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HIGH-TECH AND GREEN TECHNOLOGIES*

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RESEARCH EXTENSION DEVELOPMENT INNOVATION



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PERCEPTION OF COASTAL COMMUNITIES ON SERVICES AND MANAGEMENT OF MANGROVE FORESTS IN STA. FE, ROMBLON: BASIS FOR Eco-DRR PRACTICE AND POLICY FORMULATION

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Mangroves provide coastal communities sustenance and resilience against climate change; yet they are threatened by anthropogenic activities. Santa Fe lacks mangrove-specific policies to address the unique threats and community reliance on mangroves. Moreover, there has been limited exploration of effective management strategies of mangroves in the perspectives of direct beneficiaries (i.e., coastal communities). This study assessed the perceptions of coastal communities and specifically aimed to determine the (a) socio-demography, level of awareness on ecosystem services, and frequency of resource utilization of respondents, (b) community and local government management of mangroves, and (c) implications for ecosystem-based disaster risk reduction and policy formulation in Sta. Fe, Romblon. Structured survey and interview were administered to respondents within the mangrove buffer zone in Barangays Canyayo, Pandan, Poblacion, and Tabugon, selected through purposive sampling. Descriptive analysis revealed high awareness of mangroves' protective role but lower recognition of their broader ecological functions. While utilization of mangroves for fuel and construction was minimal, community participation in conservation and policy-making was low. Natural disasters emerged as the top perceived threat across all sites. This suggests the need to contextualize management strategies to include community perception and Eco-DRR practices, facilitating more comprehensive and sustainable management plans to mitigate natural hazards.

Keywords: coastal communities, ecosystem services, Eco-DRR, management plan, mangrove ecosystem, Romblon

**TREE DIVERSITY ON LANDSLIDE-PRONE AREA AT ODIONGAN, ROMBLON, PHILIPPINES:
BASIS FOR ECOSYSTEM-BASED DISASTER RISK REDUCTION (ECO-DRR) MEASURES**

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Landslides, a significant geological hazard driven by rapid rock/soil mass movement due to slope instability, are exacerbated by climate change induced heavy rainfall and subsequent excessive soil water content. Tree planting is widely recognized as a crucial mitigation strategy for shallow landslides. This study aims to determine the distribution of tree species found in the landslide-prone area at Sitio Aurora, Pato-o, Odiongan, Romblon. Specifically, it focuses on selecting a slope area using Google Earth for GIS mapping, collecting different plant parts for accurate identification, determining tree diversity in various sampling areas, and analyzing the implications of tree diversity assessment in developing strategies for Ecosystem-based Disaster Risk Reduction (Eco-DRR). To achieve these objectives, a GIS-based approach to map landslide susceptibility and field surveys for the point-centered quarter method was used. Collected plant samples were examined for identification through morphological assessment and taxonomic classification analyzed using the Shannon-Weiner Index with PAST software. The survey revealed 37 distinct tree species, all classified within the Magnoliopsida class, confirming the dominance of dicotyledonous trees. The most dominant species identified were Cheese Tree (*Glochidion ferdinandi*) from the Phyllanthaceae family, alongside Hauli (*Ficus septica*), Molave (*Vitex parviflora*), and Tibig (*Ficus nota*). The Phyllanthaceae family exhibited the highest abundance, followed by Moraceae and Lamiaceae. This diversity assessment provides insights into the tree species composition within vulnerable landslide-prone areas, highlighting species that thrive in exposed conditions. Further research is recommended to explore the interactions between these identified tree species, soil properties, geological features, and microclimate, thereby strengthening the evidence-based for Eco-DRR strategies.

Keywords: landslide, slope instability, tree planting, tree diversity, species composition, Eco-DRR

SMART VERTICAL HYDROPONICS FOR URBAN FOOD SECURITY: AUTOMATION AND PERFORMANCE IN LETTUCE CULTIVATION

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Vertical hydroponics is a modern agricultural technique that addresses the challenges of limited agricultural land and increasing food demand, aligning with SDG 2, which aims to end hunger and promote sustainable agriculture. The research involves designing and evaluating an automated vertical hydroponic system for lettuce (*Lactuca sativa*) production. This system optimizes space efficiency through vertical farming. It uses an innovative automated pumping system integrated with Arduino-based sensors to monitor environmental factors like pH, moisture, temperature, water volume, and flow rate. Over 43 days, the systems performance was compared to a manual hydroponic system (MHS), with key indicators—leaf number, width, and length—measured every three days. The automated system significantly improved leaf width and length, with mean values of 6.23 cm and 9.96 cm, compared to 4.64 cm and 7.75 cm in the manual system. The t-test confirmed the significance of these improvements ($p < 0.05$), though the number of leaves was similar between systems. This automated vertical hydroponic system enhances lettuce growth, particularly in leaf dimensions, and offers a sustainable solution for urban farming in space-constrained environments. Future research should explore its application to other crops and refine automation for broader agricultural use.

Keywords: automation, Arduino-based sensors, hydroponics system, lettuce, *Lactuca sativa*, smart farming, urban farming

SUSTAINABLE AMELIORATION OF ACIDIC SOILS FOR CLIMATE-RESILIENT CORN PRODUCTION: COMPARATIVE EFFECTS OF GROUND CALCIUM CARBONATE AND MARBLE DUST

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Acidic soils hinder crop production by limiting nutrient availability and plant growth and marble dust, a byproduct of the marble processing industry, can be a sustainable soil amendment. This study evaluated Ground Calcium Carbonate (GCC) and Marble Dust (MD) as soil amendments to improve soil pH and enhance corn growth. GCC, refined from MD using a ball mill roller, and MD, directly sourced from marble processing waste, were applied at five levels: 0g (control), 125g, 250g, 375g, and 500g per pot. Conducted in a screenhouse using a split-plot completely randomized design, the study assessed stalk diameter, plant height, corn weight, and soil pH. ANOVA and LSD tests revealed significant improvements across treatments, with 250g and 375g applications achieving optimal results. Soil pH increased from 5.3 to over 8.0, and corn yield improved notably. However, higher application rates (500g) offered no additional benefits, indicating diminishing returns. GCC consistently outperformed MD in enhancing growth. Both materials are effective for ameliorating acidic soils, with optimal application rates between 250g and 375g per pot. Further field trials are recommended to validate these results on a larger scale.

Keywords: acidic soils, soil ameliorants, marble dust, ground calcium carbonate, corn growth

ADAPTATION STRATEGIES TO CLIMATE VARIABILITY USED BY FARMING HOUSEHOLD IN THE PROVINCE OF ROMBLON (ADSTRAC)

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Climate variability significantly impacts agriculture and livelihood in resource-rich areas such as Romblon, Philippines. Resilience in communities is further fueled by understanding adaptation strategies and socioeconomic factors interrupting them, not to mention gender roles. This study examined a descriptive-correlational research design as it sought to find out about adaptation strategies used by farm households and whether any correlation exists between the socioeconomic characteristics of these households, gender roles, and the chosen adaptation measures. The research was conducted in selected Barangays that are dependent on agriculture and vulnerable to climate change in the provinces of Romblon and specifically in San Andres, San Agustin, and Magdiwang. Based on proportional allocation, 313 registered farming households were sampled randomly through the stratified sampling technique. The data were analyzed using frequency, percentage, mean, Chi-square, and Pearson correlation tests. It was found that most households depend on crop farming, and farmers in the area are highly conversant with the different types of climate change, its causes, and effects. Some of the adaptation strategies used were crop diversification, irrigation, mulching, and crop insurance, but a lack of government support and high costs of inputs plagued these strategies. For the gender roles, men took on marketing- and mechanization-related operations, while women were mainly responsible for post-harvest activities. Correlation was found between womens adaptation and access to credit, irrigation, agricultural inputs, government support payments, and training. More experienced and older farmers were found to be better at adaptation. However, larger family size was not observed to foster adaptation. Hence, interventions to improve adaptive capacities should provide enough support to target the barriers of finance and access, taking gender-inclusive approaches. Policy intervention has to deal with financial backing, technology dissemination, and gender-sensitive training. Future research should explore community-based strategies to manage climate variability sustainably.

