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(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM, THIRUVANMIYUR - CHENNAI

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PROCEEDINGS OF THE

AVISHKAR 5.0

INNOVATE-EXCEL-WIN

APRIL 02, 2026

Organized by

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Proceedings of the

Intra-University Technical Project Expo

AVISHKAR 5.0

Innovate – Excel – Win

2nd April 2026

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ABOUT VISTAS

VELS Institute of Science, Technology & Advanced Studies (VISTAS), Chennai, is a distinguished multidisciplinary university founded in 1992 by the visionary educationist Dr. Ishari K. Ganesh. Established in memory of Shri. Isari Velan, a respected former Minister in the Government of Tamil Nadu under Dr. M.G. Ramachandran (Dr. MGR), the institution has grown into a center of academic excellence and innovation. Recognized as a Deemed-to-be University in 2008 under Section 3 of the UGC Act, 1956, VISTAS offers a comprehensive range of undergraduate, postgraduate, and doctoral programs across diverse disciplines, including Engineering and Technology, Medicine, Management, Pharmaceutical Sciences, Maritime Studies, and Basic and Life Sciences. Accredited with an "A++" grade by NAAC and recognized as a Category 1 Institution by UGC, VISTAS provides a dynamic learning environment supported by modern infrastructure, advanced research facilities, and strong industry integration. We focus on innovation, sustainability, and global competence to shape future-ready professionals and responsible citizens.

ABOUT AVISHKAR 5.0

Avishkar 5.0 is a flagship intra-institutional technical project expo of VISTAS, designed to showcase the creativity, innovation, and technical expertise of students across Engineering, Life Sciences, Basic Sciences, Computing Sciences, and Pharmacy. The platform enables students to present their innovative projects, fostering critical thinking, problem-solving abilities, and leadership skills. By encouraging interdisciplinary collaboration and real-world application of knowledge, Avishkar 5.0 catalyzes technological advancement, entrepreneurial thinking, and career development. This event reflects VISTAS' commitment to fostering innovation-driven learning and delivering meaningful solutions to societal challenges.

SCOPE OF THE AVISHKAR 5.0

- The scope of AVISHKAR 5.0 encompasses the promotion of experiential learning, critical thinking, and the exploration of emerging domains such as Artificial Intelligence, Sustainable Engineering, Smart Systems, Biotechnology, and Data Science.
- It is designed to facilitate the transformation of innovative ideas into tangible outcomes through Intellectual Property Rights (IPR), product development, and technology transfer, thereby encouraging students to develop prototypes, patents, and market-ready solutions.
- The platform further extends its scope by enabling meaningful academia–industry interaction, supporting incubation and entrepreneurial initiatives, and strengthening essential professional competencies, including communication, teamwork, and project management.
- Overall, AVISHKAR 5.0 aims to create a dynamic ecosystem that bridges academia and industry while preparing students for research excellence, innovation leadership, and impactful contributions to societal and technological advancement.

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PREAMBLE

AVISHKAR 5.0 serves as an Intra-University Technical Project Expo, aiming to inspire students to exhibit their inventions by recognizing the best projects within designated categories. This Expo fosters the development of leadership skills among students and facilitates their engagement with a broader audience. Acting as a conduit for technological advancement and career growth, this platform primarily encourages students to elevate their thinking by creating innovative solutions for societal needs.

Participants are encouraged to propose their ideas and transform them into practical applications. AVISHKAR 5.0 nurtures a culture of free thought and innovation, sparking creativity and empowering students to develop novel products across various fields such as Engineering, Science, Agriculture, and Medicine. AVISHKAR 5.0 offers participants the opportunity to refine their skills and ideas through unique approaches, fostering collaboration with peers and experts. Interaction with specialists and high-level representatives enables participants to share opinions and enhance their practical knowledge.

This multi-disciplinary project Expo welcomes students from diverse academic backgrounds, including the School of Engineering, School of Basic Sciences, School of Life Sciences, School of Computing Sciences, and School of Pharmaceutical Sciences. Innovation spans across a wide spectrum, encompassing topics such as sustainability, agriculture, sensors, automation, healthcare, app development, artificial intelligence, robotics, mechatronics, graphic design, e-waste management, web development, IoT solutions, water conservation, alternative energy, medical devices, energy storage, pharmaceutical innovations, formulations, and drug discovery. Participants have the freedom to select any of these topics to showcase their innovations and creativity.

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Message from the Chancellor's Desk

Dr. Ishari K Ganesh
Founder & Chancellor, VISTAS
Chairman, Vels Group of Institutions

It gives me immense pleasure to announce the conduct of **AVISHKAR 5.0: Innovate, Pioneer, Excel**, a premier intra-university platform that fosters innovation, creativity, and academic excellence among our students.

In today's rapidly evolving technological landscape, the need for innovative thinking and interdisciplinary solutions has become more crucial than ever. AVISHKAR 5.0 serves as a dynamic forum where young minds can transform ideas into meaningful outcomes, addressing real-world challenges across diverse domains of science, engineering, and technology.

This initiative goes beyond a conventional exhibition; it is a platform that encourages critical thinking, research orientation, and practical application of knowledge. By bringing together students from various disciplines, it promotes collaborative learning and inspires them to contribute effectively to societal and technological advancement.

I commend the efforts of the organizers in creating such a vibrant academic environment and extend my best wishes to all participants. May AVISHKAR 5.0 ignite innovative ideas, strengthen intellectual capabilities, and pave the way for a progressive and sustainable future.

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Message from the Vice President Desk

Dr. Preethaa Ganesh
Vice President
Vels Group of Institutions

With great pleasure, I extend a warm welcome to all attendees of the Intra-Institutional Technical Project Expo, AVISHKAR 5.0. Hosting an event of this scale reflects our unwavering commitment to nurturing innovation and providing a dynamic platform for young minds to showcase their creativity, explore new frontiers, and develop solutions to real-world challenges.

At VISTAS, we have consistently upheld a culture of excellence, creating an ecosystem where students are empowered to learn, grow, and expand their horizons across diverse disciplines. The domains of Basic Sciences, Life Sciences, Pharmacy, Computing Sciences, and Engineering are inherently interdisciplinary, offering immense scope for collaboration and impactful contributions to the evolving landscape of science and technology.

Today, we stand at the cusp of a technological revolution. Advancements in areas such as sensors, healthcare, app and web development, robotics, IoT solutions, e-waste management, water conservation, alternative energy, medical devices, energy storage, and pharmaceutical innovations—including drug discovery and formulation—are transforming the way we live and interact with the world. Platforms like AVISHKAR 5.0 play a vital role in encouraging students to engage with these emerging fields and translate ideas into meaningful innovations.

I extend my sincere appreciation to all the participating schools for their valuable contributions to this event. My heartfelt thanks also go to the organizers for their dedication and seamless execution.

I wish all participants the very best. I am confident that this expo will be an enriching and rewarding experience for everyone involved.

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Message from the Pro - Chancellor's Desk

Dr. A. Jothi Murugan,
Pro Chancellor (Planning & Development)

AVISHKAR 5.0 - Innovate, Excel, Win is an exciting initiative organized by VISTAS to encourage young innovators to showcase their creativity, research, and technical expertise. This event serves as a dynamic platform for students to present their ideas, interact with experts, and gain insights into emerging trends in science, engineering, and technology.

The expo aims to bring together students, faculty, and industry professionals to explore groundbreaking innovations and advancements. It fosters a collaborative environment where knowledge sharing, problem-solving, and interdisciplinary learning take center stage. With project presentations, interactive discussions, and hands-on demonstrations, AVISHKAR 5.0 is designed to inspire students to think critically and develop real-world solutions.

I am confident that the enthusiastic participation and exchange of ideas at this event will contribute to new innovations and technical advancements. The discussions and deliberations during this expo will not only enhance the students' scientific understanding but also encourage them to take their projects to greater heights in research and development.

I extend my best wishes to the organizers, participants, and faculty members for the grand success of AVISHKAR 5.0. May this event ignite curiosity, inspire innovation, and pave the way for future breakthroughs.

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Message from the Pro-Chancellor's (SOE) Desk

Dr. M. Bhaskaran
Pro-Chancellor (SOE), VISTAS

I am delighted to note that VISTAS is organizing AVISHKAR 5.0 - Innovate, Excel, Win, an intra-university student project expo that provides a dynamic platform for showcasing creativity, innovation, and research excellence. Such initiatives play a vital role in inspiring young minds to develop groundbreaking ideas and apply their knowledge to real-world challenges.

In today's rapidly evolving technological landscape, innovation is the key driver of progress across diverse sectors, including engineering, healthcare, information technology, and sustainable development. The growing demand for cutting-edge solutions presents immense opportunities for research and development. AVISHKAR 5.0 offers students an invaluable opportunity to present their projects, exchange ideas, and collaborate on pioneering research that can shape the future.

I commend the organizing committee for choosing a timely and impactful theme for this expo. It is encouraging to witness a wide spectrum of student-led projects that reflect enthusiasm, creativity, and a strong commitment to advancing knowledge. With valuable insights from experts in academia and industry, this event will serve as a catalyst for deeper exploration and innovation, fostering a vibrant ecosystem of learning.

I am confident that AVISHKAR 5.0 will provide a stimulating and enriching experience for all participants, enabling them to enhance their skills, broaden their perspectives, and build meaningful collaborations.

I extend my heartfelt congratulations to the organizers and participants, and wish AVISHKAR 5.0 great success in igniting curiosity, nurturing talent, and advancing academic and technological excellence.

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Message from the Vice Chancellor's Desk

Dr. T.Sasipraba
Vice-Chancellor, VISTAS

I am pleased to note that **VISTAS** is organizing **AVISHKAR 5.0 Innovate, Excel, Win**, an **intra-university student project expo** that serves as a vibrant platform for innovation and creativity. Events like these are essential in fostering a research-driven mindset among students, encouraging them to develop solutions that address real-world challenges.

I strongly believe that **AVISHKAR 5.0** will play a crucial role in enhancing the quality of student research and promoting interdisciplinary collaboration. Innovation is the driving force of progress, and through this expo, students can transform their ideas into impactful projects.

This platform allows participants to showcase their groundbreaking projects, share their experiences, and engage in discussions on the challenges and advancements in their respective fields. **AVISHKAR 5.0** is not just a competition, it is a celebration of talent, perseverance, and the pursuit of excellence.

