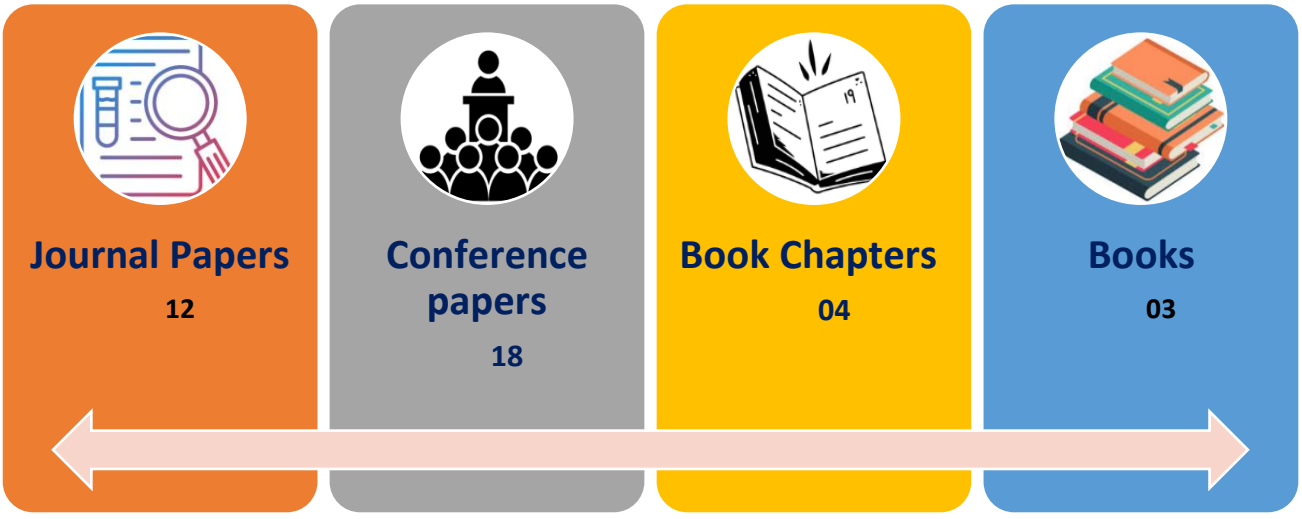
PCET's Pimpri Chinchwad College of Engineering and Research, Ravet, Pune

E&TC Publication Booklet

(A.Y. 2024-25)



Department of Electronics and Telecommunication, PCCOER, Ravet, Pune

Index

Summary of Publication

Department-wise Summary of publications (A.Y. 2024-25)

Sr. No.	Department	Publications				
		Journal	Conference	Book Chapter	Books	Total
1	Electronics and Telecommunication	12	18	4	03	37

Summary of Publications

Journal Paper Indexing	
WoS (SCI/ESCI/SCIE)	**00**
Scopus	**11**
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Conference Paper	
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International Conference	**18**
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List of Journal Publication

Sr. No	Paper Id	Department	Title of Article	Author(s)	Journal Name	Volume	Issue	Pages	DOI	Indexing
1	JP202425_ETC_1	Department of Electronics and Telecommunication Engineering	Unpaired recurrent learning for real-world video de-hazing	Patil P.W.;Randive S.N.;Gupta S.;Rana S.;Venkatesh S.;Murala S.	Pattern Recognition	166	-	-	10.1016/j.patcog.2025.111698	Scopus,
2	JP202425_ETC_2	Department of Electronics and Telecommunication Engineering	Lightweight progressive recurrent network for video de-hazing in adverse weather conditions	Shaikh J.A.H.;Mukane S.M.;Randive S.N.	Visual Computer	41	7	4661-4672	10.1007/s00371-024-03683-x	Scopus,
3	JP202425_ETC_3	Department of Electronics and Telecommunication Engineering	Sewage water management and healthcare monitoring in IoT using Optimized deep residual network	Shende D.;Angal Y.S.	Journal of Experimental and Theoretical Artificial Intelligence	37	5	821-844	10.1080/0952813X.2023.2300004	Scopus,
4	JP202425_ETC_4	Department of Electronics and Telecommunication Engineering	An efficient fault diagnosis model using Lappet Falco optimisation based on a deep neural network for the VSI under varying load conditions	Baste V.;Shende D.;Idhate S.;Deshpande A.	International Journal of Power Electronics	21	3	247-278	10.1504/IJPELEC.2025.145951	Scopus,
5	JP202425_ETC_5	Department of Electronics and Telecommunication Engineering	A novel two-way feature extraction technique using multiple acoustic and wavelets packets for deep learning based speech emotion recognition	Bhangale K.B.;Kothandaraman M.	Multimedia Tools and Applications	84	15	14529-14552	10.1007/s11042-024-19674-y	Scopus,
6	JP202425_ETC_6	Department of Electronics and Telecommunication	Comparison of dual isolated converters with flyback converters for bidirectional	Mapari R.;Bhangale K.;Kadlag S.S.;Shriwastava R.	International Journal of Applied Power Engineering	14	1	55-63	10.11591/ijape.v14.i1.pp55-63	Scopus,

		Engineering	energy transfer							
7	JP202425_ETC_7	Department of Electronics and Telecommunication Engineering	Novel 2-D Wavelet-Based Spectral-Temporal Representation for Deep Learning Based Stress Detection Using EEG Signal	Dhake D.;Angal Y.	Circuits Systems and Signal Processing	-	-	-	10.1007/s00034-025-03230-6	Scopus,
8	JP202425_ETC_8	Department of Electronics and Telecommunication Engineering	Design and analysis of spin-based logic gates for enhancing computational efficiency	Rajput P.J.;Bhandari S.U.;Malik G.F.A.	Journal of Theoretical and Applied Information Technology	103	9	3866-3876		Scopus,
9	JP202425_ETC_9	Department of Electronics and Telecommunication Engineering	A Novel Optimized Hybrid Deep Learning Framework for Mental Stress Detection Using Electroencephalography	Andhare M.S.;Vijayan T.;Karthik B.;Urooj S.	Brain Sciences	15	8	835	10.3390/brainsci15080835	Scopus,
10	JP202425_ETC_10	Department of Electronics and Telecommunication Engineering	Person identification using novel local triangular binary pattern-based texture descriptor	Arti Tekade, T. Vijayan, B. Karthik and Anurag Mahajan	EURASIP Journal on Advances in Signal Processing	-	-	1-14	https://doi.org/10.1186/s13634-025-01213-y	Scopus,
11	JP202425_ETC_11	Department of Electronics and Telecommunication Engineering	Commercial Automation Using RTOS-Based Architecture	Dr. Dipali Shende,Mrs. Vaishali Baste, Mrs. Shital More	Journal of Advancement in Electronics Design	7	-	39-51	10.5281/zenodo.11483444	NA
12	JP202425_ETC_12	Department of Electronics and Telecommunication Engineering	Speech Emotion Recognition Using Generative Adversarial Network and Deep Convolutional Neural Network	Bhangale, Kishor and Kothandaraman, Mohanaprasad	Circuits, Systems, and Signal Processing	43	-	2341--2384	-	Scopus,

List of Conference Publication

Sr. No	Paper ID	Department	Author(s)	Conference Paper Title	Conference Name	volume	Page No	International/ National	DOI	Date of Conefrence (Month-Year)	Location of Confe-rence	Indexing
1	CP202425_ ETC_1	Department of Electronics and Telecommunic ation Engineering	Deshmukh A.;Khan A.;Patil V.;Bhangale K.	FPGA Implementation for Speech Feature Extraction in Real Time	2025 International Conference on Computing Technologies Icoct 2025	-	-	International	10.1109/ICOCT64433. 2025.11118733	13-14 June 2025	Bengaluru , India	Scopus,
2	CP202425_ ETC_2	Department of Electronics and Telecommunic ation Engineering	Deshmukh A.;Khan A.;Patil V.;Bhangale K.	Real Time FPGA Implementation for Speech Feature Extraction	2025 6th International Conference for Emerging Technology Incet 2025	-	-	International	10.1109/INCET64471. 2025.11140105	23-25 May 2025	Bengaluru , India	Scopus,
3	CP202425_ ETC_3	Department of Electronics and Telecommunic ation Engineering	Gaikwad A.;Narawade G.;Sable S.;Mapari R.;Kawade R.;Bhangale K.	6 Degree of Freedom Robotic-Arm Using Gesture Control	2025 International Conference on Computing Technologies Icoct 2025	-	-	International	10.1109/ICOCT64433. 2025.11118735	13-14 June 2025	Bengaluru , India	Scopus,
4	CP202425_ ETC_4	Department of Electronics and Telecommunic ation Engineering	Kawade R.;Kale A.;Chalmeti S.;Mapari R.	Sortify- An Autonomous Voice Controlled 6 DOF Robotic Arm for Object Detection And Sorting	2025 5th International Conference on Intelligent Technologies Conit 2025	-	-	International	10.1109/CONIT65521. 2025.11167579	20-22 June 2025	HUBBALI, India	Scopus,
5	CP202425_ ETC_5	Department of Electronics and Telecommunic ation	Andhare M.;Dhoble P.R.;Patil S.A.;Naik I.M.;Pathrikar	Implementation of Central Gateway with SOME/IP	2025 International Conference on Computing Technologies Icoct 2025	-	-	International	10.1109/ICOCT64433. 2025.11118488	13-14 June 2025	Bengaluru , India	Scopus,

		Engineering	V.									
6	CP202425_ETC_6	Department of Electronics and Telecommunication Engineering	Badgujar V.;Panse A.;Mohite M.;Bedse S.;Lanjulkar P.;Kumbhar V.;Tekade A.;Andhare M.	Sustainable Agriculture Using Machine Learning and IoT	2024 15th International Conference on Computing Communication and Networking Technologies Icccnt 2024	-	-	International	10.1109/ICCCNT61001.2024.10725625	24-28 June 2024	Kamand, India	Scopus,
7	CP202425_ETC_7	Department of Electronics and Telecommunication Engineering	Dr. Dipali Shende	Whether Monitoring and Analysis Using GUI	ConvergenceX:Uniting the World Through IoT and AI Innovation	-	-	International	-	April, 2024	PCCOER, Pune	NA
8	CP202425_ETC_8	Department of Electronics and Telecommunication Engineering	Dipali Kedar Shende,Vaisahali Baste,Shital More	Commercial Automation Using RTOS-Based Architecture	ConvergenceX:Uniting the World Through IoT and AI Innovation	-	-	International	-	April, 2024	PCCOER, Pune	NA
9	CP202425_ETC_9	Department of Electronics and Telecommunication Engineering	Adke P.;Kushwaha A.K.;Khatavkar S.M.;Shende D.	Use of Improved Generative Adversarial Network (GAN) Under Insufficient Data	Lecture Notes of the Institute for Computer Sciences Social Informatics and Telecommunications Engineering Lnicst	536	288-299	International	10.1007/978-3-031-48888-7_24	April 5–7, 2024	Bhimavaram, India,	Scopus,
10	CP202425_ETC_10	Department of Electronics and Telecommunication Engineering	Bhangale K.;Kadam S.;Chame S.;Saklikar H.	Machine Learning Based Heart Disease Prediction Using ECG Image	2024 5th International Conference for Emerging Technology Incet 2024	-	-	International	10.1109/INCET61516.2024.10593572	24-26 May 2024	Belgaum, India	Scopus,
11	CP202425_ETC_11	Department of Electronics and Telecommunication	Raghupathy M.;Salunkhe S.;Dhende S.;Bhangale K.;Dhake D.	Neural Stress Mapping with Machine Learning from EEG Data	Communications in Computer and Information Science	2234 CCIS	56-71	International	10.1007/978-3-031-74682-6_5	14 June, 2024	Navi Mumbai, India	Scopus,