Keywords: adaptation strategies, climate variability, farming households

Bagyong Kristine (TS Trami) in Bicol, Philippines: Flood Risk Forecasting, Disaster Risk Preparedness Predictions and Lived Experiences through Machine Learning (ML), Econometrics, and Hermeneutic Analysis

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This work was conducted just two days after the onslaught of Bagyong Kristine (TS Trami) in October 2024 that flooded the Bicol Region, Philippines. We combined quantitative approaches (machine learning and econometrics) and qualitative techniques (hermeneutic phenomenological, narrative, thematic, and anthropology-at-home) to forecast future flood risks, predict disaster risk preparedness (DRP), and explore the lived experiences of households in Camarines Sur. We utilized both secondary and primary data to offer more robust analysis to support local government, uplift flooded localities, and advance scientific communities. Coastal communities of San Jose are particularly at risk, with varying flood susceptibility levels. Support Vector Machine (SVM) was used to forecast flood risks indicating moderate-to-high risks. The study explores multidimensional factors influencing DRP, floods, and calamity experiences utilizing significant indicators as a priori predictors in ML runs. Improved housing, income, and digital access are associated with higher disaster risk preparedness (DRP). Conversely, living in non-concrete housing, lacking access to basic services, experiencing poverty, and engaging in informal livelihoods elevate risk levels. Experiences with floods are linked to place of residence, water and sanitation, garbage collection, and education. Calamity experiences are associated with housing, access to amenities, informal livelihoods, and preparedness. ML predictions suggest that SVM and Random forests yield the best performance in predicting DRP. Hermeneutic analyses offer valuable and fresh insights for policymaking. It has been revealed that the region is very accustomed to typhoons but not to severe flooding. Geographical vulnerabilities near water bodies underscore the constant threat of floods, emphasizing the mix of resilience, faith, fear, and community solidarity among respondents. By blending scientific methods with indigenous wisdom, a comprehensive analysis was conducted to develop culturally integrated policies. The unexpected challenges faced reveal unpreparedness for extreme rainfall events. Community cooperation, government accountability in disaster management, and environmental conservation efforts are emphasized, advocating for proactive measures, accurate forecasting, and sustainable practices to reduce flooding disasters.

Keywords: Bagyong Kristine (TS Trami), flood risk forecasts, disaster risk preparedness (DRP), machine learning (ML), hermeneutic analysis, lived experiences, Bicol region

COMMUNITY EXTENSION SERVICES CROWDSOURCING PLATFORM

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Open innovation in the form of crowdsourcing platforms is becoming popular among users and industries. This study aims to determine the compatibility of the crowdsourcing platform with the Community Extension Services Office in terms of its functionality, performance efficiency, and improved operational services at Guimaras State University. The system aims to help the Community Extension Services Office move its paper-based directory to a more effective digital platform. The system follows Agile Process Model methods and utilizes open-source technologies. The system has demonstrated successful performance in carrying out the necessary functions. Its implementation is anticipated to enhance the overall performance of the Community Extension Services Office and the benefit of the community respondents in the province of Guimaras. As a result, the Community Extension Services staff now confidently attests to success of the Community Programs in a huge wide of sectors in the province of Guimaras. The CES department has achieved its goals and effectively resolved the concerns that were previously linked to the disarray of data.

Keywords: Crowdsourcing platforms, Community Extension Services Office, Performance efficiency

TRIPSY: AN ANDROID-BASED APPLICATION FOR TRICYCLE BOOKING AND DISPATCH SYSTEM IN THE MUNICIPALITY OF ROMBLON

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This study addresses the escalating demand for efficient transportation services in the Municipality of Romblon through the introduction of TRIPSY—an Android-based application designed to optimize tricycle booking and dispatch. The primary objectives were to develop a user-friendly application that caters to passengers, tricycle drivers, and administrative oversight. Adherence to ISO/IEC 25010:2011 standards for software quality was a paramount consideration. The Waterfall SDLC was used for it is systematic and in structured manner. Also, convenience sampling was utilized as sampling procedure due to time constraints and availability of respondents. The study validated results through a meticulous evaluation process. For one hundred (100) passengers, the application demonstrated a remarkable overall acceptability with a weighted mean of 4.39, indicating a Strongly Agree response. Key attributes like functional suitability, performance efficiency, and usability were scrutinized and found to be exemplary. The lowest score, observed in system reliability, calls for targeted improvement. Similarly, ten (10) tricycle drivers reported an outstanding acceptability score of 4.67, with compatibility identified as a potential area for enhancement. Administrative oversight, crucial for system functionality, confirmed TRIPSY's efficiency aligning with ISO/IEC 25010:2011 standards. In conclusion, TRIPSY stands as a robust solution for tricycle booking and dispatch in Romblon. Systems acceptability among passengers and drivers, coupled with alignment with ISO/IEC 25010:2011 standards, underscores its efficacy. Recommendations for improvement in system reliability and compatibility pave the way for future enhancements.

Keywords: android-based, dispatch system, system evaluation, transportation, tricycle

EVALUATING FINANCIAL SUSTAINABILITY AND INTERNAL CONTROLS IN UNIVERSITY CATERING SERVICES IN THE CONTEXT OF DIGITAL ACCOUNTING SYSTEMS: A CASE STUDY IN ROMBLON, PHILIPPINES

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This study assesses the financial sustainability and internal control practices of a university-managed catering service in the Philippines. Romblon State University's Catering Services, a major income-generating unit, was examined due to its significant financial contributions and institutional relevance. Guided by the COSO Internal Control Framework and the standard transaction processing cycles in accounting information systems, the research employed a descriptive qualitative approach. A process walkthrough was conducted involving interviews, document analysis, and task demonstrations with the process owner. The study focused on five high-risk processes: purchases, cost accumulation, cost allocation, sales order, and billing. Findings revealed informal and undocumented practices across all processes, with heavy reliance on verbal communication and manual tracking. Key control gaps included the absence of structured cost tracking, undocumented order and billing procedures, and reliance on a single personnel for all critical tasks. These issues limit financial transparency, increase operational risks, and jeopardize service continuity. The study highlights the need to formalize procedures, decentralize responsibilities, and integrate cost monitoring tools to enhance internal controls and financial decision-making. By mapping actual practices against established control and transaction models, the research provides practical recommendations for improving governance and sustainability in university-managed income-generating units. The findings offer valuable insights for institutional administrators, policy developers, and educators aiming to strengthen operational accountability and financial integrity in higher education settings.

Keywords: COSO framework, digital accounting systems, financial sustainability, information systems and control, internal control, Philippines

SMART WASTE MANAGEMENT SYSTEM USING COMPUTER VISION

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Waste Management in a university setting is a complex task that involves handling diverse waste streams in classrooms, laboratories, and canteen areas, proper segregation of wastes, and disposal while ensuring compliance with environmental regulations and sustainability goals. In response to the inefficiencies in handling adequate waste segregation at Guimaras State University (GSU), this study presents the development of a Smart Waste Management System using Computer Vision. The system aims to develop a model to classify waste according to waste type, handle automatic segregation, and provide stakeholders with real-time updates. Adopting the Cross Industry Standard Process for Data Mining (CRISP-DM) is part of the approach, including business understanding, data understanding, data preparation, modeling, evaluation, and deployment phases. The complications of waste management processes have been identified through interviews with utility personnel at Guimaras State University – Mosqueda Campus. A prototype bin was developed using hardware electronic technologies and third-party platforms, such as Edge Impulse and Blynk, to handle waste identification for proper disposal and segregation. The study's primary results include a substantial decrease in the complexity of the waste management process, as well as promoting adequate waste segregation. By utilizing hardware technologies and training a machine learning model, the system was able to manage waste identification, automate waste disposal operations, and offer real-time updates to the stakeholders. Overall, the Smart Waste Management System using Computer Vision offers efficiency and sustainability in the waste management process at GSU.