I am confident that the dedicated efforts of the organizing committee will result in an enriching and insightful event. The high-quality projects and innovative presentations at this expo will inspire students to continue their journey in research and development, shaping the future of science and technology. I extend my heartfelt congratulations to the entire organizing team and wish **AVISHKAR 5.0** great success in fostering innovation, collaboration, and academic excellence.

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Message from the Registrar's Desk

Dr. M. Chandrasekaran
Registrar, VISTAS

It is with great pleasure that I express my appreciation for the successful conduct of **AVISHKAR 5.0: Innovate, Excel, Win** by **VELS Institute of Science, Technology & Advanced Studies (VISTAS)**, as a significant intra-university initiative aimed at fostering innovation, creativity, and academic excellence among students.

In the contemporary landscape characterized by rapid technological advancements, such initiatives play a vital role in nurturing a research-oriented academic environment. AVISHKAR 5.0 provides a structured platform for students to engage in critical thinking, adopt interdisciplinary perspectives, and develop practical solutions to complex real-world challenges, thereby strengthening their academic and professional competencies.

The project expo exemplifies the institution's commitment to experiential learning and innovation-driven education. It facilitates knowledge exchange, promotes collaborative inquiry, and enhances intellectual engagement among participants, contributing to their holistic academic development.

I place on record my appreciation for the dedicated efforts of the organizing committee in successfully coordinating this event. I extend my best wishes to all participants and express my confidence that AVISHKAR 5.0 will serve as a catalyst in advancing research aptitude, fostering innovation, and contributing meaningfully to societal and technological progress.

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ISOLATION, CHARACTERIZATION AND BIOACTIVITY EVALUATION OF MARINE SPONGE-BASED METABOLITE FOR ANTICOAGULATION APPLICATION

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ABSTRACT

Marine organisms are considered a rich source of biologically active metabolites with significant pharmaceutical potential. The present study was designed to develop and evaluate an anticoagulant transdermal patch using metabolites obtained from marine sponge. Initially, sponge samples were selected and procured, followed by molecular identification using 18S rRNA analysis to confirm the species. The metabolites were extracted from the sponge material using suitable solvents, and the obtained extract was subjected to qualitative and quantitative analysis to determine the presence of bioactive compounds. Further purification of the extract was carried out using liquid–liquid fractionation followed by thin layer chromatography to obtain metabolite fractions with potential biological activity. The obtained extract or fraction was incorporated into a transdermal patch formulation using an appropriate polymer matrix along with plasticizer. The prepared patches were evaluated for physicochemical parameters such as thickness, surface pH, weight uniformity, folding endurance, and in-vitro drug release profile to ensure stability, uniformity, and suitability for transdermal application. The biological activity of the formulated patch was assessed by performing anticoagulant assay to determine its clot-inhibiting potential, and haemolysis assay to evaluate its compatibility with blood cells. The results of the study indicate that marine sponge metabolites can be considered as a promising natural source for the development of an effective anticoagulant transdermal drug delivery system with potential biomedical applications.

KEY WORDS: Marine sponge, Anticoagulant patch, Transdermal drug delivery, Metabolite extraction, 18S rRNA identification, Thin layer chromatography

ONION GUARD: AN IOT-BASED ONION SPOILAGE RISK DETECTION SYSTEM

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ABSTRACT

Post-harvest onion storage is vulnerable to spoilage caused by microbial activity and unfavourable environmental conditions, resulting in significant agricultural losses. An Internet of Things (IoT) based monitoring system was implemented to enable early spoilage detection by monitoring volatile organic compound (VOC) emissions, temperature, and humidity within storage environments. The system used an ESP32 microcontroller integrated with an MQ-135 gas sensor for VOC detection and a DHT22 sensor for environmental monitoring. The collected data were processed to compute an Onion Spoilage Risk Index (OSRI), representing the combined influence of gas concentration, temperature, and humidity on storage stability. Sensor data were transmitted to the cloud through MQTT communication using AWS IoT and visualized in real time via a Node-RED dashboard. Experimental evaluation showed that the calculated OSRI, derived from VOC concentration, temperature, and humidity, remained below 0.45 under normal storage conditions, indicating safe storage. When environmental changes increased the OSRI beyond the threshold, spoilage risk was detected, and a ventilation process was activated to reduce gas accumulation. The monitoring system achieved an overall detection accuracy of approximately 88%. Future work includes extending the system to support spoilage monitoring for multiple vegetables and integrating improved sensing and analytical methods to further enhance detection accuracy and enable intelligent agricultural storage management.

KEY WORDS: Early Spoilage Detection; Onion Storage Monitoring, Smart Agriculture, Post-Harvest, Loss Reduction.

EARLY PREDICTION OF PANCREATIC ABNORMALITIES USING GAIN METRIC

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ABSTRACT

Pancreatic cancer and associated disorders are usually detected at their later stages, since their early signs and symptoms are minimalor even unnoticeable. This paper proposed a new methodology for early detection based on Digital Image Processing concept. The proposed system follows a structured workflow comprising image acquisition, preprocessing in terms of contrast enhancement and thresholding, and extraction of the Region of Interest. Accordingly, with the extracted values of GAIN, an image is classified as either normal or abnormal in pancreas, with the support of simple machine learning and statistical analysis. GAIN refers to the variance in intensity between normal and affected pancreatic images. By highlighting subtle pixel-level variations, the approach enhances detection of pancreatic abnormalities that could easily be missed through visual observation. this technique is cost- effective , Non-invasive in nature and can be integrated into any imaging modality, thus supporting clinical practice at every level, from central hubs to peripheral and remote diagnostics. Such a system will be of great help to healthcare professionals by providing speedy and accurate diagnoses, which may lead to better outcomes in pancreatic care.

KEY WORDS : Pancreatic cancer, GAIN Metric, Contrast Enhancement, Thresholding, Region of Interest Extraction, Remote Diagnostics

SAFE SHIELD: A SAFETY SYSTEM THAT REALLY CARES

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ABSTRACT

Safe Shield offers a fresh approach to safety for women and children, particularly when existing safety apps fall short. Unlike other safety apps, which need to be activated and connected to the internet, Safe Shield is automatic and can operate without an internet connection. For women, Safe Shield app will use AI to identify distress in voice such as screams, cries and emergency KEY WORDS like help in multiple languages including Indian. This will monitor and analyze the surroundings in real time, detecting dangers and it immediately sends SOS alters along with that live location to emergency contacts. Other features include voice stress analysis, crowd safety score, secret SOS modes, camera evidence, and real-time GPS tracking. For children, Safe Shield has a smart band that is smartphone-free and offers SOS, GPS, and fall detection. It has a school safety system that offers a bullying reporter, a lost kid identification card through a QR code, and a kiosk for anonymous reporting. It employs different technologies like Python, machine learning, React Native, and GSM. The system is intelligent and offline-capable. The system has an accuracy of 87.5% in detection and has a quick response time. The system is proactive, inclusive, and accessible. The system is unique in that it is automatic, offline, and inclusive.

KEY WORDS : SOS, GPS, Machine Learning

MUSKMELON RIND DERIVED POLYMERIC HYDROGELS WITH THYMOL INCORPORATION FOR TISSUE ENGINEERING APPLICATION

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ABSTRACT

Natural polymers derived from agro-waste are increasingly recognized as sustainable alternatives for biomedical applications. This study aims to utilize muskmelon (Cucumis melo) rind, a pectin-rich agricultural byproduct, for the development of polymeric hydrogels intended for tissue engineering. Pectin was extracted from muskmelon rind and used to fabricate hydrogels via solution casting followed by chemical crosslinking using calcium chloride. Thymol, a natural phenolic compound with established antimicrobial and antioxidant properties, was incorporated into the hydrogel matrix to enhance bioactive functionality. Response Surface Methodology (RSM) employing a Central Composite Design was applied to optimize pectin concentration and evaluate its influence on hydrogel properties. The prepared hydrogels were characterized for physicochemical properties, swelling behaviour, structural stability, and in vitro performance. The results indicated that higher pectin concentrations improved gel integrity and crosslink density, whereas lower concentrations resulted in reduced structural stability. Incorporation of thymol contributed to enhanced antioxidant and antibacterial potential, suggesting improved therapeutic functionality. In conclusion, the study demonstrates a value-added strategy for converting muskmelon rind into a functional biomaterial. The optimized pectin-based hydrogels exhibit promising characteristics suitable for tissue engineering applications, highlighting their potential as sustainable, multifunctional, and eco-friendly scaffolds for regenerative medicine.

KEY WORDS : Muskmelon rind; pectin, hydrogel, thymol, crosslinking, antioxidant.

AXON-BAND EMG SIGNAL CONTROLLER FOR HANDS-FREE INTERACTION

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ABSTRACT

Many people, especially those with physical limitations, find it difficult to use devices like computers and smartphones through traditional input methods. This creates a need for a simple, hands-free and user-friendly interaction system. Axon-Band is a wearable device designed to solve this problem using EMG (muscle) signals. Worn on the forearm, it detects small muscle movements and converts them into commands. These commands can control digital devices without the need for touch. The system works with both Bluetooth and Wi-Fi and is supported by a mobile application where users can easily set and customize gestures. The device provides multiple features in one system. Users can control the cursor using Air Mouse, perform actions using shortcut gestures, communicate using preset messages, and control appliances. All these functions are triggered using simple hand gestures. This solution improves accessibility, reduces dependency on traditional devices, and provides a more natural way of interacting with technology. Axon-Band offers a practical and scalable approach for future assistive systems.

KEY WORDS: EMG, Gesture Control, Wearable Device, Assistive Technology, Human Interaction

AUTONOMOUS 6WD FACE-RECOGNIZING ROBOT WITH INTERACTIVE TFT TOUCH DISPLAY USING AI THINKER VC-02

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ABSTRACT

This paper presents an autonomous six-wheel-drive (6WD) face-recognizing robot integrated with an interactive TFT touch display for intelligent surveillance applications. The system combines computer vision, artificial intelligence, and embedded systems to perform real-time facial recognition and autonomous navigation. The robot employs ESP32-CAM for image acquisition, OpenCV-based face detection algorithms, and Arduino Uno for motor control, enabling both manual and autonomous operation modes. Experimental results demonstrate 94-96% recognition accuracy under optimal lighting conditions and effective obstacle avoidance using ultrasonic sensors. The interactive TFT display provides real-time monitoring and control interface, enhancing human-robot interaction. The proposed system offers a scalable solution for applications in security surveillance, attendance systems, and automated patrolling, demonstrating the practical integration of AI with robotics in real-world scenarios.

