UNIVERSITY OF ECHAHID CHEIKH LARBI TEBESSI, TEBESSA

LABORATORY OF MATHEMATICS, INFORMATICS AND SYSTEMS – LAMIS

WEEK OF ARTIFICIAL INTELLIGENCE TRENDS - WAIT'2023

NATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE - NCAI'23

TEBESSA, DECEMBER 19-20, 2023

NCAI'23 ABSTRACT BOOK...

MAIN TOPICS

- COMPUTER VISION AND GRAPHICS
- CONTROL & COMPUTER ENGINEERING
- SUSTAINABLE AND RENEWABLE ENERGY ENGINEERING
- CYBER SECURITY AND PRIVACY
- COMPUTER NETWORKS
- INNOVATIVE PRODUCTS

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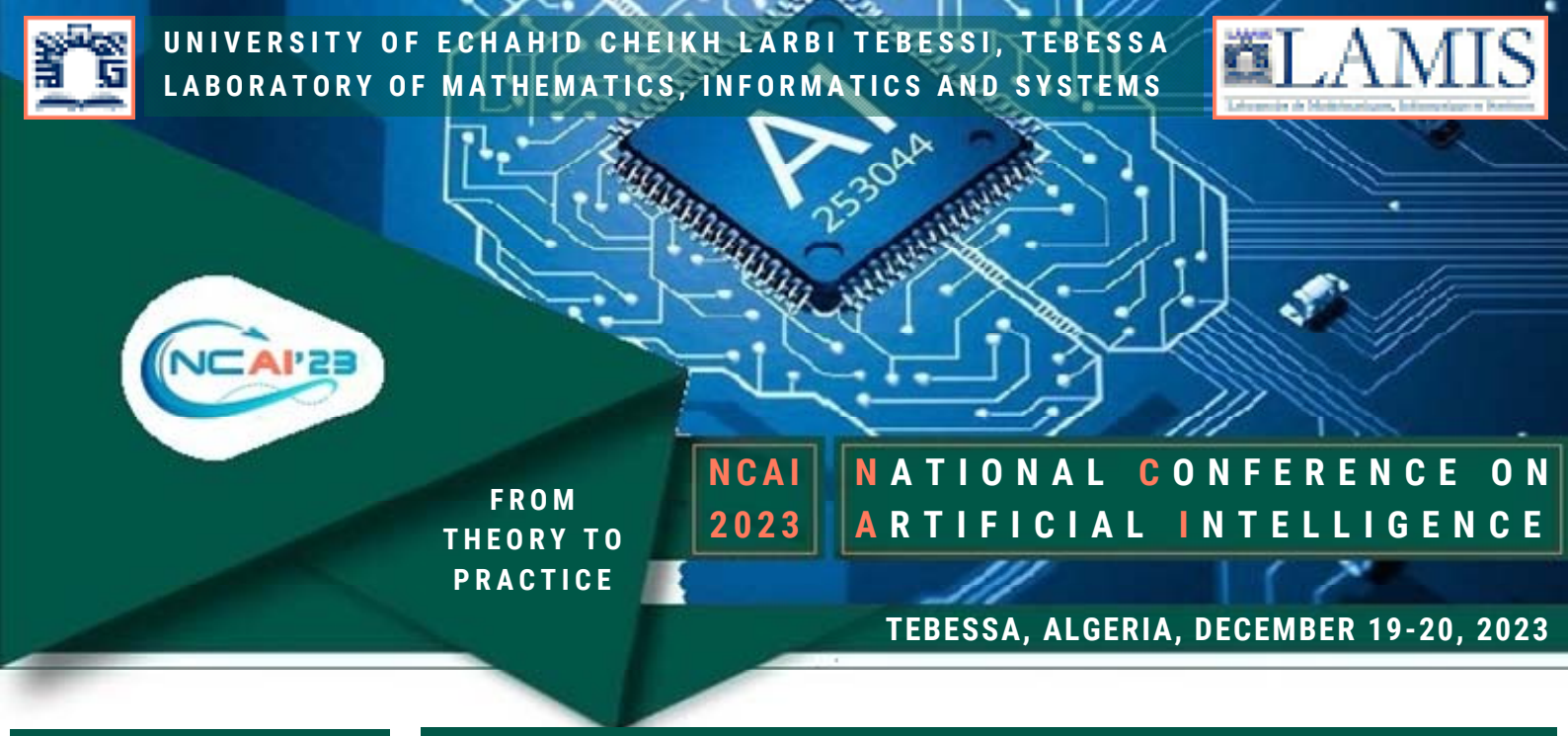

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Important Dates

Paper submission
July 20, 2023
Paper Notification
Sept 21, 2023
Camera ready version
Oct 05, 2023
Registration
Oct 26, 2023
Project Description submission (Student exhibition)
Nov 1, 2023
Project Notification
Nov 15, 2023

Registration fee

Students	6000 DA
Others	8000 DA

CALL FOR PAPER

The purpose of the National Conference on Artificial Intelligence: From Theory to Practice (NCAI'2023) is to provide an excellent forum for addressing and discussing a variety of crucial themes and aspects related to AI and its applications. We believe that this event will provide an opportunity to learn from one another, exchange ideas, and explore innovative ways to shape the future of AI.. In addition to oral presentations and poster sessions, an innovation exhibition in this event will provide an opportunity for students to showcase their innovative products.

The main topics will include, but not be limited to:

Computer Vision and Graphics

1) Pattern recognition and machine learning
2) Artificial Vision and Virtual Reality
3) Deep, Transfer & Reinforcement learning
4) Medical imaging, ….

Control & computer engineering

1) Robotics, Industry 4.0, Agriculture 4.0
2) Embedded and Real-time systems
3) Electric vehicle systems
4) Fault detection and diagnosis, ……

Sustainable and Renewable Energy Engineering

1) Smart Grid Technology
2) Power System Control and Stability
3) Generation Transmission and Distribution
4) Power Management Systems
5) Future Challenges and Directions

Cyber Security and Privacy

1) Security, Privacy, and Trust
2) Cryptography, Steganography & Watermarking
3) Biometric DeepFakes, Digital Data Forensics
4) Blockchain theories and applications, ….

Computer Networks and Technologies

1) IoT, Edge, Fog and Cloud computing
2) 4G and 5G Communication Networks
3) Healthcare and Social Network
4) New Trends in Internet Technology, ….

Innovative Products

Any practical work in the form of a hardware and/or software application that highlights the intervention of AI in any field is invited to submit a description of this product in order to participate at the innovation exhibition.

Submissions

All papers must be written in English. From 4- 6 pages papers (in IEEE double-column format). Submission must be made through EasyChair: *https://cmt3.research.microsoft.com/NCAI2023*

To partcipate in the innovation exhibition please fill and send the form n the following link :
https://forms.gle/qWnDD5B4aRDYTDvZ6

Papers accepted for the NCAI'2023 after the double-blind peer-review process will be published in the NSAI ‘2023 conference proceedings. Conference proceedings indexation will be annouced soon. Additionally, selected papers that have been presented at the conference will also be considered for further development of a possible publication in the highly esteemed partner **journal Acta Informatica Pragensia (AIP)** *https://aip.vse.cz/*. AIP uses the Diamond Open Access model of sharing scientific knowledge — that means fully open access, no fees for authors, free English proofreading. If invited to publish in this journal authors will be expected to develop the work by 40-50%, including a change of title and abstract.

Contact For further information or questions, you can email the symposium secretary at: *ncai23@gmail.com*

EXPERTISE IS EVERYWHERE AND ACCESSIBLE TO EVERYONE

CONTENTS

ROOM P_CCE : CONTROL AND COMPUTER ENGINEERING (IN-PERSON)

ROOM O_SIP : SIGNAL AND IMAGE PROCESSING (ON-LINE)

ROOM O_CIS 1 : COMMUNICATION AND INFORMATION SECURITY (ON-LINE)

ROOM O_CCE 2 : CONTROL AND COMPUTER ENGINEERING (ON-LINE)

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WEEK OF ARTIFICIAL INTELLIGENCE TRENDS - WAIT'2023

WELCOME TO NCAI'2023 CONFERENCE

Dear Esteemed Colleagues and Participants,

We are pleased to extend a warm welcome to you for the first edition of the National Conference on Artificial Intelligence – NCAI'23, a pivotal component of the Week of Artificial Intelligence Trends - WAIT'2023, a hybrid event (in-person, online).

This edition of NCAI promises to be exceptional, featuring a robust scientific program that highlights key advancements over recent years in pivotal axes that have far-reaching implications across various domains. The program includes two invigorating keynote addresses and a curated selection of 61 presentations across three sessions, each focusing on recent and relevant advances. All presentations are scheduled over two days, ensuring a rich in-person experience.

Our heartfelt gratitude goes to the numerous volunteers whose dedication ensures the conference maintains high technical standards and delivers an engaging program. The success of this in-person gathering is indebted to the contributions of our session chairs, organizers, technical reviewers, and paper authors. We express our sincere thanks to our esteemed speakers for graciously agreeing to share their expertise and knowledge with the community.

The organizers aspire for NCAI to become a regular event, and we trust that your participation in NCAI'2023 will be both enjoyable and productive. Best wishes for a stimulating and successful conference.

