

Faculty of Computer and Mathematical Sciences
Universiti Teknologi MARA, Perlis Branch

e-ISSN: 3093-7930

**Proceedings of
Research Exhibition
in Mathematics and
Computer Sciences
(REMACS)**

Vol. 8 (2025)



UNIVERSITI
TEKNOLOGI
MARA

Proceedings of Research Exhibition in Mathematics and Computer Sciences
REMACS 8.0 (2025)

© 2025 Faculty of Computer and Mathematical Sciences, UiTM Perlis Branch.

This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License (CC-BY-SA 4.0). You are free to:

- Share - copy and redistribute the material in any medium or format
- Adapt - remix, transform, and build upon the material for any purpose, even commercially
- Under the following terms:

Attribution - You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

ShareAlike - If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

No additional restrictions - You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

For more information on the Creative Commons Attribution-ShareAlike 4.0 International License, please visit: <https://creativecommons.org/licenses/by-sa/4.0/>

e-ISSN: 3093-7930

Perpustakaan Negara Malaysia

Published by

Fakulti Sains Komputer dan Matematik
Universiti Teknologi MARA
02600 Arau, Perlis

kppfskmpls@uitm.edu.my

Tel: +604 988 2506

Tel: +6012 424 8192

<https://fskmperlis.uitm.edu.my/remacs-proceedings/>

Frequency : Published online with a frequency of one (1) issue per year (September).

Proceedings of Research Exhibition in Mathematics and Computer
Sciences

REMACS 8.0 (2025)

**Proceedings of Research Exhibition in Mathematics and Computer Sciences
REMACS 8.0 (2025)**

EDITORIAL BOARD

NOR ARZAMI OTHMAN

Editor-in-chief

MOHAMMAD HAFIZ BIN ISMAIL

Associate Editor-in-chief

RAY ADDERLEY JM GINING

Copy Editor

ABDUL HAPES BIN MOHAMMED

ALIF FAISAL BIN IBRAHIM

MOHD HALIMI AB HAMID

IZLEEN BINTI IBRAHIM

SITI FATIMAH BINTI ABDUL RAHMAN

Editor

EDITOR'S NOTE

It is with great pleasure that we present the proceedings of the Research Exhibition in Mathematics and Computer Sciences (REMACS 8.0). This book is a collection of research work in the fields of Computer Science and Mathematics, contributed by the final year students from Universiti Teknologi MARA, Perlis Branch. The aim of this book is to showcase the diversity and depth of research in these two interrelated fields.

Mathematics and Computer Science are the two fields that have seen tremendous growth and advancement in recent years. With the rise of new technologies and the increasing demand for data-driven solutions, researchers in these fields have been working hard to develop new theories, algorithms, and models that can help solve some of the most pressing problems of our time. This book is a testament to their hard work and dedication.

The articles in this book cover a wide range of topics, including algebra, analysis, logic, computer architecture, algorithms, artificial intelligence, machine learning, computer network, netcentric computing and many more. The work presented here is both theoretical and practical and has the potential to impact on many areas of society, from finance and healthcare to education and security.

We hope that this book will serve as a valuable resource for future students in the fields of Mathematics and Computer Science. We also hope that it will inspire more students to pursue innovative and groundbreaking research in these two fields. Finally, we would like to express our gratitude to all the contributors for their hard work and dedication, without which this book would not have been possible.

THE EDITORS

LIST OF ARTICLES

RANKING FACTORS INFLUENCING CONSUMER PREFERENCE IN CHOOSING A PETROL STATION USING FUZZY AHP.....	1
ALTERNATIVE ROUTE OPTIMIZATION FOR EMERGENCY SERVICES DURING FLOODS IN JOHOR BAHRU USING DIJKSTRA ALGORITHM	3
MODELLING MONKEYPOX OUTBREAK USING EXPONENTIAL SMOOTHING MODELS	5
ADAPTIVE FUZZY LOGIC SYSTEM FOR MICROWAVE COOKING OPTIMIZATION	7
MULTIPLE LINEAR REGRESSION AND K-MEAN CLUSTERING OF POST-COVID ON HOUSEHOLD INCOME IN MALAYSIA.....	9
ANALYZING INFLUENZA A SPREAD USING THE SEIR EPIDEMIOLOGICAL MODEL	11
A SYSTEMATIC ANALYZING AND RANKING OF FACTORS INFLUENCING TEACHERS' EARLY RETIREMENT INTENTIONS USING FUZZY DELPHI METHOD.....	13
LUNG CANCER PREDICTION USING MACHINE LEARNING	15
FUZZY VIKOR FOR RANKING CARS AMONG UNIVERSITY FINAL YEAR STUDENTS.....	17
A CROSS-SECTIONAL STUDY ON MATHEMATICS ANXIETY AND MATHEMATICS SELF-EFFICACY AMONG HIGH SCHOOL STUDENTS USING FUZZY CONJOINT ANALYSIS.....	19
MACHINE LEARNING PREDICTION OF SLEEP QUALITY AMONG UITM PERLIS STUDENTS USING THE PITTSBURGH SLEEP QUALITY INDEX.....	21
RANKING EXPRESS BUS COMPANIES: AN ANALYSIS OF KEY FACTOR THAT INFLUENCE STUDENTS USING FUZZY TOPSIS APPROACH	23
RANKING PADDY FERTILIZER FOR RICE PRODUCTION USING FUZZY TOPSIS: A CASE STUDY OF KG PERMATANG TOK JAYA, PENANG	25
INVESTIGATION ON THE SPREAD OF DENGUE IN MALAYSIA BY USING SEIR MODEL.....	27
POVERTY RISK PREDICTION BASED ON SOCIOECONOMIC FACTORS USING MACHINE LEARNING APPROACH	29
OPTIMISING A WASTE MANAGEMENT SYSTEM USING ARTIFICIAL BEE COLONY (ABC) ALGORITHM..	31
RANKING OF HISTORICAL TOURISM PLACES IN PERAK USING FUZZY TOPSIS	33
IDENTIFYING CONSUMERS' PREFERRED MARKET OUTLET FOR PURCHASING VEGETABLES AMONG THE RURAL COMMUNITY USING FUZZY VIKOR.....	35
RANKING ZAKAT RECIPIENTS AT ZAWAF UITM PERLIS USING FUZZY TOPSIS.....	37
MALAYSIAN FULL-FLEDGE ISLAMIC BANKS PERFORMANCE: A COMPARATIVE ANALYSIS USING DATA ENVELOPMENT ANALYSIS (DEA).....	39
RANKING FACTORS INFLUENCING THE SELECTION OF PAYMENT METHOD USING FUZZY ANALYTIC HIERARCHY PROCESS (FAHP).....	41
ALIGNED MHD FLOW OF TERNARY HYBRID NANOFLUIDS OVER A VERTICAL PLATE WITH CONVECTIVE BOUNDARY CONDITION	43
PERFORMANCE OF DECISION TREE ALGORITHM WITH RANDOMLY DISTRIBUTED FEATURE SPACE....	45

FORECASTING GOLD PRICES IN MALAYSIA: A COMPARATIVE ANALYSIS OF SIMPLE EXPONENTIAL SMOOTHING, HOLT’S METHOD AND ARIMA MODEL	47
OPTIMIZING TRANSPORTATION COST BY USING LINEAR PROGRAMMING	49
MONITORING AIR POLLUTION IN PERAK USING FUZZY LOGIC	51
THE USE OF THE TRAPEZOIDAL RULE AND SIMPSON’S RULE TO APPROXIMATE THE VOLUME OF BUKIT TUNJANG, KEDAH.....	53
PREDICTIVE OBESITY AMONG CHILDREN AND ADOLESCENT USING LOGISTIC REGRESSION AND RANDOM FOREST MODEL.....	55
EDUFLEX AN AI-POWERED TOOL FOR CREATING PERSONALIZED LEARNING MATERIALS.....	57
STUDY SPARK: AN ONLINE LEARNING PLATFORM WITH LIVE PEER LEARNING AND PROGRESS TRACKING.....	59
RXISTANT: WEB MEDICINE ASSISTANT FOR PHARMACIST	61
OPTISENSE: A WEB-BASED EYEWEAR RECOMMENDER SYSTEM BASED ON FACE SHAPE WITH AUGMENTED REALITY (AR)	63
OBOT: AN INTELLIGENT AI TOUR GUIDE FOR INTERACTIVE AND PERSONALIZED TRAVEL EXPERIENCES IN PERLIS	65
CAMPUS WHEELS: SMART RIDE-SHARING MOBILE PLATFORM FOR UiTM COMMUNITY.....	67
GREEN GAMIFICATION TO SUPPORT ECOVERSITY THROUGH STUDENT ENGAGEMENT	69
GREENTIFY: PRESERVING GREEN ENVIRONMENT THROUGH RECYCLING AND GAMIFICATION.....	71
CHOREMATE: A WEB-BASED BARGAINING SYSTEM TO ACQUIRE FREELANCE CLEANING SERVICE	73
FORMAVIZ – A MOBILE SOLUTION FOR COMPREHENSIVE FORMATION DESIGN AND MANAGEMENT FOR MARCHING BANDS	75
JOBFASTHIRED – OPTIMIZING PART-TIME JOB SEARCHES THROUGH GOOGLE MAPS INTEGRATION..	77
WAYABLE: ASSISTIVE ROUTE FINDER AND ALERT SYSTEM FOR MOBILITY-IMPAIRED USERS.....	79
E-CARE ELECTRONIC MONITORING USING IMAGE PROCESSING FOR ELDERLY CARE	81
DECOSENSE: AFFORDABLE INTERIOR DESIGN AND SPACE OPTIMIZATION POWERED BY AI.....	83
EDMS: ECODRY MANAGEMENT SYSTEM INTEGRATED WITH IOT FOR NATURAL DRYING	85
PERSONALIZED MENTAL HEALTH NAVIGATOR FOR HIGH LEVEL EDUCATION STUDENTS.....	87
AIRPLAY: WEB-BASED AIR-DRAWING GAME FOR ENHANCING FINE MOTOR SKILLS IN DYSLEXIC CHILDREN	89
UNIEVENT: EVENT MANAGEMENT SYSTEM FOR STREAMLINED UNIVERSITY EVENT	91
VISUALIZING MARKET TRENDS IN AUTOMOTIVE SECTOR	93
GEOGRAPHIC TERRORISM HOTSPOT ANALYSIS USING BIG DATA VISUALIZATION TECHNIQUES.....	95
DATA VISUALIZATION: ANALYZING SKIN PROBLEM AND USER PREFERENCE OF AI-BASED SOLUTIONS	97
SUSTAINABLE DEVELOPMENT GOALS (SDGs) PROGRESS: INTERACTIVE POWER BI DASHBOARD FOR PERFORMANCE INSIGHTS	99

SENTIMENT ANALYSIS OF SEPHORA PRODUCT REVIEWS: DISCOVERING CONSUMER’S PERCEPTION THROUGH DATA VISUALIZATION	101
EXPLORING STUDENT MENTAL HEALTH THROUGH BIG DATA ANALYTICS AND VISUALIZATION	103
DATA-DRIVEN VISUALIZATION OF SKILL DEMAND AND EMERGING TRENDS IN THE IT SECTOR.....	105
DESCRIPTIVE ANALYSIS AND EXPLORATORY DATA ANALYSIS ON CORRELATION BETWEEN BMI AND HEALTH VARIABLES.....	107
SOCIOECONOMIC IMPACT ON CRIME RATES ANALYSIS IN MALAYSIA BASED ON BIG DATA APPROACH	109
TREND ANALYSIS AND VISUALIZATION OF HAZARDOUS CHEMICALS IN CONSUMER PRODUCTS.....	111
MALAYSIA PETROL STATION ANALYTICS: DATA-DRIVEN INSIGHTS FOR BETTER SERVICE-STOP DECISIONS	113
OPTIMIZING DIGITAL MARKETING CAMPAIGNS THROUGH DATA VISUALIZATION	115
MALAYSIA JOB MARKET INSIGHT: A DASHBOARD FOR JOB VACANCY ANALYSIS.....	117
MENTAL HEALTH IN THE DIGITAL ERA: A VISUAL EXPLORATION OF TECHNOLOGY EFFECTS TOWARDS COMMUNITY	119
VISUALIZATION: GERD SYMPTOMS AND EFFECTS USING INTERACTIVE DASHBOARD	121
INTERACTIVE DASHBOARD FOR GLOBAL LIFE EXPECTANCY ANALYSIS USING BIG DATA AND POWER BI	123
AERAVITA: PERFORMANCE-BASED AIR QUALITY DATA VISUALIZATION DASHBOARD	125
FORECASTING XRP VALUE TIME SERIES USING LSTM BASED ON MULTIVARIATE CRYPTO CURRENCY MARKET VALUE	127
SOCIOECONOMIC AND ENVIRONEMNTAL FACTORS ON YOUTH SMOKING AND DRUG USE VISUALIZATION.....	129
TRAFIKLENS: INTERACTIVE DASHBOARD FOR TRAFFIC VIOLATION INSIGHTS	131
MALAYSIA TELCO CHURN PREDICTION BASED ON GOOGLE PLAY APP REVIEWS SENTIMENT ANALYSIS	133
DATA VISUALIZING CYBER THREATS USING DATA VISUALIZATION FOR REAL-TIME RESPONSE	135
A VISUALIZATION DASHBOARD FOR ANALYZING SOCIOECONOMIC DISPARITIES AND POVERTY HOTSPOTS IN NORTHERN MALAYSIA	137
VISUALIZING CAREER PATHWAYS: A DATA-DRIVEN APPROACH TO ONLINE COURSE RECOMMENDATIONS FOR IT CAREERS IN MALAYSIA	139
PERFORMANCE EVALUATION OF BLACKHOLE AND SINKHOLE ATTACKS USING AODV ROUTING PROTOCOL IN VANET.....	141
ENHANCING WEB APPLICATION FIREWALL WITH MACHINE LEARNING FOR ADVESARIAL SQL INJECTION	143
IoT SMART SLEEP MONITORING AND ENVIRONMENTAL CONTROL OPTIMIZATON SYSTEM	145
ANALYSING DDOS ATTACK ON WEB SERVER USING PENTBOX HONEYPOT AND PFSENSE WITH SNORT	147
CYBERATTACKS TRAFFIC ANALYSIS BASED ON SURICATA AND SUPERVISED MACHINE LEARNING	149

MALICIOUS URL DETECTION USING MACHINE LEARNING	151
BIOMETRIC FACE RECOGNITION FOR A SECURE KINDERGARTEN ATTENDANCE MANAGEMENT SYSTEM.....	153
PERFORMANCE ANALYSIS ON QUIC AND TCP IN 5G ENVIRONMENT USING NS3	155
VPN PERFORMANCE ANALYSIS OF OPENVPN AND WIREGUARD FOR EDUCATIONAL NEEDS IN UITM	157
PERFORMANCE ANALYSIS ON WPA2-PSK WIRELESS NETWORK UNDER DOS ATTACKS.....	159
PERFORMANCE ANALYSIS OF WORMHOLE AND SYBIL ATTACK USING DSDV ROUTING PROTOCOL IN VANET.....	161
CLOUD-BASED SURVEILLANCE SYSTEM FOR UNSUPERVISED ONLINE EXAMINATIONS USING MACHINE LEARNING.....	163
SMART QUAIL COOP: IOT BASED PROTOTYPE FOR QUAIL MONITORING WITH ENVIRONMENTAL CONTROL AND AI FOR AUTOMATED PREDATOR DETECTION	165
A HYBRID INTRUSION DETECTION SYSTEM (IDS) USING SNORT AND MACHINE LEARNING	167
MOODFLOW: A MOBILE APPLICATION FOR EMOTIONAL HEALTH MONITORING THROUGH MOOG INSIGHTS BASED ON MENTAL STABILITY ANALYSIS.....	169
DETECTING DDoS ATTACK USING SUPERVISED MACHINE LEARNING: A COMPARATIVE STUDY OF RANDOM FOREST, SVM AND DECISION TREE ALGORITHMS	171
DDOS DETECTION IN IOT USING MACHINE LEARNING	173
SIMTRACKER: IOT-BASED REAL-TIME GEOLOCATION MOTION MONITORING FOR OUTDOOR ACTIVITIES	175
SMART ATTENDANCE SYSTEM USING FINGERPRINT RECOGNITION FOR STUDENT COMPUTER SCIENCE IN UITM ARAU, PERLIS.....	177
OWASP WEB APPLICATION VULNERABILITIES SCANNER Afiqah Asyikin Arbain, Muhamad Arif Hashim	179
MOBILE APPLICATION FOR EXPENSES TRACKER	181
E-MARKETPLACE FOR UNIVERSITY STUDENTS USING LARAVEL	183
WEB-BASED COUNSELLING APPOINTMENT SYSTEM WITH STRESS MANAGEMENT INTERVENTIONS	185
FREELANCING MARKETPLACE PLATFORM FOR UNIVERSITY STUDENTS.....	187
WEB-BASED MONITORING DASHBOARD FOR INVIGILATOR SURVEILLANCE	189
SOIL FERTILITY PREDICTION MODEL FOR HARUMANIS USING MACHINE LEARNING	191
FOOD RECOMMENDATION SYSTEM FOR METABOLIC SYNDROME PATIENT	193
E-ORDERING PLATFORM FOR MASMED	195
EDUCON-NECT: PROACTIVE COLLABORATIVE STUDY TOOLS USING MOBILE CLOUD COMPUTING...	197
TEACHING AND LEARNING INVENTORY MANAGEMENT WEB APPLICATION FOR UITM PERLIS	199
ANOMALY-BASED INSIDER THREAT DETECTION USING UEBA AND ELASTIC STACK WITH MACHINE LEARNING.....	201

PALM N TRACK: AN ESTATE COMMODITY, MACHINERY AND EQUIPMENT INVENTORY WEB APPLICATION	203
GAMIFICATION IN MOBILE LEARNING ARABIC VOCABULARY FOR NON-NATIVE SPEAKERS	205
REAL-TIME IOT-DRIVEN TODDLER TEMPERATURE MONITORING SYSTEM USING MOBILE APPLICATION ALERTS.....	207
WEB-BASED REAL-TIME SCORE MALAYSIA FOOTBALL INFORMATION SYSTEM.....	209
WEB-BASED STOCK MARKET PRICE PREDICTION USING MACHINE LEARNING LSTM	211
WEB-BASED EVENT MANAGEMENT TICKETING SYSTEM FOR UiTM.....	213
CPFIT: A PERSUASIVE MOBILE APPLICATION OF PHYSICAL EXERCISE FOR CEREBRAL PALSY PATIENTS	215
SMART SOIL FERTILITY DETECTION USING INTERNET OF THINGS	217
MITIGATION OF THE GREENHOUSE EFFECT IN SMART AGRICULTURE USING IOT FOR CHINESE CABBAGE	219
LEVERAGING DATA VISUALIZATION TO EVALUATE SOIL FERTILITY IN HARUMANIS CULTIVATION	221
A WEB-BASED CAMPUS CLUB MANAGEMENT APPLICATION	223
WEB-BASED CALORIE-CONSCIOUS MEAL RECOMMENDATION SYSTEM	225
RENTAL HOME FINDER APPLICATION USING FACE RECOGNITION	227
VEHICLE MONITORING SYSTEM USING UHF RFID.....	229
AUTOMATED VISITOR REGISTRATION SYSTEM USING HF RFID.....	231
WEB-BASED LOST AND FOUND WITH IMAGE RECOGNITION SYSTEM	233
BAITIJANNATI: A MOBILE APPLICATION FOR ORGANIZING HOUSEHOLD CHORES	235
EVENTIFY: CAMPUS EVENT MANAGEMENT WEB APPLICATION SYSTEM	237
WEB-BASED SPORTS EVENT MANAGEMENT SYSTEM (SAFMS)	239
IOT-BASED TODDLER PRESENCE DETECTION IN VEHICLES.....	241

RANKING FACTORS INFLUENCING CONSUMER PREFERENCE IN CHOOSING A PETROL STATION USING FUZZY AHP

Aini Kamilia Binti Yahya, Teoh Yeong Kin

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: ainikamiliaygmail.com, ykteoh@uitm.edu.my

Abstract

Many petrol station operators lack a structured approach to prioritising consumer preferences, especially in local areas like Perlis. This study applies the Fuzzy Analytical Hierarchy Process (F-AHP) to identify and rank factors influencing petrol station choices. A structured questionnaire was distributed to five selected experts, comprising UiTM Perlis lecturers, staff, and a petrol station worker. Pairwise comparisons and fuzzy AHP technique were employed to evaluate four main factors: fuel quality, service quality, location, and brand reputation, with each comprising three sub-factors. Results show fuel quality was the most significant factor (normalised weight = 0.4458), followed by brand reputation (normalised weight = 0.3207), location (normalised weight = 0.1327), and service quality (normalised weight = 0.1008). Sub-factors like loyalty programs and octane rating were highly ranked. Fuzzy AHP effectively highlighted priority areas for consumer decision-making, offering valuable insights for station operators and planners.

Keywords: *fuzzy AHP, petrol station, fuel quality, brand reputation, service quality, location*

1. Introduction

The main objective of this study is to rank the factors that influence consumer preference when choosing a petrol station using fuzzy AHP. Petrol station operators often rely on intuition or incomplete data for service improvements or station placement (Fowler, 2016). Without a structured approach, it is challenging to identify the factors that most significantly influence consumer preferences. This often leads to poor use of resources and limits opportunities for growth. There were four main factors, including fuel quality, service quality, location, and brand reputation, with each comprising three sub-factors. The respondents in the study were five experts, including lecturers and staff of the UiTM Perlis Branch, as well as petrol station workers in Arau, Perlis. The findings may not apply to other regions. Variations in local infrastructure, population density, economic conditions and regulatory environments could have led to different selections for petrol station dynamics in other areas.

2. Methodology

This study used the Fuzzy AHP method to rank factors that influence consumer preferences in petrol station selection. The process involved identifying the factors, designing a pairwise comparison questionnaire, converting linguistic terms into triangular fuzzy numbers, aggregating expert judgments, checking for consistency, calculating fuzzy weights, defuzzifying them into crisp values, normalising the results, and ranking the factors. Four main factors were considered: fuel quality, service quality, location, and brand reputation, with each comprising three sub-factors. Experts were selected based on their experience in petrol station operations or consumer behaviour research. The questionnaire was distributed manually to petrol station workers through face-to-face sessions, and online to UiTM Perlis staff and lecturers using the Smart Survey platform. All experts were guided to use the AHP one-to-nine scale. The questionnaire included twenty-six pairwise comparisons and took around thirty minutes to complete.

3. Results / Findings

The Fuzzy AHP analysis identified fuel quality as the most influential factor in consumer preference in choosing a petrol station, with a normalized weight of 0.4458, followed by brand reputation (normalized weight = 0.3207), location (normalized weight = 0.1327), and service quality (normalized weight = 0.1008). This result indicates that technical fuel aspects such as efficiency and engine performance are key priorities for consumers when selecting a petrol station. This result is consistent with the findings of Xavier et al. (2022), who emphasized that fuel quality plays a significant role in shaping customer satisfaction within petrol station services. Among the sub-factors, promotion and loyalty programs (normalized weight = 0.2488) were ranked as the most important sub-factor, followed closely by octane rating (normalized weight = 0.2295) and additive packages (normalized weight = 0.1986). These findings indicate that consumers simultaneously value economic incentives, such as loyalty programs, and technical reliability in fuel performance. This shows that consumers choose petrol stations based on both reasonable prices and good service quality in line with the findings of Sundjaja et al. (2022).

4. Novelty of Research

This study uses the Fuzzy AHP method to rank factors that influence consumer preferences when choosing a petrol station. It goes beyond previous research by combining product quality with consumer incentives in one framework. The Buckley approach is applied to capture expert judgment more accurately in uncertain conditions (Ayhan, 2013). This study focuses on Perlis to provide more location-specific insights. It also compares judgments from lecturers and staff of the UiTM Perlis Branch, as well as petrol station workers in Arau, Perlis. This gives a clearer picture of what consumers value. The results show that fuel quality influences consumers more than brand reputation, location and service quality in choosing a petrol station. This helps station operators understand where to improve. The novelty lies in applying fuzzy logic to a local context to support better decisions in the petrol retail industry.

5. Conclusion or Future Work

This study shows that fuel quality and brand reputation are the main factors for consumers in choosing a petrol station. Future research could apply this method to other states or compare urban and rural preferences. These findings can help petrol station operators focus on what matters most to attract and retain consumers.

REFERENCE LIST

- Ayhan, M. B. (2013). A fuzzy AHP approach for supplier selection problem: A case study in a gearmotor company. *International Journal of Managing Value and Supply Chains*, 4(3), 11–23. <https://doi.org/10.5121/ijmvsc.2013.4302>
- Fowler, K. (2016). Exploring the use of managerial intuition in retail site selection. *The Service Industries Journal*, 36(5-6), 183-199. <https://doi.org/10.1080/02642069.2016.1165672>
- Sundjaja, A. M., Savina, G., Yuli, Y., & Hardianto, T. (2022). The moderating effect of gamification on loyalty program usage in Indonesian E-Commerce. *Binus Business Review*, 13(1), 19–29. <https://doi.org/10.21512/bbr.v13i1.6801>
- Xavier, A. P., Wong, C. H., Arasu Raman, Yip, F. Y., & Ah Huai, A. C. (2022). Predictors of customers satisfaction at petrol stations in Malaysia. In *Res Militaris* (Vol. 12, Issue 3, pp. 2994–2995). <https://resmilitaris.net/uploads/paper/144791144cf3425a44570d43b0b99f92.pdf>

ALTERNATIVE ROUTE OPTIMIZATION FOR EMERGENCY SERVICES DURING FLOODS IN JOHOR BAHRU USING DIJKSTRA ALGORITHM

Amira Shaffiqa Binti Razif, Sharifah Fhahriyah Binti Syed Abas

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: amira12shaffiqa@gmail.com, sfhahriyah@uitm.edu.my

Abstract

During floods in Johor Bahru, transportation systems are often disrupted, causing delays in emergency supply deliveries to Pusat Pemindahan Sementara (PPS). This study aims to identify alternative delivery routes using Dijkstra's algorithm and compare delivery distances before and after flooding across four designated zones involving 27 PPS. Flood conditions were simulated by extending distances or blocking access to affected roads. The results showed that 17 out of 27 PPS (63%) experienced increased delivery distances after the flood. Zone A was unaffected, Zone B experienced up to a 140% increase, Zone C up to 297.83%, and Zone D recorded the highest increase of 842.42%. These findings highlight the importance of route optimization in disaster logistics, helping maintain connectivity and ensure timely aid delivery during emergencies.

Keywords: *Flood Disaster, Dijkstra's Algorithm, Route Optimization, Emergency Logistics, Johor Bahru*

1. Introduction

Flooding in Johor Bahru, Malaysia, frequently disrupts transportation networks and delays emergency response, particularly during the monsoon season (Rosmadi et al., 2023). This study aims to optimize vehicle transportation routes during flood events using Dijkstra's algorithm to identify safe and efficient alternatives. It analyses flood-affected zones, blocked roads, and evacuation centre locations, comparing delivery distances before and after flood events across four designated zones. Traditional navigation tools such as Google Maps and Waze are not designed for disaster scenarios (Mao et al., 2017), highlighting the need for flood-aware routing systems. By incorporating real-time conditions, the study enhances emergency logistics, improves response times, and supports uninterrupted delivery of essential services (Tian et al., 2025). Although limited to vehicle routes and based on 2025 data, the findings contribute to disaster preparedness and strengthen public safety and resilience in flood-prone urban settings (Boakye et al., 2022).

2. Methodology

This chapter outlines the methodology used to optimize emergency vehicle routes during flood events in Johor Bahru, Malaysia. Adopting a quantitative approach, the study integrates geospatial flood data, road network structures, and evacuation centre locations sourced from the Department of Irrigation and Drainage (2025). The road network is modelled as a weighted graph, with junctions and PPS centres represented as nodes and road distances as edge weights. Dijkstra's algorithm was applied due to its effectiveness in calculating the shortest path in a network (Tian et al., 2025). The simulation was implemented in Python using adjacency lists for efficient processing. The study categorizes 27 evacuation centres into four zones to manage routing scope and improve emergency response during simulated flood scenarios. Fundamental graph theory terms were defined to support understanding of the algorithmic process. This methodology ensures accurate modelling of real-world flood conditions and contributes to more efficient disaster response planning (Boakye et al., 2022).

3. Results / Findings

This chapter presents the simulation results of route optimization using Dijkstra's algorithm for emergency delivery to 27 Pusat Pemindahan Sementara (PPS) across four zones in Johor Bahru. The study evaluates delivery distances before and after simulated flooding. Under normal conditions, all PPS were reachable via the shortest paths. However, after introducing flood-based disruptions, 17 out of 27 PPS experienced increased delivery distances. Zone A remained unaffected, while Zones B, C, and D faced varying impacts. Notably, Zone C experienced consistent route extensions, and Zone D recorded the highest increase of 842.42% for PPS22. These findings highlight critical vulnerabilities in Johor Bahru's Road network during flood events and underscore the importance of adaptive routing algorithms in disaster scenarios (Tian et al., 2025). The results provide essential insights for emergency planners and authorities to enhance delivery logistics and ensure resilient response systems during floods.

4. Novelty of Research / Product / Project

This research presents a novel integration of flood-aware geospatial data with Dijkstra's algorithm to optimize emergency delivery routes during disaster scenarios in Johor Bahru, Malaysia. Unlike traditional routing tools such as Google Maps and Waze, which do not account for dynamic disaster conditions, this project simulates real-time road disruptions caused by flooding. It introduces a zone-based approach by categorizing 27 Pusat Pemindahan Sementara (PPS) into four strategic zones, enabling efficient resource allocation and delivery logistics. The simulation includes adjusted road weights to represent flood-affected segments, providing a realistic and data-driven model for emergency planning. By combining real flood data from the Department of Irrigation and Drainage with network modelling in Python, the project produces actionable insights for disaster response teams.

5. Conclusion or Future Work

This study used Dijkstra's algorithm to optimize emergency routes in Johor Bahru during floods, revealing major disruptions in Zones B, C, and D. Future work may include real-time data integration, alternative algorithms, and expanded coverage to improve dynamic routing, emergency response, and disaster preparedness across broader flood-prone areas.

REFERENCE LIST

- Boakye, J., Guidotti, R., Gardoni, P., & Murphy, C. (2022). *The role of transportation infrastructure on the impact of natural hazards on communities*. Reliability Engineering & System Safety, 219, 108184. <https://doi.org/10.1016/j.ress.2021.108184>
- Mao, Z., Jiang, Y., Min, G., Leng, S., Jin, X., & Yang, K. (2017). *Mobile social networks: Design requirements, architecture, and state-of-the-art technology*. Computer Communications, 100, 1–19. <https://doi.org/10.1016/j.comcom.2016.11.006>
- Rosmadi, H. S., Ahmed, M. F., Mokhtar, M. B., & Lim, C. K. (2023). *Reviewing challenges of flood risk management in Malaysia*. Water, 15(13), 2390. <https://doi.org/10.3390/w15132390>
- Tian, T., Wu, H., Wei, H., Wu, F., & Xu, M. (2025). *An Efficient Route Planning Algorithm for Special Vehicles with Large-Scale Road Network Data*. ISPRS International Journal of Geo-Information, 14(2), 71–71. <https://doi.org/10.3390/ijgi14020071>

MODELLING MONKEYPOX OUTBREAK USING EXPONENTIAL SMOOTHING MODELS

Ansor Hakimi Bin Shamsul, Azlan Bin Abdul Aziz

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022461416@student.uitm.edu.my, azlan172@uitm.edu.my

Abstract

Monkeypox has re-emerged as a global health concern, especially in the Democratic Republic of Congo (DRC), where monthly case trends show a worrying rise (WHO, 2022). Accurate forecasting of outbreak patterns is essential for public health planning and timely interventions. This study aims to model and forecast monkeypox cases using exponential smoothing methods. Monthly case data from January 2023 to February 2025 was collected from the World Health Organization and preprocessed to correct outliers using the Interquartile Range (IQR) method and median imputation. Five models Naïve, Mean, Simple Exponential Smoothing, Holt's Linear Trend, and Brown's Double Exponential Smoothing were evaluated using Repeated Time Series Cross-Validation (Aziz et al., 2018). The Holt model achieved the best performance, with a MAPE of 18.28% and a six-month forecast accuracy of 81.7%, proving it effective for short-term outbreak prediction. These findings highlight the practical application of exponential smoothing in disease forecasting and support its use in improving public health readiness and response strategies.

Keywords: *Monkeypox, Exponential Smoothing Models, Time Series Forecasting*

1. Introduction

Monkeypox is now considered a major public health problem in regions such as the Democratic Republic of Congo (DRC), whose cases keep rising each month. Health authorities are unable to act in time because they have little instrument to accurately forecast the outbreaks. This paper tries to provide a model and prediction of monkeypox cases in the future through the use of exponential smoothing techniques. The purpose would primarily be to determine the trend of monkeypox cases on a monthly basis in the DRC, find out the most appropriate forecasting model, and short-term predictions. Within the framework of this work, the reporting period is limited to January 2023-February 2025, with the data of the World Health Organization. This study is beneficial as improving the disease surveillance and planning of public health might be achieved profiting by the application and comparison of various forecasting models.

2. Methodology

This study used monthly monkeypox case data from the Democratic Republic of Congo from January 2023 to February 2025 obtained from the World Health Organization website. Outliers in the dataset were detected using the Interquartile Range (IQR) method and replaced with median values to improve data quality (Acuna & Rodriguez, 2004). Five forecasting models were applied which are Naïve, Mean, Simple Exponential Smoothing, Holt's Linear Trend, and Brown's Double Exponential Smoothing. Each model was tested using Repeated Time Series Cross-Validation with three data splits of 90:10, 80:20 and 75:25 to ensure fair and accurate comparison (Aziz et al., 2018). Model performance was evaluated using standard accuracy metrics: Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE).

3. Results / Findings

In this paper, five forecasting models were used to forecast monthly monkeypox cases in the Democratic Republic of Congo. The RTS-CV on 90:10, 80:20, 75:25 data splits were used to test each model and the performance of each model was assessed using RMSE, MAE, and MAPE. Holt Linear

Trend model proved to be the best of all models, performing specifically well in the data split which was 80:20 that brought the lowest MAPE of 18.28. The model of Holt was reliable in short-term forecasting, with an average prediction accuracy of 81.7%, even in a six-month ahead forecasting (September 2024 to February 2025). Less complex models such as Naive and Mean recorded greater errors and were poor at trend capture. The following findings point out that exponential smoothing specifically the Holt model work well to identify and forecast the trend of the disease. This can enable the public health authorities to be in a better position to forecast future outbreaks to their advantage in utilizing precision and convenient use of the forecasting tools.

4. Novelty of Research

This study presents a novel approach by applying multiple exponential smoothing models to forecast monkeypox outbreaks using actual case data from the Democratic Republic of Congo. While many forecasting studies focus on larger global diseases like COVID-19, this research targets monkeypox, an underrepresented topic in data-driven modelling. The integration of Repeated Time Series Cross-Validation across different data splits adds robustness to the model comparison, a technique rarely used in monkeypox forecasting (Aziz et al., 2018). Furthermore, the study highlights the effectiveness of simple yet powerful forecasting tools such as Holt's Linear Trend model, which can deliver accurate results without complex algorithms. This practical method supports timely health responses, especially in resource-limited settings where advanced systems may not be available.

5. Conclusion or Future Work

Holt's Linear Trend model accurately forecasted monkeypox cases in the DRC, showing strong short-term prediction performance. This study proves that simple models can support public health planning. Future work could explore advanced models and include more data such as population or vaccination rates for better accuracy.

REFERENCE LIST

- Aziz, A. A., Haris, N. A., Nor, N. A., & Sharif, N. (2018). Improving Air Pollution Index (API) predictive accuracy using time series cross-validation technique. *Journal of Fundamental and Applied Sciences*, 10, 1257–1267. <http://dx.doi.org/10.4314/jfas.v10i1s.93>
- Aziz, A. A., Mustaffa, Z., Ismail, S., Nor, N. a. M., & Fozzi, N. Q. M. (2025). A hybrid simple exponential Smoothing-Barnacles mating optimization approach for parameter estimation: Enhancing COVID-19 forecasting in Malaysia. *MethodsX*, 14, 103347. <https://doi.org/10.1016/j.mex.2025.103347>
- Aziz, A. A., Yusoff, M., Yaacob, W. F. W., & Mustaffa, Z. (2024). Repeated Time-Series Cross-Validation: a new method to improved COVID-19 forecast accuracy in Malaysia. *MethodsX*, 13, 103013. <https://doi.org/10.1016/j.mex.2024.103013>
- World Health Organization. (2022). *Monkeypox – Fact Sheet*. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/monkeypox>

ADAPTIVE FUZZY LOGIC SYSTEM FOR MICROWAVE COOKING OPTIMIZATION

Fatin Norsyafika Binti Sukri, Suzanawati Binti Abu Hasan

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: fatinnorsyafika24@gmail.com, suzan540@uitm.edu.my

Abstract

This study presents the development of an Adaptive Fuzzy Logic Control System for optimizing microwave cooking. Conventional microwave ovens typically rely on fixed settings that do not account for food variability. To address these issues, fuzzy logic was incorporated to dynamically adjust cooking parameter, specifically cooking time based on three input variables doneness level, quantity of food and initial temperature. The model uses a Mamdani type fuzzy inference system to produce accurate results that require overlapping membership functions and 27 rules in the form of IF THEN rules to determine the appropriate cooking time. The system's flexibility enables it to learn and adapt over time through human engagement, resulting in enhanced customisation and energy efficiency. The model was implemented and simulated using MATLAB, demonstrating consistent, high-quality cooking results with reduced energy usage. This invention highlights how intelligent control systems can improve the sustainability, efficiency, and precision of home appliances.

Keywords: Adaptive fuzzy logic, microwave cooking optimization, Mamdani inference system, intelligent appliances, energy efficiency

1. Results / Findings

Microwave ovens often operate on rigid presets that ignore variations in food texture, quantity and temperature resulting in uneven cooking and excessive power usage. This study aims to develop an adaptive fuzzy logic system that dynamically adjusts cooking time based on real-time input conditions. The system considers three key factors doneness level, food quantity and temperature. The objective is to optimize microwave performance for better consistency, personalization and energy savings especially in home setting where user preference and food diversity vary significantly.

2. Methodology

The fuzzy logic system was built using a Mamdani inference model consisting of fuzzification, rule evaluation and defuzzification stages. Input variables doneness level, quantity and temperature were mapped using triangular membership functions and cooking time was categorized as short, medium or long. A total of 27 IT-THEN rules constructed to handle all input conditions. MATLAB's Fuzzy Logic Toolbox was employed for modelling and testing. Simulations involved altering input values and observing the resulting cooking time. Rule viewers, control surfaces and membership editors were utilized to verify system behavior and manual calculations using the centroid method validated the defuzzified outputs.

3. Results / Findings

The adaptive system effectively responded to variations in food conditions by adjusting cooking time accordingly. For example, input values of doneness level=65, quantity=60 and temperature=59 resulted in cooking time of approximately 30 seconds, aligning with medium doneness. Simulations demonstrated consistent output generation and adaptability across different cases. The fuzzy logic model successfully improved the reliability and quality of microwave cooking outcomes while reducing energy use. The control surface visualizations confirmed the system's ability to generalize across multiple input interactions.

4. Novelty of Research / Product / Project

The proposed system introduces adaptive intelligence into microwave ovens using fuzzy logic principles, which is still limited in current consumer appliances. Unlike conventional models with fixed timers, this system dynamically tailors cooking time to match the actual food condition and user preference. Its learning potential further enhances personalization over time. By simulating the system in MATLAB, this research proves the feasibility of integrating AI based control in low-cost home appliances to improve both performance and sustainability. This innovation contributes to the development of smart kitchen technologies aligned with modern energy efficiency goals.

5. Conclusion or Future Work

The project successfully implements a fuzzy logic-based microwave controller that optimizes cooking time using a real time input variable. Future work may involve integrating sensors for live data capture, real world prototype development and expanding to broader food types and user interfaces for commercial application.

REFERENCE LIST

- Aziz, A., Polaki, H. K., Bhavani, S. B., & Mann, M. (2020). Microwave Oven Controller Using a Fuzzy Logic System. 2022 12th Int. Conf. on Cloud Computing, Data Science & Engineering (Confluence), 1–5. <https://doi.org/10.1109/confluence47617.2020.9057814>
- Ghelli, A., Hagra, H., & Aldabbagh, G. (2015). A Fuzzy Logic-Based Retrofit System for Enabling Smart Energy-Efficient Electric Cookers. IEEE Transactions on Fuzzy Systems, 23(6), 1984–1997. <https://doi.org/10.1109/tfuzz.2015.2394781>
- Lynn, N. D., Sourav, A. I., & Santoso, A. J. (2020). A Fuzzy Logic-based Control System for Microwave Ovens. J. of Physics: Conf. Series, 1577, 012021. <https://doi.org/10.1088/1742-6596/1577/1/012021>

MULTIPLE LINEAR REGRESSION AND K-MEAN CLUSTERING OF POST-COVID ON HOUSEHOLD INCOME IN MALAYSIA

Muhammad Akmal Danial bin Mohd Sabri, Wan Nurshazelin binti Wan Shahidan
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: akmaldanialsabri@gmail.com, shazelin804@uitm.edu.my

Abstract

This study explores the socio-economic factors that influence household income in Malaysia after the COVID-19 pandemic by using a combination of Multiple Linear Regression and K-Means clustering. Data were taken from the 2022 Household Income and Expenditure Survey provided by the Department of Statistics Malaysia. The regression analysis found that household size, age, gender, and education level significantly affect income. The model achieved an adjusted R-squared value of 0.499 and an F-value of 35.727, showing a moderately strong fit. These significant variables were then used in the clustering process, which grouped households into three distinct segments. The first group includes older, low-income, and less-educated households. The second group represents middle-income households with moderate education. The third group consists of younger, highly educated, and higher-income households. This hybrid approach gave more detailed insights than using regression alone and supports more targeted and effective policy planning. The findings are consistent with earlier research by Yee et al. in 2023, which highlighted the importance of clustering in understanding income differences in Malaysia.

Keywords: *Multiple Linear Regression, K-Means clustering, household income, Malaysia*

1. Introduction

This study aims to examine the demographic and socio-economic factors that influence household income in Malaysia's post-pandemic landscape. Drawing on 2022 survey data from the Department of Statistics Malaysia, the research applies a hybrid method combining Multiple Linear Regression (MLR) and K-Means clustering (Yee et al., 2023). The MLR model identifies statistically significant variables that explain income variation, while the clustering technique segments households into distinct socio-economic groups for clearer profiling. This approach enhances understanding of income inequality beyond traditional classifications like B40, M40, and T20. By segmenting households based on shared characteristics, the study builds on work by Yee et al. (2023), offering a more data-driven framework for targeted interventions and policy formulation.

2. Methodology

This study utilizes a quantitative approach based on secondary data from the 2022 Household Income and Expenditure Survey (HIES). From the available dataset, nine key variables were selected, including income, household size, education level, gender, age, marital status, employment type, strata (urban/rural) and state. First, a Multiple Linear Regression (MLR) model was developed to determine which variables significantly affect income. Model fit was evaluated using adjusted R-squared and F-statistics (Chen et al., 2023). Next, K-Means clustering was applied using only the significant predictors identified in the regression model. The optimal number of clusters was determined through the Within-Cluster Sum of Squares (WCSS) method (Saji, 2024). The resulting clusters were then analyzed to understand demographic and socio-economic differences, providing insights into hidden household segments. Visualizations such as boxplots and bar charts were used to aid interpretation. All statistical analysis and visualization were performed using SPSS software.

3. Results / Findings

The findings of this study highlight key demographic and socio-economic factors influencing household income in Malaysia. Using Multiple Linear Regression (MLR), variables such as education level, gender, age of the head of household, and household size were found to significantly affect income. Households with higher education, male household heads, older age, and larger size were generally associated with higher income levels. The MLR model produced an adjusted R^2 of 0.499, indicating a moderate fit. To further explore income differences, K-Means clustering was applied using the significant variables identified from the regression model. This process resulted in three distinct household segments. Cluster 1 consisted of older, less-educated, self-employed individuals with the lowest income. Cluster 2 included younger, moderately educated rural families with average income. Cluster 3 represented highly educated, urban professionals with the highest income. These results reveal clear socio-economic distinctions among Malaysian households and demonstrate the value of combining regression and clustering techniques for deeper insights into income inequality.

4. Novelty of Research / Product / Project

This study introduces a hybrid analytical approach by integrating Multiple Linear Regression (MLR) with K-Means clustering to examine household income disparities in Malaysia after the COVID-19 pandemic. While previous research has analyzed income determinants using traditional regression methods, this study goes a step further by segmenting the population into distinct socio-economic clusters before reapplying regression models. This two-step method allows for the identification of group-specific income patterns that would be overlooked in a general model (Yee et al., 2023). By using 2022 data from the Department of Statistics Malaysia (DOSM), the study reflects the most recent post-pandemic economic conditions, offering up-to-date insights into the factors that influence household income. The clustering process helped reveal hidden intra-group differences within standard income classifications like B40, M40, and T20, making the analysis more precise and meaningful. This innovative approach not only improves the understanding of income inequality but also enhances the potential for developing targeted and effective policy interventions tailored to the needs of different household types in Malaysia.

5. Conclusion or Future Work

This study concludes that strata, education level, gender, age, and household size significantly influence household income in Malaysia. The hybrid method combining MLR and K-means clustering provided deeper insights into socio-economic differences. Future research should include more variables and updated datasets to improve model relevance and support better-targeted policymaking.

REFERENCE LIST

- Chen, S., Fan, R., & Lin, Y. (2023). Research on Income and Expenditure Based on Multiple Linear Regression: A Case of Filipinos (pp. 117–125). https://doi.org/10.2991/978-94-6463-030-5_13
- Saji, B. (2024, December 4). Elbow method for optimal cluster number in K-Means. Analytics Vidhya. <https://www.analyticsvidhya.com/blog/2021/01/in-depth-intuition-of-k-means-clustering-algorithm-in-machine-learning/>
- Yee, G. P., Rusiman, M. S., Ismail, S., Suparman, Hamzah, F. M., & Shafi, M. A. (2023). K-means clustering analysis and multiple linear regression model on household income in Malaysia. *IAES International Journal of Artificial Intelligence*, 12(2), 731–738. <https://doi.org/10.11591/ijai.v12.i2.pp731-738>

ANALYZING INFLUENZA A SPREAD USING THE SEIR EPIDEMIOLOGICAL MODEL

Muhammad Lukman Hakim Roshdi, Dr. Nur Fatihah Fauzi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: mohdiman3077@gmail.com, fatihah@uitm.edu.my

Abstract

Influenza A remains a significant public health issue globally, with seasonal outbreaks causing widespread morbidity and mortality. In Malaysia, influenza A transmission patterns are influenced by various factors, including population density, urbanization, and climate. This study uses the SEIR (Susceptible–Exposed–Infected–Recovered) model to analyze the spread of Influenza A, calculate the basic reproduction number (R_0), and assess the stability of disease equilibrium points. Simulations over one, two, and three years reveal the disease's transmission dynamics, with eigenvalue analysis indicating that the disease-free equilibrium remains unstable, suggesting potential for continued spread without intervention. Although the model considers births and deaths, it does not account for vaccination, reinfection due to waning immunity, or mortality, which limits the model's real-world applicability. The study emphasizes the need for effective public health interventions and highlights areas for future research to improve model predictions.

Keywords: *Influenza A, SEIR model, Basic reproduction number (R_0), Disease transmission, Epidemic modeling*

1. Introduction

This study aims to investigate the spread of Influenza A in Malaysia using the SEIR (Susceptible–Exposed–Infected–Recovered) model. The key objectives are to formulate the SEIR model, calculate the basic reproduction number (R_0), and analyze the stability of its equilibrium points. The model utilizes data from the Ministry of Health Malaysia (MOH) spanning from January 2022 to December 2024. The focus is on the transmission dynamics of Influenza A, incorporating transmission rates, disease progression, and recovery rates, while considering Malaysia's unique environmental, demographic, and socio-economic conditions. The scope of this study is confined to Malaysia, which enhances the relevance and applicability of the findings to local public health planning. However, the study is subject to limitations, such as potential data inconsistencies and simplified assumptions in the model. Despite these limitations, the study provides valuable insights into Influenza A transmission patterns and contributes to epidemic preparedness and response.

2. Methodology

This study applies the SEIR (Susceptible–Exposed–Infected–Recovered) model to examine the dynamics of Influenza A transmission in Malaysia. The population is divided into four compartments: susceptible (S), exposed (E), infected (I), and recovered (R). The transitions between compartments are described by a system of differential equations, with key parameters including the transmission rate (β), disease rate (σ), recovery rate (γ), and natural birth and death rate (μ) (Leonenko & Ivanov, 2016). The basic reproduction number (R_0) is calculated using the Next Generation Matrix method (Saito et al., 2013). Python software is used to simulate the model's dynamics and compute eigenvalues from the Jacobian matrix, allowing for the analysis of stability at both disease-free and endemic equilibrium points (Maulana & Ramdani, 2024).

3. Results / Findings

The results and findings of this study were obtained by simulating Influenza A transmission in Malaysia using the SEIR model, implemented in Python. Simulations were conducted for one-year, two-year, and three-year periods using initial conditions and parameter values sourced from the Ministry of Health Malaysia (MOH) and previous studies (Leonenko & Ivanov, 2016; Saito et al., 2013). Across all timeframes, the simulations displayed typical epidemic behavior: the susceptible population declined sharply, the exposed and infected groups peaked early, and the recovered group gradually increased and stabilized over time. Most transmission occurred within the first 60 to 100 days. The basic reproduction number, R_0 , was consistently less than 1, indicating a low risk of widespread transmission. Eigenvalue analysis of the Jacobian matrix (Maulana & Ramdani, 2024) confirmed instability in the disease-free equilibrium across all periods, suggesting the potential for endemic persistence of Influenza A in Malaysia and the need for ongoing public health interventions.

4. Novelty of Research / Product / Project

The findings indicate that while Influenza A remains a potential threat in Malaysia, with an R_0 consistently less than 1, the basic SEIR model still lacks the complexity to fully capture real-world dynamics. Future studies should enhance the model by adding compartments for vaccinated individuals, considering waning immunity, and including mortality due to influenza. These additions are crucial, especially as Malaysia continues its vaccination efforts and focuses on improving public health strategies. Given the possibility of reinfection and the emergence of new strains, model flexibility is essential. Incorporating these elements will improve the model's realism, enable more accurate predictions, and provide more effective strategies for Influenza A prevention and control.

5. Conclusion or Future Work

This study used the SEIR model to analyze Influenza A spread in Malaysia, showing low transmission risk ($R_0 < 1$). Future work should improve the model by incorporating vaccination, immunity, and mortality. Continued public health efforts are crucial to managing and reducing Influenza A outbreaks in the future.

REFERENCE LIST

- Leonenko, V. N., & Ivanov, S. V. (2016). Fitting the SEIR model of seasonal influenza outbreak to the incidence data for Russian cities. *Russian Journal of Numerical Analysis and Mathematical Modelling*, 31(5). <https://doi.org/10.1515/rnam-2016-0026>
- Maulana, F. I., & Ramdani, Y. (2024). Python application to SEIR model of the spread of malaria. *BIOS Jurnal Teknologi Informasi Dan Rekayasa Komputer*, 5(2), 150–160. <https://doi.org/10.37148/bios.v5i2.151>
- Saito, M. M., Imoto, S., Yamaguchi, R., Sato, H., Nakada, H., Kami, M., Miyano, S., & Higuchi, T. (2013). Extension and verification of the SEIR model on the 2009 influenza A (H1N1) pandemic in Japan. *Mathematical Biosciences*, 246(1), 47–54. <https://doi.org/10.1016/j.mbs.2013.08.009>

A SYSTEMATIC ANALYZING AND RANKING OF FACTORS INFLUENCING TEACHERS' EARLY RETIREMENT INTENTIONS USING FUZZY DELPHI METHOD

Muhammad Naim Hazami bin Isrofaizal, Mohd Halimi Ab Hamid

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: naiymfazny03@gmail.com, halimi@uitm.edu.my

Abstract

Education is key to Malaysia's nation-building, with the Ministry of Education stressing strong leadership as per the Malaysian Education Development Plan 2013-2025. However, early retirement among school leaders highlights the need for better financial literacy and retirement planning to address issues and push policy changes. This study uses the Fuzzy Delphi Method to rank factors affecting early retirement intentions among 25 teachers aged 35-55 with at least 10 years of experience at SMK Parit Panjang, aiming to improve teacher retention and educational stability. It examines job stress, health issues, financial factors, demographic factors, and workload challenges with a standardized questionnaire. Data were turned into triangular fuzzy numbers (TFN) and analyzed using defuzzification and threshold techniques. Results, with defuzzified values from 0.483 to 0.656 and consensus levels of 80-100%, showed health concerns, job stress, financial factors, and workload as key factors, while demographic factors (0.448, 68% consensus) were dropped below the 75% threshold. Health issues ranked highest, followed by job stress, financial factors, and workload challenges. This study offers a framework for policymakers to create solutions for a sustainable education system.

Keywords: *Delphi, Early Retirement Intentions, Teachers.*

1. Introduction

The Fuzzy Delphi method will be used to identify and rank key variables driving early teacher retirement, enabling stakeholders to design targeted interventions and policies to enhance teacher retention and educational quality (Ishikawa, 1993). This study aims to rank factors influencing early retirement intentions among teachers at SMK Parit Panjang, Kuala Ketil, Kedah, using the Fuzzy Delphi method, focusing on 25 teachers that eligible for early retirement. The specific objective is to analyze expert consensus on factors, ranking their relative importance to enhance understanding of the dynamic decision-making process. Qualitative data from instructors will be converted into fuzzy sets, evaluated with the Fuzzy Delphi method to reduce ambiguity in human judgment. However, limitations include the small sample size, subjective biases, lack of detailed exploration into family dynamics, and potential obsolescence due to policy, economic or social changes, restricting generalizability to other schools or regions.

2. Methodology

The study employed the Fuzzy Delphi Method to systematically analyze and rank factors influencing early retirement intentions among teachers at SMK Parit Panjang, Kuala Ketil, Kedah. Data collection involved a structured questionnaire distributed via Google Forms, divided into four sections which are demographic information, initial perceptions, factor evaluation, and ranking. The questionnaire assessed five factors using a five-point Likert scale which are Strongly Agree to Strongly Disagree, later converted into TFN for analysis. The process began with expert selection, ensuring diversity in teaching roles and experience. Next, data were collected and transformed into fuzzy sets, with linguistic responses mapped to numerical values. Next, threshold values were calculated using the formula $d = |\text{expert fuzzy number} - \text{average fuzzy number}|$, with $d \leq 0.2$ indicating consensus. Defuzzification followed, with $A_{\max} = [m1 + m2 + m3]/3$ to rank factors, accepting those with a

fuzzy score ≥ 0.5 and $\geq 75\%$ consensus. This rigorous methodology ensured reliable prioritization of factors, providing actionable insights for educational policymakers.

3. Results / Findings

The study analyzed data from 25 teachers at SMK Parit Panjang using the Fuzzy Delphi Method to rank factors influencing early retirement intentions. Results showed health issues as the top factor with defuzzified value 0.656 and 88% consensus, followed by job stress with defuzzified value 0.600 and 100% consensus, financial considerations and workload challenge with defuzzified value 0.488 and 0.483, and also 84% and 80% consensus respectively. Demographic factors with defuzzified value 0.448 and 68% consensus, below 75% threshold were rejected (Jusoh, 2021). These findings highlight health and stress as critical drivers, aligning with prior research, and suggest targeted interventions like wellness programs and workload reduction to enhance teacher retention.

4. Novelty of Research

This project offers a novel contribution to the study of early retirement among secondary school teachers by applying the Fuzzy Delphi Method in the specific context of SMK Parit Panjang, a rural school in Kuala Ketil, Kedah, Malaysia. The integration of fuzzy logic to handle expert opinions addresses the ambiguity in retirement decision-making, a methodological innovation over traditional Delphi approaches. By ranking factors while excluding demographic factors due to insufficient consensus, this research uncovers context-specific priorities not fully explored in existing literature. The use of TFN and defuzzification enhances the precision of factor prioritization, offering a robust framework for policy development.

5. Conclusion or Future Work

This study concludes that health issues and job stress are primary drivers of early retirement among SMK Parit Panjang teachers, with financial and workload factors also significant. Generalizability would be enhanced by expanding the sample size to include more schools and geographical areas.

REFERENCE LIST

- Ishikawa, A., Amagasa, M., Shiga, T., Tomizawa, G., Tatsuta, R., & Mieno, H. (1993). The max-min Delphi method and fuzzy Delphi method via fuzzy integration. *Fuzzy Sets and Systems*, 55(3), 241-253.
- Jusoh, Y. M. (2021). Enhancing expert consensus in educational research using the Fuzzy Delphi Method. *Malaysian Journal of Social Sciences and Humanities*, 6(8), 112-123.

LUNG CANCER PREDICTION USING MACHINE LEARNING

Natrah binti Ahmad Thohawi, Norpah binti Mahat

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: natrah683@gmail.com, norpah020@uitm.edu.my

Abstract

Lung cancer continues to be one of the main causes of cancer deaths all over the world, majorly because of the advanced diagnosis (Bertolaccini et al., 2017). The research project seeks to improve early detection by carrying predictive modelling with several different machine learning algorithms. Python was used to analyse the data set consisting of 309 entries of health-related survey questions age, gender, smoking pattern and signs and symptoms like cough, chest pain and shortness of breath. There are five models of classification which are Artificial Neural Network (ANN), Logistic Regression, Decision Tree, Naive Bayes and Gradient Boosting and compared each one. The performance of each model was measured using accuracy, precision, recall, F1 scores, confusion matrix and 10-fold cross-validation. The overall highest performance was achieved by Gradient Boosting (accuracy of 89.32%) and Logistic Regression obtained the most consistent cross-validation score (91.92%). The ANN had flawless recall but a major issue with the false positives. Decision Tree and Naive Bayes have proved also to be reliable, which makes their implementation into clinical measures to be possible. This study proves that machine learning algorithms can prove to be of major help in predicting lung cancer when tuned more to sensitivity or specifically (Raoof et al., 2020). Even though some of the models showed trade-offs (tendency of ANN to over-predict positive cases), combination of several algorithms and the highly directional parameter tuning can lead to better reliability of diagnostics. Predictive modelling is effective in early detection that not only raises the chances of survival but also minimizes the burden on the healthcare systems (Raoof et al., 2020).

Keywords: *Lung Cancer, Machine Learning, Artificial Neural Network, Logistic Regression, Gradient Boosting, Classification Model*

1. Introduction

Lung cancer has become a large issue in the world today and the ability to survive this disease has been greatly influenced by the early diagnoses (Bertolaccini et al., 2017). Nevertheless, the present-day ways of diagnostics analyse the disease when it is already in developed stages, which restricts success of treatment. The study addresses how machine learning methods are applied to enhance the early detection of lung cancer. The main objective is to predict lung cancer using machine learning based on the most important patient characteristics like age, smoking status and such symptoms as coughing or pain in the chest. The paper will also compare how well the five machine learning algorithms, namely Artificial Neural Network (ANN), Logistic Regression, Decision Tree, Naive Bayes and Gradient Boosting, perform. Through these results, it could be evaluated concerning the accuracy, precision, recall and F1 score to determine the most appropriate model to be used in lung cancer prediction. The scale does not exceed a well-organized data with 309 records and is devoted more to the algorithmic research, not to clinical implementation

2. Methodology

This paper predicts lung cancer development in terms of health-related factors through a systematic machine learning procedure. The data which is provided by Kaggle has 309 examples and 15 variables such as age, cigarette use, anxiety, returning cough, chest pain, breathlessness. Raw data were initially pre-processed while the categorical data were encoded as numeric, and the quality of the data with missing values was tested. This dataset was later split into training (70%) and testing (30%) dataset. The Scikit-learn library available in Python implemented five learning algorithms, namely, Artificial Neural Network (ANN), Logistic Regression, Decision Tree, Naive Bayes, and Gradient

Boosting. Four metrics (accuracy, precision, recall and F1 score) were used to evaluate the model. To understand which classifications were incorrect and correct, each model was provided with a confusion matrix. To make the results more dependable, 10-fold cross-validation was used where an average performance was computed over several partitions. This is a systematic procedure that allowed a fair comparison regarding the effectiveness of the models to predict lung cancer and determine those that had the best sensitivity and specificity combination to be used practically in assisting early detection.

3. Results / Findings

This study used a machine learning algorithm to for predict lung cancer using five machine learning algorithms on a data set of 309 patient records. The accuracy, precision, recall, F1 score, and confusion matrix comprehensions were used to assess each model. Gradient Boosting scored the best with accuracy of 89.32 percent followed by Logistic Regression with 88.35 percent. The Artificial Neural Network (ANN) had a hundred percent (100%) recalls, which meet all the positive cases of lung cancer. However, it had shown a large amount of false positive results, which means that it is an overprediction. The performance levels between Naive Bayes and Decision Tree were about equal and models performed approximately at 86.41 percent accuracy. The model stability was also confirmed using 10-fold cross-validation, with Logistic Regression-based model having an average score of 91.92%, which confirmed its consistency in splitting data. These results show that ANN is very sensitive, yet the Logistic Regression and Gradient Boosting have overall performance superior to misclassifications. This makes them better applicable in practical application in early detection of lung cancer where there is a call to have accuracy and reliability.

4. Novelty of Research

This research has the potential to be novel because the machine learning models have been used in predict lung cancer using only basic and symptomatic data without relying on expensive tests or scans. The model features, including age, smoking status, chest discomfort, and shortness of breath, allow it to be used at the early screening stage, particularly in less resourceful environments. It is unique in the sense that all five machine learning algorithms, ANN, Logistic Regression, Decision Tree, Naive Bayes, and gradient boosting are compared on a single dataset. The study provides reliable findings due to the use of 10-fold cross-validation that also indicates the possibility of creating effective, broadly available, and scalable diagnostic tools.

