Proceedings of the International Conference

on

Advancements in Biomedical Systems & Healthcare Technology - ICABSHT 2024

20 - 21 December, 2024

Editors

Dr. R. Vidhyapriya

Dr. D. Brindha

Dr. M. S. Sangeetha

Ms. S. Nivethalakshmi

ORGANIZED BY

Department of Biomedical Engineering

PSG College of Technology

Coimbatore - 641004

Tamil Nadu, India

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Preface

Welcome to the International Conference on Advancements in Biomedical Systems & Healthcare Technology – ICABSHT 2024, organized by the Department of Biomedical Engineering, PSG College of Technology, Coimbatore, on 20 and 21 December 2024. The conference proceedings encapsulate the abstracts of diverse insights and cutting-edge research shared by the participants of the conference in significant domains such as wearable health sensors, diagnostic devices, regenerative medicine converging on the theme of clinical diagnosis, point-of-care devices, therapeutic technologies, preventive healthcare.

In this compendium, one can find a wealth of knowledge covering innovations in healthcare technology and medical solutions. We extend our gratitude to the Management, Principal, Head of the Department, advisory committee, conference committee, sponsors, participants, faculty members, staff and students who have contributed for making the ICABSHT 2024 a platform for meaningful discourse.

As we delve into this intellectual journey, we anticipate that this proceeding will be a valuable resource for researchers, academicians, and professionals worldwide, fostering collaboration and inspiring future advancements towards improving global healthcare systems.

Welcome to ICABSHT-2024!

The Organizing Committee
ICABSHT 2024

P. S. Govindaswamy Naidu & Sons' Charities

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MESSAGE

I am delighted to note that the Department of Biomedical Engineering is organizing **"International Conference on Advancements in Biomedical Systems & Healthcare Technology (ICABSHT 2024)"** during 20 – 21 December 2024. Innovations in biomedical engineering are vital for a sustainable and healthier future since the field contributes significantly to improving healthcare outcomes and quality of life.

The theme of ICABSHT 2024 emphasizes the significance of fostering collaboration and exchanging ideas among researchers, scientists, engineers, healthcare practitioners, and academicians. I am convinced that the discussions and deliberations at ICABSHT 2024 will provide useful insights and innovative research towards the development of efficient, accessible, and safe healthcare solutions.

Congratulations to all the organizers, faculty members, research scholars and students, ICABSHT 2024 participants. The effort you made to researching innovative scientific breakthroughs and sustainable healthcare solutions is absolutely admirable. Focusing on sustainable healthcare practices is crucial for addressing contemporary challenges and ensuring a better future for all.

Wishing you continued success in your endeavours for a more innovative and sustainable healthcare landscape.

L. GOPALAKRISHNAN
MANAGING TRUSTEE

Dr. K. PRAKASAN
B.Sc., B.Tech., M.Tech., Ph.D

Principal

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Email : principal@psgtech.ac.in, principal@psgtech.edu, website : www.psgtech.edu

MESSAGE

As advancements in healthcare and biomedical systems become increasingly vital for improving human well-being, academic institutions play a crucial role in fostering innovation and driving progress in these areas. International Conference on "Advancements in Biomedical Systems and Healthcare Technology", (ICABSHT 2024) provides an excellent platform for in-depth deliberation on the latest developments in biomedical engineering, medical devices, and healthcare technologies.

Discussions during the presentations will address some of the key challenges faced by the healthcare industry and contribute to the development of efficient, accessible, and advanced healthcare solutions. These discussions will be immensely beneficial to students who will acquire knowledge about innovative technologies and emerging practices to pursue research.

I congratulate the Department of Biomedical Engineering for their efforts in organizing ICABSHT 2024 and wish all participants an enriching learning experience and fruitful knowledge sharing.

Dr.K.PRAKASAN

Dr. K. PRAKASAN
B.Sc., B.Tech., M.Tech., Ph.D
Principal

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Message from the Head of the Department

With immense pleasure, I welcome you all to the "International Conference on Advancements in Biomedical Systems & Healthcare Technology (ICABSHT 2024)." This conference presents a valuable opportunity for our department to engage with latest trends in biomedical systems, healthcare technology, and medical devices.

The field of biomedical engineering plays a pivotal role in enhancing healthcare outcomes and improving patient care through technological advancements. ICABSHT 2024 aims to bring together experts, researchers, industry professionals, and healthcare practitioners to discuss and exchange ideas on recent developments in biomedical systems, diagnostics, therapeutics, and healthcare technologies. This event will feature keynote addresses and paper presentations covering, wide range of topics, highlighting contemporary breakthroughs and future trends in the field.

I am convinced that participants will gain valuable insights into the latest advancements, network with experts and peers, showcase their work, and contribute to the growing discourse on biomedical innovations. This conference provides an excellent platform for collaboration and knowledge-sharing, paving the way for future advancements in healthcare technology.

On behalf of the Department of Biomedical Engineering, I extend my heartfelt appreciation to the organizers, committee members, and student volunteers of ICABSHT 2024 for their dedicated efforts and commitment to making this conference a success. I hope ICABSHT 2024 will be an enriching, memorable, and informative experience for all participants, inspiring them to further their pursuit of knowledge and skills.

My best wishes for ICABSHT 2024's overwhelming success!

Dr. R. Vidhyapriya
Professor and Head
Convenor – ICABHT 2024

About the College

PSG College of Technology (PSG CT), established in the year 1951 by PSG & Sons' Charities, is an ISO 9001 – 2015 certified autonomous college affiliated to Anna University, Chennai. The College offers 21 Undergraduate programmes and 24 Postgraduate programmes including Engineering and Technology, Computer Applications, Management Sciences, Basic and Applied Sciences.

PSG CT is equipped with several state-of-the-art centres of excellence that include TIFAC Core in Product Design, Machine Tool Research Centre, Engineering Design Centre, Virtual Reality Centre, Tool and Die Centre, Centre for Nano-technology, Centre for Robotics, Centre for excellence in Artificial Intelligence and Software, Centre for Non-Linear Dynamics, Danfoss Centre of Excellence in Climate and Energy, Centre of Excellence for welding Engineering and Technology. Under the Banner of PSG Industrial Institute, there are in-campus manufacturing units of machine tools, pumps, motors and off-campus foundry units. Furthermore, PSG CT has established very good network with industry, research institutes, alumni and entrepreneurs.

PSG CT was ranked second under Colleges/ Institutes (Govt. & Govt. Aided) (Technical) by ATAL Ranking of Institutions on Innovation Achievements (ARIIA), Ministry of Education, Government of India in the year 2021 and the best industry linked institution by AICTE-CII in the year 2012. During the occasion of India assuming the G20 Presidency on December 1, 2022, PSG CT was identified as one among the 75 educational institutions across India, with special responsibilities towards organizing special lectures, student exchange programmes, academic and cultural activities to spread awareness among the youth and the academic community on the G20 agenda.

About the Department

The Biomedical Engineering Department, established in 2006, offers an Undergraduate Programme in Biomedical Engineering. The department's mission is to provide world-class education in Biomedical Engineering, foster cutting-edge research and development, encourage entrepreneurship, and inspire young minds to innovate technologies for healthcare applications. Biomedical Engineering is a multidisciplinary field that integrates mathematics, physics, chemistry, and biology to address medically relevant challenges.

It applies engineering approaches and methodologies to devise solutions for medical problems, paving the way for advancements in healthcare. The rapid development of new tools and technologies has enabled Biomedical Engineering to create innovative solutions for biomedical and therapeutic applications. These advancements provide vast opportunities to enhance our understanding of complex living systems, prevent diseases, maintain health, and improve the quality of life.

About the Conference

The conference will highlight key technological advancements essential for transforming the Indian healthcare industry, with a focus on Biomedical Engineering, Biomaterials, and Biomedical Imaging. By addressing critical challenges in healthcare delivery, it aims to foster innovation that enhances the efficiency and quality of patient care.

These advancements are expected to bridge the gap between cutting-edge research and practical applications, driving progress in diagnostics, treatment, and healthcare infrastructure. The conference emphasizes promoting indigenous manufacturing to enhance healthcare services and infrastructure in India. It aims to foster collaboration among researchers, industry experts, and policymakers to drive accessible and sustainable innovations.