		Engineering										
12	CP202425_ETC_12	Department of Electronics and Telecommunication Engineering	Dharmadhikari S.;Raina A.;Chaskar S.;Bhangale K.;Mogal A.;Awasarmol P.;Bhatkar M.;Mapari R.	Smart IoT Based Real Time Crop Monitoring and Spectrum Management for Hydroponic System	2024 4th Asian Conference on Innovation in Technology Asiancon 2024	-	-	International	10.1109/ASIANCON62057.2024.10838172	23-25 August 2024	Pimari Chinchwad, India	Scopus,
13	CP202425_ETC_13	Department of Electronics and Telecommunication Engineering	Shete A.;Gupta A.;Waghumbare A.;Singh U.;Dhamale T.;Napte K.	Human Activity Prediction Using Generative Adversarial Networks	2024 15th International Conference on Computing Communication and Networking Technologies Icccnt 2024	-	-	International	10.1109/ICCCNT61001.2024.10726013	24-28 June 2024	Kamand, India	Scopus,
14	CP202425_ETC_14	Department of Electronics and Telecommunication Engineering	Sital P.S.;Chavan S.;Borse K.;Singh R.K.;Shukla S.;Dhamale T.;Napte K.	Compact and Planar Sinuous Antenna operating in the Wide Band Frequency Range	2024 4th Asian Conference on Innovation in Technology Asiancon 2024	-	-	International	10.1109/ASIANCON62057.2024.10838051	23-25 August 2024	Pimari Chinchwad, India	Scopus,
15	CP202425_ETC_15	Department of Electronics and Telecommunication Engineering	Pagare A.;Shewalkar S.;Yadav S.;Dhake D.	Simulation and Analysis of Solar-Powered Electric Golf Cart	2024 4th Asian Conference on Innovation in Technology Asiancon 2024	-	-	International	10.1109/ASIANCON62057.2024.10837826	23-25 August 2024	Pimari Chinchwad, India	Scopus,
16	CP202425_ETC_16	Department of Electronics and Telecommunication Engineering	Pagare A.;Shewalkar S.;Yadav S.;Dhake D.	Comprehensive Analysis of Solar-Powered Electric Carts	2024 IEEE 3rd International Conference on Electrical Power and Energy Systems Icepes 2024	-	-	International	10.1109/ICEPES60647.2024.10653569	21-22 June 2024	Bhopal, India	Scopus,
17	CP202425_ETC_17	Department of Electronics and	Adke P.;Kushwaha A.K.;Kshirsag	Enlighten GAN for Super-Resolution Images from	Lecture Notes of the Institute for Computer Sciences Social	536	433-445	International	10.1007/978-3-031-48888-7_37	April 5–7, 2024	Bhimavaram, India,	Scopus,

		Telecommunication Engineering	ar P.;Hadawale M.;Gaikwad P.	Surveillance Car	Informatics and Telecommunications Engineering Lnicst							
18	CP202425_ETC_18	Department of Electronics and Telecommunication Engineering	Rajput P.J.;Bhandari S.U.;Khurge D.	Design of Spin-FET Electrical Model for Basic Gates	VLSI Sata 2024 4th IEEE International Conference on VLSI Systems Architecture Technology and Applications	-	-	International	10.1109/VLSISATA61709.2024.10560268	17-18 May 2024	Bangalore, India	Scopus,

List of Book Chapter Publication

Sr.No.	ID	Department	Title	Author(s)	Corresponding Author	Book Chapter	Volume	Pages	DOI	Scopus Indexed
1	BC202425_ETC_1	Department of Electronics and Telecommunication Engineering	EEG Features Selection by Using Tasmanian Devil Optimization Algorithm for Stress Detection	Dipali Dhake	Evolutionary Artificial Intellignece	Algorithms for Intelligent Systems	245–257	245-257	10.1007/978-981-99-8438-1_18	NA

List of Book Publication

Sr. No	Book ID	Department	Name of the Author	Title of the book/chapters published	National / International	ISBN/ISSN number of the proceeding	Name of the publisher
1	BO202425_ETC_1	Department of Electronics and Telecommunication	Dr. Dipali K. Shende	Machine Learning	International	978-93-6674-194-9	Scientific International Publishing House
2	BO202425_ETC_2	Department of Electronics and Telecommunication	Dr. Dipali K. Shende	Computer Based Optimization	International	978-93-7128-268-0	Global Scholers Press
3	BO202425_ETC_3	Department of Electronics and Telecommunication	Mrs.Maithili Shailesh Andhare	Microprocessor and Microcontrollers	International	978-93-6674-925-9	Scientific International Publishing House

Journal Publications (A.Y. 2024-25)

ScienceDirect

Pattern Recognition
Volume 166, October 2025, 111698

Unpaired recurrent learning for real-world video de-hazing

Prashant W. Patil [a], Santosh Nagnath Randive [b], Sunil Gupta [c], Santu Rana [c], Svetha Venkatesh [c], Subrahmanyam Murala [d]

https://doi.org/10.1016/j.patcog.2025.111698
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Highlights

- Lightweight video de-hazing approach without any additional prior information.
- Proposed a mixed multi-level attentive feature extraction for robust feature learning.
- Proposed a recurrent feature alignment module for temporally consistent video restoration.
- Extensive analysis on real-world and synthetic de-hazing databases with SOTA methods.

Abstract

Automated outdoor vision-based applications have become increasingly in demand for day-to-day life. Bad weather like haze, rain, snow, *etc.* may limit the reliability of these applications due to degradation in the overall video quality. So, there is a dire need to pre-process the weather-degraded videos before they are fed to downstream applications. Researchers generally adopt synthetically generated paired hazy frames for learning the task of video de-hazing. The models trained solely on synthetic data may have limited performance on different types of real-world hazy scenarios due to significant domain gap between synthetic and real-world hazy videos. One possible solution is to prove the generalization ability by training on unpaired data for video de-hazing. Some unpaired learning approaches are proposed for single image de-hazing. However, these unpaired single image de-hazing approaches compromise the performance in terms of temporal consistency, which is important for video de-hazing tasks. With this motivation, we have proposed a lightweight and temporally consistent architecture for video de-hazing tasks. To achieve this, diverse receptive and multi-scale features at various input resolutions are mixed and aggregated with multi-kernel attention to extract significant haze information. Furthermore, we propose a recurrent multi-attentive feature alignment concept to maintain temporal consistency with recurrent feedback of previously restored frames for temporal consistent video restoration. Comprehensive experiments are conducted on real-world and synthetic video databases (REVIDE and RSA100Haze). Both the qualitative and quantitative results show significant improvement of the proposed network with better temporal consistency over state-of-the-art methods for detailed video restoration in hazy weather. Source code is available at: https://github.com/pwp1208/UnpairedVideoDehazing.

Introduction

Fog, snow, rain, and haze are different types of adverse weather conditions that often degrade the quality of videos recorded for computer vision applications such as video surveillance, traffic monitoring, and autonomous driving. These applications routinely

Lightweight progressive recurrent network for video de-hazing in adverse weather conditions

Research Published: 22 October 2024

Volume 41, pages 4661–4672, (2025) Cite this article

The Visual Computer

Aims and scope

Submit manuscript

Javed Aymat Husen Shaikh, Shailendrakumar Mahadev Mukane & Santosh Nagnath Randive

Abstract

Automated outdoor vision-based applications have witnessed a growing demand in everyday life. These applications, ranging from surveillance and traffic management to environmental monitoring and autonomous systems, utilize computer vision and imaging technologies to automate various processes. However, adverse weather conditions such as fog, snow, rain, and haze can severely impair video quality, limiting the performance of automated applications. Therefore, the pre-processing techniques like video de-hazing can improve visibility, ensuring that downstream applications have better performance and reliability. Further, the existing methods rely on computationally heavy networks for the task of video de-hazing. In this work, a lightweight (∼0.24M parameters) progressive recurrent network for video de-hazing is proposed. In that, a multi-kernel feature block is proposed that addresses the challenge of varying haze intensities within frames, allowing the network to adapt and selectively emphasize features based on local haze characteristics. Additionally, a multi-receptive edge extraction block is proposed that enhances edge information by leveraging features learned with different receptive fields, capturing both local and global information. Experimental analysis on various video de-hazing datasets proves the significance of the proposed method over state-of-the-art methods for video de-hazing task. *Testing code is provided in the supplementary material.*

Research Article

Sewage water management and healthcare monitoring in IoT using Optimized deep residual network

Dipali Shende & Yogesh S. Angal

Pages 821-844 | Received 22 Feb 2022, Accepted 20 Nov 2023, Published online: 23 Feb 2024
Cite this article https://doi.org/10.1080/0952813X.2023.2300004 Check for updates

ABSTRACT

The Internet of Things (IoT) is termed as the interconnection of different smart objects with respect to devices. In this research, two different application scenarios are considered to show the efficiency of the Deep Residual Network (DRN) through multicast routing. The entities involved in the process are IoT nodes, IoT heads, and base stations (BS). The nodes are allowed to capture the information, and the collected data are routed to BS through the head node. The process of routing is made using the CrowWhale optimisation algorithm that enables to transfer the data packets from IoT nodes to BS. In the sewage water management system, entering sewage water into fresh water is detected by DRN which is trained using an optimisation algorithm. In the healthcare system, heart disease prediction is done using DRN to detect normal and abnormal cases more effectively. The adopted CrowWhale-ETR+DRN offered energy, accuracy and sensitivity as 82.54, 0.967, and 0.978 with 100 nodes for the environmental protection dataset. The energy, accuracy, and sensitivity obtained by the proposed model are 83.232, 0.964, and 0.974 using 100 nodes for the heart disease dataset, respectively.