Keywords: waste management, Arduino, Esp32, computer vision, sensor

EXAMBOT: AI-POWERED EXAM GENERATOR AND MANAGEMENT SYSTEM FOR BATSTATEU ARASOF-NASUGBU

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In today's technology-driven world, the integration of artificial intelligence (AI) in education has become transformative. This study presents EXAMBOT: AI-Powered Exam Generator and Management System for Higher Education Institutions, a solution designed to overcome traditional exam creation challenges such as inconsistency, inefficiency, and lack of alignment with learning standards. EXAMBOT leverages AI technologies, including Natural Language Processing (NLP) and OpenAI's GPT models, to automatically generate high-quality exams aligned with Blooms Taxonomy and tailored to a Table of Specifications (TOS). The system aims to automate exam generation, assess cognitive skills effectively, and improve user satisfaction. Developed using an agile methodology, EXAMBOT underwent continuous refinement based on iterative development and user feedback. Evaluation with 30 faculty and 135 students highlighted its strengths in aligning questions with learning outcomes, customizing difficulty, and enhancing productivity. Results showed that EXAMBOT not only streamlines the exam process but also produces accurate, course-relevant content. Faculty praised its adaptability, ease of use, and effectiveness in meeting pedagogical needs. Its alignment with standard frameworks and time-saving features makes it a valuable academic tool for improving assessment practices in higher education.

Keywords: AI in Education, exam generator, Blooms taxonomy, NLP, table of specifications

ALUMNI INFORMATION MANAGEMENT SYSTEM

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This study developed a web-based Alumni Information Management System for Guimaras State University to centralize alumni data, enhance networking opportunities, and support career development. Designed to be intuitive and user-friendly, the AIMS allows alumni to easily update their personal profiles, specify job preferences, and upload resumes. The systems design is informed by frameworks such as the Information Systems Success Model (DeLone & McLean, 2003) and UTAUT (Xue et al., 2024), ensuring high usability and acceptance. The Alumni Information Management System (AIMS) effectively enhances communication between the institution and its alumni. Centralizing alumni information has demonstrably improved engagement, streamlined networking, and empowered alumni to identify relevant career opportunities through features like job alerts, integrated application tools, and an intuitive interface. These features are effective in strengthening the bond between alumni and the institution, ultimately fostering enhanced career support and expanded networking possibilities. This research identifies and addresses a previously unrecognized need specific to Guimaras State University alumni. While existing studies contribute valuable insights to alumni engagement and career support, a research gap exists regarding the integration of these services within a tailored platform for Guimaras State University alumni. This study's system offers a practical and scalable solution for universities facing similar challenges.

Keywords: alumni, engagement, career support; networking, information

UNIVERSITY DIGITAL SECURITY SYSTEM USING QUICK RESPONSE CODE

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With campus security and smooth operations being crucial for educational institutions, Guimaras State University (GSU) recognized the need for a more reliable and efficient system to tackle these challenges. Traditional methods of monitoring attendance and controlling campus access were no longer enough to ensure the safety of students, GSU personnel, and guest. To address these issues, this study developed and evaluated a digital security system using Quick Response (QR) codes to enhance campus security, streamline attendance monitoring, improve access control, and support emergency response. To ensure the systems development followed a structured approach, the Software Development Life Cycle (SDLC) methodology was used. The system generates unique Quick Response codes for students, GSU personnel, and guests, storing encrypted personal information such as student IDs and reasons for visits using SHA-256 encryption to protect privacy and prevent unauthorized access. By scanning these Quick Response codes at designated entry points, the system enables real-time monitoring, allowing university staff to monitor who is on campus, why they are there, and quickly respond to emergencies or security threats. The results show that the system effectively improved campus security, simplified the entry process, and enhanced operational efficiency with automated check-ins and a real-time dashboard. This study demonstrates that Quick Response code technology can be an effective solution for improving security and operational efficiency in universities.

Keywords: QR codes, emergency response, SHA-256 encryption, real-time monitoring, data privacy, operational efficiency, digital security system

DEVELOPMENT OF AN IOT-DRIVEN ELECTRICAL MANAGEMENT SYSTEM FOR SMART CAMPUS INTEGRATION

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Universities, which are one of the large consumers of electricity due to their infrastructure and high occupancy rates, are particularly impacted by inefficient electrical management practices. The implementation of IoT infrastructure can lead to significant cost savings and a reduced ecological footprint by automating many building management processes. This study aimed to develop an IoT prototype device that enhanced the electrical monitoring and control systems of classrooms and other office spaces using IoT technologies. Since the main objective of this study was to design a functional prototype for electrical management and monitoring, prototyping development lifecycle was adopted. With this approach, it ensures that the both the hardware and software met the needed functional requirement for real-time data collection and automation process. The IoT prototype has utilized a combination of IoT devices including an Arduino microcontroller which serves as the prototype processing unit. A current relay sensor was used for switching devices on and off, and a CT (current transformer) sensor for monitoring power consumption in real-time. To enhance safety and ensure compatibility with high-power electrical appliances, various circuit breakers were also integrated into the system. Additionally, a customized system was developed to allow the users to remotely monitor and control the prototype. To further enhance the functionality of the system, cron jobs were embedded to enable automation of operations based on the predefined conditions. These components and features created a reliable, responsive, and intelligent electrical management solution tailored for smart campus environments.

Keywords: Internet of Things (IoT), automation, smart campus, sensors, cron jobs

SAFEGUARDING CYBERSPACE: AN ANALYSIS ON VICTIMS UNREPORTED AND THEIR COPING STRATEGIES IN THE MUNICIPALITY OF SAN AGUSTIN, ROMBLON

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The rapid rise of social media has transformed communication but also heightened the vulnerability of adolescents to cyberbullying, a pervasive issue that often remains unreported. This study, conducted in the Municipality of San Agustin, Romblon, explores unreported cyberbullying incidents, focusing on victims' experiences, the psychological effects, and their coping strategies. Despite official records from local authorities indicating no reported cases, a pre-survey revealed that 74% (37 out of 50) of adolescents had experienced cyberbullying but chose not to report it, highlighting a significant gap in awareness and intervention. The research aims to identify the key factors influencing the reluctance to report, examine the emotional and psychological impacts-such as depression, anxiety, and trust issues-and assess the coping mechanisms employed by victims. Utilizing a qualitative approach, the study employed purposive sampling to select 10 adolescent victims from various schools and community centers for in-depth interviews, ensuring rich, firsthand accounts of their experiences. Findings reveal that unreported cyberbullying leads to severe emotional distress, diminished self-esteem, and, in some cases, suicidal ideation. Major barriers to reporting include fear of retaliation, embarrassment, social stigma, and a lack of confidence in institutional support systems. Victims primarily cope through social withdrawal, seeking support from trusted individuals, and, less commonly, confronting perpetrators. The study underscores the urgent need for comprehensive intervention programs tailored to local needs, including awareness campaigns, improved reporting mechanisms, and accessible psychological support, to foster a safer digital environment for adolescents in San Agustin, Romblon.