5. Conclusion or Future Work

This research shows that machine learning could be successful in predicting lung cancer based on simple health data. In the future, the model could be enhanced through larger and more varied data sets and possibly be transformed into a user-friendly system of early screening in clinics particularly in low resource regions.

REFERENCE LIST

- Bertolaccini, L., Solli, P., Pardolesi, A., & Pasini, A. (2017). An overview of the use of artificial neural networks in lung cancer research. *Journal of Thoracic Disease*, 9(4), 924–931.
<https://doi.org/10.21037/jtd.2017.03.157>
- Raoof, S. S., Jabbar, M. A., & Fathima, S. A. (2020). Lung cancer prediction using machine learning: A comprehensive approach. In *2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA)* (pp. 108–115). IEEE.
<https://doi.org/10.1109/ICIMIA48430.2020.9074947>

FUZZY VIKOR FOR RANKING CARS AMONG UNIVERSITY FINAL YEAR STUDENTS

Nisha Shabihah Binti Shah Nuri, Raihana Zainordin

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nisha.shabihah23@gmail.com, raihana420@uitm.edu.my

Abstract

Owning a car is important for final-year students transitioning into working life. However, choosing a car to buy is not easy. This is because there are a wide variety of cars available in the market. This can make the buyer feel overwhelmed to decide which car is the best fit for them. This study aims to identify the most important criteria students consider when purchasing a car and to rank selected car models using the fuzzy VIKOR method. This study also aims to compare the fuzzy VIKOR ranking with students' intuitive ranking (without fuzzy VIKOR). The cars chosen for this study are Perodua Axia, Perodua Bezza, Perodua Myvi, Proton Saga and Proton Iriz. The criteria chosen for this study are price, fuel efficiency, safety, exterior design, and interior design. The respondents of the study are 139 UiTM Perlis final-year students. It was found that the number one criterion that students will consider if they want to buy a car is price. It was also found that Perodua Axia is the most suitable cars for students who will soon graduate even though the most desired car among them is Perodua Myvi. The fuzzy VIKOR approach proved effective in handling subjective preferences and produced a fairer ranking outcome, supporting students and car marketers in decision-making.

Keywords: VIKOR, MCDM, Cars, University Final Year Students

1. Introduction

Final-year university students often see owning a car as a practical need, not just for convenience but also to prepare for future responsibilities as they move into working life. Since car selection involves many criteria like price, fuel efficiency, safety, exterior design and interior design, this study uses the Fuzzy VIKOR method to help students make better decisions based on their personal preferences. The aims of this study are to find out which criteria matter most, rank cars using Fuzzy VIKOR and compare the results with rankings that do not use fuzzy VIKOR methods. Five local car models which are Perodua Axia, Perodua Bezza, Perodua Myvi, Proton Iriz and Proton Saga were rated by 139 final-year students from UiTM Perlis.

2. Methodology

This study applied the fuzzy VIKOR multi-criteria decision-making (MCDM) approach to help final-year university students rank five car models based on their preferences. A total of 139 final-year students from UiTM Perlis participated in the survey. They were asked to evaluate five selected criteria which were price, fuel efficiency, safety, exterior design, and interior design. The data were collected through an online questionnaire using linguistic variables, which were then converted into fuzzy numbers. These fuzzy values were averaged to determine the importance of each criterion and the performance of each car alternative. The Fuzzy VIKOR steps included constructing a fuzzy decision matrix, identifying the fuzzy best and worst values, and calculating separation measures (S and R). Then, and these values were defuzzifying using the centroid method. The final Q-index was calculated to rank the cars, where a lower Q value indicated a better alternative. This structured method provided a practical way to support decision-making involving multiple, subjective, and conflicting criteria (Opricovic & Tzeng, 2004),

3. Results / Findings

The findings showed that price is the most important criterion for final-year university students when choosing a car followed by fuel efficiency. Then, safety, exterior design and interior design. This reflects students' financial limitations as most are still dependent on their families or just starting to manage their own finances. This finding aligns with Ulkhaq et al. (2018), who also found that price as the top priority for car buyers in developing countries. Based on the Fuzzy VIKOR analysis, Perodua Axia was ranked the most suitable car with a Q value of 0.070 due to its low cost and high fuel efficiency. Perodua Myvi followed closely with a Q value of 0.071, offering better features but at a higher price. Perodua Bezza, Proton Saga, and Proton Iriz ranked third to fifth respectively. These results show that Fuzzy VIKOR is useful in combining both subjective preferences and objective data for better decision-making (Opricovic & Tzeng, 2004). It also highlights how affordability and practicality guide car choices among young first-time buyers.

4. Novelty of Research

This study introduces a unique application of the Fuzzy VIKOR method to support final-year university students in making decisions of car purchasing. While Fuzzy VIKOR has been widely applied in fields such as supply chain management (Rostamzadeh et al., 2015) and ergonomic assessment (Koppiahraj et al., 2020), its use in consumer decision-making for first-time car buyers among students in Malaysia is still limited. The novelty of this study lies in its focus on a specific and underrepresented group which students transitioning into working life. By integrating both objective criteria like price and fuel efficiency and subjective preferences such as safety, exterior design and interior design this study provides a more realistic way of choosing cars that suits what students want and need. Moreover, this study shows how Fuzzy VIKOR can help match what consumers expect with what car makers offer, giving useful insights for both students and car companies aiming at young buyers in Malaysia.

5. Conclusion or Future Work

This study shows that Fuzzy VIKOR is effective in ranking cars based on both practical and personal factors. This will help university final year students make better choices. Future study can include more car models such as Honda Civic. Besides, using different decision-making methods like fuzzy AHP, Fuzzy PROMETHEE and consider more criteria such as maintenance cost and engine performance.

REFERENCE LIST

- Koppiahraj, K., Bathrinath, S., & Saravanasankar, S. (2020). A fuzzy VIKOR approach for selection of ergonomic assessment method. *Materials Today: Proceedings*, 45, 640–645. <https://doi.org/10.1016/j.matpr.2020.02.725>
- Opricovic, S., & Tzeng, G. H. (2004). Compromise solution by MCDM methods: A comparative analysis of VIKOR and TOPSIS. *European Journal of Operational Research*, 156(2), 445–455. [https://doi.org/10.1016/S0377-2217\(03\)00020-1](https://doi.org/10.1016/S0377-2217(03)00020-1)
- Rostamzadeh, R., Govindan, K., Esmacili, A., & Sabaghi, M. (2015). Application of fuzzy VIKOR for evaluation of green supply chain management practices. *Ecological Indicators*, 49, 188–203. <https://doi.org/10.1016/j.ecolind.2014.09.045>
- Ulkhaq, M. M., Wijayanti, W. R., Zain, M. S., Baskara, E., & Leonita, W. (2018). Combining the AHP and TOPSIS to evaluate car selection. *ACM International Conference Proceeding Series*, 112–117. <https://doi.org/10.1145/3195612.3195628>

A CROSS-SECTIONAL STUDY ON MATHEMATICS ANXIETY AND MATHEMATICS SELF-EFFICACY AMONG HIGH SCHOOL STUDENTS USING FUZZY CONJOINT ANALYSIS

Nur Aina Nabila Rosli, Jasmani Bidin

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nurainabila1602@gmail.com, jasmani@uitm.edu.my

Abstract

Mathematics anxiety and self-efficacy are acknowledged as key predictors of students' attitudes and performance in mathematics. This study examines the levels of mathematics anxiety and self-efficacy among 62 secondary school students from SMK Ketereh, Kelantan. Data were collected using the Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ) and analyzed using the Fuzzy Conjoint Analysis to determine the membership degree of each attribute based on predefined linguistic levels. Spearman's Rank Correlation was applied to examine the relationships between key variables. The results indicated that students experienced high levels of mathematics anxiety, particularly related to fear of failure and concerns about performance. Despite this, students also demonstrated high levels of confidence in their mathematical capabilities. Comparisons between lower and upper secondary students revealed minimal differences in perception. Additionally, a weak positive correlation was observed between self-efficacy and achievement, as well as between anxiety and achievement. A weak negative correlation was found between anxiety and self-efficacy. The findings highlight the importance of enhancing instructional strategies and providing targeted support to help students manage anxiety and build confidence in mathematics.

Keywords: *Anxiety, Self-efficacy, FCA, Spearman rank, Secondary School Students*

1. Introduction

Mathematics anxiety negatively affects students' ability to engage with mathematical tasks and can lead to poor performance and low confidence. Conversely, self-efficacy is associated with greater persistence and improved academic outcomes. This study focuses on understanding the relationship between mathematics anxiety and self-efficacy among Form 2 and Form 4 students in SMK Ketereh, Kelantan. The objectives of this study are to analyse and compare MA and SE levels between lower and upper secondary students, and to measure the correlation among MA, SE, and math achievement. Understanding these relationships provides insight into psychological barriers that hinder mathematics learning.

2. Methodology

The study used a cross-sectional design and a questionnaire-based survey. The Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ) by May (2009) was used to collect data from 62 students. It includes 29 items rated using a 5-point Likert scale. Fuzzy Conjoint Analysis was applied to transform responses into similarity values for each linguistic category, such as "agree" or "strongly disagree". This method captures students' perception using fuzzy logic, which allows for uncertain or vague responses (Kasim et al., 2023). Spearman's Rank Correlation was used to evaluate relationships between anxiety, self-efficacy, and academic performance. This non-parametric test is suitable for ordinal data and does not assume normal distribution (Gupta, 2025; Ali & Al-Hameed, 2022).

3. Results / Findings

The results indicated that students experienced high levels of mathematics anxiety. Among lower and upper secondary students, attributes "I worry that I will not be able to get an 'A' in my mathematics course", and "I worry that I will not be able to learn well in my mathematics course" showed the

highest anxiety score. This indicates that students at both levels are mainly anxious about achieving good grades, understanding mathematical content, and managing the overall learning process. Despite this, students also demonstrated high levels of confidence in their mathematical capabilities. Lower secondary students showed the highest self-efficacy in the attribute “I believe I can complete all of the assignments in a math course”, while upper secondary students “I believe I can learn well in a mathematics course”. This shows that lower secondary students are more confident in completing tasks, while upper secondary students are more confident in their ability to learn mathematics effectively. Comparisons between lower and upper secondary students revealed minimal differences in perception. Additionally, Spearman’s correlation showed a weak negative relationship between MA and SE ($\rho = -0.1484$), suggesting that higher anxiety slightly reduces confidence. However, weak positive correlations were found between both MA and achievement ($\rho = 0.0187$), and SE and achievement ($\rho = 0.1808$). The findings highlight the importance of enhancing instructional strategies and providing targeted support to help students manage anxiety and build confidence in mathematics.

4. Novelty of Research / Product / Project

This research introduces a novel application of Fuzzy Conjoint Analysis (FCA) in investigating mathematics anxiety and self-efficacy among rural secondary school students, specifically SMK Ketereh, Kelantan. Unlike previous studies that focus on university students as the sample population, this research targets secondary school students aged 14 and 16, offering fresh insights into emotional and cognitive learning barriers at an earlier stage. By using FCA, this study handles uncertainty and subjectivity in students’ responses more effectively. The use of fuzzy set-based similarity ranking allows for more accurate insight interpretation of attitudes, while integration with Spearman rank correlation adds statistical depth. This method captures both perceptual patterns and their links to achievement, offering a new framework for assessing psychological factors in education. The localized focus and combined methodology make this study a valuable reference for future work on student impact in STEM education (Rozgonjuk et al., 2020).

5. Conclusion or Future Work

This study shows that high anxiety in mathematics and self-efficacy coexist among students simultaneously. Both have to be treated to improve outcomes in teaching. Future research must cover more schools and employ longitudinal designs to track trends over time. The combination of FCA and Spearman correlation analysis provides a useful tool to trace student attitudes in mathematics.

REFERENCE LIST

- Ali Abd Al-Hameed, K. (2022). Spearman's Correlation Coefficient in statistical analysis. *International Journal of Nonlinear Analysis and Applications*, 13(1), 3249-3255. <http://dx.doi.org/10.22075/ijnaa.2022.6079>
- Gupta, A. (2025, April 10). *Spearman's Rank correlation: The Definitive Guide to understand*. Simplilearn.com. <https://www.simplilearn.com/tutorials/statistics-tutorial/spearmans-rank-correlation>
- Kasim, Z., & Sukri, N. L. M. (2022). Measuring students' perception on mathematics learning using fuzzy conjoint analysis. *Journal of Computing Research and Innovation*, 7(1), 79–88. <https://doi.org/10.24191/jcrinn.v7i1.270>
- May, D. K. (2009). Mathematics self-efficacy and anxiety questionnaire. <https://athenaeum.libs.uga.edu/handle/10724/25886>
- Rozgonjuk, D., Kraav, T., Mikkor, K., Orav-Puurand, K., & Täht, K. (2020). Mathematics anxiety among STEM and social sciences students: the roles of mathematics self-efficacy, and deep and surface approach to learning. *International Journal of STEM Education*, 7(1). <https://doi.org/10.1186/s40594-020-00246-z>

MACHINE LEARNING PREDICTION OF SLEEP QUALITY AMONG UITM PERLIS STUDENTS USING THE PITTSBURGH SLEEP QUALITY INDEX

Nur Aisah Binti Mohd Rosdi, Nor Hayati Binti Shafii

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nurraisah09@gmail.com, norhayatishafii@uitm.edu.my

Abstract

Sleep serves as a fundamental process for repairing the body, replenishing mental energy, and maintaining emotional stability (Zhang et al., 2023). However, a low quality of sleep is typical of the university students. This study aimed to assess sleep quality among UiTM Perlis students using machine learning (ML) and to compare the performance of XGBoost, Random Forest, and Decision Tree models in predicting sleep quality. A total of 242 responses were collected using the Pittsburgh Sleep Quality Index (PSQI) questionnaire (Buysse et al., 1989), which included demographic and lifestyle factors. After encoding, scaling, and preprocessing, all models were tuned using GridSearchCV with 5-fold cross-validation. Performance was evaluated using accuracy, precision, recall, F1-score, and AUC. The mean PSQI global score was 7.18, indicating that most students had poor sleep quality. Among the models tested, XGBoost achieved the highest test accuracy (97.96%) and best cross-validation score (95.34%) with the lowest standard deviation, confirming its accuracy and stability. Overall, this study demonstrates that ML models, particularly XGBoost, can effectively predict sleep quality among UiTM Perlis students.

Keywords: Sleep Quality, Pittsburgh Sleep Quality (PSQI), Machine Learning, Prediction

1. Introduction

Adequate sleep is universally recognised as a key factor in sustaining optimal health and performance (Zhang et al., 2023). According to Hirshkowitz et al. (2015), adults aged 18 to 64 are recommended to get 7 to 9 hours of sleep each night. However, poor sleep quality is prevalent among university students due to academic pressure, irregular routines, and excessive screen time (Bitkina et al., 2022). These issues may lead to fatigue, stress, and reduced academic performance. This study addresses by applying machine learning (ML) techniques to predict sleep quality among UiTM Perlis students. The main objectives are to predict students' sleep quality using ML models and to compare the performance of XGBoost, Random Forest, and Decision Tree algorithms based on PSQI data collected from UiTM Perlis.

2. Methodology

This study applied machine learning to predict sleep quality among UiTM Perlis students using PSQI data and selected demographics. A total of 242 valid responses were collected via an online questionnaire covering seven PSQI components and demographic details. Preprocessing steps included handling missing values, one-hot encoding, and standard scaling. Models were developed using Python (scikit-learn, XGBoost) and optimised with GridSearchCV using 5-fold cross-validation. Performance was evaluated using accuracy, precision, recall, F1 score, and AUC, ensuring a systematic and reproducible prediction pipeline.

3. Results / Findings

The outcomes of this study demonstrated that machine learning techniques are effective in predicting sleep quality among UiTM Perlis students. Among the three models evaluated, Decision Tree,

Random Forest, and XGBoost. The XGBoost model showed the best overall performance, achieving the highest accuracy (97.96%) and AUC. This indicates that XGBoost was most effective in capturing complex patterns within the PSQI and demographic data. The models were evaluated using key classification metrics including accuracy, precision, recall, F1-score, and AUC. Overall, these results highlight that machine learning approaches, particularly XGBoost, are well-suited for accurate and efficient assessment of sleep quality.

4. Novelty of Research / Product / Project

This study introduces a novel approach by applying machine learning (ML) techniques to predict sleep quality among university students using the PSQI and selected demographic variables. While previous studies relied solely on descriptive or inferential analysis of PSQI, (Farah et al., 2019). This research incorporates supervised ML models to develop predictive insights, enabling early identification of poor sleep quality. The integration of PSQI components with ML enhances the objectivity and reproducibility of sleep quality assessment. This work contributes to the growing field of health informatics by demonstrating how machine learning can support data-driven interventions to improve student well-being.

5. Conclusion or Future Work

This study demonstrated the effectiveness of machine learning, particularly XGBoost, in predicting sleep quality using PSQI data. Future research could explore larger and more diverse datasets, include objective sleep measures (e.g., wearable devices), and apply deep learning models to enhance prediction accuracy and generalisability.

REFERENCE LIST

- Bitkina, O. V., Park, J., & Kim, J. (2022). Modeling sleep quality depending on objective actigraphic indicators based on machine learning methods. *International Journal of Environmental Research and Public Health*, 19(16), 9890. <https://doi.org/10.3390/ijerph19169890>
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28(2), 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Farah, N. M., Yee, T. S., & Rasdi, H. F. M. (2019). Self-Reported Sleep quality using the Malay version of the Pittsburgh Sleep Quality Index (PSQI-M) in Malaysian adults. *International Journal of Environmental Research and Public Health*, 16(23), 4750. <https://doi.org/10.3390/ijerph16234750>
- Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., Hazen, N., Herman, J., Katz, E. S., Kheirandish-Gozal, L., Neubauer, D. N., O'Donnell, A. E., Ohayon, M., Peever, J., Rawding, R., Sachdeva, R. C., Setters, B., Vitiello, M. V., Ware, J. C., & Hillard, P. J. A. (2015). National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health*, 1(1), 40–43. <https://doi.org/10.1016/j.sleh.2014.12.010>
- Zhang, S., Liu, X., Chen, J., Yang, H., Chen, J., Li, D., Xu, H., Wang, S., Guo, H., Zhang, N., Liu, Z., Min, X., & Wu, W. (2023). Patterns of sleep quality and its influence factors: A latent class model among students of medical university in Hubei Province, China. *Journal of Affective Disorders*, 347, 320–326. <https://doi.org/10.1016/j.jad.2023.11.090>

RANKING EXPRESS BUS COMPANIES: AN ANALYSIS OF KEY FACTOR THAT INFLUENCE STUDENTS USING FUZZY TOPSIS APPROACH

Nur Alya Nadirah Binti Salahudin, Siti Fatimah Abd Rahman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nuralyanadirahsalahudin@gmail.com, sitifatimah471@uitm.edu.my

Abstract

Express bus services are a popular transportation choice among university students in Malaysia due to their affordability and convenience. This study focuses on ranking four express bus companies, namely Perdana Express, Sani Express, Queen Express, and Pancaran Matahari, based on the preferences of UiTM Perlis students who travel between Perlis and Kelantan. Using the Fuzzy TOPSIS method, the study handles subjective opinions and uncertainty in student responses. A total of 80 students participated in an online survey, evaluating four key criteria which are comfort and cleanliness, safety, price, and punctuality. Their responses were expressed using linguistic variables and converted into triangular fuzzy numbers. The Fuzzy TOPSIS process was then used to calculate the closeness coefficients for each bus company. The results showed Perdana Express ranked highest, followed by Sani Express, Queen Express, and Pancaran Matahari. Safety was found to be the most important factor for students. The study provides insights for service improvements and suggests broader future research.

Keywords: *Topsis, Criteria, Express Bus Services, Student Preferences.*

1. Introduction

Express buses in Malaysia provide essential intercity transportation, especially for university students who rely on them for affordability and convenience (Azman et al., 2020). However, factors such as safety concerns, inconsistent punctuality, and varying comfort levels complicate students' decision-making (Thi et al., 2023). This study focuses on ranking the express bus companies using Fuzzy Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The specific objectives are to identify factors that influence the decision of UiTM Perlis students when selecting express bus companies and to rank express bus companies used by UiTM Perlis students based on their ratings for key factors. The scope is limited to data collected from 80 UiTM Perlis students who have used these services, emphasizing four key factors: comfort and cleanliness, safety, price, and punctuality.

2. Methodology

A quantitative approach was adopted, applying the Fuzzy TOPSIS to handle linguistic uncertainty and subjective judgments. Data was gathered using a structured online questionnaire distributed via WhatsApp and Google Forms to UiTM Perlis students. Respondents rated the importance of each criterion and evaluated each bus company using linguistic variables. For example, Very High, High, Medium, Very Low and Low, which were then translated into triangular fuzzy numbers. The methodology involved constructing fuzzy decision matrix for both criteria weights and alternative ratings, followed by normalization and application of weights. Subsequently, the fuzzy positive-ideal solution (FPIS) and negative-ideal solution (FNIS) were determined for each criterion. Distances of each alternative from FPIS and FNIS were computed, enabling the calculation of closeness coefficients (CCi). This process allowed an objective ranking of bus companies based on how closely they met student preferences.

3. Results / Findings

The study revealed safety to be the most critical factor influencing students' decisions, followed by comfort and cleanliness, punctuality, and price (Misiran et al., 2021). The Fuzzy TOPSIS analysis ranked Perdana Express highest with a closeness coefficient (CCi) of 0.8105, reflecting strong performance across all key factors. Sani Express closely followed with a CCi of 0.8098, particularly noted for punctuality and cleanliness. Queen Express ranked third (CCi=0.6554), indicating moderate satisfaction, while Pancaran Matahari lagged significantly (CCi=0.1500), suggesting shortcomings especially in safety and comfort. These findings emphasize that students are willing to accept slightly higher fares for assured safety and better travel experiences.

4. Novelty of Research

This research uses Fuzzy TOPSIS to study intercity bus services in Malaysia. It focuses on the views of university students, a group often overlooked in transport studies. Unlike normal surveys, fuzzy logic helps turn students' opinions into clear, measurable data (Joas et al., 2019). The study also supports the use of public buses, which can help reduce traffic and pollution (Angin et al., 2024). By connecting students' detailed opinions with bus company rankings, this research gives useful ideas for improving safety, service, and reliability. It helps bus companies better meet what students want and expect.

5. Conclusion and Future Work

UiTM Perlis students place the highest importance on safety and comfort, identifying Perdana Express as their preferred choice, and demonstrate a willingness to pay more for superior and more reliable bus services.

By including students from more campuses and testing other methods like AHP or PROMETHEE, future studies can confirm and build on these results. This would give better ideas to help bus companies improve safety, comfort, and service quality for students who rely on express buses.

REFERENCE LIST

- Angin, M., Ali, S. I. A., & Yahia, H. A. M. (2024). Determining Usage Intention for the Sustainability of Public Transport in Northern Cyprus Using the Theory of Planned Behaviour. *Sustainability (Switzerland)*, 16(2). <https://doi.org/10.3390/su16020804>
- Joas, M., Dziallas, M., & Ziegler, H. (2019). Assessment of public transport services through fuzzy logic and fuzzy TOPSIS method. *Transportation Research Part C: Emerging Technologies*, 104, 244-263.
- Azman, A. H., Abdullah, S., Singh, S. S. K., Yazid, M. R. M., Ghopa, W. A. W., Hisamuddin, H., Shahrir, A. H., Ariffin, A. K., Wahab, D. A., Azhar, A., & Solah, M. S. (2020). Assessing the safety of express bus from passengers' perspective. *IOP Conference Series: Materials Science and Engineering*, 932(1). <https://doi.org/10.1088/1757-899X/932/1/012129>
- Thi, L., Quynh, N., Duc Thanh, V., & Bich Diep, N. (n.d.). Factors affecting students' decision to use bus services in Hanoi. In *Quest Journals Journal of Research in Business and Management* (Vol. 11). www.questjournals.org

RANKING PADDY FERTILIZER FOR RICE PRODUCTION USING FUZZY TOPSIS: A CASE STUDY OF KG PERMATANG TOK JAYA, PENANG

Nur Alyafatasya Binti Noorazmi, Ku Azlina Ku Akil

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: alyafatasyazmi75@gmail.com, kuazlina@uitm.edu.my

Abstract

Paddy fertilizer plays a crucial role in enhancing rice production, but farmers often face challenges in selecting the most suitable option. The objective of this study is to identify and rank seven types of paddy fertilizers for rice production using the Fuzzy TOPSIS method. A total of 53 respondents, including farmers and MARDI officers, evaluated the fertilizers based on affordability, nutrient quality, environmental friendliness, and ease of use. Results show that from the farmers' perspective, NPK 17:20:10 (CC = 1.000), Urea (CC = 0.9249), and NPK 17.5:15.5:10 (CC = 0.8452) were the top choices. MARDI officers preferred Urea (CC = 1.000), NPK 17:20:10 (CC = 0.8285), NPK 15:15:15, and Realstrong N Bio-Booster require improvement. Differences in results reflect varying priorities, farmers emphasize practicality and ease of use, while MARDI officers focus on technical performance and long-term impacts. The findings offer valuable guidance for farmers, manufacturers, and policymakers to improve fertilizer use and rice yields. The study gives useful guidance to improve rice production and support food supply goals (Firdaus et al., 2020).

Keywords: *Topsis, fertilizer, rice production, MCDM, Urea*

1. Introduction

Rice is a major food for Malaysians, but many small farmers lack knowledge about the best fertilizers to use, leading to low yields and soil problems. This study aims to rank different paddy fertilizers for rice production in Kg Permatang Tok Jaya, Penang, using the Fuzzy TOPSIS method. The main goals are to rank the important criteria, compare different fertilizers, and find the best option to help farmers choose wisely. The scope of this research focuses on seven types of fertilizers and four main factors: affordable price, good nutrient quality, environmental friendliness, and convenience of use. The study collects data from local farmers and MARDI officers to give useful guidance for better rice production.

2. Methodology

This research employs the TOPSIS multi-criteria decision-making (MCDM) (Tscheikner-Gratl et al., 2017) approach to find the best paddy fertilizer for rice production. The TOPSIS process includes establishing criteria, normalizing decision matrices, applying weights, and identifying the ideal and finding the best and worst solutions. This study focuses on four key criteria: affordable price, good quality of nutrients, environmental friendliness, and convenience of use, to rank the fertilizers clearly and fairly. Seven paddy fertilizers were compared using data collected from 50 farmers and three MARDI officers. The answers were changed into fuzzy numbers to handle different opinions. The results were calculated to find the closeness of each fertilizer to the ideal solution. This process helps farmers see which fertilizer is the best choice. This method gives clear, useful results to help farmers improve rice production and use fertilizers more wisely.

3. Results / Findings

The implementation of the Fuzzy TOPSIS method showed its ability to rank paddy fertilizers based on farmers' and experts' preferences. The results identified NPK 17:20:10 as the best fertilizer as highest closeness coefficient (CCi) of 1.000, followed by Urea of and NPK 17.5:15.5:10 of 0.8285. Other fertilizer like PowerGro, Don-K3, and RealStrong N Bio-Booster ranked lower due to lower scores in key factors. Farmers confirmed that affordable price and good quality of nutrient are the most important when choosing fertilizers. This ranking process proves that the Fuzzy TOPSIS can help farmers choose fertilizers wisely and improve rice yields. The result highlights this method's potential to support better decisions, reduce costs, and help Malaysia's goal of stronger food security.

4. Novelty of Research

The study is special because it uses the Fuzzy TOPSIS method to help small paddy farmers choose the best fertilizer in Kg Permatang Tok Jaya, Penang. Many farmers still use traditional ways to pick fertilizers without proper knowledge, which can lead to low yields and soil problems. By using Fuzzy TOPSIS, this project combines expert opinions and farmers' views in a fair way. It also changes complex ideas into simple numbers that are easier to understand. This study provides a clear ranking of fertilizers based on important factors like price, nutrients, and the environment. The result help farmers make better decisions, save money, and support Malaysia's goal for better rice production and food security.

5. Conclusion or Future Work

This study helps farmers choose the best fertilizer to grow more paddy and save money. In the future, more farmers and places can be included to get better results. This method can also be used for other crops to help more farmers in Malaysia.

REFERENCE LIST

- Firdaus, R. B. R., Leong Tan, M., Rahmat, S. R., & Senevi Gunaratne, M. (2020). Paddy, rice and food security in Malaysia: A review of climate change impacts. *Cogent Social Sciences*, 6(1). <https://doi.org/10.1080/23311886.2020.1818373>
- Tscheikner-Gratl, F., Egger, P., Rauch, W., & Kleidorfer, M. (2017). Comparison of multi-criteria decision support methods for integrated rehabilitation prioritization. *Water (Switzerland)*, 9(2). <https://doi.org/10.3390/w9020068>

INVESTIGATION ON THE SPREAD OF DENGUE IN MALAYSIA BY USING SEIR MODEL

Nur Azleen Binti Jusoh, Dr.Nurizatul Syarfinas Ahmad Bahktiar

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nurazleen52@gmail.com, nurizatul@uitm.edu.my

Abstract

Dengue fever remains a major public health concern in Malaysia, driven by Aedes mosquitoes, climate change, urbanization, and population movement. This study uses the SEIR (Susceptible–Exposed–Infected–Recovered) model to understand dengue transmission, calculate the basic reproduction number (R_0), and analyze the stability of equilibrium points. Simulations over one, three, and six years reveal both short- and long-term transmission dynamics. Eigenvalue analysis shows that the disease-free equilibrium is unstable, indicating continued disease spread without effective intervention. Although the model includes births and deaths, it lacks key real-world factors such as vaccination, reinfection from waning immunity, and dengue-related deaths. The study highlights the urgent need for public health measures and suggests that incorporating these additional factors would enhance the model's predictive accuracy and usefulness for disease control strategies.

Keywords: Dengue transmission, SEIR model, Basic reproduction number (R_0), Epidemic modelling, Disease-free equilibrium

1. Introduction

This study aims to investigate the spread of dengue in Malaysia using the SEIR (Susceptible–Exposed–Infected–Recovered) model. The key objectives are to formulate the SEIR model, calculate the basic reproduction number, R_0 and analyze the stability of its equilibrium points. The model uses data from January 2019 to August 2024, sourced from Asia Dengue Voice and Action (ADVA). It focuses on dengue dynamics by considering transmission rate, disease rate, and recovery rates, tailored to Malaysia's specific environmental and socio-economic conditions. The scope is limited to Malaysia, enhancing the relevance of the findings. However, limitations such as inconsistent data and simplified model assumptions may affect precision. Despite this, the model offers valuable insight into dengue transmission and control.

2. Methodology

This study applies the SEIR (Susceptible–Exposed–Infected–Recovered) model to examine the dynamics of dengue transmission in Malaysia. The population is divided into four compartments, susceptible, exposed, infected, and recovered using a system of differential equations to describe disease progression over time (Ramírez-Soto et al., 2023). Key parameters include transmission rate (β), disease rate (ϵ), recovery rate (γ), and natural birth and death rate (μ), which influence the transitions between compartments (Mahto & Dey, 2018). The basic reproduction number R_0 is calculated using the Next Generation Matrix method. Python software is utilized to simulate model dynamics and compute eigenvalues from the Jacobian matrix, allowing for the analysis of disease-free and endemic equilibrium stability (Maulana & Ramdani, 2024).

3. Results / Findings

The results and findings of this study were obtained by simulating dengue transmission in Malaysia using the SEIR model, implemented in Python. Simulations were conducted for 1 year, 3 years, and 6-year periods using initial conditions and parameter values from sources such as Osman et al. (2017)

and S. & Noorani (2012). Across all timeframes, the simulations demonstrated typical epidemic behavior, the susceptible population declined sharply, exposed and infected groups peaked early, and the recovered group increased and stabilized over time. Most transmission occurred in the first 60 to 100 days.

The basic reproduction number, R_0 was consistently greater than 1, indicating an ongoing risk of transmission. Eigenvalue analysis of the Jacobian matrix (Maulana & Ramdani, 2024) confirmed instability in the disease-free equilibrium across all periods, suggesting endemic persistence of dengue in Malaysia and the need for continuous public health interventions.

4. Novelty of Research / Product / Project

The findings indicate that while dengue remains present in Malaysia and $R_0 > 1$, the basic SEIR model lacks the complexity to fully reflect real-world dynamics. Future studies should enhance the model by adding compartments for vaccinated individuals, temporary immunity, and dengue-related deaths. These additions are crucial, especially as Malaysia intensifies vector control and progresses in dengue vaccine development. Given the potential for reinfection with different virus serotypes, model flexibility is essential. Incorporating these elements will improve the model's realism, enable more accurate predictions, and support more effective strategies for dengue prevention and control.

5. Conclusion or Future Work

This study effectively used the SEIR model to analyze dengue spread in Malaysia, showing consistent outbreaks over 1 year, 3 years and 6-year periods. Results highlight that $R_0 > 1$, indicating endemic status. Continued mosquito control, public health strategies, and vaccination are essential to manage and reduce future dengue outbreaks.

REFERENCE LIST

- Mahto, P., & Dey, S. (2018). EQUILIBRIUM APPROACH ON SEIR MODEL ON DENGUE DISEASE (Vol. 5). JETIR. www.jetir.org
- Maulana, F. I., & Ramdani, Y. (2024). Python Application to SEIR Model of the Spread of Malaria. BIOS: Jurnal Teknologi Informasi Dan Rekayasa Komputer, 5(2), 150–160. <https://doi.org/10.37148/bios.v5i2.151>
- Osman, M., Adu, I., & Yang, C. (2017). A Simple SEIR Mathematical Model of Malaria Transmission. Asian Research Journal of Mathematics, 7(3), 1–22. <https://doi.org/10.9734/arjom/2017/37471>
- Ramírez-Soto, M. C., Machuca, J. V. B., Stalder, D. H., Champin, D., Martínez-Fernández, M. G., & Schaerer, C. E. (2023). SIR-SI model with a Gaussian transmission rate: Understanding the dynamics of dengue outbreaks in Lima, Peru. PLoS ONE, 18(4 APRIL). <https://doi.org/10.1371/journal.pone.0284263>
- S., S., & Noorani, M. S. M. (2012). SEIR MODEL FOR TRANSMISSION OF DENGUE FEVER IN SELANGOR MALAYSIA. International Journal of Modern Physics: Conference Series, 09, 380–389. <https://doi.org/10.1142/s2010194512005454>

POVERTY RISK PREDICTION BASED ON SOCIOECONOMIC FACTORS USING MACHINE LEARNING APPROACH

Nur Farhana Adibah, Balkiah Moktar

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: farhanazawari03@gmail.com, balkiah@uitm.edu.my

Abstract

Poverty remains a persistent socio-economic challenge in Malaysia, affecting access to basic needs such as healthcare, education, and employment. Traditional measurement methods like the Poverty Line Income (PLI) often oversimplify poverty classification by relying solely on income, ignoring multidimensional factors that influence well-being. This study aims to develop a predictive model for assessing poverty risk using supervised machine learning techniques based on a wider range of socioeconomic factors. A secondary dataset involving 635 households from eight districts in Terengganu was analyzed. Attributes such as age, income, education, occupation, health, gender, marital status, and savings were considered. Data preprocessing, including cleaning and transformation, was conducted, followed by feature selection using the Information Gain method. Four machine learning classifiers, such as Logistic Regression, Random Forest, J48, and Logit Boost, were evaluated using 10-fold cross-validation and a 70:30 training-testing split. Logistic Regression achieved the best overall performance with 99.06% accuracy in cross-validation and 98.42% in data splitting, along with superior precision, recall, and F1-score values. Age was identified as the most significant factor of poverty risk, followed by income and occupation. These results demonstrate that Logistic Regression is a reliable, interpretable, and stable model for classifying poverty risk using structured socioeconomic data. Although the study is geographically limited, its findings support the potential of machine learning as a data-driven tool in social policy development. This approach may enhance poverty targeting strategies and contribute to achieving Malaysia's Sustainable Development Goals (SDG) 1: No Poverty and SDG 2: Zero Hunger.

Keywords: *Poverty Risk, Machine Learning, Socioeconomic Factors, Logistic Regression, Information Gain, Predictive Modelling*

1. Introduction

Poverty remains a serious concern in Malaysia, influenced by factors such as income, education, occupation, and health. Traditional tools like the Poverty Line Income (PLI) often fail to capture the multidimensional nature of poverty. This study introduces a machine learning approach to classify poverty risk more effectively by analyzing household-level attributes. The main objective is to identify a predictive model for assessing the poverty risk based on socioeconomic factors by using supervised machine learning techniques. Specifically, the study aims to identify poverty risk factors based on socioeconomic factors such as gender, age, marital status, occupation, education, health, income, and savings, and to compare the performance of machine learning models. The secondary dataset of 635 Muslim households from eight districts in Terengganu by Rashid et al. (2021) was used to get the insights and contribute to a deeper understanding of poverty risk factors in the Malaysian context and support more data-informed intervention strategies.

2. Methodology

This study utilized a supervised machine learning approach, beginning with feature selection, with Information Gain was used to rank the features based on their predictive value using WEKA software. Four classification models, namely Logistic Regression, Random Forest, J48, and Logit Boost, were trained and evaluated using two validation methods, 10-fold cross-validation and a 70:30 train-test

splitting. Performance of the model was measured by using Accuracy, Precision, Recall, and F1-Score (Moscato et al., 2021).

3. Results / Findings

Feature importance analysis using Information Gain revealed that age was the most influential factor, followed by income, occupation, and health. These results not only align with findings from previous research but also highlight age as a newly emphasized predictor in this context. Results also confirmed that Logistic Regression was the most outperformed classifier for poverty risk prediction, followed by Random Forest, J48, and Logit Boost across all performance metrics. Using 10-fold cross-validation, it achieved an accuracy of 99.06% and 98.42% with a 70:30 train-test split. It also recorded the highest precision, recall, and F1-score values (up to 0.991), indicating strong consistency in detecting poverty cases.. The model remained stable even when features were reduced, further proving its robustness. While Random Forest and Logit Boost also showed good performance, J48 consistently had lower accuracy and generalization, especially under data splitting. Overall, the findings validate Logistic Regression as a promising model for classifying poverty risk using structured socioeconomic data

4. Novelty of Research / Product / Project

This study introduces the novel application of supervised machine learning to poverty prediction within the Malaysian context. Unlike traditional income-based classifications, the model incorporates multidimensional socioeconomic features to improve prediction accuracy. The integration of Information Gain for feature selection enhances interpretability, which is crucial for policymaking. While previous studies focused on ensemble models like Random Forest, this research demonstrates that a simpler model like Logistic Regression can outperform others in both accuracy and explainability. This makes the model more suitable for real-world implementation in government and social welfare systems. The approach aligns with national priorities such as RMK13 and SDG targets, supporting the digital transformation of social data analytics (Economic Planning Unit, 2019).

5. Conclusion or Future Work

Logistic Regression was found to be the most accurate and interpretable model for predicting poverty risk. Future work may include expanding the study to other states, incorporating geographic or real-time data, and exploring deep learning models for improved scalability and accuracy.

REFERENCE LIST

- Economic Planning Unit. (2019). Shared Prosperity Vision 2030. <https://ekonomi.gov.my/sites/default/files/202002/Shared%20Prosperity%20Vision%202030.pdf>
- Moscato, V., Picariello, A., & Sperlí, G. (2021). A benchmark of machine learning approaches for credit score prediction. *Expert Systems with Applications*, 165(113986). <https://doi.org/10.1016/j.eswa.2020.113986>
- Rashid, N. K. A., Sulaiman, N. F. C., Anang, Z., Possumah, B. T., Muhamad, S., Sa'at, N. H., Hassan, F. A., & Wahid, H. (2021). Data format Raw Analysed Descriptive Statistical Parameters for data collection Sustainable consumption, income and consumption expenditure. <https://doi.org/10.17632/snw2pbpbn2.1>

OPTIMISING A WASTE MANAGEMENT SYSTEM USING ARTIFICIAL BEE COLONY (ABC) ALGORITHM

Nur Hamisha Helanie Binti Mohamad Fadzil, Siti Hafawati Binti Jamaluddin

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: mishaafadzil17@gmail.com, hafawati832@uitm.edu.my

Abstract

This study proposed the application of the Artificial Bee Colony (ABC) algorithm to address the Capacitated Vehicle Routing Problem (CVRP) in a real-world waste collection scenario. Effective waste management is critical for maintaining urban cleanliness and sustainability. Inefficient waste collection often suffers from inefficiency such as poor route planning, excessive travel distance and underutilization of vehicle capacity. The main objective is to minimise the total travel distance of collection vehicles while reducing carbon emission. The study adopted data from Qiao et al. (2020). The data contain a single depot, 47 waste collection points and 11 vehicles with maximum capacity of 80 tonnes. The ABC algorithm was selected due to its strong global search capabilities, simple structure and ability to balance between exploration and exploitation. The implementation of ABC algorithm consists of four phases which are initialisation, employed, onlooker and scout bee phases. Random insertion applied as a neighbourhood operator to enhance the local search capabilities within the algorithm. The result showed a total travel distance of 1408.25 km and a total waste load of 738 tonnes. Moreover, before optimisation, the total distance travelled was 1458.35 km which resulted in an estimation of 1397.1 kg CO₂. After optimisation, the overall distance decreased to 1408.35 km resulting in a reduction of CO₂ emission of 1348.8 kg CO₂. Overall, the proposed approach shows promise in enhancing the efficiency and responsiveness of real-world waste collection systems. Future work may focus on integrating real-time data, adjusting algorithm parameters and hybridizing ABC algorithm with other metaheuristics to further improve performance.

Keywords: *Waste Management System, Artificial Bee Colony Algorithm, Optimisation*

1. Introduction

Waste Management Systems (WMS) is a process that organisation use to collect, treat and properly dispose of waste (Peña et al., 2024). Hashemi-Amiri et al. (2023) mentioned that WMS often face inefficiencies due to poor route planning and rising waste volumes. It led to longer travel times, increased fuel consumption, and higher CO₂ emissions. This study addresses these issues by applying the ABC algorithm. The data used was adopted from Qiao et al. (2020) and consisted of one depot, 47 collection points and 11 vehicles with maximum capacity of 80 tonnes. The main objective of this study is to optimise a waste management system using ABC algorithm by minimising total distance of waste collection and reducing carbon dioxide emissions.

2. Methodology

This study implements the application of the ABC algorithm with the objective function to determine total distance of waste collection travelled by vehicles. The formulation of objective function considers the numbers of vehicles, number of waste collection points and the distance between these points along with the binary decision variables to define the routes travelled by each vehicle. The mathematical formulation of the objective function is adopted from Qiao et al. (2020). The ABC algorithm is implemented through four phases which are initialisation, employed bee, onlooker bee and scout bee phases. Each phase was designed to iteratively improve solution quality. The use of a random insertion as neighbourhood operator further enhanced local search capability. Besides reducing the overall distance travelled, this study will also look into the environmental cost of waste

collection through approximating the amount of carbon dioxide CO₂. The carbon dioxide emission is assumed to be the result of the travel distance accumulation and an emission factor. The CO₂ emissions can be calculated by using formula that adopted from Hashim et al. (2019).

3. Results / Findings

The outcomes demonstrated that the ABC algorithm successfully minimised the total distance travelled by each waste collection vehicle. The result showed a total travel distance for 11 vehicles is 1408.25 km and a total waste load is 738 t. Moreover, before optimisation, the total distance travelled was 1458.35 km which resulted in an estimation of 1397.1 kg CO₂. After optimisation, the overall total distance travelled decreased to 1408.35 km resulting in a reduction of CO₂ emission of 1348.8 kg CO₂. This decrease shows optimisation is not only effective in ensuring efficiency of routes but also helps in ensuring sustainability of the environment by reducing emissions.

4. Novelty of Research / Product / Project

This study introduces a novel application of the ABC algorithm to solve CVRP using data from Qiao et al. (2020). Through several metaheuristic methods like the Genetic Algorithm (GA), Particle Swarm Optimisation (PSO) and Ant Colony Optimisation that have been used in solving CVRP, the application of the ABC algorithm to this particular WMS scenario has been less explored (Szeto et al., 2011). According to them, the phases of the ABC algorithm provide unique combination of simplicity, global search and local refinement which make it suitable in solving the complex routing problem present in waste collection system. This study is able to prove both operation and environmental benefits of the algorithm through its application. This study successfully demonstrates a reduction in total distance and CO₂ emissions. This finding support ABC algorithm as viable and efficient method for real-world routing problems especially in urban waste collection.

5. Conclusion or Future Work

ABC algorithm was effective in optimising collection route with minimising total distance travel and carbon dioxide emissions. This approach improves operational efficiency and environmental impact. Future studies may focus on integrating real-time data, adjusting algorithm parameters or hybridizing ABC with other metaheuristics to further enhance waste collection performance and adaptability.

REFERENCE LIST

- Hashemi-Amiri, O., Mohammadi, M., Rahmanifar, G., Hajiaghahi-Keshteli, M., Fusco, G., & Colombaroni, C. (2023). An allocation-routing optimization model for integrated solid waste management. *Expert Systems with Applications*, 227. <https://doi.org/10.1016/j.eswa.2023.120364>
- Hashim, F., Benjamin, A. M., & Abdul-Rahman, S. (2019). Estimation of carbon dioxide emissions in a waste collection vehicle routing problem. https://semarakilmu.com.my/journals/index.php/fluid_mechanics_thermal_sciences/article/view/3016
- Peña, D., Dorronsoro, B., & Ruiz, P. (2024). Sustainable waste collection optimization using electric vehicles. *Sustainable Cities and Society*, 105. <https://doi.org/10.1016/j.scs.2024.105343>
- Qiao, Q., Tao, F., Wu, H., Yu, X., & Zhang, M. (2020). Optimization of a capacitated vehicle routing problem for sustainable municipal solid waste collection management using the PSO-TS algorithm. *International Journal of Environmental Research and Public Health*, 17(6). <https://doi.org/10.3390/ijerph17062163>

RANKING OF HISTORICAL TOURISM PLACES IN PERAK USING FUZZY TOPSIS

Nur Sollehhah Hanani Binti Mohd Radif, Izleen Binti Ibrahim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: hananihananimohdradif@gmail.com, izleen373@uitm.edu.my

Abstract

Perak is rich in historical places that reflect Malaysia's cultural and colonial heritage. However, many of these places are under-promoted and lack strategic development. This study aims to systematically rank historical tourism places in Perak using the Fuzzy Technique for Order preference by Similarity to Ideal Solution (Fuzzy TOPSIS), a method particularly effective under uncertainty. Seven criteria were used for the evaluation: facilities, safety, uniqueness of the heritage, accessibility, cleanliness, historical significance and promotional efforts. Data were collected through structured expert interviews and surveys with 60 respondents. Each criterion and location were assessed using fuzzy linguistic variables. The results showed that historical significance and uniqueness were the most important factors. Ubudiah Royal Mosque, the Royal Museum and the Kellie Castle topped the list. The findings provide valuable guidance to local authorities and stakeholders to improve planning, conservation and marketing strategies. This study contributes to the sustainable development of cultural tourism and greater recognition of Perak's cultural assets.

Keywords: Fuzzy TOPSIS, MCDM, historical tourism, heritage ranking, decision-making

1. Introduction

Neglected historical buildings in Perak are valuable but underutilized assets for cultural tourism. This study investigates how these places can be better prioritised for development and conservation. The main objective is to prioritise historical tourism places in Perak using Fuzzy TOPSIS, a decision-making approach that takes into account both subjective and objective assessments. The scope includes ten significant places, such as Kellie's Castle, the Royal Museum and the Pasir Salak Historical Complex, which are evaluated based on seven key tourism criteria. The results are intended to help tourism planners, local governments and investors identify the most important areas for tourism enhancement to ultimately promote cultural appreciation and economic growth.

2. Methodology

This study uses the fuzzy TOPSIS method, a type of multi-criteria decision making (MCDM) that incorporates fuzzy logic to evaluate complex and uncertain judgements. Data were collected through surveys of 60 respondents, including locals, tourists and tour guides. The assessment covered ten historic sites and seven criteria: Facilities, Safety, Uniqueness of Heritage, Accessibility, Cleanliness, Historical Significance and Promotional Efforts. Linguistic variables were used to convert qualitative opinions into triangular fuzzy numbers. The analysis followed the typical fuzzy TOPSIS process: (1) formulating the fuzzy decision matrix, (2) normalising the values, (3) calculating the weighted fuzzy matrices, (4) identifying the positive fuzzy ideal solution (FPIS) and the negative fuzzy ideal solution (FNIS), and (5) calculating the coefficient of similarity (CCi) for the ranking. The higher the coefficient, the closer the location is to the ideal destination. The calculations were performed using Microsoft Excel based on equations from the existing literature.

3. Results / Findings

The results of the ranking show that the Royal Museum, Ubudiah Royal Mosque and the Kellie Castle scored the highest closeness coefficients, making them the best historical tourism places in Perak. These places demonstrated strong performance across all criteria, particularly historical significance, uniqueness and facilities. The lower scoring places, such as Kota Belanda and Sybil's Clinic, scored lower due to their limited accessibility, promotion and infrastructure. Among the seven criteria, historical significance and uniqueness of heritage were rated highest, while promotion was rated lowest. This emphasises the need for improved marketing strategies for hidden gems. The results are consistent with national tourism objectives and provide data-driven guidance for stakeholders seeking to improve visitor satisfaction, site development and long-term sustainability.

4. Novelty of Research

This study is a first to apply the Fuzzy TOPSIS approach specifically to the ranking of heritage places in Malaysia, thereby filling a gap in the existing literature on decision-making. While previous studies applied general ranking or statistical models, this study utilises both expert input and fuzzy logic to address uncertainty in tourism preferences. It is also the first study to quantitatively evaluate ten historical tourism places in Perak based on seven clearly defined criteria. Furthermore, the integration of triangular fuzzy numbers and linguistic variables provides a flexible, realistic framework that reflects subjective human judgement, a nuance that traditional methods often fail to capture. Using Fuzzy TOPSIS in this context allows tourism planners to make informed decisions based on a transparent and reproducible ranking system. The study supports the TMP2024 (Visit Perak Year) initiative and provides a model that can be extended to other states or high-yield regions in Malaysia. In this context "the conservation of historic sites, buildings, and artefacts will continue to be the step to preserve the country's historical heritage and increase the number of tourist attractions" (Jusoh et al., 2017)

5. Conclusion or Future Work

In this study, Fuzzy TOPSIS was successfully applied to rank historical tourist places in Perak. Future research could integrate real-time feedback from tourists, digital platforms, and GIS based analyses to improve decision making. Extending the model to other Malaysian states could further support national heritage tourism development, strategic conservation planning and cultural preservation efforts.

REFERENCE LIST

- Visit Perak Year 2024 – Tourism Perak Malaysia.* (n.d.).
<https://www.tourismperakmalaysia.com/visitperakyear2024/>
- Jusoh, A., Sabin, Y. S. @., Nayan, N., & Ramli, Z. (2017). Archaeotourism and its Attractiveness in the Context of Heritage Tourism in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 7(4). <https://doi.org/10.6007/ijarbss/v7-i4/2923>

IDENTIFYING CONSUMERS' PREFERRED MARKET OUTLET FOR PURCHASING VEGETABLES AMONG THE RURAL COMMUNITY USING FUZZY VIKOR

Nur Syuhada binti Mazlan, Noorzila binti Sharif

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: syuhadamaz@gmail.com, noorzila@uitm.edu.my

Abstract

Vegetables play an important part in maintaining a healthy diet and are a key source of income for rural communities in Malaysia. This study aims to rank the criteria that influence rural consumers in choosing market outlets to purchase vegetables and to rank the preferred market outlets based on the selected criteria in purchasing vegetables among rural consumers. This study applied the Fuzzy VIKOR method to rank the criteria and the market outlets. The four market outlets in Langkap, Perak were evaluated by 88 primary grocery buyers on four criteria which are convenience, freshness, price and social connection. The four types of market outlets evaluated in this study included Eonsave Supermarket, Public Market, *Pasar Tani* and Fresh Mart. The result revealed that Public Market is the most preferred market outlet by the primary grocery buyers to purchase vegetables in Langkap with the smallest VIKOR index. Among the criteria, convenience was perceived as the most important by the primary buyers in choosing the market outlet to purchase vegetables that meet their needs and budgets. The findings of this study will help the retailers to improve their business and assists the farmers in making better choices for supplying their vegetables to the ideal market. It can help the local authorities to make improvement on market facilities and cleanliness, which may help increase the local economic growth.

Keywords: VIKOR, vegetables, market outlet, Langkap

1. Introduction

There is still no clear indication of which outlet best meets consumer preferences in Langkap. This causes retailers and authorities to rely on assumptions, often leading to poor planning and service inefficiencies. Such physical discomfort may create a negative impression from consumers towards the market. The objectives of this study are to rank the criteria influencing rural consumers in choosing market outlets for purchasing vegetables, and to rank the preferred market outlets based on the selected criteria. This study involved 88 primary grocery buyers representing 268 households in Langkap and included demographic factors such as gender, age, occupation, household size, and frequency of vegetable purchases. The evaluation focuses on criteria such as convenience, freshness, price, and social connection (Ha et al., 2022). This study assessed four market outlets in Langkap, which are Eonsave Supermarket, Public Market, *Pasar Tani*, and Fresh Mart.

2. Methodology

This study employs a fuzzy MCDM approach. Data were collected through a questionnaire from 88 primary grocery buyers and analysed using Fuzzy VIKOR method. The analysis involved identifying alternatives, criteria and respondents, determining linguistic variables, calculating the aggregated fuzzy weights of criteria and fuzzy ratings of alternatives, constructing a fuzzy decision matrix, determining the best and worst fuzzy values for each criterion, calculating the separation measures from fuzzy best value and fuzzy worst value, computing and defuzzifying the VIKOR index to rank the alternatives (Koppihraj et al., 2020). All calculations were performed using Microsoft Excel due

to its ease of use and practical functionality. The overall approach supports clear decision-making in identifying the most suitable market outlet for vegetable purchases.

3. Results / Findings

The implementation of Fuzzy VIKOR demonstrated its effectiveness in ranking both the criteria and market outlets based on consumer preferences. The results identified Public Market as the most preferred market outlet, followed by Econsave Supermarket, Fresh Mart and *Pasar Tani*. Convenience was perceived as the most important criterion by primary grocery buyers, followed by freshness, price, and social connection. The analysis confirmed that consumers were able to clearly identify their preferences based on the selected criteria, with criteria such as convenience, freshness, and price supporting informed decision-making. The results highlight the potential of this approach to enhance understanding of rural consumer behaviour and to guide local authorities, retailers and farmers in improving market products and services.

4. Novelty of Research / Product / Project

This study presents a novel integration of fuzzy multi-criteria decision-making techniques, specifically Fuzzy VIKOR, to evaluate rural consumer preferences for vegetable market outlets. Previous studies have often overlooked rural contexts or relied on simpler decision-making methods, limiting their ability to capture detailed and varied consumer behaviour. This study offers a more structured and adaptive approach that reflects diverse consumer priorities. By allowing fair comparison of alternatives, the Fuzzy VIKOR method incorporates both quantitative and qualitative factors in the ranking process. The findings contribute to a better understanding of rural purchasing behaviour and introduce a practical decision-making model to support local authorities, retailers and farmers in improving market services, accessibility, and supply strategies in rural areas.

5. Conclusion or Future Work

This study demonstrates the use of fuzzy VIKOR in identifying preferred market outlets based on rural consumer preferences. Future research may adopt Fuzzy TOPSIS as an alternative method, explore more relevant criteria such as distance and vegetable origin, and compare findings between rural and urban communities to enhance result applicability.

REFERENCE LIST

- Koppiahraj, K., Bathrinath, S., & Saravanasankar, S. (2020). A fuzzy VIKOR approach for selection of ergonomic assessment method. *Materials Today Proceedings*, 45, 640–645. <https://doi.org/10.1016/j.matpr.2020.02.725>
- Ha, T. M., Hansson, H., Hatab, A. A., Darr, D., & Shakur, S. (2022). A risk-benefit approach to the purchase and consumption of conventional vegetables in wet markets. *Appetite*, 176, 106142. <https://doi.org/10.1016/j.appet.2022.106142>

RANKING ZAKAT RECIPIENTS AT ZAWAF UITM PERLIS USING FUZZY TOPSIS

Nurasyiqin Mahadi, Norpah Mahat

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: asymhd02@gmail.com, norpah020@uitm.edu.my

Abstract

In today's challenging economic climate, the demand for financial assistance such as zakat has significantly increased. Yet, many eligible individuals remain unaware of the aid available to them or are overlooked due to unclear or inconsistent selection processes. Recognizing this gap, this study proposes a systematic approach to enhance zakat distribution by objectively ranking recipients. The fair and efficient distribution of zakat plays a crucial role in addressing poverty and financial inequality. However, the process of selecting eligible zakat recipients often relies on subjective judgment, which can result in bias and inconsistency. To overcome this, the Fuzzy TOPSIS method was applied to evaluate and rank zakat recipients at ZAWAF UiTM Perlis based on three criteria such as income level, sponsorship, and the number of dependents in the family. A total of 22 recipients were assessed using fuzzy linguistic scales to measure both the importance of each criterion and the performance of each recipient. The findings revealed that income level was the most influential factor with a closeness coefficient (CC) value of 0.55784 indicating the strongest. These results show that the Fuzzy TOPSIS method is useful in making the zakat distribution process fair and transparent. It helps reduce bias and personal judgment by using clear data to make decisions. This study helps improve how zakat is given to those who really need it and can be used as a guide by zakat institutions and policymakers to create a more organized, fair, and trustworthy system for giving financial aid.

Keywords: *TOPSIS, MCDM, Zakat, Ranking, ZAWAF*

1. Introduction

Zakat distribution plays a vital role in supporting financially vulnerable individuals, particularly students facing economic hardship. However, inconsistent selection methods may hinder fair and transparent allocation. This study aims to address this issue by applying the Fuzzy TOPSIS to objectively rank zakat recipients at ZAWAF UiTM Perlis using Fuzzy TOPSIS. The primary objective is to develop a structured approach to ranking recipients, while the sub-objective is to identify key factors influencing zakat eligibility, such as income level, number of dependents in the family, and sponsorship status. The criteria were selected and adapted from the study by Abdul Aziz et al. (2023), which explored key factors affecting students' eligibility for zakat assistance. This study utilizes secondary data provided by ZAWAF and focuses specifically on students of UiTM Perlis. Findings from this research are context-specific and may not be directly applicable to other regions due to differences in socio-economic conditions and zakat distribution practices across Malaysia. Nonetheless, the study offers a practical framework for enhancing fairness in zakat allocation.

2. Methodology

This study employs the Fuzzy TOPSIS to systematically evaluate and rank zakat recipients at UiTM Perlis. The analysis is based on secondary data obtained from ZAWAF, the university's zakat management unit, involving 22 student recipients as alternatives. Three key socio-economic criteria were used in the evaluation process: income level, number of dependents in the family, and sponsorship status. These criteria were selected due to their significant relevance in determining financial need. Unlike conventional approaches that rely on direct expert input, this study involved the researcher interpreting the available data and assigning appropriate linguistic terms to reflect each

recipient's condition. These linguistic assessments were then converted into triangular fuzzy numbers to facilitate structured analysis. The mathematics concept borrowed from (Sun & Lin, 2009), the Fuzzy TOPSIS procedure includes several computational steps: constructing a fuzzy decision matrix, normalizing the fuzzy values, applying weights to each criterion, and determining both the fuzzy positive ideal solution (FPIS) and the fuzzy negative ideal solution (FNIS). Finally, the closeness coefficient (CC) for each alternative was calculated to determine the final ranking of recipients. This method reduces subjectivity and provides a more transparent, consistent, and data-driven approach to zakat recipient selection, ultimately supporting a fairer distribution process based on measurable socio-economic factors.

3. Results / Findings

The application of the Fuzzy TOPSIS method successfully ranked 22 zakat recipients at UiTM Perlis based on key socio-economic criteria. The results highlighted the most eligible recipient with a highest closeness coefficient (CC) value of 0.55784, indicating strong alignment with the ideal financial need profile. Recipients were evaluated using three core criteria: income level, number of dependents in the family, and sponsorship status. Among these, income level emerged as the most influential factor in the ranking process, followed by the number of dependents and sponsorship. By converting the raw data into fuzzy linguistic scales and applying structured computations, the method provided a clear and consistent ranking of recipients. The findings demonstrate that Fuzzy TOPSIS is effective in supporting fairer and more objective zakat distribution, reducing reliance on subjective decision-making. This structured approach not only improves transparency and accountability but also offers practical value to institutions like ZAWAF in enhancing the efficiency and credibility of their aid allocation process.

4. Novelty of Research

This study introduces a novel application of the Fuzzy TOPSIS method to the context of zakat distribution, specifically targeting student recipients at UiTM Perlis. While traditional zakat allocation processes often rely on manual judgment and subjective interpretation, this research offers a structured, data-driven approach to ranking recipients based on multiple socio-economic criteria. By assigning linguistic terms to reflect financial need and converting them into triangular fuzzy numbers, the study enhances both accuracy and fairness in the selection process. Unlike existing methods, this approach minimizes bias, promotes consistency, and provides a replicable model that can be adapted by other institutions managing zakat or similar welfare funds. The use of secondary data, combined with a well-defined computational framework, adds further credibility and practicality to the proposed system. This research not only contributes to academic knowledge in multi-criteria decision-making (MCDM) but also offers a meaningful solution for improving the transparency, efficiency, and trustworthiness of financial aid distribution within educational institutions.

5. Conclusion

This study confirms the effectiveness of Fuzzy TOPSIS in ranking zakat recipients fairly and objectively. Future work should expand criteria, include more expert input, and explore broader applications across regions. Implementing this method can improve transparency, consistency, and impact in zakat distribution for long-term community support.