Conference Theme

Clinical Diagnosis

Medical imaging, Diagnostic biomarkers, Lab-on-a-chip technology, AI in diagnostics, Early detection systems, Molecular diagnostics, Wearable health sensors, Diagnostic software tools, Personalized medicine, Tele-diagnostic platforms, Imaging modalities (MRI, CT, PET).

Point-of-Care Devices

Portable diagnostic devices, Real-time health monitoring, Biosensors, Point-of-care ultrasound, Mobile health technologies, Rapid testing kits, Microfluidic devices, Remote patient monitoring, Home-based diagnostic systems, Telemedicine integration, Handheld medical instruments.

Therapeutic Technologies

Minimally invasive therapies, Robotic-assisted surgery, AI-assisted treatment planning, Drug delivery systems, Regenerative medicine, Advanced prosthetics, Wearable therapeutic devices, Physiotherapy innovations, Phototherapy, Electrotherapy, 3D-printed implants.

Preventive Healthcare

Early intervention strategies, Health screening programs, Digital health platforms, public health informatics, Lifestyle modification tools, Genetic screening, Wearable preventive devices, Health education technologies, Mobile apps for preventive care, Community-based health initiatives.

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Schedule

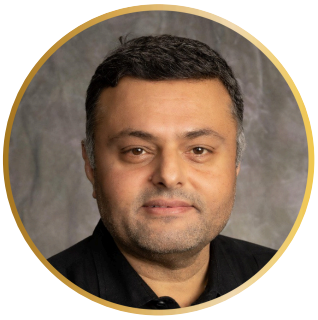
Day 1: 20 December 2024 (Friday)		
08.30 a.m. – 09.30 a.m.	**Registration**	
09.30 a.m. – 10.30 a.m.	**Inauguration**	
10.30 a.m. – 10.45 a.m.	**Tea Break**	
10.45 a.m. – 11.15 a.m.	**Plenary Talk I: Dr. Suresh Kumar R,** Vice President, Providence India, Hyderabad	
11.15 a.m. – 11.45 a.m.	**Plenary Talk II: Dr. Ketul C. Popat,** Professor, Department of Bioengineering, College of Engineering and Computing George Mason University	
11.45 a.m. – 12.45 p.m.	**Paper Presentation Session-I** Paper IDs: BM107, BM103, BM110, BM123, BM129, BM115, BM102 Venue: D-Block Conference Ground Floor	**Paper Presentation Session-II** Paper IDs: BM101, BM105, BM122, BM140, BM109, BM110, BM120 Venue: Embedded System Lab
12.45 p.m. – 01.45 p.m.	Lunch	
01.45 p.m. – 02.30 p.m.	**Plenary Talk III: Dr. Alina Sionkowska,** Professor, Nicolaus Copernicus University, Faculty of Chemistry, Poland	
02.30 p.m. – 03.15 p.m.	**Plenary Talk IV: Mr. Raghuraman K. V,** Sr. Vice President, Siemens Healthineers, Bengaluru	
03.15 p.m. – 03.30 p.m.	**Tea Break**	
03.30 p.m. – 04.30 p.m.	**Paper Presentation Session-III** Paper IDs: BM139, BM104, BM127, BM134, BM121, BM108, BM106 Venue: D-Block Conference Ground Floor	**Paper Presentation Session-IV** Paper IDs: BM111, BM113, BM114, BM117, BM130, BM126, BM118 Venue: Embedded System Lab

Schedule

Day 2: 21 December 2024 (Saturday)		
09.00 a.m. - 09.45 a.m.	**Plenary Talk V: Sudha Ramalingam,** Director, R&I, PSG IMSR, Coimbatore	
09.45 a.m. – 10.30 a.m.	**Plenary Talk VI: Dr. K. Mohanavelu,** Scientist G & Associate Director, Member Secretary, LSBD, LSRB, DRDO	
10.30 a.m. – 10.45 a.m.	**Tea Break**	
10.45 a.m. – 12.00 p.m.	**Paper Presentation Session-V** **Paper IDs:** BM125, BM138, BM132, BM128, BM116, BM136 **Venue:** D-Block Conference Ground Floor	**Paper Presentation Session-VI** **Paper IDs:** BM124, BM131, BM119, BM133, BM135, BM137 **Venue:** Embedded System Lab
12.00 p.m. – 12.30 p.m.	**Valedictory Function**: **Dr. K. Mohanavelu,** Scientist G & Associate Director, Member Secretary, LSBD, LSRB, DRDO	
12.30 p.m. – 01.30 p.m.	**Lunch**	

Eminent Speakers

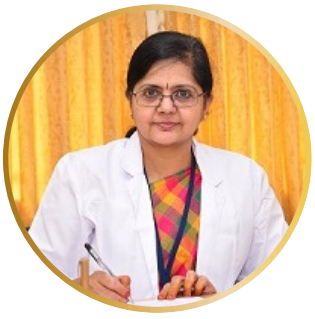
Dr. Suresh Kumar R,
Vice President, Providence India, Hyderabad



Dr. Ketul C. Popat,
Professor, Department of Bioengineering, College of Engineering and Computing George Mason University

Dr. Alina Sionkowska,
Professor, Nicolaus Copernicus University, Faculty of Chemistry, Poland

Mr. Raghuraman K. V,
Sr. Vice President,
Siemens Healthineers, Bengaluru



Dr. Sudha Ramalingam,
Director, R&I,
PSG IMSR, Coimbatore

Dr. Mohanavelu K,
Scientist G & Associate Director, Member Secretary, LSBD, LSRB, DRDO

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Design and analysis of EMG signals using Virtual Instrumentation tools

Paper ID: BM101

Veera Venkata Manikanta Gandham*, Devi Prasad Kotha, Tharun Dannana, Kishore Devarapalli

Adikavi Nannaya University, Andhra Pradesh, India.

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Abstract:

In this work an experimental attempt has been made to acquire EMG signals of the biceps of the arm and feed to the Virtual Instrument tools through EKG sensor. The analysis of EMG acquisition has shown the superior performance when compared to the traditional methods of acquisition and processing of the EMG signals. In this real time case study of biceps part and elbow part has been considered along with Virtual Instrumentation tools. It was observed with the addition of VI tools the effect of noise on the acquire signals has been reduced substantially.

Keywords: *EMG, NI ELVI LABVIEW, Data acquisition, virtual instrumentation, Vernier EKG sensor.*

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Smart Insoles for Foot Pain Management and Gait Analysis Using IoT and AI: An Advanced Approach

Riya Singh[1]*, Divyanshu Singh[1], Shruthi K[2]

Paper ID: BM102

[1] Easwari Engineering College, Chennai, India.
[2] Ghani Khan Chowdhary Institute of Engineering and Technology, Malda, West Bengal, India.

*Corresponding author email: riyasinghbme@gmail.com

Abstract:

Foot pain is a prevalent issue, particularly among individuals with physically demanding lifestyles or conditions such as plantar fasciitis and arthritis. Traditional pain management methods, such as manual massage or basic Electrical Muscle Stimulation (EMS) devices, often lack real-time adaptability and personalized relief. This paper presents a novel approach through the development of smart insoles that integrate advanced sensors, Internet of Things (IoT) connectivity, and Artificial Intelligence (AI)-driven analytics for foot pain relief and gait analysis. The insoles are equipped with accelerometers, gyroscopes, and pressure sensors to monitor foot movement and pressure distribution, with data transmitted wirelessly via IoT to a cloud platform. AI algorithms analyse this data in real time, allowing the system to dynamically adjust EMS intensity based on user activity, pain history, and walking patterns. The AI models also provide predictive insights into potential health risks, such as stress fractures or gait abnormalities, offering preventive recommendations before issues escalate. This personalized approach, combined with continuous monitoring and data storage, enables both immediate therapeutic interventions and long-term health assessments. The smart insole's ability to deliver customized pain relief while providing predictive, preventive care positions it as a powerful tool for improving foot health in both clinical and everyday settings.

Keywords: *Smart insoles, Foot pain relief, Electrical Muscle Stimulation (EMS), Gait analysis, Internet of Things (IoT), Artificial Intelligence (AI), Predictive analytics, Pressure sensors, Preventive healthcare.*

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Proceedings of the International Conference on Advancements in Biomedical Systems & Healthcare Technology – ICABSHT 2024

Exploring Cardiac Rhythm Dynamics in MATLAB

Krishna Kumar R[1]*, Kishore Kumar M[1], Lakshana S J[1], Jeyashree S[1], Harshavardhini R K[1], Venkatesan A[2]

Paper ID: BM103

[1] KPR Institute of Engineering, Coimbatore, India.
[2] Recorder Medical Systems, Chennai, India.