Sincerely, NCAI'2023 Chairs

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INVITED KEYNOTES

Dr. Hamda SLIMI

University of Echahid Cheikh Larbi Tebessi, Tebessa, ALGERIA

Keynote Title

BEYOND WORDS: DIVING INTO CHATGPT AND THE FRONTIER OF LARGE LANGUAGE MODELS

Hamda Slimi is an assistant professor at the University of Tebessa, who has extensive experience in working with Large Language Models like BERT and RoBERTa, and graph embedding techniques such as Node2Vec. His research at the LAMIS lab focuses on NLP, with a specialization in detecting fake news using both text content and graphs. He is committed to furthering our understanding of how language works and how it can be effectively processed and analyzed for various applications.

Pr. Chaouki AOUITI

University of Carthage, Faculty of Sciences of Bizerte – Tunisia

Keynote Title

SYSTEM DYNAMIQUE DE TYPE RESEAUX DE NEURONES RECURRENTS

Chaouki Aouiti currently works at the departement of Mathematics, Faculty of Sciences of Bizerte, University of Carthage. Chaouki does research in Applied Mathematics. Their current project is 'Dynamical behaviors of nonlinear systems'.

Pr. U. Rajendra ACHARYA

University of Southern Queensland, Springfield 4300, Australia

Keynote Title

APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNIQUES FOR HEALTHCARE

U. R. Acharya, Ph.D., DEng, DSc, is a Professor at University of Southern Queensland, Australia; a Distinguished Professor at the International Research Organization for Advanced Science and Technology, Kumamoto University, Japan; Adjunct Professor at the University of Malaya, Malaysia; and Adjunct Professor at the Asia University, Taiwan. His research interests include biomedical imaging and signal processing, data mining, and visualization, as well as applications of biophysics for better healthcare design and delivery. His funded research has accrued cumulative grants exceeding six million Singapore dollars. He has authored over 600 publications, including 550 in refereed international journals, 42 in international conference proceedings, and 17 books. He has received more than 67,500 citations on Google Scholar (with an h-index of 130). He has been ranked in the top 1% of the highly cited researchers for the last seven consecutive years (2016–2022) in computer science, according to the Essential Science Indicators of Thomson. He is on the editorial boards of many journals and has served as a guest editor on several AI-related issues.

PAPER ABSTRACTS

National Conference on Artificial Intelligence (NCAI 2023) deals with the latest ideas, information and technologies reached today. All of the papers in this section are divided into three topics, namely: Image and Signal processing (SIP), Computer & Control Engineering (CCE), and Communication and Information Secutiry (CIS).

ROOM P-SIP : SIGNAL AND IMAGE PROCESSING — IN PERSON

Paper ID: 9

Tarek Nouioua
Department of Mathematics and Computer Sciences,
Faculty of Exact sciences and sciences of Nature and life, University of Tebessa,
Tebessa, Algeria
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Abstract—Flood detection is crucial for effective disaster response and management, enabling early warning systems and targeted relief efforts. This paper proposes a deep learning-based approach for flood detection in satellite images using convolutional neural networks (CNNs) and transfer learning techniques. Satellite imagery provides wide coverage and high spatial resolution, making it a valuable resource for flood monitoring. However, the complexity of flood patterns requires advanced computational techniques for accurate analysis. CNNs have shown remarkable success in image classification tasks and can automatically learn meaningful features from imagery. The proposed methodology aims to train a robust flood detection model capable of discerning flooded and nonflooded regions within satellite images. Transfer learning enhances the model's performance by adapting pretrained models to the flood detection domain, even in regions with limited historical flood data. The outcomes of this research have the potential to revolutionize flood detection systems and improve disaster management strategies, leading to reduced vulnerability in flood-prone areas. By leveraging deep learning methodologies, we can advance our understanding of floods and build more resilient communities to confront this escalating threat. The paper introduces a novel approach combining CNNs and transfer learning for flood detection, with the goal of developing an accurate and robust flood detection model. The work's outcomes contribute to the advancement of flood monitoring systems, improving disaster response and reducing vulnerability in flood-prone areas.

Index Terms—Flood detection, Deep learning, Satellite imagery, Convolutional neural networks (CNNs), Transfer learning, Computer Vision & AI

Paper ID: 10

Analyze And Prediction Of Nephropathy Chronic With Hybrid Model Of Machine Learning And RELIEF Feature Selection

Safa Boughougal[1], Mohamed Ridda Laouar[2], Abderahim Siam[3]
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Abstract— A disease is considered silent when it exhibits no symptoms during its initial stages, as is the case with chronic kidney disease (CKD). For this reason, early detection of CKD is difficult, especially in the early stages. In this study, we proposed an approach based on supervised machine learning algorithms: Random Forest, bagging classifier and hybrid model RFBG with the use of a RELIEF feature selection method on the dataset of the UCI Machine Learning Repository. Before starting model training, we used an efficient and accurate data preprocessing. To improve the performance of our approach, we used a hybrid model, comparing the performance results with only the relevant features and with all features. The RFBG model achieved a better accuracy of 100% using the RELIEF feature selection method.

Index Terms—chronic kidney disease, prediction, data imputation, Feature selection, Relief, bagging classifier, decision support, preprocessing.

Paper ID: 15

Facesec: facial recognition model for secure access

A. Djeddar[1], A. Abbaci[2] and H. Bendjenna[3]
[1,2]USDB University, Blida 1
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Abstract— In today's fast-paced, security-conscious world, keeping employees safe and maintaining effective time management within a company or establishment is of the utmost importance. The inspiration for this research work stems from real-life problems faced by companies, where unauthorized access and ineffective employee tracking was a serious challenge. However, one innovative solution that has emerged to address these challenges is the proposal of a deep learning model named Facesec, which is based on the Convolutional Neural Network (CNN) architecture. The proposed model focuses on the application of deep learning techniques for facial recognition in the context of intrusion detection in video surveillance systems. It is specifically designed to reinforce security measures within companies.

Index Terms— Facial recognition, security, Facesec, CNN, access authorization.

Paper ID: 20

Palmprint Recognition from Conventional to Learning-based Techniques: A Review

Asma Aounallah, Hakim Bendjenna and Abdallah Meraoumia

Laboratory of Mathematics,Informatics and Systems(LAMIS), University of Echahid Cheikh Larbi Tebessi Tebessa ,Algeria

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Abstract—In recent decades, palmprint biometrics has been the subject of intensive study. So far, there exist lots of research that has studied the field of palmprint recognition process and at different modules in the aim of achieving best performance system. Therefore, we elaborate this paper to minimize the threshold of palmprint recognition techniques and this by giving a summary of a selective conventional and learning-based techniques used for enhancing the three most important modules in a palmprint recognition system, including the ROI detection and extraction in the preprocessing module, feature extraction and matching module.

Index Terms—palmprint recognition, conventional methods, learning methods, ROI extraction, feature extraction, matching

Paper ID: 58

Deep learning model for breast cancer lesions detection on mammography images

[1]Nada khiari, [1]Mohammed Amine Yakoubi, [2]Amine Khiari and [1]Ahlem Melouah

[1]University of Badji Mokhtar Annaba, Algeria

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Abstract—This document presents detailed steps and strategies used in order to create a deep learning (DL) model for lesions detection on mammography images. We used U-Net training method on Resnet34 architecture. Knowing that U-net has been developed precisely for biomedical image segmentation. Next, we employed the FastAI library that simplifies and accelerates the model's training task. For the data, the studies and the available resources lead us to INbreast, which is build with full-field digital mammograms contrary to other digitized mammograms. The aim of this work is to reproduce state-of-the-art model and to make it easily accessible for our users, which they do not have access to mammography equipment, or their equipment do not integrate a recent mammography software. To validate the robustness of our model, we presented a comparison between our model and some recent works in detection lesions on mammography.

Index Terms—Deep learning, Mammography, Lesion detection, INbreast.

Paper ID: 80

Improving Contactless Palmprint Recognition System Performance through Deep Rule-Based Classification

Yacine Belhocine, Abdallah Meraoumia, Hakim Bendjenna and Mohammed Saigaa

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Abstract— In recent years, as technology has advanced and more and more activities have become digitized, cybersecurity has become a top priority for governments around the world. Cybersecurity is essential for protecting computer systems, networks, and data from cyberattacks that can have a negative impact on individuals, businesses, and governments. Indeed, biometrics is a key means of cybersecurity that can help to prevent unauthorized access, identity theft, and unauthorized changes to data. This paper proposes a contactless palmprint recognition system that uses Pyramid Histogram of Oriented Gradients (PHOG) and Local Phase Quantization (LPQ) as feature extraction techniques, and a Deep Rule-Based (DRB) classifier for classification. Experimental results using typical databases

demonstrated an excellent identification rate, which was significantly superior to those reported in similar works.

Index Terms— Cybersecurity, Biometrics, LPQ, PHOG, Deep Rule-Based (DRB) classifier.