Keywords: cyberbullying, authorities, victim, social media, adolescents

VISUALIZATION OF HEALTH INFORMATION SOURCE FROM RURAL HEALTH UNITS USING QGIS

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The study utilized the System Development Life Cycle methodology, which offers a structured approach for creating, maintaining, and potentially replacing software systems. To gain insights into patient health procedures, interviews were conducted with personnel at the Barangay Health Station Office, and health data forms were retrieved from the Rural Health Office. A web-based platform available to the user was developed utilizing PHP, MySQL, and CSS. The system allows policymakers, health administrators, and community leaders to interact with interactive visualizations for spatial trend analysis of health conditions and related interventions. The outcome demonstrates the capability of QGIS in the development of health information systems and data-driven solutions toward improved health outcomes for rural communities, whose availability and accessibility of health care services were previously low. The study highlights the need for applying advanced geographical visualization technologies for ensuring equitable provision of health care and improving the public health initiatives in the Province of Guimaras. There is a scope for applying sophisticated technologies in the healthcare information system that allows for stakeholders to be able to provide informed decisions bearing direct impacts upon improving the public health and, as a result, shaping an effective dynamic healthcare environment. The study may illustrate the future potential of applying information visualization to improving the health care management process and decision-making and, as such, improving the public health programs.

Keywords: visualization, health information system, rural health, QGIS, data-driven strategies

KAMAI: A MOBILE FILIPINO SIGN LANGUAGE RECOGNITION APPLICATION USING DEEP LEARNING

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This research presents the design and development of KamAi, a mobile application that utilizes deep learning to recognize basic Filipino Sign Language (FSL) gestures. Developed for Android devices, KamAi addresses communication barriers faced by the Deaf community by enabling real-time recognition of FSL letters, numbers, and commonly used words. The application combines Convolutional Neural Networks (CNNs) with Google's MediaPipe for accurate gesture detection, offering an accessible and userfriendly tool for both Deaf and hearing individuals engaged in FSL learning. Guided by a developmental research design and the Design Thinking framework, the study involved collaboration with FSL educators, Deaf and mute users, hearing individuals, and IT experts to ensure the app's functionality, usability, and cultural relevance. A comprehensive dataset of over 29,000 images, including both captured and publicly available sources, was used to train the deep learning models. Evaluation of the models showed strong performance: the letter recognition model achieved 88.38% accuracy, 97% precision, 87% recall, and a 90% F1-score. The number recognition model attained 91.41% accuracy and 89% precision but had a lower recall of 21% and F1-score of 28%, reflecting challenges in distinguishing visually similar signs. The word recognition model demonstrated 83.08% accuracy, 96% precision, 88% recall, and a 91% F1-score, effectively classifying everyday gestures. User Acceptance Testing (UAT), based on ISO 25010 software quality standards, rated all six attributes—Functionality (4.73), Reliability (4.51), Compatibility (4.71), Usability (4.50), Efficiency (4.59), and Portability (4.77)—as “Highly Acceptable.” These results affirm KamAi's practical viability as a mobile assistive learning tool and its potential to enhance inclusive education and digital accessibility within the Philippine context.

Keywords: android application, Filipino sign language, deep learning, gesture recognition, design thinking

PREDICTING SUCCESS RATE IN LICENSURE EXAMINATION OF CRIMINOLOGY USING DATA MINING TECHNIQUES

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Recently, the GSU College of Criminal Justice Education Bachelor of Science in Criminology faced a low passing rate in CLE. Various data show an inconsistent percentage of passers from 2019 to 2024, which affects the university reputation. In line with this concern, the researchers developed a Success Rate Prediction Model that utilized the performance of the Bachelor of Science in Criminology of Guimaras State University Batch 2023-2024 in predicting the passing rate of the criminology students in the Criminology Licensure Examination using the Random Forest Classification Algorithm. The results showed that the accuracy was 0.9286, precision was 0.8750, recall was 1.0000, and F1 score was 0.9333, which means the model can accurately and precisely make predictions, specifically the actual passers (true positive) based on the data gathered. In addition to this, the F1 score suggests that the metrics are a reliable basis for prediction. In conclusion, the model can potentially be used as a predictor for the success rate.

Keywords: waste management, Arduino, Esp32, computer vision, sensor

i-SUPPORT: A WEB-BASED MENTAL HEALTH SUPPORT SYSTEM FOR COLLEGE STUDENTS

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Like many academic institutions, students in colleges today suffer from numerous mental health concerns, ranging from academic burdens, personal factors, social pressures, uncertainty about the future, and financial stress, all of which remain unaddressed. Students often try to cope by talking to friends or family, but this has its pitfalls: issues of confidentiality, lack of understanding, or inadequate emotional support. This study aimed to develop i-Support, a web-based mental health care system that offers stress self-assessment, educational videos, a Q&A module, and a referral booking feature for consulting with school guidance personnel. Using the Agile Software Development Life Cycle and convenience sampling, the system was evaluated by 200 college students. Findings showed that younger students, particularly first-year and male students, are more vulnerable to mental health issues. The system addressed the need for a more accessible and supportive platform. With a high acceptability rating (weighted mean = 4.54) and compliance with ISO/IEC 25010:2011 standards, i-Support was found to be effective, user-friendly, and reliable. It offers a practical digital solution that supports student mental well-being and contributes to SDG 3: Good Health and Well-being.

Keywords: mental health support, decision support, web-based system, self-assessment, referral booking

ENHANCING FACE MASK DETECTION USING RESNET-50 AND MOBILENETV2: A TRANSFER LEARNING APPLICATION

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This research is essential for organizations that enforce strict regulations for airborne diseases. This study addresses the challenge of accurately detecting individuals wearing facemasks, a task complicated by the partial occlusion of facial features during the COVID-19 pandemic. This research aims to enhance facemask detection accuracy using a two-stage transfer learning approach with pre-trained convolutional neural network models, specifically ResNet-50 and MobileNetV2. A dataset comprising 15,005 annotated images, balanced between masked and unmasked individuals, was utilized. Data augmentation techniques, structured annotation, and systematic model fine-tuning were employed to optimize performance. The system achieved notable results, with 99.1% accuracy for detecting facemasks and 98.8% for identifying individuals without facemasks. Overall performance metrics included an accuracy of 98.21%, precision of 98.33%, recall of 98.52%, specificity of 98.01%, and Matthews correlation coefficient of 98.04%. A t-test revealed a significant improvement ($p = 0.0001$, $t = 0.86$), with the two-stage transfer learning method yielding a 5.47% higher accuracy than the conventional approach. These findings demonstrate the effectiveness of advanced transfer learning techniques in improving public health monitoring systems and offer valuable insights for developing automated surveillance solutions.

Keywords: Facemask detection, Machine learning, MobileNetV2, ResNet-50, Transfer learning

MOONLIGHT CREATION: A WEB BASED BOOKING SYSTEM FOR EVENTS SUPPLIERS AND FREELANCERS

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This study introduced Moonlight Creation, a web-based booking system designed to optimize event planning in the Municipality of Romblon. The platform streamlines the process by organizing event suppliers, and packages, enabling clients to easily schedule services. Simultaneously, it equips suppliers with tools to manage bookings and leverage client ratings efficiently. The agile Model was employed in the systems development, ensuring a flexible and adaptive approach to accommodate evolving requirements and improve workflow. The system was rigorously evaluated using the ISO/IEC 25010:2011 standard. It is revealed that 50 clients rated a weighted average score of 4.15, reflecting a “Strongly Agree” response, while 30 event suppliers and freelancers provided a commendable rating of 4.06. These findings align with the Sustainable Development Goals (SDG) 8, 9, and 17 by fostering inclusive economic growth, innovation, and collaboration. This system enhances productivity in the Municipality of Romblons event industry by streamlining the booking process and enabling fair work opportunities for freelancers and suppliers (SDG 8). It promotes technological innovation (SDG 9) by introducing a digital platform modernizing traditional event planning methods. Additionally, the platform strengthens partnerships (SDG 17) by connecting clients, freelancers, and suppliers, fostering a cohesive ecosystem for sustainable economic development. The results affirm Moonlight Creation’s potential to enhance event management for clients and suppliers, positioning it as a valuable tool for modernizing event planning in Romblon.