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Abstract:

Cardiac signals, represented by electrocardiograms (ECG), reflect the heart's electrical activity driven by membrane potential and recovery variable dynamics. Membrane potential, or voltage difference across cardiac cell membranes, is generated by sodium, potassium, and calcium ion movements. It undergoes phases of resting (-80mV), depolarization (+30mV), and repolarization (-80mV), influencing cardiac contraction. The recovery variable represents the gradual recovery from depolarization, regulating repolarization rate, action potential duration, and refractoriness. Mathematical models, such as the Hodgkin-Huxley equations, simulate these dynamics using ordinary differential equations, providing valuable insights into cardiac electrophysiology and arrhythmia mechanisms. Understanding membrane potential and recovery variable dynamics is crucial for predicting arrhythmia onset, optimizing pacing strategies, and developing effective anti-arrhythmic treatments. ECG analysis, combined with mathematical modelling, enhances diagnosis and treatment of cardiac conditions, including atrial fibrillation, ventricular tachycardia, and heart block. By elucidating the complex interplay between membrane potential, recovery variable, and cardiac signalling, researchers can develop more effective therapeutic interventions, improving patient outcomes and reducing cardiovascular mortality. Advanced Cardiac Signal Processing and Analysis using MATLAB is an integrated framework to analyse electrocardiogram signals which retrieves processed information for diagnosis and monitoring of cardiovascular diseases. This framework makes use of the pre-processing, noise removal, and filtering performed through wavelet transforms. It uses feature extraction based on the time-frequency analysis along with arrhythmia detection algorithms using machine learning. The efficient implementation was done through the use of MATLAB-based tools and functions. Results. The proposed framework is highly efficient in the adequate detection of arrhythmia with sensitivity equal to 95%, specificity equal to 92%, and reliable analysis of heart rate variability, achieving a correlation coefficient of 0.95; this enables more accurate diagnosis of cardiovascular diseases.

Keywords: *Fitzhugh, Nagumo model, cardiac signal, arrhythmia, ECG, MATLAB*

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Proceedings of the International Conference on Advancements in Biomedical Systems & Healthcare Technology – ICABSHT 2024

Personalized Learning Recommendation System for Children with Learning Disabilities

Paper ID: BM104

Sudha Sadasivam G*, Saranya K G, Vaishnavi K, Mohammad Fazil S F

PSG College of Technology, Coimbatore, India

*Corresponding author email: gss.cse@psgtech.ac.in

Abstract:

Learning disorder can be characterized by difficult reading, writing and it occurs in the common children with normal vision and intelligence, symptoms include late talking, delay in reading and writing and most students succeed in school with tutoring and specialized education programmes. Learning recommendation system for such children are needed because by practicing and learning the content in an effective way this problem can be handled. These students have the capabilities to learn contents but the problem is it takes additional time and care to get them work done. Learning patterns differ from people even though they share the same learning disorder level. That is why it is important to recommend them with the learning materials.

Keywords: *Learning disorder, Learning Materials*

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Proceedings of the International Conference on Advancements in Biomedical Systems & Healthcare Technology – ICABSHT 2024

Deep Learning Method Based on YOLOv7 Algorithm for the Detection of Microscopic Urinary Particles

Paper ID: BM105 Suhail K*, Brindha D

PSG College of Technology, Coimbatore, India

*Corresponding author email: suhailkp13694@gmail.com

Abstract:

The identification of kidney diseases is carried out by examining urinary sediment. The existence of different types of microscopic particles in the urine sediment may be the indication of various of renal abnormalities. The traditional approach for urinalysis was carried out by the process of centrifugation of urine samples, which leads to the manual errors. Automated urinalysis can be performed by utilizing machine learning classifiers, which needs segmentation and feature extraction leads to the reduction of performance due to inhibit features of microscopic images. Deep learning-based algorithms are complex models since it requires manual annotation of huge number of images in the dataset. This paper proposes a faster deep learning model YOLOv7, which necessitates a smaller volume of data in contrast to other deep learning models. YOLOv7 algorithm is employed to detect seven classes of microscopic urinary particles. The proposed model performed better for urinalysis by resulting a mean average precision of 75.4%.

Keywords: *YOLOv7, Urinalysis, Deep Learning, Microscopic image analysis*

ISBN Number: 978-93-95105-58-3

Proceedings of the International Conference on Advancements in Biomedical Systems & Healthcare Technology – ICABSHT 2024

Haptic Feedback in Medical Robots Using Current – Torque Feedback

Paper ID: BM106

Jayavel S*, Bathrinath G, Anbarasi M P

PSG College of Technology, Coimbatore, India

*Corresponding author email: jayavels2005@gmail.com

Abstract:

Robot-assisted surgery (RAS) also known as robotic surgery is a minimally invasive surgery, that uses highly precise actuators, high-definition micro cameras, and a doctor's console where the doctor can view the internal parts of the body, where the actuator travels and can able to control the actuator's motion through the external doctor's console, through joysticks. The actuators are powerful enough to grab the bones and can exert a huge amount of gripping force based on the joystick's movement. The problem with this approach is that the doctor can only visualize the surroundings of the actuator and can't sense the surroundings, and hence they can't distinguish between hard bone and soft tissue, so if they exert high force on smooth tissues, the tissues will get damaged. To prevent damage to the smooth tissues, the doctor should be able to feel the hardness of the part gripped by the actuator. This process of transferring the resistance offered to the actuator to the resistance in the joystick is called Haptic feedback. In this work, the process of achieving the haptic feedback of the medical robots with the help of current transformers will be broadly discussed.

Keywords: *Haptic Feedback, Cable Pulley, Torque, Current Transformer, Medical Robotics*

ISBN Number: 978-93-95105-58-3

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Comparison of Hybrid Encryption Algorithms for 2D Medical Image Security

Paper ID: BM107 Vidhyambika S R*, Rajathi N

Kumaraguru College of Technology, Coimbatore, India

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Abstract:

Regulatory frameworks mandate the protection of medical images due to their sensitive nature, which often includes personally identifiable information and critical health data. If compromised, these images can be exploited by hackers for identity theft, financial fraud, or blackmail, potentially causing significant harm to patients and healthcare providers. Moreover, data breaches can lead to misdiagnoses and improper treatment when tampered images influence clinical decisions. As the volume of medical data rises with the expansion of telemedicine, robust security measures are essential to maintain trust in healthcare systems. Safeguarding medical images preserves patient confidentiality, upholds healthcare credibility, and enables the delivery of quality care. This paper proposes a collection of robust encryption algorithms, including RSA+AES+SHA-256, ECC+AES+SHA-256, AES+SHA-256, Chaotic Maps+AES, DNA Cryptography+AES, Blowfish+SHA-256, and DES+AES+MD5, aimed at fortifying the security of medical images. Evaluated through performance metrics such as MSE, PSNR, SSIM, entropy, edge preservation, and encryption time, the results demonstrate that these algorithms effectively improve security while preserving image quality and minimizing encryption time, making them suitable for real-time telemedicine.

Keywords: *Medical Image Encryption, Cryptography, Telemedicine Security, Data Privacy, Healthcare Applications.*

ISBN Number: 978-93-95105-58-3

Proceedings of the International Conference on Advancements in Biomedical Systems & Healthcare Technology – ICABSHT 2024

A Survey of Sentiment Analysis – Approaches, and Scope in Private Sector Employees

Paper ID: BM108 Najma M*, Banu Rekha B

PSG College of Technology, Coimbatore, India

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Abstract:

In today's digital era, online platforms provide organizations with indirect feedback that reflects public opinion and user experience. Sentiment analysis has become essential for processing this unstructured data, particularly in understanding employee sentiment within the private sector. This survey offers a comprehensive examination of sentiment analysis in the context of private-sector employee feedback, which presents considerable potential but also faces distinct challenges when applied to workplace reviews and employee sentiments. Key obstacles include the accurate interpretation of nuanced language, such as sarcasm and implicit biases, as well as the contextual variability of terms across roles and industries. Furthermore, the survey explores issues related to mixed sentiment expressions, privacy and ethical concerns, and the need for domain-specific language models that capture the complexity of workplace dynamics. The study identifies research gaps in current methods and proposes future advancements tailored to the needs of the private sector, ultimately helping organizations respond more effectively to employee perspectives using various natural language processing (NLP) techniques.