Paper ID:90

Comparative Study of Osteosarcoma Classification

Charaf Eddine Ghenai, Mohamed Gasmi, Hakim Bendjenna and Yasmina Ben Mabrouk
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Abstract— Osteosarcoma is a type of bone cancer that primarily affects the cells that form bone tissue. It is the most common type of bone cancer, typically occurring in children and young adults, but it can also affect older adults. Osteosarcoma usually develops in the long bones, such as the arms or legs, but it can also occur in other bones. Its Diagnosis is typically Histopathology wich is a branch of pathology that involves the microscopic examination of tissue samples using the H&E technique, allowing histopathologists to visualize and assess the tissue structures, cellular morphology, and any abnormalities or pathological changes present. It plays a critical role in the diagnosis of Osteosarcoma and is considered the gold standard for confirming the presence of the disease. AI becomes a major implement to detect and classify these disease, especially with the progress of Machine and Deep Learning. This paper, we reviewed recent studies used a same Dataset of histopathological images and different ML and DL algorithms, and techniques such as Transfer Learning, to classify OS into Benign and malignant, but also into Viable Tumor, Non Viable Tumor and Non Tumor. We compared those different studies by analyzing the whole pipeline process and obtained results, and also highlight the challenges and future researches.

Index Terms— Osteosarcoma, Classification, UT Southwestern/UT Dallas for Viable and Necrotic Tumor Assessment

ROOM P-CIS : COMMUNICATION AND INFORMATION SECURITY — IN PERSON

Paper ID: 38

TinyML: A New Technique for IIoT Monitoring Systems

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Abstract— Industrial Internet of Things (IIoT) monitoring systems play an essential role in monitoring and managing industrial operations. However, the distributed nature and resource constraints of IIoT devices impose major challenges in terms of computing power, memory and energy consumption. In this paper, we present a new technique called TinyML (Tiny Machine Learning) that aims to solve these problems by integrating Machine Learning (ML) capabilities into the IIoT devices themselves. We describe TinyML's architecture in detail, focusing on its ability to deliver ML capabilities on low-power, resource-constrained devices. We also present hardware-software solutions for integrating TinyML into IIoT devices. Finally, we discuss the benefits and future prospects of TinyML for IIoT monitoring systems.

Index Terms— IIoT Monitoring Systems, Embedded Devices, TinyML

Paper ID: 40

TinyML: perspectives on security issues in IoT systems

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Abstract—IoT systems have become ubiquitous in our daily lives, offering considerable benefits in terms of connectivity and automation. However, the security of IoT systems remains a major concern, as they are often exposed to vulnerabilities and potential attacks. In this

article, we explore how TinyML (Tiny Machine Learning) can help improve security in IoT systems. These are characterized by a multitude of interconnected devices, such as sensors, actuators and communication devices. These devices can be subject to malicious attacks, such as code injection, data theft and denial-of-service attacks. Integrating effective security techniques into these systems is therefore essential to prevent cyber-attacks. TinyML, which refers to the execution of Machine Learning (ML) models on resource-constrained devices, offers a number of advantages and is a sensible solution forenhancing security in IoT systems.

Index Terms—IoT Systems, Security, TinyML

Paper ID: 41

A state-of-the-art review on Multi-Agent System Stability

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Abstract—Multi-Agent Systems (MASs) have garnered significant attention in recent years due to their capacity to tackle intricate problems and showcase emergent behavior. One pivotal aspect of these systems is stability, which pertains to the system's ability to converge to an equilibrium state. This short paper aims to elucidate the concept of stability in MASs. We provide an overview of the non-functional properties of MASs and present a definition for system stability. Moreover, we reference various definitions of stability within the context of MASs and describe recent advancements in the field. Finally, we summarize the key findings, potential impact, and future prospects of MAS stability, while also offering recommendations for further research.

Index Terms—Multi-Agent System, stability, equilibrium.

Paper ID: 47

Enhancing Osteoporosis Diagnosis through Ensemble Classifiers

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Abstract—Classifying healthy and diseased bone images presents a significant challenge due to their high similarity. Therefore, it is crucial to employ an effective technique for characterizing bone texture to determine its brittleness. To address this, our study adopts a comprehensive approach by employing various feature extraction methods to analyze bone images and extract distinctive features that capture the subtle differences between healthy and diseased bone structures. These features serve as valuable indicators to discern the presence of osteoporosis accurately. Within our framework, we integrate an efficient classifier called Ensemble Classifiers (EC), which leverages the power of combining multiple classifiers to improve classification accuracy. By combining the predictions of individual classifiers within the ensemble, EC effectively captures a wider range of information and enhances the overall performance of the system. To evaluate the effectiveness of our scheme, extensive validation is conducted using atypical dataset consisting of both healthy and osteoporotic bone images. The results obtained are highly promising, with our system achieving an impressive accuracy of 98.59%. Notably, this accuracy surpasses the performance achieved by the widely used SVM classifier, highlighting the superiority of our EC-based osteoporosis diagnosis system.

Index Terms—Osteoporosis, Feature extraction, Classification, Ensemble classifiers, LBP, LDC, oBIF.

Paper ID: 50

From sky to network:FSO in the 5G revolution

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Abstract— Free Space Optics (FSO) is an emerging optical communication technology that offers high data rates, wide bandwidth, free licensing, and strong security. It presents an attractive solution to meet the connectivity needs of 5G, which has revolutionized our lives, as well as the requirements of the Internet of Things (IoT). However, FSO communication faces challenges, particularly in adverse weather conditions. This paper focuses on analyzing the performance of FSO links based on Orthogonal Frequency Division Multiplexing (OFDM) for 5G and IoT applications. Our study aims to evaluate the effectiveness of FSO technology by considering key factors such as data rate, laser

power, bandwidth, and range. The obtained results demonstrate the successful achievement of a data rate of 10 Gbit/s, a laser power of 10 dBm, and a wide bandwidth of 6 GHz, which are suitable for 5G applications. Moreover, under clear weather conditions, a maximum range of 10 km has been achieved. However, it is crucial to highlight that adverse weather conditions, such as snow and rain, significantly impact the system's performance, emphasizing the need for further consideration in practical implementations of FSO for 5G and IoT connectivity.

Index Terms— FSO, 5G, optical network, simulation, free space optical, EVM, constellation, Link

Paper ID: 82

Optimizing Task Scheduling Algorithms through Machine Learning: A Comprehensive ComparativeAnalysis

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Abstract— In recent years, many researchers have explored the potential of integrating artificial intelligence techniques into their respective areas of research, including the field of task scheduling in distributed computing environments. In this paper, we conducted a comparative analysis of several machine learning algorithms applied to select the most suitable task scheduling algorithm to be used. The comparison includes evaluating the total energy consumption and execution time of each machine learning algorithm during the training phase, as well as the accuracy achieved by each algorithm during the decision-making phase.

Index Terms— machine learning, task scheduling heuristic, energy consumption, Min-Min, Max-Min, Suffrage

Paper ID: 84

Enhancing early stage risk prediction of diabetes mellitus through feature selection bagging andboosting techniques

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Abstract—The potential to identify people at risk and offer early therapies has caused the capacity to predict diabetes using machine learning models to garner interest in the medical community. In addition to effectively predicting the existence of diabetes using patient records, this study also offered insights through data analysis and visualization we balanced the dataset and used 2 algorithms for feature selection to choose the most important attributes. We use a range of machine learning models to the pre-processed early stage diabetes prediction dataset in order to forecast the outcome value and increase accuracy. We make use of 9 supervised machine learning techniques for prediction. Traditional machine learning algorithms, as well as bagging and boosting algorithms, were tested. In the early prediction of diabetes, our research shown that the Extra Tree algorithm performed 97.95% more accurately than other algorithms in the literature.

Index Terms—Diabetes prediction, Data analysis, Imbalanced data, Feature selection, Machine learning, Ensemble models.

ROOM P-CCE : CONTROL AND COMPUTER ENGINEERING — IN PERSON

Paper ID: 48

Evaluation of Open-Circuit Fault Detection in a Three-Phase Inverter Using an Artificial Neural Network Methodology

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Abstract— The objective of this paper is to introduce a methodology that uses Neural Networks to diagnose three-phase inverters. This approach utilizes features obtained through the Clarke transformation of the currents in the inverter's output to identify open circuit faults in the Insulated Gate Bipolar Transistor (IGBT) switches. The current pattern features are derived from the average currents along the α and β axes, the angle between these currents, and the surface difference between the current vectors under healthy and faulty conditions. These extracted features are then employed as inputs for training the neural network, which learns to recognize the current patterns associated with various fault types. Simulation results obtained under the MATLAB/Simulink environment demonstrate that the proposed

method achieves higher accuracy and efficiency in detecting open circuit faults in three-phase inverters.

Index Terms— Three-phase inverters, Neural network, Open circuit faults, Clarke transformation, IGBT switches, Detecting.

Paper ID: 49

On the capability of the multilayer perceptron to predict well-logs data in unconventional hydrocarbon reservoirs

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Abstract— The main goal of this work is to test the capability of the multilayer perceptron neural network machine to predict missing or expensive logs and core rock measurement such as the Total Organic Carbon and Elemental Spectroscopy Capture (ECS), data of boreholes drilled in Lower Barnett Shale and Bakken Oil formations located in United States of America are used for the three stages of learning, cross-validation and generalization and three learning algorithms such as the Hidden Weight Optimization (HWO), the Conjugate Gradient (CG), and Levenberg Marquardt (LVM) are tested. The obtained results demonstrate that this capability is conditioned by reservoir complexity, data availability, and distribution.