Keywords: Web-based event booking, Event supplier, SDG8, SDG9, SDG17

OPTIMIZATION OF SEMESTRAL CLASS SCHEDULING USING GENETIC-BASED ALGORITHM

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This study addresses the longstanding challenges in academic class scheduling within the College of Science and Technology at Guimaras State University, where manual processes often result in class conflicts, inefficient use of rooms, and imbalanced faculty workloads. The research proposes an optimized scheduling system utilizing a genetic-based algorithm, a method inspired by the principles of natural selection and evolution. Through the use of Python programming and the DEAP library, the system applies genetic operations such as selection, crossover, and mutation to iteratively generate class timetables that minimize scheduling conflicts while satisfying institutional constraints. The study follows the Cross-Industry Standard Process for Data Mining (CRISP-DM) framework, which includes phases such as data collection, preparation, modelling, and evaluation. Input data were gathered from official class lists, faculty schedules, and room availability provided by the university registrar. Results revealed a significant reduction in scheduling conflicts after selection and mutation phases, as illustrated by fitness graphs and conflict distribution histograms. The outcome demonstrates the effectiveness of genetic algorithms in producing feasible, equitable, and efficient schedules that support both administrative goals and academic requirements. The proposed system has the potential to streamline academic planning, reduce manual scheduling errors, and serve as a scalable model for other institutions seeking data-driven solutions to class scheduling. As such, the study contributes to the advancement of educational operations through intelligent optimization strategies grounded in evolutionary computation.

Keywords: Genetic Algorithm, Class Scheduling, Optimization

VADD: AN IOT-BASED VEHICLE ACCIDENT DETECTION DEVICE WITH WEB SYSTEM INTEGRATION

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This study aimed to develop an Internet of Things (IoT) device capable of monitoring vehicle behavior through acceleration and tilt sensors. The data collected by the device is used to detect abnormal driving behavior or potential accidents. To facilitate real-time communication, a mobile application was developed to connect with the IoT device. This app receives and evaluates the transmitted data and automatically reports any detected incidents to the Municipal Disaster Risk Reduction and Management Office (MDRRMO). In addition to the mobile application, a web-based system was created for the MDRRMO. This system allows officials to receive accident reports and visualize the exact locations of incidents through an integrated map interface. The researchers employed a descriptive-developmental methodology to collect and analyze data, review relevant literature, and assess the current state of related technologies. The development process included the design and implementation of the IoT device, mobile application, and web platform. To evaluate the system, feedback was gathered from respondents using a convenience sampling method. Data collected from the evaluation phase were tabulated, analyzed, and interpreted. Results indicated a high level of acceptability and user satisfaction across all components of the system—the IoT device, mobile app, and web system. These findings suggest that the developed system is a reliable tool for detecting, reporting, and managing vehicular accidents.

Keywords: accident detection, IoT Device, mobile application, web system

PETVAX: A MOBILE APPLICATION FOR ADDRESSING RABIES CASES

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Rabies remains a significant public health concern, primarily due to unregistered pets and insufficient vaccination monitoring. This study introduces PetVax, a mobile application designed to address rabies cases by facilitating pet registration, vaccination monitoring, and communication between pet owners and local authorities. The primary objectives are to streamline pet record management, enhance vaccination compliance, and improve accessibility to vaccination schedules. The study follows the System Development Life Cycle (SDLC) methodology, including requirements gathering, system design, development, testing, and deployment. PetVax was developed with the use of technology tools such as Flet, Python, and SQLite. The application incorporates features such as pet registration, vaccination reminders, and notifications of upcoming rabies vaccination events, with all data stored in a centralized database for easy retrieval. The results demonstrate improved pet registration accuracy, increased vaccination compliance, and enhanced accessibility to pet health records. The novelty of this research lies in its integration of digital pet health management within a user-friendly platform, ensuring real-time data accessibility for both pet owners and administrators. PetVax significantly contributes to rabies prevention efforts by providing an efficient, scalable solution for local governments and pet owners.

Keywords: rabies; pet registration; mobile application; vaccination; pet health management

Agrimon: A GIS-based Monitoring and Management of Crops in Lian, Batangas

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Effective agriculture management is vital to achieving food security and sustainable development, as it empowers stakeholders to efficiently oversee and monitor agricultural activities. This study presents *Agrimon*, a web-based monitoring and management system designed to support the agricultural production oversight of Lian, Batangas through integrated mapping technologies. The system was developed using the Agile methodology, ensuring iterative improvements based on stakeholder feedback. Following system development, an evaluation was conducted to assess three key dimensions: (1) user satisfaction in terms of usability, performance, and efficiency; (2) system acceptance based on functionality, reliability, and user interface; and (3) satisfaction with the systems report generation and mapping features. Data were gathered through structured survey questionnaires administered to end users—comprising local farmers, representatives from the Municipal Agriculture Office, and IT experts. The findings revealed high levels of satisfaction among end users, particularly regarding the system’s usability, performance, and operational efficiency. IT experts affirmed the systems strong functionality, reliability, and user-friendly interface. Furthermore, staff from the Municipal Agriculture Office reported high satisfaction with the system’s reporting and mapping capabilities. These outcomes highlight *Agrimon*’s potential to enhance monitoring processes, bridge management gaps in crop production, automate reporting tasks, and improve data visualization through geospatial mapping.

Keywords: agriculture, agrimon, GIS, monitoring and management system

RESEARCH OPERATIONS MANAGEMENT SYSTEM

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The Research Operations Management System was designed and developed to support students undertaking research or capstone projects at the College of Science and Technology, Guimaras State University-Mosqueda Campus. The system's primary objective is to streamline research operations, promote collaboration, and foster academic excellence. To achieve this, the system aims to provide a user-friendly platform for managing research projects, tracking progress, and fostering collaboration among students and faculty members, thereby enhancing the overall research experience and promoting academic excellence. The system features secure user registration, system-generated research forms, version management, automated research monitoring, reporting and real-time notifications. The development of ROMS followed the System Development Life Cycle (SDLC) methodology, which involves a structured approach to Planning, Analysis, Design, Implementation, Testing and Maintenance of the system. The SDLC methodology ensured that ROMS was developed in a systematic and efficient manner, meeting the requirements of researchers and administrators. Developed using HTML, CSS, Bootstrap, JavaScript, jQuery, PHP, and MySQL, ROMS ensures accessibility, efficiency, and credibility for researchers and administrators. The findings of this study suggest that ROMS successfully achieved its objectives, providing a solution for managing research projects, automating research monitoring, and enhancing collaboration among researchers. The implementation of ROMS demonstrates significant improvements in research productivity, efficiency, and outcomes. The study highlights the importance of integrating technology into research initiatives and demonstrates the potential of ROMS to transform research operations and management. The results of this study contribute to the existing body of knowledge on research operations management, highlighting the need for centralized platforms and automated systems to support research initiatives. The findings of this study have implications for researchers, administrators, and policymakers, emphasizing the importance of investing in technology-enabled research infrastructure to enhance research productivity and outcomes.

Keywords: research operations management system, research management, research progress, collaboration, and capstone project

COMPARISON OF MACHINE LEARNING ALGORITHMS FOR PHISHING DETECTION OF UNIFORM RESOURCE LOCATORS

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This study focuses on the development of a Machine Learning Algorithms and Hybrid Model that combines Naïve Bayes and all other algorithms which are the XGBoost, Support Vector Machine, Random Forest and Decision Tree to enhance the detection of phishing websites. The system was trained and tested using three datasets (Dataset1, Dataset2 and Dataset3) with various train-test split (50%-50%, 60%-40%, 70%-30%, 80%-20%, and 90%-10%) to evaluate its performance under different conditions. The preprocessing stage included normalization, feature selection, and data balancing using SMOTE to improve accuracy. To validate the model, 10-Fold Cross Validation was applied to ensure consistency and prevent overfitting. The systems performance was assessed using key evaluation metrics such as accuracy, precision, recall, and F1-score. The results revealed the XGBoost and hybrid model is Naïve Bayes and Decision Tree classifiers, demonstrating higher detection accuracy and reliability.