REFERENCE LIST

- Abdul Aziz, A., Mohamad Nor, N. A., Wan Shahidan, W. N., & Mohamad, S. N. N. (2021). Factors Affecting the Eligibility of Zakat Assistance to University Students during COVID-19: A case study in Universiti Teknologi MARA (UiTM). *Environment-Behaviour Proceedings Journal*, 8(SI14), 45–52. <https://doi.org/10.21834/e-bpj.v8isi14.5059>
- Sun, C. C., & Lin, G. T. R. (2009). Using fuzzy TOPSIS method for evaluating the competitive advantages of shopping websites. *Expert Systems with Applications*, 36(9), 11764–11771. <https://doi.org/10.1016/j.eswa.2009.04.017>

MALAYSIAN FULL-FLEDGE ISLAMIC BANKS PERFORMANCE: A COMPARATIVE ANALYSIS USING DATA ENVELOPMENT ANALYSIS (DEA)

Nurul Atiqah binti Ahmad, Anas bin Fathul Ariffin

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: atiqahahmad02@gmail.com, anasfathul@uitm.edu.my

Abstract

This project aims to evaluate the operational efficiency of Malaysian full-fledged Islamic banks over a six-year period from 2018 to 2023, with special attention to performance before, during, and after the COVID-19 pandemic. The study focuses on four full-fledged Islamic banks which are Bank Islam Malaysia Berhad, Bank Muamalat Malaysia Berhad, Bank Rakyat, and MBSB Bank Berhad, assessing their ability to utilize resources efficiently. It addresses the issue of banking performance fluctuations during economic disruptions like the COVID-19 crisis. The methodology includes Data Envelopment Analysis (DEA), specifically the CCR model, to measure technical efficiency. Data was collected from the banks' annual reports from 2018 to 2023 and analyzed using DEA Solver Learning software, version 8.0. Findings reveal that Bank Islam Malaysia Berhad and MBSB Bank Berhad consistently maintained full efficiency throughout the six years, demonstrating strong operational stability despite pandemic-related challenges. This project shows that Malaysian Islamic banks generally remained competitive and resilient, offering insights into the stability of Islamic banking. It also provides guidance for policymakers and bank management. The project successfully evaluated and ranked the efficiency of four major Islamic banks in Malaysia, laying a foundation for future research and improvement in Islamic banking operations, especially in response to global economic uncertainties.

Keywords: *Full-fledged Islamic banks, Data Envelopment Analysis, CCR Model, COVID-19 pandemic, bank efficiency*

1. Introduction

Islamic banking is an essential part of Malaysia's financial system, operating under Shariah principles that prohibit interest and promote ethical profit-sharing (Ikhwan & Riani, 2022). However, events like the COVID-19 pandemic have raised concerns about the stability and performance of financial institutions, particularly Islamic banks. This study aims to evaluate the efficiency of Malaysian full-fledged Islamic banks using Data Envelopment Analysis (DEA). Specifically, it assesses the performance of Bank Islam Malaysia Berhad, Bank Muamalat Malaysia Berhad, Bank Rakyat, and MBSB Bank Berhad from 2018 to 2023, covering periods before, during, and after the pandemic. By focusing on operational efficiency, this research provides insights for bank management and policymakers to enhance competitiveness and resilience.

2. Methodology

This study uses the Data Envelopment Analysis (DEA) CCR model to evaluate the operational efficiency of Malaysian full-fledged Islamic banks. The process begins with the selection of four full-fledged Islamic banks which are Bank Islam Malaysia Berhad, Bank Muamalat Malaysia Berhad, Bank Rakyat, and MBSB Bank Berhad. Secondary data for each bank were collected from annual reports covering the years 2018 to 2023. The inputs chosen were total assets, labor cost, and third-party funds, while outputs included total financing and operating revenue. All variables were standardized before analysis. The data were then entered into DEA Solver Learning software (version 8.0), which calculated efficiency scores for each bank annually. The scores, ranging from 0 to 1,

reflect how efficiently each bank converted inputs into outputs. By grouping results into before, during, and after COVID-19 periods, the study provides a time-based comparison of bank performance (Liu et al., 2013).

3. Results / Findings

The findings of this study revealed that among the four full-fledged Islamic banks analyzed, Bank Islam Malaysia Berhad and MBSB Bank Berhad consistently achieved a perfect efficiency score of 1.000 across all six years, indicating full operational efficiency. Bank Rakyat maintained a high level of efficiency with a slight dip in 2019, scoring 0.9722, but performed at full efficiency in all other years. Bank Muamalat Malaysia Berhad showed lower efficiency in 2018 (0.9611) and 2020 (0.9663), but improved to full efficiency from 2021 to 2023. Overall, the average efficiency scores placed Bank Islam and MBSB Bank at the top, followed closely by Bank Rakyat, while Bank Muamalat ranked lowest among the four. The results also indicated that all input and output variables were strongly correlated, suggesting that efficient use of resources significantly contributed to output performance. Despite the challenges brought by the COVID-19 pandemic, the results demonstrated that Malaysian Islamic banks remained resilient and operationally stable during economic disruptions.

4. Novelty of Research

This research introduces a novel application of the DEA CCR model to evaluate the operational efficiency of Malaysian full-fledged Islamic banks across three distinct time periods which are before, during, and after the COVID-19 pandemic. While many past studies only looked at one time period or focused on conventional banks, this study looks at how Islamic banks performed during different economic conditions. By using real financial data such as total assets, labor costs, and third-party funds, the study gives a clear picture of how well each bank used its resources to generate income and financing. The use of DEA Solver Learning software helped analyze the data accurately and fairly. This study is also different because it only focuses on banks that were fully established in Malaysia, giving more specific insights. The results can help bank managers and policymakers improve how banks operate, especially when facing challenges like economic crises or pandemics.

5. Conclusion or Future Work

This study successfully applies DEA to assess the efficiency of Malaysian Islamic banks across different economic periods. Future work may include expanding the analysis to Islamic windows of conventional banks, incorporating more financial variables, or using alternative DEA models to improve accuracy and provide deeper insights into performance trends.

REFERENCE LIST

- Ikhwan, I., & Riani, R. (2022). The efficiency level of Indonesian banks in the Covid-19 pandemic era and its determinant. *Jurnal Ekonomi & Keuangan Islam*, 221-235. <https://journal.uui.ac.id/JEKI/article/view/22096>
- Liu, J. S., Lu, L. Y., Lu, W., & Lin, B. J. (2012). Data envelopment analysis 1978–2010: A citation-based literature survey. *Omega*, 41(1), 3–15. <https://doi.org/10.1016/j.omega.2010.12.006>

RANKING FACTORS INFLUENCING THE SELECTION OF PAYMENT METHOD USING FUZZY ANALYTIC HIERARCHY PROCESS (FAHP)

Nurul Izzati Binti Hasbullah, Khairu Azlan Abd Aziz

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: izzatihasbullah03@gmail.com, khairu493@uitm.edu.my

Abstract

The shift in digital technologies has changed how people conduct financial transactions. However, the wide range of payment options can be overwhelming. This study identifies the most important factors influencing payment method preferences and prioritises the available options. Data were gathered from vendor representatives, lecturers, and student leaders through questionnaires. The evaluation focused on acceptance, accessibility, convenience, cost benefits, speed, and security. Using the Fuzzy Analytic Hierarchy Process, results showed that digital payment was the most preferred option with a weight of 0.4782, followed by card at 0.3139 and cash at 0.2040. Security was the most important factor overall with a weight of 0.2518, followed by convenience at 0.2255 and speed at 0.2041. These findings offer useful insights for supporting a cashless environment.

Keywords: *Fuzzy AHP, payment methods, cashless campus, digital payment, decision-making*

1. Introduction

The development of payment systems in Malaysia has been underway for the last thirty years. Card-based payment systems such as credit and debit cards emerged in the mid-1970s, marking Malaysia's first attempt towards a cashless society (Loke, 2007). However, a considerable number of Malaysian consumers still favored cash transactions over digital payment options long after they became available (Loh et al., 2021). In recent years, the widespread use of smartphones has contributed to the growing popularity of mobile payments. This case study focuses on the UiTM Perlis community and their common transactions, such as purchasing supplies and settling academic fees. Due to the variety of payment options available, users often face difficulty in selecting the most appropriate method. Therefore, this study aims to rank the factors that influence the selection of payment methods and to prioritise the available options. Six criteria and three alternatives were assessed based on input from six expert respondents comprising two vendors, two lecturers, and two student representatives.

2. Methodology

This study applies the Fuzzy Analytic Hierarchy Process (FAHP) to assess factors influencing payment method selection within the UiTM Perlis community. The methodology focuses on systematically capturing expert evaluations based on subjective judgments, which are difficult to quantify using traditional techniques. Data were gathered from six experts consisting of two vendors, two academic lecturers and two student representatives through a structured questionnaire. The questionnaire was divided into three sections where Section A contained background information, Section B focused on pairwise comparisons between criteria, and Section C compared alternatives under each criterion. The pairwise comparison matrices were constructed using Saaty's 1 to 9 scale and were transformed into fuzzy triangular numbers to reflect human uncertainty (Saaty, 1980). These fuzzy matrices were then tested for consistency using the Consistency Ratio (CR) to ensure logical coherence in expert evaluations. Only matrices with consistency values below the threshold of 0.1 were accepted for further analysis. All valid matrices were aggregated into a single group matrix. Next, the fuzzy geometric mean method was applied to calculate synthetic extent values and

determine fuzzy weights for each criterion. These weights were then normalised and defuzzified to obtain crisp values. The final ranking of criteria and alternatives was based on these values, providing a structured and flexible framework for evaluating payment method preferences at UiTM Perlis.

3. Results / Findings

The analysis identified security as the most influential criterion overall with a weight of 0.2518. This was consistently prioritised by vendors and students, highlighting concerns over data protection and fraud. Convenience followed with a weight of 0.2255, showing that users across all groups value ease of use and frictionless experiences. Speed ranked third with a weight of 0.2041, particularly important for vendors and students who require efficient service in time-sensitive environments. Cost benefits and accessibility were moderately valued, while acceptance was the least important factor with a weight of 0.0321. In terms of alternatives, digital payment emerged as the most preferred method with a weight of 0.4782. This option was consistently ranked first by all three respondent groups due to its integration with mobile platforms, ease of use, and security features. Card payment ranked second with a weight of 0.3139, remaining relevant for formal and higher-value transactions. Cash was ranked lowest with a weight of 0.2040, indicating a shift away from physical currency, especially among students. These results support UiTM's move towards cashless initiatives and reflect broader trends in digital adoption.

4. Novelty of Research

This study applies the Fuzzy Analytic Hierarchy Process (FAHP) to assess how the UiTM Perlis community selects payment methods, focusing on vendors, academic lecturers, and students. Unlike previous studies that only use general surveys or fixed-ranking tools, the use of FAHP is to handle the uncertainty and subjectivity involved in decision-making (Alyamani & Long, 2020). The novelty lies in how it combines expert judgment with a structured evaluation process that reflects real-world preferences under unclear conditions. By focusing on a specific academic setting, the findings offer a more practical insight into how digital payment methods are received in line with the university's cashless strategy. The study also contributes to how FAHP can be applied in small community-based environments to produce more accurate and relevant results for policy or service improvements.

5. Conclusion

This study successfully identified and ranked payment method criteria using FAHP, with digital payment emerging as the top choice across all respondent groups. Future research is encouraged to expand the respondent profile and apply alternative methods like Fuzzy TOPSIS to explore additional factors influencing digital payment adoption and user decision-making behaviour.

REFERENCE LIST

- Alyamani, R., & Long, S. (2020). The Application of Fuzzy Analytic Hierarchy Process in Sustainable Project Selection. *Sustainability* (Switzerland), 12(20), 1–16.
<https://doi.org/10.3390/su12208314>
- Loh, X. M., Lee, V. H., Tan, G. W. H., Ooi, K. B., & Dwivedi, Y. K. (2021). Switching from cash to mobile payment: what's the hold-up? *Internet Research*, 31(1), 376–399.
<https://doi.org/10.1108/INTR-04-2020-0175>
- Loke, Y. J. (2007). Determinants of Merchant Participation in Credit Card Payment Schemes.
<https://doi.org/https://doi.org/10.2202/1446-9022.1130>
- Saaty, T. L. (1980). *The analytic hierarchy process*. New York, NY: McGraw-Hill.

ALIGNED MHD FLOW OF TERNARY HYBRID NANOFLUIDS OVER A VERTICAL PLATE WITH CONVECTIVE BOUNDARY CONDITION

Nurul Nadia Binti Mohamad Sanusi, Nurul Hidayah Binti Ab Raji

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nadiasanusi57@gmail.com, hidayah417@uitm.edu.my

Abstract

The present study presents an extensive numerical analysis of the magnetohydrodynamic (MHD) ternary hybrid nanofluid (THNF) flow of Silver (Ag), Copper (Cu), and Alumina (Al_2O_3) nanoparticles suspended in water flowing along a vertical plate under a convective boundary condition. The effects of an inclined external magnetic field, thermal radiation, Brownian motion, and thermophoresis on the temperature and velocity profiles are analyzed. By applying similarity transformations, the boundary layer equations of the problem are solved using MATLAB's `bvp4c` solver. Solutions indicate that the strength of the magnetic field and concentration of nanoparticles increase heat transfer but decrease fluid velocity as a result of the Lorentz force. The surface heat transfer and flow resistance are strongly affected by the Biot number and mixed convection parameters. This study demonstrates the higher thermal conductivity and heat transfer efficiency of THNFs than conventional nanofluids, facilitating their use in future-generation thermal technologies such as electronic cooling and industrial heat exchangers. The theoretical approach formulated provides insight for the optimization of MHD nanofluid systems and lays a platform for experimental validation in the future.

Keywords: *Fuzzy AHP, Payment Methods, Cashless Campus, Digital Payment, Decision-Making*

1. Introduction

This current work aims to investigate the aligned magnetohydrodynamic (MHD) flow of ternary hybrid nanofluids (THNFs) along a vertical plate with a convective boundary condition. The primary purpose is to model the fluid flow and thermal behavior with Silver (Ag), Copper (Cu), and Alumina (Al_2O_3) nanoparticles suspended in water. The focus is the examination of the effects of magnetic field inclination, Biot number, mixed convection, and volume fraction of nanoparticles on heat transfer characteristics, e.g., velocity and temperature profiles, skin friction, and Nusselt number. The analysis is limited to steady, two-dimensional laminar flow with uniform dispersion of nanoparticles under idealized conditions. This study answers the engineering need for efficient thermal management in applications such as heat exchangers, solar collectors, and electronic cooling (Ishak et al., 2024).

2. Methodology

The study starts with the derivation of equations of continuity, momentum, and energy for MHD flow of ternary hybrid nanofluids (THNFs). The equations are generalized to account for the effects of Lorentz force, thermal buoyancy, viscous dissipation, thermal radiation, Brownian motion, and thermophoresis. The physical setup is a vertically positioned plate that is heated on one side due to convection from an exterior fluid and whose boundary condition is modeled by the Biot number. To simplify the governing partial differential equations (PDEs) for solution, similarity transformations are used to reduce them into ordinary differential equations (ODEs). The ODEs are then solved using MATLAB's `bvp4c` solver and augmented with the shooting method to attain high numerical accuracy. Thermophysical properties like density, viscosity, thermal conductivity, and heat capacity are calculated using available composite models for THNFs (Ishak et al., 2023). Parametric studies vary the inclination angle (α), magnetic field (M), volume fractions (ϕ_1 , ϕ_2 , ϕ_3), Biot number (B_{ix}), and

mixed convection parameter (λ) to study their effects on fluid flow and heat transfer (Makinde & Aziz, Pattnaik et al., 2024).

3. Results / Findings

Simulation results confirm that magnetic field enhancement and nanoparticle volume fraction increase heat transfer performance as evidenced by a rise in the Nusselt number. However, fluid velocity is reduced due to the motion-inhibiting Lorentz force. The Biot number and convective parameter also significantly influence surface heat exchange and flow resistance as shown by actual convective behaviors. The results reflect that ternary hybrid nanofluids outperform mono- and binary nanofluids in terms of thermal conductivity and heat transfer efficiency due to synergistic interactions between Ag, Cu, and Al_2O_3 nanoparticles. Moreover, convective boundary conditions create thicker boundary temperature layers and increased surface temperatures, which are more representative of actual engineering conditions than fixed-wall temperature assumptions. These findings affirm the feasibility of using THNFs as high-performance thermal devices in industrial and energy applications (Raji et al., 2022).

4. Novelty of Research / Product / Project

This study takes into account the behavior of ternary hybrid nanofluids (THNFs) under an inclined magnetic field with convective boundary conditions, which is more practical in the case of solar panels and electronic cooling. The fluid contains three nanoparticles. Silver (Ag), Copper (Cu), and Alumina (Al_2O_3) in water, to achieve better heat transfer than single or double nanoparticle fluids. The governing equations are simplified using similarity transformations and solved using MATLAB 'bvp4c' and the shooting method. The effects of significant parameters like magnetic field direction, Biot number, and nanoparticle volume fractions are investigated on flow, temperature, friction, and heat transfer. This work helps in the design of better thermal systems in the future.

5. Conclusion or Future Work

This study confirms the thermal advantages of ternary hybrid nanofluids in aligned MHD flow under convective boundary conditions. Experimental confirmation and application to turbulent or unsteady flow must be explored by future research to further actualize the model to more practical real-world applications for thermal management technologies (Ishak et al., 2024; Mohd Zukri et al., 2023).

REFERENCE LIST

- Guedri, K., Khan, A., Gul, T., Mukhtar, S., Alghamdi, W., Yassen, M. F., & Tag Eldin, E. (2022). Thermally dissipative flow and entropy analysis for electromagnetic trihybrid nanofluid flow past a stretching surface. *ACS omega*, 7(37), 33432–33442. <https://pubs.acs.org/doi/pdf/10.1021/acsomega.2c04047>
- Ishak, N. S. S., Ilias, N. M. R., Kechil, N. S. A., & Bosli, N. F. (2024). Aligned Magnetohydrodynamics and Thermal Radiation Effects on Ternary Hybrid Nanofluids Over Vertical Plate with Nanoparticles Shape Containing Gyrotactic Microorganisms. *Journal of Advanced Research in Numerical Heat Transfer*, 18(1), 68–91. <https://doi.org/10.37934/arnht.18.1.6891>
- Makinde, O. D., & Aziz, A. (2011). Boundary layer flow of a nanofluid past a stretching sheet with a convective boundary condition. *International Journal of Thermal Sciences*, 50(7), 1326–1332. <https://www.sciencedirect.com/science/article/pii/S1290072911000603>
- Pattnaik, P. K., Baithalu, R., Mishra, S. R., & Panda, S. (2024). Effective thermal properties under the influence of various shapes of the nanoparticles on the flow of ternary hybrid nanofluid over an infinite vertical plate. *Pramana*, 98(3). <https://doi.org/10.1007/s12043-024-02792-5>

PERFORMANCE OF DECISION TREE ALGORITHM WITH RANDOMLY DISTRIBUTED FEATURE SPACE

Nurul Radziah binti Ajis, Muhamad Hasbullah bin Mohd Razali

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nurulraziawork01@gmail.com, hasbullah782@uitm.edu.my

Abstract

This study investigates the performance of well-known tree-based algorithms, namely the J48 and Random Forest (RF), on data sets with various feature space distributions. The feature space was simulated using logistic regression due to its simplicity in linearly separable scenarios mainly to reflect a bell-shaped (Normal), right (Gamma) and left (Beta) skewness of real data sets. Both algorithms were compared through accuracy. Simulation results indicate that with normally distributed feature space of balanced class data sets (Sim1, Sim2), J48 performed less accurately than RF. Meanwhile, both algorithms were found to be equally accurate in rather randomly distributed feature space with imbalanced class. This is expected since most algorithms were designed to detect the majority groups for high classification rate. Nevertheless, the simulation procedure highlights the importance of investigating the feature space structure in model performance particularly in unstructured or noisy environments due to reliance on feature space conditions. Future works would be to consider the overall structure of the data sets including class distributions and number of splits as decision trees rely heavily on the branches for classification tasks.

Keywords: *Decision Tree, Logistic Regression, Classification Accuracy, Feature Space Distribution*

1. Introduction

This study evaluates the performance of the Decision Tree algorithm on datasets with randomly distributed feature spaces, using Logistic Regression as a baseline. While Decision Trees are valued for their interpretability and ability to handle mixed data types, their performance can decline with unstructured or noisy data. In contrast, Logistic Regression remains robust in linearly separable cases. The study aims to analyse how random feature distributions impact classification performance and focuses on accuracy, precision, recall, and F-measure. It also explores the challenges random distributions pose to Decision Trees and compares their robustness against Logistic Regression in such conditions.

2. Methodology

This study uses a simulation-based approach with synthetic datasets generated from normal, beta, and gamma distributions to represent different random feature spaces. Logistic Regression establishes the ground truth for classification. The models tested include Decision Trees (J48), Random Forests, and Logistic Regression as a baseline, all implemented using the WEKA software. The models are evaluated using accuracy, precision, recall, and F-measure. A comparative analysis is conducted to assess the consistency and robustness of each model under varying random feature conditions, allowing a systematic investigation of how randomness in feature distributions affects classification performance.

3. Results / Findings

The simulation results show that Decision Trees, particularly the J48 algorithm, struggle with highly randomized feature spaces, resulting in lower accuracy and unstable outcomes. Random Forests consistently outperform J48, offering higher accuracy and better adaptability to noisy or unstructured data. Logistic Regression maintains stable performance in linearly separable cases but declines in

complex, non-linear feature spaces. Overall, Random Forests demonstrate the best performance among the tested models, followed by Decision Trees and Logistic Regression. Both Decision Trees and Random Forests improve with more data, though Random Forests achieve stable, reliable performance more quickly.

4. Novelty of Research / Product / Project

This research provides new insights into how random feature distributions impact Decision Tree performance, an area rarely explored. The project's key novelty lies in systematically simulating randomized feature spaces using various probability distributions to examine their effects on classification. It also offers a comprehensive product by comparing tree-based models with Logistic Regression under these conditions. The analysis identifies Decision Trees' weaknesses in unstructured feature spaces and highlights Random Forests' superior robustness. This study delivers practical guidance for data scientists in selecting suitable algorithms for noisy or random datasets, improving understanding of model behaviour in challenging data environments.

5. Conclusion or Future Work

This study finds Random Forest to be the most reliable classifier for randomly distributed feature spaces, offering high accuracy and consistent performance. Decision Trees, though interpretable, show instability and lower accuracy, while Logistic Regression performs well in simple, linearly separable cases but struggles with complex feature interactions.

REFERENCE LIST

- Quinlan, J. R. (2014). *C4.5: Programs for Machine Learning*. Elsevier.
- Muslim, M. A., Nurzahputra, A., & Prasetyo, B. (2018). Improving accuracy of C4.5 algorithm using split feature reduction model and bagging ensemble for credit card risk prediction. 2018 International Conference on Information and Communications Technology (ICOIACT), 4, 141–145. <https://doi.org/10.1109/icoiact.2018.8350753>
- Hui, J. (2022, March 19). Probability distributions in machine learning & deep learning. Medium. <https://jonathan-hui.medium.com/probability-distributions-in-machine-learning-deep-learning-b0203de88bdf>
- Sharma, A. (2024, December 12). 4 Simple ways to split a decision tree in machine learning (Updated 2025). Analytics Vidhya. <https://www.analyticsvidhya.com/blog/2020/06/4-ways-split-decision-tree/#h-what-is-node-splitting-in-a-decision-tree-and-why-is-it-done>
- SkillCamper. (2025, April 9). Random Forest: Why ensemble learning outperforms individual models. SkillCamper. <https://www.skillcamper.com/blog/random-forest-why-ensemble-learning-outperforms-individual-models>

FORECASTING GOLD PRICES IN MALAYSIA: A COMPARATIVE ANALYSIS OF SIMPLE EXPONENTIAL SMOOTHING, HOLT'S METHOD AND ARIMA MODEL

Puteri Norizzaty Abu Bakar, Siti Nor Nadrah Muhamad

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: ptrnrzzty@gmail.com, nadrahmuhamad@uitm.edu.my

Abstract

Gold plays a vital role in the global economy as a safe-haven asset, widely used for investment, jewellery and as a hedge against inflation and currency fluctuations. In Malaysia, gold price trends are closely watched by investors and analysts due to their sensitivity to market and global events. This study forecasts monthly gold prices in Malaysia using three univariate time series models: Simple Exponential Smoothing (SES), Holt's Method, and ARIMA. Using 122 monthly observations from April 2015 to May 2025, the models' accuracy was compared based on error measures such as RMSE, MAE, MAPE and MASE. Holt's Method outperformed SES and ARIMA (2,1,1) by achieving 91.14% accuracy with the lowest errors especially using a 60:40 training-testing split. The 12-month forecast shows a rising gold price trend from June 2025 to May 2026. The study highlights Holt's effectiveness in capturing linear trends and suggests future research on advanced or hybrid models incorporating external factors like inflation and global events for better accuracy. It also recommends future research to explore more advanced or hybrid forecasting models and incorporate external factors like inflation and global economic events to further improve prediction accuracy.

Keywords: *Gold Price Forecasting, Holt's Method, ARIMA, SES, Forecast Accuracy, RMSE, MAPE*

1. Introduction

Gold has become a preferred investment asset, especially after the COVID-19 pandemic, due to global uncertainty and rising inflation. In Malaysia, gold prices have fluctuated significantly since 2020 and show an upward trend in recent years. These changes highlight the need for accurate forecasting to support better financial decisions. This study aims to forecast monthly gold prices in Malaysia using three time series models: Simple Exponential Smoothing, Holt's Method, and ARIMA. The objectives are to apply and compare these models, identify the most accurate one, and produce a 12-month forecast using historical data from April 2015 to May 2025.

2. Methodology

This study applied three univariate time series forecasting models: SES, Holt's Linear Trend Method, and ARIMA to predict monthly gold prices in Malaysia. The dataset consisted of 122 monthly observations from April 2015 to May 2025, representing the price per gram of 916 gold in Ringgit Malaysia (RM). The data were sourced from secondary online records. To evaluate the models effectively, the dataset was divided into five different training and testing ratios: 90:10, 80:20, 70:30, 60:40 and 50:50. Gold price data from April 2015 to May 2025 is divided into training and testing sets. Three models, Simple Exponential Smoothing, Holt's method and ARIMA are applied to the training data. The models are evaluated using RMSE, MAE, MAPE and MASE. The best performing model is used to forecast gold prices from June 2025 to May 2026.

3. Results / Findings

The results revealed that among the three forecasting models, Holt's Linear Trend Method consistently produced the most accurate predictions, especially under the 60:40 training-testing data

split. This model recorded the lowest error metrics with a RMSE of 48.62, MAE of 30.28, MAPE of 8.86%, and MASE of 1.36. It also achieved the highest forecast accuracy of 91.14%, outperforming both the ARIMA (2,1,1) and SES models, which had forecast accuracies of 86.12% and 86.04% respectively under the 70:30 split. Based on this finding, Holt's Method was used to generate a 12-month forecast of gold prices from June 2025 to May 2026. The forecast indicated a consistent upward trend in gold prices, with values rising from RM449.38 in June 2025 to RM538.76 by May 2026. These findings demonstrate Holt's Method's ability to capture the linear trend present in Malaysian gold price data and suggest that it is the most suitable approach for short- to medium-term forecasting in this context.

4. Novelty of Research

This research provides a valuable contribution by comparing three fundamental time series models which are SES, Holt's Method, and ARIMA in forecasting monthly gold prices in Malaysia. The study uses actual historical data from April 2015 to May 2025, offering a localised focus that is more relevant to Malaysian investors and policymakers. In contrast to previous studies such as Abidin et al. (2018) which explored only one forecasting method this research examines all three models in detail. It also applies five different data partitioning ratios ranging from ninety percent training to fifty percent training to evaluate the consistency and accuracy of each model. The results clearly show that Holt's Method produced the most accurate forecasts with the lowest error values and the highest accuracy of 91.14% using the 60% training and 40% testing split. The study also includes a 12-month forecast from June 2025 to May 2026 which shows a consistent upward trend in gold prices. This adds practical value by providing insights that can support real financial decision making in the Malaysian context.

5. Conclusion or Future Work

This study concludes that Holt's Method is the most accurate model for forecasting Malaysian gold prices (Ariffin et al., 2024). Future research can try advanced models such as SARIMA, Prophet or LSTM. These models may improve forecasting results. It is also important to include other factors like inflation, currency exchange rates and global events. This can help make the predictions more accurate and reliable.

REFERENCE LIST

- Abidin, S. Z., Jalal, T. M. T., Razali, F. A., Hassim, N. H., & Haron, N. F. (2018). Comparison on estimating Malaysia gold price via nonlinear prediction method and Box–Jenkins model. *AIP Conference Proceedings*, 1974, 020057. <https://doi.org/10.1063/1.5041588>
- Ariffin, A. F., Haiqal, M. S., Nor, N. A. M., Hamid, M. H. A., & Samian, M. H. (2024). A Comparative Analysis of Holt's, Arima, and Prophet Methods in Forecasting Kijang Gold Prices. *International Journal of Entrepreneurship and Management Practices*, 7(25), 325–338. <https://doi.org/10.35631/ijemp.725027>

OPTIMIZING TRANSPORTATION COST BY USING LINEAR PROGRAMMING

Quintasya Kamarlia Kamaruzaman, Diana Sirmayunie Nasir

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: quintasyaa@gmail.com, dianasirmayunie@uitm.edu.my

Abstract

Effective transportation planning is critical for businesses to reduce operational costs, improve distribution efficiency, and increase overall profitability. To optimized transportation costs in a road-based distribution system, this study applies Linear Programming (LP), a mathematical technique that produces the most effective results under specified constraints. The study used secondary data which is based on a case study of the Yusril Medan Bread Distribution business and involves two supply centers and four demand areas. The data set consists of supply capacities, demand requirements and unit transportation costs between supply and demand points. To find the most cost-effective method for distributing goods, a transportation model was created and solved with LINGO software. The results were compared with the Minimum Cell Cost Method (MCCM), a commonly used heuristic in transportation planning. The LP approach achieved a total transportation cost of RM39.05, while MCCM produced a higher cost of RM42.00. These results show how effective LP is at helping balanced supply demand fullfilment, reducing distribution costs, and enhancing resource utilisation. This study additionally illustrates how important it is to integrate optimisation tools into logistics decision-making to enhance operational performance.

Keywords: *Transportation Problem, Linear Programming, Supply Chain Management*

1. Introduction

Transportation cost plays a crucial role in supply chain efficiency and profitability, particularly in distribution networks. In the current competitive environment, companies need to priorities logistics cost while guaranteeing delivery times. This study examines the use of Linear Programming (LP) to reduce transportation expenses through a practical example from the Yusril Medan Bread Distribution business. The objective is to develop an optimized transportation plan that fullfil supply and demand constraints, while minimizing cost. Rising operational expenses, including fuel prices and inefficient routing, contribute significantly to distribute challenges. By applying LP, companies can enhance resource utilization and decision-making. Chua et al. (2025) emphasized that many Malaysian businesses incur high logistics costs due to limited planning strategies and inadequate cost structures, underscoring the need for systematic optimization approaches.

2. Methodology

This study uses Linear Programming to minimize transportation costs in a supply-demand network. Data was collected from a real case study on bread distribution in Medan, Indonesia by Harahap, L., et al., (2024) involving two supply demand and four destinations. The inputs include supply capacities, demand requirements and per unit transportation costs between sources and destination. A mathematical model was developed with the objective function aiming to minimize total cost, subject to supply and demand constraints. The model was solved using LINGO software to obtain the optimal solution. To ensure model accuracy, the results from LINGO were manually validated using direct substitution into the objective function. The final allocation plan fully utilized the available supply and satisfied all demand, confirming the feasibility and optimality of the solution. The study also compares the results with the Minimum Cell Cost Method to evaluate the cost-effectiveness.

3. Results

The Linear Programming model achieved an optimal transportation cost of RM39.05, outperforming the MCCM's RM42.00. Rahayu supplied 50 units to Medan Denai and 15 to Medan Area, while Mandala supplied 50 units to Medan Tembung, 20 to Medan Timur and 15 to Medan Area, fully utilizing both centers' capacity. The LINGO solution in directed zero infeasibility and required only one iteration, confirming model accuracy and computational efficiency. The results validate LP as a superior for cost minimization in small-to-medium scale logistics and emphasizes its practicality for distribution planning. The RM3.53 cost difference, although seemingly marginal, signifies notable's savings when scaled across multiple distribution cycles.

4. Novelty of Research

This study demonstrates the practical application of Linear Programming in logistics planning through a real-life case study. Unlike heuristic methods like MCCM, LP provides a structured, scalable, and exact optimization framework. The novelty lies in showcasing LP's superior cost efficiency using actual distribution data and validating results through both software simulation and manual calculation. The use of LINGO software facilitates rapid and reliable model solving, making the technique accessible for businesses seeking cost-effective delivery strategies. The comparison with MCCM reinforces LP's advantage in precision and adaptability to various operational constraints, making it a valuable tool in modern SCM.

5. Conclusion or Future Work

Linear Programming proved effective in minimizing transportation costs in a real-world case study. The model ensured full utilization of supply while fulfilling demand at minimum cost. Future research may incorporate dynamic variables such as fuel price changes, time windows, or product perishability. It may also explore hybrid models combining LP with AI-based approaches such as Genetic Algorithms or Goal Programming to enhance flexibility and accuracy in complex logistics networks. As highlighted by Abdirad and Krishnan (2022), integrating smart optimization techniques into supply chain planning can improve service performance and customer satisfaction, making it highly relevant for evolving logistics challenges.

REFERENCE LIST

- Abdirad, M., & Krishnan, K. (2022). Examining the impact of E-Supply Chain on service quality and customer satisfaction: *A case study*. *International Journal of Quality and Service Sciences*, 14(2), 274–290. <https://doi.org/10.1108/IJQSS-08-2020-0131>
- Chua, M. Y., Lee, K. L., Md Haron, N. R. H., & Nawanir, G. (2025). Optimizing Logistics Costing in Malaysian Small and Medium Enterprises: A CASE STUDY OF GARMENT MANUFACTURER. *International Journal of Industrial Management*, 19(1), 22–28. <https://doi.org/10.15282/ijim.19.1.2025.12091>
- Harahap, L., Ariani, P., Syahfitri, R., Febrianda, D., Ritonga, Z., Program, S., Manajemen, Iskandar, W., Baru, K., Percut, K., & Tuan, S. (2024). Optimizing Transportation Costs Using the Minimum Cell Cost Method in the “Yusril Medan Bread Distribution” Business. *Economic: Journal Economic and Business*, 3(2), 55–58. <https://doi.org/10.56495/ejeb.v3i2.589>

MONITORING AIR POLLUTION IN PERAK USING FUZZY LOGIC

Rabiyatul Awadiyah Binti Redzuan, Nur Fazliana Binti Rahim(Dr)

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: ar.rabiyatul@gmail.com, fazlianarahim@uitm.edu.my

Abstract

Air pollution is a critical environmental issues that affects human health and ecological systems. Traditional air quality monitoring methods in Tasek Ipoh, Perak and Seri Manjung, Perak often face challenges such as high costs, depending on manual data collection and limited adaptability to dynamic environmental changes. This study proposes a fuzzy logic based system for monitoring air pollution which aims to develop a predictive model that assesses air quality more accurate. The result indicate that the fuzzy logic model successfully identifies areas with high risk of air pollution and generates reliable predictions of air quality levels. Among the two location studied, Tasek Ipoh was found to have a higher risk of air pollution compared to Seri Manjung, primarily due to its industrial activities. The model able to handle imprecise and complex data with cost-effective solution for air quality monitoring. This research provides valuable insights for environmental agencies, enabling more responsive decision-making and contributing to improved public health and sustainable environmental management.

Keywords: *Air Pollution, Fuzzy Logic, Monitoring*

1. Introduction

Air pollution refers to the contamination of the indoor or outdoor environment by any physical, chemical, or biological factor that alters the natural characteristics of atmosphere (Balali-mood et al, 2016). It poses a serious threat to human health and ecosystems especially in industrial areas. Traditional air quality monitoring methods in Malaysia rely on physical sensors and manual processes, which are often costly, time consuming, and inaccurate in rapidly changing environments. This study aims to develop fuzzy logic based system to monitor air pollution in real time and identify high-risk areas. The system focuses on key pollutants such as PM_{2.5}, PM₁₀, CO, SO₂, and O₃ while considering environmental factors such as temperature, humidity, and wind speed. The data is limited to Ipoh (urban) and Seri Manjung (rural). This approach supports better decision-making, environmental protection, and public health management.

2. Methodology

This study applies a fuzzy logic approach to monitor and predict air pollution levels in Perak, Malaysia. Secondary data were collected from the Department of Environment (DOE) Malaysia, covering daily data for the period of January to December 2023. MATLAB software was used to develop the fuzzy inference system. The process began by identifying the input and output variables, then assigning linguistic terms such as “Very Good”, “Good”, “Moderate”, “Unhealthy”, and “Very Unhealthy” to describe pollution levels. Triangular and trapezoidal membership functions were used because they are simple, yet effective in representing fuzzy sets (Dass et al., 2021). The Mamdani inference model was selected for its suitability in environmental decision-making logic, consist of a series on if-then rules that defined the relationships between pollutant levels and air quality (Ebrahim & Mofid, 2011). The system then used the centroid method to defuzzify the results, producing a clear numerical value for the Air Pollution Index (API). This approach helped created a practical and adaptable system for a real-time air quality monitoring and forecasting.

3. Results / Findings

Using input pollutants such as PM₁₀, PM_{2.5}, SO₂, CO and O₃, the Air Quality Index (AQI) was classified into categories ranging from “Very Good” to “Very Unhealthy”. In Tasek Ipoh, O₃ recorded the highest AQI (104.5), followed by SO₂ (92.9) and PM_{2.5} (84.3), which shows the high risk area in Perak. Seri Manjung recorded a significantly lower AQI of 16.4. Rule-based inference demonstrated that PM_{2.5} and PM₁₀ had significant effects on AQI outputs. A comparison between actual and predicted AQI values showed consistent trends, indicating system’s potential in forecasting future pollution levels. These findings demonstrate the effectiveness of fuzzy logic in environmental monitoring and in identifying the most affected areas and take action to improve air quality which was emphasized in Kravchenko et al. (2020).

4. Novelty of Research / Product / Project

This study introduces a new approach to monitoring air pollution by using a fuzzy logic system. Fuzzy logic allows for more flexible and adaptive assessment by handling uncertainty in real-time data. The use of linguistic terms and rule-based logic also makes the results easier to interpret, helping decision-makers take informed action. The study offers a smarter and more responsive way to monitor air quality, which can be scaled and applied to other regions facing similar challenges.

5. Conclusion or Future Work

This study shows that fuzzy logic is an effective tool and suitable for monitoring air pollution in Perak. Future research should combine fuzzy systems with Internet of Things and machine learning, using larger datasets to improve accuracy of prediction. This approach can support real-time monitoring, inform environmental policies, and promote healthier, more sustainable urban development.

REFERENCE LIST

- Balali-Mood, M., Ghorani-Azam, A., & Riahi-Zanjani, B. (2016). Effects of air pollution on human health and practical measures for prevention in Iran. *Journal of Research in Medical Sciences*, 21(1), 65. <https://doi.org/10.4103/1735-1995.189646>
- Dass, A., Srivastava, S., & Chaudhary, G. (2021). Air pollution: A review and analysis using fuzzy techniques in Indian scenario. *Environmental Technology & Innovation*, 22, 101441. <https://doi.org/10.1016/j.eti.2021.101441>
- Ebrahim, S., & Mofid, F. (2011). Air pollution monitoring using fuzzy logic in industries. *Advanced Air Pollution*. <https://doi.org/10.5772/16947>
- Kravchenko, Y., Leshchenko, O., Dakhno, N., Deinega, V., Shevchenko, H., & Trush, O. (2020). Intellectual fuzzy system air pollution control. 2020 IEEE 2nd International Conference on Advanced Trends in Information Theory (ATIT), 186–191. <https://doi.org/10.1109/atit50783.2020.9349334>

THE USE OF THE TRAPEZOIDAL RULE AND SIMPSON'S RULE TO APPROXIMATE THE VOLUME OF BUKIT TUNJANG, KEDAH

Shakirah Nurain Mohd Suhaimi, Mohamad Najib Bin Mohamad Fadzil

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022835966@student.uitm.edu.my, mohamadnajib@uitm.edu.my

Abstract

This study applies the Trapezoidal rule and Simpson's rule to approximate the volume of Bukit Tunjang, a hill located in Kedah, Malaysia. Elevation data were obtained from Google Earth by constructing cross-sectional profiles. The profile was used to calculate the area of each cross-sections and approximate the total volume. The Trapezoidal rule provides an approximation volume of about $529,983,883.50 \text{ m}^3$, while Simpson's rule yielded about $526,920,467.10 \text{ m}^3$. Further analysis shows that, increasing number of cross-sections the consistency of the approximations. The numerical integration methods offer as a low-cost alternative to advanced tools like LiDAR or GPS, supporting land-use planning and environmental analysis in areas with limited access to advanced technologies.

Keywords: Numerical Integration, The Trapezoidal Rule, Simpson's Rule, Volume Approximation, Bukit Tunjang

1. Introduction

Approximating the volume of geological structures like Bukit Tunjang is significant for land development, resource management and environmental planning (Pavičić et al., n.d.). Standard volume calculation methods such as LiDAR scanning or field-based surveys often are not cost-effective and limited accessibility. This study aims to explore the use of two numerical integration methods, which are the Trapezoidal rule and Simpson's rule to approximate the volume of Bukit Tunjang as a practical and cost-effective alternative to the standard method. The scope of the study includes constructing topographic profiles using Google Earth to collect elevation data of Bukit Tunjang and applying both methods to approximate the volume. The main objectives of this study are to approximate the volume of Bukit Tunjang using these numerical integration methods and to compare performance of both methods in terms of reliability and convergence.

2. Methodology

This study applied a structured process to approximate the volume of Bukit Tunjang using two numerical integration methods. The process began with the construction of topographic profile of the hill using Google Earth, where eight cross-sections were drawn across the terrain to capture elevation data at regular intervals. The elevation values were used to calculate the area of each cross-sections. Two numerical integration methods were applied to calculate the total volume (Kishor Kumar & Yadav., 2024.). The Trapezoidal rule is a method that approximates area using straight-line segments between elevation points (Winnicka., 2019). Meanwhile Simpson's rule uses parabolic curves for more better approximations over curved surfaces. The cross-sectional areas were multiplied by the distances between each cross-sections to estimate the volume of the sections. The total volume was obtained by summing the volumes of all cross-sectional intervals. A convergence analysis was also performed using different number of cross-sections to evaluate the consistency of the results. This analysis provided insight into the reliability of numerical approximation when applied to irregular terrain using accessible tools like Google Earth.

3. Results / Findings

The Trapezoidal rule approximated the volume of Bukit Tunjang at approximately $529,983,883.50 \text{ m}^3$, while Simpson's rule provides a slightly lower volume approximation than the Trapezoidal rule at approximately $526,920,467.10 \text{ m}^3$. The differences align with in how each method processes elevation data. A convergence analysis was conducted by using different number of cross-sections, starting from 3 cross-sections to 8 cross-sections. The result of the analysis showed that as more cross-sections were added, both methods provide more stable and consistent volume approximations. Overall, the findings demonstrate the practicality of numerical integration methods for approximating terrain volumes, especially for region with limited access to advanced surveying tools.

4. Novelty of Research / Product / Project

This study introduces a practical application of numerical integration methods, the Trapezoidal rule and Simpson's rule to approximate the volume of a real geological structure, Bukit Tunjang using elevation data sourced from Google Earth. While these methods are commonly taught in mathematical theory, the practical use of these methods in real-world terrain modelling remains limited, especially in the context of Malaysia geological structure. The novelty lies in offering a cost-effective and accessible methods for volume approximation of geological structures. Through the use of freely available tools like Google Earth and established numerical integration methods like the Trapezoidal rule and Simpson's rule, this study offers a cost-effective methods for preliminary land analysis and support decision-making in region with limited access to advanced surveying methods. It also potentially contributes to the underexplored areas and as a foundation for future research in environmental planning, resource estimation, and mathematical education.

5. Conclusion or Future Work

This study demonstrates the practical use of numerical integration methods for volume approximation of geological structure. Future research could incorporate elevation data with higher resolution or integrating GIS tools to enhance the accuracy of the approximation. Hybrid numerical integration methods could also be explored to more accurately model the complexity of real geological structures.

REFERENCE LIST

- Kishor Kumar Corresponding, N., & Yadav, D. P. (n.d.). ISSN : Approximation in the Application of the Integration. In *MEDHA* (Vol. 7, Issue 1).
- Pavičić, J., Andreić, Ž., Malvić, T., Rajić, R., & Velić, J. (n.d.). *Application of Simpson's and trapezoidal formulas for volume calculation of subsurface structures-recommendations*.
- Winnicka, A. (n.d.). *Comparison of numerical integration methods*.

PREDICTIVE OBESITY AMONG CHILDREN AND ADOLESCENT USING LOGISTIC REGRESSION AND RANDOM FOREST MODEL

Siti Norain Mohd Yusoff, Nor Azriani Mohamad Nor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: aieynyusoff5063@gmail.com, norazriani@uitm.edu.my

Abstract

Childhood obesity has become a serious public health concern in Malaysia and worldwide. This study aims to predict obesity among children and adolescents using two classification techniques: logistic regression and random forest. The dataset was obtained from Kaggle and includes 2,111 records with 16 demographic, dietary, and lifestyle variables. Logistic regression was used to identify significant predictors, while the random forest model captured complex interactions among variables. The performance of both models was evaluated using accuracy, precision, recall, specificity, F1-score, and AUC. The logistic regression model achieved high recall (98.9%) but very low precision (2.0%) and F1-score (3.8%), indicating a high false-positive rate. The random forest model showed more balanced metrics with a precision of 48.9% and F1-score of 46.1%, although the accuracy was lower at 49.9%. The findings suggest that while logistic regression can identify at-risk individuals, random forest provides more reliable predictions. Both models, however, showed weak performance overall (AUC \approx 0.5), highlighting the need for improved data and modeling approaches.

Keywords: *Childhood Obesity, Logistic Regression, Random Forest, Prediction Model, Malaysia*

1. Introduction

The rising prevalence of obesity among Malaysian children and adolescents poses serious health risks. Factors such as high-calorie diets, low physical activity, and technology overuse contribute significantly. This study focuses on predicting childhood obesity using logistic regression and random forest models. The objective is to identify key risk factors and evaluate the predictive performance of both models. The outcome may assist healthcare providers in early detection and prevention strategies tailored to local populations.

2. Methodology

The dataset used for this study was sourced from Kaggle, consisting of 2,111 records with 16 attributes. It includes variables like age, gender, family history, physical activity, eating patterns, and screen time. Data was split into training (80%) and testing (20%) sets. Logistic regression was applied to identify significant predictors based on p-values, while random forest focused on ranking feature importance. Both models were implemented using RStudio. Performance evaluation included standard classification metrics: accuracy, precision, sensitivity, specificity, F1-score, and AUC. Logistic regression emphasized interpretability, while random forest offered robustness in handling non-linear relationships.

3. Results / Findings

The logistic regression model showed high recall (98.9%) but very low precision (2.0%), suggesting over-prediction of obesity. It identified “eating between meals” as the only significant predictor. In contrast, random forest identified five key predictors: family history with overweight, frequency of vegetable intake, age, physical activity, and number of meals. It showed better balance in metrics, with 48.9% precision and 46.1% F1-score, although the overall accuracy was lower (49.9%). Both models performed poorly in terms of AUC (\approx 0.5), suggesting weak overall discrimination between obese and non-obese individuals.

4. Novelty of Research / Product / Project

This study applies and compares traditional statistical (logistic regression) and machine learning (random forest) methods to predict obesity in children a growing issue in Malaysia. The novelty lies in analyzing variable importance from both models and highlighting their strengths and limitations. This comparison provides insight into which model is better suited for practical application in health settings, especially under data imbalance conditions. The project sets the groundwork for future development of more advanced prediction tools.

5. Conclusion or Future Work

For future work, firstly, include more important variables such as sleep duration, stress level, screen time during weekend, and family income. This is to ensure that the model can detect obesity more accurately by considering other possible risk factors. Next, use advanced machine learning models like gradient boosting or neural networks. This is because these models can handle complex data better and give more reliable prediction results.

REFERENCE LIST

- Devetyarov, D., & Nouretdinov, I. (2010). Prediction with confidence based on a random forest classifier. IFIP Advances in Information and Communication Technology, 37–44.
https://doi.org/10.1007/978-3-642-16239-8_8
- Ministry of Health Malaysia. (2019). National Health and Morbidity Survey 2019.
<https://www.iku.gov.my/nhms>
- Muhramasaputra. (2023). *Obesity based on eating habits and physical condition* [Dataset]. Kaggle.
<https://www.kaggle.com/datasets/muhramasaputra/obesity-based-on-eating-habits-and-physical-cond>
- UNICEF. (2025). Overweight and Obesity Among Children and Adolescents.
<https://www.unicef.org/rosa/reports/overweight-and-obesity-among-children-and-adolescents>
- UNICEF. (2025). Overweight and Obesity Among Children and Adolescents.
<https://www.unicef.org/rosa/reports/overweight-and-obesity-among-children-and-adolescents>

EDUFLEX AN AI-POWERED TOOL FOR CREATING PERSONALIZED LEARNING MATERIALS

Ahmad Aiman Hakim Bin Mohd Saleh, Azmi Bin Abu Seman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: aimanhkm9862@gmail.com, azmi384@uitm.edu.my

Abstract

EduFlex is an AI-powered platform designed to revolutionize personalized learning by converting conventional lecture notes and academic materials into dynamic, adaptive study tools using Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG). The system generates tailored flashcards, quizzes, and concise notes that align with individual learners' knowledge levels and progress, dynamically adjusting materials in real-time to ensure relevance and engagement unlike traditional e-learning platforms with static content. Developed using the Waterfall methodology, the project followed structured phases planning, analysis, design, implementation, testing, and documentation to ensure robustness, incorporating key features like an interactive AI chatbot for instant clarification, dynamic content generation, and real-time feedback within an intuitive interface. Usability testing with university students showed 100% functionality, with high satisfaction in ease of use, utility, and engagement. EduFlex addresses gaps in current e-learning systems by offering AI-driven personalization, mobile-friendly access, and multilingual support, demonstrating significant potential to enhance learning outcomes through adaptive study aids. Future improvements may include gamification, enhanced UI/UX, and broader language support to boost accessibility and retention. By merging advanced AI with practical educational tools, EduFlex sets a new standard for personalized, scalable learning solutions, benefiting students, educators, and lifelong learners.

Keywords: *Artificial Intelligence, Personalized Learning Material, Web Application, Usability Testing, Adaptive Learning.*

1. Introduction

EduFlex represents an innovative AI-powered learning platform that transforms traditional educational materials into personalized study tools using advanced Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG) technology (Yang & Wen, 2023). Addressing the critical limitations of current e-learning systems that offer static, one-size-fits-all content (Khan & Ghasempour, 2024), EduFlex dynamically adapts learning materials like flashcards, quizzes, and notes to match each student's individual pace and comprehension level (Katiyar et al., 2024). By leveraging RAG-enhanced LLMs (Zhao et al., 2024), the system ensures content remains contextually relevant while providing educators with valuable performance insights (Katiyar et al., 2021). This research project aims to develop and evaluate this web-based tool, which promises to enhance engagement and knowledge retention (Ayeni et al., 2024) across both academic and professional training environments through its adaptive, AI-driven approach to personalized learning.

2. Methodology

This EduFlex was developed using the structured Waterfall mODEL methodology, proceeding sequentially through requirements analysis, system design, implementation, testing, and documentation. Requirements were derived from comprehensive literature reviews on AI in education and analysis of current e-learning systems. The system architecture was designed with data flow diagrams and ER models, utilizing Figma for user interface prototypes. Implementation employed a React frontend and Django backend, integrating LangChain and Google's Gemini API for AI content generation, with SQLite managing data storage. Rigorous evaluation included functionality testing (100% success rate) and usability tests with 30 participants, resulting in an average SUS rating of

1.63/7. These results demonstrated strong user acceptance of personalized learning features and reliable system performance, validating the technical approach and the methodology's effectiveness in meeting educational objectives.

3. Results / Findings

The evaluation of EduFlex focused on three dimensions: System Usefulness (SYSUSE), Information Quality (INFOQUAL), and Interface Quality (INTERQUAL). Participants reported high SYSUSE satisfaction, with 73.3% agreeing the platform improved learning efficiency and 83% confirming enhanced study productivity. INFOQUAL results were excellent, showing 92% accuracy in AI-generated content and 78% reduction in factual errors via the RAG system. For INTERQUAL, 80% found the dashboard intuitive. Functionality testing confirmed 100% operational reliability. These findings validate EduFlex's effectiveness in delivering personalized learning, with 87% of participants preferring it over traditional platforms, while identifying areas for interface optimization.

4. Novelty of Research

EduFlex is an innovative, AI-powered platform that uses Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG) to transform academic materials into personalized learning experiences. Unlike static e-learning tools, EduFlex dynamically generates customized flashcards, quizzes, and concise notes in real-time, adapting to individual student needs and pace. It leverages the Gemini API and LangChain for accuracy, offering features like an interactive Q&A chatbot and multilingual support. With a user-friendly interface and proven 100% functionality, EduFlex bridges the gap between conventional and adaptive education, offering a scalable solution for personalized learning.

5. Conclusion or Future Work

EduFlex successfully demonstrates the potential of AI to revolutionize personalized learning. Future enhancements could include gamification elements, expanded multilingual support, and improved mobile optimization to further boost engagement. Additionally, integrating advanced analytics for real-time progress tracking and adaptive feedback will refine its effectiveness, ensuring broader applicability across diverse educational and professional contexts.

REFERENCE LIST

- Khan, R., & Ghasempour, E. (2024). A Review of AI-Enhanced Personalized Learning Systems: Implications for the Learning Sciences. University of Toronto.
- Katiyar, Prof. Dr. N., Awasthi, Mr. V. K., Pratap, Dr. R., Mishra, Mr. K., Shukla, Mr. N., Singh, Mr. R., & Tiwari, Dr. M. (2024). Ai-Driven Personalized Learning Systems: Enhancing Educational Effectiveness. Educational Administration Theory and Practices. <https://doi.org/10.53555/kuey.v30i5.4961>
- Wen, Q., Liang, J., Sierra, C., Luckin, R., Tong, R., Liu, Z., Cui, P., & Tang, J. (2024). AI for Education (AI4EDU): Advancing Personalized Education with LLM and Adaptive Learning. Proceedings of the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 6743–6744. <https://doi.org/10.1145/3637528.3671498>
- Zhao, P., Zhang, H., Yu, Q., Wang, Z., Geng, Y., Fu, F., Yang, L., Zhang, W., & Cui, B. (2024). Retrieval-Augmented Generation for AI-Generated Content: A Survey. ArXiv, abs/2402.19473. <https://doi.org/10.48550/arXiv.2402.19473>

STUDY SPARK: AN ONLINE LEARNING PLATFORM WITH LIVE PEER LEARNING AND PROGRESS TRACKING

Ain Binti Abd Muthalib, Muhammad Nabil Fikri Bin Jamaluddin

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: ainmuthalib@gmail.com, nabilfikri@uitm.edu.my

Abstract

This project introduced Study Spark, an online learning platform aimed at improving student engagement through live peer learning and progress tracking. It addressed common online learning challenges such as low motivation and isolation by incorporating real-time communication, progress dashboards and gamification. Using an adapted waterfall methodology, the project underwent planning, design, development, testing and documentation. Functionality tests showed 100% success, and User Acceptance Testing with 30 participants reported high satisfaction. While the platform proved effective, areas for improvement include lack of features like AI-driven recommendations and video conferencing. Future work should focus on enhancing user experience and scalability.

Keywords: *Online Learning Platform, Peer Learning, Progress Tracking, Real-Time Communication, User Acceptance Testing*

1. Introduction

The shift to online education has brought challenges such as low student engagement, isolation and lack of motivation (Hari et al., 2024). Study Spark was developed to address these issues by offering a web-based learning platform that emphasizes live peer interaction and real-time progress tracking. The main objectives of this project are to identify the key requirements for an effective online learning platform, design and develop a web-based learning platform and evaluate the developed learning platform using functionality and user acceptance test. The scope of the project includes features such as live chatrooms, progress dashboards and leaderboards to promote engagement, along with tools for instructors to manage courses and quizzes (Gnanapriya & Dinesh, 2024). The system supports real-time communication and operates locally, with evaluations involving university students and lecturers to ensure relevance and usability. This platform aims to create a more engaging and supportive online learning environment.

2. Methodology

This project employed an adapted waterfall model, structured into five phases, planning, design, development, testing and documentation (Amron et al., 2022). In the planning phase, system requirements were identified through literature review and analysis of current e-learning challenges. The design phase involved the creation of sitemaps, data flow diagrams (DFD), entity relationship diagrams (ERD) and user interface mock-ups to guide development. The development phase utilized HTML, CSS, PHP, MySQL, and MongoDB to build the platform, supporting key roles, student, lecturer and administrator with functionalities such as live chatrooms, course management and progress tracking. During the testing phase, functionality testing was conducted to ensure each feature worked correctly, including login, course enrollment, chat functions and leaderboard tracking. Test cases were designed for each user role and executed with expected outcomes documented. Results showed a 100% success rate across all core features, validating the system's reliability and performance. User Acceptance Testing (UAT) was then conducted with 30 participants. Using the metrics such as Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude (ATT) and Behavioral Intention (BI) were assessed. Feedback indicated high user satisfaction, with recommendations for user interface and long-term engagement improvements. The documentation phase compiled the entire development and testing process for future reference and maintenance.

3. Results / Findings

The evaluation of Study Spark was conducted through functionality testing and User Acceptance Testing (UAT). The functionality testing phase validated all major system features, including user login, chatrooms, discussion forums and leaderboard tracking. All test cases passed successfully with a 100% functionality rate, confirming the platform's operational reliability. The User Acceptance Testing (UAT) involved 30 participants, including students and lecturers. Results showed high levels of satisfaction across key dimensions, Perceived Ease of Use (PEU), Perceived Usefulness (PU) and Attitude (ATT). However, the Behavioural Intention (BI) score was slightly lower, suggesting that while users appreciated the system, long-term usage motivation could be improved. Participants highlighted the platform's real-time interaction, progress tracking and gamified elements as engaging features. Suggestions included enhancing the user interface and integrating more advanced functionalities like video conferencing and AI-based recommendations.

4. Novelty of Project

The novelty of Study Spark lies in its unique integration of live peer learning, real-time progress tracking and gamification within a single web-based platform, specifically tailored to address the key limitations of current online learning systems, low engagement, procrastination and learner isolation. While many existing platforms offer content delivery and assessments, they often lack dynamic peer interaction and real-time accountability features. Unlike traditional e-learning systems, Study Spark enables synchronous peer collaboration through live chatrooms and discussion spaces, allowing students to support and learn from one another in real time. The progress tracking dashboard and leaderboard motivate users by making learning performance transparent and goal-oriented. Additionally, the platform supports multi-role access, providing lecturers with intuitive tools to manage courses and monitor student activity effectively. This project also combines dual-database integration, using MySQL for structured content and MongoDB for real-time progress tracking, offering flexibility and performance optimization. The emphasis on real-time engagement and social learning dynamics introduces a practical, community-driven approach to online education, distinguishing Study Spark as an innovative solution in the digital learning landscape.

5. Conclusion or Future Work

Study Spark successfully enhances online learning through live peer interaction and progress tracking. While the platform meets current educational needs, future work should focus on improving the user interface, integrating AI-driven recommendations and adding video conferencing to further enrich engagement and scalability.

REFERENCE LIST

- Amron, M. T., Noh, N. H. M., Tan, G. J., & Ramlan, M. A. (2022). Application of the waterfall method in the design of UiTM integrated staff information system (ISIS). *International Journal of Advanced Research in Education and Society*. <https://doi.org/10.55057/ijares.2022.4.3.3>
- Gnanapriya, & Dinesh. (2024). Online learning platform: A comprehensive model and analysis. *Interantional Journal of Scientific Research in Engineering and Management*, 08(09), 1–16. <https://doi.org/10.55041/IJSREM37664>
- Hari, R. M., Herbert, C., & Polly, P. (2024). Disrupted student engagement and motivation: Observations from online and face-to-face university learning environments. *Frontiers in Education*, 8. <https://doi.org/10.3389/feduc.2023.1320822>

RXISTANT: WEB MEDICINE ASSISTANT FOR PHARMACIST

Aisyah Faqihah Binti Adnan, Noorfaizalfarid Bin Mohd Noor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: marksyah03@gmail.com, nfaizalf@uitm.edu.my

Abstract

The problem of medication errors continues to affect healthcare systems and poses a significant challenge to patient safety, as it is also very costly. To address the current situation, this paper introduces Rxistant, a web-based medicine assistant designed to help pharmacists efficiently search for accurate and up-to-date drug data. Rxistant enhances drug delivery and improves prescription accuracy by utilising the RxNorm API of standardised drug nomenclature and applying machine learning to refine drug suggestions. Inbuilt with real-time retrieval of drug information, drug interaction verification, and recommendation systems, the system was implemented by adopting the Agile development methodology. The study also measures the performance of the system based on Technology Acceptance Model (TAM), which includes assessing those variables of the Technology Acceptance Model (TAM) as perceived usefulness (PU), ease of use (PEOU), attitude toward using (AT), and behavioral intention to use (BI). The pharmacists' answers emphasised the need for more efficient work (and fewer errors) but also highlighted drawbacks such as a lack of information about drug interactions and a simple interface. A further enhancement will entail the addition of a larger drug database, refine the interface, and incorporate more detailed measures, including the use of AI-powered chatbots and automatic error correction.

Keywords: Medication errors, Rxistant, Pharmacists, Technology Acceptance Model (TAM), RxNorm API

1. Introduction

The objectives of this project are to understand how pharmacists manage drug prescriptions in their daily routine, develop a web-based system with an Application Programming Interface (API) to assist pharmacists in prescribing medications efficiently, and evaluate the system using the Technology Acceptance Model (TAM). The market aims to address the use of the scope by pharmacists in hospitals, pharmacies, or clinics, and the system requires an online connection to retrieve information about medications. It will assist in the quick and precise delivery of information to pharmacists, who can then detect the appropriate drug and any errors in the prescription. The project will utilise valid sources and a blended recommender system to enhance data merging. The system will also facilitate the cross-checking of drug interactions and side effects, thereby enhancing patient safety and pharmaceutical procedures. The result is to help pharmacists provide safer and more efficient medication management.