KEYWORDS:

Sewage water management healthcare monitoring internet of things (IoT) multicast routing deep residual network (DRN)

An efficient fault diagnosis model using Lappet Falco optimisation based on a deep neural network for the VSI under varying load conditions

Vaishali Baste, Dipali Shende, Seema Idhate and Arya Deshpande

Published Online: April 30, 2025 • pp 247-278 • https://doi.org/10.1504/IJPELEC.2025.145951

Abstract

Numerous industrial applications employ three-phase converters that are based on insulated-gate bipolar transistors (IGBTs). However, the functioning and safety of power electronic devices and loads can be considerably impacted by IGBT faults. Maintaining high-power quality and system availability requires timely and accurate detection of power inverter failures. Constantly monitoring the failures in three-phase voltage source inverter (VSI) has greatly improved maintenance efficiency and stability. Hence, the developed research employs the discrete wavelet transform (DWT) and Lappet Falco optimised deep neural network (LFO-DNN) model to create an open circuit fault detection model for the VSI circuit. Data collection involves extracting features such as three-phase voltage, current, speed, and torque from erroneous data. The DNN classifier trained on these features uses the average three-phase current value to identify faulty switches. The VSI acting as a load with variable frequency reference is connected to a three-phase induction motor. The proposed Lappet Falco optimisation accurately yields impressive results in terms of prediction accuracy of 96.34%, precision of 96.34%, recall of 96.24%, F1 measure of 94.23%, MSE of 3.66, and specificity of 95.28%, demonstrating high efficiency for both 90% training and a k-fold value of 10.

Keywords

voltage source inverter, VSI, insulated-gate bipolar transistors, IGBTs, open circuit fault, deep neural network, DNN, Lappet Falco optimisation, LFO, discrete wavelet transform, DWT

Multimedia Tools and Applications
https://doi.org/10.1007/s11042-024-19674-y

A novel two-way feature extraction technique using multiple acoustic and wavelets packets for deep learning based speech emotion recognition

Kishor B. Bhangale[1] · Mohanaprasad Kothandaraman[2]

Received: 1 August 2023 / Revised: 25 March 2024 / Accepted: 10 June 2024

Abstract
Affective computing is crucial in various Human–Computer Interaction (HCI) and multimedia systems for comprehensive emotional assessment and response. The existing Speech Emotion Recognition (SER) provides limited performance due to inadequate frequency and time domain representation, poor correlation in global and local features, and contextual dependencies of components. The traditional SER techniques often result in poor accuracy due to spectral leakage, low-frequency resolution problems, and poor depiction of emotional speech's pitch, intonation, and voice timbre. This paper presents a novel two-way feature extraction (TWFR) based SER system using 2D-CNN and 1D-CNN to improve the distinctiveness of emotional speech. The first set of features, a 2-D representation of the wavelet packet decomposition (WPD) coefficients, is given to a 2-D Deep Convolution Neural Network (DCNN). The second set of features comprises various time-domain, spectral, and voice-quality features given to 1D-DCNN. The features from the last layer of 2D-DCNN and 1D-DCNN are concatenated and provided to a fully connected layer, followed by a softmax classifier for SER. The results of the TWFR-based SER scheme are assessed on EMODB and RAVDESS datasets based on recall, precision, accuracy, and F1-score. The proposed TWFR-based SER shows an overall accuracy of 98.48% for EMODB and 98.71% for RAVDESS datasets. The proposed TWFR-based SER helps improve the speech's pitch, intonation, and voice timbre in the spectral and time domain for SER and outpaces the current state of the arts.

Keywords Affective computing · Deep convolution neural network · Deep learning · Speech emotion recognition · Speech recognition · Speech analysis · Wavelet transform

✉ Mohanaprasad Kothandaraman
kmohanaprasad@vit.ac.in

[1] Vellore Institute of Technology, Chennai 600127, India

[2] Vellore Institute of Technology, Chennai, India

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Comparison of dual isolated converters with flyback converters for bidirectional energy transfer

Rahul Mapari[1], Kishor Bhangale[1], Sunil Somnath Kadlag[2], Rakesh Shriwastava[3]
[1]Department of Electronics and Telecommunication Engineering, Pimpri Chinchwad College of Engineering and Research, Pune, India
[2]Amrutvahini College of Engineering (AVCOE), Sangamner, India
[3]Department of Electrical Engineering, Govindrao Wanjari College of Engineering and Technology, Nagpur, India

Article Info

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AC-AC converter
CSPWM
DSPic33FJ64mc802 platforms
Fly back converter
Power factor
Total harmonic distortion

ABSTRACT

This article demonstrates a proposed technique for improving single-stage rectifiers' power factor (PF) and controlling the load voltage in response to grid voltage and load changes. To alleviate the above problem, this article offers a novel bi-directional continuous switching pulse width modulation (CSPWM) and sinusoidal pulse width modulation (SPWM) based converter that can improve PF and reduce harmonics. This converter is evaluated based on two cases, Case I: CSPWM-based rectification and SPWM-based inversion scheme, and Case II: Rectification and inversion, both operations using the SPWM scheme. The proposed control scheme uses two Bi-directional IGBTs and two diodes, which are bridgeless, do not need a transformer, and are free from the output current sensor. The suggested scheme is simulated using MATLAB/Simulink and implemented on DSPic33FJ64mc802 platforms to validate the effectiveness of the proposed approach using two cases for a 1 KW system. The suggested control scheme provides improved PF, good voltage regulation, and depreciation in harmonics and total harmonic distortions (THD) compared to existing systems that enhance converter performance.

Corresponding Author:

Rahul Mapari
Department of Electronics and Telecommunication Engineering
Pimpri Chinchwad College of Engineering and Research
Ravet, Pune, Maharashtra, India
Email: rahul.mapari@pccoer.in

1. INTRODUCTION

Most AC-DC power conversion applications need stabilized direct current (DC) output voltage with better steady state and transient response. The capacitor filter-based rectifier is simple and cheap; however, it degrades the supply voltage quality, compromising the response of other loads linked to it and producing other issues [1], [2]. Power electronics researchers have been inventing new ways for a superior efficacy interface since the mid-1980s to achieve these mandated standards. PF correction (PFC) circuits are the collective name for these new circuits. Power converters are essential for microgrids, smart grids, electric vehicles, industrial machinery, and commercial products [3]-[5].

A single-switch rectifier circuit is the most straightforward scheme for hysteresis current control where the band is increased [6], [7]. The two switches rectified have significantly improved over the traditional single ones [8], [9]. The typical AC-DC converter (rectifiers) use diodes but suffer from poor power quality, more considerable voltage distortions, inferior PF at primary input, low effectiveness, and bulky nature of alternating current (AC) and DC filters [10]. The Vienna rectifier generates a DC voltage across the two switches linked to the primary side of the transformer, which is represented by [11]-[13]. Even

Novel 2-D Wavelet-Based Spectral-Temporal Representation for Deep Learning Based Stress Detection Using EEG Signal

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(2025) Cite this article

Circuits, Systems, and Signal Processing

Aims and scope

Submit manuscript

Dipali Dhake & Yogesh Angal

Abstract

A huge growth in global competition and relentless lifestyle leads to mental stress that affects the physical and mental health of people. Stress makes the brain more sensitive and may lead to a variety of illnesses affecting a person's physical, mental, and behavioural health. Since electroencephalogram (EEG) signals are the most straightforward, portable, and economical way to capture brain signals, they are widely employed for mental stress detection and emotion identification. Over the last ten years, a several of deep learning (DL) based stress detection methods have been used. However, inadequate intra-class disparity, insufficient distinguishing traits, poor temporal representation, and inappropriate channel selection restrict the systems' efficacy. In order to improve temporal representation, feature distinctiveness, and intra-inter class disparity, this research describes the use of deep convolutional neural networks (DCNNs) with 2-D wavelet packet transform (WPT) for mental stress detection. Additionally, it employs enhanced Spider Monkey Optimization (ISMO) with two competitive learning strategies—replacement of weak member (RWM) and spiralizer elite learning (SEL)—to improve the diversity of SMO solutions, algorithmic convergence, and the algorithm's search space by striking a balance between exploration and exploitation. The ISMO-WPT-DCNN outperforms the prior state of the arts with an accuracy of 97.54%, recall of 0.99, precision of 0.95, and F1-score of 0.97 for stress detection on the public Database for Emotion Analysis using the Physiological Signals (DEAP).

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DESIGN AND ANALYSIS OF SPIN-BASED LOGIC GATES FOR ENHANCING COMPUTATIONAL EFFICIENCY

PRITI JAGATSING RAJPUT[1,2], SHEETAL U. BHANDARI[1], GUL FAROZ AHMAD MALIK[3]

[1]Department Of Electronics & Telecommunication Pimpri Chinchwad College Of Engineering, Pune, India.
[2]Department Of E&Tc Pimpri Chinchwad College Of Engineering & Research, Ravet, Pune, India.
[3]Department Of Electronics & Instrumentation Technology, University Of Kashmir, Srinagar, Jammu And Kashmir, 190006, India.

Email: [1]priti.Rajput21@Gmail.Com, [2]sheetal.Bhandari@Pccoepune.Org, [3]gfarozam@Gmail.Com

ABSTRACT

Spin transistors (Spin-FETs) are a promising way to solve problems with non-volatility, speed, and power consumption in standard CMOS technology. The Spin-FET electrical model using InAs channel material with 800 nm and 820 nm channel lengths is briefly explained in this paper. Spin-FET local geometry can be used to execute digital logic functions according to the experimental analysis. The local geometry of the spin transistor is designed using the Datta-Das concept and the spin injection and detection theory. It is implemented using the Verilog-A language on a Cadence platform. Transient and DC analysis for various channel lengths have been used to validate the results. The power consumption and capacitance of the complementary spin-FET and conventional CMOS have also been compared. This permits the inverter and buffer gate to function with a complimentary spin-transistor. In contrast to other research, our study presents XNOR and XOR gates that are built using a single gate SFET control input technique. However, our design improves computational efficiency by using a novel technique to regulate spin-based logic gates.

Keywords — *Spin-FET Modeling, Local Geometry, Beyond CMOS Technology, Single Gate Spin-FET, Logic Gates, Complementary Spin-FET.*

1. INTRODUCTION

The researchers pay more attention to finding alternatives for low power consumption in conventional CMOS. The International Technology Roadmap for Semiconductors [1], [2] emphasizes the quest for innovative technologies that can replace complementary metal-oxide-semiconductor (CMOS) technology with lower power consumption and variability. One of the most promising solutions to the power problem beyond current CMOS technology is spintronics, which harnesses the magnetic property of electrons for information processing[3], [4]. In the last 20 years, there has been much interest in research into spin-FET, a fundamental spin-based device described by Datta and Das [5], [6]. The fundamental idea behind a spin-FET is to regulate the spin current passing through a semiconductor channel by applying an additional electric field. Several groups had previously conducted experiments to realize this spin-FET[7], [8]. The potential of implementing such a device is also provided by several theoretical derivations [9], [10].