Keywords: phishing detection, hybrid model, XGBoost, Naïve Bayes, decision tree, random forest, support vector machine, train-test split, machine learning

MENRO: MONITORING AND MANAGEMENT SYSTEM

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The MENRO: Monitoring and Management System project represents a comprehensive solution from manual to software-based system. This aims to provide a secure and user-friendly interface that easily accesses, monitors, and manages documents, as well as to provide accurate reports and records. In the face of escalating environmental challenges, this system integrates state-of-the-art technologies to streamline data collection, analysis, and decision-making processes within the context of the Municipal Environmental and Natural Resources Office (MENRO). It incorporates a user-friendly interface for the admin (MENRO) to easily access and understand the system. This project aims (1) to design a user-friendly interface that enables the user to easily, add, edit, delete update and keep accurate reports and records. (2) To design a system that can provide apprehension receipt list of violation and penalty of registered establishments covered by MENRO, and (3) to evaluate the system using ISO/IEC 25010:2011 standard: functional suitability, performance efficiency, reliability, usability, compatibility, maintainability, portability, and security. These standards ensure that the users experience with the system is met, and the essential functions and features like, adding, editing, updating and keep accurate reports and records, monitor and managing system where at its most excellent functional operation in real-time, providing immediate feedback and alerts in case of any issues. (To developed the MENRO project the proponents used waterfall model because it is a software development methodology that follows a linear and sequential approach.) The system facilitates convenient access to the forms used by MENRO in monitoring establishments, providing a seamless process for recording and checking if specific establishments have committed offenses that need to be addressed. The ultimate objective is to assist MENRO in efficiently accessing MRF forms and issuing apprehension receipts, thereby contributing to a more streamlined and effective monitoring and management process.

Keywords: MENRO, MRF, monitoring, management system

ARTIFICIAL INTELLIGENCE (AI) LITERACY AND PERCEIVED LEVEL OF SITUATED ACADEMIC WRITING OF FIRST-YEAR STUDENTS AT ROMBLON STATE UNIVERSITY: PROPOSED WRITING INTERVENTION PROGRAM

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This study explored the relationship between artificial intelligence (AI) literacy and situated academic writing among 54-first year English major students of Romblon State University-Main Campus. The researchers employed a mixed-method approach, utilizing survey questionnaires, the Scale for the Assessment of Non-Experts' AI Literacy (SNAIL) and the Situated Academic Writing Self-Efficacy Scale (SAWSES), all adapted and modified from their original authors. It assessed the level of students' AI literacy across dimensions such as technological understanding, critical appraisal, and practical application and their perceived level of situated academic writing in terms of writing-essentials, relational-reflective, and creative identity. The findings indicate that while students demonstrate strong awareness of AI ethics and practical applications, their understanding of AI's technical aspects remains limited. Similarly, students exhibit confidence in reflective and creative aspects of writing but face challenges in formal academic language and source synthesis. A positive relationship was observed between AI literacy and writing proficiency, which suggests that higher AI literacy contributes to stronger situated academic writing skills. To address these gaps, the study proposes a writing intervention program focused on improving students' technological understanding of AI and strengthening their writing essentials, particularly in synthesizing sources, structuring arguments, and using formal academic language effectively.

Keywords: AI literacy, situated academic writing, English major students

ARTIFICIAL INTELLIGENCE LITERACY IN A PHILIPPINE ACADEMIC COMMUNITY: CONFIRMATORY FACTOR ANALYSIS AND RELIABILITY TEST OF SCALE FOR THE ASSESSMENT OF NON-EXPERTS' AI TOOL

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Artificial Intelligence (AI) is rapidly becoming a cornerstone in various sectors, and academia is no exception. This study highlights the Confirmatory Factor Analysis (CFA) and reliability test for artificial intelligence literacy instrument for the academic community. This adapted instrument from Laupichler et al. (2023) was conducted among 305 secondary school teachers in the division of Romblon, selected using convenience sampling and Raosoft for calculating the sample size. Jamovi software was used to test the model fitness and Smart PLS version 4.0 for the confirmatory factor analysis. Chi-square $\chi^2=3212$ ($< .001$), Root Mean Square Error of Approximation (RMSEA = 0.151), Comparative Fit Index (CFI = 0.90), Tucker-Lewis Index (TLI = 0.634), Standardized Root Mean Square Residual (SRMR = 0.116), Average Variance Extracted (AVE = 0.66), and Cronbachs Alpha ($\alpha= 0.91$), majority suggest the model fitness of the AI literacy test. CFA test also noted that all indicators were in an acceptable factor loading threshold (0.50-1.28) among the dimensions namely: Technological Understanding, Critical Appraisal, and Practical Application. It is recommended that this instrument be used in different academic institutions to test the level of AI literacy in their respective institutions for a more targeted technological initiative and program.

Keywords: artificial intelligence literacy, confirmatory factor analysis, reliability test, academic community, secondary school teachers

ENVIRONMENTAL AWARENESS AND PARTICIPATION OF CALATRAVA HOUSEHOLDS: A BASIS FOR STRATEGIC INDUSTRIAL EDUCATION MANAGEMENT THROUGH EXTENSION PROGRAMS AND IEC DEVELOPMENT

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This study explores how households in Calatrava, Romblon understand environmental issues, participate in waste management, and what challenges hinder deeper involvement. As rural communities face increasing pressure from pollution and poor waste practices, the findings aim to guide the development of responsive extension programs and Information, Education, and Communication (IEC) materials that support sustainable behavior. These efforts are intended to strengthen strategic industrial education management by linking community awareness to practical learning and action. The research is grounded in Environmental Awareness Theory, which highlights the link between knowledge and environmental action, and the Theory of Planned Behavior, which explains how attitudes, social norms, and perceived control influence participation. Data were gathered through structured surveys and informal interviews with 521 households across seven barangays, using a descriptive-correlational design to explore how household background, awareness, and challenges affect environmental involvement. Results show that while most residents feel responsible for managing their waste and are aware of harmful practices, actual participation remains moderate. Common barriers include low income, lack of environmental education, weak infrastructure, and behavioral challenges. Awareness alone doesn't guarantee action—factors such as education, family size, and access to local support also matter. These findings highlight the need for more localized, accessible, and action-oriented environmental education that can be integrated into industrial education management strategies. By aligning community-based learning with real-world environmental challenges, schools and institutions can better equip households with the skills, tools, and motivation to build a cleaner and more sustainable future.

Keywords: environmental awareness, environmental participation, environmental challenges, households, IEC materials, extension program/projects

FAUNA DIVERSITY ACROSS LONGITUDINAL GRADIENTS IN AN ISLAND RIPARIAN ECOSYSTEM OF CALSANAG WATERSHED FOREST RESERVE

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This study assessed the composition and diversity of faunal taxa in the riparian zones of CALSANAGs WFR to inform conservation and restoration strategies. Along a 2-kilometer transect, eight sampling sites were established, documenting 1,018 specimens. Bats dominated downstream areas, representing over 60% of recorded species, while insects comprised more than 30% of the upstream fauna. These patterns correspond to variations in vegetation structure and environmental gradients across the study area. Despite low avian abundance, the Passeriformes order and the endangered species *Todiramphus winchelli* underscores the ecosystems ecological significance. Endemic and threatened species, including the bat *Ptenochirus jagori*, the vulnerable frog *Limnonectes visayanus*, the near-threatened frog *Platymantis cornutus*, and the bat *Pteropus pumilus*, further highlight the areas unique biodiversity. The Shannon diversity index revealed high arthropod diversity ($H = 3.87$), while other taxa exhibited moderate diversity ($H = 1.35-2.15$). The findings stressed the need to manage riparian zones to ensure their protection, conservation, and restoration. It is highly recommended that locals and other stakeholders actively engage and commit to conservation initiatives to conserve the vital riparian zone successfully.