Index Terms— well-logs, prediction, MLP, HWO, LVM, CG

Paper ID: 53

LQR Controller of an Active Suspension System for a Quarter Car Vehicle

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Abstract— This paper proposes the design of an active suspension control system for quarter vehicles, acknowledging the direct impact of challenging road conditions on its performance. To achieve a balance between ride comfort and driving performance by effectively mitigating vibrations caused by road turbulence, we advocate for the development of a realtime tuning controller for the active suspension dynamics. Our proposed solution involves utilizing the Linear Quadratic Regulator (LQR) method, which has demonstrated promising results in fulfilling this purpose. We adjust the weights within the LQR framework to optimize performance, targeting improvements in both ride quality and handling capabilities. The effectiveness of our approach is evaluated through simulation experiments conducted in the MATLAB/Simulink environment. The simulation results compellingly demonstrate the substantial reduction in acceleration of the vehicle's body caused by irregular road surfaces. We meticulously analyze and present these findings, offering valuable insights into the performance enhancements achieved by the active suspension control system.

Index Terms— Linear quadratic regulator LQR; active suspension; quarter car dynamics

Paper ID: 64

On–Off Control based on Whale Optimization Algorithm for Electromagnetic Torque Ripple Minimization of WECS.

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Abstract— This paper focuses on presenting an On-Off control approach for wind energy conversion systems (WECS) using a Squirrel cage induction generator (SCIG) and incorporating the whale optimization algorithm (WOA). The On-Off control scheme is known for its simplicity and robustness against disturbances and model uncertainties. However, it can lead to the chattering phenomenon, which can be detrimental to the lifespan of the wind turbine. To address this issue, a WOA On-Off controller is proposed in this study. The objective is to reduce the electromagnetic torque ripple by tuning the Standard On-Off controller with the whale optimization algorithm. The results obtained from the proposed controller are analyzed and compared with those achieved by the Standard On-Off controller.

Index Terms— Wind Energy Conversion System (WECS), Standard On-Off Controller, Torque Ripple, Whale Optimization Algorithm (WOA).

Paper ID: 68

Comparative analysis on THD between a PI and ANN controller for a shunt active power

filter based on direct current control strategy

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Abstract— Active filtering is a promising solution for compensating reactive currents and harmonics in grid energy quality. Indeed, active filters actively detect and compensate for reactive currents and harmonics in real-time. These devices use advanced control algorithms to inject compensating currents that cancel out the undesired reactive currents and harmonics, resulting in a cleaner and more stable power supply. This research paper presents a comparative study of two controller: PI controller and artificial neural network controller on the total distortion harmonics (THD), both implemented in a three-phase Shunt Active Power Filter (SAPF) based on direct current control (DCC) strategy. The direct current control strategy is based on extracting the harmonics components by measuring the current of the non-linear load (N-L) and extracting its harmonic components. A simulation model of the SAPF is modeled and simulated in the Matlab/Simulink environment.

Index Terms— active filtering, harmonics, grid energy quality, PI controller, ANN controller, total harmonic distortion THD, shunt active power filter SAPF, direct control DCC

Paper ID: 87

A synthesis of hybrid modeling approaches for MBT

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Abstract – This paper presents an overview of modeling approaches for hybrid systems to choose a suitable behavioral model within the framework of MBT with the aim of determining coverage criteria dedicated to this type of systems by exploiting the powerful advantages of artificial intelligence (AI) submitted by multiple learning techniques. MBT is an approach in software engineering where formal or semi-formal models of system behavior are used to generate tests automatically. It is difficult because of the interactions between discrete and continuous components and the difficulty of manipulating the modeling elements associated with the continuous part, which makes it so poor. The key to a successful MBT approach is to find the right coverage criteria.

Index Terms– MBT, Hybrid Model, Multicriteria Decision Support Methods.

Paper ID: 89

Double Stator Induction Machine Speed Control Based On Fuzzy Logic

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Abstract— This paper's objective is to make sufficient speed control as well as achieving good dynamic response for a double star induction motor (DSIM) based on field orientation method; by using the Artificial Intelligence techniques (AI) and more precisely the Fuzzy Logic. Moreover, this work presents a model of this motor in d-q reference frame fed by two pulse width modulation (PWM) inverters and the IFOC control scheme model with their simulation in MATLAB/SIMULINK, which is used to examine the proposed advanced controller. the simulation results show that the intelligent regulator has achieved a good result in terms of rise time, settling time, precision and it even showed stability against parametric and torque load variations.

Index Terms – Double Stator Induction Machine, Indirect Field Oriented Control, Artificial Intelligence, Fuzzy Logic Controller.

ROOM O-SIP : SIGNAL AND IMAGE PROCESSING — ONLINE

Paper ID: 11

Convelutional neural network for screening and grading Diabetic Retinopathy disease : an Overview

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Abstract— Diabetic retinopathy (DR) is a serious complication associated with diabetes, resulting from elevated blood sugar levels that damage the delicate retinal membrane in the eye. The disease often develops silently, exhibiting either no noticeable symptoms or mild vision impairment, but ultimately leading to blindness [1]. Consequently, numerous studies have been conducted to detect and predict the onset of this disease at an earlier stage. These studies have employed various techniques to extract DR indicators and classify them into four grades, namely Non-Proliferative DR (No-PDR), Moderate Non-Proliferative DR (Moderate NPDR), Severe Non-Proliferative DR (Sever NPDR), and Proliferative DR (PDR), utilizing color fundus images available in datasets. This paper aims to provide essential definitions related to our research domain and comprehensively review the most relevant works employing artificial intelligence, machine learning, and deep learning techniques for feature extraction, prediction, and classification of DR. Moreover, it conducts a thorough comparative analysis of DR prediction methods, evaluating key performance measures such as sensitivity, accuracy, and specificity. Additionally, this paper provides a detailed overview of the diverse datasets employed in the related studies, utilized for detecting characteristics and predicting the onset of DR.

Index Terms— Diabetic Retinopathy, artificial intelligent, deep learning, CNN, dataset DR.

Paper ID: 29

Automatic Detection of laryngal Pathologies Using Deep Learning

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Abstract— Voice disorders can have a significant impact on an individual's existence. These disorders can impair a person's ability to effectively communicate, perform daily tasks and engage in social and professional activities. Automatic voice disorders detection (AVDD) is a new area of research that uses artificial intelligence to detect and diagnose voice abnormalities. These disorders can be very serious, such as vocal cord paralysis, spasmodic dysphonia, and cancer of the larynx. In this study, we developed an automatic system for the detection of laryngeal voice disorders based on deep learning algorithms (DNN), which uses the relevant acoustic features extracted from the vocal signal. To evaluate the proposed system, we utilized the HUPA database, which contains several organic pathologies of the larynx. The performances of DNN were evaluated based on fivefold crossvalidation. The best-obtained result is very encouraging, withmore than 96% accuracy and 95% f1-score.

Index Terms— Automatic Voice Disorders Detection, Deep Learning Network, HUPA database, MFCC features

Paper ID: 37

Psycho-diagnostic Prediction Based on Machine Learning Techniques

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Abstract— The development of machine learning models for psycho-diagnostic prediction in mental healthcare has great attention in the last few years. This paper aims to address the challenges of collecting data as training data for developing machine learning models for psycho-diagnostic prediction. psycho-diagnostic assessment is an important field, but it is a challenging process for clinicians. Because it requires a lot of focus to collect data and link it with each other to reach the correct diagnosis. This work focuses on applying machine learning classification models that can achieve good performance in predicting relevant psycho-diagnostic categories based on patient data. The study used health records about patients which are manually collected from a hospital in Setif-Algeria for a month. Several different classification algorithms were tested, including logistic regression, KNN, and support vector machines. Feature selection was performed to identify the most important variables for predicting psycho-diagnostic categories. The bestperforming models achieved an accuracy of around 91% for the KNN model.

Index Terms— Classification, Machine Learning, Prediction, Psycho-diagnostic.

Paper ID: 42

Advances in Lung Cancer Detection: A Literature Review on Deep Learning and CT Scans

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Abstract— Lung cancer is a deadly disease that is the world's second-largest cause of mortality. Early detection of lung cancer can drastically lower fatality rates. This review looks into the possibility of artificial intelligence (AI), specifically deep learning, in improving lung cancer detection through the analysis of medical images. CT scans have made tremendous gains in their performance in recent years, notably in terms of precision when it comes to lung tissues and microscopic nodules. As a result, CT scans have become widely used in this field. Deep learning techniques such as CNN have grown in popularity over the last two decades, with encouraging results in early lung cancer diagnosis utilizing CT images. Because of their high-resolution imaging capabilities and good contrast, CT scans have emerged as an effective method for detecting lung cancer. However, there are certain drawbacks to CT scanning, such as radiation exposure, image artifacts, and the need for preprocessing and segmentation procedures to improve accuracy. Deep learning is essential for autonomously collecting information and capturing complicated patterns from CT scans, allowing for effective feature extraction. Based on these findings, this review analyzes the efficacy and status of computer-aided detection (CAD) systems and deep learning approaches, practically CNN models that use CT images to increase the efficiency and accuracy of a lung cancer diagnosis.

Index Terms— CT scan, Deep learning, CNN, Lung cancer.