Keywords: *Natural Language Processing (NLP), sentiment analysis, sarcasm, irony, mixed sentiments, Nuanced language interpretation, Employee Sentiment, Opinion Mining, Workplace Reviews.*

ISBN Number: 978-93-95105-58-3

Proceedings of the International Conference on Advancements in Biomedical Systems & Healthcare Technology – ICABSHT 2024

Non-Sound Based Disease Detection System Using Hybrid Model Machine Learning

Paper ID: BM109 Shanmugapriya K*, Ravikumar P, Gunaprabha

Velalar College of Engineering and Technology, Erode, India.

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Abstract:

Respiratory diseases are a global health concern, and early detection is crucial for effective management. This method proposes a real-time human sound-based disease detection system using a hybrid classification model combining K-Nearest Neighbour's (KNN) and Random Forest algorithms. The system aims to identify four prevalent respiratory conditions: COVID-19, asthma, obstructive pulmonary diseases, and tuberculosis. This system leverages the unique acoustic signatures of these diseases and analyses real- time human sound data for accurate disease classification. The hybrid model harnesses the strengths of both KNN and Random Forest to potentially achieve high robustness and accuracy of about 98%.

Keywords: *KNN, RF, COVID, Tuberculosis, Asthma, COPD, Machine Learning*

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IOT – Based 6 DOF Robotic Arm with Hand Movement Control for Surgery Purpose

Paper ID: BM110 Jiyath Rashiq S*, Kisodharani S, Logesh M, Sudarsun S, Jayadevan N M

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Abstract:

In modern healthcare there is a demand for systems that allow for remote-controlled systems for performing remote surgery, or telesurgery medical procedures. The advancements in the robotic technology have introduced new ways to enhance the accessibility of healthcare systems. This project is the real-time innovation which allows the surgeons to operate from distant locations, less precision surgery and telesurgery can reduce the time, and travel burden associated with patient care, surgeons cannot access direct access of the patients. This research mainly focuses on the development of a robotic arm system which is particularly designed for non-invasive surgeries, controlled through an innovative glove interface. The glove, equipped with a gyroscope and accelerometer, captures the surgeon's hand gestures, which translates them into precise motions of the robotic arm through a software application connected to the Industrial Internet of Things (IIOT). This software application will be able to facilitate seamless communication, via monitoring through the camera, and control the arm, which enable the surgeons to conduct less precise surgeries from remote locations. This research also further helps to do minimally invasive (Minute) surgeries such as Laparoscopic surgery and Endoscopic surgery which is performed through the small incisions, or natural openings. The current system is designed only with the single robotic arm, but in future we can develop and control this system using multiple arms. Thereby, the given project sets an example for creating innovative techniques both in the healthcare and research sectors; it also educated people as to how technology should be deployed in the field of healthcare and, thus, serves as the basis for future advancements.

Keywords: *Telesurgery, IIOT, Teleoperated, robotic-arm, software application, non-invasive.*

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Identification and Classification of Cancer Gene using Neural Networks

Paper ID: BM111 Hemananth V*, Kavin S, Mithra N R, Kishore S, Jayadevan N M

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Abstract:

Identifying cancer cells using neural networks is a complex and challenging task that involves analysing large amounts of genomic and transcriptomic data. A subclass of machine learning models called neural networks may be used to identify patterns and correlations in biological data that can point to genetic variants linked to cancer. Now a day's cancer gene identification is a complicated and important step in medical field. Neural networks are useful in the study of cancer genes because they have the ability to analyse complex patterns and relationships in many genomic and clinical data. Cancer events have many genetic and molecular factors that are difficult to fully understand with traditional methods. Neural networks, particularly deep learning models, excel at learning hierarchical representations and capturing intricate patterns in data. The proposed work utilizes convolution neural network to identify cancer genes. The proposed work utilizes python tool to detect the cancer gene. The primary goal of the suggested system is to offer a user-friendly interface for deep learning models used in cancer gene identification. The system is put into use. A set of machine learning models called convolutional neural networks is employed in image processing and computer vision. This was created specifically to detect cancer genes. First, RNA-Seq data is obtained from The Cancer Genome Atlas (TCGA) via the suggested application. Then data is extracted using the data extraction process and Build CNN model using train data. Finally test data is classify using CNN models are known to produce more accurate classifications.

Keywords: *Neural Network, Convolutional Neural Network, Cancer, The Cancer Genome Atlas, Classification, Prediction.*

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A survey of Human Emotion Recognition Approaches

Paper ID: BM112

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Abstract:

Human emotion recognition has evolved as a critical area in human-computer interaction, psychology, and artificial intelligence (AI). Accurately recognizing human emotions has got profound implications. Various methods employed for recognizing human emotions are reviewed in this abstract. They range from traditional techniques to modern AI-driven approaches. Traditional methods rely heavily on physiological signals, such as heart rate, skin conductance, and electroencephalography (EEG), as well as facial expression analysis, speech signals, and body gestures. Data-driven methods like convolutional neural networks (CNNs), recurrent neural networks (RNNs), and hybrid models, which allow the system to learn emotional cues from large datasets of facial expressions, voice tone, and physiological patterns have been introduced. In particular, facial expression recognition through computer vision and speech-based emotion detection using natural language processing (NLP) have gained popularity due to their non-invasive nature. A more robust solution is offered by multimodal emotion recognition systems, which combine facial, speech, and physiological data, by reducing the ambiguity associated with using a single modality. These systems use sensor fusion techniques and ensemble learning models to improve the Precision and adaptability of emotion recognition across different environments. Even though many advances have been made, challenges remain. They include generalizability across diverse populations, cultural variations in emotional expression, and real-time implementation in naturalistic settings. The future of emotion recognition lies in developing more inclusive, adaptive, and privacy-preserving technologies that can integrate seamlessly into everyday life. To summarize, an evolution has occurred in the field of emotion recognition from signal-based traditional methods to AI-enhanced, multimodal approaches. Inspite of improved Precision and usability the next generation of emotion recognition systems will have to address the challenges of diversity, context-awareness, and real-time processing.

Keywords: *Emotion Recognition, Facial Gesture Recognition (FGR), Speech Emotion Recognition (SER), Physiological Signal-Based Recognition, Multimodal Emotion Recognition.*

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Computational Analysis of Electroosmotic Flow in Straight and Non-Straight Microchannels using Immersed Boundary Method

Paper ID: BM113 Ranjith Maniyeri*, Omkar Thakre

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Abstract:

Liquid motion in electroosmotic flow is caused by an electric field that crosses a microchannel. The Coulomb force operates on mobile ions in electrolyte liquid as a result of the external electric field, causing the liquid to flow. Due to weak inertial forces, low Reynolds number effects are handled by electroosmotic flow in microchannel. Electroosmotic flow-based devices find extensive application in microfluidic systems, including drug delivery, chemical separation analysis, and microfluidic pumps. This work presents the development of a finite volume computational model for the study of electroosmotic flow in straight microchannel through the solution of the Navier-Stokes, continuity and Poisson- Boltzmann equations. The study is conducted on a fixed Reynold number and electric field. The developed model is extended for the case of non-straight channel (stepped channel) by employing feedback forcing based immersed boundary method. The stepped walls are modelled as immersed boundaries. The effect on maximum velocity and flow rate is assessed and compared using the developed model for the case of three types of stepped wall channels.

Keywords: *Electrical Double Layer, Electroosmotic Flow, Microfluidics, Immersed Boundary Method, Finite Volume Method*

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Effect of Caloric Vestibular Stimulation on Biochemical Parameters, Hippocampal Histopathology and Gene Expression of BDNF and GDNF in the Brain of rats exposed to the Chronic Mild Stress paradigm

Paper ID: BM114

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Abstract:

Caloric Vestibular Stimulation (CVS) is a non- invasive approach to stimulate the vestibular system, which serves to maintain equilibrium. Stress is the body's non-specific reaction to any obstacle that every human encounter in today's environment. Stress can be substantially reduced by practicing vestibular stimulation. Hence, the objective of the study was to determine the effect of vestibular stimulation on augmenting liver function, lipid profile, hippocampal histopathology and neurotrophic factors in rats exposed to Chronic Mild Stress (CMS). 24 healthy male Sprague Dawley rats were assigned into four groups (n = 6). CMS was triggered for 28 days using different stimuli. CVS with hot water (42°C ± 2°C) was initiated on Day 14 of CMS and continued for 15 days. Blood samples were taken one day before the animal was sacrificed at the end of the study for investigation of the liver function test and lipid profile. After sacrificing the animals, brain samples were taken for histopathology and western blotting examination. The administration of CVS enhanced liver function, lipid profile, hippocampal histopathology, and western blotting of BDNF and GDNF in CMS-induced rats, demonstrating that CVS is beneficial in the management of stress. The outcomes of the current study uncovered that CVS is a safe physiological intervention that can be practiced for the treatment of stress.