2. Methodology

Agile methodology is a flexible software development approach designed to overcome the limitations of traditional methods like Waterfall. It emphasizes customer collaboration, working software, and adaptability to changes, consisting of five phases: planning, requirements analysis, design, development, and testing (Al-Saqqa et al., 2020; Daraojimba et al., 2024). The planning phase defines the project's scope and objectives, while the requirements analysis phase outlines functional and non-functional needs. Development involves implementing the system architecture using tools like Visual Studio Code and MySQL, and testing assesses the system's acceptance using the Technology Acceptance Model (TAM). Documentation summarizes the project's outcomes, ensuring an efficient drug information retrieval system for pharmacists.

3. Results

This experiment evaluated the user acceptance of the Rxistant application among 30 respondents from healthcare lineup using the Technology Acceptance Model (TAM). It analysed four important dimensions: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Using (AT), and Behavioural Intention to Use (BI). The results depicted an average score of 3.45 on PU, where users believed the system was effective in conducting various tasks, such as searching for drugs, as well as reducing errors. However, some users identified delays in accessing updated information records. PEOU received the highest score (3.66); the majority of users liked that it had an intuitive interface, and a few (10%) reported having a learning curve. The AT mean score was 3.36, indicating moderate satisfaction, with 43.3% agreeing that it is helpful in pharmacy processes. BI had a score of 3.48, indicating a high propensity for future use, especially in the context of prescription. All the significant functions were tested for functionality and performed as intended. To conclude, Rxistant is very user-friendly and helpful, but there is room for improvement in the speed and onboarding process. This discovery confirms its potential as a pharmacy workflow tool, assuming we make minor upgrades to existing functions.

4. Novelty of Project

This project lies in its innovative use of machine learning and the RxNorm API better to manage the medications and the accuracy of the prescriptions. The system utilises machine learning and real-time patient data to make more refined drug suggestions, ensuring fewer prescription mistakes and better personalised healthcare (Kim et al., 2017). The incorporation of the RxNorm API makes the project promising, as it enables pharmacists to access pharmacologically standardised and current drug information, thereby enhancing interoperability and the decision-making process. An important aspect is the real-time drug interaction check, which enables pharmacists to evaluate the risk of medication interactions prior to issuing the prescription, thereby enhancing patient safety. The system is also designed to be user-friendly, enabling pharmacists to access information about drugs quickly. Additionally, the Technology Acceptance Model (TAM) is proposed as the approach to assess the project, thereby contributing to the calculation of user perception levels, which will inform future improvements. Such a combination of real-time drug verification, individualised drug suggestions for prescription, and user-focused design makes the project an innovative and feasible intervention in pharmacy practice, aiming to minimise medication errors and improve patient treatment.

5. Conclusion or Future Work

The Rxistant project helps optimise the pharmacy workflow with the introduction of real-time drug information, personal recommendations, and drug interaction checks. Feedback on the user experience is also very positive, but there is still work to be done on improving speed and onboarding. Rxistant will be able to decrease the occurrence of medication errors if it continues to refine its work, which will contribute to patient safety and the overall efficiency of a pharmacy.

REFERENCE LIST

- Alsaqqa, S., Sawalha, S., & Abdel-Nabi, H. (2020). Agile Software Development: Methodologies and Trends. *International Journal of Interactive Mobile Technologies*, 14(11), 246–270. <https://doi.org/10.3991/ijim.v14i11.13269>
- Bates, D. W., & Singh, H. (2018). Two Decades Since To Err Is Human: An Assessment Of Progress And Emerging Priorities In Patient Safety. *Health Affairs*, 37(11), 1736–1743. <https://doi.org/10.1377/hlthaff.2018.0738>
- Kim, M. O., Coiera, E., & Magrabi, F. (2017). Problems with health information technology and their effects on care delivery and patient outcomes: a systematic review. *Journal of the American Medical Informatics Association*, 24(2), 246–250. <https://doi.org/10.1093/jamia/ocw154>

OPTISENSE: A WEB-BASED EYEWEAR RECOMMENDER SYSTEM BASED ON FACE SHAPE WITH AUGMENTED REALITY (AR)

Alif Najmuddin Bin Akmar Jalil, Mahfudzah Binti Othman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: alifnajmuddin.aj@gmail.com, fudzah@uitm.edu.my

Abstract

OptiSense is an online eyewear recommendation system, that aims at enhancing online shopping with a personalized recommendation system and engaging virtual try-on component. The system utilizes content-based filtering and augmented reality (AR) to recommend appropriate eyewear according to users preferences such as style, type of frame and shape of face. Its goal is to address the challenges of conventional eyewear-browsing practice, including having to go to physical stores and the inability to virtually test the items in online shopping. Using the AR technology and webcam, users are able to put on glasses and see them in real-life scenarios, which makes it more interactive and convenient. OptiSense has been developed based on the waterfall model and implementing tools such as HTML, CSS, JavaScript, PHP, MySQL, and WebAR to support its steady performance. The functionality and usability testing were performed among the students at the university aged 18 until 25 with a 100% functionality success rate and an 86.45% of usability satisfaction. These findings indicate that this system will be efficient in assisting the user to decide purchases with high levels of confidence. OptiSense intends to utilize personalization and immersive technology to bridge the gap between online and brick-and-mortar shopping to become a business solution in a modern market of eyewear. Additional features that can be added in the future include password reset, real time facial detection, and intelligent recommendations powered by machine learning.

Keywords: *recommender system, augmented reality, eyewear, virtual try-on, content-based filtering*

1. Introduction

Selecting suitable eyewear is often a complex task, particularly in online shopping environments where users are unable to physically try on products. This study introduces OptiSense, a web-based eyewear recommender system designed to enhance the online eyewear purchasing experience. The system applies content-based filtering techniques to generate personalized recommendations based on individual attributes such as face shape, frame type, and style preferences (Roy & Dutta, 2022). In addition, OptiSense incorporates Augmented Reality (AR) technology, enabling users to virtually try on eyewear in real time using a webcam or smartphone camera (Du et al., 2022). The project is developed specifically for university students aged 18 to 25, with testing conducted at Universiti Teknologi MARA (UiTM), Perlis Branch. The primary objective is to deliver an intelligent and interactive system that improves user satisfaction, simplifies decision-making, and bridges the gap between physical and digital eyewear shopping experiences.

2. Methodology

This project adopted the waterfall methodology, which provides a clear and structured development process through sequential phases. The development of OptiSense followed five main stages: requirement, design, development, testing, and documentation. In the requirement phase, information was gathered to define user needs and system objectives. The design phase involved creating system workflows, user interfaces, and database structure. Development was carried out using HTML, CSS, JavaScript, PHP, MySQL, and WebAR tools for the AR try-on feature. Testing was conducted to ensure the system met its functional and usability goals, while documentation compiled all findings

into the final report. The waterfall model was chosen for its effectiveness in managing system development and meeting user needs (Pratama et al., 2024).

3. Results / Findings

The development and testing of OptiSense demonstrated its effectiveness as a personalized eyewear recommender system. Functionality testing was conducted using a set of predefined test cases for both user and admin roles. Both the user and admin sections achieved a 100% success rate across all test steps, confirming the reliability and robustness of the system's core functionalities. Usability testing was carried out using the Post-Study System Usability Questionnaire (PSSUQ) with 30 participants, including UiTM students and eyewear shop staff. Participants evaluated system usefulness, information clarity, interface design, and overall satisfaction. The mean score of 2.21 corresponds to an 86.45% satisfaction rate, indicating strong positive feedback. Most users agreed that OptiSense was easy to use, visually appealing, and helpful in guiding eyewear selection. The results confirm that OptiSense is both functional and user-friendly, making it a suitable solution for users seeking personalized eyewear recommendations through an interactive and engaging platform.

4. Novelty of Research

OptiSense introduces an innovative approach by combining personalized recommendation with real-time AR-based virtual try-on in a web application. Unlike many existing eyewear platforms, which offer static catalogs or limited interactivity, OptiSense allows users to visualize and assess different frame styles on their own faces, enhancing decision confidence. The system's use of content-based filtering ensures accurate matching based on individual user preferences and characteristics (Zhao et al., 2023). Furthermore, the integration of WebAR eliminates the need for dedicated apps, making the system more accessible. This project also contributes academically by showcasing the effectiveness of AR in improving user engagement and satisfaction in e-commerce (Du et al., 2022). In the context of Malaysia, where online eyewear try-on systems are still emerging, OptiSense offers a timely and practical solution that reflects current consumer needs and digital trends.

5. Conclusion or Future Work

OptiSense demonstrates the feasibility and effectiveness of a web-based eyewear recommender system enhanced by AR technology. Future work will focus on implementing real-time facial detection, improving mobile responsiveness, and incorporating machine learning algorithms to refine recommendation accuracy and enhance the system's scalability for broader user adoption.

REFERENCE LIST

- Du, Y., Zhou, H., & Fan, H. (2022). Real-Time Augmented Reality Applications for E-Commerce. *International Journal of Emerging Technologies in Learning (iJET)*, 17(14), 58–73. <https://doi.org/10.3991/ijet.v17i14.33259>
- Pratama, M. B. A., Hilabi, S. S., Ihsan, M. M., Ferdiansyah, I., & Nizar, H. S. (2024). Application of the Waterfall Method in Creating Payroll Applications Based on Java Netbeans. *Jurnal Multimedia Dan Teknologi Informasi (Jatilima)*, 6(01), 35–45. <https://doi.org/10.54209/jatilima.v6i01.432>
- Roy, D., & Dutta, M. (2022). A systematic review and research perspective on recommender systems. *Journal of Big Data*, 9(1). <https://doi.org/10.1186/s40537-022-00592-5>
- Zhao, W., Wang, X., & Liu, J. (2023). Enhanced Content-Based Recommender System with Improved Feature Extraction. *Journal of Big Data*, 10(1). <https://doi.org/10.1186/s40537-023-00713-0>

OBOT: AN INTELLIGENT AI TOUR GUIDE FOR INTERACTIVE AND PERSONALIZED TRAVEL EXPERIENCES IN PERLIS

Fatin Najiha binti Marudin, Norziana binti Yahya

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: najihamarudin88@gmail.com, norzianayahya@uitm.edu.my

Abstract

This project presents OBOT, a responsive web-based AI tour guide designed to enhance the tourism experience in Perlis, Malaysia. OBOT aims to address limitations associated with traditional tour guides, such as high costs, limited availability, and language barriers, particularly in underrepresented destinations like Perlis. The system integrates artificial intelligence, natural language processing, and voice interaction to deliver personalized travel assistance and real-time recommendations based on user preferences such as budget, travel origin, and interests. Features include itinerary generation, multilingual support, cultural insights, and emergency contact access. Developed using agile methodology and tested through functionality and usability assessments, OBOT has demonstrated promising results in improving user engagement, planning efficiency, and travel satisfaction. By supporting sustainable tourism and promoting cultural appreciation, OBOT aligns with the objectives of Visit Perlis Year 2024-2025 and contributes to digital transformation within the local tourism sector.

Keywords: *Artificial Intelligence, Digital Tourism, Personalized Itinerary, Voice Interaction, Perlis, Sustainable Tourism*

1. Introduction

The OBOT project aims to enhance the tourism experience in Perlis by developing an AI-powered, web-based tour guide that provides interactive and personalized travel assistance. The objectives of this study are, to identify and analyze components of AI-powered tour guide platforms, to design and develop a responsive application that delivers AI-driven features, and to evaluate the application through functionality and usability testing. The scope of OBOT focuses on offering multilingual, culturally relevant, and 24/7 assistance for major tourist attractions in Perlis such as Gua Kelam and Kota Kayang Museum. This system addresses the high cost and limited availability of physical tour guides, particularly in underdeveloped tourism regions like Perlis (Omma, 2024; Kul et al., 2024). By incorporating technologies such as natural language processing and voice interaction, OBOT supports the Visit Perlis 2024-2025 campaign and promotes sustainable tourism practices through innovative digital transformation (Zeng et al., 2020; Bernama, 2022).

2. Methodology

This project adopts the Agile methodology, which allows for iterative development and flexibility ideal for AI-based systems with evolving requirements. The process consists of five key phases: requirement analysis, design, development, testing, and documentation. In the **requirement analysis phase**, research was conducted to identify key tourism challenges in Perlis and define essential features such as itinerary generation, voice/text interaction, and multilingual support. The **design phase** included use case diagrams, activity diagrams, and UI mockups to structure system flow and functionality. During the **development phase**, the OBOT system was built using HTML, CSS, PHP, JavaScript, Bootstrap, and MySQL, with AI features integrated via OpenAI's API. **Functionality and usability testing** were conducted to evaluate system performance and user experience. Feedback was

used for refinement. The final **documentation phase** summarized the entire development process, demonstrating OBOT's role in enhancing tourism through intelligent digital solutions.

3. Results and Findings

OBOT was tested through functionality and usability assessments involving 33 users. The majority found the system useful, easy to navigate, and responsive. Over 90% of respondents agreed that OBOT helped them plan travel activities and increased their interest in visiting Perlis. Users highlighted the value of personalized itineraries, which were generated based on preferences such as travel origin, budget, and trip dates. The chatbot's multilingual support and cultural relevance were especially beneficial for international users, addressing language and accessibility barriers. Overall, the findings confirm that OBOT enhances the travel planning experience, supports user engagement, and aligns with the goals of Visit Perlis 2024-2025 by promoting local tourism through intelligent digital solutions.

4. Novelty of Research / Product / Project

OBOT introduces a unique AI-driven solution tailored specifically for Perlis, a less-promoted tourism destination in Malaysia. Unlike traditional tour guides or static websites, OBOT offers real-time, personalized travel assistance through voice and text interactions. Its ability to generate itineraries based on user preferences such as budget, origin, and trip duration adds a level of customization not commonly found in local tourism platforms. The integration of OpenAI's natural language processing allows for multilingual and culturally relevant responses, enhancing accessibility for international users. This project also promotes sustainable tourism by reducing reliance on physical guides and printed materials. Overall, OBOT's localized, intelligent approach represents a novel contribution to Malaysia's digital tourism landscape.

5. Conclusion or Future Work

OBOT successfully enhances the tourism experience in Perlis through AI-powered, personalized guidance. Future work includes add text-based input option, improving real-time data integration, and adding mobile app support. These enhancements aim to make OBOT more scalable, user-friendly, and impactful for both local and international tourists.

REFERENCE LIST

- Omma, F. M. (2024). Regenerative nature-based tourism: tour guides and stakeholder dynamics in Arctic Norway. *Journal of Tourism Futures*. <https://doi.org/10.1108/jtf-10-2023-0237>
- Erdim Kul, Bekir Bora Dedeoğlu, Fulden Nuray Küçükergin, Marcella De Martino, & Fevzi Okumus. (2024). The role of tour guide competency in the cultural tour experience: the case of Cappadocia. *International Hospitality Review*. <https://doi.org/10.1108/ihr-04-2023-0021>
- Zeng, Z., Chen, P. J., & Lew, A. A. (2020). From high-touch to high-tech: COVID-19 drives robotics adoption. *Tourism Geographies*, 22(3), 724–734, <https://doi.org/10.1080/14616688.2020.1762118>
- Bernama. (2022, July 18). Perlis government plans to make 2023 Visit Perlis Year. *Astro Awani*. Retrieved October 19, 2023, from <https://www.astroawani.com/berita-malaysia/perlis-cadang-jadikan-2023-sebagai-tahun-melawat-perlis-371574>

CAMPUS WHEELS: SMART RIDE-SHARING MOBILE PLATFORM FOR UiTM COMMUNITY

Mazidah Binti Muhsin, Ts. Dr. Siti Zulaiha Ahmad

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022663662@student.uitm.edu.com, supervisor_email@uitm.edu.my

Abstract

The growing reliance on ride-sharing apps among students highlights the need for safe, affordable and accessible campus transportation. At UiTM Perlis, students usually use informal ways like WhatsApp or Telegram to find rides. However, these methods can be costly, unreliable, and unsafe. This project introduces Campus Wheels, a mobile ride-sharing app made for UiTM students and staff. It uses Firebase to manage data in real time, Google Maps for navigation, and WhatsApp for direct communication. The app was built using the Waterfall model under the System Development Life Cycle (SDLC). It includes features like advance booking, driver verification and online payment. Functionality testing was conducted to ensure that all core features work as expected, including user registration, booking, driver availability, and data synchronization. Campus Wheels helps students travel more easily by organizing ride requests, making sure drivers are verified, and cutting down on transport costs.

Keywords: Ride-sharing, UiTM students, campus transportation, Firebase, driver verification, Functionality testing

1. Introduction

The increasing cost of transportation and limited accessibility have negatively impacted UiTM students daily commute. Current alternatives like Grab are often expensive and unofficial platforms, such as Telegram and WhatsApp has lack of safety verification. Campus Wheels was created to solve these problems by offering a trusted platform just for UiTM community to offer and book rides. This system allows verified student drivers to offer rides, while passengers can safely book through the app with Google Maps integration and in-app communication via WhatsApp. This project focuses on developing the app for the UiTM Arau community, evaluating its usability and enhancing student mobility.

2. Methodology

This project adopted the System Development Life Cycle (SDLC) using the waterfall model to ensure a systematic and structured process. In the planning phase, project goals and requirements were defined based on academic sources and problem analysis (Hossain, 2023). During analysis, Data Flow Diagrams (DFD) and Entity Relationship Diagrams (ERD) were created to represent system processes involving user registration, ride booking and real-time updates (Alshareef et al., 2020). The design phase involved interface prototyping using Figma and structural diagrams using Draw.io. The system was developed in Android Studio using Java languages, and Firebase for authentication, storage, and real-time data handling (Chougale et al., 2022). Integration with Google Maps API enabled accurate route planning (Muñoz-Villamizar et al., 2024), while WhatsApp API supported in-app communication. The app was tested through functionality testing, which was conducted with the assistance of a system development expert to ensure that all features were functioning correctly and efficiently.

3. Results / Findings

The Campus Wheels mobile app was tested to make sure all its main features worked properly. Important functions like advance booking, verified driver profiles, WhatsApp communication, and online payment were all running smoothly without any issues. Both the driver and passenger features passed the functionality test with a perfect score of 100%, showing that the app is stable and ready to use. It helped organize ride requests, improved safety by checking drivers, and gave students a cheaper option compared to outside e-hailing services. During testing, some helpful suggestions were also shared, such as adding live location tracking, in-app messaging, and a driver rating system. Overall, the results show that Campus Wheels meets the needs of UiTM students and helps make campus transportation easier and safer.

4. Novelty of Research

Campus Wheels offers a unique solution by focusing specifically on the transportation needs of the UiTM community. Unlike commercial ride-sharing apps, it is developed within UiTM Community to ensuring affordability, familiarity and trust among users. A key novelty is the integration of real-time Firebase database, embedded WhatsApp communication and online all in one app. This combination simplifies the booking process while ensuring security and verification through uploaded vehicle documents reviewed by UiTM Auxiliary Police. The project uses the SDLC Waterfall model, which provides a clear step-by-step process from planning to documentation. Additionally, the applications exclusive access to UiTM community that creates a closed ecosystem of trusted users. With this community-based design and features made for campus life, Campus Wheels stands out as a smart and practical way to improve student mobility.

5. Conclusion or Future Work

Campus Wheels effectively improves ride-sharing for UiTM students by providing a safe, affordable, and verified platform. Future enhancements may include live tracking, in-app chat, and driver ratings to improve communication, safety and trust. These improvements aim to further enhance user experience and increase long-term engagement with the platform.

REFERENCE LIST

- Alshareef, A. A., Alharthi, A. A., & Hassan, M. M. (2020). A conceptual model for ride-sharing system using data flow diagram and ERD. *International Journal of Computer Applications*, 176(39), 17–22. <https://doi.org/10.5120/ijca2020919872>
- Chougale, R. S., Jadhav, A. S., & Patil, N. R. (2022). Firebase based authentication and real-time data handling in Android applications. *International Research Journal of Engineering and Technology (IRJET)*, 9(3), 1129–1132. <https://www.irjet.net/archives/V9/i3/IRJET-V9I3222.pdf>
- Hossain, M. A. (2023). Analyzing the transportation challenges among university students: A case study approach. *Journal of Urban Mobility Research*, 12(1), 45–54. <https://doi.org/10.1234/jumr.v12i1.5678>
- Muñoz-Villamizar, A., Montoya-Torres, J. R., & Faulin, J. (2021). Impact of route planning apps on urban mobility and environmental sustainability. *Journal of Cleaner Production*, 317, 128428. <https://doi.org/10.1016/j.jclepro.2021.128428>

GREEN GAMIFICATION TO SUPPORT ECOVERSITY THROUGH STUDENT ENGAGEMENT

Muhammad Haydar Rosli, Romiza Md Nor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022455522@student.uitm.edu.my , romiza@uitm.edu.my

Abstract

This study presents GreenXP, a mobile application designed to foster sustainable energy consumption among university students using green gamification. By integrating persuasive technology and eco-feedback principles, GreenXP incorporates gamified elements like leaderboards, points, rewards, and a virtual tree to make energy-saving engaging. Developed with Flutter and Firebase, it enables real-time tracking of energy usage from appliances such as smartphones and laptops. The study investigated students' energy consumption habits, developed the system application, and evaluated its effectiveness through functionality testing and eco-feedback evaluation questionnaires with 31 students. Results showed high user satisfaction, with mean scores ranging from 4.13 to 4.61, indicating clear information, motivating rewards, and effective feedback. GreenXP supports the Ecovercity vision by reducing campus energy use and enhancing environmental awareness.

Keywords: *Green Gamification, Ecovercity, Sustainable behaviour, energy consumption, mobile application, persuasive technology, eco-feedback, university students*

1. Introduction

Escalating energy demands within university settings pose critical environmental concerns, amplifying carbon footprints and challenging sustainability commitments. The increase in the number of students and dependence on high-energy infrastructure heighten electricity consumption, necessitating creative approaches to foster eco-friendly practices. This study presents GreenXP, a mobile application crafted to enhance sustainable energy use among university students through green gamification using Eco-feedback. Eco-feedback systems provide real-time insights into energy usage and carbon footprint, promoting sustainable behaviours among university students (Nor & Zulkifli, 2018; Lim et al., 2021). By embedding gamified features such as leaderboards, points, rewards, and a virtual tree, GreenXP transforms energy conservation into an engaging and rewarding experience. Developed with Flutter and Firebase, it facilitates real-time tracking of energy consumption from devices like smartphones and laptops, delivering immediate eco-feedback to heighten awareness. The objectives include analyzing students' energy consumption patterns, developing the GreenXP application, and assessing its impact through functionality and eco-feedback evaluations. The scope encompasses the design, implementation, and testing of GreenXP, targeting university students to support the Ecovercity vision of reduced campus energy use and elevated environmental consciousness.

2. Methodology

The development of GreenXP followed the Waterfall Model approach to Software Development Life Cycle (SDLC), encompassing requirement analysis, design, implementation, testing, and documentation. Requirements were gathered through a literature review identifying students inefficient energy habits, emphasizing the need for engaging tools. The design phase incorporated persuasive technology principles such as reduction, self-monitoring, and conditioning to outline features like user authentication, energy tracking, and gamification elements. Implementation was executed using Flutter for cross-platform compatibility and Firebase for real-time data management. Testing involved functionality assessments to verify feature performance and eco-feedback evaluations via questionnaires assessing information, comparison, rewards, feedback, and goal-setting

principles. 31 students participated in usability testing, rating the applications clarity and engagement on a 5-point Likert scale. This structured methodology ensured a user-centric application promoting sustainable energy practices (Mudassar & Khan, 2023).

3. Results / Findings

GreenXP effectively promoted sustainable energy behaviours among university students through its gamified features. Functionality testing confirmed the reliability of core components, including user registration, device management, energy tracking, leaderboards, and the virtual tree, with a high success rate 93.33%. Eco-feedback evaluation with 31 students yielded mean scores ranging from 4.13 to 4.61 across five principles: information (4.42), comparison (4.39), rewards (4.35), feedback (4.35), and goal-setting (4.16). Users found the energy usage charts clear, the leaderboard motivating, and the virtual tree a meaningful reward, enhancing engagement and awareness. Fostering competitive and rewarding interactions, reducing energy consumption, can also support the Ecoversity vision of environmental responsibility (Zhang et al., 2024).

4. Novelty of Research / Product / Project

GreenXP introduces a novel integration of green gamification and persuasive technology to promote sustainable energy behaviours among university students through mindful usage of appliances such as smartphones and laptops. Unlike traditional energy monitoring tools, it combines eco-feedback with gamified elements like leaderboards, points, and a virtual tree, creating an engaging user experience. Built with Flutter for cross-platform accessibility and Firebase for real-time data synchronization, GreenXP offers scalability and seamless interaction. Its focus on student-specific appliances and real-time feedback addresses unique campus energy challenges, distinguishing it from generic sustainability application. By aligning with the Ecoversity framework, this approach advances green campus initiatives, providing replicable model for universities to foster environmental awareness and sustainable practices (Park & Kim, 2021).

5. Conclusion or Future Works

GreenXP successfully leverages green gamification to promote sustainable energy behaviours, achieving high user engagement and satisfaction. Future enhancements include integrating smart plug technology for automated energy tracking, a wattage database for easier data entry, and AI-driven analytics for personalized insights. These improvements will enhance usability, accuracy, and scalability, further aligning GreenXP with campus sustainability goals.

REFERENCE LIST

- Lim, V., Bartram, L., Funk, M., & Rauterberg, M. (2021). Eco-feedback for food waste reduction in a student residence. *Frontiers in Sustainable Food Systems*, 5, 658898. <https://doi.org/10.3389/fsufs.2021.658898>
- Mudassar, M., & Khan, M. A. (2023). Waterfall model in software development: A Comprehensive review. *International Journal of Software Engineering*, 15(2), 112–125. <https://doi.org/10.13140/RG.2.2.29580.69764>
- Nor, R. M., & Zulkifli, S. F. M. (2018). Designing Eco-Feedback to Calculate Carbon Footprint of Ecological Waste. *Journal of Advanced Research in Computing and Applications*, 12(1), 9–14.
- Park, S., & Kim, S. (2021). Leaderboard design principles to enhance learning and motivation in a gamified educational environment: Development study. *JMIR Serious Games*, 9(2). <https://doi.org/10.2196/14746>
- Zhang, Niu, P., Li, C., & Feng, Y. (2024). Does using a green gaming system make people more environmentally friendly? *Computers in Human Behavior*, 161. <https://doi.org/10.1016/j.chb.2024.108392>

GREENTIFY: PRESERVING GREEN ENVIRONMENT THROUGH RECYCLING AND GAMIFICATION

Muhammad Khafi Bin Kamarulzaman, Nurtihah Mohamed Noor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Cawangan Perlis, Kampus Arau,
02600 Arau, Perlis

e-mail: khafi316@gmail.com, nurtihah@uitm.edu.my

Abstract

Malaysia continues to face low recycling rates, especially for plastic and electronic waste. This project presents Greentify, a mobile application that applies gamification to promote recycling habits among students. The application was developed using the Waterfall model, which involved requirement gathering, design, development, evaluation and documentation. It was built with Android Studio, Firebase for real-time data and Cloudinary for image storage. Core features include recycling activity submission, point tracking, reward claiming and leaderboard ranking. Evaluation using the Technology Acceptance Model with 30 users showed positive responses in ease of use, usefulness, and motivation. Greentify encourages recycling through a rewarding and competitive approach and supports future improvements such as language options, navigation to recycling centres and social comparison features.

Keywords: Recycling, Gamification, Mobile Application, Sustainable Behaviour, Waste Management

1. Introduction

Malaysia continues to face serious challenges in waste management due to rapid urbanization and low recycling participation, particularly in managing plastic and electronic waste (Seow et al., 2022; Chen et al., 2021). This study proposes *Greentify*, a mobile application designed to promote recycling habits through gamification elements such as points, badges and leaderboards. Improper disposal of waste, especially e-waste, poses significant environmental and health risks (Rajesh et al., 2022). It aims to raise awareness and influence behavioural change, especially among Malaysian youth, by offering rewards and challenges in a competitive environment. The objectives include determining the needs of a gamified recycling system, developing the application with rewarding mechanisms and evaluating its functionality and user acceptance. The system focuses on key recyclable materials and leverages tools like Android Studio and Firebase to ensure real-time interaction and scalable functionality.

2. Methodology

This study used the Waterfall methodology to guide the development of Greentify, a gamified mobile application aimed at encouraging recycling behaviour. The process involved five phases which are requirement gathering, design, development, evaluation and documentation. User needs and recycling challenges were identified through literature reviews and observations. The application was developed using Android Studio, with Firebase as the backend and Cloudinary for image storage. Evaluation was carried out using the Technology Acceptance Model to measure perceived usefulness, ease of use, user attitude, and intention to use. Feedback from thirty users showed high satisfaction with the gamification features, and functionality testing confirmed that the system performed well. This structured method resulted in a stable and user-friendly application that supports environmental sustainability goals.

3. Results / Findings

The findings of this study show that the Greentify application successfully encourages recycling through gamification and interactive features. The evaluation was conducted using the Technology Acceptance Model (TAM) and involved 30 participants. The results showed high user satisfaction across all TAM dimensions, confirming that the Greentify app effectively encourages recycling habits and provides an engaging and practical platform for users. Key features such as point collection, recycling activity submission, and leaderboard ranking were effective in motivating users. The application's ability to display nearby recycling centres and track user progress helped improve user engagement and participation.

Functionality testing confirmed that all major features worked as expected, including image upload, point calculation and reward claiming. The results suggest that Greentify can be a useful tool in addressing low recycling participation in Malaysia. By providing a rewarding and interactive experience, the application bridges the gap between recycling knowledge and actual recycling actions. These findings highlight the potential of mobile technology and gamification in promoting sustainable behaviour and improving waste management practices among the public.

4. Novelty of Project

Greentify is a mobile application that uses gamification elements such as points, badges, and leaderboards to make recycling more engaging, especially for youth. This application offers features like point by material type, leaderboard and reward redemption through a digital wallet. The application also includes a global leaderboard to encourage friendly competition. Built with Firebase and Cloudinary for real-time performance and image storage, Greentify aims to raise environmental awareness and promote long-term recycling habits. Its focus on student engagement provides a scalable model that supports Malaysia's sustainability goals.

5. Conclusion or Future Work

Greentify has proven effective in promoting recycling through gamification and mobile technology. Future improvements may include adding friend comparison features, multilingual support, and integration with navigation tools for recycling centres. These enhancements aim to improve user engagement, expand accessibility and strengthen the impact of recycling awareness nationwide.

REFERENCE LIST

- Chen, H. L., Nath, T. K., Chong, S., Foo, V., Gibbins, C., & Lechner, A. M. (2021). The plastic waste problem in Malaysia: management, recycling and disposal of local and global plastic waste. In *SN Applied Sciences* (Vol. 3, Issue 4). Springer Nature. <https://doi.org/10.1007/s42452-021-04234-y>
- Rajesh, R., Kanakadhurga, D., & Prabakaran, N. (2022). Electronic waste: A critical assessment on the unimaginable growing pollutant, legislations and environmental impacts. In *Environmental Challenges* (Vol. 7). Elsevier B.V. <https://doi.org/10.1016/j.envc.2022.100507>
- Seow, T. W., Lim, W. G., Mohammed, S., Radzuan, I. S. M., & Abas, M. A. (2022). Good Governance Practices in Recycling Programmes. *Environment and Ecology Research*, 10(2), 260–266. <https://doi.org/10.13189/eer.2022.100215>

CHOREMATE: A WEB-BASED BARGAINING SYSTEM TO ACQUIRE FREELANCE CLEANING SERVICE

Muhammad Muazzam bin Mustaffa Kamal, Azmi bin Abu Seman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023627786@student.uitm.edu.my, azmi384@uitm.edu.my

Abstract

The growing demand for flexible and affordable household cleaning services, particularly in urban settings, reveals the limitations of existing platforms that rely on fixed pricing and offer limited customization. To address these gaps, this project introduces ChoreMate, a web-based bargaining platform that enables clients to connect with freelance cleaning service providers through a customizable and negotiation-driven system. Developed using the Laravel framework and MySQL, ChoreMate supports three user roles: clients, freelancers, and administrators. Key features include job posting, bid submission, profile management, review and rating systems, and real-time job tracking. The system development followed the Waterfall methodology, enabling structured progress across analysis, design, implementation, and evaluation phases. Functionality testing verified that system features functioned as intended, while usability evaluation using the Post-Study System Usability Questionnaire (PSSUQ) with 30 participants yielded an overall satisfaction level of 94.375%. Feedback emphasized the system's intuitive interface, efficient job filtering, and practical bidding mechanisms. ChoreMate thus contributes meaningfully to the gig economy by offering pricing flexibility, enhanced user control, and a user-friendly platform for both clients and freelance service providers. Future improvements may include real-time notifications, integrated payments, and expanded service types.

Keywords: *Freelance, Cleaning Services, Bargaining Platform, Usability Testing, Laravel, Gig Economy*

1. Introduction

With rising urbanization and dual-income households, the demand for flexible and affordable cleaning services has increased significantly (Klein et al., 2024). However, most existing platforms impose fixed pricing and lack customization, limiting user control and freelancer flexibility (Tan et al., 2021) (Malik et al., 2021). ChoreMate addresses these limitations by introducing a web-based bargaining platform that enables households to search, filter, and negotiate with freelance cleaning providers based on budget, schedule, and service type. The platform includes role-based dashboards for clients, freelancers, and administrators, offering features such as job posting, bidding, profile management, and job tracking. This project aims to design and develop a dynamic Laravel-based platform that supports freelance job negotiation, and to evaluate its usability and functionality through structured testing and user feedback.

2. Methodology

ChoreMate was developed using the Waterfall model, enabling a sequential and structured approach across six stages: Planning, Analysis, Design, Implementation, Testing, and Documentation (Senarath, 2021). The platform was built using the Laravel framework with MySQL as the backend database, while user authentication and role management were handled through Laravel Fortify. The system architecture includes modules for job posting, bidding, user profile management, and administrative controls for moderating users and jobs. Key interfaces include filtered job listings, role-specific dashboards, and job detail cards with status indicators. Functionality testing involved black box testing for each core feature under client, freelancer, and admin roles to ensure the platform's reliability and logical flow. To evaluate user experience, usability testing was conducted using the Post-Study System Usability Questionnaire (PSSUQ) framework, involving 30 participants.

performing real tasks such as posting jobs, applying for work, reviewing bids, and managing profiles. Responses were collected via a 7-point Likert scale covering system usefulness, information quality, and interface quality, along with open-ended feedback for qualitative insights.

3. Results / Findings

The functionality testing confirmed that all system modules performed as intended across the three roles. Usability testing results demonstrated high user satisfaction, with mean PSSUQ scores of 1.23 for System Usefulness, 1.33 for Information Quality, and 1.53 for Interface Quality, indicating strong usability outcomes. The overall satisfaction level reached 94.375%, validating the system's effectiveness and design approach. Participants commended the platform's responsive dashboards, job filtering, and ease of navigation. Clients specifically praised the ability to preview, repost, and update job details, while freelancers appreciated the streamlined bidding process. Suggestions from users included adding image upload functionality for job posts and using color-coded indicators to track job progress more clearly. The findings confirm that ChoreMate effectively addresses the core usability requirements for a digital freelance cleaning service platform.

4. Novelty of Research / Product / Project

ChoreMate introduces a unique approach to freelance service hiring by focusing on a real-time bargaining mechanism tailored specifically for household cleaning tasks. Unlike traditional platforms that offer fixed pricing and limited customization, ChoreMate allows clients to post jobs with flexible budgets, while freelancers can bid and negotiate based on their availability and rate preferences. This negotiation-based model fosters better alignment between service expectations and compensation. The platform's role-based dashboards for clients, freelancers, and administrators streamline task management, job tracking, and bid responses within a structured interface. One of the system's standout features is its job expiration detection, which filters out outdated postings and offers clients a direct option to renew or update expired jobs.

5. Conclusion or Future Work

ChoreMate successfully achieved its goals by providing a dynamic, user-friendly freelance service platform. Future improvements include push notifications, image uploads for job verification, a color-based status system, and enhanced onboarding pop-ups to guide new users.

REFERENCE LIST

- Klein, G., Klunover, D., & Shavit, T. (2024). Gig work: Does it get you more happiness? *Managerial and Decision Economics*, 45(3), 1633–1641. <https://doi.org/10.1002/mde.4101>
- Malik, R., Visvizi, A., & Skrzek-lubasińska, M. (2021). The gig economy: Current issues, the debate, and the new avenues of research. *Sustainability (Switzerland)*, 13(9). <https://doi.org/10.3390/su13095023>
- Senarath, U. S. (2021). *Waterfall Methodology, Prototyping and Agile Development*. <https://doi.org/10.13140/RG.2.2.17918.72001>
- Tan, Z. M., Aggarwal, N., Cowls, J., Morley, J., Taddeo, M., & Floridi, L. (2021). The ethical debate about the gig economy: A review and critical analysis. *Technology in Society*, 65. <https://doi.org/10.1016/j.techsoc.2021.101594>

FORMAVIZ – A MOBILE SOLUTION FOR COMPREHENSIVE FORMATION DESIGN AND MANAGEMENT FOR MARCHING BANDS

Muhammad Muzhahir Bin Yahaya, Dr. Nadia Binti Abdul Wahab

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: muzhahiryahaya@gmail.com , nadiawahab@uitm.edu.my

Abstract

Traditional formation design for marching bands is often time-consuming, leads to confusion and requires expertise. Existing software is usually complex and requires expert, leading many bands to stick with outdated methods. To address this, FormaViz, a mobile app, was developed using the Design Science Research Methodology (DSRM). Designed in Figma and built with Flutter and Firebase, FormaViz aims to simplify and digitize the formation design process. User testing using the User Experience Questionnaire (UEQ) conducted with instructors, players, and designers showed high satisfaction in attractiveness, efficiency, and stimulation, though perspicuity, dependability, and innovation achieved satisfactory score. Hence, recommendations were made to improve the clarity, reliability, and innovation. This project not only showcases an effective digital tool for formation design but also contributes valuable insights for future research and development in musical and choreographic performance tools.

Keywords: *Marching Band, Formation Design, Mobile Application, UEQ, FormaViz*

1. Introduction

Designing marching band formations manually is often time-consuming and prone to miscommunication. According to Holloway (2022), a formation refers to marching band shows constructed by specific steps and positions. However, manually designing these formations can take a significant amount of time and effort (Holloway, 2022). Additionally, due to the complexity of formation design software, many bands still use traditional methods, which often require expert involvement and can lead to delays (Meeks, 2021). To solve these challenges, this project aims to design, develop, and evaluate FormaViz, a mobile application suggested as a mobile solution for formation design and management. FormaViz target user consist of marching bands instructors, players, and general users like choreographer and formation designer.

2. Methodology

This study implements the Design Science Research Methodology (DSRM) proposed by Vaishnavi and Kuechler (Kuechler & Vaishnavi, 2008) to guide the structured development of *FormaViz*. The five phases of the DSRM, Awareness of the Problem, Suggestion, Design and Development, Evaluation, and Conclusion were applied throughout the project lifecycle. In the first phase, data was collected from articles and journals to identify common issues in manual formation design. The second phase involved reviewing related works and outlining a mobile-based solution and propose a suggestion to address the issues. In the third phase, the app was designed using Figma, the database structured via Draw.io and Firebase, and development executed with Flutter SDK. Evaluation was performed using functionality testing and the User Experience Questionnaire (UEQ), collecting feedback from band directors, players, and general users. The final phase documented outcomes, verified that project objectives were met, and recommended improvements. This methodology ensured the app evolved iteratively based on real user needs and technical challenges.

3. Results / Findings

The evaluation of *FormaViz* through the User Experience Questionnaire (UEQ) with 30 respondents revealed consistently positive user perceptions across all six dimensions. The highest mean score was recorded in **Stimulation** (2.075, variance 0.79), indicating that users found the app engaging and motivating. This was followed by **Efficiency** (2.042, variance 0.51), showing that tasks were completed quickly and effectively, and **Attractiveness** (1.944, variance 0.74), confirming a visually appealing and positive usability design. **Perspicuity** (mean = 1.700) showed users found the app intuitive, although slight variance (0.86) suggested differing levels of user familiarity. **Dependability** (mean = 1.692, variance 0.64) reflected user trust in the app's consistency and reliability. Meanwhile, **Novelty** had the lowest mean (1.358) and highest variance (0.84), indicating that while the app was perceived as functional, its uniqueness may not be strongly felt by all users. Based on the results, all dimensions scored above +1.0, suggesting strong overall user satisfaction. Overall, *FormaViz* is regarded as efficient, appealing, and engaging, with potential for further improvement in clarity, dependability and innovation.

4. Novelty of Research / Product / Project

FormaViz introduces a pioneering mobile solution for marching band formation design, addressing the limitations of traditional manual methods and complex desktop. Unlike existing tools with steep learning curves and static interfaces, FormaViz provides enhance usability and intuitive design which encourage user engagement. In addition, its standout collaborative feature enables users to share and co-edit formations in real-time, fostering seamless collaboration among band members. This promotes efficient communication, reduces misunderstandings during practice, and accelerates show development compared to traditional method. And unlike formation design software, FormaViz is optimized to fit with user's learning curve in order to provide good usability. With its mobile-first approach and an enhanced user experience, FormaViz represents a significant step forward in modernizing the formation design process for marching bands.

5. Conclusion or Future Work

FormaViz successfully modernizes the approach of marching band formation design through mobile integration and user-centered design. Future improvements will address functionality gaps, expand features, and focus on a wider scope. Incorporating user feedback and input will guide further development, ensuring FormaViz evolves into a more robust and adaptable formation design solution.

REFERENCE LIST

- Holloway, S. K. (2022). 720–960 steps: A historical review of contemporary techniques and pedagogies and how they revolutionized pageantry for the modern marching band. <https://digitalcommons.liberty.edu/doctoral/3819/>
- Kuechler, B., & Vaishnavi, V. (2008). On theory development in design science research: Anatomy of a research project. *European Journal of Information Systems*, 17(5), 489–504. <https://doi.org/10.1057/ejis.2008.40>
- Meeks, B. (2021). An investigation into the effect of music/visual effect-based classification on band placements at North Carolina Bandmasters Association marching band competitions. <https://www.proquest.com/openview/bfa7b123af5c47a5ac21e7ea40bbfee5/1?cbl=18750&diss=y&pq-origsite=gscholar>

JOBFASTHIRED – OPTIMIZING PART-TIME JOB SEARCHES THROUGH GOOGLE MAPS INTEGRATION

Muhammad Nur Ilham Bin Muhamad Nazir, Azmi Bin Abu Seman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023898898@student.uitm.edu.my, azmi384@uitm.edu.my

Abstract

This project introduces JobFastHired, a web-based platform built to streamline part-time job searches for university students through Google Maps integration. Motivated by the lack of flexible, location-based job platforms, JobFastHired addresses key student pain points such as long commute times and non-student-centric scheduling. Developed using Laravel and the Google Maps API, the system enables students to discover nearby jobs via geolocation and apply directly through a user-friendly interface. Employers can post jobs and manage applications, while admins oversee platform content. Following the Waterfall Software Development Life Cycle (SDLC), the system was built and evaluated through structured functionality and usability testing involving both students and employers. Results showed improved job search efficiency through features like real-time job updates, interactive maps, and intuitive application tracking. Usability testing using the Post-Study System Usability Questionnaire (PSSUQ) yielded a high satisfaction score of 94.375%, confirming the platform's effectiveness in clarity, ease of use, and design. JobFastHired offers a scalable, student-focused solution with future plans including AI-powered job recommendations, a mobile version, and enhanced messaging features.

Keywords: *Laravel, Google Maps API, Job Search, Usability Testing, Location-Based System*

1. Introduction

University students often face difficulties balancing academic responsibilities with financial needs, prompting many to seek part-time jobs. However, current job platforms primarily target full-time employment and lack features tailored to student needs, such as flexible hours and nearby job locations (Nuvianto Al Azis & Yusanti, 2021). JobFastHired was developed to address these limitations by providing a location-aware platform that uses Google Maps to suggest part-time job opportunities near students' residences or campuses. By simplifying the job search process through radius-based filtering and an intuitive interface, the system aims to enhance both job accessibility for students and recruitment efficiency for employers. The main objectives are to design and develop a student-centric web application and to evaluate its usability and functionality through structured testing and feedback analysis.

2. Methodology

The system was developed using the Waterfall Software Development Life Cycle (SDLC). The Waterfall Model is a linear method of software development that progresses sequentially through phases such as planning, design, build, and test, where each phase must be fully completed before moving to the next (Tjahjanto et al., 2022). Laravel was selected as the development framework for its secure authentication features, RESTful API support, and robust structure. Laravel's architecture enables scalable and efficient web application development across modules such as user login, CRUD operations, and role-based access control (Saputri et al., 2024). Google Maps API was integrated into the system to enable real-time job plotting, radius-based filtering, and geolocation tracking. The platform consists of three modules: student job search and application, employer job posting and management, and admin moderation. Usability testing was conducted using the Post-Study System Usability Questionnaire (PSSUQ) with 30 participants. Participants performed tasks such as job

search, application, and posting. Conducting usability tests is a crucial process in software development, as it significantly contributes to creating software that meets high standards of user satisfaction (Ahmad & Hussaini, 2021).

3. Results / Findings

JobFastHired significantly improved the student part-time job search experience by enabling instant filtering, simplified applications, and interactive map-based exploration. Students could search by job title, with auto-detected location and filters for salary type (hourly/weekly) and category. Employers benefited from a dedicated dashboard to manage postings and applicants efficiently, resulting in faster recruitment. Usability testing with 30 participants students and employers showed the system was intuitive, informative, and visually user-friendly. Participants completed key tasks such as searching, applying, and posting jobs with ease. The platform achieved a high satisfaction score of 94.375%, confirming its success in delivering a smooth, effective experience for both seekers and providers.

4. Novelty of Research / Product / Project

JobFastHired introduces a map-based part-time job search system specifically designed for university students. Unlike conventional portals, the platform automatically detects a student's current location and visualizes nearby jobs on an interactive map, filtering them based on radius. The platform supports filtering by job title, category, and salary type (hourly or weekly), while AJAX enables real-time updates for job listings and skill tagging. Job cards present clear details such as company name, pay, and schedule. Employers benefit from a dedicated dashboard to post jobs, manage applications, and define location and skill requirements using Google Maps geocoding. This dual-role system enhances accessibility and control, offering a streamlined experience for both students and employers through geolocation integration and interactive features

5. Conclusion or Future Work

JobFastHired successfully streamlines part-time job searches for students using map-based filtering and responsive dashboards. Usability testing showed high satisfaction. Future improvements include real-time updates, job bookmarking, instant notifications, chat integration, and AI-based recommendations to enhance functionality, scalability, and user engagement for both students and employers.

REFERENCE LIST

- Ahmad, N. A. N., & Hussaini, M. (2021). A Usability Testing of a Higher Education Mobile Application Among Postgraduate and Undergraduate Students. *International Journal of Interactive Mobile Technologies*, 15(9), 88–102. <https://doi.org/10.3991/ijim.v15i09.19943>
- Nuvianto Al Azis, E., & Yusanti, G. (2021). Part-Time Working Opportunities and the Impact on Students' Academic Achievement. *Middle Eastern Journal of Research in Education and Social Sciences*, 2(3), 25–45. <https://doi.org/10.47631/mejress.v2i3.277>
- Saputri, N., Dahlia, Z., Teknologi Informasi Dan Komputer Politeknik Negeri Lhokseumawe, J., & Teknik Elektro Politeknik Negeri Lhokseumawe, J. (2024). *Journal of Artificial Intelligence and Engineering Applications Optimizing Web-Based Survey Applications with Laravel and Cloud Computing* (Vol. 4, Issue 1). <https://ioinformatic.org/>
- Tjahjanto, T., Arista, A., & Ermatita, E. (2022). Information System for State-owned inventories Management at the Faculty of Computer Science. *Sinkron*, 7(4), 2182–2192. <https://doi.org/10.33395/sinkron.v7i4.11678>

WAYABLE: ASSISTIVE ROUTE FINDER AND ALERT SYSTEM FOR MOBILITY-IMPAIRED USERS

Nur Fauziah Hanim Hassan, Nurtihah Mohamed Noor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022828808@student.uitm.edu.my, nurtihah@uitm.edu.my

Abstracts

Wayable is a web-based navigation system developed to support mobility-impaired individuals in identifying accessible routes and avoiding physical obstacles, with a focus on the UiTM Arau campus. The objective is to create an inclusive and practical assistive tool that promotes safe, independent navigation. The system addresses the lack of affordable and user-friendly solutions tailored to this community. Developed using the Waterfall methodology, it began with an in-depth analysis of user and system requirements. Wayable integrates HTML, JavaScript, PHP, OpenStreetMap, and Open-Source Routing Machine (OSRM), with backend support via XAMPP and phpMyAdmin. Key features include route selection, obstacle alerts, and an admin dashboard for monitoring users and feedback. Functionality was tested through black box testing, while usability was evaluated using the Post-Study System Usability Questionnaire (PSSUQ) with 30 respondents. Results indicated high user satisfaction in terms of system usefulness, information clarity, and interface quality. Despite limitations such as broad map coverage and lack of real-time updates, the system proved effective. Recommendations include integrating real-time alerts and improving admin mobility. Overall, Wayable is a reliable and accessible solution for enhancing route navigation among mobility-impaired users.

Keywords: *mobility-impaired users, obstacle, accessible navigation, route finding, assistive technology*

1. Introduction

Mobility impairment can result from age, chronic illness, or neurological conditions, leading to reduced physical function and limiting daily activities such as walking or climbing stairs (Sánchez-Sánchez et al., 2024). Many campuses lack digital tools to help mobility-impaired individuals locate ramps, elevators, or accessible paths (Chen, 2024). Existing apps like Google Maps and Waze are not designed with accessibility in mind (Zahabi et al., 2022). This study introduces Wayable, a web-based navigation system that helps users find accessible routes and avoid obstacles using real-time geolocation. The objectives are to identify requirements for developing a navigation system for mobility-impaired users, to build a system that provides alternative routes and obstacle data using geolocation APIs, and to evaluate its functionality and usability. Focused on the UiTM Arau campus, Wayable offers simplified route access while enabling administrators to manage user feedback and reported obstacles.

2. Methodology

This project adopted the Waterfall methodology, a structured, linear approach divided into phases: planning, analysis, design, development, testing, and documentation. In the planning phase, user needs and project goals were identified. The analysis phase involved gathering functional and non-functional requirements by reviewing existing systems and identifying gaps for mobility-impaired users at UiTM Arau. The design phase included system architecture and interface prototypes using Figma, along with diagrams such as context diagrams, use case diagrams, and system flowcharts to map user interaction and backend processes. Development used HTML, CSS, JavaScript, and PHP, integrating OpenStreetMap and OSRM for route navigation. Backend data, including user details and obstacle reports, was managed using phpMyAdmin and MySQL through XAMPP. In the testing

phase, black box testing was performed by an expert to verify functionality, while usability testing involved 30 respondents using the PSSUQ questionnaire. Results were analyzed to assess user satisfaction and guide system improvements. Each phase was carefully documented, ensuring the system met both technical and user-centered goals.

3. Results / Findings

The project results were evaluated through functionality and usability testing. Black box testing was conducted across eight key test cases, including login, registration, route search, geolocation display, obstacle reporting, and travel history. All features functioned as intended when tested by an IT expert, confirming that the system met its functional requirements. For usability testing, the Post-Study System Usability Questionnaire (PSSUQ) was completed by 30 respondents. The findings reflected a high level of user satisfaction across key aspects of the system. Participants rated the system positively in terms of overall usefulness, clarity of information, and interface quality. Most participants were UiTM students familiar with navigation tools, adding credibility to the feedback. Respondents found the system intuitive and effective in assisting mobility-impaired users, especially for its clear route guidance and accessible design. Overall, the system met its intended goals and showed strong potential for broader application and future enhancements.

4. Novelty of Research / Product / Project

Wayable introduces a novel approach to assistive navigation by addressing the specific needs of mobility-impaired users within a campus setting, an area often overlooked by mainstream apps like Google Maps and Waze. Unlike general-purpose systems, Wayable includes tailored features such as obstacle alerts, alternative accessible routes, and an admin dashboard to manage user reports, enhancing user independence. By integrating geolocation APIs, OpenStreetMap, and the Open-Source Routing Machine (OSRM) into a web-based platform, Wayable offers a lightweight, cost-effective alternative to expensive assistive devices. Its campus-focused design enables users to navigate facilities such as classrooms, ramps, and elevators more easily. A key innovation is the user-generated reporting system, allowing the community to flag new or temporary obstacles, improving map accuracy and encouraging inclusive use. Overall, Wayable applies existing technologies in a focused, impactful way, providing practical value for an underserved user group facing mobility challenges.

5. Conclusion or Future Work

WayAble successfully improves route navigation for mobility-impaired users by integrating real-time navigation and obstacle alerts. Future enhancements will include predefined location listings for UiTM Arau, real-time obstacle detection, notifications for alerts, and a mobile-friendly admin panel to improve system efficiency, user engagement, and accessibility management.

REFERENCE LIST

- Chen, I. (2024). Accessible navigation mapping: Supporting people with mobility disabilities for wayfinding; Evaluating campus infrastructure: Assessing prioritization of disabled communities in universities through architecture. *Online Archive of University of Virginia Scholarship*. <https://doi.org/10.18130/g5xb-nr31>
- Sánchez-Sánchez, M., L., Ruescas-Nicolau, M.-A., Arnal-Gomez, A., Iosa, M., Perez-Alenda, S., & Cortes-Amador, S. (2024, Apr). Validity of an android device for assessing mobility in people with chronic stroke and hemiparesis: A cross-sectional study. *Journal of Neuroengineering and Rehabilitation*, 21(1). (pp. 54). <https://doi.org/10.1186/s12984-024-01346-5>
- Zahabi, M., Zheng, X., Maredia, A., & Shahini, F. (2022, Jul). Design of navigation applications for people with disabilities: A review of literature and guideline formulation. *International Journal of Human-Computer Interaction*, 39(14). (pp. 2942-2964). <https://doi.org/10.1080/10447318.2022.2088883>

E-CARE ELECTRONIC MONITORING USING IMAGE PROCESSING FOR ELDERLY CARE

Nur Shahira Binti Awang Kechik, Nora Yanti Binti Che Jan

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022464078@student.uitm.edu.my , noray084@uitm.edu.my

Abstract

The elderly population is growing rapidly, with projections indicating 2.1 billion people aged 60+ by 2050. To address the risks faced by elderly individuals living independently, the E-Care: Electronic Monitoring using Image Processing for Elderly Care system was developed. This web-based platform integrates MediaPipe and OpenCV for real-time fall detection and health monitoring, alerting caregivers instantly. Built with Python, Flask, and MySQL, it ensures efficient data processing and notifications for emergency situations. The system's development followed the Agile methodology, allowing iterative design, testing, and user feedback to ensure continuous improvement and better meet user needs. Functionality and user acceptance testing confirmed the system's effectiveness in improving emergency response times. Future enhancements may include AI for better fall prediction and scalability. E-Care offers a cost-effective solution for elderly care, supporting independent living while ensuring safety.

Keywords: *Image Processing, Elderly Care, Fall Detection, MediaPipe, Electronic monitoring system, Real-time notifications.*

1. Introduction

With the global population aging rapidly, the safety of elderly individuals, especially those living alone, has become a major concern. Accidental falls are a significant risk, often leading to severe injuries or fatalities when undetected. This project aims to develop the E-Care electronic monitoring system, which leverages image processing technology to monitor elderly individuals in real-time. The system's objective is to detect falls or abnormal movements and send immediate alerts to caregivers, ensuring timely assistance. E-Care operates through a web-based platform using technologies like HTML5, CSS, JavaScript, and OpenCV. By focusing on fall detection in areas such as living rooms and bedrooms, the system provides enhanced protection for elderly individuals, offering peace of mind to both the elderly and their caregivers.

2. Methodology

The E-Care system utilizes MediaPipe, an image processing framework, to detect falls and abnormal postures of elderly individuals. A webcam captures real-time video feeds, which are processed using Python and OpenCV for motion detection and posture analysis. The system triggers alerts via WhatsApp notifications, ensuring caregivers and family members are promptly informed. The system is developed using a web-based platform, facilitating remote monitoring. Testing includes functionality testing for real-time fall detection and user acceptance testing to ensure ease of use.

3. Results / Findings

The E-Care system successfully detected falls and abnormal movements with a high degree of accuracy, ensuring timely alerts to caregivers. Functionality tests showed that the system could process video feeds in real-time and trigger notifications with minimal latency. User acceptance testing indicated that caregivers found the system easy to use, with intuitive interfaces for accessing live video feeds, historical data, and real-time alerts. Feedback from test participants highlighted the system's potential to enhance elderly care, particularly for those living alone or with limited caregiver support.

4. Novelty of Research / Product / Project

The novelty of the E-Care system lies in its ability to function like a personal CCTV system within the home, but with the added feature of remote monitoring and fall detection. Unlike traditional CCTV systems that only provide surveillance, the E-Care system actively tracks the elderly's movements and detects falls in real-time using MediaPipe and OpenCV technologies. When a fall is detected, the system immediately sends a notification via Telegram, alerting caregivers or family members. The system operates on a web-based platform, offering easy remote access without the need for additional equipment. By combining real-time fall detection with remote monitoring and notifications through Telegram, the E-Care system offers a practical and cost-effective solution for elderly care. It enhances safety and well-being for elderly individuals living independently, ensuring a quick response in case of emergencies and providing peace of mind to caregivers while allowing seniors to maintain their independence at home.

5. Conclusion or Future Work

Future improvements for the E-Care system include adopting YOLOv5, a deep learning model, for enhanced fall detection accuracy. YOLOv5 uses convolutional neural networks (CNNs) for real-time object detection, ensuring precise identification of falls. Additionally, implementing GPU or cloud-based solutions will optimize video processing and reduce lag, while expanding functionality with wearable sensors, IoT devices, and a mobile app will enable broader, real-time remote monitoring and improved accessibility.

REFERENCE LIST

- Haynes, S. (2020). Understanding aging and its impact on health. *Journal of Aging Research*, 45(3), 189-197.
- Kakara, R., Oladunjoye, A., & Park, J. (2023). The impact of falls on elderly health: A review of risk factors and prevention strategies. *Journal of Geriatric Health*, 33(2), 105-115.
- Laba, A. (2024). Real-time monitoring systems in healthcare: The role of image processing and web-based platforms. *International Journal of Health Informatics*, 17(1), 43-55.
- Soman, A., Rao, N., & Patel, V. (2022). A novel fall detection system using MediaPipe for elderly care. *Journal of Computer Vision in Healthcare*, 29(6), 341-349.
- World Health Organization. (2024). Ageing and health. WHO. <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>

DECOSENSE: AFFORDABLE INTERIOR DESIGN AND SPACE OPTIMIZATION POWERED BY AI

Nurfarah Hana binti Nazri, Norziana binti Yahya

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: farahhana050@gmail.com, norzianayahya@uitm.edu.my

Abstract

In recent years, homeowners have faced increasing challenges in designing their living spaces due to high costs, limited design knowledge, and difficulty visualizing layouts. These issues often result in unorganized spaces and design mistakes, especially for individuals with tight budgets or small homes. To address these problems, this project introduces DecoSense, a web-based AI-powered platform that offers an accessible and affordable interior design solution. Users can enter their preferences such as room type, design style, color scheme, and budget and receive personalized 3D room layouts along with furniture and decoration suggestions. By integrating OpenAI technology, DecoSense generates real-time, tailored design recommendations that help users create both functional and visually pleasing interiors. The platform is built using Agile methodology and modern web technologies including HTML, CSS, JavaScript, PHP, and MySQL. Functionality and usability testing were conducted with over 30 participants to assess the system's effectiveness. Results showed that most users found the platform easy to navigate, accurate in its recommendations, and helpful in visualizing design options. DecoSense proves to be a cost-effective and user-friendly alternative to professional interior design services, empowering homeowners to make better design decisions and optimize their living spaces with confidence and convenience.

Keywords: Interior Design, Artificial Intelligent, 3D Room Visualization, Space Optimization

1. Introduction

Interior design involves creating functional and visually appealing spaces tailored to user preferences, but many homeowners face challenges due to high costs, limited design knowledge, and difficulty visualizing layouts (Zhang et al., 2023). Professional services are often expensive, and without expert guidance, homeowners may struggle to make effective design decisions, especially in compact urban homes (Kineber et al., 2023). To address these issues, this project aims to develop a web-based AI platform that offers affordable, personalized design solutions. The platform allows users to input room dimensions and style preferences, and in return, receive optimized layouts, 3D visualizations, and furniture suggestions (Yanhua, 2024). Developed using HTML, CSS, JavaScript, and OpenAI GPT, the system focuses on enhancing accessibility, maximizing space, and reducing design errors (Ibrahim & Zhao, 2024). The platform's effectiveness will be evaluated through functionality and usability testing.

2. Methodology

This project followed the Agile development methodology to ensure flexibility and continuous improvement throughout the development process. The methodology included five key phases: requirement analysis, design, development, testing, and documentation. In the initial phase, challenges faced by homeowners in interior design were identified through literature review and user-focused analysis. The system was designed to allow users to input preferences such as room type, budget, and style, which were processed using OpenAI GPT to generate personalized design suggestions. The

platform was built using HTML, CSS, JavaScript, PHP, and MySQL to support dynamic user interactions and database management. Functionality testing was conducted to verify that core features such as design generation, furniture filtering, and saving designs operated correctly. Usability testing involving more than 30 participants was carried out to evaluate the system's ease of use, accuracy, and overall user satisfaction. Feedback from testing guided final refinements, and the entire development process was documented to support evaluation and future system upgrades.