The objective of this research is to model and design a single-gate spin-based logic device that provides low energy consumption with limited delay and retains logic states without refresh cycles. The device works for low-power applications as well as nonvolatility. In this research, the electrical model has been developed for local geometry spin-FET to study the functionality of digital circuits using single gate spin-FET, which can be utilized for the digital design and modeling of logic circuits based on complementary spin-FETs using Computer Assisted Design (CAD) tool. Based on the Datta-Das theory[11] the theoretical derivations have been modeled using the Verilog-A language. Spin-FET channels were optimized with respect to the type of material used at the channel region. The DC analysis shows the variation in channel length and junction polarization, which gives optimal output voltage. However, the transient analysis proves the function works digitally for Ghz frequency. The local geometry model of spin-FET was used to perform a static simulation by creating a physical circuit. The parameters taken for the

brain sciences

MDPI

Article

A Novel Optimized Hybrid Deep Learning Framework for Mental Stress Detection Using Electroencephalography

Maithili Shailesh Andhare [1,2,*], T. Vijayan [1], B. Karthik [1] and Shabana Urooj [3,*]

[1] Department of Electronics Communication Engineering, Bharath Institute of Higher Education and Research, Chennai 600073, India; tvij16@gmail.com (T.V.)
[2] Department of Electronics and Telecommunication Engineering, Pimpri Chinchwad College of Engineering and Research Ravet, Pune 412101, India
[3] Department of Electrical Engineering, College of Engineering, Princess Nourah bint Abdulrahman University, P.O. Box 84428, Riyadh 11671, Saudi Arabia
* Correspondence: maithili.andhare@pccoer.in (M.S.A.); smurooj@pnu.edu.sa (S.U.)

Abstract

Mental stress is a psychological or emotional strain that typically occurs because of threatening, challenging, and overwhelming conditions and affects human behavior. Various factors, such as professional, environmental, and personal pressures, often trigger it. In recent years, various deep learning (DL)-based schemes using electroencephalograms (EEGs) have been proposed. However, the effectiveness of DL-based schemes is challenging because of the intricate DL structure, class imbalance problems, poor feature representation, low-frequency resolution problems, and complexity of multi-channel signal processing. This paper presents a novel hybrid DL framework, BDDNet, which combines a deep convolutional neural network (DCNN), bidirectional long short-term memory (BiLSTM), and deep belief network (DBN). BDDNet provides superior spectral–temporal feature depiction and better long-term dependency on the local and global features of EEGs. BDDNet accepts multiple EEG features (MEFs) that provide the spectral and time-domain features of EEGs. A novel improved crow search algorithm (ICSA) was presented for channel selection to minimize the computational complexity of multichannel stress detection. Further, the novel employee optimization algorithm (EOA) is utilized for the hyper-parameter optimization of hybrid BDDNet to enhance the training performance. The outcomes of the novel BDDNet were assessed using a public DEAP dataset. The BDDNet-ICSA offers improved recall of 97.6%, precision of 97.6%, F1-score of 97.6%, selectivity of 96.9%, negative predictive value NPV of 96.9%, and accuracy of 97.3% to traditional techniques.

Keywords: deep convolutional neural network; human behavior; deep belief network; deep learning; long short-term memory; stress detection

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1. Introduction

Mental stress is an inexorable issue faced by human beings irrespective of age, religion, ethnicity, region, and gender. Mental stress affects and limits an individual's ability to disrupt daily routines [1]. In psychology, stress combines the perception of stress or a situation with the body's response to it. Stress is generally triggered when an individual encounters adverse conditions, such as mental, physical, or emotional stressors. The stressors were grouped into internal and external. Internal stressors depend on individual perceptions, thoughts, and personalities. External stressors include relationship problems; financial difficulties; work pressure; and professional, political, and religious pressures [2].

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RESEARCH Open Access

Person identification using novel local triangular binary pattern-based texture descriptor

Arti Tekade[1,2*], T. Vijayan[1], B. Karthik[1] and Anurag Mahajan[3]

*Correspondence:
arti.tekade@gmail.com

[1] Department of Electronics and Communication, Bharath Institute of Higher Education and Research, Chennai, India
[2] Department of Electronics and Tele-Communication, Pimpri Chinchwad College of Engineering and Research College Ravet, Pune, India
[3] Department of Electronics and Tele-Communication, Symbiosis Institute of Technology, Pune Campus, Symbiosis International (Deemed University), Pune, India

Abstract

Human authentication is a crucial part of most computer vision automation systems. Conventional fingerprint, iris, face, or palm print-based systems cannot identify individuals when their external biometric components are destroyed, such as by severe burns, rashes, or wounds. The main elements of any person authentication system are non-forgery, security, resilience, and privacy. The local texture descriptor is vital in describing hand radiographic images' texture. This paper presents the novel local triangular binary pattern based texture descriptor to provide a local texture description of the hand radiographic images. The performance of the proposed descriptor is assessed using different machine learning classifiers such as K-nearest neighbor (KNN), support vector machine (SVM), radial basis function-SVM (RBF-SVM), classification tree (CT), and random forest (RF) for authentication of the 20 users based on hand radiographs. The suggested system provides an overall accuracy of 84.17% for KNN, 90% for SVM, 91.35% for RBF-SVM, 92.50% for CT, and 96.67% for RF for the 20 users for the In-house hand radiographic dataset.

Keywords: Person authentication, Forensic science, Forensic hand radiography, Local binary pattern, Support vector machine

1 Introduction

Using computational techniques, authentication automatically determines the correct person based on attributes stored in computer systems. These features include hand prints, iris, leg prints, and face pictures. Natural disasters such as fires, tsunamis, severe accidental rashes, and traumas can cause damage to these biometric components, making it more challenging to identify the person. Hand bones may be utilized in situations like these to confirm an individual's identification, since burns, rashes, cuts, etc., do not easily damage them. The ante-mortem (AM) and post-mortem (PM) hand X-ray images that are stored in the database are often contrasted in forensic hand X-ray-based person recognition [1].

Biometric systems may function in several modes or just one mode. Unimodal biometric systems are less trustworthy, less secure, and have limited usability. Still, multimodal

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Commercial Automation Using RTOS-Based Architecture

Dr. Dipali Shende[1]*, Vaishali Baste[2], Shital More[3]

[1] *Assistant Professor, Department of E & TC, PCCOER, Ravet, India*

[2] *Assistant Professor, Department of E & TC, SKNSCOE, Vadgaon, India*

[3] *Assistant Professor, Department of E & TC, SIT Lonavala, India*

Corresponding Author
E-mail Id:- dipali.shende@pccoer.in

ABSTRACT

The primary objective of this research is to introduce an RTOS-based architecture for data transmission between the host region and the industry area. RTOS is a process that takes place between hardware and software. It proposes a model which is used to monitor (Host Area) the different physical values in industrial plants and its assembling environment (Industry Area) by adding the functionality of an RTOS. In an electronics manufacturing facility, temperature control, security, and other factors are crucial. If an accident occurs, productivity will suffer. With the aid of the Wireless Module, a system built with an ARM processor, and a port of a Real Time Operating System (RTOS) based on Linux, this project seeks to address this issue by remotely monitoring the temperature and other physical parameter levels of various plant areas. Here in addition to detection of any faults, the preventive action is also taken by using the control system mechanism. These things will make the industry to operate properly by preventing the accidents in real time and to increase the level of production.

Keywords:- *ARM-Advanced RIS C Machines; RTOS-Real Time Operating System; RTLinux-Real Time Linux; VB-Visual Basic*

INTRODUCT ION

The RTOS-implemented system has the capacity to multitask for task monitoring and task control. By modifying the kernel, the system can also add more apps. Therefore, system updates are also feasible as needed.[1][7] The most recent ARM Controller offers more advanced applications nowadays. The system can be connected through the wireless sensor network for monitoring remote area.

Due to warmth and humidity, the electronics industry and others have recently experienced significant problems. These problems include increased board oxidation and bridging, faulty soldering joints, and solder component flaws. Through these parameters, the environment, in particular a few devices like desiccators and solder paste refrigerators for storing paste and bare PCBs, respectively, also has to be controlled. In order to increase a machine's efficiency, several factories try to keep the temperature under control. However, doing so can result in unanticipated accidents, poor product quality, and other problems.

Microcontroller-based interfaces and the monitoring and control system they enable are more expensive and less effective.[2][8] Also the response of the system is late which may sometimes lead to catastrophe. That means a real time response is missing part. Considering all these parameters the cost, efficiency,

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Speech Emotion Recognition Using Generative Adversarial Network and Deep Convolutional Neural Network

Kishor Bhangale[1] · **Mohanaprasad Kothandaraman**[1]

Received: 22 September 2022 / Revised: 8 November 2023 / Accepted: 8 November 2023 /
Published online: 16 December 2023

Abstract

Speech emotion recognition (SER) has recently increased because of vast innovations in human–computer interaction and affective computing. In recent years, numerous deep learning-based schemes presented for SER have shown significant improvement over the traditional machine learning approaches. Most deep learning-based faced SER systems face challenges due to data imbalance problem that occurs due to unequal samples in the database. The input to two-dimensional CNN uses traditional MFCC for SER. It degrades the quality of deep attributes because of the higher variance, frequency resolution problem and spectral leakage problem of traditional MFCC. This paper proposed the novel Multi-taper Mel Frequency Logarithmic Spectrogram to enrich the Deep Convolutional Neural Network effectiveness for SER. Further, Generative Adversarial Network is used for speech emotion data augmentation during training to deal with data scarcity problems in SER. The performance of the proposed SER scheme is validated using the Berlin EmoDB and RAVDESS datasets. The proposed method provides SER accuracy of 96.65% and 97.12% for the EmoDB and RAVDESS dataset, respectively, and significantly improves over the recent techniques.

Keywords Data augmentation · Deep learning · Deep convolutional neural network · Generative adversarial network · Multi-taper Mel frequency spectrogram · Speech processing · Speech emotion recognition

✉ Mohanaprasad Kothandaraman
kmohanaprasad@vit.ac.in

Kishor Bhangale
kishorbarasu.bhangale2019@vitstudent.ac.in

[1] SENSE, VIT, Chennai, India

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Conference Publications (A.Y. 2024-25)

FPGA Implementation for Speech Feature Extraction in Real Time

Publisher: IEEE

Aditya Deshmukh ; Arman Khan ; Vedika Patil ; Kishor Bhangale All Authors

Abstract:
Speech recognition is vital for many human-computer interaction systems and Mel frequency cepstrum coefficients (MFCCs) plays vital role in feature extraction of the speech. This project aims to develop a Field Programmable Gate Array (FPGA) based application specific integrated circuit (ASIC) for extracting MFCCs from raw audio signals, and subsequently transmitting this feature data via USB to a laptop for further processing. MFCCs is widely used features in speech recognition, speaker identification, and other audio-based applications due to their ability to capture essential characteristics of the human voice. By extracting these features efficiently and transmitting them to a more powerful computing platform, this project seeks to provide a foundation for advanced speech processing tasks. The system will consist of an embedded platform (here, FPGA). It will be responsible for acquiring audio signals, performing pre-processing, extracting MFCC feature, and transmitting the feature data via USB to the laptop.