Paper ID: 56

Prediction of Chronic Disease by Using a Parallel Unidimensional Convolutional Neural Network based Feature Extractor and SVM Classifier

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Abstract— Because of its severity and wide spread, chronic disease prediction (CD) has become a common research topic, especially with the development of deep learning. A new automated technique for the detection of these diseases has been proposed in this article. A deep network architecture using a network of parallel unidimensional convolutional neurons (1D-PCNN) was used for the extraction of distinctive deep features, then the support vector machine (SVM) technique was used for the CD classification. The particularity of the proposed framework lies in the design of the 1D-PCNN which is able to learn the deep characteristics of the input layer via parallel convolution layers. Thus, the deep characteristics of each parallel branch are extracted simultaneously before being combined into the fusion layer. The effectiveness of the technique has been evaluated on two public databases, Pima Indian Diabetes Database (PIDD) and Cleveland Heart Disease Database (CHDD), and the results are promising. For the two databases mentioned, the suggested approach achieved accuracy of 83% and 88%, F-Score of 73% and 90% and AUC of 80% and 87% respectively. In addition, the approach has outscored both standard 1D-CNN, conventional machine learning methods and other existing state-of-the-art models.

Index Terms— Chronic diseases, Data classification, Parallel unidimensional convolutional neural network (1D-PCNN), SVM.

Paper ID: 70

Biometric-based efficient medical image watermarking in E-healthcare application

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Abstract— Since the COVID19 pandemic, telemedicine has attracted a lot of at-tention and been the answer to many problems. However, this technology has also brought about a number of challenges, one of which is the security and in-tegrity of the data transmitted between clinicians and patients. Given how sensi-tive the medical industry is, it is crucial to ensure and guarantee the security of data in telemedicine. To solve this problem, we develop a method for watermark-ing medical images in which the characteristics of the patient's palmprint are em-bedded, and we compare the classification outcomes of several descriptors throughout the feature extraction stage. The accuracy of the applied descriptors varies, reaching a value of 0.99 in HOG and 0.98 in GABOR, but the efficacy of the watermarking was near across the board, at around 0.55 db for all the de-scriptors used in feature extraction phase. The suggested system shows promising results in both the identification phase and the watermarking system, which can be enhanced in future study to investigate further feature extraction techniques and mark insertion methods.

Index Terms— Watermarking, Biometric systems, Telemedicine.

Paper ID: 96

Multiscale Fusion in Deep Supervised Hashing (MFDSH)

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Abstract—Deep networks-based hashing has gained significant popularity in recent years, particularly in the field of image retrieval. However, most existing methods only focus on extracting semantic information from the final layer, disregarding valuable structural information that contains important semantic details crucial for effective hash learning. To address this limitation and improve image retrieval accuracy, we propose a novel deep hashing method called Multiscale Fusion in Deep Supervised Hashing (MFDSH). Our approach involves extracting multiscale features from multiple convolutional layers and fusing them to generate more robust representations for efficient image retrieval. Experimental results on CIFAR10 and NUS-WIDE datasets demonstrate that our method surpasses the performance of state-of-the-art hashing techniques.

Index Terms— Image retrieval, Deep learning, Multi-scale feature, Deep supervised hashing.

Paper ID: 97

Transfer learning-based approach for breast cancer diagnosis using histopathological images

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Abstract—Finding an effective method for classifying Hematoxylin & Eosin stained breast cancer histopathological images is a serious issue. Pathologists require valuable assistance in determining the type of cancer (benign or malignant) to facilitate the selection of the most suitable treatment by oncologists. This document presents an innovative approach to enhance the accuracy of breast cancer histopathological image classification using convolutional neural networks and transfer learning. This approach achieves an outstanding accuracy rate of 96% for the proposed model.

Index Terms— histopathological classification, CNN, Transfer learning, Breast Cancer, deep learning.

ROOM O-CIS 1 : COMMUNICATION AND INFORMATION SECURITY — ONLINE

Paper ID: 6

Deep Learning for Enhanced Human Activity Recognition in Smart Environments: A CNN-LSTM Hybrid Approach

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Abstract—In the past two decades, remarkable technological advancements have led to the rise of intelligent digital sensors. The widespread adoption of Internet of Things (IoT) services has created value across various domains, including homes, buildings, cities, factories, and smart environments. Specifically, smart homes have been equipped with an array of sensors and actuators to offer enhanced services to residents. An essential aspect of many smart home applications involves automatically identifying residents' regular activities. However, accurately recognizing human activities based on behavioral patterns within the intricate home environment, which may involve multiple inhabitants, presents a challenge. To tackle this complexity, researchers have explored deep learning algorithms, renowned for their effectiveness in diverse fields, to enhance the accuracy of human activity recognition. This study focuses on investigating and designing a Human Activity Recognition system in smart environments, utilizing a hybrid deep learning approach known as CNN-LSTM. The evaluation of our proposed model shows that it surpasses baseline methods, achieving outstanding results in terms of accuracy and performance.

Index Terms—Smart environment, Smart home, HAR, IoT, Sensor, Deep learning.

Paper ID: 25

Age Estimation : Bridging the Gap Between Handcrafted and Deep Learning Techniques

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Abstract—Age estimation involves predicting or estimating the age of an individual by considering factors like physical appearance, biological markers, behavior, and contextual information. This task is challenging due to the influence of multiple factors and individual variations in age estimation. In the field of computer vision, age estimation algorithms are commonly developed using pattern recognition systems that rely on images. An important aspect of this process is feature extraction, where suitable features are selected to represent the image effectively and concisely. Various approaches for feature extraction exist in the literature, including hand-crafted techniques such as LBP, DCT, and HOG, as well as learned hand-crafted techniques like CA-LBFL and CBFD, along with deep learning techniques such as PCANet and CNN. In this paper, three age estimation methods are introduced: one using a hand-crafted technique (LBP), another employing a learned hand-crafted technique (CBFD), and the third utilizing a deep learning technique (DCTNet). The main objective of this study is to extract feature vectors that accurately capture the unique features of different faces. The performance evaluation of these age estimation methods is carried out using the MORPH II database.

Index Terms—Age estimation, Feature extraction, Learning techniques, Handcrafted techniques, CBFD, DCTNet.

Paper ID: 30 **Edge-based machine learning for early detection and prevention of heart attack in healthcare**

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Abstract— Heart disease is a leading cause of human mortality, and the early identification of such conditions plays a crucial role in saving numerous lives. Given the advancements in technology, particularly in healthcare, we have devised a healthcare system aimed at setecting heart diseases, including heart attacks, specifically in remote areas. Our approach involves operating within an edge computing environment to mitigate network issues and ensuring real-time functionality. This is achieved by integrating Internet of Things (IoT) devices and a local server to locally store and archive information, while also establishing a connection with the cloud for processing extensive data sets. Our study focuses on three different machine learning algorithms () and their comparative results, which indicate the random forest algorithm's superiority. Our work is centered on assessing the effectiveness of the proposed models as well as evaluating their processing time.

Index Terms— Keywords: Edge computing, healthcare, cardiacarrest, real-time, Cloud computing,

Paper ID: 34 **Review on Arabic Handwritten Recognition Methods**

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Abstract— Machine learning and Deep learning techniques have shown effectiveness in developing high-performing artificial intelegence models, particularly in the field of Arabic handwriting recognition. This is significant because there are valuable handwritten documents from ancient civilizations that need to be digitallized. The literature on Arabic handwritten recognition is reviewed in this work, with a focus on deep learning and machine learning techniques for feature extraction. The paper thoroughly analyzes and categorizes the state-of-the-art methods found in the literature. Based on the results obtained, the current literature strongly supports the utilization of deep learning techniques, as they have been found to achieve the highest performance in various tasks or applications.

Index Terms— Arabic handwritten, handwritten recognition, machine learning, deep learning.

Paper ID: 59 **An Efficient Iris Recognition System based on Fine-tuned Xception Model**

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Abstract— Iris recognition is a highly secure biometric method for individual identification, leveraging the highly distinctive patterns present in the iris. These patterns possess the characteristic of being stable throughout a person's lifetime. Additionally, the capture of iris modality is a simple and uncomplicated process. However, challenges such as illumination variation, reflections, blur, and occlusions significantly impact the quality of iris recognition systems. Deep Convolutional Neural Network (CNN) models, renowned for their success in image recognition, often involve a large number of parameters that impact computational time and resource utilization. To address these challenges, we propose an effective iris recognition system based on Deep Learning. The system employs YOLOv4-tiny for precise iris region

localization. For the iris recognition, we proposed a new deep CNN model inspired by the pre-trained Xception model. We used Transfer Learning and Data Augmentation techniques to effectively train the proposed Deep CNN on small iris datasets. These two techniques not only enhanced the recognition accuracy but also effectively prevented overfitting. By applying a two-fold cross-validation protocol, achieving exceptional accuracy rates of up to 99.68%, 99.73%, and 96.88% on the IITD, CASIAIris-Interval, and Ubiris-v1 datasets, respectively. These results highlight the effectiveness of our system in iris recognition, demonstrating its superiority over existing methods.