Keywords: biodiversity, conservation, endemic species, habitat degradation, riparian ecosystems, wildlife

EARLY GROWTH DYNAMICS OF NATIVE TREE SPECIES IN RIPARIAN REFORESTATION SITES OF CALSANAG MUNICIPALITIES ON TABLAS ISLAND, ROMBLON, PHILIPPINES

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This study assessed the early growth performance and survival responses of selected native tree species for potential use in riparian restoration within the CALSANAG Watershed Forest Reserve on Tablas Island, Philippines. Five ecologically important native species were randomly out-planted and monitored over one year in riparian sites. Key growth parameters, including stem height, root collar diameter, chlorophyll content, root length, and the number of shoots, were measured to evaluate species-specific responses to riparian conditions. Pearson correlation analysis determined the relationships between species and growth attributes. Among the evaluated species, *Ficus nota* and *Ficus septica* demonstrated the most robust growth performance, exhibiting significant height and root development increases and strong positive correlations to other growth traits. *Nauclea orientalis* exhibited the highest chlorophyll concentration, indicating the potential for high photosynthetic activity, while *Pterocarpus indicus* had the lowest average chlorophyll content. Notably, *Fagraea racemosa* showed a negative correlation across multiple growth parameters, suggesting poor adaptation to the riparian environment. The results emphasize the role of species-specific traits in determining seedling performance under restoration conditions. Based on observed growth dynamics and positive correlations, *Ficus nota* and *Ficus septica* are recommended for inclusion in future riparian restoration initiatives within the CALSANAG watershed. These findings support the importance of using locally adapted native species to promote ecological recovery and enhance the resilience of riparian ecosystems.

Keywords: Riparian restoration, Native tree species, early growth performance, Species survival

SUSTAINING A LOCAL TREASURE: DEVELOPING LARVAL CULTURE PROTOCOL FOR THE MONKEY RIVER PRAWN (*MACROBRACHIUM LAR*) FOR COMMUNITY LIVELIHOOD AND CONSERVATION

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Monkey river prawn (*Macrobrachium lar*), a potential cultivable species of freshwater prawn, was found to be the most abundant freshwater prawn species in the streams of San Agustin. Due to the high demand of prawn as source of food and major ingredient for sarsa, a local delicacy, establishing protocol for its hatchery and larval rearing is necessary to reduce fishing pressure and promote culture of this important crustacean. Thus, this study investigated the hatching and larval rearing of *Macrobrachium lar* using different temperature, salinity, stocking density and using greenwater as food in captivity. The experiment was consisted of three phases. The first phase was on the hatching rate of *M. lar* as influenced by salinity and temperature, the second phase was on the larval development of *M. lar* as influenced by salinity, and the third phase was on the larval development as influenced by stocking density and greenwater. Result shows berried *M. lar* reared in 0ppt at 28°C obtain higher hatching rate (98.50 ± 0.71) compared to other treatments. A temperature of 28-30°C produced optimal survival of hatched larvae. However, survival showed decreasing pattern overtime. Meanwhile, a stocking density of 25 larvae/L exhibited the highest survival rate, especially in the greenwater treatment, with a recorded survival of 93% on day 1. All treatments successfully developed up to Zoea II stage but failed to progress further. The greenwater treatment yielded slightly better survival and larval activity compared to egg custard. The study recommends further studies on salinity acclimation and feeding protocols to support complete larval development.

Keywords: greenwater, larviculture, *Macrobrachium lar*, salinity, stocking density, temperature

DISTRIBUTION AND ABUNDANCE OF MANGROVE SPECIES IN THE SOUTHERN PART OF TABLAS ISLAND, ROMBLON, PHILIPPINES

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Mangrove forests in Santa Fe, Romblon, play a crucial role in ecosystem-based disaster risk reduction (Eco-DRR) by providing coastal protection. However, overexploitation due to a lack of monitoring has threatened these vital ecosystems. This study assessed the distribution and abundance of mangrove species in four barangays (Poblacion, Pandan, Tabugon, and Canyayo) in Santa Fe to identify species crucial for coastal protection and areas vulnerable to hazards due to declining mangrove populations. Using a 10x10 meter belt-transect method, ten mangrove species were identified. *Avicennia marina* and *Rhizophora mucronate* were found to have the greatest importance value, indicating their strong adaptation to the local environment. Despite the presence of these resilient species, all four barangays exhibited low species diversity. This highlights the urgent need for rehabilitation and conservation measures to address the impacts of anthropogenic activities and environmental pressures on these critical mangrove forests.

Keywords: Mangrove assessment, Sta. Fe, Romblon, Species diversity, Eco-DRR, Coastal protection

NON-COMMERCIAL FERTILIZER PRODUCTION UTILIZING A PHOTOVOLTAIC POWERED DEHYDRATOR OF SEAFOOD WASTE

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The improper disposal of seafood waste had been a major environmental concern for the community. This issue not only harmed the environment but also posed serious health risks due to harmful contaminants and pathogens. Tejeros Convention wet market struggled with these problems, as residents dealt with unpleasant odors and improperly disposed waste that had accumulated for over a week. To address the problem, the study developed a photovoltaic-powered seafood waste dehydrator with a controlled drying feature using optimized developmental design. It determined the performance of seafood waste when exposed to different composting phases. The study aimed to assess the differences in the NPK ratio of random soil samples with and without dried seafood waste. Additionally, the study evaluated the design, development, and implementation of the photovoltaic-powered seafood waste dehydrator using ISO-25010. The research highlighted the effectiveness of the heating system during the drying process. It demonstrated the effectiveness of the photovoltaic powered seafood waste dehydrator in managing moisture levels and improving the NPK ratio of soil samples. The nutrient composition of the soil was assessed with and without dried seafood waste in terms of NPK ratio, revealing the potential impact of incorporating dried seafood waste into soil management practices. Farmers and experts shared perspectives suggesting that the dehydrator effectively met operational requirements. The study recommended exploring commercial applications for large-scale seafood waste management, supported by feasibility studies and industry collaborations. Further investigation into the long-term effects of incorporating dried seafood waste as a soil amendment was also suggested.

Keywords: photovoltaic-powered, dehydrator, seafood waste, and NPK ratio

ECOLOGICAL TRENDS AND SPECIES COMPOSITION OF INDUSTRIAL TREE PLANTATIONS IN THE CALSANAG MUNICIPALITIES OF TABLAS ISLAND PHILIPPINES

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This research investigated the species composition, diversity, and ecological patterns of Industrial Tree Plantations (ITPs) in the CALSANAG municipalities of Calatrava, San Andres, and San Agustin in Tablas Island, Philippines. A stratified random sampling design and geospatial analysis were employed to assess over 4,000 individual trees across diverse land cover types. Results showed a strong dominance of exotic species, particularly in Calatrava (75%). San Andres had the highest proportion of native trees (47%) and displayed greater ecological stability based on biodiversity indices such as Simpson's Dominance and Shannon Index. Spatial analysis revealed ITP hotspots concentrated along waterways and ridgelines—areas corresponding to higher tree densities and more balanced species composition. Visualized through a gradient-based heat map, tree density ranged from 1–10 to over 61 trees per hectare, with San Agustin exhibiting the highest densities and most extensive plantation clustering in its southeastern portions. In contrast, San Andres showed moderate densities in its central and southern zones. At the same time, Calatrava exhibited scattered patches of moderate tree density amid broader low-density areas, suggesting variability in plantation intensity, land use, and site suitability. These patterns show that tree population density mainly depends on topography, water body proximity, and landscape accessibility. To enhance biodiversity and ecosystem resilience, the research suggests using multi-species or mixed-species plantations with other indigenous trees. Ecologically designed conservation and restoration should focus on ridgelines and riparian corridors.