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DOI: 10.1109/ICOCT64433.2025.11118733
Date Added to IEEE *Xplore*: 15 August 2025
Publisher: IEEE
ISBN Information:
Conference Location: Bengaluru, India

Real Time FPGA Implementation for Speech Feature Extraction

Publisher: IEEE Cite This PDF

Aditya Deshmukh ; Arman Khan ; Vedika Patil ; Kishor Bhangale All Authors

Abstract:
Speech recognition is vital for many human-computer interaction systems and Mel frequency cepstrsl coefficients (MFCCs) plays vital role in feature extraction of the speech. This project aims to develop a Field Programmable Gate Array (FPGA) based application specific integrated circuit (ASIC) for extracting MFCCs from raw audio signals, and subsequently transmitting this feature data via USB to a laptop for further processing. MFCCs is widely used features in speech recognition, speaker identification, and other audio-based applications due to their ability to capture essential characteristics of the human voice. By extracting these features efficiently and transmitting them to a more powerful computing platform, this project seeks to provide a foundation for advanced speech processing tasks. The system will consist of an embedded platform (here, FPGA). It will be responsible for acquiring audio signals, performing preprocessing, extracting MFCC feature, and transmitting the feature data via USB to the laptop.

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Date Added to IEEE *Xplore*: 04 September 2025
Publisher: IEEE
ISBN Information:
Conference Location: BELGAUM, India
ISSN Information:

6 Degree of Freedom Robotic-Arm Using Gesture Control

Publisher: IEEE

Ajinkya Gaikwad ; Gouri Narawade ; Soham Sable ; Rahul Mapari ; Rupali Kawade ; Kishor Bhangale All Authors

Abstract:
The modeling and analysis of robotic systems is critical for accurate control and automation in industrial applications. The kinematic model of a 6-DOF gesture- controlled robotic arm, intended for pick-and-place tasks and object classification according to size, shape, and color, is developed in this paper. The system recognizes gestures of a human hand movement simply by combining sensors such as flex sensors, accelerometer, and gyroscope. Data processing and control is performed by an ESP32 microcontroller. A depth-sensing camera integrated with ROS2 enables real-time object detection and classification, while NEMA stepper motors provide smooth and precise motion control. The Denavit-Hartenberg (DH) parameterization for forward kinematics is used to create the kinematic model, which allows for precise end effector location on the robotic arm. The inverse kinematics approach enables the arm to achieve any position and orientation in an unstructured environment. This model enhances precision, sorting efficiency, and gesture control accuracy because of its ability to reach the base position after completing each task thus making the system error free, according to experimental validation. This precision and error free behavior is achieved with help of limit switches and inductive sensors. The proposed approach is scalable and adaptable for industrial automation, laying a solid platform for future improvements in gesture-controlled robotic arms.

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DOI: 10.1109/ICOCT64433.2025.11118735

Date Added to IEEE *Xplore*: 15 August 2025

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ISBN Information:

Conference Location: Bengaluru, India

Abstract:
This paper examines the advancements in autonomous robotic systems, emphasizing their application in industrial automation. The paper discusses a wide range of technologies and their integration with Sortify - An autonomous voice controlled 6 degrees of freedom robotic arm for object detection and sorting, including computer vision, voice recognition, control algorithms, and hardware configurations. Key computer vision techniques such as Haar Cascade for object detection are explored. Voice recognition, enabled by Natural Language Processing (NLP) and the Google Speech-to-Text API, adds interactivity to the system by enabling voice-driven commands. Furthermore, it highlights the integration of Robot Operating System (ROS), along with stepper and servo motors for precise movement control. The use of embedded computing platforms such as Jetson Nano, Raspberry Pi, and Arduino Nano, is also discussed. The paper identifies the existing gaps in current research and suggests how those can be addressed in future developments. Future research opportunities in areas like machine learning, real-time processing, and energy-efficient designs are also proposed, with the aim of advancing industrial automation.

Published in: 2025 5th International Conference on Intelligent Technologies (CONIT)

Date of Conference: 20-22 June 2025

DOI: 10.1109/CONIT65521.2025.11167579

Date Added to IEEE *Xplore*: 24 September 2025

Publisher: IEEE

ISBN Information:

Conference Location: HUBBALI, India

Implementation of Central Gateway with SOME/IP

Publisher: IEEE

Maithili Andhare ; Parth Ramesh Dhoble ; Shraddha Anil Patil ; Ishwari Mahesh Naik ; Vaibhav Pathrikar All Authors

Abstract:
The growing complexity of in-vehicle communication networks has made the use of service-oriented architectures such as SOME/IP in place of traditional CAN-based implementations necessary. The design and implementation of a central gateway to enable connectivity between legacy CAN/CAN-FD networks and Ethernet-based SOME/IP communication to enable seamless integration of mixed-protocol electronic control units (ECUs) in future vehicles are described in this paper. A microcontroller-based concept is realized based on an RTOS, where CAN messages are decoded, translated and passed on using the SOME/IP protocol stack. Performance analysis demonstrates the gateway's capability to offer low latency and high reliability and hence it can be a good solution for future automotive networks.Gateway architecture facilitates real-time communication using task priority and deterministic scheduling capabilities of the RTOS. Scalability is achieved by modular software components such that the inclusion of further protocols or ECUs can be done easily. Security features like authentication and encryption to suit automotive cybersecurity requirements could be potential enhancements.

Published in: 2025 International Conference on Computing Technologies (ICOCT)

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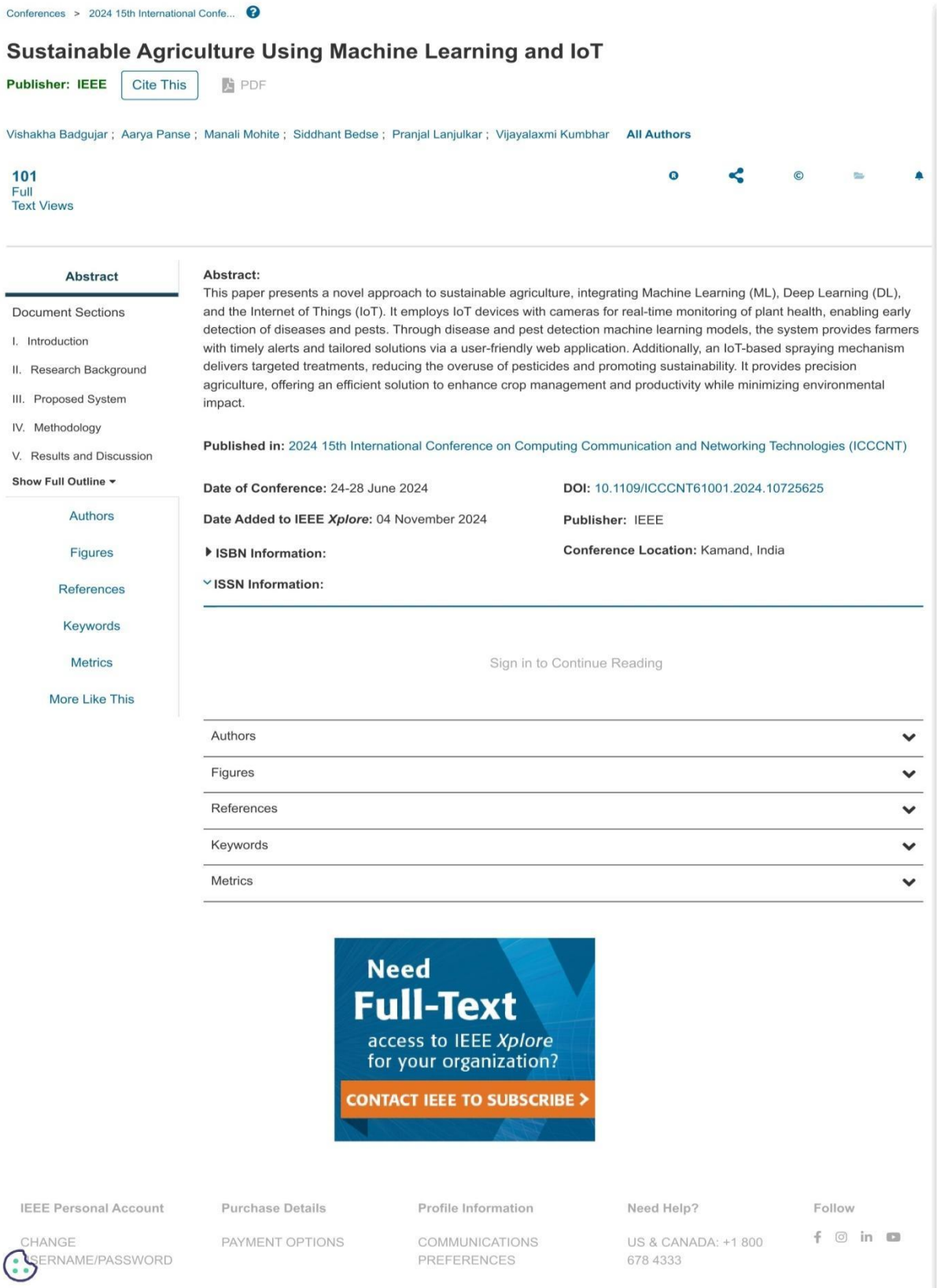

Conferences > 2024 15th International Confe...

Sustainable Agriculture Using Machine Learning and IoT

Publisher: IEEE | Cite This | PDF

Vishakha Badgujar ; Aarya Panse ; Manali Mohite ; Siddhant Bedse ; Pranjal Lanjulkar ; Vijayalaxmi Kumbhar All Authors

101 Full Text Views

Abstract

Document Sections

I. Introduction
II. Research Background
III. Proposed System
IV. Methodology
V. Results and Discussion

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Abstract:
This paper presents a novel approach to sustainable agriculture, integrating Machine Learning (ML), Deep Learning (DL), and the Internet of Things (IoT). It employs IoT devices with cameras for real-time monitoring of plant health, enabling early detection of diseases and pests. Through disease and pest detection machine learning models, the system provides farmers with timely alerts and tailored solutions via a user-friendly web application. Additionally, an IoT-based spraying mechanism delivers targeted treatments, reducing the overuse of pesticides and promoting sustainability. It provides precision agriculture, offering an efficient solution to enhance crop management and productivity while minimizing environmental impact.