KEY WORDS *:* Face Recognition, Autonomous Robotics, Computer Vision, Embedded Systems, Artificial Intelligence, Surveillance Systems, Human-Robot Interaction

GESTURE CONTROLLED WIRELESS ROBOTIC HAND

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ABSTRACT

Advancements in robotics and human-machine interaction have enabled intuitive control systems. This paper presents a gesture-controlled wireless robotic hand that mimics human movements in real time. The system provides a natural interface where gestures are directly translated into robotic actions without complex mechanisms. It consists of two main sections: a transmitting unit and a receiving unit. The transmitting unit is a wearable glove with flex and motion sensors, including an accelerometer, to detect finger bending and hand orientation. A microcontroller processes these signals, encodes them into commands, and transmits them wirelessly via Bluetooth or RF. On the receiving side, a robotic hand with servo motors replicates the movements. A microcontroller decodes the signals and controls the motors to perform corresponding actions. The system ensures real-time response and accuracy, enabling smooth synchronization between human gestures and robotic movements. Its wireless design enhances flexibility and ease of use. Emphasizing simplicity, the system is suitable for education and practical applications. Potential uses include prosthetics, rehabilitation, industrial automation, and hazardous environment handling. In conclusion, the gesture-controlled robotic hand demonstrates an effective solution for intuitive human-robot interaction and future smart robotics.

KEY WORDS : Gesture control, Wireless communication, Robotic hand, Flex sensors, Servo motors

HEALTH COMPANION: AN IOT BASED POSTURE MONITORING SYSTEM

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ABSTRACT

The IoT-Based Posture Monitoring System using Load Sensors and ESP32 was developed to address the growing issues related to human posture while sitting, particularly for students or those working from home. It aims to provide the most efficient means for individuals who often sit for extended periods, which is not safe. Poor posture, as perceived by the human body, has led to various problems, including lower back pain, spinal alignment issues, poor work performance, and inadequate sleep or fatigue. The technology is smart and automated, monitoring the user's position and providing necessary information based on the condition with immediate response time. It includes load sensors and a pressure information measuring system operated by the ESP32. At different timescales, we use amplifier module HX711 for accurate analog-to-digital translation. The system features an OLED display that provides instant feedback. Additionally, the ESP32 can function as a web server, allowing you to monitor your posture data directly through a web browser. For notifications of incorrect posture, alerts are sent via Email (SMTP and SMS through GSM). Consequently, it acts as a signal within the system and is easy to read. Overall, this project is an efficient framework to improve posture habits, enhance health, and prevent long-term physical problems using embedded systems or IoT systems in the long run.

KEY WORDS: IoT, Posture Monitoring, Load Sensors, Real-Time Monitoring, Email Notification

DEVELOPMENT OF COLORIMETRIC FILMS FOR MONITORING FOOD FRESHNESS USING NATURAL PIGMENTS

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ABSTRACT

Research into sustainable smart packaging has led to the development of bio-based pectin–chitosan films incorporating natural pigments from grape peel, beetroot, red amaranthus, and jamun fruit. Pigments rich in anthocyanins and betalains were extracted via ethanol-assisted ultrasonication and embedded into the biopolymer matrix, producing biodegradable films with pH-sensitive colorimetric properties. Anthocyanin films shifted from red to purple to green/yellow, while betalain films transitioned from red/pink to orange/yellow. Combining pigments enhanced the color range and response (ΔE^* ~31) compared to single pigment films. FTIR confirmed successful pigment incorporation and polymer interactions. The optimized formulation (1.5 g chitosan + 1.0 g pectin) yielded films with desirable mechanical strength, flexibility, and uniform morphology. Application tests with chicken stored at 4 °C and 27 °C demonstrated accurate real-time freshness monitoring, as color changes correlated with spoilage and volatile nitrogen levels. The films remained intact, safe, and non-toxic, confirming suitability for food contact. Overall, these biodegradable colorimetric films present an inexpensive, eco-friendly solution for intelligent food packaging, aligning with circular bioeconomy principles, waste valorization, and sustainable food safety monitoring.

KEY WORDS: Pectin, Chitosan, Intelligent packaging, Biodegradable films.

PORTABLE MUSIC TO VIBRATION SYSTEM

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ABSTRACT

This project focuses on the development of a wearable assistive device that transforms sound signals into tactile sensations using a threshold-based detection method. A sound sensor is employed to detect surrounding audio signals, which are then processed by an Arduino microcontroller. Whenever the detected sound level surpasses a set threshold, a coin vibration motor is triggered to produce noticeable vibrations, allowing users to perceive critical sounds through touch. The use of a threshold mechanism minimizes unnecessary activations caused by ambient noise, thereby enhancing the system's accuracy and usability. The device is designed with a wearable setup incorporating Velcro straps and soft padding materials to ensure comfort, portability, and user convenience. Overall, the system is compact, energy-efficient, and affordable, offering an effective solution to support individuals with hearing impairments by improving their awareness of environmental sounds and promoting safety

KEY WORDS: Wearable Assistive Device, Sound-to-Tactile Conversion, Arduino Microcontroller, Threshold-Based Detection, Vibration Feedback

SMART MULTIMODAL EMOTION RECOGNITION SYSTEM FOR HUMANOID AI

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ABSTRACT

A significant limitation of contemporary AI systems is their inability to accurately interpret human affective states, which results in rigid and contextually inappropriate interactions across domains such as education, healthcare, and intelligent virtual assistance. To address this gap, we propose a Multimodal Affective Computing Framework integrated into a Humanoid AI platform, capable of inferring emotional states by jointly analyzing linguistic content, vocal characteristics, and facial cues. The proposed architecture leverages transformer-based language models sourced from Hugging Face for sentiment and emotion classification from textual inputs, employs the Whisper automatic speech recognition model for converting spoken language into processable text, and utilizes the DeepFace library for real-time facial affect analysis. Paralinguistic features extracted from raw audio signals are further processed through deep neural networks to capture emotion-relevant acoustic patterns. A weighted multi-source fusion strategy consolidates predictions from each modality into a unified affective label, ensuring robustness under varying input conditions. Built entirely on open-source components, the system offers a scalable and economically viable pathway toward deploying emotionally aware humanoid agents in human-centric environments including therapeutic support, adaptive learning, and conversational AI.

KEY WORDS*:* Multimodal Emotion Recognition, Affective Computing, Humanoid AI, Transformer-based Models, Acoustic Feature Extraction, Facial Expression Analysis, Decision-Level Fusion

SUSTAINABLE BIO-BASED STORAGE TECHNOLOGY FOR IMPROVING ONION SHELF LIFE

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ABSTRACT

Post-harvest onion loss is a major agricultural and economic issue, especially in regions lacking proper storage facilities. A significant portion of onions spoil due to microbial growth, fungal infections, moisture imbalance, and oxidation, reducing quality and market value. Chemical preservatives have traditionally been used, but they pose health and environmental risks, creating demand for safer alternatives. This study introduces a natural, biodegradable food coating to extend onion shelf life. The coating uses agar as a film-forming base, combined with neem, turmeric, and aloe vera extracts, which provide antimicrobial and antioxidant effects. Agar forms a protective barrier on the onion surface, while the plant extracts inhibit bacterial and fungal growth. The preparation process is simple, cost-effective, and adaptable for small or large-scale use. Once applied, the coating reduces moisture loss and slows oxidative reactions, maintaining freshness and quality. Experimental results indicate a reduction in post-harvest losses by 20–25%. Overall, this eco-friendly technique offers a sustainable solution for agriculture, improving food preservation and storage practices.

KEY WORDS *:* Agar coating, Antimicrobial extracts, Post-harvest preservation, Moisture control, Oxidation prevention

DESIGN AND DEVELOPMENT OF A LOW-COST OFFLINE EDUCATIONAL LAPTOP USING E-INK TECHNOLOGY

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ABSTRACT

Education is one of the basic needs to all the students from both urban and rural areas but some colleges run without sufficient facilities and faculties. So, students were forced to move to cities for complete their education. In this phase of life, students face serious problems financially like internet cost, electricity cost and buying subject related materials. Students also get easily distracted by commercial devices which include unwanted advertisement, games, social Medias and unrestricted contents. On another side, paper usage is high which cause environmental impact due to pulping process. To overcome this problem, we developed a student laptop with an affordable price which includes E-Ink technology display, Raspberry Pi 4B, a 10,000 mAh battery backup, a micro-SD card and a keyboard. This laptop is energy efficient, low power consuming, distraction free, works on offline without using SSDs or HDDs, reduce the usage of paper and gives eye friendly reading experiences. This solution helps and support sustainable education and control environmental pollution by pulping process.

KEY WORDS : E-Ink technology, Sustainable education; Student laptop, Low power consuming.

AURA: COMPUTER VISION-BASED AUTOMATED UNIT FOR ELDER CARE IN INDOOR ENVIRONMENT

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ABSTRACT

Artificial intelligence combined with embedded vision technologies is enabling the development of intelligent tools for everyday use and it is now possible to develop intelligent tools in our daily lives for eldercare. This work presents a development of Robot to assist the elder for their daily needs in indoor environment. AUR- computer vision based robot developed using YOLOv8 deep learning and implemented using a Raspberry Pi 4 along with high resolution camera. The system is designed to identify common household objects such as bottles, fruits, and cups, aiming to support elderly and physically challenged individuals in daily activities. A custom dataset comprising different object classes was developed and used to train the model, achieving a mean average precision (mAP) of 92.5% and high accuracy. The prototype has been developed by deploying the trained model on the Raspberry Pi. The prototype model has been tested in the real time indoor environment. Experimental results demonstrate stable real-time performance at 12–15 frames per second under varying environmental conditions. The proposed system integrates computer vision with embedded AI to provide a cost-effective, portable, and efficient assistive solution for elderly care

KEY WORDS *:* YOLOv8, Raspberry Pi, Object Detection, Computer Vision, Elderly Assistance and Embedded AI KEY WORDS Real-Time Processing

PRODUCTION OF ECO-FRIENDLY BIOPLASTIC FROM STARCH

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ABSTRACT

Plastic pollution is widely recognized as a major environmental problem because conventional plastics remain in the environment for extremely long periods without breaking down. In response to this issue, bioplastics made from renewable and natural materials have gained attention as a safer and more sustainable alternative. This project focuses on producing a simple form of biodegradable plastic using corn starch as the main ingredient. The method involves mixing corn starch with water, a small amount of vinegar, and glycerin, and then heating the mixture carefully while stirring. As the temperature increases, the mixture thickens into a gel-like substance that behaves similarly to a polymer. Once the desired consistency is reached, the mixture is poured onto a flat surface and left undisturbed to dry, forming a thin, flexible sheet. Glycerin is added to improve flexibility, while vinegar helps in achieving a smoother texture. The resulting material is biodegradable and can break down naturally over time, reducing environmental impact. This model helps in understanding how everyday materials can be used to create eco-friendly alternatives and highlights the importance of adopting sustainable solutions to reduce plastic waste and protect the environment.