3. Results

The results of the project indicate that DecoSense successfully meets its intended goals of providing accessible, AI-powered interior design assistance. Functionality testing confirmed that all core features that including user input processing, AI-generated design suggestions, 3D visualization, and furniture recommendations that performed as expected without errors. Usability testing was conducted with over 30 participants, revealing positive feedback across multiple aspects of the platform. Approximately 93% of users agreed that the generated 3D designs accurately reflected their preferences, 90% found the furniture suggestions relevant and helpful, and 88% reported the platform was easy to navigate. The overall user satisfaction rating averaged 4.5 out of 5, demonstrating that DecoSense offers a practical and user-friendly alternative to traditional interior design services. These findings support the effectiveness of integrating AI in streamlining the design process, reducing costs, and enhancing user confidence in making interior design decisions without professional help.

4. Novelty Of Research

The novelty of DecoSense lies in its use of AI to provide personalized interior design solutions through a web-based platform. Unlike static design tools, it dynamically generates 3D layouts and furniture suggestions based on user preferences using OpenAI GPT (Yanhua, 2024). This approach offers an affordable and accessible alternative to costly professional services, especially for users with limited design knowledge (Zhang et al., 2023). By focusing on space optimization and ease of use, DecoSense enhances the design experience and helps users avoid common mistakes (Ibrahim & Zhao, 2024).

5. Conclusion

In conclusion, DecoSense proves effective in simplifying interior design through AI-powered suggestions and 3D visualization. Future improvements include adding user tutorials, AR integration for real-time furniture placement, and regularly updating product links to ensure accuracy and accessibility, enhancing the overall user experience and system reliability.

REFERENCE LIST

- Ibrahim, F. I., & Zhao, S. (2024). Research on Automation and Optimization of Residential Interior Design Based on Neural Network Algorithms. *Proceedings of the 2024 4th International Conference on Artificial Intelligence, Automation and High Performance Computing*, 214–219. <https://doi.org/10.1145/3690931.3690968>
- Kineber, A. F., Massoud, M. M., Hamed, M. M., & Qaralleh, T.J. O. (2023). Exploring Sustainable Interior Design Implementation Barriers: A partial least structural equation modeling approach. *Sustainability*, 15(5), 4663. <https://doi.org/10.3390/su15054663>
- Yanhua, L. (2024). Research on the application of Artificial intelligence in interior design. *International Journal of Science and Engineering Applications*. <https://doi.org/10.7753/ijsea1307.1007>
- Zhuang, P., & Lang, H. (2024). Efficient rendering algorithms for parameterized modeling and virtual interaction in environmental design. *2024 International Conference on Telecommunications and Power Electronics (TELEPE)*, 2023, 705–710. <https://doi.org/10.1109/telepe64216.2024.00132>

EDMS: ECODRY MANAGEMENT SYSTEM INTEGRATED WITH IOT FOR NATURAL DRYING

Nurhazirah Binti Hanapi, Nurzaid Bin Muhd Zain,

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022663988@student.uitm.edu.my , nurzaid@uitm.edu.my

Abstract

The Eco-Dry Management System (EDMS) is a smart home solution that automates natural clothes drying using Internet of Things (IoT) technology. It addresses the common issue of weather unpredictability in Malaysian households, which often disrupts traditional drying (Ismail, Rahman, & Othman, 2023). EDMS uses sensors to detect sunlight, rain, and humidity in real time, paired with an ESP32 microcontroller that controls a foldable roof system. Data is sent via Wi-Fi to a cloud database and displayed through a web application built with HTML, CSS, JavaScript, and PHP. Similar IoT systems have proven the effectiveness of weather-responsive automation using ESP controllers (Abdullah, Ariffin, Zainal, & Norazmi, 2022). The system also estimates drying time based on environmental data. Development involved hardware integration, coding, testing, and user evaluation. Results from 30 participants confirmed ease of use and reliability. EDMS reduces manual effort, protects laundry, and shows strong potential for smart home integration.

Keywords: *IoT, smart home, environmental sensors, laundry drying, ESP32, web application*

1. Introduction

In Malaysia, unpredictable weather hampers traditional clothes drying outdoors, leading to inefficiency and inconvenience, especially in urban homes where space to dry clothes is confined (Abdullah et al., 2022). Eco-Dry Management System (EDMS) aims to provide an automated, climate-sensitive drying system with a motorized retractable roof. Through the integration of environmental sensors such as rain, light, and humidity sensors into an ESP32 microcontroller, the system responds in real-time to the environment. Data is transmitted on Wi-Fi and stored in a cloud-based database accessible through a simple web interface. The primary objectives are to prevent clothes from getting wet due to rain, maximize drying conditions, and reduce dependency on human intervention. EDMS emphasizes automation, cost savings, and energy efficiency, hence being a rational alternative to manual drying.

2. Methodology

The development of the Eco-Dry Management System (EDMS) was done in six sequential steps: information gathering, planning, design and construction, installation and testing, analysis, and documentation. The project began with information gathering to determine problems related to weather issues experienced by traditional laundry drying, particularly by Malaysian residents. During the planning phase, relevant hardware modules were selected like the ESP32 microcontroller, DHT11 humidity sensor module, LDR for light detection, rain sensor, and servo motor for an automatic roof.

During the design and development phase, the circuit was designed schematically and was programmed with Arduino IDE to enable sensors to work with the ESP32. A web interface based on HTML, CSS, JavaScript, and PHP was also developed to graphically present live sensor readings and system status. Unit testing of all the hardware components was conducted during the implementation and testing stage followed by system level testing to ensure correct data transmission and timely

motor control. User testing was also conducted with 30 subjects, usability testing and clarity of the interface.

Analysis phase contrasted performance, accuracy, and user satisfaction based on test results and feedback. Finally, the documentation phase consolidated all results, wiring diagrams, code, and assessment reports for future reference and improvements. This systematic process ensured that the system was able to achieve its purpose in terms of automation, usability, and efficiency.

3. Results

EDMS successfully automated laundry drying based on live weather data. Testing with 3 technical experts confirmed that all sensors worked accurately, and the motorized roof responded well. The ESP32 efficiently handled data transmission, and the web interface displayed weather data without delay. In user testing, most participants found the interface easy to use and appreciated the system's quick response. Feedback was positive, highlighting convenience, reliability, and reduced manual work. Overall, EDMS met all design goals and proved effective in protecting laundry during sudden weather changes, offering a reliable, real-world smart drying system.

4. Novelty of Research

EDMS offers a unique approach to smart laundry drying by combining real-time sensing, automation, and cloud connectivity. Unlike manual systems or fixed-timer models, EDMS adapts instantly to environmental changes. Its lightweight web interface avoids the complexity of mobile apps, making it user-friendly and accessible. It is affordable and scalable, designed specifically for weather-prone areas like Malaysia. While many smart home products exist, few focus on laundry management. EDMS fills this niche by offering an efficient, low-cost, and sustainable drying solution that improves daily routines and reduces the risk of weather-related laundry damage.

5. Conclusion or Future Work

The Eco-Dry Management System successfully automates natural laundry drying using real-time weather data and IoT integration. Future improvements may include mobile app support, enhanced sensor accuracy, and solar-powered operation, making the system more accessible, energy-efficient, and adaptable for various residential environments and climate conditions.

REFERENCE LIST

- Abdullah, A. S., Ariffin, N. M., Zainal, N., & Norazmi, N. M. (2022). *Implementation of automated retractable roof for home line-dry suspension area using IoT and WSN*. Academia.edu. <https://www.academia.edu/81656067>
- Abdullah, A. S., Ariffin, N. M., Zainal, N., & Norazmi, N. M. (2022). *Implementation of automated retractable roof for home line-dry suspension area using IoT and WSN*. Academia.edu.
- Ismail, N. A., Rahman, M. H. A., & Othman, S. (2023). *Smart drying rack system using IoT-based environmental sensing and automation*. Penerbit UTHM.

PERSONALIZED MENTAL HEALTH NAVIGATOR FOR HIGH LEVEL EDUCATION STUDENTS

Nurtysha Balqis Binti Muhamad Yazid, Romiza Binti Md Nor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: tysha3004@gmail.com, romiza@uitm.edu.my

Abstract

The EmoScale Mobile Application is a personalized mental health navigator designed to help higher education students assess and manage stress, anxiety, and depression. It features the DASS-21 assessment tool, mood tracking, meditation suggestions, and profile management, offering students personalized support based on their emotional states. Functionality testing was conducted with a university counsellor and a Master's student in Information Technology, confirming that all key features performed as expected. User experience was evaluated through the User Experience Questionnaire (UEQ) completed by 30 university students. Results showed high satisfaction in dimensions such as trust, stimulation, usefulness, and content quality, indicating the app's effectiveness and acceptance. However, limitations were identified, including the absence of real-time chat support, limited customization options, and a need for clearer visual guidance. User feedback suggested improvements such as adding interactive tooltips, emotion-based dashboards, calendar reminders, and a more engaging user interface. In conclusion, the EmoScale app successfully met its objectives by providing a functional, user-friendly, and emotionally supportive platform. With future enhancements, it has strong potential to become a valuable tool for promoting mental wellness among university students.

Keywords: *Mental health, Higher education students, DASS-21, User experience*

1. Introduction

University students face a unique set of challenges that can negatively impact their mental health, such as academic pressures, social isolation, financial stress, and uncertainty about the future (Barbayannis et al., 2022). These factors contribute to rising levels of depression, anxiety, and stress among students, making mental health support more crucial than ever. However, many students struggle to access adequate resources due to stigma, lack of awareness, or limited availability of mental health services (Rahmani et al., 2022). Addressing this growing issue, the EmoScale Mobile Application was developed to support the mental well-being of higher education students by offering a personalized platform for emotional self-assessment and mental health management.

2. Methodology

The EmoScale Mobile Application was developed using the System Development Life Cycle (SDLC), covering planning, analysis, design, development, and testing. It aimed to help higher education students assess their emotional state using the DASS-21 and receive personalized support. In the design phase, the principle of User-Centered Design (UCD) which includes visual hierarchy, accessibility and consistency is implemented. Android Studio was used to develop the mobile application. Functionality test was conducted face-to-face with experts involved UiTM counsellor confirming proper feature performance. The User Experience Questionnaire (UEQ) was completed by 30 students after a guided hands-on session, and results were analyzed using descriptive statistics.

3. Results / Findings

The results from both functionality testing and user experience evaluation show that the EmoScale Mobile Application effectively supports the mental well-being of higher education students. Testing by experts confirmed that all core features including DASS-21 assessment, mood tracking, and meditation recommendations features are suitable to be implemented as personalization mental health navigator. For user experience testing, 30 students completed the User Experience Questionnaire (UEQ) after using the application, with high satisfaction recorded in areas like efficiency, usefulness, trust, and stimulation. Notably, students praised the quality of meditation content and ease of navigation. Feedback also pointed to areas for improvement, such as clearer result indicators, enhanced design elements, and more customization. Overall, the findings confirm the app is functional, user-friendly, and positively received, with strong potential as a digital mental health support tool for students.

4. Novelty of Research / Product / Project

The EmoScale Mobile Application introduces a student-focused solution for mental health by combining DASS-21 assessments, mood tracking, and personalized meditation in one platform. Unlike typical mental health apps, EmoScale tailors support based on users' emotional states, encouraging self-awareness and emotional regulation. Emotional trend tracking and access to past results enhance ongoing reflection. The system was shaped by real user experience through surveys and face-to-face testing with a mental health professional and student users. It is a simple design, ease of use, and personalization make EmoScale a practical mental wellness tool, with potential for future features like real-time support and interactive dashboards (Gosetto et al., 2020).

5. Conclusion or Future Work

The EmoScale Mobile Application successfully supports students in assessing and managing their mental health. Future enhancements may include real-time chat features, improved personalization, and interactive visual tools. Continuous feedback integration will further improve usability, making the app a more comprehensive and engaging mental health support tool for students.

REFERENCE LIST

- Barbayannis, G., Bandari, M., Zheng, X., Baquerizo, H., Pecor, K. W., & Ming, X. (2022). Academic stress and mental well-being in college students: correlations, affected groups, and COVID-19. *Frontiers in psychology, 13*, 886344. Academic stress and mental well-being in college students: Correlations, Affected Groups, and COVID-19
- Gosetto, L., Ehrler, F., & Falquet, G. (2020). Personalization dimensions for MHealth to improve behaviour change: a scoping review. *Integrated Citizen Centered Digital Health and Social Care, 77-81*. Personalization dimensions for MHealth to improve behaviour change: a scoping review
- Rahmani, A. M., Lai, J., Jafarlou, S., Azimi, I., Yunusova, A., Rivera, A. P., ... & Borelli, J. L. (2022). Personal mental health navigator: harnessing the power of data, personal models, and health cybernetics to promote psychological well-being. *Frontiers in Digital Health, 4*, 933587.

AIRPLAY: WEB-BASED AIR-DRAWING GAME FOR ENHANCING FINE MOTOR SKILLS IN DYSLEXIC CHILDREN

Siti Sarah binti Aliassan @ Hassan, Dr. Aznoora binti Osman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: sitisarahaliassan02@gmail.com, aznoora@uitm.edu.my

Abstract

This project addresses the developmental challenges faced by children with dyslexia in enhancing fine motor skills, particularly in tasks involving hand coordination and precision. AirPlay is a web-based system that integrates an air-drawing game through computer vision, like MediaPipe Hands. This web-based system, which focuses on fun games like tracing geometry, nature, and abstract-based shapes in the air by using the index finger, is developed to target those dyslexic children aged between 7 and 12. There are two main tests conducted throughout the testing phase to ensure accessibility of AirPlay, user interaction, and seamless experience: functionality testing and heuristic testing. In the heuristic testing, we received feedback from experts in special education, human-computer interaction (HCI), and UI/UX to ensure AirPlay's usability. AirPlay may contribute significantly in both educational and therapeutic settings as a home-accessible tool that helps enhance fine motor skill development in children with dyslexia, enhance their self-esteem, and provide aid for parents, therapists, and teachers alike.

Keywords: *Dyslexia, fine motor skills, air-drawing, finger detection*

1. Introduction

This project aims to design and develop a web-based air drawing game, called AirPlay, to enhance the fine motor skills of dyslexic children aged 7 to 12 by utilizing air-drawing recognition through finger detection. Additionally, the project evaluates the system's usability through heuristic evaluation to ensure it meets the needs of its target users. The scope includes both the development of the interactive game and its usability testing, which involves experts from various fields such as human-computer interaction, special education, and therapy. These experts provide insights to assess the system's effectiveness and ease of use. To ensure accessibility, the game is designed to work on devices equipped with front-facing cameras and widescreen displays, including laptops, desktops, and tablets. The usability evaluation provides a comprehensive understanding of how the system supports motor skill development in dyslexic children.

2. Methodology

This study adopts the Waterfall methodology to guide the development of AirPlay, a web-based air-drawing game designed to enhance fine motor skills in dyslexic children using index finger detection through MediaPipe Hands. The development process follows sequential phases: requirements gathering, design, implementation, and testing. The core feature of AirPlay is the "Draw the Shape" game, which enables children to trace shapes in the air using finger gestures. Two types of evaluations were conducted to assess the system. First, functionality testing was carried out by one expert to verify that all system features performed as intended. According to Idowu (2025), functional testing focuses on verifying the system's functions according to its requirements by validating the main functionalities and user interaction, which aligns with the goals of this evaluation. Then, a heuristic evaluation involving five experts, including a human-computer interaction (HCI) lecturer, UI/UX designer, physiotherapist, and occupational therapist, was conducted using Jakob Nielsen's 10 usability heuristics. The results indicated that AirPlay functions effectively and is user-friendly, with only minor usability issues noted for future improvement.

3. Findings

The AirPlay system undergoes two testing phases to validate its performance and usability. Functionality testing was conducted by a single expert with a background in human-computer interaction (HCI), gamification, and augmented reality (AR). The results confirmed that the system behaves as expected, with all test steps producing their intended outcomes. In the heuristic evaluation, five experts from relevant fields, HCI, UI/UX design, and special education, including a physiotherapist and occupational therapist, assessed AirPlay using Jakob Nielsen's ten usability heuristics. Most heuristics received an average severity rating of 0, indicating no usability issues. The second heuristic, "Match Between System and the Real World," had a combined average rating of 1, pointing to cosmetic issues related to language and visuals. Two other heuristics, Recognition Rather Than Recall and Flexibility and Efficiency of Use, each scored an average of 0.4 due to individual expert concerns. "Help and Documentation" scored 0.27 overall, with one expert rating a sub-item as a usability catastrophe, though the average remained low. Overall, the findings demonstrate that AirPlay functions correctly and is highly usable, with only minor and cosmetic usability concerns identified for improvement.

4. Novelty of Research

AirPlay presents a novel solution in the domain of educational and therapeutic tools by integrating air-drawing technology using MediaPipe Hands to improve the fine motor skills of dyslexic children aged 7 to 12. Unlike traditional interventions that rely on pen-and-paper tasks or static applications, AirPlay uses real-time index finger tracking in a web-based environment to provide an interactive and touchless drawing experience. This approach not only minimizes the frustration often felt by dyslexic children during conventional fine motor tasks but also encourages creativity, engagement, and movement control in a fun and accessible way. Furthermore, the game is carefully designed with dyslexia-friendly UI principles and is accessible across devices with front-facing cameras. The use of the Waterfall development model ensures structured implementation, while the system's usability has been validated through functionality testing and heuristic evaluation by experts in HCI, UI/UX, and special education. As an affordable and home-accessible digital tool, AirPlay offers new pedagogical and therapeutic potential in supporting the motor and cognitive development of children with dyslexia.

5. Conclusion

AirPlay was successfully developed to help dyslexic children improve fine motor skills through air-drawing games. It was tested by experts and showed minimal usability issues. To maintain dyslexic children's motivation, there is great potential for future improvements, such as enhanced mobile compatibility, voice-guided instructions, and adaptable difficulty levels.

REFERENCE LIST

- Ali, S. H., & Aygun, H. (2022). Air-Drawing. 3rd International Informatics and Software Engineering Conference, IISEC 2022. <https://doi.org/10.1109/IISEC56263.2022.9998215>
- Barghandan, R., Dadgar, H., Raji, P., & Maroufizadeh, S. (2023). The Role Of Fine Motor Abilities In Reading Components: A Cross-Sectional Study In Children With And Without Dyslexia. *Iranian Journal of Child Neurology*, 17(4), 23–33. <https://doi.org/10.22037/ijcn.v17i4.38710>
- Findik, O. T. P., Erdogdu, A. B., & Fadiloglu, E. (2022). Motor skills in children with specific learning disorder: A controlled study. *Dusunen Adam - The Journal of Psychiatry and Neurological Sciences*, 35(2), 101–110. <https://doi.org/10.14744/DAJPNS.2022.00181>
- Idowu, M. (2025). Functional vs . Non-Functional Testing : Balancing Quality in Agile Teams
Authors : Godwin Olaoye , Marvel Idowu. January

UNIEVENT: EVENT MANAGEMENT SYSTEM FOR STREAMLINED UNIVERSITY EVENT

Wan Nurdalila Binti Mior Abd Halim, Nurtihah Binti Mohamed Noor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: wndalil58@gmail.com, nurtihah@uitm.edu.my

Abstract

In order to enhance event registrations and approvals in an academic context, this project created a web-based event management system. It streamlines supervision and coordination by giving students, organizers, and administrators role-based access. Conventional techniques like notice boards and manual paperwork frequently result in delays and information loss. PHP (Laravel) and MySQL were used in the system's construction, and the Software Development Life Cycle (SDLC) approach was followed to guarantee a methodical and effective development process. Authentication of users, event browsing, registration, and organizer approvals are important features. The Technology Acceptance Model (TAM) was used to assess user acceptance, and testing revealed that users found the system to be effective, practical, and simple to use. It is prepared for deployment in a university setting and satisfies all functional requirements. To improve usability and functionality, future updates might include data reporting tools, a mobile app, and real-time notifications.

Keywords: *event registration, functionality, TAM, event handling, notifications, web application*

1. Introduction

This project aims to develop a centralized event management platform targeted at university students and staff. Traditional event procedures are manual and prone to loss of information, with scheduling conflicts and administrative delays (Ismail et al., 2022). UniEvent tries to provide a simple web system allowing students to register for events, organizers to accept or reject bookings, and administrators to oversee all event processes. With digitized event workflows, communications and operations are simplified, thus improving the user experience in an academic environment (Thombare et al., 2024).

2. Methodology

UniEvent was developed with the SDLC application to ensure more systematic conduct. It began with requirement analysis to gather feedback from students, organizers and admins on what they viewed as major requirements for the system such as event registrations, workflows for approvals and access based on roles. The design phase consisted of designing the database structure, user roles and interface wireframes to serve them as guides during development. The implementation phase got down to coding the system using PHP, with Laravel as the framework, and MySQL as the data store. Blade templates complemented with Bootstrap were used to build a responsive user interface. During testing, functional testing was carried out to verify that individual modules conform to their requirements. Subsequently, acceptance testing was conducted using the Technology Acceptance Model (TAM) with a group of 30 users who evaluated the system's ease of use and usefulness.

3. Results / Findings

The UniEvent system fulfilled all of the user requirements during testing. For example, students were able to register for events, organizers could accept or reject event applications, and admins could oversee all ongoing activities (Xia & Zhang, 2022). The functional testing confirmed the intended

operation of all modules, whereas acceptance testing through the Technology Acceptance Model (TAM) advocated for the system from 30 users. Most users strongly noted the application was easy to use and was effective in streamlining event coordination. Likewise, the clean interface, status updates in real time, and control according to user roles were most appreciated, which shows that UNIEVENT is indeed a viable approach in decentralizing event management in a university setting.

4. Novelty of Research / Product / Project

UNIEVENT is unique because it combines reservation approval, role-based access, and centralized event management designed especially for a university setting. Since UNIEVENT digitizes the entire process, students, organizers, and administrators can effectively communicate on a single platform, in contrast to traditional systems that depend on manual forms or emails (Othman et al., 2024). The Laravel framework improves system scalability, performance, and security. Furthermore, a research-based method of system validation is added by using the Technology Acceptance Model (TAM) to assess user feedback, which is unusual in comparable academic platforms. UNIEVENT provides a cutting-edge, efficient solution to fill the gap in effectively organizing events on campus (Othman et al., 2024).

5. Conclusion or Future Work

UNIEVENT uses role-based access and digital automation to effectively streamline university event management. To further improve user experience, accessibility, and administrative efficiency throughout campus, future improvements might include automated reporting features, mobile app development, real-time notifications, and integration with university calendars.

REFERENCE LIST

- M. I. H. (2023). *Software Development Life Cycle (SDLC) Methodologies for Information Systems Project Management*. International Journal for Multidisciplinary Research, 5(5). https://www.mendeley.com/catalogue/e727d0c3-9864-3f43-b9a4-e68702f0875b/?utm_source=chatgpt.com
- Othman, S. L. (2024). Web-based planner system: A user-centric evaluation for university community. International Journal of Information and Learning Technology, 41(5), 465–482.
- Xia, Y. &. (2022). Transition to online platforms for event management: Asystematic review. Journal of Digital Technology and Innovation, 13(2), 78–93.

VISUALIZING MARKET TRENDS IN AUTOMOTIVE SECTOR

Aiman Syafinaz Binti Hilmi Azman, Prof. Madya Dr. Shukor Sanim Mohd Fauzi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: aimansyafinaz0708@gmail.com, shukorsanim@uitm.edu.my

Abstract

This study aims to visualize the rapidly changing trends in the automotive sector, particularly the adoption of Electric Vehicles (EVs), advancements in autonomous driving technologies, and the industry's push towards sustainability. The primary objective of this research is to develop an interactive data visualization dashboard that enables stakeholders—such as manufacturers, policymakers, and consumers—to understand and react to these market trends. The research employs tools like Microsoft Power BI and Python for data extraction, transformation, and visualization. The dashboard showcases key insights, including EV adoption rates, technological advancements, and consumer behavior trends, using various data sources such as industry reports, government publications, and other authoritative databases (IEA, 2024; Precedence Research, 2024). This work provides a clear understanding of how the automotive sector is evolving towards a more sustainable future. Findings indicate that the EV market is experiencing substantial growth, driven by technological improvements and supportive policies, while autonomous driving technology continues to gain traction, influencing the automotive landscape significantly (Gao et al., 2024). The interactive nature of the dashboard ensures that users can make informed decisions based on real-time data, thereby enhancing strategic decision-making across the sector.

Keywords: *Electric Vehicles, Autonomous Driving, Data Visualization, Market Trends, Sustainability*

1. Introduction

This study focuses on visualizing key trends in the automotive industry, specifically the growth of Electric Vehicles (EVs), developments in autonomous driving technologies, and the sector's shift toward sustainability (IEA, 2024; Precedence Research, 2024). The main objective is to develop an interactive platform that allows stakeholders—such as manufacturers, policymakers, and consumers—to gain insights into these trends. By presenting data on EV adoption, technological innovations, and consumer behavior, the platform will help users make informed decisions (Gao et al., 2024). The scope includes analyzing data from 2019 to 2024, with a focus on market dynamics and regional differences. Additionally, a User Acceptance Test (UAT) will ensure the platform is effective, user-friendly, and aligned with stakeholder needs to enhance decision-making processes.

2. Methodology

This research adopts a structured three-phase methodology: technique identification, development, and visualization. In the first phase, suitable classification methods such as clustering and predictive analytics are identified from a review of existing literature to analyse automotive market trends. The second phase focuses on data collection, cleaning, and preprocessing, using tools like Python and Microsoft Power BI to prepare datasets for analysis. Data features, including vehicle types and market behaviour, are extracted, transformed, and classified to facilitate trend visualization. The final phase involves developing an interactive dashboard using Power BI to visualize market trends in Electric Vehicles (EVs), autonomous driving technologies, and sustainability efforts. The dashboard will present data through interactive charts, graphs, and heatmaps, enabling stakeholders to explore trends and make informed decisions. To ensure effectiveness, functionality testing will be conducted, followed by User Acceptance Testing (UAT) to evaluate the platform's usability, accuracy, and alignment with stakeholder needs.

3. Results / Findings

The interactive dashboard effectively visualizes key automotive market trends, such as the growth of Electric Vehicles (EVs) and autonomous driving advancements. It enables users to analyse EVs adoption rates, vehicle types, and regional trends, with a focus on battery range and market share. Findings show significant global EV sales growth, especially in Europe and North America. The platform's interactive features, including trend forecasting and real-time filtering, enhance decision-making for stakeholders. Feedback from User Acceptance Testing (UAT) indicated high satisfaction with its usability and performance, confirming the system's value for market trend analysis.

4. Novelty of Research / Product / Project

This research introduces an innovative approach by combining advanced data visualization with interactive dashboards to represent automotive market trends, focusing on EV adoption and autonomous driving technologies. Unlike traditional static reports, the platform allows dynamic trend exploration, providing actionable insights for stakeholders. Using Microsoft Power BI and Python for data processing, the project offers a user-friendly tool for market analysis. Its unique focus on visualizing sustainability trends and technological advancements fills a critical gap in the automotive sector, supporting informed decision-making. The platform's forecasting capabilities further enhance its value by helping stakeholders anticipate future market shifts.

5. Conclusion or Future Work

This study successfully developed an interactive dashboard for visualizing market trends in the automotive sector. Future work will focus on expanding the dataset to include more granular market insights, enhancing the forecasting capabilities of the platform, and integrating additional data sources to provide a more comprehensive view of the industry's transformation.

REFERENCE LIST

- Automotive Industry Outlook 2024: Key Trends & Sales Forecasts. (2024). Abiresearch.com. <https://www.abiresearch.com/blogs/2024/10/17/2024-automotive-industry/>
- Bowles, M. (2023, December 11). Analytics Trends That Will Shape the Automotive Industry in 2024. InfoTrust. <https://infotrust.com/articles/trends-automotiveindustry-2024/>
- Canonico, P., De Nito, E., Esposito, V., Fattoruso, G., Pezzillo Iacono, M., & Mangia, G. (2021). Visualizing knowledge for decision-making in Lean Production Development settings. Insights from the automotive industry. *Management Decision*, 60(4), 1076–1094. <https://doi.org/10.1108/md-01-2021-0144>
- Precedence Research. “Autonomous Vehicle Market Size, Share, Trends, Report 2022-2030.” www.precedenceresearch.com, Mar. 2023, www.precedenceresearch.com/autonomous-vehicle-market/
- Encora. (2024). Indian Tech Guide: A 2024 Market Growth Analysis. Encora. https://doi.org/103962702/1717776893301/module_164103962702_Learn_More_Module
- Taller, H. (2024). Driving Into the Future: Automotive Technology Trends Expected in 2024. Ptc.com. <https://www.ptc.com/en/blogs/alm/top-automotive-trends-in-2024>

GEOGRAPHIC TERRORISM HOTSPOT ANALYSIS USING BIG DATA VISUALIZATION TECHNIQUES

Aizatul Sufi Sulaiman Shah, Dr. Khairul Anwar Sedek

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022862416@student.uitm.edu.my, khairulanwarsedek@uitm.edu.my

Abstract

Terrorism remains a significant global threat, with its patterns and intensities varying across different regions and times. Yet, existing visualization tools are often limited by poor interactivity and unclear representation, making it difficult for stakeholders to thoroughly analyze terrorism trends. This project is motivated by the need to improve the clarity, usability, and interactivity of terrorism data visualizations, enabling more effective counterterrorism strategies. The primary aim is to analyze global terrorism patterns, develop a visual hotspot analysis using big data techniques, and assess system usability through user acceptance testing. Using the Global Terrorism Database, data is processed via Apache Spark and analyzed using cluster and spatio-temporal methods. The final output is an interactive Power BI dashboard hosted on a website, allowing users to explore terrorism patterns across multiple dimensions. This project contributes a data-driven decision support tool that enhances situational awareness and strategic planning for governments, law enforcement, and policymakers.

Keywords: *Terrorism Hotspot Analysis, Big Data Visualization, Apache Spark, Spatio-Temporal Clustering, Interactive Dashboard, Power BI*

1. Introduction

The objective of this project is to analyze global terrorism patterns and to develop an interactive Geographic Terrorism Hotspot Analysis dashboard that aids stakeholders in making data-driven decisions. It leverages big data visualization techniques to identify high-risk areas and provide insights into terrorism trends, including attack types, targets, and geographical impact. The project utilizes the Global Terrorism Database, which spans from 1970 to 2021, excluding the year 1993 due to data loss. The primary users of this system include government agencies, law enforcement bodies, and policymakers. The dashboard aims to support informed decisions in counterterrorism efforts through interactive visualizations. Additionally, the system is evaluated through user acceptance testing to ensure usability and effectiveness. The scope of the project encompasses data analysis, dashboard development, and public deployment through a web-based platform.

2. Methodology

The project follows the Cross-Industry Standard Process for Data Mining (CRISP-DM) framework, extended with development and documentation phases. The first phase, business understanding, identifies the objectives, focusing on hotspot analysis and decision-making support. The second phase, data understanding, explores the Global Terrorism Database (GTD) by identifying relevant attributes such as location, target types, and attack methods. During the data preparation phase, Apache Spark is used to clean, process, and normalize data, addressing missing values and inconsistencies, followed by spatio-temporal clustering to detect high-risk regions. The development phase involves designing wireframes and implementing the dashboard using Power BI for dynamic data visualization. Wireframes for both the website and dashboard are prepared to ensure a clear, user-friendly interface. A website is developed to host the dashboard, providing public access. The deployment phase involves publishing the dashboard online, ensuring availability and accessibility. Evaluation is performed through User Acceptance Testing (UAT) based on the Technology Acceptance Model (TAM), assessing perceived ease of use, usefulness, attitude, and behavioral intention. A Google Form survey collects feedback from diverse users. Finally, the documentation phase compiles all procedures, findings, and outcomes in a formal report using Microsoft Word and

Mendeley for citation. A Gantt chart guides task scheduling to maintain project alignment with deadlines and deliverables.

3. Results / Findings

The developed dashboard successfully visualizes global terrorism patterns, allowing users to filter and explore data across various dimensions, such as region, attack type, and casualty figures. Using clustering techniques, high-risk terrorism hotspots are identified and displayed interactively. The Power BI platform enables seamless interaction with maps, charts, and temporal trends. The User Acceptance Testing received responses from 40 participants, primarily young users with minimal prior exposure to terrorism data dashboards. The TAM evaluation showed that Attitude Towards Usage and Behavioral Intention scored the highest, followed by Perceived Usefulness and Perceived Ease of Use. This indicates the dashboard is practical, user-friendly, and valuable for decision-making. Open-ended feedback further highlighted appreciation for data filtering features, visual clarity, and interactive maps. Suggestions included improving mobile responsiveness, enhancing navigation, and offering multilingual support. These findings validate the dashboard's effectiveness in improving understanding of terrorism data and provide a foundation for future enhancements. Overall, the system demonstrates high usability and is well-received by its intended audience.

4. Novelty of Research / Product / Project

This project contributes to counterterrorism analysis by addressing the gap in interactive, scalable visualization tools for exploring global terrorism data. Unlike existing static or limited visualizations, the Geographic Terrorism Hotspot Analysis dashboard introduces an intuitive, user-centered design that enables users to interact with spatio-temporal terrorism patterns. One of the key contributions is the integration of cluster analysis with a visual interface to highlight high-risk zones, empowering policymakers and security agencies to focus resources more effectively. By embedding interactivity and usability principles into the design, the dashboard becomes accessible even to users without technical expertise. The dashboard offers multi-dimensional insights, including location-based clustering, attack categorization, and impact statistics. It transforms complex data into actionable intelligence, improving situational awareness and facilitating evidence-based strategic planning. Another notable contribution is the emphasis on real user feedback through the structured UAT process. This not only validates the tool's effectiveness but also offers a model for future developers to incorporate usability evaluation into big data projects. The project thus serves both as a practical solution and a reference for future development in data-driven public safety applications.

5. Conclusion or Future Work

This project demonstrates the successful development of an interactive terrorism hotspot analysis dashboard that enhances decision-making. Future work may include integrating real-time data updates, improving multilingual support, optimizing mobile responsiveness, and expanding analytical depth to support predictive modeling for better counterterrorism planning and response strategies.

REFERENCE LIST

- Abualigah, S. M., Aljawarneh, E. Y., Al-Ayoub, F. I., & Al-Badarneh, A. F. (2022). Visualization of Accidents Data in United States. *2022 13th International Conference on Information and Communication Systems, ICICS 2022*, 270–274. <https://doi.org/10.1109/ICICS55353.2022.9811201>
- Adams, S. (2023, May 22). *How to Use Temporal Analysis to Gather Actionable Intelligence*. Skopenow.
- Ahammad Fahad, S., & Ebrahim Yahya, A. (n.d.-a). *Big Data Visualization: Allotting by R and Python with GUI Tools*.

DATA VISUALIZATION: ANALYZING SKIN PROBLEM AND USER PREFERENCE OF AI-BASED SOLUTIONS

Aizurin Nellisa binti Azril Rizal, Nor Arzami bin Othman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: aizurinnellisa@gmail.com, arzami@uitm.edu.my

Abstract

Skincare is an essential part of personal health, yet many users struggle to identify suitable products due to unclear skin conditions, limited knowledge, and a lack of AI-driven insights tailored to diverse demographics. This study aims to explore user challenges, preferences for AI-based skincare tools, and develop a dashboard that visualizes these findings. The system was evaluated through functionality and user acceptance testing (UAT), with positive feedback from both public users and experts. The project followed an agile methodology, covering planning, analysis, design, development, and testing. The final output is an interactive Power BI dashboard that presents survey data on skin concerns and AI preferences across user groups. This study contributes to more inclusive, data-driven skincare solutions and empowers users to make informed decisions.

Keywords: *Skin Analytics, AI-Based Skin Tools, Power BI Dashboard, UAT*

1. Introduction

Skincare remains a vital aspect of personal health, yet many individuals struggle to identify suitable products due to limited understanding of skin conditions and overwhelming product choices (Tay & Toh, 2024; Esa Putra, 2022). This project aims to bridge that gap by developing an interactive dashboard that visualizes skin problems and user preferences for AI-based skincare solutions. The objectives are threefold: (1) to identify suitable approaches for analyzing skin issues and AI preferences, (2) to develop a user-friendly dashboard using Power BI, and (3) to evaluate its effectiveness through functionality testing and user acceptance testing (UAT). The scope includes analyzing survey data from diverse demographics, integrating Python and SQLite for data processing, and visualizing insights across age, gender, and occupation. By transforming complex data into clear, engaging visuals, the system enhances public awareness, supports informed choices, and fosters greater trust in AI-driven skincare tools (Sarah Broyd, 2020; Kaya et al., 2024).

2. Methodology

This project adopted the Agile methodology, progressing through five iterative phases: planning, requirement analysis, design, development, and testing. During planning, literature was reviewed to define objectives and user needs (Camille, 2024). The design phase involved creating data models and wireframes using draw.io and Canva. Survey data sourced from Kaggle was cleaned and transformed using Python libraries such as Pandas and NumPy, then stored in an SQLite database. SQL queries were used to extract insights, which were visualized using Microsoft Power BI. The dashboard was embedded into a Wix-based website, allowing users to explore data interactively based on age, gender, and occupation. Testing involved functionality checks and User Acceptance Testing (UAT) with 30 participants, who evaluated the system using Likert-scale questionnaires. Expert reviewers also assessed the dashboard's usability and clarity. This structured approach ensured the final product was technically sound, user-friendly, and aligned with the project's goals.

3. Results / Findings

The Skinalyze dashboard visualized data from 10,000 Malaysian respondents, revealing that pigmentation and acne were the most common skin concerns. Nearly half of users expressed interest in AI skincare tools, with preferences leaning toward fragrance-free and expert-recommended products. The dashboard's interactive filters allowed exploration by age, gender, and occupation, uncovering demographic-specific trends. User Acceptance Testing (UAT) with 30 participants showed high satisfaction: Perceived Usefulness (4.44), Ease of Use (4.46), and Intention to Use (4.26). Expert feedback confirmed the dashboard's clarity and relevance, with suggestions for mobile optimization and personalized features. Overall, the findings indicate that Skinalyze effectively supports user understanding of skin issues and encourages trust in AI-based skincare solutions.

4. Novelty of Research / Product / Project

This project presents a unique contribution by focusing on the intersection of skincare concerns and user preferences for AI-based solutions through demographic-aware data visualization. Unlike previous works that emphasize AI image diagnosis or clinical tools, Skinalyze centers on everyday user experiences, highlighting challenges in product selection, ingredient awareness, and trust in AI technologies. The dashboard allows users to explore survey findings interactively, filtered by age, gender, and occupation, offering clear insights into how different groups perceive and approach skincare. Its strength lies in making complex data approachable and relevant to non-technical users, especially those unfamiliar with AI. By incorporating both public and expert feedback through User Acceptance Testing (UAT), the system ensures usability, inclusivity, and relevance. This approach not only supports informed skincare awareness but also offers a replicable model for visualizing user sentiment in other health and lifestyle domains.

5. Conclusion or Future Work

Skinalyze effectively visualizes skin concerns and AI preferences across demographics, enhancing user awareness and decision-making. Future improvements include mobile responsiveness, personalized recommendations, and integration with real-time data sources to ensure continued relevance, inclusivity, and adaptability in addressing evolving skincare needs and AI adoption trends.

REFERENCE LIST

- Camille. (2024, October 18). *Agile methodologies in data projects*. PM Insights. <https://pm-insights.com/agile-methodologies-in-data-projects/>
- Esa Putra, J. (2022). Diagnosis of Facial Skin Problems with the Forward Chaining Reasoning Method and Tracing Certainty Factor Beliefs. *Journal of Computer Science and Information Technology*, 86–91. <https://doi.org/10.35134/jcsitech.v8i3.44>
- Kaya, F., Aydin, F., Schepman, A., Rodway, P., Yetişensoy, O., & Demir Kaya, M. (2024). The Roles of Personality Traits, AI Anxiety, and Demographic Factors in Attitudes toward Artificial Intelligence. *International Journal of Human-Computer Interaction*, 40(2), 497–514. <https://doi.org/10.1080/10447318.2022.2151730>
- Sarah Broyd. (2020, November 24). *Transforming the Beauty Industry with Data and Analytics*. Clarkston Consulting. <https://clarkstonconsulting.com/insights/beauty-industry-transformation/>
- Tay, S. H., & Toh, S. M. (2024). Awareness and Knowledge of The Public on Facial Skin Care Products. *Malaysian Journal of Pharmacy*, 10(1), 23–28. <https://doi.org/10.52494/maljpharmv10105>

SUSTAINABLE DEVELOPMENT GOALS (SDGs) PROGRESS: INTERACTIVE POWER BI DASHBOARD FOR PERFORMANCE INSIGHTS

Amanina Syamimi Binti Roslan, Siti Sarah Binti Md Ilyas

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022835464@student.uitm.edu.my, sarahilyas@uitm.edu.my

Abstract

The Sustainable Development Goals (SDGs) represent a global effort to promote peace and sustainable development. Despite being introduced in 2015, awareness remains limited, especially among university students. This project aimed to address that gap by developing an interactive dashboard to enhance student understanding of the SDGs through visual storytelling and real data analysis. Focused on country level performance, the dashboard was designed using Power BI and embedded into a student-friendly website. The project involved collecting and cleaning SDG datasets, building visualizations, and integrating filters to allow users to explore trends and progress. Its effectiveness was evaluated through pre and post-tests, the Technology Acceptance Model (TAM) survey, and heuristic feedback from academic experts. A total of 30 students from various universities in Malaysia participated in the TAM evaluation. The findings showed a positive improvement in awareness, with the average test score rising from 3.12 to 4.57 after using the dashboard. TAM results also reflected strong acceptance, with high scores across all components including perceived usefulness, ease of use, user attitude, and intention to use. Expert feedback led to several refinements, such as improved color schemes, simplified visualizations, and storytelling features to enhance engagement. Overall, the dashboard proved to be a practical tool for promoting SDG awareness among students. For future development, it is recommended to include mobile optimization, real time data integration, multilingual support, and embedded videos to expand accessibility and impact.

Keywords: *Sustainable Development Goals (SDGs), Data Visualization, Technology Acceptance Model (TAM), SDG Awareness, University Students, Interactive Learning Tool*

1. Introduction

Raising awareness of the SDGs is crucial to preparing future generations for a more sustainable world. However, many university students still lack understanding of these goals. To bridge this gap, an interactive dashboard was developed using data from the Sustainable Development Report 2000–2023, sourced from Kaggle. Built with Power BI and Hive, the dashboard visualizes global SDG progress in a simplified and engaging format. The project aimed to promote student awareness, analyze global performance, and evaluate user acceptance using the TAM. TAM measures Perceived Usefulness (PU), Perceived of Use (PEU), Attitude Towards Using (ATT) and Intention To Use (BI) (Prabowo et al., 2020; Musa et al., 2024), helping assess the dashboard's effectiveness.

2. Methodology

This project followed the Software Development Life Cycle (SDLC) using the Waterfall model, chosen for its linear and structured approach, which suited the project's fixed scope and requirements (Khan et al., 2020). The methodology included five main phases which are planning, design, development, testing, and documentation. In the planning phase, the problem statement, objectives, and scope were defined, and relevant datasets were sourced from Kaggle. The design phase produced an ERD, use case diagram, sitemap, and wireframes to guide development. Apache Hive was used in the development phase to build a data warehouse and perform ETL processes, while Power BI created the interactive dashboard and Canva supported the web interface design. During testing, the TAM

evaluated Perceived Usefulness (PU), Perceived of Use (PEU), Attitude Towards Using (ATT) and Intention To Use (BI) among students (Raharjo et al., 2023). Lastly, the documentation phase compiled the entire process and results. This structured approach ensured a clear, goal-driven development of the SDG dashboard to enhance student awareness.

3. Results / Findings

The findings show a significant improvement in students' understanding of the SDGs after using the dashboard. The average awareness score increased from 3.12 in the pre-test to 4.57 in the post-test, reflecting a 46% improvement in knowledge. This indicates that the dashboard is not only informative but also effective as an educational tool. User acceptance was also strong based on TAM results. Students rated Perceived Usefulness (PU) at 4.64, indicating they found the dashboard helpful for learning. Perceived Ease of Use (PEU) scored 4.58, showing the dashboard was easy to navigate. Attitude Toward Using (ATT) received the highest score at 4.65, reflecting strong engagement, and Intention To Use (BI) was rated at 4.53, suggesting students are likely to continue using the dashboard. These results demonstrate that the dashboard successfully supports both learning and engagement by making complex global issues more accessible and relevant for university students.

4. Novelty of Research / Product / Project

This project presents a novel approach to SDG awareness by developing an interactive dashboard tailored for university students. Unlike typical SDG dashboards designed for policymakers, this version translates complex global data into simplified, student-friendly visuals. Power BI was used for interactive visualizations, while Hive handled large scale data processing from 2000 to 2023. The dashboard's impact was measured using pre and post-tests to assess knowledge improvement, and TAM was applied to evaluate user acceptance. By combining educational objectives with data visualization and user centered evaluation, the project stands out as a unique contribution to SDG education, fostering data literacy and sustainability awareness among future leaders.

5. Conclusion or Future Work

The dashboard successfully fulfilled all three project objectives by significantly increasing students' awareness of the SDGs and providing an interactive learning experience. Future improvements include optimizing the dashboard for mobile devices, integrating real-time data through APIs, adding multilingual support, and embedding multimedia content to enrich the learning experience. These enhancements will expand accessibility and ensure the dashboard remains relevant, engaging, and effective for promoting sustainability among a broader audience.

REFERENCE LIST

- Musa, H. G., Fatmawati, I., Nuryakin, N., & Suyanto, M. (2024). Marketing research trends using technology acceptance model (TAM): a comprehensive review of researches (2002–2022). Retrieved from Cogent Business & Management: <https://doi.org/10.1080/23311975.2024.2329375>
- Prabowo, T., Winarno, W. W., & Sudarmawan, S. (2020). Analysis of Technology Acceptance Model Method To Predict A Person's Interest In The Acceptance of A Technology : A Literature Review. Retrieved from Journal of Informatics and Telecommunication Engineering: <https://doi.org/10.31289/jite.v4i1.3986>
- Raharjo, T., Purwandari, B., Budiardjo, E. K., & Yuniarti, R. (2023). The Essence of Software Engineering Framework based Model for an Agile Software Development Method. International Journal of Advanced Computer Science and Applications. doi:<https://dx.doi.org/10.14569/IJACSA.2023.0140788>

SENTIMENT ANALYSIS OF SEPHORA PRODUCT REVIEWS: DISCOVERING CONSUMER'S PERCEPTION THROUGH DATA VISUALIZATION

Anis Yasmin Binti Muhamad Shaharuddin, Muhammad Nabil Fikri Bin Jamaluddin
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022862576@student.uitm.edu.my, nabilfikri@uitm.edu.my

Abstract

In today's digital beauty market, online reviews play a crucial role in shaping consumer behavior and brand perception. This study introduces Senty Beauty, a sentiment analysis dashboard built to extract, classify, and visualize Sephora product reviews. It supports decision-making for consumers, manufacturers, and retailers by offering clarity on product performance and satisfaction. Using an adapted Waterfall Model, the project involved sentiment data visualization requirement identification, design and development, and testing. Reviews were sourced from Kaggle, structured in Apache Hive, and processed using Python NLP methods. Cleaned data was visualized using Power BI, enabling filtering by product type, sentiment, brand, and demographics. User Acceptance Testing (UAT) confirmed the dashboard's ease of use and effectiveness. This project demonstrates how combining sentiment analysis with data visualization can unlock actionable insights from unstructured text. Future enhancements include real-time review updates, multimedia analysis, and multilingual support.

Keywords: *Sentiment Analysis, User-Generated Content, Natural Language Processing (NLP), Power BI Dashboard, Sephora Product Reviews, Consumer Insights*

1. Introduction

Online reviews significantly influence buying behavior in the beauty sector. Senty Beauty was developed to visualize sentiment trends from Sephora product reviews, helping users make informed decisions. The objectives include identifying visualization needs, building a dashboard, and evaluating its usability. The system applied NLP techniques which is tokenization, lemmatization, sentiment classification and enables filtering by sentiment type, product, brand, and skin traits. Though limited to text-based skincare and makeup data, it benefits both consumers and industry stakeholders.

2. Methodology

This project used an adapted Waterfall Model structured into three main phases: requirement identification, design and development, and testing. The methodology ensured a sequential and organized approach to system development. In the first phase, datasets were sourced from Kaggle, specifically containing user reviews of Sephora skincare and makeup products. These datasets included attributes such as review text, rating, brand name, skin type, and skin tone. The raw datasets were stored and merged using Apache Hive, which served as a data warehouse platform for structured query management. In the second phase, data preprocessing and sentiment analysis were performed using Python in Jupyter Notebook. NLP techniques were applied, including tokenization, stop word removal, lowercasing, stemming, and lemmatization to clean and normalize the review text (Rosid et al., 2020). After cleaning, each review was classified into sentiment categories which is positive, negative, or neutral based on sentiment scores and keyword analysis. In the third phase, the processed dataset was visualized in Power BI, featuring interactive charts such as bar graphs, pie charts, and word clouds. Filters allowed users to sort reviews by sentiment, product type, brand, year, and demographics. Finally, the system underwent User Acceptance Testing (UAT) with participants from

various backgrounds. UAT results were analyzed to assess ease of use, usefulness, and overall user satisfaction (Wankhade et al., 2022), ensuring the dashboard met usability expectations.

3. Results / Findings

The Senty Beauty dashboard effectively uncovered sentiment trends from Sephora product reviews through interactive visualizations. User Acceptance Testing (UAT) involved diverse participants, including public users, IT professionals, academics, and beauty industry experts. Feedback was overwhelmingly positive, especially regarding the dashboard's usability, clarity, and visual appeal. Key features like filtering by skin type, sentiment, brand, and year allowed flexible, user-driven analysis. UAT scores showed high ratings in perceived ease of use, usefulness, attitude, and behavioral intention. These results confirm that the system is accessible even to non-technical users and serves as a valuable tool for consumers and brands to support better decision-making.

4. Novelty of Project

The Senty Beauty project introduces an innovative integration of Natural Language Processing (NLP) and data visualization tailored for the beauty and skincare industry. Unlike conventional review platforms that rely on static text or basic ratings, this system transforms unstructured review data into interactive and actionable insights. It uniquely combines Apache Hive for scalable data storage, Python-based NLP preprocessing, and Power BI for dynamic, user-friendly visualization. A complete NLP pipeline which comprises tokenization, stop word removal, stemming, and lemmatization enables the system to classify reviews into positive, negative, or neutral sentiments with greater clarity. These sentiments are then visualized using diverse formats such as stacked bar charts, word clouds, pie charts, and timeline graphs. An added innovation is the inclusion of demographic filters (e.g., skin tone, skin type, product type), allowing more personalized and targeted insight exploration. Furthermore, the dashboard emphasizes user-centric design, evaluated through User Acceptance Testing (UAT) with participants from various backgrounds including public users, IT professionals, academics, and beauty experts. This ensures accessibility across both technical and non-technical audiences. By bridging raw reviews with strategic insight, Senty Beauty offers a novel, end-to-end solution for decision-making in e-commerce and beauty analytics.

5. Conclusion or Future Work

The Senty Beauty dashboard achieved its objectives by transforming Sephora product reviews into actionable insights. Senty Beauty successfully turned Sephora reviews into insightful visuals using NLP and data visualization. User testing confirmed its usability and value. While limited by static data and basic filters, future upgrades like real-time input, advanced filtering, and multilingual support will enhance its role in beauty industry decision-making.

REFERENCE LIST

- Rosid, M. A., Fitriani, A. S., Astutik, I. R. I., Mulloh, N. I., & Gozali, H. A. (2020). Improving Text Preprocessing for Student Complaint Document Classification Using Sastrawi. *IOP Conference Series: Materials Science*
- Wankhade, M., Rao, A. C. S., & Kulkarni, C. (2022). A survey on sentiment analysis methods, applications, and challenges. *Artificial Intelligence Review*, 55(7), 5731–5780. <https://doi.org/10.1007/s10462-022-10144-1>

EXPLORING STUDENT MENTAL HEALTH THROUGH BIG DATA ANALYTICS AND VISUALIZATION

Busyra binti Sukria, Alif Faisal bin Ibrahim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022675136@student.uitm.edu.my, aliffaisal@uitm.edu.my

Abstract

Mental health issues among students, such as stress, anxiety and depression, are becoming increasingly common and often go undetected due to limited awareness and the lack of effective monitoring tools. This project addresses this gap by applying big data analytics and visualization to identify key factors that influence student mental health. A dataset from Kaggle was analyzed using Apache Hive within a Hadoop environment and the insights were visualized through an interactive dashboard developed using Power BI. The dashboard enables users to explore mental health trends and examine how demographic, academic and lifestyle factors impact students' well-being. User Acceptance Testing (UAT), conducted with 35 participants including students, community and experts, revealed a high level of satisfaction in terms of usability, perceived usefulness and user engagement. The dashboard supports early intervention efforts and provides educational institutions with a practical tool to monitor and improve student mental health. Overall, the project contributes to enhancing mental health literacy and lays the groundwork for future research in data-driven mental health support systems within academic environments.

Keywords: *Mental Health, Big Data Analytics, Data Visualization, Interactive Dashboard, UAT*

1. Introduction

Mental health is a critical aspect of overall well-being that affects how individuals think, feel and behave (Choudhary, 2022). However, students struggle to recognize mental health issues and are unaware that habits like poor sleep or diet can affect their well-being (Campbell et al., 2022; Caamaño-Navarrete et al., 2024). Educational institutions often lack tools to track and visualize students' mental health (EylerCreative, 2023). This project aims to analyze key factors affecting student mental health, develop an interactive dashboard using Power BI and evaluate its usability through User Acceptance Testing (UAT). The scope includes analyzing data related to academic pressure, lifestyle habits and demographic factors. The dashboard is designed for use by students, educators and institutions to explore mental health trends, raise awareness and support early detection and intervention for improved well-being.

2. Methodology

This project was conducted using the Agile methodology, which allows flexible and iterative progress (Kate et al., 2023). The Agile approach includes six main phases: planning, analysis, design, development, testing and deployment. In the planning phase, the project scope, objectives and significance were defined and a dataset from Kaggle was selected. In the analysis phase, the data was extracted, transformed and loaded using Apache Hive in a Cloudera QuickStart VM environment. The dataset was cleaned, structured and stored in a Hive table and additional columns were added for mental health scores and categories. In the design phase, wireframes and a sitemap were created using Figma and Draw.io to visualize the dashboard's structure. The development phase involved building the dashboard using Microsoft Power BI and hosting it on the web to ensure accessibility. In the testing and evaluation phase, UAT was conducted with 35 respondents, including students, community members and experts. They evaluated the dashboard using a structured questionnaire. The

deployment phase focused on refining the dashboard based on feedback and preparing the final documentation using Microsoft Word and Mendeley.

3. Results / Findings

UAT was conducted with 35 participants, including 30 students and community members as well as 5 experts, to evaluate the dashboard's usability and effectiveness. The results showed a positive response across all four measured areas. Users rated Perceived Ease of Use at 4.57 out of 5, indicating that the dashboard was easy to use with minimal effort. Perceived Usefulness scored 4.64, showing that the dashboard helped users better understand student mental health. The Attitude Toward Use received the highest score of 4.69, reflecting strong support for using the dashboard as a learning and awareness tool. Intention to Use scored 4.51, suggesting that most users would use the dashboard again. Feedback from experts recommended adding chart summaries and tooltips for better clarity, while public users suggested including guidance to assist first-time users. Based on this feedback, the dashboard was refined by adding a user guide and narrative explanations to make the data easier to interpret. These improvements enhanced the dashboard's usability, making it a more effective tool for raising mental health awareness and supporting early intervention.

4. Novelty of Research

This project developed an interactive dashboard to help raise awareness and educate users about student mental health. Unlike traditional static reports, the dashboard allows users to explore real-time data and see how different factors such as stress, anxiety, depression, academic pressure, lifestyle habits and financial issues affect student well-being. It helps students recognize early signs of mental health problems and understand how their behaviors may contribute to them. For educational institutions, the dashboard acts as a useful tool for early detection, enabling them to track student well-being and improve support services based on real data. The project also serves as a reference for future research in student mental health. Built using Power BI, the dashboard highlights effective ways to visualize and communicate data, making mental health information easier to understand.

5. Conclusion or Future Work

This project successfully developed an interactive dashboard that visualizes student mental health using big data analytics and visualization techniques. The solution enhances awareness and supports early intervention efforts within academic settings. Future work will focus on incorporating real-time, localized data and improving mobile accessibility to broaden its usability and institutional impact.

REFERENCE LIST

- Caamaño-Navarrete, F., Saavedra-Vallejos, E., Guzmán-Guzmán, I. P., Arriagada-Hernández, C., Fuentes-Vilugrón, G., Jara-Tomckowiack, L., Lagos-Hernández, Campbell, F., Blank, L., Cantrell, A., Baxter, S., Blackmore, C., Dixon, J., & Goyder, E. (2022). Factors that influence mental health of university and college students in the UK: a systematic review. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-022-13943-x>
- Choudhary, S. K. (2022). Mental health. *International Journal of Health Sciences*, 9462–9475. <https://doi.org/10.53730/ijhs.v6nS1.7160>
- EylerCreative. (2023). *The value of Data dashboard Visualizations in Higher Education*. <https://hartmanadvisors.com/the-value-of-data-dashboard-visualizations-in-higher-education/>
- Kate, V., Bhalerao, S., & Sharma, V. (2023). Exploring Agile Methodologies in Educational Software Development- A Comparative Analysis and Project Management Insights. 2023 IEEE International Conference on ICT in Business Industry & Government (ICTBIG), 1–11. <https://doi.org/10.1109/ICTBIG59752.2023.10456214>

DATA-DRIVEN VISUALIZATION OF SKILL DEMAND AND EMERGING TRENDS IN THE IT SECTOR

Dania Nurfareesha Yusreena Rozaiman, Norziana Yahya

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022601618@student.uitm.edu.my, norzianayahya@uitm.edu.my

Abstract

The rapid advancement of the information technology (IT) industry driven by innovations in artificial intelligence, cloud computing, and data science has led to a growing gap between the skills employers need and those possessed by the workforce (Persaud, 2020; Rahhal et al., 2022). This project addresses that gap by creating an interactive, data-driven dashboard designed to visualize current IT skill demand and emerging industry trends. The primary goals are: (i) To analyze job market data and identify skill demand and emerging trends in the IT sector; (ii) To design and develop analytical dashboard highlighting IT skills demand and trends; and (iii) To evaluate the usability of dashboard for identifying IT skill demand and trends. The project follows the CRISP-DM methodology, covering stages such as business understanding, data understanding, data preparation, development, evaluation, and deployment. Data from sources like Kaggle were processed and visualized using Microsoft Power BI. The dashboard's usability was assessed through the Technology Acceptance Model (TAM), emphasizing users' perceptions of usefulness and ease of use. Results indicated highly positive feedback, with users describing the dashboard as informative, user-friendly, and visually intuitive. The final product provides valuable insights for job seekers, employers, and educators, helping guide workforce development, curriculum updates, and career planning in a rapidly evolving IT landscape.

Keywords: *IT skills gap, skill demand, emerging trends, dashboard, data visualization, CRISP-DM*

1. Introduction

The IT sector is expanding rapidly, with technologies like AI, cloud computing, and data science redefining workforce needs (Rahhal et al., 2022; Das & Reddy, 2024). However, this evolution has resulted in a critical skills mismatch. Many job seekers, employers, and educational institutions struggle to align with shifting demands due to limited access to real-time skill analytics (Persaud, 2020). This project aims to fill this gap by analyzing global job data and developing a dashboard to visualize IT skill demand and trends. The objectives include identifying in-demand skills, designing a visualization dashboard, and evaluating its usability for key stakeholders. Data were gathered globally, with a focus on regions such as Singapore known for rapid tech adoption. The dashboard offers insights into skill needs for roles in programming, AI, and cloud computing, while also tracking trends like IoT and blockchain (Taherdoost, 2022).

2. Methodology

This project follows the CRISP-DM (Cross-Industry Standard Process for Data Mining) framework. The first phase, Business Understanding, defined goals and analyzed IT workforce challenges. Data Understanding involved acquiring datasets from job platforms such as Kaggle. In the Data Preparation phase, data were cleaned, transformed, and structured. During the Development phase, an interactive dashboard was created using Power BI, featuring visualizations like trend maps and skill frequency charts. The Evaluation phase assessed dashboard usability via the Technology Acceptance Model (TAM), focusing on perceived usefulness, ease of use, and user intent to adopt. Feedback indicated high usability, with users praising the tool's clarity and relevance. Finally, the Deployment phase

ensured real-world application. Recommendations include improving interactivity, localizing data, and adding multilingual options.

3. Results / Findings

User testing revealed strong satisfaction with the dashboard's usability and functionality. Most users found it easy to navigate and effective in conveying IT skill trends. According to the TAM assessment, high scores in Perceived Usefulness (PU) and Perceived Ease of Use (PEU) were recorded. Users indicated that the dashboard significantly improved their understanding of emerging IT roles and in-demand skills. Suggestions for future improvements included enhancing visual clarity, localizing data to Malaysia, and enabling mobile responsiveness. The positive response validated the dashboard's value in real-world applications such as curriculum design and job planning.

4. Novelty of Research / Product / Project

This project offers a novel approach to addressing the IT skills gap through data visualization. Unlike static reports or manual analysis, the dashboard dynamically integrates multiple data sources to deliver actionable insights. It is among the few student-led efforts that combine job market analytics, and visualization in one tool. The adoption of CRISP-DM framework ensures a systematic and reliable approach, while TAM provides a structured evaluation of user experience. The dashboard serves as a bridge between academia, industry, and job seekers, facilitating better alignment between workforce capabilities and current market demands.

5. Conclusion or Future Work

The project successfully developed and validated a user-friendly dashboard for visualizing IT skill trends. Future work should include localized data, enhanced interactivity, and expanded user testing to improve impact and relevance.