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Paper Id -136 ISBN Number : 978-93-5493-555-8

IOT Based Weather Monitoring & Analysis Using GUI

Adesh Dhage
Department of E&TC, Pimpri Chinchwad College of Engineering and Research, Ravet,
Pune, India
adesh.dhage_entc21@pccoer.in

Yogesh Pawar
Department of E&TC, Pimpri Chinchwad College of Engineering and Research, Ravet,
Pune, India
yogesh.pawar_etc2020@pccoer.in

Rohan Yadav
Department of E&TC, Pimpri Chinchwad College of Engineering and Research, Ravet,
Pune, India
rohan.yadav_entc21@pccoer.in

Dipali Shende
Department of E&TC, Pimpri Chinchwad College of Engineering and Research, Ravet,
Pune, India
dipali.shende@pccoer.in

Abstract - Weather forecasting is the application of science and technology to predict the state of the atmosphere at a particular location. The majority of early weather forecasting techniques were based on pattern identification, or the observation of recurring patterns in the events. For instance, one may notice that an especially crimson sunset typically heralded favorable weather the next day. Not all of these forecasts, though, turn out to be accurate. Here this system will predict weather based on parameters such as temperature, humidity, wind speed, rain gauge, wind direction, soil temperature, atmospheric pressure, soil moisture. We will collect the weather data with the help of some sensors and pass it to the system. System will take this parameter and will predict weather from previous data in database(dataset). The primary objective of our project is to develop a well- made and accurate weather forecasting model capable of predicting climate changes over extended periods and assessing their implications for future generations. The weather forecasting system forecasts weather based on historical records; thus, this prediction will prove to be trustworthy. It takes into account elements like temperature, humidity, wind speed, rain gauge, wind direction, soil temperature, atmospheric pressure, soil moisture. Air traffic, maritime, agriculture, forestry, military, navy, and other fields may all use this technology.

Keywords— BME280, Rain Gauge Sensor, Soil Moisture Sensor, Wind Direction Sensor, Wind Speed Sensor, ESP32 Controller, Linear Regression, AWS, Graphical User Interface.

I INTRODUCTION

According The Indian economy's most significant sector is agriculture. Fifty percent of India's workforce is employed in the agriculture industry, which generates eighteen percent of the country's GDP. The world's top producer of wheat, rice, pulses, spices, and spice-related items is India. The weather is a vital natural element for life; depending on its severity, it may either provide or destroy opportunities for survival. To put it simply, weather forecasting is the process of predicting the state of the atmosphere in a given location at a given time utilizing physics principles, technology, and a range of statistical and empirical methodologies. The weather prediction is incredibly helpful in protecting both people and property and to protect the crops and it will tell us what to expect in our atmospheric environment. Weather prediction data is essential for making quick modifications to daily agricultural activities, which reduces losses due to unfavorable weather conditions and raises the quantity and quality of agricultural output. aids in seasonal or long-term planning as well as crop selection according to ideal weather conditions. Seasonal forecasting contributes to the betterment of farmers lives in areas where there is significant fluctuation in yearly rainfall. Seasonal forecasts play an important role in deciding the eco- nomic policies of governments, during major drought was forecasted, monetary policy could be relaxed to maintain growth targets. The unique aspect of our approach is that ability to provide fast and reliable forecasts while operating on low-cost and resource- efficient computing systems. These forecasts have practical applications in our daily lives, enabling us to make informed decisions and adapt effectively to changing weather conditions. This paper presents the review on the various methods of Weather Forecasting. It focuses on the accurate weather prediction using advance IOT[1] and Machine Learning model[5][6] which predicts the Realtime weather conditions at max accuracy and this data is displayed on the dashboard.

II LITERATURE REVIEW

1. Gaurav Verma, Pranjul Mittal, Shaista Farheen (Department of Electronics Communication) Dayananda Sagar College of Engineering/ "Real Time Weather Prediction System Using IOT and Machine Learning"/ IEEE 2020 - Methodology Used 'Logistic Regression Model', Parameters 'Temp., Humidity, Light Intensity', Conclusion 'By using sensors machine Learning module

Paper Id -170 ISBN Number : 978-93-5493-555-8

Commercial Automation Using RTOS-Based Architecture

Dr. Dipali Shende
Department of E & TC,
PCCOER,Ravet

Mrs. Vaishali Baste
Department of E & TC,SKNSCOE,
Vadgaon

Mrs. Shital More
Department of E & TC, SIT
Lonavala

Abstract - The primary objective of this research is to introduce an RTOS-based architecture for data transmission between the host region and the industry area. RTOS is a process that takes place between hardware and software. It proposes a model which is used to monitor (Host Area) the different physical values in industrial plants and its assembling environment (Industry Area) by adding the functionality of an RTOS. In an electronics manufacturing facility, temperature control, security, and other factors are crucial. If an accident occurs, productivity will suffer. With the aid of the Wireless Module, a system built with an ARM processor, and a port of a Real Time Operating System (RTOS) based on Linux, this project seeks to address this issue by remotely monitoring the temperature and other physical parameter levels of various plant areas. Here in addition to detection of any faults, the preventive action is also taken by using the control system mechanism. These things will make the industry to operate properly by preventing the accidents in real time and to increase the level of production.

KEYWORDS—ARM-Advanced RIS C Machines; RTOS - Real Time Operating System; RTLinux-Real Time Linux; VB-Visual Basic

I INTRODUCTION

The RTOS-implemented system has the capacity to multitask for task monitoring and task control. By modifying the kernel, the system can also add more apps. Therefore, system updates are also feasible as needed.[1][7] The most recent ARM Controller offers more advanced applications nowadays. The system can be connected through the wireless sensor network for monitoring remote area. Due to warmth and humidity, the electronics industry and others have recently experienced significant problems. These problems include increased board oxidation and bridging, faulty soldering joints, and solder component flaws. Through these parameters, the environment, in particular a few devices like desiccators and solder paste refrigerators for storing paste and bare PCBs, respectively, also has to be controlled. In order to increase a machine's efficiency, several factories try to keep the temperature under control. However, doing so can result in unanticipated accidents, poor product quality, and other problems. Microcontroller-based interfaces and the monitoring and control system they enable are more expensive and less effective.[2][8] Also the response of the system is late which may sometimes lead to catastrophe. That means a real time response is missing part. Considering all these parameters the cost, efficiency, durability, reliability of such system will not be optimum. So, a change in the existing system is needed. Real Time Linux (RTLinux) can be ported to the ARM platform so that the system can be implemented. The RTOS-implemented system has the capacity to multitask for task monitoring and task control. By modifying the kernel, the system can also add more apps. Therefore, system updates are also feasible as needed. The most recent ARM Controller offers more advanced applications nowadays. For monitoring a remote location, the system can be connected via a wireless sensor network. For the ARM Controller, RTLinux is a pre-emptive, hard real-time deterministic multitasking kernel. RTLinux can run additional jobs by applying patches in accordance with our needs. RTLinux manages memory, time, and inter-process communication (using semaphores, message queues, and mailboxes). By gathering data from perceived values of the electronics manufacturing sectors under the direction of engineers, it helps to monitor and control the environment. The system's entire architecture is based on three categories: communication protocols, software details, and hardware specifics. The RTOS-implemented system has the capacity to multitask for task monitoring and task control. By modifying the kernel, the system can also add more apps.[3][9]

II CURRENT COMMERCIAL AUTOMATION SCENARIO

Globally, the new phrase The economy is quickly picking up speed. The industrial sector, which includes the automotive industry, has been altered and moulded by this new, disruptive technology, which has lately discovered its growth curve. Following Industry 4.0, this business era is seen as a collection of ICTs (information and communications technologies) and digitally enabled technologies. These include advancements in manufacturing machinery, intelligent goods, data tools, and analytics that make use of the Internet of Things (which can include, among other things, 3-D printing, prototypes, connected cars, product lifecycle management, and cyber physical production systems).[4][10]

Use of Improved Generative Adversarial Network (GAN) Under Insufficient Data

| Conference paper | First Online: 05 January 2024

| pp 288–299 | Cite this conference paper

Cognitive Computing and Cyber Physical Systems

(IC4S 2023)

Pallavi Adke, Ajay Kumar Kushwaha, Supriya M. Khatavkar & Dipali Shende

Part of the book series: Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering ((LNICST,volume 536))

Included in the following conference series: International Conference on Cognitive Computing and Cyber Physical Systems

Abstract

The article covers enhancements to the generative adversarial network (GAN) model's architecture and training, enabling stable training in the absence of sufficient data. An improved generative adversarial network (GAN) architecture has been proposed. These improvements are then applied to the augmentation of a dataset on tyre joint defects, which is utilised for classification applications. The dataset used has a higher percentage of conformity images and is quite uneven. It is difficult to create precise defect classification models given this uneven and constrained dataset of defect identification. So, in the work that is being presented, research is done to expand the defect dataset and improve the balance between the various defect classifications. Indeed, the quality of generated images has considerably improved as a result of recent developments in generative adversarial networks (GANs). Deep learning models in the GAN class combine a generator network with a discriminator network. The current study reveals that the recommended augmented GAN model is useful in enhancing the performance classification model under a small dataset. The generated effects of progressed GAN are evaluated using the Fréchet Inception Distance (FID) score, which indicates extensive development over the styleGAN architecture. Additional dataset augmentation exams making use of generated photos monitor a 10% boom in category version precision in comparison to the preliminary dataset. To evaluate the effectiveness of GAN-generated picture augmentation, PCA plots can be used to visualize the distribution of real and augmented images in a lower-dimensional space.

Machine Learning Based Heart Disease Prediction Using ECG Image

Publisher: IEEE Cite This PDF

Kishor Bhangale ; Saurabh Kadam ; Sakshi Chame ; Hardik Saklikar All Authors

Abstract:
In a global health context outlined by the World Health Organization (WHO), the escalating prevalence of CVDs underscores a pressing need for advanced diagnostic methodologies. CVDs remain a leading cause of morbidity and mortality worldwide, necessitating innovative approaches for early detection. Traditional diagnostic methods face challenges in providing timely and accurate identification of heart conditions, often relying on subjective interpretation and lacking the sensitivity required for early intervention. Recognizing this critical gap, our engineering project focuses on the early detection of heart diseases using ML and DL techniques applied to ECG images. The integration of ML and DL offers a promising avenue to overcome the limitations of conventional diagnostic tools, leveraging intricate patterns within ECG data for more precise and timely detection. By addressing these challenges, our research aims to contribute to the advancement of cardiovascular health, providing a robust framework for early disease detection and improving overall patient outcomes.

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Conference Location: Belgaum, India

Neural Stress Mapping with Machine Learning from EEG Data

| Conference paper | First Online: 31 December 2024

| pp 56–71 | Cite this conference paper

Intelligent Computing and Big Data Analytics

(ICICBDA 2024)

Meenakshi Raghupathy, Sakshi Salunkhe, Shweta Dhende, Kishor Bhangale & Dipali Dhake

Part of the book series: Communications in Computer and Information Science ((CCIS,volume 2234))

Included in the following conference series:
International Conference on Intelligent Computing and Big Data Analytics

Abstract

In our rapidly changing world, the influence of stress on our mental health has become a pressing concern, necessitating innovative approaches for timely detection and intervention. Stress can affect mental as well as physical states. There are many disorders and harmful effects of stress, so our work is helpful to detect stress using EEG (electroencephalography), which detects the electrical activities happening inside the brain. The primary goal is to assess stress levels by collecting data from EEG sensors. By analyzing EEG data, there is a possibility to detect stress using the activity of neurons. To study the variation in the EEG signal, we can use different stimuli like audio and videos which could help to study the modulation. Music and videos have an impact on external and internal factors that can be studied by using this technique. To achieve this, a machine learning model i.e. Random Forest can be used and hence a stress detection system in real time is developed with an accuracy of 77%. A summary report is generated where the statistical measures such as mean, median, skewness and kurtosis are calculated with respect to the EEG data. Using this real time stress detection system, we can analyze an individual's stress levels and provide assistance for their mental health which can help them be more productive and maintain a positive outlook on life.