KEY WORDS : Polymerization, Eco-friendly materials, Renewable resources, Plastic waste reduction, Sustainable development, Environmental conservation

DEVELOPMENT AND CHARACTERIZATION OF GARLIC PEEL BASED HYDROGEL FILM FOR WOUND HEALING APPLICATIONS

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ABSTRACT

Garlic (Allium sativum) peel is a byproduct of agro-industry and is a good source of bioactive molecules with powerful antioxidant and antimicrobial active potential. This research article describes the formulation and characterization of an ethanolic garlic peel extract (EGPE). Fourier-transformed infrared spectroscopy (FTIR) of garlic peel powder did confirm the presence of hydroxyl (–OH), carbonyl (C=O), and sulfur (C–S) functional groups which indicate that antioxidants and antimicrobial compounds exist. EGPE was subsequently blended into a chitosan-based hydrogel film that was produced using the solar-casting technique using glycerol as a plasticizer. FTIR of the EGPE-chitosan film indicated clear evidence of molecular interactions between EGPE and chitosan showing that the bioactive compounds integrated into the polymer matrix. This modified EGPE-chitosan hydrogel film is an appropriate method for additional research in wound-healing and other biomedical applications.

KEY WORDS *:* Garlic peel extract, Chitosan hydrogel film, FTIR analysis, Ethanolic extraction method, Bio-active compounds, Antioxidant, Antimicrobial, Wound healing

FLARE NOVA AI AN AIOT-DRIVEN FRAMEWORK FOR SMART EARLY DETECTION AND PREDICTION OF FIRE RISKS

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ABSTRACT

Fire hazards are a major challenge on environmental, economic, and safety in a broad scope of applications. Nevertheless, the current fire detection solutions are usually limited by expensive cost of deployment, slow response, and lack of scalability. The current paper proposes a hybrid Internet of Things (IoT) and Artificial Intelligence (AI)-based system of early fire detection. The system is able to monitor the critical environmental parameters, i.e. temperature, humidity, gas concentrations, etc., continuously with the help of distributed IoT sensors. The main value of this work is the design of a two-stage hybrid detection mechanism that combines real-time environmental sensing with the visual analysis of fire and smoke based on deep learning methods in a coherent architecture. The suggested framework is more accurate and robust due to the ability to work with multimodal data fusion. The performance of the experiment shows high classification, and better reliability with changes of the conditions. Also, localization based on GPS will allow generating alerts in real-time and tracking the location accurately, responding to the incident quickly and managing it effectively in a variety of large-scale settings.

KEY WORDS : hybrid Internet of Things, Artificial Intelligence, multimodal data fusion

SAFE WALK-SMART SHOE FOR BLIND NAVIGATION

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ABSTRACT:

Every day, millions of visually impaired people face the challenge of navigating the world around them safely and independently. Traditional aids like white canes and guide dogs, while helpful, have limitations they can't always detect obstacles at eye level or provide real-time directional guidance. This project proposes a smarter solution: an AI-powered navigation shoe designed to help visually impaired individuals move through their environment with greater confidence and safety.The shoe is embedded with an ultrasonic module (ROBU ULTASONIC SENSOR) used to detect object by sending sound waves and measuring distance. like YOLO and MobileNet SSD, which can identify obstacles, stairs, and hazards in real time. Instead of using sound or speech which can be distracting the system communicates through vibration. Different vibration patterns in the left and right motors tell the user whether to turn, stop, or walk. The entire system runs on a compact rechargeable battery and is built to be lightweight, affordable, and practical for everyday use. The goal isn't just to build a device it's to give visually impaired people a tool that genuinely improves their quality of life. By bringing together artificial intelligence and wearable technology in a simple shoe, this project takes a meaningful step toward a more inclusive and accessible world.

KEY WORDS : AI-powered navigation, Visually impaired assistance .Ultrasonic sensor ,Obstacle detection ,Wearable technology.

IOT BASED NOISE MONITORING SYSTEM

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ABSTRACT

The present paper proposes a system called Smart Acoustic Guardian that can be used to monitor indoor acoustic environments like classrooms, hospitals, libraries, and offices using IoT technology. In this system, acoustic sensors are used to monitor indoor acoustic environments and send information to a cloud-based dashboard using microcontrollers like ESP modules and Raspberry Pi. The user can set their own acoustic limit depending on their requirements. In case of high acoustic levels, notifications are sent to the user. It can also be used for data analysis to understand acoustic patterns and improve acoustic conditions. The system can be considered a cost-effective solution to improve acoustic environments.

KEY WORDS: Smart Acoustic Guardian, IoT technology, acoustic sensors, indoor monitoring, ESP modules, Raspberry Pi, cloud dashboard, noise notifications, acoustic data analysis, cost-effective solution.

INTEGRATED SONAR AND VISION SYSTEM FOR UNDERWATER DETECTION

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ABSTRACT

The detection and classification of underwater objects is a critical yet challenging task due to factors such as poor visibility, noisy sonar signals, and the similarity between different underwater structures. Traditional systems rely on single sensing techniques, which often result in low accuracy, delayed detection, and reduced reliability.This project proposes an Integrated Sonar and Vision System for Underwater Detection, which combines acoustic sensing and visual imaging with artificial intelligence to enhance detection performance. The system utilizes sonar data to identify object presence and distance, while an underwater camera captures visual features such as texture and shape. These inputs are processed using machine learning and computer vision models, and their outputs are fused to generate a more accurate and reliable classification of underwater objects, such as rocks and mines. The proposed approach follows a multi-stage pipeline involving data acquisition, preprocessing, feature extraction, and multi-modal fusion for final prediction. This integration significantly reduces false positives and improves detection accuracy, even in low-visibility and noisy underwater environments.The system is designed to operate in real time and can be deployed for applications in naval defence, marine exploration, commercial shipping, and environmental monitoring. By combining multiple sensing technologies with AI, the proposed solution enhances underwater safety, supports efficient resource management, and provides a scalable foundation for future advancements such as autonomous underwater vehicles and deep learning-based detection systems.

KEY WORDS : Smart Acoustic Guardian, IoT technology, acoustic sensors, indoor monitoring, Arduino , Raspberry Pi, cloud dashboard, noise and led notifications, acoustic data analysis, cost-effective solution.

AI-POWERED COLLEGE PLACEMENT AUTOMATION SYSTEM USING ROBOTIC PROCESS AUTOMATION AND LARGE LANGUAGE MODELS

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ABSTRACT

V-Place is an AI-powered placement automation platform designed to streamline and enhance the campus recruitment process for students, placement officers, and recruiters. Traditional placement systems often face challenges such as manual resume screening, inefficient communication, lack of personalized guidance, and limited analytics. V-Place addresses these issues by integrating intelligent automation and data-driven decision-making into a single unified platform. Key features include AI-based Resume Screening, Smart Job Matching, Automated Email Communication, AI-Generated Interview Questions, Placement Analytics Dashboard, Student Performance Tracking, and an Interactive Chatbot for real-time assistance. The system leverages advanced technologies such as Machine Learning, Natural Language Processing (NLP), and Robotic Process Automation (RPA) to improve accuracy and efficiency in the recruitment workflow. The platform is developed using a modern web-based architecture with a scalable backend and secure database management, ensuring real-time updates, data privacy, and seamless interaction between users. Students can easily access job opportunities, receive personalized recommendations, and prepare for interviews, while recruiters can efficiently shortlist candidates and manage hiring processes. By automating repetitive tasks and providing intelligent insights, V-Place enhances placement success rates, reduces manual effort, and creates a smarter, faster, and more transparent recruitment ecosystem.

KEY WORDS: Placement automation, AI recruitment, resume screening, job matching, student analytics, interview preparation, chatbot, campus placements.

IOT - ENABLED SMART DUSTBIN NETWORK WITH AI-BASEDGAR BAGE REPORT VERIFICATION SYSTEM

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ABSTRACT

Managing garbage in fast-growing cities is more challenging than it seems. Bins overflow before anyone notices, collection trucks take set routes regardless of real needs, and illegal dumping often goes unreported for days. To address these issues together instead of separately, we created a Smart Garbage Management System that combines low-cost IoT-enabled smart bins with a real-time monitoring dashboard and a community reporting app into one working system. At the hardware level, a microcontroller fits inside each bin and uses a sensor to track how full it is. LEDs provide a quick status: green when empty, Yellow at half capacity, and red when full. The device sends updates over a wireless network to a central server every few seconds. Once a bin reaches full capacity, an automatic alert appears on the management center's dashboard before the situation worsens. That dashboard gives staff a live map of every bin in the area, automatically creates collection schedules based on fill levels instead of fixed routes, and maintains a time stamped log of every pickup that occurs. On the community side, residents use a mobile app to take photos of garbage they see on the street. Before that photo gets to the operations team, AI checks it to confirm whether it shows real waste, filtering out blurry, irrelevant, or prank submissions automatically. Verified reports show up on the management center's task list, field teams go out to clean the area, and the citizen who submitted the report can track the status from submitted to resolve on their phone. Together, this system reduces wasted collection trips, addresses overflowing bins more quickly, and engages the public in keeping their city clean without adding unnecessary bureaucracy on either side.

KEY WORDS : Smart Garbage Management, Internet of Things (IoT), Microcontroller, Sensors, AI Verification, Real-time Monitoring, Smart City, Waste Collection Scheduling,

VIBROTHERA – A WEARABLE VIBRATING BAND FOR PHANTOM LIMB PAIN RELIEF

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ABSTRACT :

The People who's Amputated and Suffers with Sudden Phantom Limb Pain which effects in Stabbing, Cramping, Pulsing and pain like poking with pins and Needles . This Often Happens because the Brain and Nerves Still Remember that the amputated part is still Present ,But the part is missed for this many treatments are available but they are either costly or not affordable for the all people . so For that I have Developed an IOT and Embedded system Device Called VibroThera is proposed .This device uses small Vibration Motors to stimulate and respond the nerves which creates the pain and signal from Brain ,which helps in reducing the pain sensation . This System has Basic Components Like Arduino Borad ,Vibrating Motors, sensors, Battery ,Buzzer .It's Making is Low -Cost, affordable and Easy to use by all people. This device is Designed in the form of Wearable sock so that it can be comfortable for daily Use. It's also Safe to use ,comfortable ,portable and user-friendly .This project mainly scopes on providing Impactful and Effective economical solution for all people and people who suffers from ;phantom limb pain but can't able to afford for it . Overall ,VibroThera aims to improves the quality of people's Quality of Life and patients who suffers by reducing pain in a simple and practical way.