Keywords: *Caloric Vestibular Stimulation, Biochemical Parameters, Hippocampal Histopathology, BDNF, GDNF Chronic Mild Stress*

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A Hybrid Approach to Real-Time Intra-Body Localization: Integrating Mathematical Models with Machine Learning for Enhanced Accuracy

Paper ID: BM115

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Abstract:

This study aims to develop a hybrid intra-body localization model to meet the demands of high- precision, adaptable localization in medical applications, specifically electroencephalography (EEG) electrode placement and nasogastric tube (NGT) localization, where accurate positioning is crucial to procedural efficacy and patient safety. The model integrates mathematical algorithms with machine learning (ML) within a cascaded framework, using mathematical models for baseline estimations and ML for real-time refinements. For EEG placement, the model combines 2-Dimensional (2D) orthogonal projection and 3-Dimensional (3D) ellipsoidal fitting as baseline estimators, with a Multi-Layer Perceptron (MLP) for refined adjustments. In NGT localization, the model uses an inverse dipole baseline with a Genetic Algorithm (GA) to optimize sensor configurations. Experimental results show a 20% improvement in EEG localization accuracy with the hybrid model over standalone mathematical models and a 33% reduction in sensor usage for NGT localization while maintaining positional accuracy within 5% of the true position, even under noisy conditions. These findings highlight the potential of hybrid models to enhance precision and resource efficiency in intra-body localization tasks, paving the way for broader applications across medical procedures that require adaptable, real-time localization. Future research could explore extending this framework to other healthcare applications, establishing new standards in patient safety and procedural accuracy.

Keywords: *hybrid intra-body localization, medical applications, electroencephalography (eeg), nasogastric tube (ngt), localization accuracy, machine learning (ml), mathematical algorithms, cascaded framework, multi-layer perceptron (mlp), genetic algorithm (ga)*

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Analysis of Robotics in Knee Replacement

Paper ID: BM116

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Abstract:

Robotic knee surgeries are revolutionizing the field of orthopaedics in India, becoming a popular choice for total knee replacements due to their precision, efficiency, and ability to enhance surgical outcomes. These advanced procedures utilize robotic systems to assist surgeons, ensuring accurate alignment of implants and reducing the risk of complications. With expanding accessibility in urban centres, they offer significant benefits such as quicker recovery times, reduced pain, and greater patient satisfaction compared to traditional methods. The future of robotic-assisted knee surgeries looks promising as healthcare facilities increasingly adopt this technology. However, questions remain about their feasibility in rural areas, where affordability and accessibility are significant challenges. Despite their advantages, traditional knee replacement methods may continue to play a vital role in settings where robotic systems are unavailable or cost-prohibitive. As the technology advances and becomes more affordable, it is likely to complement rather than entirely replace conventional techniques, shaping the future of knee replacement surgeries in India.

Keywords: *robotic knee surgeries, orthopaedics, total knee replacements, precision, efficiency, surgical outcomes, robotic systems, accurate alignment.*

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Carbon dioxide sequestration by Spirulina Algae and Converting it into Edible Capsules

Paper ID: BM117

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Abstract:

The current global landscape clearly demonstrates the looming threat of pollution and climate change. The concentration of CO2, the most significant Green House Gas, has risen to incredible heights. Although carbon capture and storage (CCS) techniques have been extensively researched, their economic burden and long-term environmental safety pose questions. An alternative method of recycling CO2 into biomass for photosynthesis, which may then be utilized to produce biomass for bioenergy and other products with added value, is through the usage of microalgal cell factories. One of the most important sources of sustainable biofuels for the coming of renewable energy is algae. Algae are an adaptable feedstock that can metabolise a number of waste streams, including municipal wastewater and carbon dioxide from industrial flue gas, to create a wide range of products with different compositions and uses. Lipids, which can be converted into biodiesel, carbohydrates, which can be converted into ethanol, and proteins, which may be utilised for both human and animal use, are some of these products. Algae are frequently genetically modified to facilitate beneficial process optimization or modification.

Keywords: *Carbon capture and storage (CCS) techniques, Algae, photosynthesis, carbon dioxide sequestration.*

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Design and Optimization of Portable Zeolite – Based Oxygen Concentrators for Remote Area

Paper ID: BM118 Josephin Arockia Dhivya*, Varun R, Venkateshwaran S, Vaidhiyanathan N

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Abstract:

Medical oxygen supplies are mostly very low in remote areas where peoples are with respiratory problems. This research will help in resolving the problem by development of portable zeolite-based oxygen concentrator to those problematic areas. Zeolites are materials which has great adsorption property which can be efficiently used to separate the oxygen from the air where the air is compressed which is reliable and portable to use. Mainly oxygen concentrators are focused for designing it in portable manner and easy to use and for making it durable for tough conditions. These devices showed that it can produce high-purity oxygen at fixed flow rate which meets the medical standards. This innovation technology not only resolves the demand of oxygen supply in remote areas but also helps in betterment of respiratory problems.

Keywords: *oxygen concentrator, Air separation, pressure swing adsorption, zeolite, Percent Saturation Oxygen*

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A Shoulder – Starp Based Posture Monitoring System

Paper ID: BM119

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Abstract:

In contemporary society, posture-related musculoskeletal disorders are on the rise due to extended periods of sedentary behaviour and repetitive tasks. People are increasingly spending most of their time slouching and hunching over desktop screens, tablets and mobile phones. This continuous behaviour over extended periods of time causes severe upper and lower backpain that subsequently leads to cervical spondylosis and bulging of lumbar discs. To recognize the prevalence of this issue, we have developed a posture monitoring system manifested as a shoulder strap to monitor the siting posture of individuals by computing the angular tilt of shoulder and upper back and utilizing a pretrained machine learning algorithm to predict the current posture. Key challenges within the field, such as the accuracy of posture detection, user acceptance, and seamless integration into daily routines, are identified and resolved through automated timely calibration. These challenges that underscore the need for innovative solutions and interdisciplinary collaborations to overcome barriers hindering the widespread adoption of posture monitoring technologies have been considered during the development. By offering a comprehensive understanding of the current landscape, including challenges and emerging trends, this review serves as a roadmap for future research and development endeavors a robust, convenient and affordable posture monitoring system can be obtained. Ultimately, the widespread adoption of these systems holds the promise of reducing the incidence of posture-related disorders and enhancing musculoskeletal health across diverse environments such as workplaces, educational institutions, and healthcare facilities.

Keywords: *posture-related disorders, musculoskeletal health, sedentary behaviour, repetitive tasks, back pain, cervical spondylosis, lumbar discs, posture monitoring system*

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Quantitative analysis of stroke patient walking dynamic using a tri-axial accelerometer

Paper ID: BM120

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Abstract:

This study investigates the use of upper-body acceleration measurements to assess gait stability in patients with hemiplegic stroke. Traditional gait analysis techniques often focus on lower-body metrics, but upper-body dynamics play a crucial role in overall gait stability. To address this, we developed a novel device featuring an accelerometer mounted on an elastic belt, positioned around the lower back near the body's centre of mass. The device collected triaxial acceleration data during walking, which was analysed to compute Root Mean Square (RMS) values for each axis. Our findings highlight the potential for integrating upper-body acceleration measurements into comprehensive gait analysis frameworks for stroke rehabilitation. The proposed approach offers a novel perspective on gait stability and has implications for improving rehabilitation strategies and enhancing patient outcomes. Our results highlight the potential of upper-body acceleration measurements as an effective tool for evaluating treatment outcomes in hemiplegic stroke patients. By integrating these metrics into gait analysis frameworks, we provide a more holistic view of treatment effectiveness, offering valuable insights into rehabilitation progress and patient recovery.

