (ITS) diversifies vehicular services, e.g., route planning, augmented reality (AR), and autonomous driving [1]. Those services are almost sensitive to latency and require to consume many computation resources. However, the limited computation capacities in vehicles fail to meet the requirements of services, increasing the processing delay of services and degrading the quality of service (QoS) [2]. A potential method is to offload the computing tasks to the cloud server, where the tasks are executed with adequate computation resources. Nevertheless, the service latency is hardly guaranteed because of the remote distance between vehicles and the cloud server.

Recently, mobile edge computing (MEC), emerging as a computing paradigm, can efficiently provide users with latency-sensitive services [3]. In MEC-enabled ITS, the roadside units (RSUs) are deployed along the roads, processing computing tasks close to users [4]. Therefore, most of the computing tasks can be offloaded to RSUs for execution, which decreases the service latency and mitigates the workload on the cloud server [5]. Nevertheless, the computing tasks whose requirements exceed the computation capacity of RSUs are still offloaded to the cloud server due to the limited computation resources on RSUs. Besides, to balance the workload on RSUs, the tasks offloaded to RSUs may be offloaded again to other RSUs [6]. As mentioned above, it is necessary for different computing tasks to determine reasonable offloading strategies.

In ITS, the computing tasks are executed with the computation resources on RSUs to return the feedback to the

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Deep learning algorithms can summarize images to understand how to carry out necessary tasks. The purpose of this study is to compare several deep learning methods. Both experience-based and explanation-based learning are possible in deep learning. The most widely utilized algorithms, such as Convolutional Neural Networks (CNN), Multilayer Perceptron (MLP), Generative Adversarial Networks (GAN), Radial Basis Function Networks (RBFN), and Deep Belief Networks (DBN), and the Diabetic Retinopathy dataset is utilized in this study to evaluate the effectiveness of the algorithms. A comparative study of the classifiers reveals that CNN performs more accurately than the other approaches.

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Quantum computing has emerged as both a boon and a bane in the realm of network security. This paper delves into the intriguing interplay between quantum computing and the vulnerabilities of Quantum Key Distribution (QKD) protocols, a cornerstone of secure quantum communication. While QKD offers unmatched security through the principles of quantum mechanics, it is not impervious to attacks in the age of rapidly advancing quantum computing. We examine these vulnerabilities, highlighting the challenges of ensuring the long-term security of quantum networks in a post-quantum world. Through a comprehensive exploration of threat models and the practicality of QKD, we uncover potential weaknesses in quantum network security. In particular, we investigate QKD's susceptibility to evolving quantum algorithms, hardware vulnerabilities, and post-processing security concerns. This work aims to provide a roadmap for understanding and addressing these vulnerabilities, ensuring the continued robustness of quantum communication networks, and fostering the development of post-quantum cryptographic solutions. As quantum computing advances, its implications for quantum network security are far-reaching. This study underlines the critical need for research and innovation in securing quantum communication. By unravelling the vulnerabilities within Quantum Key Distribution and exploring post-quantum cryptographic alternatives, this research contributes to the development of more resilient and secure quantum networks, safeguarding sensitive information and communications in an increasingly quantum-enabled world.

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Abstract:

Aircraft engines are critical, therefore any move to make them safer, more reliable, and fuel-efficient is highly encouraged. To solve the challenges of flight safety and maintenance expense during aircraft engine operation, a prognostics and health management system is deployed. This system is primarily concerned with flaw detection, health evaluation, and life prediction. Making decisions about aircraft engine operation and maintenance is strongly reliant on estimating the remaining useful life (RUL). This study provides an ensemble transfer learning model for RUL prediction using the C-MAPSS turbofan engine dataset. Pre-processing procedures such as filtering and normalization are used to improve the dataset. The proposed ensemble model for RUL prediction is then trained on the processed data. Some of the well-known transfer learning models that are compared include Xception, ResNet-50, and VGG-16. The ensemble model outperforms the other models, with the highest R2 value of 0.9901. Furthermore, the ensemble model is very effective; it can predict RUL in just 37 seconds, which suggests that it could be useful for keeping an eye on engine health and making decisions about aircraft.

Development of Advanced Noise Filtering Techniques for Medical Image Enhancement

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Abstract— **Medical imaging modalities, including computed tomography (CT), magnetic resonance imaging (MRI), X-rays, and ultrasound, are extensively employed in the healthcare industry for diagnostic purposes. Noise, on the other hand, can disturb these approaches and lead to inaccurate diagnosis. Due to this problem, the significance of noise removal technologies has grown in the field of medical imaging, specifically for the examination and understanding of medical images and anatomical structures. To tackle these challenges, a variety of denoising techniques have been developed, such as the Weiner filter (WF), Gaussian filter, and median filter. This work employs a Deep Learning (DL) method known as Convolutional Autoencoder (CAE) to remove noise from medical images. We gather chest X-ray images for analysis and focus on common noise types that affect medical images, such as Poisson and Gaussian noise. We evaluate the effectiveness of the suggested denoising method CAE by comparing it to the commonly employed WF methodology. The Structural Similarity Index (SSIM) and Peak Signal-to-Noise Ratio (PSNR) are employed to assess and compare the performance of the WF and CAE in reducing Poisson and Gaussian noise. The study's findings indicate that the suggested denoising method based on CAE shows promising results in terms of improving quality.**

Keywords— *Gaussian Noise, Medical Image, Convolutional Auto Encoder, Filter, Peak Signal to Noise Ratio*

I. INTRODUCTION

In recent decades, medical imaging and diagnostic instruments have undergone significant advancements and are now essential elements in the process of disease diagnosis [1]. Obtaining an insider's perspective of the body is impossible without medical images, which provide information on the heart, brain, nerves, and other organs. By applying multiple mathematical algorithms to medical images, one can potentially determine whether or not wholesome tissue has been compromised. However, if even a single region is overlooked during medical imaging, a catastrophic outcome, such as mortality, is possible. The most difficult aspect of medical imaging is obtaining an image without significant information loss. Medical imaging includes radiography, thermography, endoscopy, medical photography, and microscopy [2]. It is critical in diagnostics, research, and related sectors. These images may contain noise due to both the acquisition and transmission methods. Background noise, blood flow, body fat, breathing motions, different sorts of noise, etc. can all cause medical images to be distorted or damaged. To improve the image class, it is critical to eliminate noise from the image [3]. Researchers are continuously trying to figure out the optimal way for image denoising. The removal of noise from an image is a repair method. Using previous data on the deterioration process, it is possible to try image recovery after corruption

To denoise images, academics have suggested a variety of filtering methods. The paper [4] proposed a network evolution framework for optimizing network architectures and hyperparameters using Differential Evolution (DE). Finding the best-fitting parameters is the goal of this model. They also used a transfer learning method to speed up the training procedure. By utilizing popular methodologies like dense blocks and residuals, the proposed algorithm finds optimistic network topologies while remaining flexible. Afterward, multiple medical picture datasets were used to assess the proposed model. The outcomes achieved with varying degrees of noise show that the suggested DEvoNet framework can select the right parameters to construct a robust denoising network. The primary objectives of the spatial filtering techniques outlined in this research article [5] are enhanced contrast and edge retention. This article focuses on pre-processing algorithms that improve the PSNR ratio, a key property of every image. For speckle noise reduction at different densities, the best PNSR values were achieved by the Wiener and Noise Adaptive Fuzzy Switching Median