KEY WORDS: Arduino Board, Vibration Motor, Buzzer ,embedded systems, safety Alert , push button, real time systems microcontroller , assistive technology and reducing pain, low-cost electronics, easy to use ,affordable ,portable

DESIGN AND IMPLEMENTATION OF A COST-EFFECTIVE PRIVATE CLOUD STORAGE SYSTEM USING TRUENAS SCALE AND NEXTCLOUD

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ABSTRACT

The exponential growth of digital data has significantly increased the demand for scalable, secure, and cost-effective cloud storage solutions. Commercial cloud platforms offer convenience but are often associated with recurring subscription costs, limited scalability, vendor lock-in, and data privacy concerns. To address these challenges, this project presents the design and implementation of a private cloud storage system by repurposing legacy hardware into a fully functional cloud server using open-source technologies such as True NAS Scale, ZFS, and Next cloud.The proposed system provides centralized storage, enabling efficient data management, multi-user collaboration, remote accessibility, and seamless data synchronization. By leveraging advanced storage mechanisms such as storage pooling, datasets, access control lists (ACLs), and network file sharing protocols, the system achieves enterprise-level performance while maintaining low implementation costsFurthermore, the solution ensures complete data ownership, enhanced security, and flexibility, making it highly suitable for small organizations, educational institutions, and individual users. This approach demonstrates how legacy systems can be transformed into efficient private cloud infrastructures, offering a sustainable and economical alternative to commercial cloud services.

KEY WORDS : Private cloud, cloud storage, TrueNAS Scale, Nextcloud, ZFS, data security, storage virtualization, legacy hardware, open-source technologies, network storage, data synchronization, cost-effective solutions.

IOT BASED SMART PARKING PREDICTION SYSTEM

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ABSTRACT

As urban populations surge, inefficient parking management has become a primary driver of traffic congestion and environmental pollution. This project introduces an IoT-based Smart Parking Prediction System designed to automate space allocation and monitoring using the ESP32 microcontroller. The system utilizes two Infrared (IR) sensors to detect vehicle entry and stall occupancy in real-time. Upon detection, the ESP32 processes the occupancy data to control a Servo motor, which acts as an automated physical barrier. If a space is available, the gate opens, and a Traffic Light LED transitions from red to green, providing immediate visual guidance. Simultaneously, a 16x2 LCD provides the driver with an updated count of available slots. Powered by a 9V 300mAh rechargeable battery, this prototype emphasizes energy efficiency and portability. By integrating IoT capabilities, the system allows for future cloud-based data logging and remote status updates. This research demonstrates a lowcost, scalable solution for smart city infrastructure, effectively reducing "cruising time," lowering fuel consumption, and streamlining the transition toward intelligent, data-driven urban mobility.

KEY WORDS: Traffic Light LED Indicato, ,Space Allocation ,Smart City Infrastructure, Energy Efficient System ,Wireless Data Processing ,Vehicle Detection , Low-cost Prototype

IOT-BASED SMART IRRIGATION SYSTEM

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ABSTRACT:

The IoT Smart Irrigation System is an automated agricultural irrigation solution designed to conserve water, reduce manual labor, and improve farming efficiency using Internet of Things (IoT) technology. The system uses soil moisture sensors to continuously monitor the moisture level of the soil, and the collected data is processed by an Arduino Uno microcontroller. When the soil moisture falls below a predefined threshold, the system automatically turns on a water pump through a relay module, and it turns off the pump once the soil reaches the required moisture level. The system also allows real-time monitoring through an IoT platform, enabling remote supervision and control of irrigation. This helps prevent over-watering and under-watering, reduces electricity consumption, and optimizes resource usage. By integrating sensors, automation, and IoT technology, the smart irrigation system provides a cost-effective, efficient, and sustainable solution for modern agriculture and water resource management.

KEY WORDS :

IoT, Smart Irrigation, Soil Moisture Sensor, Arduino Uno, Automation, Water Conservation, Real-Time Monitoring, Sustainable Agriculture.

HAND GESTURE CONTROL RECOGNITION LANGUAGE

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ABSTRACT:

Communication is a major challenge for individuals with speech or hearing impairments, particularly when interacting with people who are unfamiliar with sign language. To address this issue, this project presents a real-time hand gesture language recognition system using Internet of Things (IoT) technology, designed to convert hand gestures into meaningful text or voice output. The proposed system uses limit switches mounted on a 3D-printed hand structure to detect finger movements. When a user performs a gesture, the switches are triggered and corresponding signals are sent to the ESP8266 microcontroller. The microcontroller processes these inputs using embedded C++ programming and compares them with predefined gesture patterns to identify the intended message. The system is powered by two 18650 Li-ion batteries, with a 7805 voltage regulator ensuring a stable power supply. Recognized gestures are transmitted via the built-in Wi-Fi capability of the ESP8266 for IoT-based applications. Additionally, an HC-05 Bluetooth module is integrated to send the processed data to a mobile device, where it is converted into audible speech output, enabling easier communication. This system can also serve as an assistive tool for paralysis patients, allowing them to express basic needs through simple hand movements. Overall, the project offers a cost-effective, portable, and user-friendly solution to improve accessibility and communication for differently-abled individuals using modern wireless technologies.

KEY WORDS

Hand Gesture Recognition, IoT, ESP8266, Bluetooth HC-05 module, Limit Switch, Communication System.

RE-PEEL BIOPLASTICS

NATURALLY CRAFTED, RESPONSIBLY MADE!

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ABSTRACT

Plastic comes in all kinds of shapes—sheets, panels, film, and it's easy to adjust how flexible it is, depending on what we need. It's lightweight, strong, visually appealing, and cheap compared to other materials with similar advantages. No wonder industries use it everywhere, but there's a catch: plastic has been around for centuries. It takes around 500 years to break down, and once it does, it turns toxic. Plastic pollution messes up land, water, and oceans, and it even affects people. For example, it can throw off hormone levels and mess with the thyroid. That's where biodegradable plastic comes in as a real game-changer. The study set out to make biodegradable plastic from banana peels—basically swapping out conventional plastic—and to show that the starch inside banana peels and fruit peels rich in cellulose actually works in making the biodegradable material. The biodegradable film from banana peels degraded quickly, the control film broke down more slowly, and synthetic plastic just didn't degrade at all. After all the tests, the banana peel film came out on top. It performed the best overall, making it a great option for industry uses like mounding and packaging. In addition to that, it helps protect the environment from the disaster caused by synthetic plastics.

KEY WORDS : Zero-Waste Packaging; Phytotoxic Effects; Circular Economy; Carbon Footprint Reduction; and Bio-assimilation.

"FROM SEEDS TO SHINE – ECO-FRIENDLY HERBAL TINT FOR HEALTHIER HAIR."

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ABSTRACT

The increasing demand for safer and eco-friendly cosmetic products has encouraged the development of natural alternatives to synthetic hair dyes. This study focuses on the formulation and evaluation of a vegan herbal hair tint prepared using an environmentally friendly process. Conventional hair dyes often contain harmful chemicals such as ammonia and synthetic colorants, which may cause scalp irritation, hair damage, and long-term health concerns. To address these issues, a plant-based formulation was developed using roasted seeds of cumin (Cuminum cyminum), mustard (Brassica nigra), and fenugreek (Trigonella foenum-graecum), along with essential oil to enhance fragrance and application properties. The ingredients were roasted, finely powdered, and blended to obtain a uniform paste with suitable consistency for hair application. The formulated herbal hair tint was evaluated for physicochemical characteristics, spreadability, stability, and colouring efficiency. The results indicated effective grey hair coverage, non-sticky texture, and ease of application. Additionally, the herbal formulation improved hair texture, imparted natural shine, and supported overall hair health, demonstrating its potential as a safe and sustainable alternative to conventional hair dyes.

KEY WORDS *:*Vegan herbal hair tint, natural hair dye, eco-friendly formulation, Cuminum cyminum.

DEVELOPMENT OF A PH-RESPONSIVE COLOR-CHANGING SMART BANDAGE INFUSED WITH NATURAL ANTIMICROBIAL AGENTS FOR EARLY INFECTION DETECTION

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ABSTRACT

This project focuses on developing a smart herbal medicated bandage capable of detecting infection early and promoting wound healing. The bandage integrates two primary functions: infection detection and therapeutic delivery. Natural antimicrobial agents such as honey, turmeric (curcumin), aloe vera, neem extract, and tea tree oil are selected for their antibacterial, anti-inflammatory, and wound-healing properties. These medicaments are incorporated into a hydrogel or sterile gauze matrix, forming the therapeutic layer of the bandage. To maintain stability and prevent degradation, the agents are infused into a gelatinous sheet that preserves moisture and is stored under cool conditions. Upon application, body temperature gradually dissolves the gelatinous layer, enabling controlled release of the herbal compounds directly into the wound site.For infection detection, a pH-sensitive indicator layer containing dyes such as bromothymol blue or phenol red is integrated into the bandage. Since bacterial activity elevates wound pH, the indicator produces a visible color change, signaling infection onset. This dual-function design ensures both timely detection and effective treatment. The bandage is evaluated under simulated wound conditions to assess color response, antimicrobial activity, and healing efficacy. Results demonstrate its potential as an affordable, accessible, and innovative wound-care solution, combining traditional herbal medicine with modern smart-bandage technology.