Index Terms— Iris recognition, Deep Learning, Convolutional Neural Networks, Transfer Learning, Data Augmentation, pretrained Xception model

Paper ID: 71

An Efficient Image Watermarking Technique Based on Arnold Cat Map

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Abstract— The adoption of biometric measurements has become a widely discussed topic in recent years due to its various applications and implications across different fields. Biometric measurements refer to the use of individuals' unique physical or behavioral characteristics to identify and authenticate them. These characteristics include fingerprints, facial features, iris patterns, voice patterns, hand geometry, and behavioral traits like gait or typing patterns. This paper presents a novel approach that exploits watermarking to integrate biometric measurement methods. Using Arnold's cat map algorithm, the proposed approach uses a watermark to accurately embed biometric data, such as palmprint, into a host image. Using the Gabor filter, we aim to enhance security by adding a precise watermark during one of the iterations. The watermark in this study is additional personal information associated with the individual. The experimental findings indicate substantial performance improvement in identity verification and biometric security when employing this system.

Index Terms— Watermarking, LSB, Biometric, Arnold Cat Map, Gabor filters, PSNR

Paper ID: 93

A Novel Approach for Historical Documents Script Classification

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Abstract— The accurate identification of script types in historical manuscripts is crucial for comprehending their context and significance. In this study, we aim to develop a comprehensive system that combines hand-crafted and machine learning features to recognize script types within manuscripts, utilizing the ClAMM dataset. The proposed system encompasses three fundamental steps: preprocessing the dataset through denoising and binarization techniques, extracting hand-crafted features using the Harris detector, and performing script classification employing pretrained CNN models. By integrating both manual feature engineering and advanced machine learning techniques, our system demonstrates its efficiency in accurately identifying script types. The obtained results not only validate the effectiveness of our approach but also contribute to the broader advancement of script classification in the field of historical manuscript analysis.

Index Terms— Script Classification, historical manuscripts, feature extraction, deep learning, transfer-learning.

Paper ID: 99

Exploring Environmental Sensors for Human Activity Recognition: Comparative Analysis of Six Models

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Abstract— Recent advancements in human activity recognition have driven extensive research in healthcare, smart homes, and surveillance systems. While traditional approaches rely on wearable devices and camera-based methods, they face challenges related to user comfort, privacy concerns, and installation requirements. Fortunately, the emergence of sensor technology and the Internet of Things (IoT) presents new opportunities for activity recognition using environmental sensors. This paper investigates the feasibility of employing environmental sensors for human activity recognition and conducts a comparative analysis of six different models exclusively utilizing environmental sensor data. The research encompasses the development of a robust data collection framework, the application of preprocessing techniques, and the evaluation of the models using diverse metrics. The study's outcomes provide valuable insights into the potential of environmental sensors for activity recognition, offering guidance to researchers, practitioners, and system developers in making informed decisions regarding model selection and system design. By harnessing the power of environmental sensors, this research contributes to the advancement of activity recognition techniques, facilitating improved healthcare monitoring, efficient smart home

automation, and enhanced surveillance systems.

Index Terms— human activity recognition, environmental sensors, dataset, machine learning models, comparative analysis.

ROOM O-CCE 1 : CONTROL AND COMPUTER ENGINEERING — ONLINE

Paper ID: 14

Elevating Energy Efficiency and Sustainability: Unveiling the Potential of an Intelligent electric Energy Management System

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Abstract— Electrical energy is a cornerstone of our contemporary society, used and applied in nearly every aspect of our lives. This increasing demand for electricity and growing concerns about global climate change in recent years has sparked a renewed focus on the efficiency, sustainability, and cleanliness of its sources. By leveraging cutting-edge Artificial Intelligence (AI) technologies, smart grid infrastructures, and efficient equipment, the automation of human interventions and decision-making processes can be realized, thus improving the production, consumption, and storage of electricity. Smart electric power management systems have the potential to address the multifarious risks and challenges associated with electricity, while concurrently improving its reliability and quality. This paper aims to provide a comprehensive overview of intelligent electrical power management systems, highlighting their distinctive attributes, progressive stages, and key components that contribute to building a cleaner, more prosperous future. Moreover, the explores emerging trends and innovations that support the adoption of intelligent electrical energy management systems in smart cities.

Index Terms – Smart City, Intelligent Energy Management, Electric Energy, intelligent Systems, Artificial Intelligence, Machine Learning, Deep Learning, Internet of Things.

Paper ID: 45

Bearing fault detection by vibration analysis

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Abstract— This study presents an analysis of vibration signals using a proposed approach that incorporates several signal processing methods. Each method is organized in a complementary manner, providing diagnostic results in the form of fault frequencies for failed components in bearings. The first step of the approach involves decomposing the signal using the successive variational mode decomposition algorithm. Effective modes are then selected using an indicator called the efficient weighted Kurtosis index. By determining the envelope spectrum of the selected effective modes, faults in the bearing can be detected. In this study, the proposed approach was applied to a vibration signal from the Case Western Reserve University database, revealing a peak at the fault frequency of the inner ring.

Index Terms— vibration, bearing, fault, frequency, spectrum

Paper ID: 54

Individual and Equivalent Capacitor Voltage Regulation of the MMC Sub-Module of the Grid-Connected Photovoltaic System

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Abstract— This paper includes a method for regulating the equivalent and individual capacitor voltage of sub-module in addition to the suppression of Modular Multilevel Converter (MMC) circulating currents in PV systems. Two conversion stages are employed in this photovoltaic system: DC-DC Boost converter is usually employed in the adaptation stage between the PV panel and the DC-AC converters on the other hand, it is used for boosting the array voltage and achieving maximum power point tracking for the PV array to the DC-link and a modular multilevel converter that serves as an interface. The Fuzzy Logic (FL) controller maximum power point tracking is used to extract maximum power from the PV systems, and the primary goals for the MMC stable are suppressing circulating current and keeping the steady-state submodule capacitor voltages at a specific level. When capacitor voltages are out of balance, the arm current is distorted. Therefore, the goals of this paper are to build a circulating current suppression strategy based on a proportional resonant controller (PR), phase-shifted carrier (PSC) modulation to maintain the voltage stability of the sub-module capacitor, and proportional-integral (PI) control for the average sub-module capacitor voltage. Then, by using MATLAB/Simulink, the effectiveness and viability of the suggested method are demonstrated.

Index Terms— MMC, Individual and Equivalent Capacitor Voltage, Sub-Module, Fuzzy Logic, Grid.

Paper ID: 55

Detection of stator faults in three-phase induction machine using discriminate analysis and ensemble methods

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Abstract— The efficient and reliable operation of three-phase Induction Machines (IMs) is crucial for many industrial applications. Stator faults, such as inter-turn shorts circuit can have a significant impact on IM performance, leading to unplanned downtime and costly repairs. Early detection of stator faults is therefore essential to ensure the smooth operation of IMs. This paper presents an investigation study to diagnose stator faults in three-phase IM using Discriminate Analysis (DA) and Ensemble Methods (EMs). DA is a powerful statistical technique that aims to classify data into distinct categories based on their characteristics. EMs, on the other hand, combine predictions from multiple models to improve the accuracy and robustness of fault detection. In order to achieve optimal classification and acknowledge the substantial influence of hyperparameter selection, we conducted experiments that involved multiple classifier models for each utilized algorithm. As a result, two classifier models, specifically linear DA and subspace discriminant EM, exhibited high accuracy. The first model achieved a perfect accuracy of 100% during the testing phase, whereas the second model achieved a testing accuracy of 98.2%.

Index Terms— Three-phase induction machine, Stator fault, Fault detection, Ensemble methods, discriminate analysis, Performance evaluation.

Paper ID: 63

High Performance of Second Order Sliding Mode Control Using Intelligence Artificial of Induction Motor

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Abstract— In order to obtain high-performance speed control in AC drive systems, as well as backstepping control (BC) is a control technique. In this study, we combine artificial neural networks (ANNs) with the second-order sliding mode (SOSMC) approach. On the other hand, the SOSMC controller is effective to lessen the rotor flux ripple, stator current ripple, and torque ripple in the induction machine (IM). The proposed controller is more widely used than other controllers because of how easy it is to operate. A new SOSMC algorithm for IM called Cat NNs-SOSMC is presented. Finally, the simulation results for robustness and tracking tests are shown. Identify how the proposed control technique improves IM performance bydemonstrating its effectiveness.

Index Terms— Induction motor, Backstepping control, second order sliding mode, intelligent artificial, neural networks

Paper ID: 86

Reconstructs Signals Classification for Bearing Fault Vibration Analysis

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Abstract— In this paper, a new method the classification using Gaussian Mixture Model dedicate to induction machine bearing faults is proposed. This work based on Multiresolution analysis used for reconstruct the Analytic Vibration Signal of bearing fault. We consider here the Haar wavelet, after having created functions that effectuate multiresolution analysis and synthesis using these wavelets. This algorithm allows reconstructing the signal from the last level of approximation and all details. Thereby, making the classification task for three classes of bearing faults using Gaussian Mixture Model (GMM) Classifier. This method has been applied on the vibration data of a 5.5-kW induction motor test bench.

Index Terms— Analytic Vibration; bearing faults; the Haar wavelet ;Multiresolution Analysis; Classification; Gaussian Mixture Model.