Keywords: *stroke rehabilitation, gait analysis, tri-axial accelerometer, trunk acceleration, gait parameters, functional recovery, root mean square (RMS), Autocorrelation, Walking dynamics, motor recovery*

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Digital Stethoscope Interfaced using Arduino DUE

Paper ID: BM121

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Abstract:

The medical device used for auscultation is known as a stethoscope Most heart diseases are associated with and reflected by the sounds that the heart produces. Heart auscultation, defined as listening to the heart sound, has been a very important method for the early diagnosis of cardiac dysfunction. An ordinary acoustics- based stethoscope is limited in its ability to provide high-quality sound in noisy environments. Digital stethoscope overcomes this issue by amplifying body sounds electronically. Acoustic stethoscope can be changed into a digital stethoscope by inserting an electric capacity microphone onto its head. As the sound signals are transmitted electronically, it can be wireless and can provide noise reduction. Wireless transmission of heartbeat rate can be done using IOT techniques. This paper presents an Arduino DUE based cost-effective digital stethoscope with real-time realization of cardiac sounds over a graphic display and logging capabilities for post-processing.

Keywords: *heart diseases, cardiac dysfunction, acoustic stethoscope, digital stethoscope, amplifying body sounds, noise reduction*

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IoT Enabled Thermotherapy Equipment

Paper ID: BM122 Arthi V*, Hepzibath Blessy R, Kiruthika T, Sanjana Vidyaprakash

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Abstract:

Millions of individuals worldwide suffer from various forms of pain, ranging from mild discomfort to chronic, debilitating conditions. Whether it's muscle stiffness, joint inflammation, or post-injury pain, these conditions can greatly impact quality of life, limiting mobility, productivity, and even mental health. Traditional pain management techniques, such as medication or basic heating devices, often provide temporary relief but lack customization to individual needs. With the advancement of healthcare technology, thermotherapy has emerged as a promising alternative for natural, non-invasive pain relief. Our approach presents the development of a multifunctional heating pad integrated with IoMT technology, designed to provide precise and customizable thermotherapy for various therapeutic applications. The heating pad is equipped with temperature control mechanisms, allowing users to tailor the therapy to their specific needs through a user-friendly mobile application. This paper further explores the design, implementation, and testing of the heating pad, highlighting its potential to improve patient comfort and therapeutic efficacy.

Keywords: *Chronic pain, Internet of Medical Things (IoMT), Thermotherapy*

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Computer Aided Diagnosis System for the Detection and Characterization of Skin Oncological Conditions

Paper ID: BM123 Karthik K*, Sankar Hariharan G, Athish A S, Nina Charles J, Shrinithi S

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Abstract:

Millions of individuals worldwide suffer from various forms of pain, ranging from mild discomfort to chronic, debilitating conditions. Whether it's muscle stiffness, joint inflammation, or post-injury pain, these conditions can greatly impact quality of life, limiting mobility, productivity, and even mental health. Traditional pain management techniques, such as medication or basic heating devices, often provide temporary relief but lack customization to individual needs. With the advancement of healthcare technology, thermotherapy has emerged as a promising alternative for natural, non-invasive pain relief. Our approach presents the development of a multifunctional heating pad integrated with IoMT technology, designed to provide precise and customizable thermotherapy for various therapeutic applications. The heating pad is equipped with temperature control mechanisms, allowing users to tailor the therapy to their specific needs through a user-friendly mobile application. This paper further explores the design, implementation, and testing of the heating pad, highlighting its potential to improve patient comfort and therapeutic efficacy.

Keywords: *Chronic pain, Internet of Medical Things (IoMT), Thermotherapy*

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Design and Development of 3D Printed Scaffold for Bone Regeneration

Paper ID: BM124 Harini M*, Manu Dhanu Sri R A, Aravind Vigneswaran C, Umesh K

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Abstract:

Millions of individuals worldwide suffer from various forms of pain, ranging from mild discomfort to chronic, debilitating conditions. Whether it's muscle stiffness, joint inflammation, or post-injury pain, these conditions can greatly impact quality of life, limiting mobility, productivity, and even mental health. Traditional pain management techniques, such as medication or basic heating devices, often provide temporary relief but lack customization to individual needs. With the advancement of healthcare technology, thermotherapy has emerged as a promising alternative for natural, non-invasive pain relief. Our approach presents the development of a multifunctional heating pad integrated with IoMT technology, designed to provide precise and customizable thermotherapy for various therapeutic applications. The heating pad is equipped with temperature control mechanisms, allowing users to tailor the therapy to their specific needs through a user-friendly mobile application. This paper further explores the design, implementation, and testing of the heating pad, highlighting its potential to improve patient comfort and therapeutic efficacy.

Keywords: *Chronic pain, Internet of Medical Things (IoMT), Thermotherapy*

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Effect of Open loop cyclical Functional Electrical Stimulation on Selected Lower Limb Motor Performance Variables among Patients with Supra Tentorial Stroke

Paper ID: BM125 Brammatha A*, Franklin Shaju M K, Kannabiran B

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Abstract:

Functional Electrical Stimulation Training (FEST) during specific tasks can improve motor performance after stroke due to activity-dependent plasticity and brain remodelling. The purpose of this study was to analyse the effects of open loop cyclical functional electrical stimulation on the lower limb motor performance, balance and walking on acute stroke in-patients. The study included 12 subjects diagnosed with acute stroke who fulfilled selection criteria who were randomly divided into experimental group that received functional electrical stimulation during various task training, and a control group that received only standard conventional exercises, with 6 subjects in each group. The study used a before–after study design. FES was incorporated into the task training for 45 minutes 5 days per week for 2 weeks. Pretest and Post test was assessed using outcome measures Fugl-Meyer Assessment Scale, Berg Balance Scale and Functional ambulation category for changes in motor recovery performance, functional balance and independence in walking. Results show that in Fugl-Meyer Assessment Scale-Lower extremity, the experimental group scores ranged from 16.7 ± 3.72 to 26.05 ± 1.70 and the control group scores ranged from 16.3 ± 3.24 to 16.8 ± 3.76, which showed significant differences ($p < .05$) only in the FES training group, and there was also significant difference between the groups ($p < .05$). The study concludes that the open loop cyclical functional electrical stimulation therapy for 2 weeks along with task training may be suggested as an effective therapy for improving lower extremity motor performance for acute stroke in-patients. Therefore, functional electrical stimulation during task training may be recommended as part of the rehabilitation program for acute stroke patients. Future studies should focus on using various control systems, sensors and for longer duration in order to harness the benefits of early intervention and neural plasticity.

Keywords: *Open loop FES, Functional electrical stimulation, Balance, Stroke, Walking*

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Modelling and Optimization of Nanocrystalline Biodegradable Alloys for Orthopaedic Implants

Paper ID: BM126 Ramya M*

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Abstract:

Biomaterials find numerous medical applications such as fixation devices, replacements, and surgical equipment. Many implant materials are designed to remain permanently in the body, even though their functional role is only temporary. Though these materials are biocompatible, there are various complications such as allergy and sensitization. A biodegradable material would get dissolved and absorbed by the body after the healing process is completed. A biodegradable material avoids extra surgery, lowering cost and patient mobility. Magnesium (Mg) has garnered significant attention as a promising biodegradable implant material due to its outstanding biocompatibility and degradability. Additionally, its mechanical characteristics closely mimic those of natural bone. However, the rapid deterioration of magnesium poses challenges for complete bone formation, necessitating improvements in corrosion resistance. To address this issue, various approaches have been explored. Magnesium-based metallic glasses have gained significant attention for their exceptional strength, elasticity, and enhanced corrosion resistance compared to their crystalline counterparts. This work explores biodegradable quaternary glass-forming alloys and focuses on developing materials with tailored properties for biomedical applications. These alloys, typically composed of four constituent elements, are designed to exhibit glass-forming ability (GFA) while maintaining biocompatibility and controlled degradation rates.