KEY WORDS : Bandage, Infection detection, pH indicator, Herbal medicaments, Wound healing, Biomedical dressing

DEVELOPMENT OF TASTE-MASKED ORAL THIN FILM STRIPS CONTAINING KALMEGH EXTRACT (ANDROGRAPHOLIDE) USING SWEETENING AND FLAVORING AGENTS

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ABSTRACT:

Oral drug delivery is widely used due to convenience and patient adherence, but bitterness of many herbal bioactives limits acceptance. Andrographolide, the main compound from *Andrographis paniculata* (Kalmegh, "King of Bitters"), has notable antiviral, antibacterial, anti-inflammatory, and immunomodulatory effects. However, its intense bitterness hinders oral use, especially in children and elderly patients. To address this, taste-masked oral thin film strips were formulated using Kalmegh extract with sweeteners and fruit flavors. Oral thin films dissolve rapidly in the mouth without water, improving ease of use, drug distribution in saliva, and potential mucosal absorption for faster therapeutic action. Gelatin served as the primary polymer, while glycerin acted as a plasticizer to enhance flexibility and mechanical strength. The solvent casting method was used to incorporate andrographolide into the polymeric matrix. Sweeteners and flavoring agents effectively masked bitterness while maintaining stability. The films were cast, dried, and cut into uniform strips designed to dissolve quickly on the tongue, releasing the active ingredient in a controlled, palatable manner. This approach improves patient compliance, particularly in pediatrics, and demonstrates how traditional herbal medicine can be integrated with modern drug delivery systems. Overall, taste-masked Kalmegh oral thin films represent a promising, user-friendly alternative to conventional dosage forms.

Key Words : Andrographolide, Kalmegh, Taste-masking, Oral thin films,Patient compliance.

FORMULATION AND EVALUATION OF FISH SKIN–BASED HERBAL WOUND HEALING DRESSING

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ABSTRACT

Wound healing is a complex physiological process requiring dressings that support tissue regeneration, prevent infection, and maintain a moist environment. This study focuses on the formulation and evaluation of a novel wound-healing dressing prepared from fish skin incorporated with herbal extracts. Fish skin is a rich source of collagen, biocompatible proteins, and bioactive compounds that promote cell proliferation, tissue regeneration, and wound repair. The addition of herbal ingredients provides antimicrobial, anti-inflammatory, and antioxidant benefits, further enhancing healing and reducing infection risk. In this work, fish skin was processed, sterilized, and combined with selected herbal extracts to develop a bioactive composite dressing. The dressing was evaluated for physicochemical properties including thickness, tensile strength, swelling index, moisture retention, and pH. Antimicrobial activity was assessed to determine its effectiveness against microbial growth. In-vitro and in-vivo wound-healing studies were conducted to evaluate tissue regeneration and wound closure.Results showed that the fish skin–herbal composite exhibited good mechanical strength, high moisture retention, and significant antimicrobial activity. Collagen supported faster epithelialization and tissue regeneration, while herbal components enhanced antimicrobial protection and reduced inflammation. Overall, the developed dressing demonstrated promising wound-healing potential as a natural, biocompatible, cost-effective, and eco-friendly alternative to conventional wound dressings.

KEY WORDS : Fish skin collagen, Herbal wound dressing, Wound healing, antimicrobial activity, Tissue regeneration, Bioactive wound dressing, Moisture retention, Natural biomaterials.

FORMULATION AND EVALUATION OF HERBAL MEDICATED PATCH FOR DYSMENORRHEA MANAGEMENT

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ABSTRACT

Primary dysmenorrhea affects 50-90% of all adolescent and reproductive-age women and is primarily caused by a surplus of prostaglandins which bring about pain and uterine contractions. Although NSAIDs are frequent, the long-term use of these drugs may have systemic and gastrointestinal side effects. A safer alternative would be medicinal plants due to their analgesic, antipsasmodic and anti-inflammatory properties. Foeniculum vulgare has antispasmodic activity attributed to anethole and Zingiber officinale inhibits the production of prostaglandin and cyclooxygenase. Lavandula angustifolia and Ricinus communis oils possess analgesic, permeation promoting and anti-inflammatory properties. This research proposal will aim at developing a herbal transdermal patch that will be based on lavender, fennel, castor, and ginger extract in a Carbopol 940 gel foundation.

This is a safe, non-invasive and is an alternative to oral analgesics used to treat dysmenorrhea due to its localised effect, long acting and good absorption.

KEY WORDS : Hydrogel, Transdermal drugs, Dysmenorrhea, Herbal patch, Menstrual discomfort.

DEVELOPMENT AND CHARACTERIZATION OF POLYHERBAL CHOCOLATE FOR GASTRO PROTECTIVE ACTIVITY

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ABSTRACT

Heartburn and gastric irritation are common gastrointestinal problems that significantly affect the quality of life. These conditions are often associated with excessive gastric acid secretion, irregular dietary habits, and stress. Herbal medicines rich in bioactive phytoconstituents such as flavonoids, phenolic, tannins, and saponins have been reported to possess gastro protective and anti-ulcer properties. The present study aims to develop a polyherbal chocolate formulation intended for gastro protective activity and management of heartburn.In this Nutraceutical project work, selected medicinal herbs such as *Citrus maxima*, *Zingiber officinale*, *Glycyrrhiza glabra,* and *Emblica officinalis* will be incorporated into a chocolate base due to their reported antioxidant, anti-inflammatory, and gastric mucosal protective properties. The herbal chocolate will be prepared using suitable ingredients including cocoa butter, cocoa powder, milk powder, and sweetening agents to improve palatability and consumer acceptance. The prepared herbal chocolate will be evaluated for physicochemical and sensory parameters including appearance, texture, hardness, weight variation, melting characteristics, and overall acceptability. The incorporation of herbal extracts into a chocolate dosage form is expected to enhance patient compliance while delivering potential gastro protective benefits. The study demonstrates the feasibility of developing a novel polyherbal chocolate formulation that combines therapeutic value with improved palatability, suggesting its potential use as a functional nutraceutical for digestive support and management of heartburn.

Key words: Gastro protective activity, Nutraceuticals, Polyherbal Formulations, Phytoconstituents, Patient compliance.

DISINFECTANT GEL BAG FOR INFECTION CONTROL

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ABSTRACT:

The communicable disease is still a big concern regarding public health, and the problem with educated and regulated dispersal of sputum results in the primary spread of communicable disease. Most traditional ways to collect sputum are set up for storage, but it does not allow for immediate pathogen neutralization when transferring and discarding these samples. This research is recommending developing a self-disinfecting sputum bag/collection method that employs self-activated disinfectant and pathogen neutralization through the controlled release of a disinfectant using natural moisture from the sputum. The system contains disinfectant-encapsulated alginate gel beads. In preparation, these gel beads are produced using an ionic gelation method, and they encapsulate the disinfectant. Once the gel beads are in contact with the sputum, the action of moisture on the gel beads causes swelling, and the controlled release of the various disinfectants occurs. In addition, the internal absorbent pad minimizes leaks by allowing for fluid containment and also allows for ease in carrying. The incorporated visual confirmation strip aids in confirming whether the sputum sample is contaminated and/or activated for pathogen neutralization. The self-sealing mechanism will reduce the risk of spreading communicable disease into the environment when the sputum is discarded. The design and ideas behind the prototype were developed utilizing inexpensive, readily accessible materials with a low manufacturing cost, supporting scalability in developing countries and/or regions. It will provide a cost-effective, innovative, and easy-to-use pharmaceutical intervention method for improving sputum management practices.

KEY WORDS : Sputum disposal, Self-disinfecting system, gel beads, Infection control, Pathogen.

DESIGN AND DEVELOPMENT OF A POLYHERBAL TOPICAL FORMULATION FOR WOUND CARE APPLICATIONS

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ABSTRACT

The current invention pertains to polyherbal topical formulation and the process of its preparation as an agent used to treat wounds. It also includes extracts of Centella asiatica (Vallari) and Calendula officinalis , which have been chosen due to their complementary action in stimulating tissue regeneration, decreasing inflammation, and controlling the oxidative stress. It is aimed at developing a safe, cost-effective, and multifunctional herbal wound care system. Plant materials are hydroalcoholically extracted to produce a semi-solid extract which is subsequently incorporated into a base that is pharmaceutically acceptable e.g. a cream or gel. The formulation will be used to improve wound healing through the maintenance of a moist environment, stability, and patient acceptability.Early physicochemical and physical analyses, such as appearance, homogeneity, PH, viscosity, spreadability and extrudability were conducted to ascertain its topical application. The phytochemical screening showed that triterpenoids, flavonoids, and phenolic compounds were present and these ones are associated with therapeutic effect in wound healing.Formulation quality was evaluated based on the standard guidelines so as to achieve consistency. The formulation also displayed a high in-vitro antioxidant activity meaning that it can be used to control oxidative stress in wounds. The batch-to-batch reproducibility is guaranteed by analytical standardization by chromatographic methods like HPTLC. Altogether, the invention provides a scalable and environmentally friendly methodology to address effective polyherbal topical formulations to be used as wound care and in dermatology.

KEY WORDS *:* Centella asiatica; Calendula officinalis; Wound healing; Antioxidant activity; HPTLC Standardization

VITADIP: DEVELOPMENT AND EVALUATION OF A WELLNESS-BASED DIP-AND-DRINK NUTRACEUTICAL FORMULATION FOR FOCUS, CALM, AND SLEEP

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ABSTRACT

The growing incidence of stress, cognitive fatigue, and sleep disturbances necessitates the development of convenient and effective herbal nutraceutical systems. Dip-and-drink formulations offer a simple and user-friendly alternative to conventional dosage forms.VitaDip formulations were developed using natural herbal ingredients. The Focus blend contained Brahmi, Ginseng, and Green tea extract; the Calm blend included Ashwagandha, Chamomile, and Lavender; and the Sleep blend comprised Chamomile extract, Ashwagandha extract, Nutmeg, and milk powder. Natural sweeteners and flavoring agents such as honey powder, jaggery, lemon, and ginger were incorporated. The formulations were prepared as free-flowing powders using dry mixing and evaluated for physicochemical properties, dispersion time, pH, organoleptic characteristics, and stability.All formulations exhibited good flow properties and rapid dispersion in water. The pH was within acceptable limits for oral consumption. Sensory evaluation indicated satisfactory taste, aroma, and overall acceptability. Stability studies showed no significant changes in physical appearance or performance under storage conditions.VitaDip demonstrates a promising herbal dip-and-drink system with improved convenience, palatability, and user compliance. The formulation offers potential as a functional beverage for mood enhancement and wellness support.

Key Words: VitaDip, Herbal formulation, Dip-and-drink system, Nutraceuticals, Mood enhancement, Functional beverage, Stress management, Sleep support

AI-BASED OPTIMISATION OF MAGNETO-RADIATIVE CASSON NANOFLUID FLOW FOR ADAPTIVE HYPERTHERMIA CANCER THERAPY

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ABSTRACT

Hyperthermia therapy treats cancer by heating tumour tissues to 42–45°C, but achieving uniform heating remains challenging due to complex blood flow and tissue properties. This project develops a mathematical and AI-based optimisation framework that incorporates Casson nanofluid modelling, magnetic field effects, and thermal radiation. The governing equations are solved using the Finite Element Method (FEM) to simulate the temperature distribution. AI algorithms such as Genetic Algorithm and Particle Swarm Optimisation are used to determine optimal treatment parameters. The study aims to improve temperature control and treatment efficiency and proposes a smart adaptive hyperthermia medical device for safer and more precise cancer therapy.