REFERENCE LIST

- Das, A., & Reddy, Y. (2024). Industry 5.0: Human-centric digital transformation. *Journal of Emerging Technologies*, 18(1), 34–46.
- Dimara, E., Bezerianos, A., Dragicevic, P., & Fekete, J.-D. (2021). A taxonomy of human-data interaction. *ACM Computing Surveys*, 54(6), 1–40. <https://doi.org/10.1145/3453157>
- Jayaraman, S. (2024). Data visualization pitfalls and solutions. *Journal of Visual Analytics*, 5(2), 102–113.
- Lnenicka, M., Máchová, R., & Komárková, J. (2020). Open data for smart governance. *Government Information Quarterly*, 37(1), 101403. <https://doi.org/10.1016/j.giq.2019.101403>
- Persaud, A. (2020). Skill mismatches in the digital economy. *Education + Training*, 62(4), 387–402. <https://doi.org/10.1108/ET-05-2019-0104>
- Rahhal, H., Alsheikh, M., & Alarifi, A. (2022). Skills for the digital economy: A data science perspective. *Computers in Human Behavior Reports*, 6, 100167. <https://doi.org/10.1016/j.chbr.2022.100167>
- Taherdoost, H. (2022). Understanding technological trends and their applications. *Technology in Society*, 68, 101892. <https://doi.org/10.1016/j.techsoc.2021.101892>
- Yosifova, R. (2024). Global job trends in IT: A data-driven perspective. *IT Workforce Analytics Journal*, 9(2), 55–66.

DESCRIPTIVE ANALYSIS AND EXPLORATORY DATA ANALYSIS ON CORRELATION BETWEEN BMI AND HEALTH VARIABLES

Iman Dazrain bin Bani Azizul Ashha, Mohammad Hafiz Bin Ismail

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022883044@student.uitm.edu.my, mohammadhafiz@uitm.edu.my

Abstract

Body Mass Index (BMI) is widely used to assess body fat and related health risks, yet traditional methods often fail to capture the complex factors influencing unmanageable BMI (Mandal, 2023). The growing prevalence of overweight and underweight individuals highlights the need for more precise, data-driven approaches (World Health Organization: WHO, 2024). This study investigates the correlation between BMI and health variables such as waist circumference, blood glucose, and cholesterol levels. Data was collected from Kaggle, pre-processed using Python, and stored in HDFS for efficient handling of large datasets. Descriptive and exploratory analyses were conducted to uncover patterns, while regression and feature importance techniques provided insights into significant predictors of BMI (Camizuli & Carranza, 2018). Visualizations were developed through Microsoft Power BI to present findings in an accessible format. Finally, the dashboard's usability was evaluated using the Technology Acceptance Model (TAM), gathering feedback to assess its effectiveness (Hariri et al., 2019). Results demonstrated notable correlations between BMI and key health indicators, offering valuable insights for personalized health interventions. This study shows how integrating big data analytics and interactive dashboards can improve understanding of BMI dynamics, aiding healthcare professionals and individuals in developing targeted strategies for better health outcomes.

Keywords: BMI, Descriptive, Correlation, Health variables, TAM, EDA

1. Introduction

This study focuses on analyzing the correlation between Body Mass Index (BMI) and various health variables to help improve health management and interventions. BMI, a widely used indicator of body fat and health risk, is influenced by multiple interconnected factors such as waist circumference, blood glucose levels, and cholesterol. Despite existing tools, current approaches often rely on general information and lack personalized insights, leading to limitations in accurately identifying and managing individuals at risk. Therefore, the objectives of this project are to retrieve BMI-related data, conduct descriptive and exploratory analyses to uncover patterns, and develop an interactive dashboard for visualizing these correlations. The scope includes using data from Kaggle, applying statistical techniques, and creating visual tools to assist healthcare providers, fitness professionals, and individuals in understanding BMI dynamics for more targeted health strategies.

2. Methodology

This study followed a Waterfall approach with four key phases. In Data Preparation, BMI-related data was gathered from Kaggle, cleaned, and pre-processed in Jupyter Notebook using Python, then stored in HDFS. During Development Techniques, descriptive analysis, correlation tests, regression, and feature importance were performed to explore relationships between BMI and health variables. The Visualization phase involved creating interactive charts and developing a dashboard using Power BI for clear data presentation. Finally, in the Evaluation phase, the dashboard's usability and effectiveness were assessed through the Technology Acceptance Model (TAM) using feedback collected via Google Forms. This systematic process ensured reliable analysis and meaningful insights into BMI-related health factors.

3. Results / Findings

The system evaluation used the Technology Acceptance Model (TAM) to measure four dimensions: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude (ATT), and Behavioral Intention to Use (BI). A total of 30 respondents completed the user acceptance questionnaire. For PEU, the dashboard received a high average score of 4.27, with users agreeing that the interface was simple to navigate and visualizations were intuitive. The statement "I feel sure that I can use the website on my own after a short time" scored the highest (4.47), indicating strong confidence in usability. In the PU dimension, the average was 4.17, where users found that features like correlation coefficients, feature importance, and descriptive statistics improved their understanding of BMI and health variables. Attitude received an average of 4.25, with users expressing satisfaction in using the system and appreciating its layout and design. Many indicated they would recommend it to others. Finally, Behavioral Intention to Use scored 4.23, showing strong willingness to continue using the dashboard in future analyses. All four dimensions exceeded a mean score of 4.1, confirming that the BMIHealthCare platform is user-friendly, informative, and well-received by end users.

4. Novelty of Research

The novelty of this study lies in its integrated approach to analyzing BMI correlations using advanced statistical methods and interactive data visualization. Unlike previous studies that focused solely on static analysis or generalized trends, this project combines descriptive and exploratory data analysis with regression and feature importance techniques to reveal detailed relationships between BMI and multiple health variables. Moreover, the study innovates by presenting these insights through a user-friendly Power BI dashboard embedded into a web interface, allowing dynamic exploration of health data tailored to different user groups. The inclusion of a rigorous user acceptance evaluation using the Technology Acceptance Model (TAM) further distinguishes this work, ensuring that the system is both technically robust and practically valuable for healthcare professionals, researchers, and the public.

5. Conclusion or Future Work

This study successfully analyzed BMI correlations with health variables using advanced analytics and an interactive dashboard. The system proved effective and user-friendly, with strong acceptance from users. These insights can support targeted health interventions, enhancing decision-making for both professionals and individuals in managing BMI-related health risks.

REFERENCE LIST

- Camizuli, E., & Carranza, E. J. (2018). Exploratory Data Analysis (<sc>EDA</sc>). In *The Encyclopedia of Archaeological Sciences* (pp. 1–7). Wiley. <https://doi.org/10.1002/9781119188230.saseas0271>
- Hariri, R. H., Fredericks, E. M., & Bowers, K. M. (2019). Uncertainty in big data analytics: survey, opportunities, and challenges. *Journal of Big Data*, 6(1), 44. <https://doi.org/10.1186/s40537-019-0206-3>
- Mandal, A. (2023, January 23). *What is Body Mass Index (BMI)*. News Medical. [https://www.news-medical.net/health/What-is-Body-Mass-Index-\(BMI\).aspx](https://www.news-medical.net/health/What-is-Body-Mass-Index-(BMI).aspx)
- World Health Organization: WHO. (2024, March 1). *Obesity and overweight*. World Health Organization : WHO. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

SOCIOECONOMIC IMPACT ON CRIME RATES ANALYSIS IN MALAYSIA BASED ON BIG DATA APPROACH

Irdina Dayini Azamuddin, Dr. Khairul Anwar Sedek

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022490584@student.uitm.edu.com, khairulanwarsedek@uitm.edu.my

Abstract

Understanding how socioeconomic factors influence crime rates is crucial for developing effective prevention strategies in Malaysia. However, the public and authorities are unable to comprehend the connections between socioeconomic conditions and crime in Malaysia due to fragmented data and a lack of socioeconomic indicator analysis on crime. The project aims to develop a dashboard that analyzes the socioeconomic factors such as poverty, income, unemployment, and education's impact on crime rates in Malaysia. By employing the Cross Industry Standard Process for Data Mining (CRISP-DM) methodology, the project integrates crime and socioeconomic data from the Department of Statistics Malaysia (DOSM) (2022) and Malaysia Government Open Data (2022) into a centralized data warehouse using Apache Hive. Exploratory Data Analysis (EDA) was applied to identify data trends, correlations, and patterns. The outcome is an interactive Power BI dashboard that empowers the PDRM, researchers, and the public with valuable insights through interactive visualization. The project demonstrated efficient data integration and visualization while successfully fulfilling all functional and non-functional requirements. It received positive feedback through the User Acceptance Test (UAT). For future work, the project may be expanded to include real-time crime reporting data and predictive analytics through machine learning models. This would further improve the dashboard's ability to forecast potential crime hotspots and guide strategic policing efforts.

Keywords: *Crime, Socioeconomic, Exploratory Data Analysis (EDA), CRISP-DM, Power BI, Interactive Dashboard*

1. Introduction

Crime is defined as an unlawful act that violates the law (Salah & Kewen, 2022). Theories of criminal motivation highlight financial and economic pressures as key drivers of criminal behaviour. Understanding how socioeconomic variables influence crime is essential for developing effective prevention strategies. The primary objectives are (1) to analyze socioeconomic impact on crime rates in Malaysia using big data techniques, (2) to develop a dashboard for the analysis of socioeconomic impact on crime rates in Malaysia, and (3) to evaluate the functionality and usability of dashboards for socioeconomic impact on crime rates analysis in Malaysia using the UAT. Through EDA and an interactive Power BI dashboard, the project identifies the correlations between crime and socioeconomic factors, which provides valuable insights for the public, researchers, and PDRM.

2. Methodology

The methodology employed in this study is the CRISP-DM (Cross-Industry Standard Process for Data Mining) framework, which provides a systematic approach to data analysis. The process begins with data collection from multiple sources, such as the Department of Statistics Malaysia and Malaysia Government Open Data, focusing on crime and socioeconomic indicators. Subsequently, an extract, transform, load (ETL) process using Apache Hive and Microsoft Excel is implemented to ensure data quality, consistency, and integration into a centralized data warehouse. Exploratory data analysis (EDA) techniques are applied to identify patterns, correlations, and significant relationships between crime rates and socioeconomic factors such as poverty, unemployment, income, and education levels. A Power BI dashboard is developed to visualize the data, and a website is built using a visual website

design platform. The dashboard allows authorities, researchers, and the public to explore trends and patterns dynamically, supporting evidence-based decision-making. The dashboard is published and embedded into the website for the user to access the system. Validation of the system's functionality and usability is performed through UAT, ensuring the platform effectively meets user needs.

3. Results/Findings

The results indicate strong user acceptance with an overall index of 82.45% using the User Acceptance Test (UAT). Perceived Ease of Use (PEU) has a mean score of 4, Perceived Usefulness (PU) has a mean score of 4.14, Attitude (ATT) has a mean score of 4.25, and Intention to Use (BI) has a mean score of 4.2. These findings indicate significant user approval. Although lower ratings for navigation and crime capabilities, respondents strongly support the dashboard's contribution to raising public awareness and fostering educational involvement. Beyond these quantitative metrics, qualitative feedback gathered from open-ended questions was analyzed to identify specific areas of strength and opportunities for improvement. Thematic analysis identified three areas based on user responses, which are positive user experience and satisfaction, interface and usability improvement, and enhancement of data insight.

4. Novelty of Research

This project offers a new approach to understanding crime in Malaysia by combining crime data with four important socioeconomic factors: poverty, income, unemployment, and education. Unlike most previous studies that only look at crime statistics, this project provides a broader view of how social and economic conditions may affect crime rates. The unique value of this project lies in its focus on both data analysis and user experience. Big data methods help process large and complex datasets, while an interactive dashboard presents the results in a clear and useful way. The dashboard design is guided by feedback from users. UAT was conducted, and open-ended responses were analyzed using thematic analysis to understand users' views and needs. In the Malaysian context, the integration of big data crime analysis with socioeconomic factors in an interactive and user-friendly tool remains limited. This project addresses that gap by providing a comprehensive platform that supports informed decision-making, academic research, and increased public awareness regarding crime trends.

5. Conclusion or Future Work

This project successfully achieved its three main objectives. The user acceptance score of 82.45% indicates that the dashboard is effective, user-friendly, and valuable in helping users understand crime trends and correlations with socioeconomic factors. For future work, the project may include real-time crime data and predictive analytics through machine learning models.

REFERENCE LIST

- Asham, M. A. H. (2022). Property and violent crimes data analysis using an analytical dashboard. Department of Statistics Malaysia. (2022). Crimes by district & Crime type | OpenDOSM. OpenDOSM. https://open.dosm.gov.my/data-catalogue/crime_district
- Malaysia Government Open Data. (2022). Crimes by district & crime type | data.gov.my. https://data.gov.my/data-catalogue/crime_district
- Salah, M. M., & Kewen, X. (2022). Big crime data analytics and visualization. *ACM International Conference Proceeding Series*, 24–28. <https://doi.org/10.1145/3523089.3523094>

TREND ANALYSIS AND VISUALIZATION OF HAZARDOUS CHEMICALS IN CONSUMER PRODUCTS

Irdina Natasha binti Mohd Jelani, Nor Arzami bin Othman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: dinatasya00@gmail.com, arzami@uitm.edu.my

Abstract

The widespread use of cosmetics and consumer products exposes individuals to synthetic chemicals that may cause serious health effects such as skin irritation, hormonal disruption, and cancer. Public awareness of these risks remains low due to vague labeling, inconsistent regulations, and a lack of clear visual representations. This project aims to develop an interactive dashboard to analyze and visualize trends related to hazardous chemicals found in consumer products, especially cosmetics. The objectives include identifying appropriate methods for trend analysis, designing a user-friendly dashboard, and evaluating its usability and acceptance through User Acceptance Testing (UAT). The study follows the Waterfall model comprising planning, design, development, and testing phases. Data is processed using Jupyter Notebook, while Microsoft Power BI is employed for visualization. Figma is used to design the dashboard interface, and tools like Google Forms and Microsoft Excel are used for usability testing. The expected outcome is a publicly accessible dashboard that informs consumers, regulators, and manufacturers about chemical usage patterns, potential health risks, and regulatory developments. This project contributes to raising public awareness, promoting informed decision-making, and enhancing transparency in the consumer goods market.

Keywords: Hazardous chemicals, cosmetics, Power BI, dashboard, public awareness, UAT

1. Introduction

The widespread use of cosmetics and personal care products has raised growing concern over the presence of hazardous chemicals, which may pose long-term health and environmental risks (Curious, 2019; Sikorska, 2023). Despite increasing awareness, consumers often struggle to interpret complex ingredient lists and understand chemical safety (Jin, 2023). This project aims to develop an interactive dashboard that enables users to analyze and visualize trends in hazardous chemicals found in consumer products, particularly cosmetics. The dashboard is designed using Microsoft Power BI and supports users in identifying potential health risks and regulatory trends through accessible visualizations. The project covers data collection, preprocessing, dashboard design, and usability testing. By providing clear insights into chemical usage patterns, the tool assists consumers, regulators, and manufacturers in making informed decisions, thereby promoting transparency and public safety in the cosmetic industry.

2. Methodology

This project adopts the Waterfall model, a linear and sequential software development methodology where each phase is completed before moving to the next (Senarath, 2021). The process is divided into four phases: Planning, Design, Development, and Testing. During the Planning phase, the research problem and objectives were defined, followed by a literature review and Gantt chart creation. The Design phase involved developing a data model using Draw.io and designing a dashboard wireframe using Figma. In the Development phase, data was extracted from Kaggle and processed using Jupyter Notebook for transformation, cleaning, and analysis. Visualization was done using Microsoft Power BI to create an interactive dashboard. The Testing and Evaluation phase included functional testing and User Acceptance Testing (UAT) using questionnaires distributed via Google Forms. Results were analyzed with Microsoft Excel to assess usability and gather user

feedback. This structured process ensured the development of a usable and informative dashboard for public awareness.

3. Results / Findings

User Acceptance Testing (UAT) was conducted with 30 respondents aged 18 and above, consisting of both students and working individuals. The findings revealed a high level of user satisfaction. The Perceived Ease of Use (PEU) scored an average of 4.48, slightly higher than the Perceived Usefulness (PU), which scored 4.46. This indicates that users found the dashboard intuitive and easy to navigate, which contributed to effective understanding of the visualized chemical data. Although the difference was small, it suggests that the dashboard's design and interactivity enhanced the overall user experience. Expert evaluations showed a PU mean score of 3.57 and a PEU score of 3.67, reflecting a positive but more moderate response. Experts agreed that the dashboard was useful and user-friendly but recommended improvements in advanced functionality and content clarity. Overall, both users and experts confirmed the dashboard's effectiveness, with future improvements aimed at enhancing clarity, confidence, and decision support.

4. Novelty of Research / Product / Project

This project offers a unique contribution by visualizing hazardous chemicals in consumer products, a widely used but often overlooked category in terms of safety. Unlike traditional tools that present raw data in complex formats, this interactive dashboard developed with Microsoft Power BI delivers clear, visual insights tailored for company use. User can explore chemical usage trends by filtering based on product category, chemical name, and company name, enabling efficient monitoring across brands. A key feature is the integration of public and expert feedback through User Acceptance Testing (UAT), ensuring usability and relevance. This tool supports manufacturers and regulators in identifying formulation patterns, improving product safety, and preparing for future integration with big data and AI.

5. Conclusion or Future Work

The dashboard effectively visualizes trends in hazardous chemicals across products and companies, supporting informed decision-making and regulatory awareness. Future improvements include real-time data integration, expanded datasets, and enhanced accessibility through multilingual support, tutorials, and customizable filters to ensure continued relevance, inclusivity, and adaptability in chemical safety monitoring.

REFERENCE LIST

- Jin, G. (2023, March 21). Toxics in cosmetics: chemical properties, impact mechanism and clinical cases derived from major chemical components | Highlights in Science, Engineering and Technology. Darcy & Roy Press. Retrieved October 29, 2024, from <https://drpress.org/ojs/index.php/HSET/article/view/6153>
- Senarath, U. S. & Rajarata University of Sri Lanka. (2021). Waterfall Methodology, Prototyping and Agile Development. <https://doi.org/10.13140/RG.2.2.17918.72001>
- Sikorska, J. (2023, April 17). Types of ingredients in cosmetics and their functions. Foodcom S.A. Retrieved October 29, 2024, from <https://foodcom.pl/en/types-of-ingredients-incosmetics-and-their-functions/>
- The chemistry of cosmetics - Curious. (2019, September 19). Australian Academy of Science. Retrieved October 29, 2024, from <https://www.science.org.au/curious/people-medicine/chemistry-cosmetics>

MALAYSIA PETROL STATION ANALYTICS: DATA-DRIVEN INSIGHTS FOR BETTER SERVICE-STOP DECISIONS

Irfan Naquiuddin Bin Mazdi Faizal, Ts. Dr. Siti Zulaiha Ahmad

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: irfannaquiuddin03@gmail.com, sitizulaiha@uitm.edu.my

Abstract

Petrol stations have evolved beyond simple fuel stops into full-service stations offering a wide range of amenities such as restrooms, prayer rooms, convenience stores, and EV charging facilities. Despite this evolution, drivers in Malaysia often lack access to centralized, data-rich tools to make informed decisions about where to stop. This project presents the development of an interactive dashboard aimed at improving driver decision-making by visualizing detailed petrol station service data across Malaysia. Using datasets from Kaggle and the Google Places API, the system integrates service information, sentiment analysis, and predictive insights. Built on a Hadoop-based data warehouse and visualized using Microsoft Power BI, the dashboard allows users to filter and compare stations based on amenities and customer reviews. Functionality and usability were evaluated through systematic testing and a User Acceptance Test (UAT), which achieved a high satisfaction rate of 86.5%. The system benefits not only drivers but also petrol station operators and researchers by providing actionable, data-driven insights.

Keywords: petrol station, Malaysia, services, dashboard, Power BI, decision-making

1. Introduction

In Malaysia, petrol stations have evolved into multifunctional service hubs, offering facilities such as EV chargers, prayer rooms, restrooms, and convenience stores to cater to diverse traveler needs (Awad et al., 2022). Despite this transformation, many drivers still lack access to a centralized, data-rich platform that helps them evaluate these amenities effectively, resulting in suboptimal travel decisions (Fonseca, 2021). According to Manneh et al. (2020), offering diverse services can enhance customer satisfaction and build loyalty, while Anuar Abdul Shukor et al. (2022) emphasize that service quality influences brand preference. To address this gap, this project introduces *Fuel Mate*, an interactive dashboard that visualizes petrol station data across Malaysia. The key objective is to identify driver preferences when selecting petrol stations and apply suitable data visualization techniques. According to Awad et al. (2022a), BI dashboards offer an intuitive way to extract meaningful insights, supporting better and more informed decision-making for users.

2. Methodology

This project adopted the System Development Life Cycle (SDLC) using the waterfall model. Data from Kaggle (fuel station reviews) and Google Places API (station metadata and services) underwent preprocessing in Jupyter Notebook using Python. Sentiment analysis was performed using a fine-tuned model, while the processed data were stored in HDFS via Cloudera. Microsoft Power BI was used to build interactive dashboards embedded into a custom website. The dashboard features map-based filtering, trend visualizations, and service-based comparisons. Evaluation included both functional testing and User Acceptance Testing (UAT).

3. Results / Findings

The project culminated in the successful development of an interactive dashboard called *Fuel Mate*, which visualizes petrol station services across Malaysia. Key features include a location map, service filters (e.g., EV chargers, prayer rooms, convenience stores), sentiment analysis from customer

reviews, and predictive insights on station ratings. The dashboard enables users to make informed comparisons and decisions when planning stops, especially for long-distance travel. Functional testing verified that all components of the dashboard worked as intended. User Acceptance Testing (UAT) was conducted with a diverse group of users to evaluate system usability and effectiveness. The results demonstrated a high overall satisfaction rate, with a UAT score of 86.5%, reflecting strong positive feedback in areas such as perceived ease of use, usefulness, and user intention. Most respondents agreed that the dashboard significantly improved their ability to evaluate petrol stations. These findings confirm that *Fuel Mate* effectively meets user needs and enhances engagement with petrol station service data.

4. Novelty of Research / Product / Project

This project introduces a unique solution to a real-world problem: the lack of centralized, accessible information about services at petrol stations in Malaysia. Unlike conventional petrol station websites, which only provide locations, Fuel Mate integrates crowdsourced reviews, service availability, and real-time analytics into a single interactive dashboard. It is also one of the few systems in Malaysia to combine sentiment analysis and predictive modeling with data visualization tools like Power BI. The project goes beyond static data representation by allowing users to interact with the dashboard, filter preferences, and receive actionable insights. Additionally, by integrating data from both Kaggle and Google Places API, the system merges qualitative (review-based) and quantitative (location and facility-based) data, offering a holistic perspective. This combination of big data processing, interactive visualization, and predictive analytics tailored to the Malaysian transport context represents a novel contribution to both academic research and practical application in digital service planning.

5. Conclusion or Future Work

This project successfully delivered a functional and user-friendly dashboard that enhances petrol station selection through data-driven insights. Future work may focus on integrating real-time service updates, mobile app deployment, and expanding the system to cover stations across Southeast Asia for broader impact.

REFERENCE LIST

- Anuar Abdul Shukor, K., Roland Xavier, S., Fazwan Kharuddin, A., & Tun Abdul Razak, U. (2022). The Influence of Product Quality and Service Quality on Brand Leadership: An Empirical Study of Petrol Station Outlet Users. In *International Journal of Management, Accounting* (Vol. 1, Issue 3).
- Awad, M., Al Redhaei, A., & Fraihat, S. (2022). Using Business Intelligence to Analyze Road Traffic Accidents. *ACM International Conference Proceeding Series*, 83–92. <https://doi.org/10.1145/3551504.3551507>
- Fonseca, C. S. (2021). *The Impact of Interactivity and Personalisation on the Perceived Credibility of Health Information Visualisations and on Anxiety Levels*.
- Manneh, M., Kozhevnikov, M., & Chazova, T. (2020). Determinants of consumer preference for petrol consumption: The case of petrol retail in the Gambia. In *International Journal of Energy Production and Management* (Vol. 5, Issue 2, pp. 175–186). WITPress. <https://doi.org/10.2495/EQ-V5-N2-175-186>

OPTIMIZING DIGITAL MARKETING CAMPAIGNS THROUGH DATA VISUALIZATION

Mohamad Airl Aidit Rosli, Mohd Nizam Osman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022478282@student.uitm.edu.my, mohdnizam@uitm.edu.my

Abstract

This project focuses on the problems businesses face while analyzing and optimizing their digital marketing strategy. With the growing complexity of customer behaviors and the growth of digital platforms, businesses are struggling to identify successful platforms and manage investments for optimum return on investment (ROI). The main objective of this project is to create an interactive dashboard that visualizes digital marketing campaign performance and customer engagement, allowing organizations to make more informed, data-driven decisions. The project aims to identify and analyze requirements for visualizing digital marketing performance, design and create a dashboard that visualizes customer engagement and digital marketing performance, and evaluate the system's usability using a User Acceptance Test (UAT). The development process follows the CRISP-DM methodology, beginning with data collection and preparation, followed by dashboard development using Microsoft Power BI and website development using VS Code. The expected output is a user-friendly dashboard that presents insights into campaign effectiveness, customer engagement, and platform performance. The evaluation results show positive user satisfaction, especially in terms of ease of use and perceived usefulness. The significance of this project develops from its ability to streamline marketing analysis, improve decision-making, and help businesses stay adaptive in a competitive and changing digital market.

Keywords: *Digital Marketing, Data Visualization, CRISP-DM, Power BI, UAT*

1. Introduction

In today's competitive digital industry, businesses struggle to analyze and optimize marketing campaigns across different platforms, particularly without an understanding of customer engagement (Sharon G., 2024). Challenges include selecting the right platforms, managing advertising budgets efficiently, and analyzing return on investment (Gibson, 2024). This project addresses these challenges by developing an interactive dashboard that supports data-driven decision-making in digital marketing. The dashboard, created with Microsoft Power BI and datasets from Kaggle, visualizes campaign performance, customer engagement, and ROI across many channels. The system's functionality was evaluated through a User Acceptance Test (UAT) based on the Technology Acceptance Model. By integrating data visualization and strategic insights, the dashboard empowers businesses to make informed decisions and improve marketing outcomes in a changing digital environment.

2. Methodology

This project uses the Cross-Industry Standard Process for Data Mining (CRISP-DM), a technology-independent concept that provides a structured approach to data-driven projects. CRISP-DM simplifies, accelerates, and manages data mining processes across industries (Massahiro Shimaoka et al., 2023). One significant advantage is that it provides simple, common-sense steps and creates a common language for teams (Saltz, 2021). The six iterative phases include business understanding, data understanding, data preparation, development, evaluation, and deployment. Business understanding focuses on defining the problem, objectives, and scope. Data understanding explores the dataset from Kaggle, while data preparation involves cleaning and organizing the data using ETL

techniques. The development phase includes building the dashboard with Power BI and integrating it with a website. Evaluation is conducted through a User Acceptance Test (UAT) based on the Technology Acceptance Model (TAM). Lastly, the deployment phase involves presenting results and refining the dashboard based on feedback.

3. Results / Findings

The results from the User Acceptance Test (UAT), conducted with 30 respondents using the Technology Acceptance Model (TAM), show that overall user feedback on the platform is highly positive. Among all four elements evaluated, Attitude (ATT) obtained the highest mean score of 4.38, indicating that users had a very positive experience with the platform. Perceived Ease of Use (PEU) was closely followed at 4.35, indicating that users found the platform easy to use. The Perceived Usefulness (PU) score was 4.30, indicating users recognized the platform's usefulness in assisting digital marketing campaigns. The Behavioral Intention (BI) element, while the lowest at 4.18, indicates a generally positive intention to continue using the platform, with minor concerns about its sustainability for the future. The findings from 30 participants indicate strong user acceptability and satisfaction, with chances to improve future usage intentions through continued functional and strategic improvements.

4. Novelty of Project

This project's novelty lies in the development of an interactive dashboard that combines performance data from several digital marketing platforms to enable data-driven decision-making. Unlike typical dashboards, the system visualizes customer engagement and ROI across platforms, allowing organizations to find the most efficient marketing channels. Built using Power BI and web technologies, it combines usability with insightful analytics. The inclusion of a User Acceptance Test (UAT) based on the Technology Acceptance Model (TAM) enhances value by evaluating the system's effectiveness from the user's perspective, making it both innovative and practical for business use.

5. Conclusion or Future Work

The project successfully developed a user-friendly dashboard for visualizing digital marketing performance using ROI and engagement metrics, which received positive feedback from users. Future improvements will include real-time data integration, channel coverage expansion, and the use of machine learning for predictive insights to enable better decision-making.

REFERENCE LIST

- Gibson, K. (2024, February 22). *4 Factors to Consider When Creating a Digital Marketing Budget*. <https://online.hbs.edu/blog/post/budgeting-in-marketing-plan>
- Massahiro Shimaoka, A., Cordeiro Ferreira, R., & Goldman, A. (2023). The Evolution of CRISP-DM for Data Science: Methods, Processes and Frameworks. *SBC Reviews on Computer Science*. <https://doi.org/10.13140/RG.2.2.22493.42721>
- Saltz, J. S. (2021). CRISP-DM for Data Science: Strengths, Weaknesses and Potential Next Steps. *Proceedings - 2021 IEEE International Conference on Big Data, Big Data 2021*, 2337–2344. <https://doi.org/10.1109/BigData52589.2021.9671634>
- Sharon G. (2024, February 22). *8 Digital Marketing Challenges Business Owners Face and How to Overcome Them*. <https://www.linkedin.com/pulse/8-digital-marketing-challenges-business-owners-face-how-grant--k8fee/>

MALAYSIA JOB MARKET INSIGHT: A DASHBOARD FOR JOB VACANCY ANALYSIS

Muhammad Azim Bin Che Mansor, Ts Dr. Norziana Binti Yahya

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022462112@student.uitm.edu.my, norzianayahya@uitm.edu.my

Abstract

Malaysia's evolving job market presents both opportunities and challenges for job seekers, employers, and policymakers. However, obtaining timely and meaningful insights into job trends, demands, and employment patterns remains a complex task due to fragmented data sources and non-interactive platforms. This project addresses these challenges by developing an interactive job market dashboard that consolidates, analyzes, and visualizes job-related data in a user-friendly format. Using the CRISP-DM methodology, the project covers the full data pipeline from data collection, cleaning, and storage to visualization and evaluation. Datasets were sourced from Kaggle and the Department of Statistics Malaysia, covering job postings, labor force participation, and sectoral productivity. Tools such as Jupyter Notebook, Apache Hive, and Microsoft Power BI were employed to process and visualize the data. The dashboard features include trend analysis, demographic filters, job category distribution, and predictive analytics for unemployment and GDP. Results from the user acceptance test indicate strong perceived ease of use and usefulness, especially among fresh graduates. The project contributes to career decision-making, workforce planning, and economic policy by offering a data-driven view of Malaysia's labor landscape.

Keywords: *Malaysia job market, big data analytic, visualization, CRISP-DM, job trend*

1. Introduction

Malaysia's job market faces numerous challenges, including fragmented job data, skill mismatches, and limited access to real-time labor insights. Job seekers, especially fresh graduates, often struggle to find relevant opportunities, while employers encounter difficulties aligning candidates with job requirements. To address these issues, this project proposes the development of an interactive dashboard that visualizes comprehensive job market data to support data-driven career and recruitment decisions. The main objectives are to analyze job-related data using big data techniques, to design and develop a user-friendly dashboard tailored to Malaysia's employment landscape, and to evaluate the system's usability through user acceptance testing. The dashboard integrates multiple datasets from 2023–2024 using tools such as Python, Apache Hive, and Microsoft Power BI, offering features like job distribution by region, salary trends, industry demand, and predictive analysis, thereby benefiting job seekers, employers, policymakers, and educational institutions.

2. Methodology

The project employs the CRISP-DM methodology comprising six phases: business understanding, data understanding, data preparation, development, evaluation, and deployment. Data was collected from Kaggle (Jobstreet postings) and the Department of Statistics Malaysia (labor force and productivity datasets). The data preparation phase involved cleaning, transforming, and standardizing using Python (Jupyter Notebook), followed by structured storage in Apache Hive. Development focused on creating dashboards in Power BI featuring bar charts, maps, area charts, and predictive visualizations. Evaluation included functionality testing and UAT conducted via Google Forms. Feedback was analyzed based on TAM factors (Perceived Ease of Use, Usefulness, and Attitude), and improvements were iteratively applied.

3. Results / Findings

The developed dashboard offers multi-layered insights into Malaysia's job landscape. It visualizes key metrics such as most in-demand job roles, regional employment trends, unemployment rates by district, and top-paying industries. Predictive charts forecast future unemployment and GDP trends. UAT feedback from 30+ respondents showed high levels of satisfaction: 83% found it easy to navigate, and 87% reported the visualizations were useful in understanding the job market. Fresh graduates particularly valued filters by education and region, which helped align their qualifications with job demands. The dashboard meets its goal of enhancing transparency and data accessibility for multiple stakeholders.

4. Novelty of Research / Product / Project

This project introduces a unique approach by combining big data techniques with interactive data visualization in a Malaysian employment context. Unlike traditional job portals that are mostly text-based and static, this dashboard integrates real-time, multi-source data and presents it through engaging and filterable visuals. The integration of Hive as a data warehouse ensures scalability, while Power BI provides a low-latency user interface. The dashboard benefits not only job seekers but also policymakers, recruiters, and academic institutions by offering actionable labor insights.

5. Conclusion or Future Work

This project successfully delivers a comprehensive job market dashboard tailored to Malaysia's workforce dynamics. Future improvements include integrating APIs for real-time job feeds, personalized recommendations, mobile responsiveness, and cloud hosting to scale accessibility and performance.

REFERENCE LIST

- Aun, L. (2020). *Work and Wages of Malaysia's Youth: Structural Trends and Current Challenges*. https://www.iseas.edu.sg/wpcontent/uploads/2020/08/ISEAS_Perspective_2020_98.pdf
- Department of Statistics Malaysia. (2024). *Labour Markets | OpenDOSM*. Open.dosm.gov.my. <https://open.dosm.gov.my/dashboard/labour-market>
- Duggal, N. (2020, October 21). What Is Data Processing: Types, Methods, Steps of Data Processing Cycle. Simplilearn.com. <https://www.simplilearn.com/what-is-data-processing-article>
- Husin, N. A., Rasli, S., Kumar, M. S. G., & Suppiah, G. (2021). UNEMPLOYMENT CRISIS AMONG FRESH GRADUATES. *American International Journal of Social Science Research*, 10(1), 1–14. <https://doi.org/10.46281/aijssr.v10i1.1461>
- IKIM. (n.d) Malaysian Graduate Employability Challenge. Laman Web Rasmi: Institut Kefahaman Islam Malaysia (IKIM). <https://www.ikim.gov.my/index.php/2022/08/09/malaysian-graduate-employability-challenge/>
- Wang, L., Chen, W., & Wang, H. (2023). Data Visualization Analysis for Job Recruitment Based on Big Data. *ACM International Conference Proceeding Series*, 78–83. <https://doi.org/10.1145/3617184.3618036>

MENTAL HEALTH IN THE DIGITAL ERA: A VISUAL EXPLORATION OF TECHNOLOGY EFFECTS TOWARDS COMMUNITY

Muhammad Samir Syazwan bin Jafri, Alif Faisal bin Ibrahim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: samirsyazwan@gmail.com, aliffaisal@uitm.edu.my

Abstract

Increased digital consumption has raised public concern about its psychological effects, especially among adolescents. Overexposure to screens, gaming, and social media has been linked to anxiety, depression, and sleep disturbances. Despite the severity, there is a lack of awareness and absence of data-driven tools to educate the public. This project aims to bridge that gap by developing an interactive dashboard that visualizes the correlation between technology usage and mental health indicators. Using data sourced from Kaggle, the dataset was cleaned in Jupyter Notebook, processed in Apache Hive, and stored using HDFS. Power BI was used to visualize patterns and trends across demographic groups such as age and gender. The User Acceptance Testing (UAT) was conducted with 35 participants, including students, mental health experts, and general users. Results revealed strong approval in perceived ease of use (4.58/5), perceived usefulness (4.63/5), and intention to reuse. This dashboard enhances digital mental health awareness by making complex data accessible and actionable for policymakers, educators, and healthcare professionals.

Keywords: *Mental Health, Technology Overuse, Data Visualization, Apache Hive, Power BI, UAT*

1. Introduction

Mental health conditions such as anxiety and depression are escalating due to overreliance on technology (Advocates, 2023; Zayed, 2024). In Malaysia, the rise of social media use and screen exposure especially among youth has disrupted sleep patterns and contributed to emotional instability (UC Davis Health, 2024). However, most users are unaware of the cumulative impact of their digital habits (Lauren, 2023). The objective of this project is to identify patterns between technology usage and mental health indicators such as sleep quality, emotional regulation, and stress. The system visualizes these relationships through a dashboard for public and institutional use. The scope includes global open-source data filtered for relevance to Malaysia and segmented by demographic variables. The dashboard offers mental health professionals and educators an evidence-based tool to promote digital well-being and encourage preventive action.

2. Methodology

This study applied the CRISP-DM methodology: Business Understanding, Data Understanding, Data Preparation, Development, Evaluation, and Deployment. The dataset on mental health and technology usage was retrieved from Kaggle and included features like screen time, gaming hours, social media use, sleep patterns, and stress levels. Using Jupyter Notebook, the dataset underwent preprocessing including missing value handling, categorical encoding, and feature engineering (e.g. quantile-based age ranges and screen time categories). Data was stored in HDFS and queried via Apache Hive, which enabled scalable processing. Data visualization was performed in Power BI through interactive dashboards that presented trends by gender, age, and usage type. A sitemap and wireframes were created using Figma to guide dashboard layout and navigation. User Acceptance Testing (UAT) was performed via Google Forms, capturing feedback on ease of use, usefulness, and user satisfaction. The system was iteratively improved based on both expert and public recommendations, such as clearer tooltips and summary sections for easier interpretation.

3. Results / Findings

User testing involved 35 respondents, 30 general users and 5 expert evaluators. Four UAT dimensions were measured: Perceived Ease of Use (4.58), Perceived Usefulness (4.63), Attitude Toward Use (4.66), and Intention to Use (4.49). Feedback revealed that users found the dashboard intuitive and informative, especially in identifying behavioral triggers related to mental stress. Experts suggested enhancements including a narrative walkthrough, interactive filters, and legend explanations for first-time users. These features were added in the refinement phase. The dashboard allowed clear visualization of correlations between technology habits and mental health e.g., users with > 6 hours daily screen time had higher depression and poor sleep scores. Overall, the dashboard proved effective in raising awareness, enabling pattern exploration, and supporting early intervention strategies through data visualization.

4. Novelty of Research

This project is novel in its integration of big data analytics with mental health awareness tools. Unlike prior studies which used static reports or charts, this project introduces a dynamic dashboard powered by Apache Hive and Power BI. The ability to filter mental health insights by age group, screen time category, or support access makes this tool highly interactive and relevant. While prior literature explores the psychological effects of digital habits, few have made these patterns visible in a real-time dashboard targeted at educators, counsellors, and public users. This system combines cloud storage, scalable SQL querying, and data visualization to enable exploration of mental health insights. Furthermore, the interface and architecture are designed to be adapted for Malaysian institutions, including schools and government bodies, enabling long-term awareness programs.

5. Conclusion or Future Work

The dashboard system successfully visualizes the connection between digital habits and mental health risks, empowering users with data-driven insights. Future work will include real-time behavioral tracking, predictive risk modeling using machine learning, and improved mobile accessibility to broaden the impact on digital wellness across diverse communities.

REFERENCE LIST

- Advocates, C. (2023, April 26). The Impact of Technology on Mental Health: Balancing Connection and Screen Time. <https://citizenadvocates.net/blog/theimpact-of-technology-on-mental-health-balancing-connection-and-screen-time/>
- Zayed, A. (2024, April 29). Impact of internet addiction on mental health: potential impact and therapies. <https://diamondrehabthailand.com/impact-of-internetaddiction-on-mental-health/#:~:text=of%20internet%20withdrawal,-,Can%20excessive%20internet%20use%20lead%20to%20anxiety%20and%20depression%3F,%2C%20inadequacy%2C%20and%20social%20isolation>
- UC Davis Health. (2024, May 10). Social media's impact on our mental health and tips to use it safely. <https://health.ucdavis.edu/blog/cultivating-health/socialmedias-impact-our-mental-health-and-tips-to-use-it-safely/2024/05>
- Lauren, B. B. (2023). A Multi-Method Examination of Social Media Mental Health Content and its Impact on Vulnerable Adolescents.

VISUALIZATION: GERD SYMPTOMS AND EFFECTS USING INTERACTIVE DASHBOARD

Muhammad Syafiq Norhazwan Bin Nor Ramzi, Mahfudzah Binti Othman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: fathazwan14@gmail.com, fudzah@uitm.edu.my

Abstract

Gastroesophageal Reflux Disease (GERD) is a chronic condition in which stomach acid refluxes into the esophagus, causing discomfort and potentially severe complications if left untreated (Katz et al., 2022). Despite its prevalence, public awareness of GERD remains low, primarily due to the complexity of medical information and lack of accessible educational resources (Maret-Ouda et al., 2020). This project aims to address this gap by developing an interactive dashboard that visualizes comprehensive GERD-related data in an engaging and understandable format. The dashboard integrates cleaned and structured datasets containing information on GERD symptoms, causes, preventive measures, treatments, and demographic trends. Utilizing Power BI and Python-based tools, the project applies the CRISP-DM methodology (Shimaoka et al., 2024) to guide the process from data collection and preparation to visualization and deployment. A User Acceptance Test (UAT) involving potential users was conducted to evaluate the dashboard's usability, clarity, and perceived usefulness. Results indicate strong user satisfaction and improved understanding of GERD-related information. By simplifying complex data, this project contributes to increasing health literacy and promoting early detection and prevention of GERD.

Keywords: GERD, Data Visualization, CRISP-DM, Interactive Dashboard, Health Informatics

1. Introduction

Gastroesophageal Reflux Disease (GERD) affects millions worldwide, yet awareness and early diagnosis remain limited (Mehta et al., 2021). This project focuses on addressing the lack of accessible, user-friendly information about GERD by developing an interactive dashboard. The objectives are to (i) To study and analyze GERD symptoms and effects using literature elicitation. (ii) To develop an interactive dashboard for GERD symptoms and effects using data visualization tools and techniques. (iii) To evaluate the interactive dashboard for GERD symptoms and effects through User Acceptance Test. The scope encompasses collecting reliable data from medical research articles, open datasets, and health resources, transforming it into structured information, and presenting it through clear and engaging charts and dashboards. By enabling users to explore GERD-related data interactively, this project aims to empower both patients and healthcare providers to make informed decisions, ultimately contributing to early intervention and better health outcomes.

2. Methodology

The project employs the Cross Industry Standard Process for Data Mining (CRISP-DM) methodology to guide its development. The process begins with Business Understanding, identifying the need for accessible GERD information. In Data Understanding, datasets were gathered from Kaggle, open data portals, and medical publications, focusing on symptoms, demographics, and treatment outcomes. Data Preparation involved cleaning, normalizing, and transforming raw data using Python libraries (Pandas, NumPy) and storing it in Apache Hive. Development focused on designing an interactive dashboard in Power BI, incorporating visualizations such as bar charts, pie charts, and line graphs to illustrate GERD prevalence, symptom distribution, and dietary triggers. Evaluation was conducted through a User Acceptance Test with target users, measuring perceived ease of use and usefulness. Feedback guided iterative improvements to enhance clarity and engagement. Finally, Deployment

made the dashboard accessible for public awareness and professional reference. This structured approach ensures the project delivers a robust, informative platform that effectively bridges knowledge gaps about GERD.

3. Results / Findings

The resulting dashboard effectively visualizes critical GERD information, enabling users to explore causes, symptoms, treatments, and preventive measures interactively. UAT participants reported high satisfaction with the dashboard's usability, clarity, and relevance. Key features such as the dynamic filtering of symptom data by demographic variables and clear comparisons of treatment options were highlighted as particularly beneficial for improving understanding. The visualizations made complex medical information more approachable, with over 85% of participants agreeing that the dashboard enhanced their awareness of GERD. The project demonstrates that combining structured data mining methodologies with user-centered design can create impactful health education tools. This approach supports early detection, encourages healthier lifestyles, and empowers users to engage more proactively with their health.

4. Novelty of Research / Product / Project

This project presents a novel application of CRISP-DM in visualizing health data specific to GERD, leveraging data mining and business intelligence techniques to improve health literacy. Unlike traditional text-based resources or static infographics, the dashboard provides an interactive, user-friendly interface that adapts to users' exploration of complex datasets. The integration of demographic segmentation and dynamic visualization tools like Power BI distinguishes the project as a scalable and adaptable educational resource. Additionally, the project demonstrates the value of combining open data with interactive dashboards to create a bridge between clinical knowledge and public understanding. By providing clear, accessible insights into GERD, this project represents an innovative step toward empowering users to take control of their health and informing healthcare professionals in patient education and decision-making.

5. Conclusion or Future Work

The interactive GERD dashboard successfully demonstrates the potential of data visualization to improve public awareness and early detection. Future enhancements will incorporate real-time data updates, multilingual support, and integration with healthcare provider systems to expand reach and impact further.

REFERENCE LIST

- Katz, P. O., Dunbar, K. B., Schnoll-Sussman, F. H., Greer, K. B., Yadlapati, R., & Spechler, S. J. (2022). ACG Clinical Guideline for the Diagnosis and Management of Gastroesophageal Reflux Disease. *American Journal of Gastroenterology*, 117(1), 27–56. <https://doi.org/10.14309/ajg.0000000000001538>
- Maret-Ouda, J., Markar, S. R., & Lagergren, J. (2020). Gastroesophageal reflux disease a review. In *JAMA - Journal of the American Medical Association* (Vol. 324, Issue 24, pp. 2536–2547). American Medical Association. <https://doi.org/10.1001/jama.2020.21360>
- Mehta, R. S., Nguyen, L. H., Ma, W., Staller, K., Song, M., & Chan, A. T. (2021). Association of Diet and Lifestyle With the Risk of Gastroesophageal Reflux Disease Symptoms in US Women. *JAMA Internal Medicine*, 181(4), 552. <https://doi.org/10.1001/jamainternmed.2020.7238>
- Shimaoka, A. M., Ferreira, R. C., & Goldman, A. (2024). The evolution of CRISP-DM for Data Science: Methods, Processes and Frameworks. *SBC Reviews on Computer Science*, 4(1), 28–43. <https://doi.org/10.5753/reviews.2024.3757>

INTERACTIVE DASHBOARD FOR GLOBAL LIFE EXPECTANCY ANALYSIS USING BIG DATA AND POWER BI

Mutmainnah Radiah Bt Jamal Abdul Hekim, Siti Sarah Md Ilyas

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: mutmainnahradiah27@gmail.com, sarahilyas@uitm.edu.my

Abstract

Life expectancy is an essential indicator of a country's health and development. However, global disparities persist due to economic instability, educational disparities, and unequal access to healthcare. Many existing dashboards are limited by rigid designs, poor interactivity, and lack of clarity. These shortcomings reduce their effectiveness in promoting public engagement and supporting informed decision-making. To visualize global life expectancy trends, this project developed an interactive, web-based dashboard. It highlights key influencing factors such as Gross Domestic Product, healthcare expenditure, and education. The dataset was sourced from Kaggle and processed using Apache Hive for extraction, transformation, and structured querying. Visualizations including bar charts, scatter plots, geospatial maps, and predictive graphs were created using Microsoft Power BI and embedded into a publicly accessible website. The dashboard's usability was evaluated using the Technology Acceptance Model (TAM) with participation from 32 users. All TAM dimensions showed high levels of acceptance, with average scores above 4.5. The highest ratings were recorded for Attitude Toward Using (4.62) and Perceived Ease of Use (4.53), reflecting strong user satisfaction and system accessibility. This project demonstrates the potential of big data and visualization technologies to enhance public access to global life expectancy insights. Recommended future improvements include more diverse data source, enhanced forecasting capabilities, more detailed data and expanded user testing sample.

Keywords: *global life expectancy, Power BI, big data. Data visualization, Technology Acceptance Model (TAM), public health, dashboard*

1. Introduction

Life expectancy is a key indicator of a nation's health and socioeconomic development (Mun, Jalal, & Al Mamun, 2023), yet disparities persist due to differences in healthcare access, income levels, and education (Bălan et al., 2023). This project aims to create an interactive, user-friendly dashboard to visualize global life expectancy trends by analyzing key indicators such as GDP, healthcare expenditure, education, and mortality rates. The objective is to develop an intuitive Power BI dashboard that allows users to explore life expectancy data across countries and time, while also evaluating the dashboard's usability through the TAM. The scope of the project includes data analysis, dashboard development, and usability testing, with the goal of providing a tool that supports policymakers and the public in making informed decisions to address global health disparities.

2. Methodology

The project adopted the Software Development Life Cycle (SDLC) using Waterfall model which has a linear approach which is suitable for the project's fixed scope and requirements. This methodology includes five main phases which are planning, design, development, testing and documentation. In the planning phase, the problem statement, objectives, and scope were established and dataset were obtained from Kaggle. The design phase produced essential components such as an Entity Relationship Diagram (ERD), use case diagram, sitemap, and wireframes to guide the development process. The development phase utilized Apache Hive to build a data warehouse and perform ETL processes, while Power BI was used to create the interactive dashboard. Testing was conducted using

the TAM to assess Perceived Usefulness (PU), Perceived Ease of Use (PEU), Attitude Towards Using (ATT), and Intention to Use (BI) among users. Finally, the documentation phase compiled the entire development process and results. This structured approach ensured a clear, goal-oriented development of the global life expectancy dashboard to facilitate data-driven decision-making.

3. Results / Findings

TAM was used to assess user acceptance of the dashboard, focusing on four key dimensions: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward Using (ATT), and Intention to Use (BI). The results revealed strong user engagement across all dimensions. Attitude Toward Using (ATT) received the highest mean score of 4.62, indicating a very positive user attitude toward the dashboard. Perceived Ease of Use (PEU) followed closely with a mean score of 4.53, suggesting that users found the dashboard easy to navigate. Intention to Use (BI) scored 4.46, reflecting users' likelihood to continue using the dashboard in the future. Perceived Usefulness (PU) scored 4.47, showing that users found the dashboard useful for understanding life expectancy trends. Overall, the results demonstrate high user satisfaction and acceptance, with positive engagement in all four TAM dimensions.

4. Novelty of Research / Product / Project

This project makes a unique contribution to global health analysis by integrating Big Data processing with Power BI visualization tools. Unlike traditional static dashboards, this solution supports interactivity and include simple predictive analytic allowing users to explore life expectancy data while considering various socioeconomic factors. The integration of Big Data ensures the dashboard can handle large, diverse datasets to provide a comprehensive view of global life expectancy trends. Key socioeconomic variables such as healthcare expenditure, Gross Domestic Product, education, and mortality rates further enrich the analysis, offering deeper insights into life expectancy outcomes (Kerdprasop et al., 2019). The dashboard also incorporates interactive features like slicers and filter with search function for better usability. Another key feature of this project is the application of the TAM, which evaluates the usability of the dashboard from a user-centered perspective. The web-based design ensures accessibility across devices, enhancing scalability and usability for diverse user groups, including policymakers, researchers, and public health professionals.

5. Conclusion or Future Work

The development of the Interactive Dashboard for Global Life Expectancy Analysis successfully met its objectives by analyzing global life expectancy data, creating an interactive Power BI dashboard, and evaluating its usability using TAM. Future work will focus on enhancing forecasting capabilities, broaden and diversify data sources, increase level of detail in data and expand usability testing. These improvements will increase the dashboard's accuracy, accessibility, and usability to support better decision-making and addressing global health disparities.

REFERENCE LIST

- Bălan S., A. -I. Mustață and C. Ifrim, "A diagnosis of the global quality of life," 2023 *24th International Conference on Control Systems and Computer Science (CSCS)*, Bucharest, Romania, 2023, pp. 625-632, doi: 10.1109/CSCS59211.2023.00104.
- Kerdprasop N., Kerdprasop K. and Chuaybamroong P., "Ensemble Modeling Method to Predict Life Expectancy of Population in High-Income Countries: Japan and Finland," 2019 *25th Conference of Open Innovations Association (FRUCT)*, Helsinki, Finland, 2019, pp. 153-161, doi: 10.23919/FRUCT48121.2019.8981510.
- J. Mun, M. S. Jalal and K. A. Al Mamun, "Analysis on Top Factors Affecting Life Expectancy in Bangladesh," 2023 *IEEE 11th Region 10 Humanitarian Technology Conference (R10-HTC)*, Rajkot, India, 2023, pp. 772-777, doi: 10.1109/R10-HTC57504.2023.10461848.

AERAVITA: PERFORMANCE-BASED AIR QUALITY DATA VISUALIZATION DASHBOARD

Najiha Binti Mahazir, Noorfaizalfarid Bin Mohd Noor

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: najihamahazir@gmail.com, nfaizalf@uitm.edu.my

Abstract

Air pollution is a growing concern in Malaysia, particularly in urban regions where pollutant levels are consistently high. The current air quality reporting by the Department of Environment (DOE) relies on static PDF formats that are text-heavy and lack interactive elements which making it difficult for the public and policymakers to interpret. This project introduces AeraVita, a performance-based data visualization dashboard developed using Microsoft Power BI. AeraVita transforms complex air quality datasets into interactive visual formats to improve understanding and engagement. The system supports visualization of multiple pollutant types (e.g., PM2.5, CO, O₃), trends across time, and geographic comparison using bar charts, line graphs, and heatmaps. Agile and CRISP-DM methodologies were adopted for development, involving stages such as data extraction using Apache Hive, transformation, and loading. A survey was conducted to identify visualization preferences, which guided the dashboard design. User acceptance was evaluated using the Technology Acceptance Model (TAM), confirming positive feedback on usability and perceived usefulness. The result is a user-friendly web-integrated dashboard beneficial for public awareness, policy formulation, and environmental research. The name AeraVita is derived from Latin words “aer” (air) and “vita” (life) which symbolizes the project's goal that is to make air quality data accessible and meaningful in promoting a healthier environment.

Keywords: *air quality, data visualization, Power BI, dashboard, TAM*

1. Introduction

Air pollution in Malaysia is increasingly concerning, especially in urbanized areas such as Kuala Lumpur and Johor Bahru where high levels of pollutants like PM2.5 and NO₂ are frequently recorded (Department of Environmental Malaysia, 2023). Exposure to such pollutants has been associated with serious health risks including cardiovascular and respiratory diseases (WHO, 2024). Despite growing concern, the Department of Environment (DOE) continues to publish static air quality reports in PDF format, which are often difficult for the public to interpret. This project introduces *AeraVita*, an interactive air quality dashboard that visualizes complex environmental data into a more accessible and engaging format. The objectives of this study are to identify user requirements for air quality visualization, develop a user-friendly dashboard using Microsoft Power BI, and evaluate its acceptance using the Technology Acceptance Model (TAM). The AeraVita dashboard aims to support public awareness and policymaking through meaningful and data-driven insights.

2. Methodology

The project methodology combines Agile and CRISP-DM frameworks. Data were sourced from the U.S. EPA and processed using Apache Hive for extraction, cleansing, and transformation. After loading the structured dataset, Power BI was used to prototype and develop the dashboard. The development included designing five main visualization pages which are Air Quality Overview, Yearly Trends, Location Insights, Pollutant Analysis, and Enforcement Insights. A preliminary public survey informed design elements such as preferred visual types and colour schemes. The dashboard was integrated into a website for public access. User acceptance was assessed using TAM via online questionnaires measuring perceived usefulness, ease of use, attitude, and intention to use. Feedback was analyzed quantitatively to validate dashboard effectiveness.

3. Results

The AeraVita dashboard was evaluated through a user study involving 30 respondents to assess its effectiveness and user acceptance. The evaluation applied the Technology Acceptance Model (TAM), which measured four key constructs: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Using (ATT), and Behavioural Intention to Use (BI). Each construct included several Likert-scale items to capture user perception. The results indicated a strong positive reception across all categories. The PU construct recorded a mean score of 4.36, suggesting that users found the dashboard helpful in improving their understanding of air quality data. The PEOU dimension achieved a higher mean of 4.52, indicating that the dashboard was easy to use and navigate. The ATT score of 4.43 reflected users' positive attitudes and comfort in using the system. The BI construct received the highest mean score at 4.56, showing users' strong intention to continue using or recommending the dashboard. Overall, the findings confirm that AeraVita is both functional and well-received, supporting its potential as an effective platform for improving environmental awareness and aiding informed decision-making among the public and policymakers.

4. Novelty of Project

AeraVita introduces a novel approach to air quality data presentation by shifting from traditional static reports to an interactive, web-integrated dashboard that caters to both public and institutional users. Unlike conventional methods employed by the Department of Environment (DOE), which provide annual reports in text-heavy PDF formats, AeraVita enables dynamic data exploration through interactive charts, heatmaps, and filters. Developed using Microsoft Power BI and supported by Apache Hive for data transformation, the dashboard effectively handles large-scale environmental datasets. What sets AeraVita apart is its user-centric design, which was informed by a preliminary survey and later evaluated using the Technology Acceptance Model (TAM) to validate its usability and acceptance. Furthermore, the dashboard allows users to explore pollution trends across multiple pollutants and regions, encouraging informed health decisions and strategic planning. By visualizing complex environmental data in a meaningful way, AeraVita enhances public engagement, supports environmental awareness, and provides a foundation for future decision-support tools within the environmental informatics domain.

5. Conclusion or Future Work

AeraVita successfully delivers a user-friendly, data-driven dashboard that enhances public awareness and supports environmental decision-making. Future improvements may include integrating real-time IoT data, predictive analytics, multilingual support, and mobile responsiveness to increase accessibility, usability, and accuracy in monitoring air quality across different user groups and geographic locations.

REFERENCE LIST

- Department of Environmental Malaysia. (2023). *Environmental Quality Report*. <https://edl.doe.gov.my/discovery?query=+where+Title+like+%2527%2525laporan+kualiti+alam%2525%2527+and+category%3d+%2527Koleksi+Digital%2527&category=Koleksi%20Digital&main=Digital>
- WHO. (2024). *Air quality, energy and health*. <https://www.who.int/teams/environment-climate-change-and-health/air-quality-energy-and-health/health-impacts>

FORECASTING XRP VALUE TIME SERIES USING LSTM BASED ON MULTIVARIATE CRYPTO CURRENCY MARKET VALUE

Nur Ain Syuhada Mohd Nasir, Mohammad Hafiz Ismail

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022887518@student.uitm.edu.my, mohammadhafiz@uitm.edu.my

Abstract

Cryptocurrencies such as XRP are gaining popularity as investment assets but present major challenges due to their high price volatility and complex relationships with other digital currencies like Bitcoin and Ethereum. Traditional univariate forecasting models often fail to capture these interdependencies, resulting in inaccurate predictions and increased investment risk. Furthermore, the large volume of cryptocurrency data adds complexity, making it harder for investors to analyse and track market trends effectively. To address these issues, this project aims to develop a predictive model for XRP using multivariate time series analysis with Long Short-Term Memory (LSTM). The model integrates Bitcoin and Ethereum as additional variables to improve forecast accuracy. The project is structured into four phases following the waterfall methodology: technique identification, model development, data visualization, and performance evaluation. A web-based dashboard, named XRPredictor, has been developed to visualize historical and forecasted data, allowing users to interpret results through interactive charts and performance metrics such as RMSE, MAE, and MSE. The system supports users of all levels, including investors, analysts, and researchers, by offering a user-friendly interface to explore cryptocurrency trends and make informed decisions without needing deep technical knowledge. Overall, the system aims to enhance forecasting accuracy and accessibility for XRP market analysis.

Keywords: *Cryptocurrency, XRP, Time Series Forecasting, Multivariate Analysis, Data Visualization*

1. Introduction

The rapid rise of cryptocurrencies like XRP, Bitcoin, and Ethereum has attracted significant attention due to their decentralized structure and potential for high returns. However, XRP's extreme price volatility presents challenges for investors in making informed decisions (Ahmed & Rahman, 2023; Indulkar, 2021). Traditional univariate forecasting methods fail to capture the complex relationships between cryptocurrencies, making accurate predictions difficult (Bhattacharya et al., 2023). This project aims to develop a multivariate time series forecasting model using Long Short-Term Memory (LSTM) to predict XRP price trends based on correlations with Bitcoin and Ethereum. A user-friendly dashboard is also developed to visualize predictions and performance metrics. The system targets cryptocurrency investors, analysts, and researchers by offering a four-year historical dataset which is from October 2021 until early 2025, enabling better understanding and decision-making in a volatile market environment.

2. Methodology

This project used the Waterfall methodology, which follows a step-by-step approach to complete each phase before moving to the next. The process was divided into four main phases which are technique identification, development, visualization, and evaluation. First, relevant data for XRP, Bitcoin, and Ethereum were collected and analyzed to understand the challenges in predicting XRP price. Then, based on a literature review, Long Short-Term Memory (LSTM) was chosen because it works well with time series and multivariate data. In the development phase, the data was cleaned and preprocessed before training the LSTM model using Python tools like TensorFlow and Keras in Jupyter Notebook. After training, the prediction results were displayed through a dashboard created

using Voila and Power BI to make it easier for users to explore and understand the forecasts. Lastly, the model's accuracy was evaluated using standard performance metrics like RMSE, MAE, and MSE. A User Acceptance Test (UAT) was also conducted to get feedback from users about the system's usability and features. Each phase helped make sure the project's goals were achieved clearly and effectively.

3. Results / Findings

The XR Predictor system received positive responses from users during the user acceptance test (UAT), which involved 30 participants with different levels of experience in cryptocurrency. The results showed high average scores for all four categories, which are Perceived Ease of Use (4.09), Perceived Usefulness (4.17), Attitude Towards Using (4.23), and Behavioral Intention to Use (4.10). Most users agreed that the dashboard was easy to use and helpful for understanding and analysing XRP, Bitcoin, and Ethereum price trends. Features like the forecast graph, historical data, and prediction accuracy metrics were highlighted as the most useful. Feedback from expert users also confirmed that the dashboard was informative and practical. However, there were a few suggestions to improve the system, such as making the layout more mobile-friendly, including simple explanations for technical terms, and adding more interactive tools like MACD or real-time updates. Overall, the findings show that the system is well accepted and has the potential to support users in making better decisions in the cryptocurrency market.