Abstract:
Numerous challenges arise in India, a developing nation heavily reliant on agriculture. These include issues such as small land plots, overuse of pesticides, and substitution of natural nutrients with harmful chemicals. Vertical farming (VF) effectively produces food sustainably while conserving space, natural resources, and labor. This system can be implemented year-round without being affected by seasonal changes, making it adaptable to any location and time. Soil erosion and infertility pose significant challenges in traditional farming. To combat this problem, soilless farming, also called hydroponics, is gaining popularity. Hydroponics is cultivating plants without soil, providing essential nutrients to the crops in a controlled environment. The utilization of research in the VF system for fresh, high-quality, locally-grown produce has risen in the past few years. This approach has been shown to significantly boost productivity and enhance production quality. Vertical farming with hydroponics addresses the issue of limited agricultural land by utilizing vertical space, while hydroponic techniques facilitate organic cultivation. The proposed vertical farming using hydroponics aims to utilize the Internet of Things (IoT) to sense and monitor vital factors like pH, TDS, temperature, and humidity to automate the system.

Published in: 2024 4th Asian Conference on Innovation in Technology (ASIANCON)

Date of Conference: 23-25 August 2024

DOI: 10.1109/ASIANCON62057.2024.10838172

Date Added to IEEE *Xplore*: 21 January 2025

Publisher: IEEE

ISBN Information:

Conference Location: Pimari Chinchwad, India

Human Activity Prediction Using Generative Adversarial Networks

Publisher: IEEE

Amar Shete ; Aashita Gupta ; Ajay Waghumbare ; Upasna Singh ; Triveni Dhamale ; Kiran Napte All Authors

Abstract:
This paper introduces an innovative approach to enhance human activity prediction by integrating Temporal Convolutional Networks (TCN) with an Encoder-Decoder model within the Generative Adversarial Network (GAN) framework. Our proposed model harnesses the power of spatio-temporal 3D convolutions to capture intricate patterns and temporal dependencies present in video data, thereby improving prediction precision and resilience. To showcase the effectiveness of our approach, we utilize the KTH dataset for action recognition tasks, demonstrating its utility in managing video data within deep learning pipelines. The KTH dataset serves as a valuable resource for simplifying data preprocessing and facilitating focused model development. At the core of our research lies the GAN-based model, which consists of a Generator and a Discriminator. The Generator is responsible for generating lifelike video frames from latent space representations, while the Discriminator guides adversarial training dynamics. By employing an encoder-decoder architecture augmented by TCN layers, our model adeptly captures both spatial and temporal information inherent in video sequences. Through extensive experiments conducted on benchmark datasets like KTH Action, we demonstrate the competitive performance of our model. Evaluation metrics including Mean Squared Error (MSE) and Structural Similarity Index (SSIM) highlight the superior accuracy of our approach compared to existing models such as FutureGAN, fRNN, and MCNet.

Published in: 2024 15th International Conference on Computing Communication and Networking Technologies (ICCCNT)

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Date Added to IEEE *Xplore*: 04 November 2024
Publisher: IEEE
ISBN Information:
Conference Location: Kamand, India
ISSN Information:

Compact and Planar Sinuous Antenna operating in the Wide Band Frequency Range

Publisher: IEEE Cite This PDF

Prashantdeep Singh Sital ; Siddhesh Chavan ; Komal Borse ; Rajesh K. Singh ; Saurabh Shukla ; Triveni Dhamale All Authors

Abstract:
This paper investigates the enhancement of a two-arm sinuous antenna's operational bandwidth through structural modification. The conventional design was altered by introducing slots into the end arcs, to create resonances at the lower frequencies. Simulation results obtained using CST Microwave Studio are presented, with the S-parameter (S11) plots utilized as the primary metric for evaluating the antenna's performance. The modifications led to a new resonance at 2.4 GHz and 3.5 GHz, effectively extending the antenna's bandwidth into the lower frequency range. This paper elaborates on the simulation setup, modification process, and resultant changes in the antenna's performance, offering a wideband operation that could prove beneficial for various communication and radar applications.

Published in: 2024 4th Asian Conference on Innovation in Technology (ASIANCON)

Date of Conference: 23-25 August 2024
DOI: 10.1109/ASIANCON62057.2024.10838051
Date Added to IEEE *Xplore*: 21 January 2025
Publisher: IEEE
ISBN Information:
Conference Location: Pimari Chinchwad, India

Simulation and Analysis of Solar-Powered Electric Golf Cart

Abhijeet Pagare ; Sarthak Shewalkar ; Supriya Yadav ; Dipali Dhake All Authors

Abstract:
The research uses MATLAB Simulink to simulate and analyze solar-powered electric golf carts to evaluate their sustainability, efficiency, and performance. Using Simulink, a thorough simulation model includes all necessary elements and assesses performance in various operational and environmental scenarios. According to the study, solar-powered electric golf carts can lower carbon emissions, lessen reliance on fossil fuels, and provide environmentally beneficial transportation options. Additional optimization techniques to improve the efficiency and performance of carts are discussed, such as improvements in battery technology, vehicle design, operating protocols, and solar panel efficiency. The applicability for real-world scenario simulations is demonstrated in an in-depth study with MATLAB Simulink. With its conclusions, suggestions, and directions for further study and improvement, this research adds to the conversation on solar-powered electric cars and sustainable transportation by utilizing MATLAB Simulink's capabilities for simulation and analysis.

Published in: 2024 4th Asian Conference on Innovation in Technology (ASIANCON)

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Date Added to IEEE *Xplore*: 21 January 2025
Publisher: IEEE
ISBN Information:
Conference Location: Pimari Chinchwad, India

Abstract:
This study proposes an innovative way to reduce transportation's negative environmental effects by combining electric automobile technology with solar-powered electric golf carts. Our approach improves operating effectiveness and lowers greenhouse gas emissions by utilizing advances in lithium-ion batteries, solar panels, permanent magnet synchronous motors (PMSMs), battery management systems (BMS), and other related technologies. Methodologically, it highlights the function of the charger in power source transitions together with other important parts such as the motor controller, MPPT boost converters, and solar power circuit. The design features are validated by MATLAB Simulink simulations, which also demonstrate performance attributes including torque production, speed, and energy efficiency under different driving circumstances. Specifically, peak line voltage, torque, and velocity are seen during the acceleration stages of the FTP-75 driving cycle, and equivalent drops are observed during deceleration. This approach promotes effectiveness, viability, and ecological responsibility in the design and operation of electric golf carts by combining cutting-edge technologies, such as lithium-ion batteries, solar panels, and PMSMs. This presents a sustainable transportation option that has the potential to redefine the industry.

Published in: 2024 IEEE 3rd International Conference on Electrical Power and Energy Systems (ICEPES)

Date of Conference: 21-22 June 2024

DOI: 10.1109/ICEPES60647.2024.10653569

Date Added to IEEE *Xplore*: 06 September 2024

Publisher: IEEE

ISBN Information:

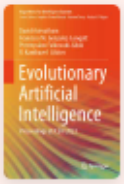
Conference Location: Bhopal, India

Book Chapters Publications (A.Y. 2024-25)

EEG Features Selection by Using Tasmanian Devil Optimization Algorithm for Stress Detection

Conference paper | First Online: 14 March 2024

pp 245–257 | Cite this conference paper



Evolutionary Artificial Intelligence

(ICEASSM 2017, ICEAI 2023)

Dipali Dhake & Yogesh Angal

Part of the book series: Algorithms for Intelligent Systems ((AIS))

Included in the following conference series:
International Conference on Engineering, Applied Sciences and System Modeling

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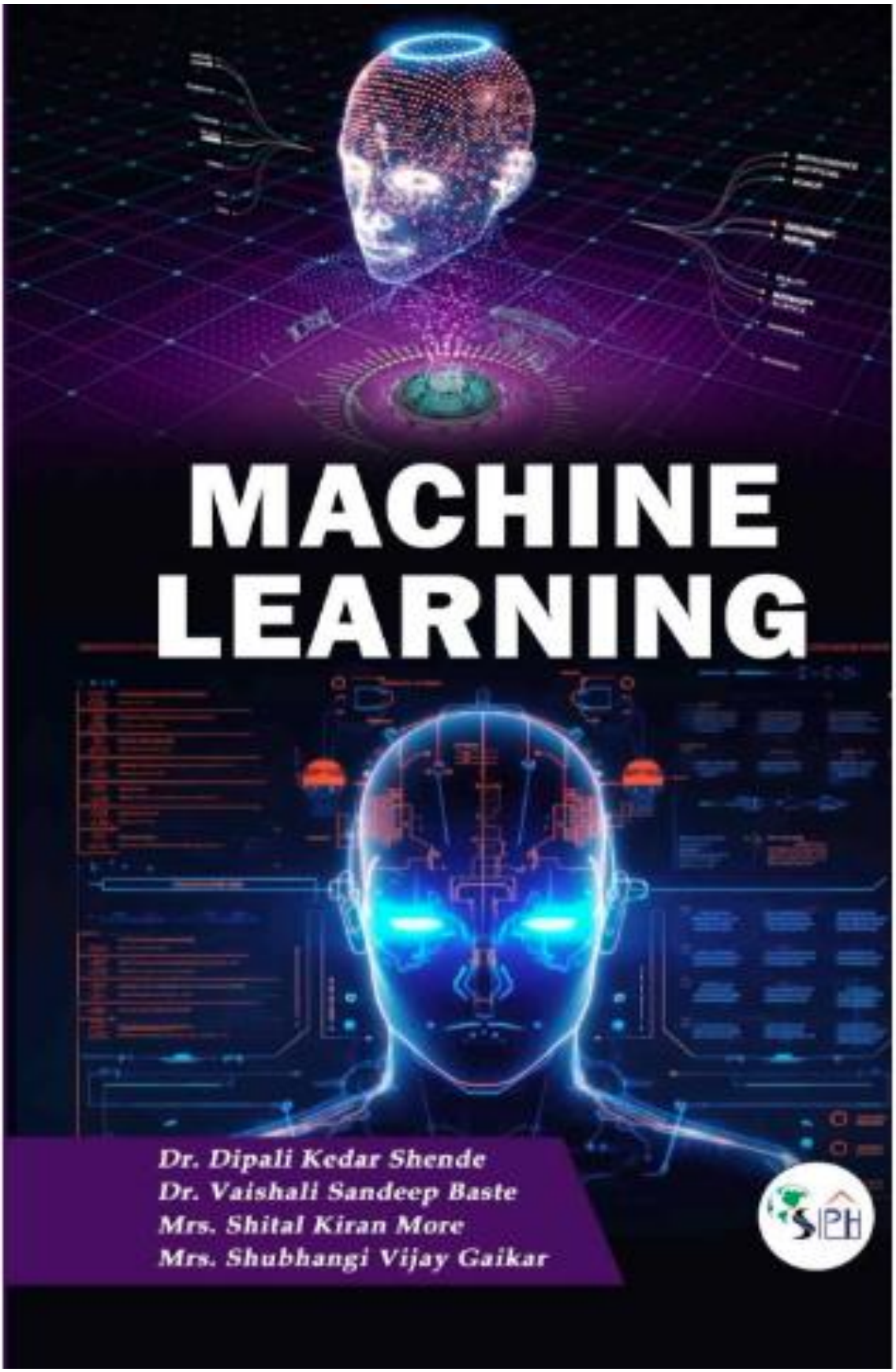
Abstract