KEY WORDS *:* Hyperthermia Treatment, Casson Fluid, MHD, Radiation, Porous Medium

FUZZY STOCKOUT–TREND BASED ADAPTIVE INVENTORY DECISION MODEL

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ABSTRACT

Inventory systems in real-world environments are often influenced by vagueness rather than precise uncertainty, particularly in determining stockout conditions. Traditional models typically assume sharp thresholds for reorder decisions, which fail to capture the gradual transition of stockout risk. This study proposes a novel fuzzy inventory framework that models stockout as a grey-zone phenomenon using membership functions.Furthermore, the model incorporates demand trends whether increasing, stable, or decreasing to better represent dynamic consumption behavior. By integrating fuzzy stockout risk with demand trends, a new metric termed the *Stocking Pressure Index (SPI)* is introduced. This index quantifies the urgency of replenishment decisions on a continuous scale, rather than relying on binary triggers.The proposed model is implemented and visualized using computational tools, generating graphical representations such as risk curves and decision surfaces. The approach offers a more realistic and flexible decision-making framework, making it suitable for applications in warehouses, healthcare inventory systems, and broader supply chain environments where uncertainty and vagueness coexist.

KEY WORDS : Fuzzy inventory system, Stockout risk, Demand trend analysis, Stocking Pressure Index (SPI), Decision-making under uncertainty

MXENE-BASED ELECTROCHEMICAL EVALUATION OF $SRNIO_2$ COMPOSITES FOR ADVANCED ENERGY STORAGE

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ABSTRACT

High-performance supercapacitors require electrode materials with rapid electron transport, accessible redox-active sites, and stable ion-diffusion pathways. In this study, a $Ti_3C_2T_x$ MXene/$SrNiO_2$ hybrid nanocomposite was prepared via a co-precipitation-assisted anchoring approach, enabling the growth of orthorhombic $SrNiO_2$ on conductive MXene nanosheets. Structural and morphological properties were investigated using XRD, SEM, EDS, and FTIR. Electrochemical evaluation using CV, GCD, and EIS demonstrated improved charge-storage behavior, lower charge-transfer resistance, and enhanced ion-transport kinetics for the MXene/$SrNiO_2$ electrode compared to pristine MXene, attributed to synergistic coupling between the conductive layered network and the redox-active nickelate component. The results suggest that the MXene/$SrNiO_2$ hybrid is a promising electrode platform for advanced supercapacitors and flexible energy-storage systems.

KEY WORDS : Mxene, $SrNiO_2$ Nanocomposite, Supercapacitor, Electrochemical Performance

SUSTAINABLE EXPLORATION OF NONLINEAR OPTICAL SINGLE CRYSTALS THROUGH LOW-TEMPERATURE GROWTH FOR NEXT-GENERATION PHOTONIC DEVICES

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ABSTRACT

Sustainability in crystal growth emphasizes high-performance materials with reduced environmental impact across their life cycle, from raw material selection to device integration. These materials enhance efficiency in lasers, optical sensors, telecommunications, and imaging technologies. A high-quality single crystal of Bis(D-phenylglycinium) sulphate monohydrate was synthesized using low-temperature solution growth with aqueous medium at ambient conditions. Transparent crystals obtained were analyzed by single-crystal XRD, confirming a monoclinic structure with space group P21. FTIR identified functional groups, while UV-visible spectroscopy assessed optical parameters including cut-off wavelength, bandgap, and refractive indices. Thermogravimetric analysis (TG-DTA) demonstrated thermal stability up to 273°C. The laser damage threshold was determined as 10.7 GW/cm², and harmonic generation efficiency surpassed conventional KDP, highlighting superior nonlinear optical performance. The low-temperature solution growth method reflects sustainable materials science principles by minimizing energy use, reducing chemical load, and maximizing yield. This eco-friendly approach, combined with advanced characterizations, underscores the potential of such crystals in next-generation optical and photonic applications, aligning material innovation with environmental responsibility.

KEY WORDS : Sustainable growth, Optical Studies, Thermal analysis, LDT, Second Harmonic Generation.

ELECTRO CATALYTIC BIO DEGRADATION OF ORGANIC EFFLUENTS

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ABSTRACT

The textile industry is one of the most productive yet globally polluting sectors, particularly due to effluents from dyeing, printing, and finishing processes. Managing these effluents responsibly is a major challenge, as dyes and auxiliaries have complex structures that make treatment difficult. Textile processing relies heavily on synthetic dyes and pigments, creating wastewater rich in organic dyes and solvents with high chemical oxygen demand (COD). In this study, wastewater collected from a textile company was analyzed through physical and chemical tests, revealing COD levels up to 48,000 mg/L. Such effluents cannot be discharged untreated, as they exceed pollution control standards. To address this, a hybrid treatment method was employed. The effluent first underwent one hour of electrochemical treatment, such as electrooxidation or electrocoagulation, which simplified complex organic molecules. This step reduced power consumption and enhanced treatment efficiency. Following this, biological processes were applied, enabling microorganisms to more effectively degrade the simplified organics. Since biological methods alone cannot handle intricate organic structures, the combined approach ensures improved pollutant removal, aligning with environmental sustainability and regulatory compliance.

KEY WORDS : Textile industry, electro oxidation, electrocoagulation, chemical oxygen demand

COFFEE WITH BIOPLASTICS & EDIBLE AND PH INDICATOR WRAPPER BY USING BETROOT

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ABSTRACT

The growing environmental concerns associated with plastic waste have accelerated the development of sustainable and biodegradable alternatives. This project focuses on the preparation of bioplastics derived from coffee waste, combined with the development of an edible, pH-responsive food wrapper incorporating beetroot extract. Spent coffee grounds, typically treated as waste, are utilized as a raw material to produce eco-friendly bioplastics, thereby promoting waste valorization and supporting circular economy principles.The developed bioplastic film is further enhanced by the incorporation of natural pigments extracted from beetroot, which are rich in anthocyanins acting as pH-sensitive indicators. These pigments enable the wrapper to exhibit visible color changes in response to pH variations, making it a promising tool for detecting food spoilage. Moreover, the materials used are biodegradable, non-toxic, and potentially edible, thereby minimizing the adverse environmental impact of conventional plastic packaging.This innovative approach integrates sustainability, food safety, and smart packaging technology. The coffee-based bioplastic imparts mechanical strength and flexibility, while the beetroot extract provides functional responsiveness as a freshness indicator. Overall, the project demonstrates a cost-effective and environmentally friendly alternative to synthetic packaging materials, contributing to reduced pollution and enhanced food quality monitoring.

KEY WORDS : Bioplastics, Coffee waste valorization, Beetroot extract, pH indicator packaging, Smart food packaging

ELECTRONIC STRUCTURE, CHARGE TRANSFER, AND REACTIVITY OF A 2-METHYL-5-(PROPAN-2-YLIDENE)CYCLOHEXANE-1,4-DIOL DERIVATIVE: A HOMO–LUMO STUDY

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ABSTRACT

This study investigates the extraction, characterization, and anticancer potential of the compound 2-methyl-5-(propan-2-ylidene)cyclohexane-1,4-diol obtained from the medicinal plant Hybanthus enneaspermus. The plant material was collected, dried at room temperature, and ground into powder. The powder was soaked in 95.5% carbinol for 72 hours with occasional shaking and then processed using Soxhlet extraction to obtain the crude extract. GC–MS analysis was used to identify and confirm the presence of the target compound. Further characterization was carried out using FT-IR and UV–Visible spectroscopy to understand its functional groups and electronic properties. Computational studies using Density Functional Theory (DFT) were performed to analyze molecular structure, stability, and reactivity through HOMO–LUMO energy calculations. In addition, molecular docking studies were conducted to evaluate the interaction of the compound with cancer-related proteins. The results showed good binding affinity, suggesting potential anticancer activity. Overall, the findings indicate that this compound has promising chemical stability and biological properties, making it a potential candidate for future cancer research and drug development.

KEY WORDS : Hybanthus enneaspermus, GC–MS analysis, Density Functional Theory (DFT), Molecular docking

SMART POLLUTION CONTROL SYSTEM

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ABSTRACT

Air around us may look normal, but small changes can still happen without us noticing. In this setup, those changes are quietly observed in the background. Whenever something in the air starts to change, the system senses it and produces a changing value. Instead of focusing on exact numbers, it simply checks whether things are within safe limits or not. When the condition becomes worse, the setup starts to react. Air is moved around to make the surroundings better, a warning sound is given, and lights change to show the situation. At the same time, a small movement is created to visually indicate that something has changed. If everything stays normal, the setup remains calm and does nothing extra. Along with this, the current condition is also shared to a mobile phone, where it shows the level, present state, and a simple message about its effect. Once turned on, the system keeps working by itself, continuously watching and responding whenever needed.

KEY WORDS : Air Pollution; AQI; MQ-135 Sensor; Arduino; IoT

PRODUCTION OF SUSTAINABLE MYCELIUM BASED LEATHER USING MUSHROOM

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ABSTRACT

Mycelium leather is a sustainable, eco-friendly, biodegradable leather made from oyster mushrooms. This Mycelium leather production directly support the goal of Sustainable Development SDG 12, responsible consumption and production. The mycelium spreads through the substrate and forms a dense mat like structure, which would further be formed as leather. In our study, low-cost waste materials were used as a substrate for the growth of mushroom. Both the solid and liquid substrate media were used to determine the optimal leather formation. A cream white to brown coloured, uniformly thick, durable leather could be formed with some smooth texture. It can be used as a sustainable alternative for conventional leather, which could be used in the production of keychains, wallets, jackets, shoes etc.