4. Novelty of Research / Product / Project

The uniqueness of this project can be seen in how it combines a multivariate time series approach with an LSTM model to predict XRP prices by including not only XRP data, but also Bitcoin and Ethereum data. Unlike most previous studies that focused on a single cryptocurrency, this project takes into account the relationship between these three major cryptocurrencies to generate more accurate forecasts. Another significant contribution is the development of an interactive dashboard named XR Predictor, which allows users to easily explore forecasts, historical trends, and performance metrics such as RMSE and MAE. In addition, this project goes beyond technical performance by evaluating the system through a User Acceptance Test (UAT), which helps measure how practical, user-friendly, and understandable the system is from the user's perspective. Overall, the project stands out by offering both a reliable forecasting model and an accessible platform that supports better decision-making for investors, financial analysts, and researchers interested in cryptocurrency analysis.

5. Conclusion or Future Work

In conclusion, the XRP forecasting system was successfully developed using LSTM and multivariate time series analysis, which involved XRP, Bitcoin, and Ethereum. For future enhancement, the system may be improved by incorporating real-time updates, ensuring mobile responsiveness, and integrating additional technical indicators to support more advanced analysis and broader user engagement.

REFERENCE LIST

- Ahmed, N.; Rahman, M. M. (2023). Time Series Forecasting of XRP Using Machine Learning Algorithms. *IEEE Xplore*. <https://ieeexplore-ieee-org.uitm.idm.oclc.org/document/10430261>
- Bhattacharya, H.; Agrawal, D.; Walia, D.; Kumar, A. (2023). Cryptocurrency Trend Predictions through LSTM-Based Prediction. *IEEE Xplore*. <https://ieeexplore-ieee-org.uitm.idm.oclc.org/document/10541754>
- Indulkar, Y. (2021). Time Series Analysis of Cryptocurrencies Using Deep Learning & Fbprophet. *IEEE Xplore*. <https://ieeexplore-ieee-org.uitm.idm.oclc.org/document/9397004>

SOCIOECONOMIC AND ENVIRONMENTAL FACTORS ON YOUTH SMOKING AND DRUG USE VISUALIZATION

Nur Aina Erynna Binti Idris, Profesor Madya Dr Shukor Sanim Mohd Fauzi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023401342@student.uitm.edu.my, shukorsanim@uitm.edu.my

Abstract

Youth smoking and drug use are major global health concerns, with lasting negative effects on individuals and society. This research aims to create an interactive dashboard that explores the socioeconomic and environmental factors influencing these behaviours. By integrating data such as age, gender, socioeconomic status, and peer pressure, the dashboard provides valuable insights into trends related to youth smoking and drug use. Using Microsoft Power BI, this tool allows stakeholders, including policymakers, educators, and health professionals, to make data-driven decisions on intervention strategies. The methodology includes gathering relevant data from reliable sources, followed by preprocessing with Python, and integrating the data into Power BI for visualization. A user-friendly dashboard was developed, incorporating dynamic elements like charts and filters. The dashboard's usability was assessed through a User Acceptance Test (UAT), confirming its practicality for the target audience. The expected outcome is a powerful tool that aids in understanding the factors contributing to youth smoking and drug use. The significance of this project lies in its potential to inform targeted health interventions and raise awareness of the risks associated with these behaviours. This work contributes to public health by emphasizing the role of data visualization in promoting healthier youth behaviours.

Keywords: Microsoft Power BI, Python, youth smoking, drug use, visualization, User Acceptance Test (UAT)

1. Introduction

Youth smoking and drug abuse remain major health challenges globally, particularly in low and middle-income countries where preventive measures are often insufficient (Çumashi et al., 2024). This research focuses on developing an interactive dashboard that visualizes key socioeconomic and environmental factors influencing youth behaviours (Das et al., 2016). The primary objective is to raise awareness and provide insights into the determinants of youth smoking and drug use, enabling stakeholders to create targeted intervention strategies. The project's scope includes the design and development of an interactive dashboard using Power BI, utilizing data from trusted databases such as Kaggle.

2. Methodology

The methodology involves collecting and analyzing data on youth smoking and drug use from reliable sources such as Kaggle. Data preprocessing is done using Python, which cleans and transforms the data before importing it into Microsoft Power BI for visualization. The Power BI platform is chosen due to its user-friendly interface and powerful data visualization features. The dashboard is designed to display trends, correlations, and patterns between various factors such as age, gender, socioeconomic status, and mental health issues. The project follows a structured development process, which includes designing wireframes, creating the dashboard layout, and integrating dynamic features such as interactive charts and filters. The usability of the dashboard is evaluated using a User Acceptance Test (UAT) with end-users to assess its practicality and ease of use. Feedback from the test is used to refine the dashboard's features and ensure its effectiveness as an educational tool. The

final product aims to provide a comprehensive and interactive platform that allows users to explore and gain insights into the factors influencing youth smoking and drug use.

3. Results / Findings

The results of this study highlight the effectiveness of the interactive dashboard in providing insights into youth smoking and drug use. UAT revealed that the dashboard significantly enhanced users' understanding of the socioeconomic and environmental factors contributing to these behaviors. The average score for Perceived Ease of Use (PEU) was 4.5, reflecting that the dashboard was user-friendly and intuitive, making it accessible even for users with limited technical expertise. Additionally, the Perceived Usefulness (PU) score averaged 4.6, indicating that users found the tool valuable in understanding complex trends related to youth substance use. The Attitude (ATT) score averaged 4.7, suggesting that users were highly satisfied with the tool, and felt positively about its potential to drive meaningful discussions about youth smoking and drug use. Moreover, the Intention to Use (BI) score of 4.5 suggested that users were likely to adopt the dashboard for future reference, confirming its relevance and practicality for ongoing educational and preventive programs.

4. Novelty of Research / Product / Project

YouthRiskFactors presents a novel approach to addressing youth smoking and drug use by integrating interactive data visualization with an analysis of socioeconomic and environmental factors. Unlike traditional methods, the developed dashboard provides an intuitive, user-friendly interface that allows users to interact with the data, identify trends, and explore correlations between multiple factors influencing youth behaviours. The use of Microsoft Power BI enhances the dashboard's accessibility, providing dynamic visualizations that allow users to drill down into specific data points, making it an effective tool for health professionals, educators, and policymakers. Additionally, the project leverages existing public datasets to create a comprehensive and easily interpretable platform that raises awareness and educates users on the risks associated with youth smoking and drug use (Chu et al., 2023). The interactive nature of the dashboard allows for real-time data exploration, making it a powerful tool for decision-making and intervention planning. This project represents a significant advancement in utilizing data visualization for public health improvement.

5. Conclusion or Future Work

YouthRiskFactors successfully developed an interactive dashboard that enhances understanding of the factors influencing youth smoking and drug use. Future work will focus on expanding the dashboard's features, incorporating additional data sources, and improving user experience. Further research will explore integrating predictive modeling to enhance prevention strategies.

REFERENCE LIST

- Adachi-Mejia, A. M., Carlos, H. A., Berke, E. M., Tanski, S. E., & Sargent, J. D. (2012). A comparison of individual versus community influences on youth smoking behaviours: A cross-sectional observational study. *BMJ Open*, 2(5), e000767. <https://doi.org/10.1136/bmjopen-2011-000767>
- Chu, T., Liu, X., Takayanagi, S., Matsushita, T., & Kishimoto, H. (2023). Association between mental health and academic performance among university undergraduates: The interacting role of lifestyle behaviors. *International Journal of Methods in Psychiatric Research*, 32(1), e1938. <https://doi.org/10.1002/mpr.1938>
- Das, J. K., Salam, R. A., Arshad, A., Finkelstein, Y., & Bhutta, Z. A. (2016). Interventions for Adolescent Substance Abuse: An Overview of Systematic Reviews. *Journal of Adolescent Health*, 59(4), S61–S75. <https://doi.org/10.1016/j.jadohealth.2016.06.021>

TRAFIKLENS: INTERACTIVE DASHBOARD FOR TRAFFIC VIOLATION INSIGHTS

Nur Aqilah Humaira Binti Ahmad, Noorfaizalfarid Bin Mohd Noor
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nuraqilahhumaira28@gmail.com, nfaizalf@uitm.edu.my

Abstract

In Malaysia, common violations such as red-light running and speeding continue to rise, but enforcement agencies still rely on static reports like PDFs, which limit data exploration and insight extraction. This study aims to develop an interactive dashboard for traffic violations insights to support enforcement strategies and raise public awareness. The system was developed using Apache Hive for big data processing and Microsoft Power BI for interactive visualization. Although based on a U.S. dataset, the dashboard is tailored to reflect Malaysia's traffic enforcement context. It enables users to analyze violations by location, time, vehicle type, race, and gender using dynamic filters and visual storytelling features. The dashboard was evaluated using the Technology Acceptance Model (TAM), with over 70% of users reporting high levels of dashboard usefulness. User feedback also led to interface enhancements that improved clarity and engagement. By transforming static traffic data into meaningful visuals, this project provides a practical tool for enforcement agencies and the public to understand trends and high-risk areas. It lays the groundwork for future integration with Malaysian data and real-time monitoring to support more informed and proactive traffic safety measures.

Keywords: *Traffic Violations, Data Visualization, Power BI, Big Data Analytics, Apache Hive, Technology Acceptance Model*

1. Introduction

Traffic violations in Malaysia have escalated, with poor driver behaviour, red light running, and speeding being the most common offenses. However, enforcement agencies still rely heavily on static reporting formats such as PDFs, limiting insight extraction and trend analysis. This study aims to develop an interactive data visualization dashboard to support traffic safety initiatives. The system uses historical data to analyze trends, identify high-risk areas, and suggest enforcement strategies. The objectives include analyzing traffic violation patterns, developing a visualization using information visualization techniques, and evaluating the dashboard via the Technology Acceptance Model (TAM). This solution supports law enforcement agencies and raises public awareness for improved road safety.

2. Methodology

The project adopted a combination of Agile and CRISP-DM methodologies. Data was sourced from a publicly available "Traffic Violations" dataset (U.S. Government Open Data Portal), comprising over 1 million records. Data preprocessing and cleansing were performed using Apache Hive and Excel, involving extraction, transformation, and loading (ETL). Attributes such as time, location, gender, vehicle brand, and violation type were prepared for analytics. Power BI was then used to develop an interactive dashboard featuring various charts (bar, pie, heatmaps). Six main dashboard pages were designed: overview, location, time trends, vehicle analysis, demographics, and enforcement insights. The website dashboard was deployed via a web-based interface using PHP with an embedded Power BI iframe. The Technology Acceptance Model (TAM) was used for user evaluation, assessing perceived usefulness, ease of use, attitude, and behavioural intention to use. TAM is considered the best model to help increase the understanding of users' acceptance of e-learning (Taufiq et al., 2019).

3. Results

The TrafikLens dashboard was evaluated by 30 respondents using a questionnaire based on the Technology Acceptance Model (TAM), comprising 20 questions divided into four key constructs: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Using (ATT), and Behavioral Intention to Use (BI). Each construct consisted of five questions evaluated on a 5-point Likert scale. For PU, the dashboard scored a mean of 4.34, indicating strong agreement that it effectively visualized traffic violations data. The PEOU construct received a mean of 4.31, with respondents finding the dashboard easy to use, interactive, and well-structured for filtering by gender, race, time, and vehicle type. ATT had a mean score of 4.27, reflecting a positive perception of the dashboard as engaging, informative, and user-friendly. Lastly, BI received a mean of 4.39, with most participants indicating they would use or recommend the dashboard for awareness and enforcement. These results suggest the dashboard effectively presents complex traffic violation data through clear, interactive visualizations that aid public understanding and strategic planning.

4. Novelty of Research

This project introduces a novel approach to traffic violation reporting by integrating big data processing with interactive data visualization. Unlike conventional systems that rely on static formats like PDFs, this dashboard enables dynamic exploration of traffic violation data using filters and slicers in Power BI. Although it uses a dataset from the U.S., the dashboard is tailored to reflect enforcement concerns in Malaysia, such as red-light running, speeding, and poor driver behaviour. The integration of Apache Hive for data cleansing and Power BI for dashboard development offers a scalable, automated pipeline for large traffic datasets. Furthermore, the application of the Technology Acceptance Model (TAM) in evaluating user experience adds an academic layer of innovation, highlighting its effectiveness from both a technical and usability standpoint. The dashboard is designed not only for enforcement agencies but also for public education, making data-driven road safety more accessible and understandable to all stakeholders.

5. Conclusion and Future Work

The developed dashboard enhances data-driven decision-making in traffic enforcement through interactive visualizations. Future work includes integrating real Malaysian traffic data, enabling real-time updates, and expanding accessibility via mobile platforms to further support enforcement strategies and promote safer road environments in Malaysia.

REFERENCE LIST

Taufiq, M., Ghani, A., Hamzah, M., Ramli, S., Ab, W., Daud, A. W., Rijal, T., Romli, M., Najihah, N., & Mokhtar, M. (2019). A Questionnaire-Based Approach on Technology Acceptance Model for Mobile Digital Game-Based Learning. In *Journal of Global Business and Social Entrepreneurship (GBSE)* (Vol. 5, Issue 14). www.gbse.com.my

MALAYSIA TELCO CHURN PREDICTION BASED ON GOOGLE PLAY APP REVIEWS SENTIMENT ANALYSIS

Nur Iriana Binti Muhamad Shukri, Dr. Khairul Anwar Bin Sedek

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022470862@uitm.student.edu.my, khairulanwarsedek@uitm.edu.my

Abstract

Customer churn continues to pose a major challenge in Malaysia's telco sector due to intense competition and frequent user dissatisfaction. This project introduces a sentiment-based churn prediction system that utilises real user feedback from telco application reviews on Google Play. The system combines big data tools, sentiment analysis, and machine learning to identify churn-prone customers based on their emotional tone. Sentiment classification is performed using the GPT model with OpenAI API, while churn probability is predicted through Random Forest. The data pipeline is managed using Apache Spark for large-scale processing and Hadoop Distributed File System (HDFS) for data storage management. The resulting insights are visualised in an interactive web-based dashboard developed using Power BI, allowing telco teams to explore churn trends and take proactive measures. The system was evaluated through model accuracy testing and a user acceptance test (UAT) involving 30 participants. The results confirmed the system's effectiveness and usability. This integrated approach empowers telco providers with data-driven strategies for improving customer retention.

Keywords: Churn Prediction, Sentiment Analysis, Big Data, Google Play Reviews, Random Forest, OpenAI API, UAT, Interactive Dashboard, Power BI.

1. Introduction

This project addresses high customer churn rates in Malaysia's telco sector by analysing emotional cues in Google Play app reviews. The objective is to use machine learning to detect dissatisfaction and predict churn risk using sentiment-labelled feedback. Google's In-App Review API was used to extract review data, which was then pre-processed using Apache Spark and stored using HDFS. Sentiment analysis was conducted using the OpenAI API, followed by churn prediction using the Random Forest algorithm. These insights were visualised using Power BI dashboards to assist telco decision-makers. The system's structure follows the CRISP-DM methodology for a systematic, iterative development process (Solano et al., 2022).

2. Methodology

The project adopts the CRISP-DM framework, involving stages from business understanding to documentation. Google Play reviews were extracted using Python and Google's In-App Review API. Apache Spark processed and cleaned the data efficiently (El Boucheffry & de Souza, 2020), and HDFS stores the data to support scalability and fault tolerance (Holdsworth, 2024). Sentiment labels like positive, neutral, and negative were assigned using the GPT model with OpenAI API's multilingual analysis capability (Khurdula et al., 2024). For churn prediction, Random Forest was implemented to classify users into churn-risk categories with high accuracy (Musyoka, 2023). The processed results were visualised using Power BI (Singh & Jadhav, 2022), allowing users to interactively explore sentiment and churn metrics. A user acceptance test (UAT) was conducted with 30 participants to assess usability, while model accuracy was evaluated using F1-score, AUC, and confusion matrix.

3. Results / Findings

The sentiment-churn pipeline successfully identified negative sentiment as a strong indicator of churn. Random Forest achieved a prediction accuracy of over 81%. The dashboard displayed key performance metrics, including churn probability, sentiment trends, and regional insights. Word clouds highlighted recurring user concerns, and filters allowed for telco-specific comparisons. The UAT confirmed high usability with average ratings above 4.5 in ease of use and intention to use. Participants found the system intuitive and insightful for decision-making. The visual storytelling in Power BI effectively communicated sentiment and churn trends, providing telcos with a powerful tool for customer retention.

4. Novelty of Project

This project uniquely combines sentiment analysis, machine learning, and data visualisation to create a churn prediction pipeline tailored to the Malaysian telco industry. Unlike traditional models based solely on numerical records, this system analyses unstructured, user-generated content from Google Play reviews. The GPT model created by the OpenAI API enhances sentiment accuracy across multiple languages, while Apache Spark ensures scalable processing. HDFS supports efficient storage of large datasets, and Power BI enables decision-makers to visualise trends interactively. The integration of these technologies into one solution demonstrates a practical advancement in customer retention strategies.

5. Conclusion or Future Work

The proposed system effectively predicts customer churn by combining sentiment analysis, big data processing, and machine learning. It provides telco providers with actionable insights by analyzing user reviews from Google Play, offering a more accurate and user-focused approach. The system demonstrated strong performance in both prediction accuracy and user acceptance. Future improvements include integrating real-time data streaming, automated sentiment responses, and expanding data sources to enhance scalability, responsiveness, and predictive power.

REFERENCE LIST

- El Bouchefry, K., & de Souza, R. S. (2020). Learning in Big Data: Introduction to Machine Learning. In *Knowledge Discovery in Big Data from Astronomy and Earth Observation* (pp. 225–249). Elsevier. <https://doi.org/10.1016/B978-0-12-819154-5.00023-0>
- Holdsworth, J. (2024, June 14). *What is Hadoop Distributed File System (HDFS)?* IBM.
- Khurdula, H. V., Pagutharivu, A., & Soung Yoo, J. (2024). The Future of Feelings: Leveraging Bi-LSTM, BERT with Attention, Palm V2 & OpenAI Pro for Advanced Text-Based Emotion Detection. *SoutheastCon* 2024, 275–278. <https://doi.org/10.1109/SoutheastCon52093.2024.10500140>
- Musyoka, P. (2023). Machine Learning Classification Customer Churn Prediction. *Medium*.
- Singh, S., & Jadhav, L. (2022). Data Analysis and Visualization of Sales Dataset using Power BI. *International Journal for Research in Applied Science and Engineering Technology*, 10(6), 1749–1759. <https://doi.org/10.22214/ijraset.2022.44132>
- Solano, J. A., Lancheros Cuesta, D. J., Umaña Ibáñez, S. F., & Coronado-Hernández, J. R. (2022). Predictive models assessment based on CRISP-DM methodology for students performance in Colombia - Saber 11 Test. *Procedia Computer Science*, 198, 512–517. <https://doi.org/10.1016/j.procs.2021.12.278>

DATA VISUALIZING CYBER THREATS USING DATA VISUALIZATION FOR REAL-TIME RESPONSE

Nurul Ain Natasya Binti Othman, Mohd Nizam B Osman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nurultasya415@gmail.com, mohdnizam@uitm.edu.my

Abstract

In today's digital era, individuals and organizations face rising cyber threats compounded by the overwhelming volume of security-related data. Traditional cybersecurity systems often fail to detect anomalies promptly due to fragmented data, leading to alert fatigue and overlooked breaches. This project proposes a customized data visualization dashboard that integrates Big Data Analytics and Anomaly Detection to monitor user behavior and cyber risks in real time. Using the CRISP-DM methodology, datasets from Kaggle and DOSM were processed to identify threat patterns and generate real-time dashboards with Power BI. A User Acceptance Test (UAT) was conducted to assess usability and satisfaction. The dashboard provides clear, interactive visuals of threats, enabling users to detect and respond to anomalies effectively, reduce alert fatigue, and make better-informed decisions. This system offers a low-cost, scalable cybersecurity tool for citizens and small organizations, promoting greater awareness and proactive threat response.

Keywords: *Cyber Threats, Cyber Security, Power BI Dashboard, UAT*

1. Introduction

Nowadays, individuals and organizations face growing cyber threats alongside massive amounts of security data, making it difficult to detect and respond to attacks effectively. Traditional systems often cause alert fatigue and missed threats due to scattered and overwhelming information (Buiya et al., 2024). This project introduces a customized data visualization dashboard that combines Big Data Analytics and Anomaly Detection to monitor user behavior, identify anomalies and prioritize critical threats. By presenting complex security data in a clear and unified view, this tool helps users—especially those without technical expertise—quickly understand and respond to cybersecurity risks.

2. Methodology

The CRISP-DM (Cross Industry Standard Process for Data Mining) methodology was adopted, beginning with business understanding and progressing through data preparation, modeling, and evaluation. Datasets were sourced from Kaggle, followed by data cleaning, transformation, and storage in Apache Hive. Python was used for preprocessing, including removal of null and duplicate values, and generation of new fields for location and system attack classification. Power BI was used to build the interactive dashboards, enabling real-time visualization of threats. Finally, a User Acceptance Test was conducted with 30 participants to assess the usability of the dashboard across several constructs: Perceived Ease of Use, Perceived Usefulness, Attitude Toward Using, and Behavioral Intention.

3. Results / Findings

The CyberShield Power BI dashboard successfully displayed cybersecurity threat data, including attack types, targeted systems, and mitigation suggestions. Visual tools such as maps, charts, and prediction models enabled users to identify suspicious behavior and prioritize high-risk threats. UAT results showed that most users rated the system as easy to use and effective in enhancing their understanding of cyber risks. Respondents particularly appreciated the visual clarity and integration of

multiple data sources. The system significantly reduced information silos and alert fatigue, improving threat detection and decision-making capabilities.

4. Novelty of Research / Product / Project

This project presents an innovative integration of anomaly detection and data visualization for cybersecurity threat monitoring. Unlike conventional systems, it merges diverse data sources into a unified platform and prioritizes critical alerts to reduce mental strain. The use of Power BI and Apache Hive in combination with real-time external data via APIs enables both technical and non-technical users to navigate and interpret threat data easily. This low-cost, scalable solution is especially beneficial for smaller organizations and the public, providing enterprise-level visualization capabilities in an accessible format.

5. Conclusion or Future Work

CyberShield enhances cyber threat monitoring through visual analytics and user-centric design. Future work includes expanding the dataset scope, adding automated response actions, and integrating machine learning for predictive threat intelligence.

REFERENCE LIST

Buiya, R., Alam, M., & Islam, R. (2024). Leveraging Big Data Analytics for Advanced Cybersecurity: Proactive Strategies and Solutions. 15(01).

A VISUALIZATION DASHBOARD FOR ANALYZING SOCIOECONOMIC DISPARITIES AND POVERTY HOTSPOTS IN NORTHERN MALAYSIA

Ros Sara Elysa Rosfauzi, Dr. Norfiza Ibrahim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: roselysa02@gmail.com, norfiza@uitm.edu.my

Abstract

This research project presents the development of an interactive dashboard, PovertyLens, to analyze socioeconomic disparities and poverty hotspots in Northern Malaysia, focusing on Perlis, Kedah, Penang, and Perak. The project adopts the Cross Industry Standard Process for Data Mining (CRISP-DM) methodology and uses geospatial analytics and big data tools to visualize poverty distribution through hotspot analysis. Key challenges identified include economic vulnerability among agricultural households, underrepresentation of rural and indigenous communities like the Orang Asli, and limited access to education, electricity, and healthcare. The dashboard provides high-resolution, localized insights aimed at informing NGOs, government agencies, researchers, and the public for more equitable policy and targeted interventions. User testing used the Technology Acceptance Model (TAM) to assess perceived usefulness, ease of use, user attitude, and intention to use. Results showed strong approval, highlighting the dashboard's accessibility, informativeness, and real-world potential in planning and service delivery. TAM-based feedback also reflected strengths in navigation and interactivity, while suggesting improvements like text resizing, bilingual support, and clearer data visuals. This project helps bridge gaps between marginalized communities and institutional support by offering timely, evidence-based insights. By combining technology, data science, and social awareness, PovertyLens supports Malaysia's goals of reducing inequality, strengthening welfare systems, and advancing the Sustainable Development Goals (SDGs).

Keywords: *PovertyLens, CRISP-DM, Socioeconomic Disparities, Technology Acceptance Model (TAM), Poverty Hotspots, Geospatial Analytics*

1. Introduction

This project aims to develop an interactive visualization dashboard, PovertyLens, to analyze socioeconomic disparities and identify poverty hotspots across Northern Malaysia, specifically in Perlis, Kedah, Penang, and Perak. The dashboard integrates geospatial analytics and data visualization tools to provide actionable insights for stakeholders such as policymakers, NGOs, and researchers. By visualizing spatial patterns of poverty and their relationship with factors like education, employment, and healthcare, the system supports evidence-based planning and resource allocation. The objectives are to determine suitable techniques for spatial distribution analysis, design and build a geospatial dashboard, and evaluate its usability through Functionality Testing and the Technology Acceptance Model (TAM). This approach aligns with recent efforts to promote data-driven strategies to address inequality and advance the Sustainable Development Goals (Yang & Zhang, 2019; Li & Lin, 2020).

2. Methodology

The project adopted the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology, consisting of five phases: Business Understanding, Data Understanding, Data Preparation, Development, and Evaluation. The Business Understanding phase involved reviewing poverty issues using reports from the Department of Statistics Malaysia and ICU JPM, followed by dataset exploration in the Data Understanding phase using Jupyter Notebook. In Data Preparation, data was extracted and transformed using Pandas, structured in Apache Hive and Hadoop HDFS, and exported

as CSVs. The dashboard was then developed using Power BI, integrating visualizations across the four states and a rule-based recommender system. Evaluation involved Functionality Testing to ensure technical performance, and TAM-based user evaluation to assess four dimensions: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward Using (ATT), and Behavioural Intention to Use (BI), as defined in the TAM framework (Davis, 1989).

3. Results / Findings

The Functionality Test validated all dashboard functions, including visual navigation and the recommendation quiz. Based on TAM results, users responded positively across all measured dimensions. The mean score for PEU was 4.06, indicating intuitive design and ease of navigation. PU scored a mean of 4.26, showing the dashboard's effectiveness in conveying poverty-related insights. ATT yielded a mean of 4.25, reflecting favourable user attitudes, while BI scored 4.4, indicating users' intention to continue using the tool. Users commended the system's interactivity, layout, and localized information. However, some suggested enhancements such as adding multilingual options, adjustable font sizes, and clearer data legends. These suggestions were addressed in the refinement phase to improve the dashboard's accessibility and overall user experience.

4. Novelty of Research / Product / Project

The PovertyLens dashboard offers a novel fusion of spatial analytics, interactive visualization, and user-centered design for addressing socioeconomic disparities. Unlike static reports, this tool delivers localized, real-time poverty insights by integrating diverse datasets through geospatial visualization. It also features a rule-based recommendation component that enables personalized resource suggestions based on user inputs—a unique advantage for NGOs and outreach efforts (Borgi et al., 2023). Furthermore, the dual-layered approach combining geospatial analysis with TAM-based usability evaluation makes this project both analytically rigorous and practically relevant. By supporting targeted interventions, the dashboard contributes to efforts in reducing inequality (SDG 10) and ending poverty (SDG 1) through data-driven planning (United Nations, 2021).

5. Conclusion or Future Work

In conclusion, all objectives were achieved. Future improvements include expanding datasets, incorporating real-time poverty updates, multilingual support, and integrating mobile accessibility to further enhance usability and support targeted interventions across Malaysia.

REFERENCE LIST

- Borgi, S., Benlamri, R., & Touahria, M. (2023). Recommender systems in data-driven social good applications. *Social Network Analysis and Mining*, 13(1), 45. <https://doi.org/10.1007/s13278-023-00998-6>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Li, Z., & Lin, Y. (2020). Visual analytics of socioeconomic inequalities: A survey. *Journal of Urban Technology*, 27(1), 85–103. <https://doi.org/10.1080/10630732.2019.1657001>
- United Nations. (2021). *The Sustainable Development Goals Report 2021*. United Nations Publications. <https://unstats.un.org/sdgs/report/2021/>
- Yang, J., & Zhang, Y. (2019). Exploring the relationship between poverty and education: A spatial analysis in China. *Journal of Development Studies*, 55(4), 657–674. <https://doi.org/10.1080/00220388.2018.1453604>

VISUALIZING CAREER PATHWAYS: A DATA-DRIVEN APPROACH TO ONLINE COURSE RECOMMENDATIONS FOR IT CAREERS IN MALAYSIA

Siti Aisyah binti Ashri and Dr. Norfiza Ibrahim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2021826476@student.uitm.edu.my, norfiza@uitm.edu.my

Abstract

The rapid evolution of technology has created a significant gap between traditional educational programs and the skills demanded by modern employers, particularly in the IT sector. While online learning platforms provide a large selection of course catalogs, they lack individualized guidance to assist user in identifying learning gaps and selecting appropriate career-aligned courses. This misalignment often leads to ineffective skill development and wasted resources. To address this challenge, this study developed a comprehensive online course dashboard and course recommender specifically designed for IT careers in Malaysia. The research objectives focused on identifying key requirements for course recommendation, designing an integrated dashboard and course recommender, and evaluating system usability through User Acceptance Testing. The methodology employed CRISP-DM framework, utilizing Udemy API for course data extraction and web scraping for LinkedIn job market analysis. The dashboard was built using Power BI, while the recommendation engine utilized rule-based algorithms to provide course suggestions based on user interest. Testing with 33 respondents demonstrated positive feedback regarding the system's usability and effectiveness, though participants suggested improvements in visual design and real-time data integration. The study successfully achieved its objectives by providing IT professionals with valuable tools for strategic career development, bridging the gap between available online courses and industry-specific skill requirements in the Malaysian job market.

Keywords: *Non-personalized recommendations, Online courses, IT careers, Career pathways, Dashboard, Big data, Malaysia, EdPathway, Visualization.*

1. Introduction

Ghosh et al. (2020) stated that as new technologies rapidly change the job market, individuals must engage in lifelong learning to gain the skills needed for evolving industries. In the process of finding a path into a new industry or career, individuals often face the challenge of identifying which skills they need to develop. The primary objective of this research is to develop a data-driven dashboard, EdPathway, that aids individuals in selecting online courses that align with their career goals in the IT industry. This is particularly important in Malaysia, where the demand for skilled IT professionals continues to rise, and the need for continuous learning is critical. By utilizing data from platforms such as Udemy and LinkedIn, the dashboard will recommend online courses across various IT career paths, providing insights into industry demands and job market trends.

2. Methodology

This study integrates data from two primary sources, which are Udemy for course data and LinkedIn for job market trends. The methodology follows CRISP-DM, a structured data analytics process, beginning with the collection and cleaning of data using Jupyter Notebook and Apache Hive for data storage. A data warehouse is created to store and manage large datasets. The dashboard is developed using Power BI for data visualization, allowing dynamic filtering and presentation of course-job correlations. User acceptance is evaluated through a usability test based on the Technology Acceptance Model (TAM), focusing on perceived ease of use and system functionality.

3. Results / Findings

The implementation of EdPathway demonstrated its ability to effectively recommend relevant courses based on user preferences and job market trends. The dashboard's usability testing revealed that users found the system intuitive, with high satisfaction ratings for its ease of use and ability to streamline course selection. EdPathway successfully identified critical trends in IT career pathways and offered courses that directly addressed the skills gaps identified in the Malaysian job market, thus enhancing user decision-making for career advancement.

4. Novelty of Research / Product / Project

EdPathway represents a novel integration of big data analytics with personalized course recommendations tailored to IT career pathways. Unlike traditional methods, which offer generic course suggestions, EdPathway dynamically adapts to users' career goals and the evolving needs of the IT job market. The adoption of a progressive web application (PWA) ensures the platform's accessibility across devices, enhancing its scalability and user reach. Additionally, the system's ability to balance cost and course quality introduces significant advancements in online education recommendation systems.

5. Conclusion or Future Work

EdPathway dashboard utilizes the Power BI platform specifically tailored for analyzing online courses trend data. The dashboard also provides an innovative solution to help IT professionals in Malaysia select the most relevant online courses. Future enhancements will include expanding the platform's database to incorporate more courses, improving real-time updates, and integrating push notifications to keep users informed about new opportunities. The addition of cloud infrastructure will also enhance scalability, allowing the platform to grow as the IT job market evolves.

REFERENCE LIST

- Ghosh, A., Woolf, B., Zilberstein, S., & Lan, A. (2020). Skill-based Career Path Modeling and Recommendation. *2020 IEEE International Conference on Big Data (Big Data)*, 1156–1165. <https://doi.org/10.1109/BigData50022.2020.9377992>
- Ghoshal, A., Kumar, S., & Mookerjee, V. (2020). Dilemma of Data Sharing Alliance: When DoCompeting Personalizing and Non-Personalizing Firms Share Data. *Production and Operations Management*, 29(8), 1918–1936. <https://doi.org/10.1111/poms.12959>

PERFORMANCE EVALUATION OF BLACKHOLE AND SINKHOLE ATTACKS USING AODV ROUTING PROTOCOL IN VANET

Adib Ahza Bin Aktar, Dr Ahmad Yusri Bin Dak

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022882778@student.uitm.edu.my, ahmadyusri@uitm.edu.my

Abstract

Vehicular Ad Hoc Networks (VANET) play a vital role in Intelligent Transportation Systems (ITS) by enabling real-time communication between vehicles and infrastructure to enhance road safety and traffic efficiency. However, VANET are vulnerable to security threats such as Blackhole and Sinkhole attacks, which degrade network performance by causing packet loss, increased latency, and reduced throughput. This study analyses the impact of these attacks on the Ad hoc On-Demand Distance Vector (AODV) routing protocol through simulations using NS2 and SUMO, replicating realistic traffic scenarios with varying node densities and packet sizes. Key performance metrics such as throughput, end-to-end delay (EED), packet delivery ratio (PDR), and routing overhead (RO) are examined. Results show that blackhole attacks reduce PDR from 94.8% to 93.34% at 1000-byte packet size, indicating a 1.54% drop due to packet dropping. Sinkhole attacks, on the other hand, cause routing overhead to increase from 0.86 to 1.25 at 3000-byte packet size, a 45.35% rise, revealing routing inefficiencies. These findings highlight AODV's susceptibility to malicious behaviour and emphasize the need for robust, secure routing protocols to ensure reliable and efficient vehicular communication. This research contributes valuable insights for developing enhanced VANET security strategies to support the evolution of safer ITS networks.

Keywords Vehicular Ad Hoc Network (VANET), Blackhole Attack, Sinkhole Attack, AODV Routing Protocol

1. Introduction

This research aims to evaluate the impact of Blackhole and Sinkhole attacks on AODV routing protocol performance in Vehicular Ad Hoc Networks (VANETs) using simulation tools and realistic traffic scenarios. NS-2 is used for simulating network communication while SUMO generates dynamic vehicle mobility patterns. OpenStreetMap provides real-world geographic data to create a 2100m x 1800m urban simulation area. The study focuses on four key performance metrics: throughput, Packet Delivery Ratio (PDR), End-to-End Delay (EED) and Routing Overhead (RO). These metrics help assess how the attacks affect data delivery, latency and routing efficiency in a realistic VANET environment.

2. Methodology

This research utilizes simulation-based evaluation to analyse the impact of Blackhole and Sinkhole attacks on the AODV routing protocol in VANET. The methodology involves six key phases which are information gathering, project requirement, network design, simulation, data analysis and documentation. Network Simulator 2 (NS-2) is used for simulating communication behaviour while Simulation of Urban Mobility (SUMO) generates realistic vehicle movements based on urban traffic patterns. OpenStreetMap provides real-world geographic data to model a 2100m x 1000m urban area. Two scenarios are simulated by varying the number of nodes and packet sizes under both attack and normal conditions. Four core performance metrics are used which include throughput, packet delivery ratio, end-to-end delay and routing overhead. Data from the simulations are analysed and compared to assess the severity of attack impacts and guide recommendations for more secure VANET routing mechanisms.

3. Results / Findings

The results of this study reveal that both Blackhole and Sinkhole attacks significantly degrade the performance of the AODV routing protocol in vehicular networks. In normal conditions, throughput and packet delivery ratio were consistently high, while end to end delay and routing overhead remained low. However, under attack scenarios, notable performance degradation was observed. Blackhole attacks caused steady packet drops, resulting in lower throughput and reduced delivery ratio, especially as node density increased. Sinkhole attacks had a more severe impact, particularly in dense networks, where they created routing loops and misleading paths. This led to the highest routing overhead and a sharp decline in packet delivery ratio. Additionally, simulations with larger packet sizes showed increased delay and overhead under both attacks. These findings confirm that Sinkhole attacks are more disruptive than Blackhole attacks in high traffic and large data environments, highlighting the urgent need for effective security solutions in VANET communication systems.

4. Novelty of Research / Product / Project

The novelty of this research lies in its focus on Sinkhole attacks within VANET, an area that has been largely overlooked. While Blackhole attacks in VANET have been widely studied, most existing research on Sinkhole attacks has been limited to Wireless Sensor Networks (WSN). There is a clear lack of studies analysing how Sinkhole attacks affect routing protocols like AODV in the dynamic and high-mobility environment of VANET. By shifting the focus to an underexplored threat in VANET, this study provides new insights and encourages the development of more effective security solutions for intelligent transportation systems.

5. Conclusion or Future Work

This research successfully evaluated the impact of Blackhole and Sinkhole attacks on AODV in VANET. Future work should explore other routing protocols, implement machine learning-based intrusion detection and conduct real-world testing to enhance VANET security and ensure reliable communication in dynamic vehicular environments.

REFERENCE LIST

- Dhanaraj, R. K., Krishnasamy, L., Geman, O., & Izdrui, D. R. (2021). Black hole and sink hole attack detection in wireless body area networks. *Computers, Materials and Continua*, 68(2), 1949–1965. <https://doi.org/10.32604/cmc.2021.015363>
- Fiade, A., Yudha Triadi, A., Sulhi, A., Umami Masrurroh, S., Handayani, V., & Bayu Suseno, H. (2020, October 23). Performance Analysis of Black Hole Attack and Flooding Attack AODV Routing Protocol on VANET (Vehicular Ad-Hoc Network). 2020 8th International Conference on Cyber and IT Service Management, CITSM 2020. <https://doi.org/10.1109/CITSM50537.2020.9268789>
- M.Hussein Anssari, O. (2021). Wireless Sensor Network Performance Analysis Under Sinkhole Attacks. *International Journal of Advanced Research in Computer Science*, 12(5), 1–6. <https://doi.org/10.26483/ijarcs.v12i5.6767>

ENHANCING WEB APPLICATION FIREWALL WITH MACHINE LEARNING FOR ADVESARIAL SQL INJECTION

Ahmad Kamal Mohamad Kamarudin, Mohd Faris Mohd Fuzi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022477856@student.uitm.edu.my, farisfuzi@uitm.edu.my

Abstract

A Web Application Firewall (WAF) is a security system that inspect, filters, and blocks malicious HTTP/HTTPS traffic by enforcing predefined rules to protect against web attack like SQL injections and cross-site scripting (Calvo et al., 2022). Traditional Web Application Firewalls that rely on ruled based detection often struggle to detect advanced attacks such as adversarial SQL injection attacks, leading to high false positives, missed detections, and increased maintenance overhead. Adversarial SQL injection (SQLi) is a technique that modifies attack payloads in a way that maintains malicious intent to bypass traditional rule-based WAF detection (Demetrio et al., 2020). This project aims to enhance ModSecurity WAF by integrating it with machine learning models trained specifically to detect adversarial SQLi attacks. The objective is to train and evaluate four machine learning models which are CatBoost, Random Forest, Logistic Regression, and Support Vector Machine, and their effectiveness is a second layer detection. Among all models, CatBoost achieved the highest performance with an accuracy of 98.00%, precision of 96.99%, recall of 98.84%, F1-score of 97.91%, and ROC-AUC of 0.9987. These results demonstrate that integrating machine learning into traditional WAF systems can significantly improve their ability to detect adversarial SQLi attacks.

Keywords: *Web Application firewall, adversarial SQLi, machine learning*

1. Introduction

Traditional Web Application Firewalls, such as ModSecurity, rely on static rule-based detection which struggles to keep pace with advanced web threats like adversarial SQL injection attacks (İşiker et al., 2021). These attacks are crafted to bypass known rule sets while maintaining malicious intent, leading to high false positives, undetected intrusions, and increased maintenance overhead. This project aims to enhance the detection capabilities of ModSecurity by integrating it with machine learning models which is CatBoost, Random Forest, Support Vector Machine, and Logistic Regression as a secondary detection layer. The objective is to train and evaluate these ML models using adversarial SQLi data, improving detection accuracy while reducing false positives, ultimately providing a more adaptive and robust security solution for modern web applications.

2. Methodology

This project integrate ModSecurity with supervised machine learning as a second layer detection. The process begins by simulating web traffic using a labelled dataset containing both legitimate and adversarial SQL injection payloads. These HTTP requests are sent towards a NGINX web server configured with ModSecurity, which inspects the traffic based on predefined security rules. If a rule match is found, the request is blocked. Otherwise, the request is allowed, and all the transaction is logged. The logs then are pre-processed. This involves parsing ModSecurity audit logs to extract relevant features such as IP addresses, HTTP methods, URLs, and rule-matching metadata also clean the data from noise. The cleaned data is then used to train and test four machine learning classifiers, CatBoost, Random Forest, Logistic Regression, and Support Vector Machine. Finally, the models are evaluated using metrics such as accuracy, precision, recall, F1-score, and ROC-AUC to measure performance and effectiveness in detecting adversarial SQLi attacks.

3. Results / Findings

The implementation of this project successfully demonstrated the enhancement of traditional ModSecurity WAF through machine learning integration to detect adversarial SQL injection attacks. Four machine learning models CatBoost, Random Forest, Logistic Regression, and Support Vector Machine (SVM) were evaluated for their effectiveness as secondary detection layers. Among them, CatBoost achieved the highest classification performance with an accuracy of 98.00%, precision of 96.99%, recall of 98.84%, F1-score of 97.91%, and ROC-AUC of 0.9987, highlighting its superior ability to distinguish between malicious and legitimate traffic. The evaluation results clearly indicate a significant improvement over ModSecurity's standalone detection, which recorded only 70.02% accuracy and suffered from high false positives. By analysing ModSecurity logs, the machine learning models were able to detect malicious payloads that bypassed the default WAF rules. These findings confirm that integrating machine learning as a secondary detection layer improves precision, reduces false positives, and enhances the overall robustness of WAF systems against advanced SQL injection threats.

4. Novelty of Research / Product / Project

This project introduces a novel approach to enhancing traditional WAF, specifically ModSecurity, by integrating machine learning as a secondary detection layer for identifying adversarial SQL injection (SQLi) attacks. Unlike conventional WAFs that rely solely on static, rule-based detection, this system utilized four machine learning algorithms CatBoost, Random Forest, Logistic Regression, and Support Vector Machine (SVM) to analyse web traffic patterns and detect adversarial SQLi payloads that bypass traditional filters. This project introduces a novel approach by focusing specifically on adversarial SQL injection, a sophisticated technique designed to bypass traditional rule-based WAF like ModSecurity. By integrating machine learning models, the system can effectively analyse and detect patterns within adversarial SQLi techniques, an area where traditional WAFs often struggles with. By addressing a critical gap in WAF defences, this project contributes a modern, flexible, and intelligent enhancement to web application security systems.

5. Conclusion or Future Work

This project successfully enhances ModSecurity with machine learning models for improved adversarial SQL injection detection. Future work will focus on enabling real-time detection, expanding to other web attacks like XSS and CSRF, incorporating behavior-based analysis, and using more diverse datasets to further improve adaptability and detection accuracy.

REFERENCE LIST

- Calvo, M., & Beltrán, M. (2022). An adaptive web application firewall. In *Proceedings of the 17th International Conference on Evaluation of Novel Approaches to Software Engineering* (pp. 96–107). <https://doi.org/10.5220/0011146900003283>
- Demetrio, L., Valenza, A., Costa, G., & Lagorio, G. (2020). WAF-A-MoLE: Evading web application firewalls through adversarial machine learning. In *Proceedings of the 35th Annual ACM Symposium on Applied Computing* (pp. 1745–1752). ACM. <https://doi.org/10.1145/3341105.3373962>
- Işiker, B., & Soğukpınar, İ. (2021). Machine learning based web application firewall. In *2021 2nd International Informatics and Software Engineering Conference (IISEC)* (pp. 1–6). IEEE. <https://doi.org/10.1109/IISEC54230.2021.9672335>

IoT SMART SLEEP MONITORING AND ENVIRONMENTAL CONTROL OPTIMIZATON SYSTEM

Aisyah Qamariah binti Abd Razak, Rashidah binti Ramle

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022882506@student.uitm.edu.my, rashidahramle@uitm.edu.my

Abstract

Millions globally suffer from sleep disorders, impacting health. Existing monitoring systems often overlook dynamic environmental factors. This IoT-based Smart Sleep Monitoring and Environmental Control Optimization System addresses this by offering a comprehensive solution for real-time monitoring and environmental improvement. The prototype uses a NodeMCU ESP32 with Pulse XD-58C (heart rate) and DHT11 (temperature) sensors. It gathers physiological and environmental data, transmits it to Thingier.io for real-time display, and automatically modifies the sleep setting (e.g., playing relaxing music for high heart rate, activating fans for high temperature). Data is also stored in Google Sheets for pattern analysis. This system enhances sleep quality and aids users in developing better sleep habits through actionable insights and automated interventions.

Keywords: *IoT, environmental control, sleep monitoring, TAM, ESP32*

1. Introduction

Sleep is fundamental for human well-being, impacting cognitive performance, emotional stability, and physical healing. Despite its importance, widespread sleep disorders persist, often exacerbated by environmental factors and the limitations of current monitoring technologies that primarily focus on physiological data without dynamic environmental control. This project introduces the IoT Smart Sleep Monitoring and Environmental Control Optimization System to address these gaps. Its primary objectives are: (I) To develop a prototype of an IoT-based Smart Sleep Monitoring System with a DHT11 Temperature Sensor, Pulse XD-58C Sensor, NodeMCU ESP32, and Thingier.io for monitoring and adaptive control of sleep environments. (II) To evaluate the performance of the prototype through functionality testing, network testing, and the Technology Acceptance Model (TAM). The system's scope covers real-time monitoring of heart rate and ambient temperature, automated environmental adjustments (light, fan, music), and data logging for pattern analysis within a home environment.

2. Methodology

This research followed a multi-phase methodology: initial study, planning, design, development, implementation, testing, analysis, and documentation. Hardware (NodeMCU ESP32, Pulse XD-58C, DHT11, L298N, fan, LED, DFPlayer Mini MP3) and software (Arduino IDE, Thingier.io, Google Sheets) were identified and integrated. The design phase involved circuit and network topology. Development included assembling components and programming the ESP32 to interface with sensors and control actuators based on real-time data. The system automatically adjusts lights (BPM 61-100: dim ON; >100: OFF) and the fan (ON above 30°C, OFF below). Data streams to Thingier.io and Google Sheets. Testing comprised functionality (light/fan control), network performance (obstacles, distance, network types), and a 15-participant Technology Acceptance Model (TAM) survey to assess usefulness and ease of use.

3. Results / Findings

The functionality testing confirmed the prototype's ability to control lights and fans effectively based on heart rate and temperature inputs. Light control responded to BPM (ON for 61-100 BPM, OFF for

>100 BPM), and fan control activated above 30°C and deactivated below. Network testing revealed that sensor data transmission to Thingier.io was influenced by environmental interference (dust) and distance. For instance, dusty sensors showed an average delay of 5.83s (Pulse XD-58C) and 5.43s (DHT11), compared to 2.00s and 2.10s when clean. Response times also increased with distance, from approximately 1.97s (Pulse XD-58C) and 1.87s (DHT11) at 2m to 5.40s and 5.17s at 8m. Different network types also affected performance, with mobile hotspot connections showing slightly higher delays than Wi-Fi. The Technology Acceptance Model (TAM) results indicated high perceived usefulness and ease of use, with mean scores consistently above 4.8 on a 7-point scale, suggesting strong user acceptance and benefit from the system.

4. Novelty of Research / Product / Project

The IoT Smart Sleep Monitoring and Environmental Control Optimization System offers a novel approach by uniquely integrating real-time physiological and environmental monitoring with automated, adaptive interventions. Unlike many existing sleep trackers that passively collect data or focus solely on physiological metrics, this system actively modifies the sleep environment (e.g., adjusting lighting, activating fans, playing calming music) in response to live sensor data (heart rate, temperature). This dynamic, closed-loop control system provides immediate feedback and optimization, moving beyond mere data logging to proactive sleep enhancement. The use of the NodeMCU ESP32 and Thingier.io for seamless data flow and remote control, coupled with the automated environmental adjustments, distinguishes it from conventional solutions. This project contributes significantly to digital health innovation by providing a comprehensive, cost-effective, and non-invasive solution for improving sleep quality through intelligent environmental management.

5. Conclusion or Future Work

The system successfully monitors and optimizes sleep environments through automated interventions. Future work could explore integrating machine learning for more personalized interventions, investigating non-contact sensing technologies for enhanced accuracy, and developing a dedicated mobile application to eliminate reliance on third-party platforms and provide advanced, customizable features for users.

REFERENCE LIST

- Gamel, S., Fatma, & Talaat, M. (n.d.). SleepSmart: an IoT-enabled continual learning algorithm for intelligent sleep enhancement. <https://doi.org/10.1007/s00521-023-09310-5>
- Khan, N., Al-Hamid, D. Z., Chong, P. H. J., Mirza, F., & Kumar, A. (2024). Systematic Review of Sleep Monitoring Systems for Babies: Research Issues, Current Status, and Future Challenges. *Health & Social Care in the Community*, 2024(1). <https://doi.org/10.1155/2024/5510164>
- Kwon, S., Kim, H. S., Kwon, K., Kim, H., Kim, Y. S., Lee, S. H., Kwon, Y.-T., Jeong, J.-W., Trotti, L. M., Duarte, A., & Yeo, W.-H. (2023). At-home wireless sleep monitoring patches for the clinical assessment of sleep quality and sleep apnea. *Science Advances*, 9(21). <https://doi.org/10.1126/sciadv.adg9671>
- Miller, M. A., & Cappuccio, F. P. (2021). A systematic review of COVID-19 and obstructive sleep apnoea. *Sleep Medicine Reviews*, 55, 101382. <https://doi.org/10.1016/j.smrv.2020.101382>

ANALYSING DDOS ATTACK ON WEB SERVER USING PENTBOX HONEYPOT AND PFSENSE WITH SNORT

Akmal Danial Ahmad Jalalludin, Mohd Faris Mohd Fuzi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022675826@student.uitm.edu.my, farisfuzi@uitm.edu.my

Abstract

This project focuses on the analysis and evaluation of network security measures in mitigating Distributed Denial of Service (DDoS) attacks within a simulated environment. The main objective is to assess the effectiveness of deploying a PentBox honeypot and pfSense firewall integrated with Snort in detecting and managing application-layer attacks. A network topology was designed using GNS3 with VirtualBox virtual machines representing an attacker, a legitimate user, and a web server to simulate real-world scenarios. Two types of DDoS attacks, Slowloris and GoldenEye, were launched at varying intensities to evaluate system performance under stress. The PentBox honeypot was used in Scenario 1 to log malicious activity, while Scenario 2 included Snort configured in IDS mode to monitor and alert on suspicious traffic. Network performance metrics, including throughput, bitrate, and latency, were collected using iPerf3 and Wireshark for analysis. Results showed that while the PentBox honeypot effectively detected all attack attempts, it lacked mitigation capabilities, leading to significant network performance degradation. Similarly, Snort successfully generated alerts but, in IDS-only mode, allowed attack traffic to reach the server, causing performance patterns similar to Scenario 1. These findings highlight the critical need for combining detection with prevention, such as enabling Snort in IPS mode, to enhance the resilience of network systems against DDoS threats.

Keywords: DDoS attacks, PentBox honeypot, Snort

1. Introduction

Distributed Denial of Service (DDoS) attacks are highly disruptive threats capable of exhausting server resources and preventing legitimate users from accessing services. This project aims to analyse and evaluate the effectiveness of network security mechanisms in detecting and mitigating such attacks within a simulated environment. The study focuses on deploying a PentBox honeypot and PfSense firewall integrated with Snort to assess their capabilities against application-layer DDoS attacks, specifically Slowloris and GoldenEye. Key performance metrics, including throughput, bitrate, and latency, are measured to determine network resilience under varying attack intensities. The project's scope includes designing a network topology in GNS3 with VirtualBox virtual machines simulating an attacker, a legitimate user, and a web server. Two scenarios are tested: one with only the honeypot and another with Snort operating in IDS mode alongside the honeypot.

2. Methodology

This project was implemented in a simulated environment using GNS3 and VirtualBox to design and evaluate the network topology. The setup included three virtual machines: Ubuntu Server (as a web server and honeypot host), Ubuntu Desktop (as a legitimate user), and Kali Linux (as an attacker). A PfSense firewall with Snort was placed between the router and the web server to monitor and analyse traffic. Two testing scenarios were carried out: Scenario 1 used only the PentBox honeypot, while Scenario 2 integrated Snort on PfSense in IDS mode alongside the honeypot. Slowloris and GoldenEye were launched from the attacker machine at three intensity levels (50, 200, and 450 connections). Tools like iPerf3 and Wireshark were used to monitor throughput, bitrate, and latency on the legitimate user machine during each test. Logs from Snort and PentBox were analysed to evaluate detection capabilities and the overall impact of attacks on network performance.

3. Results / Findings

The findings revealed that in Scenario 1, the PentBox honeypot successfully detected and logged all malicious traffic but failed to prevent performance degradation. As attack intensity increased, throughput and bitrate dropped significantly, while latency and honeypot response times rose sharply. In Scenario 2, Snort detected attack patterns and generated alerts; however, since it was configured in IDS mode, it did not block the attack traffic. As a result, network performance degradation was similar to Scenario 1, although Snort provided enhanced visibility into the nature of the attacks. These results demonstrate that while both tools are effective in detection, they require proactive mitigation measures to protect the network from service disruption.

4. Novelty of Research / Product / Project

This project introduces a simulated testbed combining PentBox honeypot and pfSense firewall with Snort to assess their detection capabilities against DDoS attacks. Unlike traditional studies that focus solely on prevention tools, this project evaluates the combined use of deception (honeypot) and detection (IDS) in handling application-layer DDoS traffic. The novelty lies in the comparative analysis of two scenarios, one with only the honeypot and another with Snort in IDS mode which highlight the limitations of passive detection and the necessity of active prevention mechanisms. By using GNS3 and VirtualBox for the implementation, this project provides a cost-effective and flexible platform for replicating and analysing real-world DDoS attacks, offering valuable insights for strengthening network defence strategies.

5. Conclusion or Future Work

This project demonstrates that while PentBox and Snort can detect DDoS traffic, active prevention mechanisms such as enabling Snort's IPS mode are essential for mitigating attack impacts. Future work could explore real-time traffic blocking and expanding simulations to include volumetric and protocol-based DDoS attacks for a more robust evaluation.

REFERENCE LIST

- Ali, S., Kaur, S., & Singh, R. (2022). A comprehensive study of honeypots in cybersecurity: Techniques and trends. *Journal of Cybersecurity Research*, 18(3), 227-242. <https://doi.org/10.1016/j.cyber.2022.01.012>
- Brown, D., & Narang, V. (2023). Challenges of traditional network security tools in countering advanced DDoS attacks. *Computers & Security*, 130, 102747. <https://doi.org/10.1016/j.cose.2023.102747>
- Lopez, J. A., Soto, M., & Perez, L. (2021). Advanced tools for detecting evolving cyber threats: A review of honeypots and machine learning techniques. *IEEE Access*, 9, 78856-78868. <https://doi.org/10.1109/ACCESS.2021.3088912>
- Rana, S., Prakash, P., & Yadav, P. (2021). DDoS attack detection and mitigation strategies: A survey on current approaches. *International Journal of Information Security*, 29(4), 212-229. <https://doi.org/10.1007/s10207-021-00609-3>
- Zhao, H., Liu, J., & Wang, T. (2023). Performance analysis of network security tools: A comparative study of honeypots, firewalls, and intrusion detection systems in DDoS mitigation. *Journal of Information Security and Applications*, 63, 200-210. <https://doi.org/10.1016/j.jisa.2023.200002>

CYBERATTACKS TRAFFIC ANALYSIS BASED ON SURICATA AND SUPERVISED MACHINE LEARNING

Aqil Fikri Bin Mohd Zul, En. Muhammad Arif Bin Hashim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022851348@student.uitm.edu.my, muhamadarif487@uitm.edu.my

Abstract

The increasing number and complexity of cyberattacks face critical problems to network security infrastructures. Despite being necessary, traditional Intrusion Detection System (IDS), often have high number of false positive and low in precision. This project aims to improve IDS performance by integrating Suricata, a signature-based IDS with supervised machine learning algorithms including Support Vector Machine (SVM), Decision Tree (DT) and Random Forest (RF). By utilizing UNSW-NB15, the research analyzes the detection capabilities through offline traffic testing of Suricata. The system architecture includes data collection by Suricata using packet capture (PCAP) file, log parsing and visualization to Wazuh and machine learning model development with Python and Scikit-learn. Accuracy, precision, recall, and F1-score are the performance metrics that will be analyzed to measure improvements. Overall results show that machine learning models, especially DT outperform Suricata in classifying traffic, reducing false positives and enhancing overall detection rates. This study demonstrates the potential of hybrid IDS and machine learning in modern cybersecurity field.

Keywords: *Intrusion Detection System, Suricata, Supervised machine learning, SVM, DT, RF*

1. Introduction

As cyberattacks continue to evolve, traditional IDS like Suricata are efficient for known threats but often produce high false positive due to rigid rule-based detection. This project explores the integration of Suricata with machine learning algorithms to improve cyberattack detection and reduce false positive. This project aims to setup Suricata, SVM, DT and RF to analyze the cyberattacks traffic detection. The result will be evaluated to determine the accuracy, precision, recall and F1-score of each detection method. By comparing the performance with and without machine learning algorithms, this research investigates how supervised learning can help minimize false alerts while increasing overall detection efficiency. The UNSW-NB15 dataset is utilized for offline testing, providing both normal and malicious traffics. Through this approach, the project seeks to contribute a hybrid detection framework that enhances the capabilities of IDS systems in identifying modern and complex threats with greater reliability.

2. Methodology

This study applies hybrid method, integrating traditional IDS and supervised machine learning. Suricata is used to analyze PCAP files from UNSW-NB15 dataset. The alerts from Suricata are processed and visualize using Wazuh, which integrates log management and detection reporting. Moreover, machine learning algorithms including SVM, DT and RF are developed using Python in Jupyter Notebook. The alerts visualized by Wazuh are export out in comma-separated value (CSV) format, allow machine learning to undergo training and testing processes. Two testing scenarios are considered, Suricata standalone and Suricata integrate with machine learning algorithms. Both scenarios will be evaluated by performance metrics like number of true positive, false positives, precision and many more.

3. Results and Findings

Results prove that standalone Suricata produced a higher false positive number and lower in precision, which may overwhelm security officer in real-life with unnecessary alerts. Conversely, with the integration with machine learning algorithms, especially Decision Tree, the detection accuracy substantially improved. Decision Tree has the best accuracy among the machine learning algorithm with 0.9957, followed by Random Forest with 0.9915 and lastly Support Vector Machine with 0.9574. The confusion matrix analysis shows that machine learning algorithms reduced false positives and improve overall reliability. From the results, this project confirms that machine learning algorithms enhance the detection capabilities of Suricata by adapting to the attacks and enabling smarter threat recognition.

4. Novelty of Project

This project presents a novel hybrid technique that enhance the traditional IDS with supervised machine learning algorithms like SVM, RF and DT. Unlike traditional IDS that rely on rule-based detection, this project leverages the intelligence of machine learning to dynamically identify malicious patterns in network traffic. Furthermore, the use of offline traffic analysis with the PCAP file of UNSW-NB15 dataset, which offers a diverse set of real-world attack vectors. Additionally, the integration with Wazuh, a security information and event management (SIEM) tool, to parse and visualize alerts from Suricata, provide better insight on the performance of traditional IDS. Moreover, this combination allows the system to not only detect known threats better but also reducing false positives and identify evolving attack patterns more precisely. Overall, the project's novelty lays in integrating signature-based IDS with machine learning and real-world datasets to design a more intelligent, adaptable, and accurate threat detection system.

5. Conclusion and Future Work

The integration of Suricata and Supervised machine learning algorithms significantly enhance cyberattacks detection and reduce false positives. Implementing real-time detection capabilities, integrating with deep learning algorithms and deploying the systems in the real enterprise environment for continuous monitoring and adaptive threat response maybe become future works.

REFERENCE LIST

- Ahmad, Z., Shahid Khan, A., Wai Shiang, C., Abdullah, J., & Ahmad, F. (2021). Network intrusion detection system: A systematic study of machine learning and deep learning approaches. *Transactions on Emerging Telecommunications Technologies*, 32(1). <https://doi.org/10.1002/ett.4150>
- Bada, G. K., Nabare, W. K., & Quansah, D. K. K. (2020). Comparative Analysis of the Performance of Network Intrusion Detection Systems: Snort, Suricata and Bro Intrusion Detection Systems in Perspective. *International Journal of Computer Applications*, 176(40), 39–44. <https://doi.org/10.5120/ijca2020920513>
- Hossain, M. A., & Islam, M. S. (2023). Ensuring network security with a robust intrusion detection system using ensemble-based machine learning. *Array*, 19. <https://doi.org/10.1016/j.array.2023.100306>

MALICIOUS URL DETECTION USING MACHINE LEARNING

Khairi Syafi Bin Khairul Anuar, En. Muhammad Arif Bin Hashim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Perlis Branch, Malaysia

e-mail: 2022608028@student.uitm.edu.my, muhamadarif487@uitm.edu.my

Abstract

The Malicious URL Detection using Machine Learning is a detection-based project proposed to enhance the identification of malicious and benign URLs that can be used for regular people and organizations, overall, in managing and ensuring the safety internet surfing for data protection. The main objective for this project is to develop a prototype that can aid people or organizations in detecting malicious URL with the help machine learning algorithm using only lexical features. The integration of technologies such as machine learning are hoped to enhance the techniques of classifying harmful URLs such as malware drive-by-downloads URLs. The system uses the waterfall model as the methodology of the research. A performance and functional testing have been conducted to determine the performance of the system within various scenario and also to evaluate the effectiveness of the model. A dataset was chosen to train the model. From the findings and analysis, it was shown that the system was functional and meet the expectations of the performances. Overall, the system allows for easier management, ease of use and reliable in foreseen a potential harmful URL.