Keywords: *Biomaterials; Biodegradable Implants; Bone; Metallic Glasses; Magnesium*

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Adaptive Compression Bandage for Musculoskeletal Injury

Paper ID: BM127

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Abstract:

The treatment of musculoskeletal injuries, particularly sprains, often involves the application of compression bandages to reduce swelling and provide support. Traditional compression bandages lack the ability to adjust pressure dynamically in response to changing conditions. This paper presents the design and implementation of an adaptive compression bandage system for musculoskeletal injuries such as sprain, knee osteoarthritis, etc., which autonomously adjusts the compression level based on oxygen saturation obtained from the integrated sensors. The proposed system utilizes a microcontroller to process sensor data, such as swelling and movement, and actuate the bandage accordingly. Preliminary tests demonstrate that the adaptive bandage can maintain optimal compression levels, potentially improving patient outcomes by accelerating the healing process and enhancing comfort. This innovative approach represents a significant improvement over static methods, offering personalized care that adapts to the unique needs of each patient throughout the healing process. Novelty of this research paper is that compression of bandage is controlled by the oxygen level in blood circulation. The bandage could be designed to work in tandem with other wearable devices, such as smartwatches.

Keywords: *Adaptive compression, musculoskeletal injury, knee osteoarthritis, sprain, microcontroller, injury management.*

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EMG Controlled Prosthetic Hand

Paper ID: BM128

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Abstract:

Amputation, particularly of the upper limbs, is a condition affecting individuals worldwide, with over 110,000 amputees in India alone. Amputees often face significant challenges in performing daily activities and maintaining a sense of normalcy. Myoelectric prostheses, which restore the basic functions of lost limbs by utilizing bioelectric signals generated by muscles, offer a promising solution. However, the high cost of advanced prosthetic devices restricts access for many amputees, leaving them with limited options such as simpler, body-powered alternatives. This study aims to address the accessibility gap by developing an affordable, fully functional, and user-friendly myoelectric prosthetic hand. The focus is on balancing affordability, performance, and aesthetics to cater to a broader consumer base. The research involves a systematic design and development process, emphasizing economically sustainable manufacturing methods while ensuring that the prosthetic meets essential functional and market requirements. The project concludes with the creation of a manufacturable prototype that maintains high performance and usability at a significantly reduced market price. This innovation seeks to improve the quality of life for amputees by offering an accessible and practical solution that enhances their ability to perform daily tasks independently.

Keywords: *Amputation, Myoelectric Prosthesis, Bioelectrical signals, economically sustainable.*

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Neonatal Hearing Loss: A Comprehensive Review of Current Methods, Challenges, and Future Directions

Paper ID: BM129 Anushya A G*, Hema Pushpa J, Padmapriya B, Brindha D, Ramesh S

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Abstract:

Early identification and treatment of neonatal hearing loss are essential for the best potential speech, language, and cognitive development, making it a serious public health concern. Even with the availability of modern screening tools like Auditory Brainstem Response (ABR) and Otoacoustic Emissions (OAE), these procedures have limits in terms of sensitivity and specificity, especially when used to complex cases of auditory impairment or high-risk groups. With an emphasis on creating objective screening methods that are more dependable and effective, this study explores at developments in the identification of newborn hearing loss. Using objective testing techniques like OAE and ABR, which provides an overview of the physiological principles underlying in newborn hearing loss. Although these techniques are still fundamental, their drawbacks encourage research into new technologies, such as the combination of ABR and Electroencephalogram (EEG), as well as the potential for machine learning and portable electronics to improve diagnostic precision. Along with outlining future research approaches targeted at enhancing neonatal hearing loss detection, diagnosis, and intervention techniques, the study also addresses present issues in neonatal hearing screening.

Keywords: *Neonatal hearing loss, Otoacoustic Emissions, Auditory Brainstem Response, Electroencephalogram, Machine learning.*

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Point-of-Care (POC) Diagnostics: Accelerating Medical Decision-Making with Advanced Technologies - Review

Paper ID: BM130 Swathy Manoharan*, Padmapriya B, Logesh Kumar S

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Abstract:

Through the integration of state-of-the-art technologies, POC diagnostics is revolutionizing the rapid delivery of healthcare by improving the speed, accuracy and accessibility of medical testing. This review examines these innovations' transformative effects and shows how they all work together to enhance healthcare outcomes. By enabling early detection, speeding up diagnostic turnaround times and increasing accessibility, POCs are expected to transform high-quality diagnostic tests in settings with limited resources. To overcome present obstacles and optimize these technologies' potential advantages in clinical practice, continued development and improvement are imperative.

Keywords: *Point-of-Care (POC), Point-of-Care Testing (POCT), Biomarkers, Microfluidics, Portable optical biosensors, point-of-care ultrasound (POCUS)*

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Early Diagnosis of Acute Lymphoblastic Leukemia from Blood Smear Images Using Deep Learning: A Systematic Literature Review

Paper ID: BM131

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Abstract:

Acute Lymphoblastic Leukemia (ALL) is the most common and crucial type of cancer, which spreads through the bone marrow. This study helps physicians identify the ALL early and helps prevent the spreading of the disease. This systematic review gives complete information on ALL and its subtypes, which may be caused in the early young stage and the older adults. This review helps identify the methodology for early diagnosis of ALL detection using blood smear images, which gives high accuracy, F1 score, Specificity and Sensitivity. Images from Peripheral Blood Smears (PBS) are essential for the preliminary screening of ALL in suspected cases. In the Deep Learning technique, Convolutional Neural Network (CNN) has been most commonly used to identify ALL and its subtypes. Different steps before classification, like augmentation, preprocessing, segmentation, and feature extraction, with various challenges faced by the author's different datasets and various challenges, have been discussed in this paper. Finally, several key challenges and future directions are explored, providing readers with insights that could inspire the development of new research questions in this field.

Keywords: *Acute lymphoblastic leukaemia (ALL), Peripheral Blood Smear (PBS), Deep Learning, Convolutional Neural Network (CNN).*

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A Deep Learning Approach to Predict Nutritional Deficiencies from Facial and Nail Images: A Review

Paper ID: BM132

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Abstract:

Nutritional deficiencies remain a major global health concern, frequently showing up as subtle physiological symptoms seen in facial and nail features. Because they require invasive procedures, traditional techniques of identifying inadequacies are sometimes unfeasible and unworkable. Recent developments have demonstrated the potential of deep learning models for non-invasive image-based methods of recognizing nutritional deficiencies. This research investigates the most advanced enhancement, feature extraction, and classification techniques applied to facial and nail photos to detect nutrient deficiencies such as iron and vitamins. The study highlights important research gaps that impede advancement in this field through a comparative analysis, such as small datasets, demographic diversity, and model interpretability. By tackling these issues, scalable and easily available nutritional diagnostics for bettering global health could be developed.

Keywords: *Nutritional deficiency detection, Deep learning, Facial image & Nail image analysis, non-invasive diagnostics*

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Enhanced Security for Healthcare Data Sharing Using Federated Learning, Blockchain, and Quantum Cryptography: A Review

Paper ID: BM133

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Abstract:

As the demand for secure and efficient data exchange in healthcare increases, creative solutions to protect data privacy, integrity, and accessibility across several institutions are urgently needed. This study provides a unified framework integrating three cutting-edge technologies, blockchain, quantum cryptography, and federated learning, to address the complex issues of safe data transfer in the healthcare sector. Data breaches are less likely when federated learning is used, which enables decentralized data analysis by keeping sensitive patient data locally. Blockchain technology enables an unchangeable and transparent ledger that facilitates the safe recording of data transactions and ensures strict adherence to data governance requirements. Quantum cryptography enhances data transmission security and prevents unauthorized access to shared data by applying the ideas of quantum physics. To satisfy the fundamental need for data security, this paper discusses three state-of-the- art technologies to enhance the security of healthcare data sharing and promote international collaboration to address global healthcare concerns.

Keywords: *Federated Learning, Blockchain, Quantum Cryptography, Deep Learning.*

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A review on Electro Oculography (EOG) based Intelligent approaches for tracking Human Eye movements in building Human Machine Interfaces (HMI)

Paper ID: BM134 Deepa Unnikrishnan*, Banu Rekha B

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Abstract:

Eye tracking refers to a technology that estimates the direction of user's gaze and aims at analysing and recording the eye movements and positions using an eye tracker. Eye-tracking data provide previously unattainable insights into human behaviour and his interaction with surroundings EOG based human machine interface open up new possibilities for non-verbal communication between human and machines enabling emotion prediction, sleep stage detection, clinical diagnosis of certain mental illnesses etc. The interaction between humans and computing systems will become more natural and friendlier as a result of eye tracking enabled gadgets, which are intended to enable a better understanding of human behaviours and intentions. A wide variety of applications use eye-tracking technology, including gaze tracking studies, PC interaction for individuals with disabilities, controlling a wheelchair, entertainment and gaming, operator interfaces, neuromarketing applications, etc. Various techniques exist now for tracking gaze direction, each with a distinct level of difficulty and expense. In this study, the various eye tracking methods and its versatile applications with a focus on Electrooculography (EOG) is examined. This work aims to provide a critical evaluation of the data available from existing studies based on EOG.