KEY WORDS : Mushroom; Mycelium leather; Biodegradable; Eco-Friendly; Sustainable

HERBAL BANDAGE WITH SMART PH RESPONSIVE FOR WOUND MONITORING AND HEALING

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ABSTRACT

Wound infections pose serious healthcare challenges, often delaying healing and causing complications in vulnerable patients. Conventional dressings act mainly as barriers but cannot detect infections early. This study introduces a smart herbal wound dressing that promotes healing while enabling infection detection through visible color changes. Three medicinal plants—*Curcuma longa*, *Azadirachta indica*, and *Aloe barbadensis Miller*—were chosen for their antibacterial, anti-inflammatory, and wound-healing properties. Their bioactive compounds (curcumin, azadirachtin, and aloin) were evaluated via molecular docking against COX-2 (5IKR), MMP9 (1L6J), and TNF-α (2AZ5), showing strong binding affinities and therapeutic potential. To detect infection, red cabbage extract was added as a natural pH-responsive indicator that changes color with bacterial growth. A hydrogel was formulated using aloe vera gel with turmeric and neem extracts, offering antimicrobial action and tissue regeneration. The final product is a multi-layer smart bandage comprising sterile gauze, an herbal hydrogel layer, and a pH-sensitive indicator layer. This innovative dressing combines healing and early infection detection, ensuring biocompatibility, eco-friendliness, and cost-effectiveness, making it ideal for rural healthcare and home-based wound monitoring.

KEY WORDS : Curcuma longa, Azadirachta indica, Aloe barbadensis miller, Smart bandage, Wound healing;

CURCUMIN INCORPORATED BLUEBERRY FRUIT BASED GUMMIES

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ABSTRACT

Gummies have long been popular for their chewy texture and bright colours, enjoyed by all age groups. Once considered empty-calorie treats, they are now evolving to meet consumer demand for healthier options. Traditionally made with gelatine and fruit flavours, modern gummies emphasize plant-based ingredients, natural flavours, and functional components. Novel fruit-based formulations offer improved nutrition and appeal to health-conscious consumers. This study explores the transformation of gummy candies into functional foods by incorporating nutraceuticals. Specifically, curcumin from turmeric was integrated into gummies featuring blueberry, beetroot, pomegranate, and strawberry. Soxhlet extraction was used to isolate curcumin, the key bioactive compound. The nutritional profile was further enhanced with palm sugar, a minimally processed sweetener rich in minerals and antioxidants. Results show that curcumin-infused fruit gummies possess favourable physicochemical and nutritional properties. This shift from conventional sweets to functional nutraceuticals highlights a broader trend toward healthier indulgences. Curcumin-based fruit gummies exemplify how confections can delight consumers while supporting health and well-being through innovative formulations.

KEY WORDS : Gummy candies, Turmeric, Curcumin, Blueberry, beetroot, Strawberry, Pomegranate, Fruit based Gummies.

HYDROPHOBIC WAX COATED BIODEGRADABLE PAPER POUCHES FOR SUSTAINABLE SEEDLING CULTIVATION

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ABSTRACT

The widespread use of plastic plant containers has created serious environmental challenges, as large quantities of non-degradable pots continue to accumulate in landfills each year. To overcome this issue, the present work proposes the design and development of a hydrophobic wax-coated biodegradable plant pouch as a sustainable substitute for conventional plastic pots. The pouch is prepared using recycled paper pulp combined with natural fibers such as coconut husk and eco-friendly binding agents like starch, thereby minimizing environmental impact. The fabrication process includes pulp formation, shaping through molding, drying under natural conditions, and coating with a natural wax layer to improve water resistance and structural strength. In contrast to plastic containers, this biodegradable pouch can be directly placed into the soil, where it gradually decomposes and contributes to soil enrichment. The developed prototype was evaluated using a money plant (*Pothos*), showing effective moisture retention and healthy growth characteristics. The system is economically viable as it utilizes low-cost raw materials and energy-efficient processes such as sun drying. Furthermore, the innovation supports key Sustainable Development Goals, including responsible consumption (SDG 12), climate action (SDG 13), and terrestrial ecosystem protection (SDG 15). Drawing inspiration from traditional Indian practices that promote the use of natural and zero-waste materials, this approach provides a practical and scalable solution for sustainable gardening. Overall, the biodegradable plant pouch offers an environmentally friendly alternative that helps reduce plastic waste while encouraging eco-conscious horticultural practices.

KEY WORDS : Biodegradable plant pouch, Sustainable gardening, Hydrophobic coating, Paper pulp technology and Eco-friendly materials.

RAPID BIOGAS: ACCELERATING BIOGAS PRODUCTION USING MICROBES

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ABSTRACT

The increasing dependence on fossil fuels and the recent LPG shortages in India highlight the urgent need for sustainable and locally available energy sources. Conventional biogas production methods are often slow and inefficient, typically requiring 30–40 days for effective methane generation, which limits their large-scale adoption. This project proposes a rapid biogas production system that utilizes optimised microbial consortia to accelerate the anaerobic digestion process and enhance methane yield. The study focuses on isolating and characterising high-efficiency methanogenic microorganisms from natural anaerobic environments and developing a synergistic microbial community capable of faster organic matter degradation. In addition, an optimised bioreactor system is designed to maintain ideal operational parameters such as temperature, pH, and substrate composition, ensuring efficient microbial activity. The proposed system aims to reduce the biogas production time to approximately 7–10 days while maintaining methane purity of around 40–50%, making it suitable for household and small-scale industrial applications. A pilot-scale reactor of 100-litre capacity will be tested under controlled conditions to evaluate gas yield, production rate, and operational stability. The expected outcomes include the development of an enhanced microbial consortium, an optimised rapid biogas reactor prototype, and a feasibility assessment for large-scale implementation. By converting organic waste into renewable energy more efficiently, this technology has the potential to improve energy security, reduce environmental pollution, and support a sustainable circular economy.

KEY WORDS : microbial consortium, Biogas, methanogenic microorganism, bioreactor

BIOAYUR COSMA

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ABSTRACT

Trending awareness on the harmful adverse effects of synthetic chemicals in cosmetics has drastically increased the demand as well as growing interest for natural, safe, and sustainable natural Ayurvedic alternatives. This project, BioAyur Cosma, aims to develop herbal cosmetic formulations by integrating traditional Ayurvedic knowledge with modern biochemistry concepts. GlowVeda Serum, Derma Pure powder and Ayura Dust Wax Powder are formulations of natural and skin-beneficial ingredients such as aloe vera gel, rose water, glycerine, vitamin E oil, vetiver powder, arrowroot powder, essential oil microcapsules, ashwagandha, gram flour (besan), turmeric powder, sandalwood powder, rice flour, and Fuller's earth, excellent for their cleansing, anti-inflammatory, oil-absorbing, and skin-brightening properties. These products are designed to improve skin health by providing hydration, reducing excess oil, controlling sweat, and promoting natural skin glow eco-friendly, cost-effective, and suitable for all skin types. This project highlights the effectiveness of combining biochemistry with Ayurveda to develop safe, sustainable, and innovative cosmetic solutions. It emphasizes the potential of herbal formulations as a reliable alternative to chemical-based cosmetics in the modern beauty industry.

KEY WORDS : Ayurveda; Cosmetics; Natural; Ingredients; Serum; Powder; Wax.

VERMITRANSFORMATION OF *PONTEDERIA CRASSIPES* AMENDED WITH BIOCHAR FOR ENRICHED VERMICOMPOST PRODUCTION

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ABSTRACT

Water weeds present a serious threat to the environment and the agricultural sector and require sustainable water management through weed control. In this study, biochar and cellulose-degrading fungi were added to the leaves of the aquatic hyacinth *Pontederia crassipes*, which were then vermicomposted to produce vermicompost rich in nutrients. *P crassipes* collected from ponds in Kanchipuram, which is a contributor to water pollution because of its rich organic matter content. Biomass was subjected to pre-composting with cellulose-degrading fungi for 28 days to partially degrade the substrate. Vermicomposting was then carried out with different proportions of pre-composted plant material and cow manure, amended with different levels of biochar (2, 4 and 6% w-w), with or without inoculation with fungal spores. The vermicomposting equipment was maintained for 50 days under controlled humid conditions. The structural and biochemical alterations were investigated using SEM and FTIR. Earthworm growth was used to estimate decomposition efficiency. The goal of this project is to find an environmentally friendly way to convert invasive aquatic biomass into useful organic manure for crop productivity sustainable agriculture, and the circular bioeconomy.

KEY WORDS : *Pontederia crassipes*, Biochar, *Eudrilus eugeniae,* Vermicompost, Physicochemical

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ABSTRACT

A portable colony identifier is a novel and innovative tool designed to execute rapid, accurate, immediate on – site detection and enumeration of microbial colonies obtained in the laboratory. Conventional colony counter and counting methods are time consuming, expensive, prone to happen human error and labor intensive, particularly when handling larger sample size. This study elaborates the design and development of a compact, user friendly, time efficient device integrated with image processing and machine learning algorithms for automated colony identification and quantification. The device and system employs high resolution imaging and advanced pattern recognition techniques which detects colony's color, ignores overlapped colonies and contaminations. The portability which make the process easier and suitable for applications in clinical diagnostics, food safety analysis, environmental monitoring and microbiological research. The proposed device enhances efficiency for lager sample size with high performance and minimize subjective bias, and speed up the real time data acquisition, making it a valuable and effective tool for microbiology workflows.

KEY WORDS : Portable Colony Identifier, Colony Counting, Image Processing, Mobile application

NEUSYNAP DB – AI POWERED PLATFORM FOR REVOLUTIONIZING BRAIN HEALTH DIAGNOSIS

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ABSTRACT

Neurological conditions represent a growing global health burden, driven by complex relations between heritable, environmental, and life factors. Advancements in genomics and bioinformatics have enabled the identification of complaint- associated heritable variants; still, the lack of integrated, user-friendly platforms limits their effective operation in disquisition and clinical decision- timber. To address this gap, we developed NeuSynapDb, a comprehensive web-predicated genomic analysis tool designed for neurological trouble assessment. NeuSynapDb integrates curated genomic datasets, including complaint- associated genes, single nucleotide polymorphisms (SNPs), and functional reflections linked to major neurological conditions analogous as Alzheimer's complaint, Parkinson's complaint, epilepsy, and multiple sclerosis. Stoners can input genomic data to gain detailed perceptivity into implicit complaint vulnerability, functional impacts of variants, and associated natural pathways. The database features an intuitive user interface, enabling indefectible data visualization, relative analysis, and recovery of clinically applicable genomic information also, NeuSynapDb supports cross- representing with established public databases, enhancing data responsibility and interpretability. By integrating computational intelligence with genomic data, the platform aims to grease early opinion, substantiated medicine, and targeted remedial strategies. NeuSynapDb serves as a precious resource for researchers, clinicians, and bioinformaticians, bridging the gap between genomic data and practical neurological complaint trouble assessment. Its scalable architecture ensures future expansion with arising datasets and logical tools.

KEY WORDS : Neurological diseases, ClinVar, k- mer matching, FASTA.

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