Keywords: Industrial Tree Plantations, Species Diversity, Exotic and Native Trees Sustainable

EERAS: A PROTOTYPE DESIGN OF AN ENERGY EFFICIENT RECIRCULATING AQUACULTURE SYSTEM UTILIZING SOLAR ENERGY

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This study presents the development of EERAS: An Energy Efficient Recirculating Aquaculture System utilizing Solar Energy – a prototype designed which integrates aquaculture and hydroponics to simultaneously cultivate tilapia and lettuce using a solar-powered, closed-loop system. Unlike conventional systems, EERAS stands out by incorporating recyclable materials such as plastic bottles and used PVC pipes, promoting both cost-efficiency and environmental sustainability. This study employed a developmental research method to design, construct, and assess the EERAS prototype. A descriptive evaluative approach was also used to gather feedback from experts and end-users through survey questionnaires. It utilized a judgment sampling technique involving fifty (50) respondents from relevant academic departments and fields, and data were analyzed using statistical methods to determine the system's acceptability and functionality. The system received an overall rating of Highly Acceptable based on the set parameters. This design project sets apart from similar technologies based on its integration of renewable energy, use of upcycled materials, and its dual-yield capability in one compact system. It provides an affordable and scalable solution to sustainable food production, especially in urban and low-resource settings. Additionally, its educational value and community relevance enhance its potential as a model for hands-on sustainability learning. The study concludes that EERAS meets quality standards and user expectations. For future innovation, researchers could potentially explore areas such as upgrading energy components, improving water flow with larger pipes, exploring alternative energy sources, and incorporating more crop varieties to create a more robust system, boost food sustainability and achieve high production rate.

Keywords: aquaculture system, food production, renewable energy, sustainability

EVALUATION OF A MARBLE DUST NITROGEN-BASED REFILLABLE PORTABLE FIRE EXTINGUISHER FOR MULTI-CLASS FIRE SUPPRESSION

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This study explores the potential of marble dust as an alternative fire extinguishing agent, addressing both fire safety innovation and sustainable waste utilization. Romblon, Philippines, produces large quantities of marble dust as a byproduct of its marble industry, leading to environmental management challenges. This research evaluates the effectiveness of marble dust, pressurized with nitrogen, in suppressing fires of various classifications. A refillable 5-lb fire extinguisher was developed and tested using three different marble dust loads: 3 lbs, 4 lbs, and 5 lbs. A standardized volume of diesel fuel was used as the ignition source in controlled chamber conditions. Each setup was tested on simulated Class A and B fire scenarios. Key performance metrics included extinguishing time, quantity of agent used, and reignition occurrence. Results showed that the 4-lb configuration had the shortest extinguishing time but consumed the highest amount of agent, while all setups successfully suppressed the fire with no reignition. Statistical analysis confirmed significant differences between the configurations. Comparatively, a commercial dry chemical extinguisher performed faster but with similar material consumption. The marble dust extinguisher effectively suppressed Class A and B fires, validating its potential as a low-cost, refillable, and eco-friendly alternative. The study concludes that marble dust can serve as a functional fire suppression agent and offers a promising solution for repurposing industrial waste. Further research is recommended to optimize its performance and scalability for broader applications.

Keywords: marble dust, fire extinguisher, fire suppression, nitrogen propellant, sustainable engineering, waste utilization

INNOVATION IN ACTION: ASSESSING THE EFFECTIVENESS OF Z-CARD IN TEACHING FUNDAMENTAL INTEGER OPERATIONS

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The ability to perform integer operations proficiently is a prerequisite in more advanced mathematical concepts. Facilitators of learning, curriculum planners, and researchers have suggested interventions to improve students' mastery in learning the fundamental operations of integers, and yet the problem still exists. Non-numeracy and low mastery of grade-7 students at San Andres National High School is evident based on the result of the diagnostic test hence the development of Z-Card, a game-based approach in mathematics education. It adapted the ADDIE framework focusing on designing, development and validation of Z-Card based on the following criteria: goals and objectives, card design, components and organizations, playability, and usefulness. Additionally, a quasi-experimental design was employed to evaluate the effectiveness of Z-Card in teaching and learning the fundamental operation of integers. The result revealed that integrating Z-Card in the teaching and learning process significantly improves the students mastery in learning the fundamental operations of integers suggesting that students improved their numeracy skills and mathematical proficiency. Thus, educators must consider utilizing Z-Card in teaching and learning the fundamental operation of integers in classroom instructions to further validate the findings of the study and expand its application to other mathematical topics across different grade levels.

Keywords: Effectiveness, Game-Based Approach, Innovation Integer Operations, Z-Card

EVOLUTIONARY IMAGE AUGMENTATION WITH GENETIC ALGORITHM FOR ENHANCING CNN-BASED ROMBLON MARBLE PATTERN RECOGNITION MODEL

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This study investigates the impact of Genetic Algorithm (GA)-based data augmentation on the performance of Convolutional Neural Networks (CNNs) in marble texture classification. Multiple CNN architectures, including AlexNet, InceptionV3, VGG16, MobileNet, and ResNet50, were trained on both raw and GA-augmented datasets. Results indicate that models trained on the raw dataset exhibited lower accuracy, with VGG16 achieving the highest at 33.78%. However, the GA-augmented dataset significantly improved model performance, with VGG16 reaching 94.68% accuracy, followed by MobileNet (92.68%) and InceptionV3 (92.46%). Furthermore, loss scores decreased across all models, confirming improved convergence and reduced overfitting. ROC AUC analysis further validated these enhancements, demonstrating a higher capacity for distinguishing marble textures. These findings highlight the effectiveness of evolutionary augmentation techniques in optimizing deep learning models, with VGG16 emerging as the most reliable architecture. This study underscores the importance of advanced augmentation in real-world image classification applications.

Keywords: convolutional neural network, data augmentation, marble classification, genetic algorithm

TECHNOLOGY-AIDED INSTRUCTIONAL MATERIALS FOR SUSTAINABLE LEARNING: EVALUATING INTERACTIVE MATH SHEETS FOR GRADE 3

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This action research aimed to assess the content and curriculum alignment of Interactive Sheets developed as instructional materials for Grade 3 Mathematics, specifically targeting the least mastered competency: subtracting 3- to 4-digit numbers with and without regrouping. The study employed developmental research design using the Four-D Model (Define, Design, Develop, and Disseminate) and followed a mixed-method approach. A complete enumeration of 14 participants—12 Grade 3 teachers and 2 Master Teachers from public elementary schools in the District of Alcantara, Romblon—served as respondents and validators. Results revealed that subtraction with regrouping was the most challenging competency. The developed Interactive Sheets were evaluated using DepEd’s Evaluation Rating Sheet for Print Resources. Findings showed that the materials were rated “Very Satisfactory” across content, format, presentation, and accuracy. Thematic analysis of expert feedback emphasized strengths such as content relevance, learner engagement, and design appeal. Recommendations highlighted the need to enhance cultural inclusivity, simplify language, and integrate values like honesty and teamwork into instructional content. The study concludes that the Interactive Sheets are effective, developmentally appropriate tools that can support teachers in addressing challenging Math competencies. Future research is encouraged to evaluate the materials classroom effectiveness and extend their use to other subjects and grade levels.

Keywords: instructional Materials, Interactive Sheets, Least Mastered Competency, Developmental Research