Paper ID: 88

Implementation on FPGA of Anti-WindupFuzzy Logic Controller Algorithm using Grey Wolf Optimization applied to DC motor

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Abstract— The mathematical model of an electromechanical system and the design and implementation of a fuzzy logic controller that makes use of integral action and anti-windup in a parallel structure are both discussed in this work. One of the best controllers for conditions like disturbances and saturations is the FL control. Fuzzy logic type 1 algorithms are thoroughly studied, and difficult algebraic ideas are condensed into numerical equations. Greywolf optimization (GWO) is used to improve two parameters of our proposed controller. Vivado and XSG tools were used to co-simulate our suggested controller on both software and hardware, and the fixed-point structure of our controller's data propagation optimizes the methods used to implement it. This article's first focus is on using a better optimization approach to regulate the fuzzy controller's ideal settings in order to boost output speed and precision. Second, a pipeline method put out by XSG to create fuzzy controllers as efficiently as possible. When our controller is applied to the saturated system, the responses of the system are compared. To verify the efficacy of the proposed control strategy, a thorough comparison is done using control simulations between it and previous PID systems.

Index Terms— Anti-Windup, Fuzzy Logic Controller, Xilinx System Generator, FPGA.

Paper ID: 100

FPGA Implementation of an Embedded System for Transformer Monitoring based on FRA Signal Morphology Interpretation

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Abstract— Previous studies have provided designs and implementations of embedded systems to monitor load currents, over voltages, oil level and oil temperature of the transformers. In addition, this paper proposes a method for monitoring transformer winding displacement through the design and implementation of an integrated platform using FPGA card based on FRA signal morphology interpretation (FRA-SMI). The platform is independently able to perform two impedance measurements separately in the low and the high-frequency bands respectively to detect and classify winding damage. Its output test values are recorded in the FPGA's internal memory, then processed and compared to the limit values to detect and locate transformer winding deformations. An experimental case is used to perform the ability of the proposed method. The results proved that the use of physical parameters is very accurate in monitoring and diagnosing transformer winding displacements.

Index Terms— Transformer monitoring, FPGA, FRA, Embedded System, Diagnostic.

ROOM O-CIS 2 : COMMUNICATION AND INFORMATION SECURITY — ONLINE

Paper ID: 13

Exploiting Artificial Intelligence Approaches to Augment Decision-making Processes for an Intelligent Performance in Football

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Abstract— The world of Football has witnessed remarkable advancements, elevating the sport from being merely "The Beautiful Game" to a realm where numbers and Data hold immense significance. While some clubs and teams have achieved success through research, there is a pressing need for further investment in research, particularly with the integration of Artificial Intelligence (AI) technologies. AI has the potential to revolutionize team performance analysis by providing real-time insights and facilitating the analysis of instant games, providing an illustrative instance of the application of reinforcement learning for the purpose of analyzing player styles and conducting comparative assessments among various players can significantly enhance the simulation of these players within video games, such as FIFA games, furthermore, to augment the process of recruiting new players in accordance with the distinct training methodologies employed by individual clubs within diverse leagues. In this paper, we propose a novel approach to developing an intelligent system that can analyze and predict Football players' performances in real-time. Our approach utilizes machine learning and deep learning techniques, as well as a recommendation system, to comprehensively analyze players' performance. This proposed system aims to support managers and players in making informed decisions by providing them with valuable insights based on diverse Data sources. By leveraging this system, teams can enhance their performance and potentially attain higher international rankings.

Index Terms— Analyzing, Prediction, Machine Learning, Deep Learning, Football, Players 'Performance, physical, technical, Real-Live, Recommendation System, Analysis, Artificial Intelligence.

Paper ID: 16

ChatGPT: Revolutionizing Education with Artificial Intelligence

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Abstract— Artificial Intelligence (AI) is rapidly transforming the education sector, offering new possibilities for personalized and adaptive learning experiences for students. One AI tool that is gaining popularity in education is ChatGPT, an advanced language model that uses natural language processing to simulate human-like conversations. In this article, we will explore how ChatGPT is being used in education, its benefits and challenges, and real-life examples of its impact on student learning. We will also discuss the potential for further development and integration of ChatGPT and other AI-powered tools in education and the need for responsible implementation. Finally, we assessed the capacity of ChatGPT to answer questions in French and English from Duolingo and TV5 Monde platforms and compared it with two advanced-level students. ChatGPT showed superior performance in both tests, scoring 94% and 92% in French and English, respectively. In contrast, the two students achieved only 78% and 84% in the French and English tests, respectively.

Index Terms— Artificial Intelligence, ChatGPT, Education, Duolingo, TV5 monde.

Paper ID: 17

Adaptive approaches to e-learning for enhancing learning and individualised experiences

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Abstract— The notion of individualisation has emerged as a significant advance in the field of learning. Nowadays, this concept is widely embraced by educational systems globally, aiming to optimise student performance by leveraging diverse e-learning platforms that cater to individual needs. These platforms empower students to acquire knowledge aligned with their interests and skills. By prioritizing students' interests during the creation of e-learning platforms, not only academic success is fostered, but also proactive engagement is promoted among stakeholders seeking to understand the talent development context. This paper focuses on providing a global vision of adaptive e-learning approaches using a recognised categorisation framework. This categorisation identifies three main approaches: the macro-adaptive approach, the aptitude-treatment interaction (ATI) approach and the micro-adaptive approach. By presenting some examples within each category, it aims to identify and analyse the similarities and differences between these approaches. Furthermore, it delves into the history of adaptive e-learning systems, revealing a correlation between their development and the evolving trends in education and cognitive science. Ultimately, these ideas contribute to a better understanding of the field of adaptive e-learning and its evolution over time.

Index Terms— Adaptive E-Learning, Intelligent System, Adaptive Learning Approaches, Macro-Adaptive Approach, Aptitude- Treatment Interaction (ATI) Approach, Micro-Adaptive Approach.

Paper ID: 22

Blockchain-Enabled Secure and Verifiable Federated Learning for Education: A Case Study in Algeria

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Abstract— The growth of digital technologies in education provides a novel paradigm for optimized and effective learning environments. This study investigates using Blockchain and federated learning technologies to improve education in Algeria. A Blockchain-Enabled Secure and Verifiable Federated Learning (BESVFL) architectural model is proposed. Using various federated learning algorithms, we can assist students in making strategic decisions, while Blockchain technology creates a safe repository for maintaining educational documents such as degrees and diplomas. Although our proposal is still in progress, We offer a comprehensive analysis of the suggested architecture in the context of several factors, including scalability, security, and privacy.

Index Terms— Education, Algeria, Blockchain, Federated Learning, Scalability, Security, Privacy.

Paper ID: 33

Network attack detection in the PfSense firewall via Deep Learning

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Abstract— The detection of network attacks is a crucial aspect in ensuring the sustainability and proper functioning of information systems. Complex threat patterns and malicious actors possess the ability to inflict significant damage to cyber systems. In this study, we propose novel approaches utilizing deep learning techniques to identify and respond to threats and alerts found within network logs acquired through pfSense, an open-source firewall software. pfSense incorporates various robust security services including firewall capabilities, URL filtering, and virtual private networking (VPN), among others. The primary objective of this research is to analyze the acquired logs from a local installation of pfSense software, in order to develop a potent and efficient solution that can effectively manage traffic flow by automatically recognizing patterns through the proposed deep learning architectures, which present a significant challenge. To accomplish this, we have devised an attack detection system based on the CICDDOS2019 dataset, leveraging a deep neural network (DNN) model that has been seamlessly integrated into pfSense, enabling automatic identification and prevention of attacks.

Index Terms— PfSense, Firewall, Intelligence Artificial, Deep Learning, Deep Neural Network, CICDDOS2019.

Paper ID: 47

Boosting Gain and bandwidth in 5G Wireless Communication Systems

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Abstract—With the increasing demand for fast and dependable wireless communication, 5G technology has emerged as a highly promising solution. This study addresses the critical objective of enhancing gain and bandwidth performance in 5G wireless communication systems, with particular emphasis on utilizing Multiple-Input Multiple-Output (MIMO) techniques. To achieve our objective, we propose an optimized 2×1 microstrip antenna array design tailored for 5G applications operating in the FR1 frequency range. The antenna array consists of rectangular patch microstrip antennas, with each element measuring 9.6mm×13mm. For accurate simulation and analysis, we employ the HFSS software at a frequency of 7GHz. The selected substrate material is FR4, known for its favorable characteristics, including a relative permittivity (ϵeff) of 4.4. Our main goal is to leverage the advantages provided by the proposed design of the antenna array to enhance both gain and bandwidth. By doing so, we aim to optimize the performance of 5G wireless communication systems. The antenna array showcases a significant gain improvement of 6.86dB, resulting in expanded bandwidth at 540 MHz. These enhancements are essential for achieving superior coverage, increased data rates, and improved overall system efficiency in the demanding 5G environment.

Index Terms—Array Patch Antenna, Gain, Bandwidth.

Paper ID: 75

A comprehensive survey of task offloading techniques in IoT-Fog-Cloud computing

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Abstract— The proliferation of IoT devices has led to a surge in the data generated by these devices. This creates challenges in managing, processing, and analyzing this data in a timely and efficient manner. The IoT Fog-Cloud computing paradigm has emerged as a promising solution to address these challenges by enabling data processing and storage at different layers of the IoT architecture. In this paper, we present a comprehensive survey of the state-of-the-art task offloading techniques in IoT Fog Cloud computing. We will first introduce the IoT-Fog-Cloud architecture and its main functions. Then, we examine different types of task offloading that are included in the full or complete offloading, and the associated advantages and challenges. We examine various factors that influence the decision to offload tasks. Next, we examine the various task offloading strategies that have been proposed for IoT-Fog-Cloud computing. We also discuss the trade-off between these approaches in terms of different evaluation parameters such as energy consumption, latency, response time, and cost. Finally, we highlight the open research challenges and future directions for task offloading in IoT-Fog-Cloud computing.