Keywords: *sleep stage detection, clinical diagnosis, human-computer interaction, gaze tracking, electrooculography (eog)*

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Deep Learning Techniques in Schizophrenia Diagnosis: A Review

Paper ID: BM135

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Abstract:

Schizophrenia is a complicated mental condition characterised by structural and functional abnormalities in the brain. Due to this, it becomes more challenging to diagnose Schizophrenia with traditional neuroimaging techniques. Recent advancements in deep learning have made diagnosing complex diseases easier. With an emphasis on multimodal data fusion of fMRI and MRI modalities, this study investigates the current status of deep learning methods for diagnosing Schizophrenia. The review systematically examines deep learning architectures, such as Recurrent Neural Networks (RNNs), Convolutional Neural Networks (CNNs), and hybrid models. It discusses their suitability for spatial and temporal data processing inherent to MRI and fMRI data. Important issues like model interpretability, clinical application, and data scarcity are discussed, along with potential fixes and future research avenues. This article reviews the most recent deep learning techniques applied to diagnose Schizophrenia, which provides insights into the models employed and their respective diagnostic accuracy.

Keywords: *Structural MRI, Functional MRI, Schizophrenia, Deep Learning.*

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AI for Healthcare Workflow Optimization: Reducing Physician Burnout and Improving Patient Care

Paper ID: BM136 Deeksha K*

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Abstract:

This review discusses the role of artificial intelligence (AI) in optimizing healthcare workflows to mitigate physician burnout and improve patient care. The paper examines various AI technologies, including machine learning, natural language processing, and robotic process automation, and their potential to streamline administrative tasks, enhance clinical decision support, and reduce the cognitive load on healthcare providers. Furthermore, we evaluate current challenges, ethical considerations, and future directions for AI- driven workflow automation in healthcare.

Keywords: *Healthcare automation, robotic, AI, NLP*

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Design and Development of Dental Implants

Paper ID: BM137 Dhanushika P*, Charulatha K, Kanishk P, Guru Prasath D

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Abstract:

Dental implants have emerged as an important treatment in modern dentistry for the repair of lost teeth, providing patients with enhanced oral function, aesthetics, and overall quality of life. The optimal dental implant reduces peak stress values at the interface between the implant and the bone while optimizing anchoring strength in the human jaw bone under specified standard loads. Implant design controls the stress concentration at the bone-implant interface, which influences the biological reaction of the bone. This paper models optimal thread design to minimize the stress distribution surrounding the jawbone. Cylindrical type dental implants with micro threading and square threading improve anchoring and reduce screw loosening to optimize performance. Biomaterials used in the implant also play a major role. Since Ni-Ti shape memory alloys (SMAs) have unique characteristics such as biocompatibility, excellent wear and corrosion resistance, and functional characteristics like super elasticity and the shape memory effect, they are used in a wide range of biomedical applications. Dental implant design has focused on modifying the main design of shape, size, material, and surface topography in order to fulfil market demands. As a result, the modelling of a dental implant with an improved threading type in the implant body is accomplished with precise dimensions using Solid works 3D CAD software. And consequently, utilizing COMSOL Multiphysics, which is based on finite element analysis, it analyses the biomechanical properties by importing an STL file from SolidWorks. Several biomechanical factors affect the effectiveness of dental implants, including the nature of loading, the properties of the material used, the shape and geometry of the implants, the quantity and quality of bone around the implants, the surgical technique, and the lack of a proper rapid integration of the implant surface with the jaw bone.

Keywords: *Dental implant, Nitinol (Ni-Ti) material, Super elasticity, Biocompatibility*

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Smart Assistive Glove for Speech Impaired Individuals

Paper ID: BM138

Girisha V P*, Maria Trinita J, Harishma A B, Ajitha G, Manu Dhanu Sri R A, Padmapriya B, Dhakshana A
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Abstract:

According to the World Health Organization, an estimated 466 million people globally experience some form of disabling hearing loss, which often results in speech difficulties. The present research outlines the development of a sophisticated assistive technology aimed at empowering speech-impaired individuals through the use of smart gloves equipped with flex sensors. The core technology involves strategically placed flex sensors within the smart gloves, enabling the capture of intricate hand movements associated with sign language. The methodology integrates advanced machine learning algorithms to facilitate the accurate recognition and interpretation of sign language gestures. Furthermore, the smart gloves are designed with a compact and ergonomic form factor, integrating Bluetooth connectivity for seamless communication with external devices such as smart phones. Additionally, a translator module is incorporated within the system, which not only converts gestures into text or speech but also allows for translation into multiple languages, thereby expanding the accessibility and usability of the technology across different linguistic communities. This approach ensures real-time processing and conversion of these gestures into digital text. This real-time processing capability establishes an immediate and intuitive communication channel for speech-impaired individuals that promote their accessibility and independence. The proposed methodology signifies a systematic and technologically advanced approach to assistive device development, holding the potential to significantly improve the quality of life for those with speech impairments.

Keywords: *Sign Language, Flex Sensor, Machine Learning algorithms, Bluetooth, gloves, Translator Module, Accelerometer, Microcontroller, Speech impaired*

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Thermacare: Automatic Infant Warmer for Hypothermia Prevention

Paper ID: BM139

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Abstract:

The critical care of neonates, especially preterm infants, necessitates precise control of environmental conditions, particularly temperature, to ensure their survival and healthy development. Babies require temperature that match the temperature of the mother's womb, which is between 35°C - 37°C. Furthermore, preterm and other at-risk babies have low ability to regulate temperature and produce body heat as characterized by their dry skin conditions; hence, the need for baby incubators. For their operation, these baby incubators provide strict regulated energy change that is influenced by heat transfer caused by the surrounding atmospheric temperature. Baby incubators are essential devices in neonatal care units, providing a controlled environment that mimics the intrauterine conditions. This study focuses on the development and performance analysis of an advanced temperature with a warmer system within a baby incubator. The infant warmer in this module used an Arduino microcontroller which is displayed LCD, the skin sensor used is the DS18B20 temperature sensor to read the skin temperature, while the infant warmer temperature sensor used is LM35. The study also discusses the impact of these regulated conditions on neonates' health outcomes, highlighting the importance of precise environmental control in reducing the risks associated with hypothermia and dehydration. This research contributes to the advancement of neonatal care by providing a more reliable and efficient solution for maintaining optimal environmental conditions in baby incubators.

Keywords: *LM35, DS18B20, TMP36, Incandescent Bulb, Warmer, Hypothermia, Dimmer*

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A Review on Artificial Intelligence Application in Musculoskeletal Imaging and Diagnosis

Paper ID: BM140

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Abstract:

Artificial intelligence (AI) is transforming musculoskeletal imaging by enhancing diagnostic accuracy, efficiency, and patient outcomes. By employing advanced techniques like deep learning, AI systems can perform tasks such as image quality enhancement, automated segmentation, and detection of fractures, tumours, osteoporosis, and soft tissue injuries with precision often exceeding that of human radiologists. AI-powered models like CNNs and AXNet streamline workflows through automated scheduling, prioritization of critical cases, and natural language report generation. These advancements not only minimize radiation exposure but also improve diagnostic consistency across practitioners with varying experience levels. AI also facilitates specialized applications, including bone age assessment, knee pathology detection, and peripheral nerve segmentation using magnetic resonance neurography (MRN).AI-driven tools have shown promise in developing predictive models for patient- specific treatment plans, improving outcomes in conditions like osteoarthritis and spinal deformities. However, challenges such as data privacy concerns, lack of explainable AI models, and generalizability to diverse populations hinder its integration into clinical practice. By addressing these challenges through the development of ethical, interpretable models and robust data-sharing frameworks, AI can revolutionize musculoskeletal healthcare, delivering equitable and personalized diagnostic support globally.

Keywords: *artificial intelligence, machine learning, deep learning, musculoskeletal system*

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