Stress detection is imperative in human–machine interaction systems to monitor the mental health of the person. Various stress detection schemes based on machine learning and deep learning have been presented in the past. However, the performance of the stress detection system is challenging due to inadequate training data, poor feature variability, poor feature selection, and the intricacy of the deep learning framework. This paper provides the stress detection system using multiple electroencephalograph (EEG) signals and a Tasmanian Devil Optimization (TDO)-based feature selection scheme to select important and distinctive features. It uses a lightweight Deep Convolutional Neural Network (DCNN) to improve feature representation and stress detection. The efficiency of the suggested scheme is estimated on the public Dataset for Emotion Analysis using Physiological Signals (DEAP). It provides a stress detection rate of 97.95 and 89.75% with

Books Publications (A.Y. 2024-25)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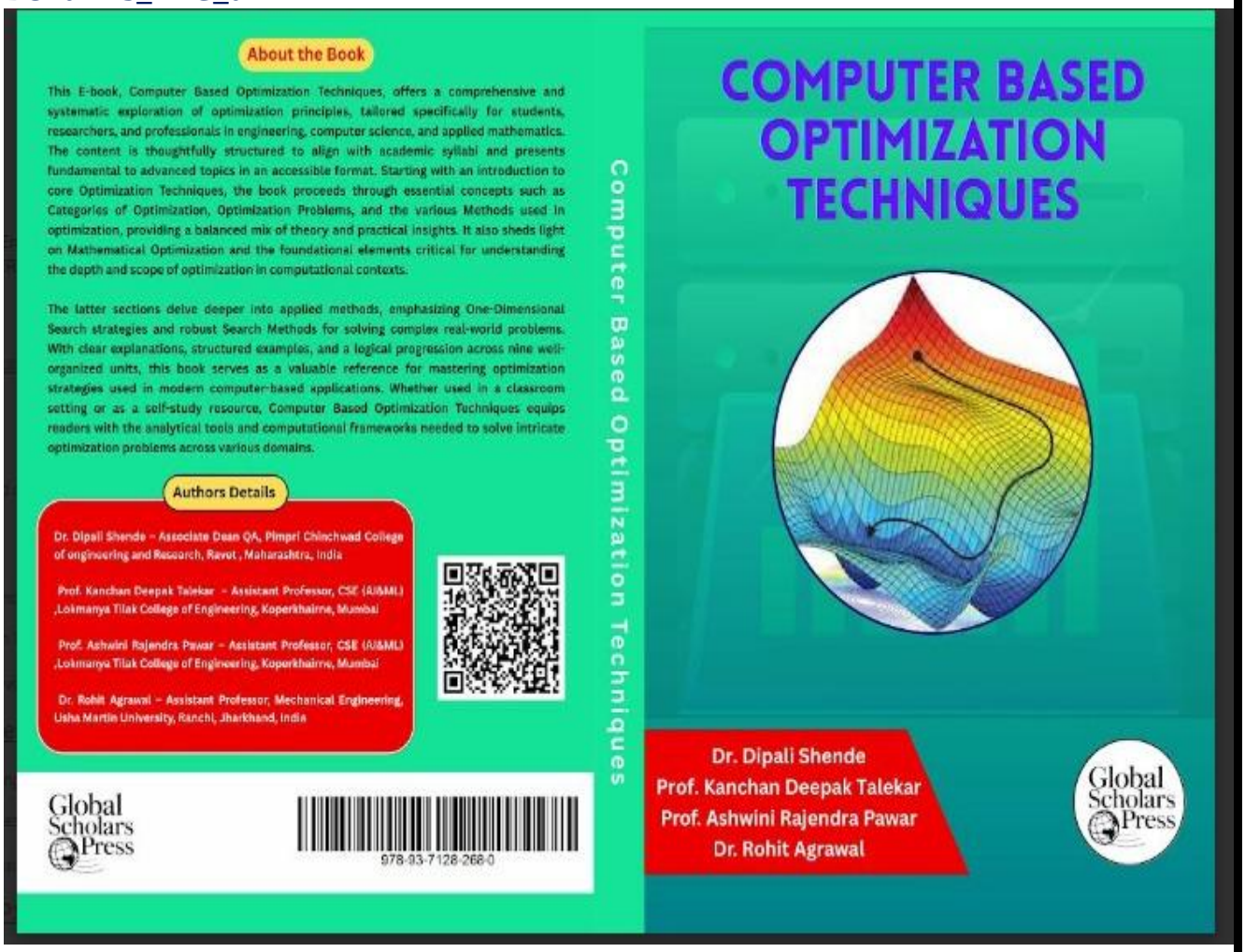
About the Book
This E-book, Computer Based Optimization Techniques, offers a comprehensive and systematic exploration of optimization principles, tailored specifically for students, researchers, and professionals in engineering, computer science, and applied mathematics. The content is thoughtfully structured to align with academic syllabi and presents fundamental to advanced topics in an accessible format. Starting with an introduction to core Optimization Techniques, the book proceeds through essential concepts such as Categories of Optimization, Optimization Problems, and the various Methods used in optimization, providing a balanced mix of theory and practical insights. It also sheds light on Mathematical Optimization and the foundational elements critical for understanding the depth and scope of optimization in computational contexts.
The latter sections delve deeper into applied methods, emphasizing One-Dimensional Search strategies and robust Search Methods for solving complex real-world problems. With clear explanations, structured examples, and a logical progression across nine well-organized units, this book serves as a valuable reference for mastering optimization strategies used in modern computer-based applications. Whether used in a classroom setting or as a self-study resource, Computer Based Optimization Techniques equips readers with the analytical tools and computational frameworks needed to solve intricate optimization problems across various domains.
Authors Details
Dr. Dipali Shende – Associate Dean QA, Pimpri Chinchwad College of engineering and Research, Ravet , Maharashtra, India
Prof. Kanchan Deepak Talekar – Assistant Professor, CSE (AI&ML) ,Lokmanya Tilak College of Engineering, Koperkhairne, Mumbai
Prof. Ashwini Rajendra Pawar – Assistant Professor, CSE (AI&ML) ,Lokmanya Tilak College of Engineering, Koperkhairne, Mumbai
Dr. Rohit Agrawal – Assistant Professor, Mechanical Engineering, Usha Martin University, Ranchi, Jharkhand, India
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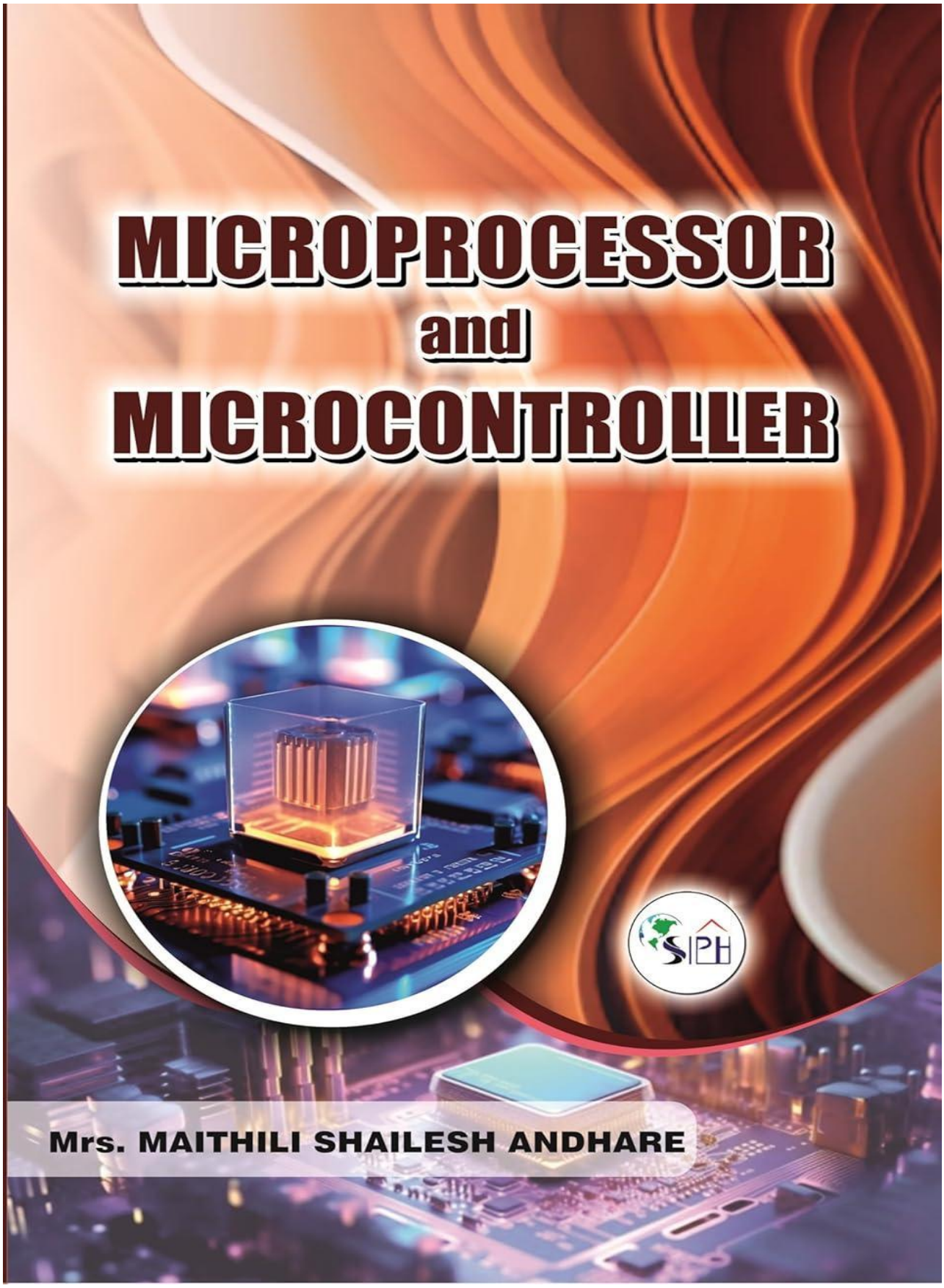
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