Index Terms— Internet of things, Computation offloading, Fog computing, Cloud servers, Computational task.

Paper ID: 95

A new framework Using K-means Clustering algorithm to Group Homogeneous Data

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Abstract— The rapid deployment of Internet of Things (IoT) devices and other innovative technologies have simplified much of our daily work. The identification of data challenges continues to grow. Every day, multitudes of people and companies place huge amounts of data in the cloud. But users of this data no longer know how to group and identify them once placed on public networks. Grouping and classifying data is one of our major concerns in an environment where the reliability and accuracy of data are of great importance. This research presents a classification framework for clustering data. We propose a combined approach of two technologies which are: classification and K-means clustering, to improve the recognition of similar data with precision. Firstly, we use the K-mean clustering algorithm to group homogeneous data into clusters, and then we will apply the classification based on the Naive Bayes theorem for more precision. This solution provides more reliability regarding data classification with minimal time execution and a very low margin of error.

Index Terms— cluster; classification; k-Means clustering; data analysis.

ROOM O-CCE 2 : CONTROL AND COMPUTER ENGINEERING — ONLINE

Paper ID: 31

Integrating Blockchain into the Internet of Robotic Things: Empowering Artificial ntelligence for Secure and Collaborative Robotics

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Abstract—The Internet of Robotic Things (IoRT) is an emerging field that combines robotics, cloud computing, and IoT devices to enable autonomous data exchange and decisionmaking. However, managing the interactions between diverse robotics applications and IoT devices presents challenges in terms of security, privacy, and resource management. To overcome these limitations, the integration of blockchain technology into IoRT networks has emerged as a promising solution. This position paper provides a comprehensive overview of blockchain integration in IoRT, exploring the challenges, characteristics, and potential applications of this approach. By leveraging blockchain, we propose a novel IoRT architecture that aims to enhance security,privacy, and network performance. This research contributes to the intersection of artificial intelligence and blockchain technologies, advancing the development of secure and collaborative robotics. Through the comparison of related works, we provide insights into the future direction of our proposed solution.

Index Terms—blockchain, robotic, internet of things, security, artificial intelligence

Paper ID: 60

Design and Prototyping of an Intelligent Electronic Anti-pollution Station Based on an IoT Solution for Monitoring and Reporting Urban Pollution

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Abstract—Pollution has a significant negative impact on the health of populations, particularly those living in urban areas. To address this issue, this paper focuses on the design, development, and prototyping of an intelligent electronic antipollution station based on an Internet of Things solution, to overcome the problems of conjunctivitis and processing large amounts of data in the cloud. The data will be processed using the feedforward neural network artificial intelligence algorithm to accurately predict and identify emergency situations. The results produced by this algorithm are promising, especially after completing its learning process.

Index Terms—air pollution, intelligent electronic anti-pollution station, artificial intelligence, prediction, internet of things, cloud, forward neural network.

Paper ID: 61

Integration of CBC Mode and CTR Mode for InSAR Interferogram Encryption Based on the Feistel Network

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Abstract—Transmission of satellite images from space to Earth is exposed to threats that can compromise the confidentiality and quality of the data. Therefore, it is crucial to select encryption algorithms capable of securing the transmitted images while preserving their original quality. The objective of this study is to analyze the quality of a specific type of satellite image, namely the interferograms of the Synthetic Aperture Radar Interferometry (inSAR) system, encrypted using an encryption system based on the Feistel network which integrates two modes encryption, Cipher Bloc Chaining (CBC) and Counter-mode encryption (CTR). This analysis is conducted using different objective evaluation metrics based on the calculation of a digital fingerprint using the SHA-256 hash function. Quantitative measures used include root mean square error (MSE), maximum signal-to-noise ratio (PSNR), and structural similarity index (SSIM). In addition, statistical analyzes such as histogram analysis of the encrypted interferogram and entropy are used, giving acceptable results indicating that the cryptosystem used guarantees security.

Index Terms—inSAR interferogram, SHA-256 hash function, feistel network, encryption mode (CBC, CTR), SSIM, entropy.

Paper ID: 62

Performance Enhancement of 2D Spectral/Spatial Encryption In Incoherent OCDMA Networks By Implementing Novel Spectral Coding

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Abstract—This research presents for the first time a new two-dimensional spectral flexible weight (2D-SFW) code for spectral/spatial-optical code division multiple access (OCDMA) networks. The designed SFW code is used to generate the 2D-SFW code. By using the MAI cancelation feature, the recommended approach entirely removes multiple access interference (MAI). The code performance is assessed considering the effects of shot noise, phase-induced intensity noise, and thermal noise. The numerical findings demonstrate that our proposed code exceeds reported two-dimensional (2D) codes such as 2D dynamic cyclic shift (2D-DCS), 2D multi-service (2D-MS), and 2D hybrid zero cross-correlation/multidiagonal (2D-ZCC/MD). The performance of our 2DSFW system is improved by preserving the same mode length and extending the spatial code: it gives a higher bit rate and massive capacity while consuming lesser power.

Index Terms—2D-SFW, spectral/spatial, OCDMA, MAI

Paper ID: 65

The E ffectiveness of N eural N etworks for Identification and C ontrolling N onlinear S ystems

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Abstract—Artificial Neuronal networks (ANNs) are considered one of the most important fields of artificial intelligence, which reflects a significant and significant development in the way of human thinking, the focus on the idea of neural networks about the simulations of the human mind by using an electronic computer. It has been used in recent years to identify and accompany the non-linear systems and this has achieved success in the scientific field. In general, we can say that the neural networks are arranged in layers of artificial cells, and the latter helps in processing information in a good way to identify the nonlinear systems. In this work we show how ANNs can be put in order to form nets that can learn from external data. In sequence, it is presented structures of inputs that can be used along with ANNs to model nonlinear systems. A few systems were used to test the identification and control of the structures proposed. The results show the ANNs (Back Propagation Algorithm) used are efficient in modeling and controlling the nonlinear plants.

Index Terms—Nonlinear systems; Modeling; Neural network; Back-propagation.

Paper ID:85

Harmonic Compensation Using Shunt Active Power Based on Fuzzy Logic Controller

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Abstract—many power systems are internally connected into a network and to the grid. If a fault exists in any one of the network, it should

affect the whole power system, such as Harmonics. Because of current waveform distortion, reduce the power quality and cause the problem of "power grid pollution". In order to improve the power quality, this paper presents the simulation study of a hysteresis band current based on fuzzy logic controller, three phase shunt active filter (SAF) to suppressing harmonic pollution caused by non linear load, such as power electronic equipments. Harmonic current identified employ a simple method based on the use of the fundaments of Instantaneous Reactive Power Algorithm. The reference current that should be tracked to reduce or eliminate the harmonic currents. The main objective of this studied is not only reduces the harmonic current contents but also ensures a stable control of the sinusoidal source currents, with very weak ripples and a better total harmonic distortion (THD) confirmed to the international standards recommendation (IEEE 519) on harmonics levels. Some results are presented to prove the effectiveness of the proposed compensation technique.

Index Terms—Harmonic; Instantaneous Reactive Power Algorithm; Fuzzy logic controller; shunt active filter.

Paper ID: 91

Multiscale analysis of 3D seismic data using the 2D Continuous Wavelet Transform enhanced by deep learning for automatic fault tracking

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Abstract—The aim of this work is to suggest a new technique of automatic fault tracking from 3D seismic data using 2D Continuous Wavelet Transform (CWT) method combined with artificial intelligence, time slices of the variance attribute derived from the 3D seismic data, chosen by the user, are analyzed using the 2D CWT with the 2D Mexican Hat as an analyzing wavelet and maxima of the modulus of the 2D CWT are mapped for the full range of scales. The ensemble of mapped maxima for the set of time slices is filtered using a Convolutional Neural Network machine; the training of the machine is done a supervised deep mode using the tracked faults manually as a desired output. Application to real data shows the efficiency and the robustness of the proposed method, this last can greatly help seismic interpreters to avoidmanual fault tracking, which is a hard task and timeconsuming.

Index Terms—well-logs, prediction, MLP, HWO, LVM, CG

Paper ID: 94

Performance Optimization and Comparative Analysis of Reliable Multicast Protocols (AMRHy and DyRAM) in Wireless Mesh Networks

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Abstract—Wireless Mesh Network (WMN) plays important roles towards the next generation wireless networking. It is a key technology to support wireless multi-hop networks. Due to dynamic routing nature of WMNs, the optimization of routing protocol is most critical task. Our work consists on the study and the analysis of the performances of two reliable multicast protocols based on active networks: AMRHy(Active Dynamic Replier Reliable Multicast) and DyRAM(Active Multicast Reliable Hybrid). This analysis will allow us to show the contribution of the combination of the class receiver-initiated and sender-initiated in solving the reliability problem involving the active routers.

Index Terms—reliability, Active networks, Sender-initiated, Receiver-initiated, DyRAM, AMRHy, loss recovery, Delivery time