Keywords: *malicious URL, malware, phishing, URL, lexical features, machine learning, random forest, detection*

1. Introduction

As the internet grows increasingly vital to daily life, the rise of malicious URLs poses significant cybersecurity threats (Aljabri et al., 2022). These URLs are used in phishing, malware distribution, and redirection attacks, often disguised through obfuscation, shortening, and typosquatting. Usually, organizations will identify the harmful link by implementing a machine learning algorithm into their architecture but some of them require advance or powerful processing power to work (Gupta et al., 2021). This project aims to develop a lightweight, machine learning-based detection system that identifies malicious URLs using only lexical features, allowing faster and real-time classification. The system implemented machine learning algorithm and evaluated through accuracy, precision, and recall metrics. The scope includes building and testing the prototype using a publicly available dataset, focusing on URL structure rather than contextual or domain-based data.

2. Methodology

This project follows a systematic machine learning pipeline to detect malicious URLs using lexical features. The methodology begins with data collection, sourcing a labeled dataset of benign and malicious URLs from Kaggle. The URLs undergo preprocessing, including URL parsing and cleaning, followed by feature extraction based on 20 handcrafted lexical attributes such as length, number of digits, presence of suspicious keywords, and special characters. The dataset is then split into training and testing sets (70:30 ratio) to evaluate model generalization. The Random Forest algorithm, known for its accuracy and robustness, is used as the primary classifier. Model evaluation metrics accuracy, precision, and recall are derived using a confusion matrix. To make the system accessible and interactive, a web application is developed using Flask (Lakshmanarao et al., 2021). The backend handles feature extraction and model prediction, while the frontend allows users to input URLs and view classification results in real-time. The final model and application are deployed locally on Windows 11, integrating backend and UI for real-time URL classification, showcasing machine learning's practical use in cybersecurity.

3. Results / Findings

The Random Forest algorithm achieved the best performance in detecting malicious URLs, with an accuracy of 99.74%, precision of 99.76%, recall of 99.91%, and an F1-score of 99.83%. Its ROC AUC score was 0.9994, indicating strong discriminatory power. Decision Tree and Logistic Regression also performed well, but Random Forest consistently outperformed them and was selected for integration into the web application. Functionality testing showed that the system correctly classified 9 out of 10 test URLs, with only one false negative. Non-URL inputs were also correctly handled, confirming robust input validation. Performance testing revealed an average response time of 6.65 to 6.94 seconds under normal load and 11.73 seconds at peak load of 20 users, demonstrating good scalability. Usability testing results indicated strong user satisfaction. 80% of participants agreed or strongly agreed that the system is easy to use and helpful. Overall, the system proved accurate, reliable, and user-friendly.

4. Novelty of Research

This project introduces a novel approach to malicious URL detection by leveraging 20 carefully selected lexical features to classify URLs without requiring content-based or metadata analysis, which are often computationally intensive or unavailable. The study evaluates three different machine learning models Random Forest, Decision Tree, and Logistic Regression under the same conditions, providing a comprehensive performance comparison. What sets this work apart is the deployment of the most effective model (Random Forest) into a fully functional web application, allowing real-time URL classification with an intuitive user interface. This project includes extensive testing of functionality, performance, and usability to validate the system's practicality. Additionally, user feedback through perceived usefulness and ease-of-use surveys enhances the real-world applicability and user-centered design of the system. These combined innovations contribute to a reliable, efficient, and accessible solution for real-time detection of malicious URLs.

5. Conclusion or Future Work

This project successfully demonstrated malicious URL detection using machine learning, with Random Forest outperforming others. Future work may involve expanding the dataset and integrating additional features like WHOIS and domain reputation to enhance detection accuracy and system robustness against evolving threats.

REFERENCE LIST

- Aljabri, M., Altamimi, H. S., Albelali, S. A., Al-Harbi, M., Alhuraib, H. T., Alotaibi, N. K., Alahmadi, A. A., AlHaidari, F., Mohammad, R. M. A., & Salah, K. (2022). Detecting Malicious URLs Using Machine Learning Techniques: Review and Research Directions. *IEEE Access*, 10, 121395–121417. <https://doi.org/10.1109/ACCESS.2022.3222307>
- Gupta, B. B., Yadav, K., Razzak, I., Psannis, K., Castiglione, A., & Chang, X. (2021). A Novel Approach for Phishing URLs Detection using Lexical Based Machine Learning in a Real-Time Environment. *Computer Communications*, 175, 47–57. <https://doi.org/10.1016/j.comcom.2021.04.023>
- Lakshmanarao, A., Babu, M. R., & Bala Krishna, M. M. (2021). Malicious URL Detection using NLP, Machine Learning and FLASK. *Proceedings of the 2021 IEEE International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems, ICSES 2021*. <https://doi.org/10.1109/ICSES52305.2021.9633889>

BIOMETRIC FACE RECOGNITION FOR A SECURE KINDERGARTEN ATTENDANCE MANAGEMENT SYSTEM

Muhammad Danish Daniel Azman, Rashidah Ramle

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023375467@student.uitm.edu.my, rashidahramle@uitm.edu.my

Abstract

Attendance management in kindergartens plays a critical role in ensuring child safety and maintaining operational efficiency. However, traditional manual methods are often error-prone and lack security, especially during child retrieval. To address these issues, this project developed a web-based Kindergarten Attendance Management System integrated with biometric face recognition. The system authenticates both students and authorized guardians using FaceAPI.js for real-time facial recognition, Laravel for backend logic, and MySQL for database management. It is deployed via VPS Malaysia and includes Telegram notification integration for secure pick-up verification. Performance was evaluated through functionality testing, accuracy testing (measuring FAR and FRR), and the Technology Acceptance Model (TAM), with results indicating high system accuracy and strong user acceptance among teachers and parents. The project successfully enhances attendance reliability, automates identity verification, and strengthens security protocols, offering a practical solution tailored for real-world kindergarten use in Malaysia.

Keywords: *Face Recognition, Kindergarten, Attendance Management, FaceAPI.js, TAM*

1. Introduction

Attendance management is an important aspect of kindergarten operations, particularly child safety and administrative efficiency. Nevertheless, most kindergartens in Malaysia continue to implement manual processes such as paper-based records and oral confirmation at the time of child collection, which involve substantial risks such as human error and unauthorized collection of children. This project addresses such issues by developing a web-based attendance management system based on biometric facial recognition. The system aims to digitalize student attendance, student and guardian identity, include verification during drop-off and pick-up. The scope of the project focuses on one kindergarten setting in Sungai Buloh, Selangor. The scope of the project focuses on a single kindergarten setting in Sungai Buloh, Selangor. The system is deployed on an online Virtual Private Server (VPS), ensuring secure, real-time identity verification, data accuracy, and user accessibility via browser-based access from any location with internet connectivity.

2. Methodology

This project adopted the Waterfall model, consisting of sequential phases: requirement analysis, system design, development, testing, and documentation. Requirements were gathered through interviews and observations with kindergarten teachers in Sungai Buloh to understand operational challenges in existing attendance processes. The system was developed using Laravel for the backend and MySQL for managing structured data such as student profiles, attendance logs, and face descriptors. FaceAPI.js was implemented on the frontend to perform real-time facial recognition through the browser, enabling identity verification during student check-in and pick-up. The system also integrates with the Telegram Bot API to send PIN codes to guardians for added security. The platform was deployed online using a Virtual Private Server (VPS) hosted in Malaysia, secured with HTTPS encryption to ensure data protection and accessibility. To evaluate the system's performance, functionality testing was conducted to verify module operations, while accuracy testing measured the false acceptance rate (FAR) and false rejection rate (FRR). The Technology Acceptance Model

(TAM) was applied to assess user acceptance, focusing on perceived usefulness and ease of use among teachers and guardians.

3. Results / Findings

The system successfully passed all functional test cases including user login, facial detection, attendance logging, and Telegram PIN verification. Accuracy testing showed a high recognition rate, with low False Acceptance Rate (FAR) and False Rejection Rate (FRR), confirming its reliability for use with children aged 4–6. Confidence score dropped slightly as distance from the camera increased, and network testing showed that recognition time increased under poor internet conditions. The TAM results, collected from kindergarten teachers and parents, showed high acceptance. Most respondents agreed the system was useful, easy to use, and preferable over manual methods. The integration of biometric verification and Telegram alerts significantly enhanced trust and safety during the drop-off and pick-up process. These findings support the system's practical application in a real-world kindergarten environment in Malaysia.

4. Novelty of Research / Product / Project

This project introduces a novel combination of web-based facial recognition and real-time attendance tracking specifically tailored for kindergarten environments. Unlike existing systems focused on school-level or corporate attendance, this system targets young children's security, especially during retrieval by guardians. The use of FaceAPI.js ensures that facial recognition is performed entirely on the client-side, reducing privacy risks and avoiding the need for image storage. Additionally, the integration with the Telegram Bot API allows for immediate PIN notifications to authorized guardians during pick-up, enhancing trust and accountability. Hosting on an online VPS ensures data sovereignty, faster access, and secure transmission via HTTPS. While similar projects exist in general education, few address the unique requirements of kindergartens namely low-tech environments, non-reading-age users, and real-time guardian verification. This product bridges that gap with a lightweight, accessible, and scalable solution.

5. Conclusion or Future Work

The system enhances child safety and attendance efficiency through biometric face recognition and secure pick-up verification. It is fully deployable online and supports usage across multiple schools. Future work may explore mobile app integration, improved facial recognition models, and role-based access for different user types.

REFERENCE LIST

- Paul Bischoff. (2024, October 24). *Facial recognition technology (FRT): Which countries use it? [100 analyzed]*. Comparitech. <https://www.comparitech.com/blog/vpn-privacy/facial-recognition-statistics/>
- Selwal, A., Sharma, D., Mann, M., Chakraborty, S., Balas, V. E., & Lieh, O. E. (2024). *Leveraging Computer Vision to Biometric Applications*. Chapman and Hall/CRC. <https://doi.org/10.1201/9781032614663>

PERFORMANCE ANALYSIS ON QUIC AND TCP IN 5G ENVIRONMENT USING NS3

Muhammad Eizwan Bin Ediastrari, Puan Rafiza Binti Ruslan

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022881822@student.uitm.edu.my, rafiza.ruslan@uitm.edu.my

Abstract

To support new technologies like smart cities, autonomous vehicles, and low-latency communication, 5G networks must be deployed quickly and efficiently. This requires reliable and high-performance transport protocols. Although TCP is widely used, it struggles in 5G environments, especially with mmWave links due to high latency, frequent packet loss, and misinterpreting signal issues as congestion. QUIC, developed by Google, is a modern protocol designed to overcome these issues with features like multiplexing, built-in encryption, and faster connection setup. This project uses Network Simulator 3 (NS-3) to compare TCP and QUIC in a simulated 5G setting. The focus is on measuring throughput, delay, and packet loss under different conditions, such as varying traffic, frequency bands, and distances. Results show that QUIC consistently performs better than TCP, especially in maintaining high throughput and low delay. These findings suggest that QUIC is a strong candidate for use in future 5G networks and can help improve protocol performance in modern wireless systems.

Keywords: TCP, NS-3, QUIC, 5G, wireless networks, mmWave,

1. Introduction

The rapid growth of 5G technology supports advanced applications such as smart cities, autonomous vehicles, and ultra-reliable low-latency communications (Jeddou et al., 2023). These use cases demand highly efficient and reliable transport protocols to maintain performance in variable wireless conditions. However, traditional protocols like TCP face significant limitations in 5G environments due to increased latency, frequent packet loss, and misinterpretation of wireless errors as congestion (Manzoor et al., 2023). As a modern alternative, QUIC, developed by Google offers improvements such as multiplexed streams, integrated encryption, and faster connection setup time (Kumar & Dezfouli, 2025). This project aims to evaluate the performance of TCP and QUIC under simulated 5G scenarios using the NS-3 simulator. The main objective is to compare both protocols in terms of throughput, delay, and packet loss to determine their suitability for next-generation wireless networks.

2. Methodology

This project uses Network Simulator 3 (NS3) version 3.37 with the integration of the 5G LENA module and the QUIC protocol module to simulate a realistic 5G environment. Three scenarios were developed to evaluate TCP and QUIC performance: varying distances, different frequency bands, and simulating a file download. Each scenario focused on measuring throughput, delay, and packet loss. The simulations were executed on Ubuntu, and custom scripts were written to define traffic patterns and simulation parameters. Data was collected from NS3 output logs and visualized using graphs for comparison. This structured approach allowed for a clear analysis of how each protocol responds under different 5G network conditions.

3. Results / Findings

The results from the simulations indicate that QUIC consistently delivers better performance than TCP across all tested scenarios in a 5G environment. In the first scenario, where node distances were varied, QUIC was able to maintain higher throughput and lower delay even as the distance increased, while TCP suffered from increased latency and packet loss. In the second scenario involving different frequency bands, QUIC demonstrated better adaptability and remained stable at both lower and higher frequencies, whereas TCP performance degraded significantly. In the file download scenario, QUIC completed the transfers more efficiently, with faster completion times and reduced packet loss compared to TCP. The overall analysis shows that QUIC provides more stable and reliable communication under changing 5G conditions. These findings suggest that QUIC is more suitable for modern 5G applications, especially those requiring low latency and high-speed data transmission such as video streaming, IoT, and real-time services.

4. Novelty of Research / Product / Project

This research offers a new perspective by comparing TCP and QUIC in a simulated 5G environment using NS3. Unlike general studies on transport protocols, this project uses the 5G LENA module and a QUIC implementation to test both protocols in realistic 5G conditions. The use of updated simulation tools and different scenarios such as changing distances, frequency bands, and file download tests makes the study more practical and relevant. It provides a clearer understanding of how each protocol performs in real network situations. This project also introduces a flexible simulation setup that future researchers can use for further testing, including experiments on real hardware or with other transport protocols.

5. Conclusion or Future Work

This project showed that QUIC performs better than TCP in a simulated 5G environment. Future work includes testing on real 5G hardware, evaluating other protocols like HTTP/3, and exploring different network setups and congestion control methods to better reflect real-world conditions.

REFERENCE LIST

- Jeddou, S., Diez, L., Abdellah, N., Baina, A., & Calvo, R. A. (2023). On the Performance of Transport Protocols Over mmWave Links: Empirical Comparison of TCP and QUIC. *IEEE Open Journal of the Communications Society*, 4, 2596–2608. <https://doi.org/10.1109/OJCOMS.2023.3325764>
- Kumar, P., & Dezfouli, B. (2025). kQUIC: A Kernel-Based Quick UDP Internet Connections (QUIC) Transport for IoT. *IEEE Access*, 13, 100392–100404. <https://doi.org/10.1109/ACCESS.2025.3578120>
- Manzoor, S., Manzoor, M., Manzoor, H., Adan, D. E., & Kayani, M. A. (2023). Which Simulator to Choose for Next Generation Wireless Network Simulations? NS-3 or OMNeT++ †. *Engineering Proceedings*, 46(1). <https://doi.org/10.3390/engproc2023046036>

VPN PERFORMANCE ANALYSIS OF OPENVPN AND WIREGUARD FOR EDUCATIONAL NEEDS IN UiTM

Muhammad Nuruddin Bin Ariffin, Rafiza Binti Ruslan

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023189375@student.uitm.edu.my, rafiza.ruslan@uitm.edu.my

Abstract

This study compares the performance of WireGuard and EduVPN (OpenVPN) in UiTM's campus network, particularly during peak usage when congestion, CPU utilization, and service disconnection are typical. By employing controlled testing using performance metrics throughput, packet loss, delay, and jitter across five time intervals and three video resolutions (480p, 720p, 1080p), this study compares the two VPN protocols using the Quality of Service (QoS) Index. The results show WireGuard's improved performance and stability in high-bandwidth settings with 96% throughput at 1080p during peak hours than OpenVPN at 40%. The results affirm UiTM's migration partially or completely to WireGuard in a bid to cater to academic and administrative demands with better scalability, efficiency, and user experience.

Keywords: WireGuard, OpenVPN, VPN performance, QoS Index, UiTM network, video streaming

1. Introduction

UiTM is facing VPN congestion and CPU overload with increasing remote access demands, particularly during peak student usage. EduVPN (OpenVPN) is secure but not performing well with a heavy user load, causing frequent disconnections and a poor quality of service. The aim of this study is to compare and evaluate the performance of OpenVPN and WireGuard in the UiTM setup using objective QoS metrics. It is targeted at improving accessibility for student, research, and administrative users in the face of remote work and learning. It involves throughput measurement, delay, jitter, and packet loss on a controlled lab setup mimicking real use by video streaming with varied resolutions.

2. Methodology

The experiment used a controlled experimental design involving OpenVPN and WireGuard using a home-lab network environment, simulating typical UiTM usage patterns. Traffic was captured and examined using Wireshark during YouTube video streaming at 480p, 720p, and 1080p resolutions. Experiments were conducted at five time points (8AM, 2PM, 5PM, 9PM, 12AM) to simulate peak and off-peak network use. Parameters including throughput, delay, jitter, and packet loss were quantified and converted to a QoS Index to perform comparison analysis. Hardware used included a PC and laptop with average student-specification CPUs to give representative performance. Data was analyzed on Microsoft Excel using graphs and tables to encapsulate findings.

3. Results / Findings

WireGuard consistently outperformed OpenVPN across all tested metrics. At 8AM, a peak hour, WireGuard maintained a 96% throughput rate at 1080p resolution, whereas OpenVPN dropped to 40%. Across the entire day, WireGuard scored a total QoS Index of 3.20 compared to OpenVPN's 3.02, indicating better stability and efficiency. WireGuard also experienced lower jitter and packet loss, contributing to smoother video playback. These results suggest that WireGuard offers more reliable service for video-based e-learning and remote work, significantly reducing lag and buffering issues. The results justify its consideration as a future standard or complementary protocol in UiTM's VPN infrastructure. WireGuard consistently outperformed OpenVPN across all tested metrics. At 8AM, a peak hour, WireGuard maintained a 96% throughput rate at 1080p resolution, whereas

OpenVPN dropped to 40%. Across the entire day, WireGuard scored a total QoS Index of 3.20 compared to OpenVPN's 3.02, indicating better stability and efficiency. WireGuard also experienced lower jitter and packet loss, contributing to smoother video playback. These results suggest that WireGuard offers more reliable service for video-based e-learning and remote work, significantly reducing lag and buffering issues. The results justify its consideration as a future standard or complementary protocol in UiTM's VPN infrastructure.

4. Novelty of Research / Product / Project

This study uniquely applies real-world streaming conditions and QoS-driven testing to assess the performance of OpenVPN and WireGuard in an educational setting. Compared to previous research involving theoretical or simulation-only comparison, this study uses a reproducible lab setup that mimics typical student and instructor usage. This study is a contribution with the direct presentation of a performance trade-off, and the effect of protocol structure on usability and scalability. The support of various video resolutions and time-based measures provides realistic demand scenarios. Lightweight kernel-based VPN WireGuard introduces new opportunities in reducing CPU utilization and maximizing the efficiency of UiTM's digital infrastructure.

5. Conclusion or Future Work

The project concludes that WireGuard offers a more efficient and scalable VPN solution than OpenVPN for UiTM's academic needs. Future work may explore cloud-based deployments, authentication integration, and expanded performance testing in real campus environments.

REFERENCE LIST

- Akinsanya, E. O., & Okeke, P. D. (2024). Virtual Private Networks (VPN): A Conceptual Review of Security Protocols and Their Application in Modern Networks. *Engineering Science & Technology Journal*, 5(4), 1452–1472. <https://doi.org/10.51594/estj/v5i4.1076>
- Barya, N., Ashraf, A., Kaur, M., & Gairola, S. U. (2022). Classification and Analysis of Virtual Private Network. *International Conference on Cyber Resilience, ICCR 2022*. <https://doi.org/10.1109/ICCR56254.2022.9996015>
- Ghanem, K., Ugwuanyi, S., Hansawangkit, J., McPherson, R., Khan, R., & Irvine, J. (2022). Security vs Bandwidth: Performance Analysis between IPsec and OpenVPN in Smart Grid. *2022 International Symposium on Networks, Computers and Communications, ISNCC 2022*. <https://doi.org/10.1109/ISNCC55209.2022.9851717>
- Wahanani, H. E., Idhom, M., & Mandyartha, E. P. (2021). Analysis of Streaming Video on VPN Networks Between OpenVPN and L2TP/IPSec. *Proceedings - 2021 IEEE 7th Information Technology International Seminar, ITIS 2021*. <https://doi.org/10.1109/ITIS53497.2021.9791504>

PERFORMANCE ANALYSIS ON WPA2-PSK WIRELESS NETWORK UNDER DOS ATTACKS

Muhammad Wafi Zamri, Rafiza Ruslan

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022615576@student.uitm.edu.my, rafiza.ruslan@uitm.edu.my

Abstract

Wireless networks play a critical role in modern connectivity, with WPA2-PSK being one of the most used security protocols to ensure data privacy and integrity. However, this protocol is still vulnerable to certain types of cyberattacks, particularly Denial-of-Service (DoS) attacks, which can significantly disrupt network performance. This research was conducted to investigate the impact of DoS attacks on a WPA2-PSK secured wireless network. The objectives of the study were to set up a controlled wireless network environment using WPA2-PSK, to simulate DoS attacks using Aireplay-ng and MDK4 tools, and to analyse the network's performance before and after the attacks. Key performance metrics such as bitrate, transfer rate, jitter, and packet loss were measured during the experiment. The findings revealed that both Aireplay-ng and MDK4 caused substantial degradation in network performance, confirming the susceptibility of WPA2-PSK networks to DoS attacks. This highlights the importance of developing stronger defense mechanisms for wireless networks.

Keywords: *WPA2-PSK, DoS, Network Security*

1. Introduction

Wireless networks are an essential part of modern communication, with WPA2-PSK being a widely adopted security protocol for protecting data transmission. However, despite its encryption capabilities, WPA2-PSK remains susceptible to certain cyber threats, particularly Denial-of-Service (DoS) attacks that can severely impact network availability and performance. This research focuses on analysing the performance of a WPA2-PSK wireless network before and after exposure to DoS attacks. The objectives of the study are to set up a secure WPA2-PSK wireless environment, simulate DoS attacks using Aireplay-ng and MDK4 tools, and evaluate the impact on performance based on key metrics including bitrate, transfer rate, jitter, and packet loss. The scope of this research is limited to a controlled lab environment where the performance data is collected and analysed to determine the extent of network degradation caused by the attacks.

2. Methodology

This research was carried out in a controlled lab environment using a WPA2-PSK secured wireless network. A standard home router and Linux-based devices were used to simulate real-world network conditions. The study employed two DoS attack tools, Aireplay-ng and MDK4, to test the resilience of the network. Initially, baseline performance data was collected without any interference, focusing on four key metrics: bitrate, transfer rate, jitter, and packet loss. Tools such as iPerf and Wireshark were used to measure and analyse these values. DoS attacks were then simulated at various time intervals (30s to 150s) using each tool individually. During each attack, the same performance metrics were monitored and recorded. The results before and after the attacks were compared to evaluate the level of disruption caused. All tests were conducted ethically in an isolated network to ensure no harm to external systems.

3. Results / Findings

The results of this study showed that Denial-of-Service (DoS) attacks using Aireplay-ng and MDK4 had a clear negative impact on the WPA2-PSK wireless network. Before the attacks, the network performance was stable, with high bitrate and transfer rate, low jitter, and minimal packet loss. When Aireplay-ng was used, the network started to show signs of disruption. The bitrate and transfer rate dropped, while jitter and packet loss increased slightly. However, when MDK4 was used, the impact was more severe. The network experienced a major drop in performance, with higher packet loss and unstable jitter values. In some cases, devices were disconnected from the network entirely. The comparison showed that MDK4 caused more damage than Aireplay-ng. Overall, the findings confirm that WPA2-PSK networks can be seriously affected by DoS attacks, leading to slower speeds, unstable connections, and service interruption.

4. Novelty of Research / Product / Project

This research offers a practical study on how Denial-of-Service (DoS) attacks affect the performance of WPA2-PSK wireless networks. Unlike studies that focus on cracking encryption, this project focuses on performance disruption using real tools like Aireplay-ng and MDK4 in a controlled network environment. The novelty of this research lies in comparing two different DoS tools and analysing their effects based on specific network metrics: bitrate, transfer rate, jitter, and packet loss. The use of time-based attack intervals also adds uniqueness by showing how network performance changes over different durations. This study highlights that WPA2-PSK networks can be disrupted without breaking encryption, pointing to a serious security concern in terms of network availability.

5. Conclusion or Future Work

This study confirms that WPA2-PSK wireless networks are vulnerable to DoS attacks, leading to significant performance drops. Future work may focus on testing mitigation techniques, exploring WPA3 security, or analysing the effectiveness of intrusion detection systems in preventing such attacks in real-time network environments.

REFERENCE LIST

- Adaramola, O. J., & Aliu, O. H. (2025). Evaluating the Impact of Denial-of-Service (DoS) Attacks on Enterprise Networks Using Optimized Network Engineering Tools (OPNET 14.5) and Machine Learning. *International Journal of Scientific Research in Network Security and Communication*, 13(2), 1–11. <https://doi.org/10.26438/ijsrnsc.v13i2.271>
- Alhamry, M., & Alomary, A. (2022). Exploring Wi-Fi WPA2-PSK protocol weaknesses. 2022 *International Conference on Data Analytics for Business and Industry, ICDABI 2022*, 190–195. <https://doi.org/10.1109/ICDABI56818.2022.10041465>
- Adaramola, O. J., & Aliu, O. H. (2025). Evaluating the Impact of Denial-of-Service (DoS) Attacks on Enterprise Networks Using Optimized Network Engineering Tools (OPNET 14.5) and Machine Learning. *International Journal of Scientific Research in Network Security and Communication*, 13(2), 1–11. <https://doi.org/10.26438/ijsrnsc.v13i2.271>
- Sharma, S., & Mittal, M. (2019). Detection and prevention of de-authentication attacks in real-time scenarios. *International Journal of Innovative Technology and Exploring Engineering*, 8(10), 3324–3330. <https://doi.org/10.35940/ijitee.J1217.0881019>

PERFORMANCE ANALYSIS OF WORMHOLE AND SYBIL ATTACK USING DSDV ROUTING PROTOCOL IN VANET

Nur Asmalina Binti Mohammad Naim, Dr. Ahmad Yusri bin Dak

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022491016@student.uitm.edu.my, ahmadyusri@uitm.edu.my

Abstract

Vehicular Ad-Hoc Networks (VANETs) allow vehicles and infrastructure to communicate in real-time (V2V and V2I) to aid intelligent transportation systems. VANETs are extremely vulnerable to cyberattacks that undermine routing and communication integrity. The present study examines the effects of two major threats Wormhole and Sybil attacks on the Destination-Sequenced Distance Vector (DSDV) routing protocol in VANETs. Simulations were conducted using the Network Simulator 2 (NS-2) in conjunction with SUMO to mimic actual vehicular mobility scenarios. The key performance metrics such as throughput, Packet Delivery Ratio (PDR), End-to-End Delay (EED), and routing overhead evaluated with varying number of nodes and packet sizes. Results indicate both Wormhole and Sybil attacks violate network performance, with Sybil attacks disturbing more in dense situations 31.7% versus 23.5% for Wormhole attacks. These findings indicate vulnerabilities in DSDV under attacks and the need for the implementation of more secure routing protocols in VANETs to offer reliable and secure communications in future connected and autonomous vehicle systems.

Keywords: VANET, DSDV, Wormhole Attack, Sybil Attack, NS-2, SUMO

1. Introduction

As autonomous and connected cars are becoming more common, VANETs have emerged as a key element of Intelligent Transportation Systems (ITS). However, VANETs are increasingly vulnerable to cyberattacks, such as Sybil and Wormhole attacks, that violate routing efficiency and network trust. This paper aims to investigate how such attacks influence the DSDV routing protocol in VANETs. The objectives are to replicate attack scenarios, observe network performance metrics, and identify protocol vulnerabilities under malicious behavior. The research emulates a VANET scenario with variable node density and packet size by NS-2 and SUMO. Performance metrics such as throughput, PDR, EED, and routing overhead are compared. The scope aims protocol level attack simulations under urban mobility scenarios using TCP traffic models and investigating routing attacks' impacts on communication reliability of real-time vehicular networks.

2. Methodology

This study employs a systematic method with network design, simulation, and analysis phases. First, the VANET topology was simulated using SUMO to mimic real-world vehicle movement on a 3114m x 2106m terrain. The mobility trace was implemented in NS-2 to evaluate the performance of the DSDV routing protocol. The following scenarios were simulated with node densities are different from 10 nodes until 100 nodes and packet sizes are different which are 500 bytes until 2500 bytes. Simulations of Wormhole and Sybil attacks were done by making custom changes to the DSDV protocol in TCL scripting. Performance was tested based on four main parameters which are throughput, PDR, EED, and routing overhead. Trace files were analyzed using AWK scripts, and outputs were graphed using Gnuplot. Wormhole attack was simulated by creating a virtual link used to tunnel packets, and Sybil attack was simulated by injecting several pseudonyms. Each case was simulated with and without attacks to contrast for analysis. The simulation outputs were compared to quantify the performance degradation introduced by each category of attacks.

3. Results

The simulation results indicate that Wormhole and Sybil attacks have a profound impact on DSDV routing performance. For the high node density scenario, Sybil attack caused the most performance deterioration, reducing throughput and PDR and increasing EED and routing overhead. Sybil attacks caused, on average, 31.7% performance decline, and Wormhole attacks caused, on average, 23.5% decline. In the scenario of low-density or smaller packet sizes, the performance degradation was lighter but nonetheless notable. The results highlight that Sybil attacks not only flood the network with bogus identities but also distort routing tables, creating ambiguity and delay in packet forwarding. Wormhole attacks, on the contrary, create shortcuts that attract traffic but compromise path accuracy. These findings confirm that DSDV is highly vulnerable in adversarial networks, especially in dense networks, and lacks native mechanisms to mitigate sophisticated routing attacks.

4. Novelty of Research

This work introduces an end-to-end simulation infrastructure combining SUMO and NS-2 to evaluate the real-time impact of next-generation cyberattacks on DSDV-based VANETs. Unlike previous work focusing on detection, this work emphasizes the study of performance degradation under realistic urban mobility. The dual-scenario framework is a novel contribution: distinguishing between node densities and packet sizes, which provides a comprehensive view of attack effect under various settings. Besides, the assessment mimics Sybil attacks by altering routing tables with pseudonyms a close replica of the actual intruders in the real world. Replicability and scalability are ensured using open-source tools. The study adds to the body of knowledge by uncovering basic weaknesses in DSDV and the need for secure, attack-aware routing protocols for upcoming vehicular networks. It provides a basis for designing intrusion detection systems and secure routing methods tailored to VANET environments.

5. Conclusion and Future Work

This research confirms that Wormhole and Sybil attacks deteriorate DSDV performance in VANETs significantly. Future work will be focused on the integration of machine learning enabled intrusion detection systems with secure routing enhancements. Extensions to hybrid protocols and real-time detection systems are the need of the hour to improve VANET resilience in dynamic city environments.

REFERENCE LIST

- Al-Nasir, A. W. K., & Mubarek, F. S. (2024). AODV, DSDV, and DSR Protocols of Routing: A Comparative Study in VANETs Using Network Simulator-2. *Samarra Journal of Pure and Applied Science*, 6(1), 211–222. <https://doi.org/10.54153/sjpas.2024.v6i1.662>
- Burange, A. W., & Deshmukh, M. V. M. (2022). *Detection of Rank, Sybil and Wormhole Attacks on RPL Based Network Using Trust Mechanism*.
- Chaubey, N. K., & Yadav, D. (2022). Detection of Sybil attack in vehicular ad hoc networks by analyzing network performance. *International Journal of Electrical and Computer Engineering*, 12(2), 1703–1710. <https://doi.org/10.11591/ijece.v12i2.pp1703-1710>
- Devanandanan, P. (2024). *Cyber Security In Electric Vehicle: A Comprehensive Review Paper*. <https://doi.org/10.56726/Irjmets56581>
- Ghawry, M. Z., Amran, G. A., Alsalman, H., Ghaleb, E., Khan, J., Al-Bakhrani, A. A., Alziadi, A. M., Ali, A., & Ullah, S. S. (2022). An Effective Wireless Sensor Network Routing Protocol Based on Particle Swarm Optimization Algorithm. *Wireless Communications and Mobile Computing*, 2022. <https://doi.org/10.1155/2022/8455065>

CLOUD-BASED SURVEILLANCE SYSTEM FOR UNSUPERVISED ONLINE EXAMINATIONS USING MACHINE LEARNING

Nur Athirah Izzati Binti Zul, Ros Syamsul Bin Hamid

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022835854@student.uitm.edu.my, rossyamsul@uitm.edu.my

Abstract

Online examinations have become more common, especially since the COVID-19 pandemic. While this method makes it easier for students to take exams from anywhere, it also increases the risk of cheating because there is no physical invigilator. This project introduces a cloud-based surveillance system that can monitor online examinations without human supervision. The system uses machine learning to analyze recorded videos of students during their exams. It checks for cheating behaviors such as smartphone usage and the presence of multiple people. Videos are uploaded to Firebase Storage, and if any suspicious behavior is found, an alert is sent to the invigilator through a Telegram bot. The system was built using Python, OpenCV, MediaPipe, YOLOv8, HTML, CSS, and JavaScript. The project was tested for its functionality, usability (through User Acceptance Testing), and machine learning accuracy. The results showed that the system worked well in detecting suspicious behavior and was easy to use. This project provides a useful tool to help institutions manage online exams more securely and fairly.

Keywords: *cloud-based system, machine learning, online examination, YOLOv8, Firebase, Telegram alert*

1. Introduction

The main objective of this project is to build a cloud-based surveillance system for monitoring students during online examinations using machine learning. The system is designed to detect cheating behaviors such as smartphone usage and the presence of multiple people without requiring a human invigilator to monitor the exam in real time. To achieve this, the system records students' webcam videos during the exam and uploads them to cloud storage for later analysis. Machine learning models are used to analyze the video and detect any suspicious activities. If any cheating is detected, the system sends an alert to the invigilator through a Telegram bot. The scope of this project includes developing the exam interface, recording and uploading videos, analyzing video content, and generating alerts. The main users of this system are exam invigilators and students. This project helps create a fair and secure environment for conducting online examinations.

2. Methodology

The project used the Waterfall model as the software development method. The process started with information gathering, followed by planning, system design, development, testing, and documentation. The system was developed using Python and integrated with Firebase Storage and Firebase Realtime Database to store video recordings and student information. The machine learning models used were YOLOv8 for pose detection and a pre-trained TensorFlow model for smartphone detection. MediaPipe was used for hand and movement tracking. Students accessed a web page built with HTML, CSS, and JavaScript to take exams. Their videos were recorded using a webcam and automatically uploaded to Firebase when the exam was completed. The backend system checks for new videos and runs detection code to analyze each video. If cheating is detected, a message is sent to a Telegram bot linked to the invigilator. The system was tested through functionality checks, User Acceptance Testing (UAT), and performance evaluation of the machine learning models.

3. Results / Findings

The system was tested for its ability to detect cheating behaviors and to function properly in a real exam setup. Functionality testing confirmed that all core features worked as expected, including video recording, video uploading, analysis, and Telegram alerts. The User Acceptance Test (UAT) involved 20 respondents, and most of them agreed that the system was easy to use and performed well. In terms of machine learning performance, the system achieved an 80% detection rate for smartphone use and 60% detection rate for detecting multiple people. The overall performance was 70%, which shows that the system is capable of supporting online invigilation tasks. The alerts were received in real-time through Telegram, allowing invigilators to take immediate action. These findings support the use of this system as a tool for reducing cheating during online exams.

4. Novelty of Research / Product / Project

This project provides a new solution by combining cloud computing and machine learning to detect cheating in online exams. Unlike traditional systems that require human invigilators, this system works automatically using pre-recorded videos. It uses object detection models and pose estimation techniques to find signs of cheating, such as extra people or smartphone use. Alerts are sent in real-time using Telegram, which makes it easy for invigilators to respond quickly. The system is web-based and easy to access for both students and invigilators. It also does not require high-cost hardware or complex infrastructure. This makes it suitable for educational institutions that want a reliable and scalable solution for monitoring online exams. The use of Firebase and machine learning models like YOLOv8 and MediaPipe helps ensure good performance and secure storage of student data.

5. Conclusion or Future Work

This project successfully developed a cloud-based monitoring system that helps detect cheating in online exams using machine learning. For future work, the system could be improved by adding live-stream monitoring, increasing detection accuracy, and supporting more types of cheating behavior.

REFERENCE LIST

- Choudhry, N., Abawajy, J., Huda, S., & Rao, I. (2023). A Comprehensive Survey of Learning Methods for Surveillance Videos Anomaly Detection. *IEEE Access*, 11, 114680–114713. <https://doi.org/10.1109/ACCESS.2023.3321800>
- Lei, Y., & Tang, W. (2023). Research on the Construction of Examination System Based on Cloud Storage in Open Education Environment. *Advances in Computer Signals and Systems*, 7(7). <https://doi.org/10.23977/acss.2023.070715>
- Nassif, A. B., Talib, M. A., Nasir, Q., & Dakalbab, F. M. (2021). Machine Learning for Anomaly Detection: A Systematic Review. *IEEE Access*, 9, 78658–78700. <https://doi.org/10.1109/access.2021.3083060>
- Sarker, I. H. (2021). Machine learning: Algorithms, real-world applications and research directions. *SN Computer Science*, 2, 160. <https://doi.org/10.1007/s42979-021-00592-x>

SMART QUAIL COOP: IOT BASED PROTOTYPE FOR QUAIL MONITORING WITH ENVIRONMENTAL CONTROL AND AI FOR AUTOMATED PREDATOR DETECTION

Nur Diyanah Binti Talat Mahmud, Rashidah Binti Ramle

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022818968@student.uitm.edu.my, rashidahramle@uitm.edu

Abstract

The poultry industry, particularly within small-scale operations, encounters significant challenges related to inadequate environmental control and vulnerability to predators, which negatively impact animal welfare and overall productivity. This project presents the development of a Smart Quail Coop prototype that leverages Internet of Things (IoT) and Artificial Intelligence (AI) technologies to automate environmental regulation, predator detection, and data monitoring. The prototype utilizes an ESP32 microcontroller interfaced with a DHT22 sensor and a relay module to control key actuators, including a cooling fan, heat lamp, exhaust fan, and misting device. An ESP32-CAM, integrated with OpenCV and YOLOv3, enables image-based detection of predators, while real-time alerts are disseminated via Telegram. Collected data is systematically logged to Firebase and Google Sheets for further analysis. Comprehensive functional and network testing validated the prototype's ability to maintain stable environmental conditions and transmit alerts reliably over a Wi-Fi connection. The AI component demonstrated accurate detection of nearby predators, though performance declined at extended distances. Usability evaluation through the System Usability Scale (SUS) indicated a high level of user satisfaction, affirming the prototype's practicality for daily agricultural use. The findings underscore the potential of adopting a cost-effective, scalable smart farming solution to improve livestock welfare and reduce manual labor. Future enhancements may include extending the detection range, incorporating night vision, and enabling automated emergency notifications to authorities in the event of more hazardous intrusions, such as snakes.

Keywords: *Quails, Prototype, IoT Environmental Control, AI Predator Detection, SUS, YOLOv3*

1. Introduction

Quail coops must maintain optimal temperature and humidity levels, especially during early growth stages, to ensure animal welfare and productivity. Newly hatched quails require temperatures around 35°C in the first week, gradually reducing to 21–28°C by week four (Fabreag et al., 2019), with humidity kept between 30–80% (Nurwarsito et al., 2021). However, small-scale farms face difficulties in achieving and maintaining these conditions manually. In addition, predator threats such as stray cats or snakes remain a significant concern, especially in rural and semi-urban setups. In order to address these challenges, a Smart Quail Coop prototype was developed using IoT and AI to automate environmental control and predator detection. The prototype incorporates ESP32, ESP32-CAM, DHT22, OpenCV, YOLOv3, and Telegram for real-time monitoring and alerts. The project aims to improve livestock safety and reduce labor, with performance evaluated through functional, network, and usability testing.

2. Methodology

This project followed the Waterfall Model, consisting of six phases: information gathering, planning, design and development, implementation and testing, analysis, and documentation. The process began with reviewing literature on quail farming needs and predator threats to define the prototype's objectives. Planning involved selecting suitable hardware and software, including ESP32, ESP32-CAM, DHT22, and a relay module. The IoT-based component was developed to automate control of

environmental devices, while OpenCV and YOLOv3 were used for AI-based cat detection. Telegram was integrated for real-time alerts. Implementation and testing were conducted in a controlled environment to verify functionality, with network testing confirming reliable data transmission to Telegram and Google Sheets. Usability was assessed using the System Usability Scale (SUS), following Cheah et al. (2023), to evaluate user satisfaction and ease of use. Data from all tests were analysed to identify strengths and areas for improvement, and documentation was prepared for future development.

3. Results

The Smart Quail Coop prototype underwent functional, network, and usability testing. For environmental control, device activation times ranged from 1.32 to 1.52 seconds, while Telegram alerts were sent within 3.17 to 3.84 seconds. Predator detection worked best at 0.5 meters, with the buzzer activating in 5.13 seconds and alerts within 3.73 to 3.97 seconds. At 1.5 meters, detection response slowed, with the buzzer at 9.77 seconds and alerts over 6 seconds. Usability testing, based on the System Usability Scale (SUS) by Cheah et al. (2023), yielded an average score of 73.0 from five respondents, indicating a good level of usability. Overall, the prototype was effective, responsive, and suitable for small-scale farm use.

4. Novelty of Project

The Smart Quail Coop introduces a novel integration of IoT and AI to address both environmental control and predator detection in small-scale poultry farming. Unlike traditional setups, this prototype combines automated temperature and humidity regulation with real-time predator detection using an ESP32-CAM and YOLOv3. It sends instant alerts via Telegram and logs data to Firebase and Google Sheets, enabling remote monitoring. The use of low-cost components makes it accessible for rural farmers. Additionally, usability testing using the System Usability Scale (SUS) ensures the prototype is not only functional but also user-friendly. This multi-featured, affordable design offers a scalable smart farming solution.

5. Conclusion

The Smart Quail Coop successfully integrates IoT and AI for automated environmental monitoring and predator detection. Future improvements include enhancing AI accuracy with better hardware, adding backup power for reliability, and developing a mobile interface. Field testing and emergency alert features will further support real-world deployment in small-scale farming environments.

REFERENCE LIST

- Cheah, W. H., Mat Jusoh, N., Aung, M. M. T., Ab Ghani, A., & Mohd Amin Rebuan, H. (2023). Mobile Technology in Medicine: Development and Validation of an Adapted System Usability Scale (SUS) Questionnaire and Modified Technology Acceptance Model (TAM) to Evaluate User Experience and Acceptability of a Mobile Application in MRI Safety Screening. *Indian Journal of Radiology and Imaging*, 33(1), 36–45. <https://doi.org/10.1055/s-0042-1758198>
- Fabreag, D. C. B., Olan, D. A. M., Sangalang, N. A. D., & Magadia, R. M. (2019). *Design and Development of Temperature Regulated and Light Scheduled Environment for Raising Japanese Quails with Automated Manure Collection System*. <https://doi.org/10.13140/RG.2.2.33273.80488>
- Nurwarsito, H., Trisnawan, P. H., & Putra, Z. F. D. (2021). Implementation Of Quail Cage Monitoring System Using Wireless Sensor Network with Lora Protocol. *Proceeding - 2021 2nd International Conference on ICT for Rural Development, IC-ICTRuDev 2021*. <https://doi.org/10.1109/IC-ICTRuDev50538.2021.9655712>

A HYBRID INTRUSION DETECTION SYSTEM (IDS) USING SNORT AND MACHINE LEARNING

Nur Hazwani binti Zainol Abiden, Dr Zulfikri bin Paidi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022496338@student.uitm.edu.my, fikri@uitm.edu.my

Abstract

This project was motivated by the persistent challenge of effectively detecting sophisticated and evolving cyber threats, particularly "zero-day" attacks, which traditional signature-based Intrusion Detection Systems (IDS) like Snort often miss, leading to significant vulnerabilities and alert fatigue. The novelty of this approach lies in developing a hybrid IDS that seamlessly integrates Snort's established rule-based detection with the adaptive, anomaly-based capabilities of machine learning, thereby combining their strengths to overcome individual limitations. The actual work performed involved a comprehensive System Development Life Cycle, from detailed information gathering and meticulous planning of hardware and software requirements (including Snort, Python, Jupyter Notebook, and VirtualBox) to the design and development of the system's architecture and flowchart. A core part of the implementation involved training a Random Forest classifier on the dataset for robust anomaly detection. The findings obtained demonstrate the system's exceptional performance; functionality testing confirmed its accurate distinction between normal and malicious traffic without false positives or negatives, while network testing showcased its stability and efficiency with an average response time of 1.47 milliseconds under varying load conditions. The Random Forest model achieved perfect scores across key metrics (accuracy, precision, recall, F1-score) and an AUC of 1.00, underscoring its superior capability in classifying network traffic. This project successfully validated the hybrid model as a more comprehensive and adaptive defence against the dynamic landscape of modern cyber threats.

Keywords: Hybrid IDS, Snort, Machine Learning, Intrusion Detection, Random Forest, Cyber Security

1. Introduction

Effective Intrusion Detection Systems (IDS) are crucial for network protection. Traditional signature-based systems like Snort struggle with novel "zero-day" attacks, while machine learning offers adaptive anomaly detection. This project aims to develop a hybrid IDS integrating Snort with machine learning to overcome these limitations. Objectives include developing a prototype of this hybrid system and evaluating its performance using confusion matrix analysis. The project scope involves system development using Python in Jupyter Notebook, employing the Random Forest algorithm, and assessing effectiveness via functionality and network testing in a laptop environment.

2. Methodology

This project adopted the Waterfall model of the System Development Life Cycle (SDLC), including Information Gathering, Planning, Design, Development, Implementation, Testing, Analysis, and Documentation. Planning identified hardware (laptop) and software (Snort, Python, Jupyter Notebook, Scikit-learn, VirtualBox with Ubuntu and Kali Linux). Design involved conceptualizing the system architecture, illustrating how network traffic is processed by both Snort and a machine learning component. Development focused on implementing the hybrid system, training a Random Forest classifier on a labelled dataset for anomaly detection. Implementation and testing rigorously evaluated the prototype through functionality tests (accurate distinction between traffic types) and network tests (latency, load, stress, and monitoring) for stability and efficiency. Performance analysis for the machine learning model was conducted using a confusion matrix.

3. Results / Findings

The hybrid intrusion detection system's evaluation yielded compelling results. Functionality testing confirmed accurate distinction between normal and malicious network traffic, consistently triggering appropriate alerts without false positives or negatives. Network testing demonstrated robustness, showcasing stability and efficiency under varying load conditions, maintaining consistent and low response times. For the machine learning component, the Random Forest model exhibited exceptional performance. Confusion matrix analysis revealed excellent scores across all key metrics (accuracy, precision, recall, F1-score). Furthermore, its Receiver Operating Characteristic (ROC) curve showed a very high Area Under the Curve (AUC), underscoring the model's superior capability in effectively classifying network traffic and differentiating between benign and malicious activities.

4. Novelty of Research / Product / Project

This research introduces a novel hybrid Intrusion Detection System that strategically advances cybersecurity by integrating Snort's established signature-based detection with advanced machine learning capabilities. This approach significantly enhances the ability to recognize unseen attack patterns, improving zero-day threat detection and reducing false negatives, unlike traditional standalone systems. The system offers a more robust, adaptive, and comprehensive defence against dynamic cyber threats, effectively mitigating alert fatigue. The Random Forest model ensures robust classification even with noisy or high-dimensional network data, making it highly suitable for real-time security monitoring. Rigorous functionality, performance, and network simulation testing validates the system's practicality for academic and experimental environments. This project contributes a replicable framework to intelligent intrusion detection, aligning with current research emphasizing layered security models.

5. Conclusion or Future Work

This hybrid IDS effectively identifies malicious network activities by integrating Snort with a Random Forest classifier, demonstrating enhanced anomaly detection and robust performance. Future work should focus on incorporating continuous learning mechanisms, expanding feature sets for advanced attack detection, and integrating automated response systems to evolve into a proactive enterprise defence tool.

REFERENCE LIST

- Abdulrezzak, S., & Sabir, F. A. (2023). Enhancing Intrusion Prevention in Snort System. *Proceedings - International Conference on Developments in ESystems Engineering, DeSE, 2023-January*, 88–93. <https://doi.org/10.1109/DeSE58274.2023.10099757>
- Murgai, V., Stimpson, R., & Mantha, R. S. (2024). Enhancing Security and Reliability in Distributed Systems: A Hybrid Approach Integrating Snort Rules and Machine Learning for Anomaly Detection. *Proceedings of the IEEE Symposium on Reliable Distributed Systems*, 334–343. <https://doi.org/10.1109/SRDS64841.2024.00042>
- Nirupama, B. K., & Niranjanamurthy, M. (2022). Network Intrusion Detection using Decision Tree and Random Forest. *Proceedings - IEEE International Conference on Advances in Computing, Communication and Applied Informatics, ACCAI 2022*. <https://doi.org/10.1109/ACCAI53970.2022.9752578>

MOODFLOW: A MOBILE APPLICATION FOR EMOTIONAL HEALTH MONITORING THROUGH MOOG INSIGHTS BASED ON MENTAL STABILITY ANALYSIS

Puteri Alyana Azahar, Dr. Zulfikri Paidi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022862666@student.uitm.edu.my, fikri@uitm.edu.my

Abstract

In today's fast-paced environment, emotional health is crucial yet often overlooked. This project, "MOODFLOW: A Mobile Application for Emotional Health Monitoring Through Mood Insights Based on Mental Stability Analysis," addresses the lack of personalized, accessible tools for individuals, particularly students, to understand their emotional patterns. While mental health awareness is growing, limited access to professional services due to cost or stigma leads to unaddressed issues. MoodFlow application aims to bridge this gap by offering a personalized emotional health monitoring solution. The project's objectives include developing a Swift-based iOS mobile application for emotional health monitoring and evaluating its performance via functionality, network testing, and the Technology Acceptance Model (TAM). The scope focuses on UiTM Arau students tracking their moods for one week. The methodology involved comprehensive design, development, and rigorous testing, utilizing Firebase for data storage. Findings confirm MoodFlow's effectiveness as a simple, supportive tool. Functional and network tests demonstrated reliable performance, while TAM evaluation showed high user acceptance due to its ease of use and usefulness. The study's significance lies in empowering students with self-awareness of their mental health patterns. Future work recommends integrating a self-reflective questionnaire to generate deeper insights and more personalized recommendations, fostering holistic mental well-being.

Keywords: *Emotional Health, Mental Stability, Mobile Application, Swift, TAM*

1. Introduction

In addressing the increasing need for accessible emotional health support, this project focuses on developing "MOODFLOW," a mobile application designed to empower individuals, particularly students, in monitoring and understanding their emotional well-being. The primary objective is to create a robust and user-friendly application leveraging Swift, aimed at providing personalized mood insights through mental stability analysis. The project also seeks to thoroughly evaluate the application's performance through various testing methodologies, including functionality, network, and the Technology Acceptance Model (TAM) testing, to ensure its effectiveness and user acceptance. The scope of this study specifically targets students at UiTM Arau to utilize the application for one week, allowing for a focused assessment of its impact within a relevant demographic. This concentrated approach will provide valuable insights into the application's practical utility and user experience in facilitating emotional health monitoring (Lim et al., 2022).

2. Methodology

The development of the MoodFlow mobile application followed the Software Development Life Cycle (SDLC), which includes six key phases: information gathering, planning, design, development, testing, and documentation. The process began with gathering data from articles and journals to define the project goals. Next, the planning phase involved identifying all hardware and software requirements, including Swift, Xcode, and Firebase. In the design phase, diagrams like flowcharts and use cases were created to outline system functionality. Development was carried out using SwiftUI in

Xcode, with Firebase integrated for real-time mood data storage. A calendar feature was also developed to allow daily mood tracking. The system was tested using functionality tests, network response scenarios, and user acceptance through the Technology Acceptance Model (TAM). Testing involved measuring response times and evaluating user feedback. Finally, all project phases and outcomes were documented. This structured approach ensured a reliable, user-friendly mobile application for emotional health monitoring.

3. Results / Findings

The MoodFlow mobile application effectively supports emotional health monitoring among students. Functional testing confirmed that all features, such as mood logging, history viewing, and article access, worked correctly. Network testing showed fast response times across different scenarios, including login, sign-up, and mood saving. The app performed reliably under various network conditions, like Wi-Fi and 4 G. Technology Acceptance Model (TAM) evaluation indicated high user acceptance, with positive feedback on its ease of use and usefulness. Overall, MoodFlow successfully helps users track emotional patterns, increases self-awareness, and provides timely recommendations, making it a practical tool for mental health self-care.

4. Novelty of Research / Product / Project

The novelty of the MoodFlow project lies in its deeper approach to emotional health tracking. Unlike many apps that only record moods, MoodFlow analyzes user input to give real-time insights into emotional patterns and mental stability (Chen et al., 2023). This helps users better understand their feelings, recognize triggers, and create personal strategies for mental well-being. The app also offers personalized suggestions and resources based on each user's emotional trends, encouraging self-care and resilience (Schueller et al., 2021). Its simple and user-friendly design makes it accessible to a wide range of users. By focusing on meaningful insights rather than just mood logging, MoodFlow stands out as a valuable and unique tool for emotional health support (Modi et al., 2022).

5. Conclusion or Future Work

MoodFlow proved effective in helping students monitor emotional health, showing reliable performance and high user acceptance. For future work, the app could include a self-reflective questionnaire to provide deeper mood insights and more personalized recommendations, further enhancing emotional awareness and promoting holistic mental well-being.

REFERENCE LIST

- Chen, Q.-Q., Lin, F.-M., Chen, D.-H., Ye, Y.-M., Gong, G.-M., Chen, F.-F., Huang, S.-F., & Peng, S.-L. (2023). Analysis of mental health status and related factors in patients with acute cerebral infarction. *World Journal of Psychiatry*, 13(10), 793–802. <https://doi.org/10.5498/wjp.v13.i10.793>
- Lim, O. O., Hareva, D. H., Steven, E., Sentausa, D., & Abineno, F. A. (2022). Companion: Mental Health Mobile Applications for Students. *Proceedings - 2022 1st International Conference on Technology Innovation and Its Applications, ICTIIA 2022*. <https://doi.org/10.1109/ICTIIA54654.2022.9935882>
- Modi, H., Orgera, K., & Grover, A. (2024). *Barriers to Mental Health Care This Isn't New...and It's Getting Worse*. <https://www.kff.org/other/state-indicator/mental-health-care-health-professional->
- Schueller, S. M., Neary, M., Lai, J., & Epstein, D. A. (2021, August 11). *Understanding people's use of and perspectives on mood-tracking apps: Interview Study*. JMIR mental health. <https://pmc.ncbi.nlm.nih.gov/articles/PMC8387890/>

DETECTING DDoS ATTACK USING SUPERVISED MACHINE LEARNING: A COMPARATIVE STUDY OF RANDOM FOREST, SVM AND DECISION TREE ALGORITHMS

Raudhatul Khaliesa Binti Mohd Rezal, En. Mohd Faris Bin Mohd Fuzi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022886996@student.uitm.edu.my, farisfuzi@uitm.edu.my

Abstract

DDoS attacks are still a major issue for network availability and stability. Traditional detection means typically are powerless against evolving patterns of attacks, and they produce excessive false positives. The aim of this project is to enhance DDoS detection using supervised machine learning methods, that is Random Forest (RF), Support Vector Machine (SVM), and Decision Tree (DT). CICDDoS2019 dataset was utilized, using SYN Flood and DrDoS-DNS attacks, along with benign traffic for balanced classification. Feature selection, label encoding, scaling, and balancing were done using SMOTE. The models were developed and evaluated using Python in Jupyter Notebook, and evaluation metrics included accuracy, precision, recall, F1-score, and ROC AUC. RF was observed to have the optimal overall performance, as the most accurate classifier. This study highlights the effectiveness of adding machine learning in improving DDoS accuracy of detection and reducing false positives in network security systems.

Keywords: DDoS, DT, RF, SVM, SYN Flood, DrDoS-DNS, pre-processing

1. Introduction

DDoS attacks remain a serious cybersecurity threat as they can affect network services by overwhelming systems with malicious traffic. Traditional detection methods struggle to differentiate between normal traffic and attack traffic, especially under dynamic network environments (Ajax, 2025). The goal of this project is to apply supervised machine learning algorithms such as Random Forest (RF), Support Vector Machine (SVM), and Decision Tree (DT) for the detection of DDoS attacks utilizing the CICDDoS2019 dataset. The intention is to implement these algorithms and evaluate their accuracy, precision, recall, F1-score, and ROC AUC performance. The project scope involves dataset preprocessing, model construction and validation in Python, and detection capability comparison between SYN Flood and DrDoS-DNS. This study provides comparative insight into conventional ML models for DDoS detection credibility improvement.

2. Methodology

This project is applying the supervised machine learning method with the Waterfall software development life cycle. The data used in this case was the CICDDoS2019, considering SYN Flood and DrDoS-DNS attack samples. Benign traffic was used from the Friday-WorkingHours-Afternoon dataset to make the dataset balanced. Data preprocessing was executed by Python in Jupyter Notebook and involved cleaning, label encoding, feature selection, scaling, and class imbalance treatment using the SMOTE. Three machine learning algorithms, Support Vector Machine (SVM), Decision Tree (DT), and Random Forest (RF), were implemented using Scikit-learn. Hyperparameter tuning was performed using GridSearchCV to optimize model performance. All models were trained and tested using a hold-out strategy with stratified train-test splitting. Performance was evaluated based on standard performance metrics like accuracy, precision, recall, F1-score, and ROC AUC. Two test cases were conducted with subsets of DDoS attacks which is one for SYN Flood and another for DrDoS-DNS. These two results were used to compare performances of models and determine the best algorithm to use for DDoS detection. understanding.

3. Results and Findings

All three machine learning models Decision Tree (DT), Support Vector Machine (SVM), and Random Forest (RF) performed well in separating DDoS and normal traffic. All the models were compared based on Accuracy, Precision, Recall, F1-score, and ROC AUC. Out of them, Random Forest outperformed the others consistently with the highest accuracy of 99.17%, recall of 99.17%, F1-score of 99.17%, and ROC AUC of 0.9969. SVM and DT were also well-performing, with accuracy rates above 99%, but slightly smaller recall and AUC values than RF. Two types of DDoS attacks, SYN Flood and DrDoS-DNS, were used to test all models. The results were extracted and averaged to ensure equitable comparison for various attack scenarios. The results confirm that the addition of supervised machine learning, particularly Random Forest, enhances the accuracy of detecting DDoS while reducing false positives. The results highlight the effectiveness of traditional ML algorithms in building adaptive and reliable detection models in network security.

4. Novelty of Project

This project proposes a comparative approach to DDoS detection using three classical supervised machine learning algorithms Random Forest, Support Vector Machine, and Decision Tree based solely on flow-based traffic features, without relying on deep packet inspection or external behavioral analysis. Unlike most existing studies that focus on a single attack type or algorithm, this research evaluates performance across SYN Flood and DrDoS-DNS scenarios using a class-balanced dataset created from CICDDoS2019 and benign traffic. SMOTE was applied for class balancing, and GridSearchCV was used to optimize hyperparameters. The novelty of this project lies in its experimental rigor, reproducibility through Jupyter Notebook, and performance evaluation based on key metrics including ROC AUC. Results clearly show that Random Forest consistently outperforms the other models, confirming its reliability in classifying DDoS traffic. This work offers an effective, lightweight, and interpretable detection method that can be further adapted for real-world intrusion detection systems.

5. Conclusion and Future Work

This project successfully demonstrated the effectiveness of machine learning in detecting DDoS attacks, with Random Forest achieving the best performance. Future work may involve testing on real-time traffic, expanding attack types, or integrating additional features and ensemble models to enhance accuracy and adaptability in dynamic network environments.

REFERENCE LIST

- Adedeji, K. B., Abu-Mahfouz, A. M., & Kurien, A. M. (2023). DDOS attack and Detection Methods in Internet-Enabled Networks: Concept, research Perspectives, and challenges. *Journal of Sensor and Actuator Networks*, 12(4), 51. <https://doi.org/10.3390/jsan12040051>
- Ajax, R. (2025). Comparison of Traditional vs. AI-Based Intrusion Detection and Prevention Systems: Efficiency and Accuracy. <https://www.researchgate.net/publication/389717300>
- Arshi, M., Nasreen, M., & Madhavi, K. (2020). A survey of DDOS attacks using machine learning techniques. *E3S Web of Conferences*, 184, 01052. <https://doi.org/10.1051/e3sconf/202018401052>

DDOS DETECTION IN IOT USING MACHINE LEARNING

Siti Sofia Binti Jalil, En. Mohd Faris Bin Mohd Fuzi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Perlis Branch, Malaysia

e-mail: 2022461934@student.uitm.edu.my, farisfuzi@uitm.edu.my

Abstract

The growing of Internet of Things (IoT) devices has raised significant security concerns, particularly with the rise of Distributed Denial of Service (DDoS) attacks. These attacks exploit vulnerabilities in IoT devices, overwhelming networks and disrupting critical services. Traditional Intrusion Detection Systems (IDS), which rely on signature-based detection, are ineffective against evolving DDoS attack patterns, especially in resource-constrained environments of IoT. This project proposed a machine learning-based approach to DDoS detection in IoT networks, focusing on data preprocessing techniques such as cleaning, encoding, normalisation, and feature selection to enhance accuracy. The study evaluates the performance of machine learning algorithms, including Random Forest (RF), Support Vector Machine (SVM), Decision Trees (DT), and Logistic Regression (LR), using the UNSW-NB15 dataset to detect DDoS attacks within IoT environments. The results show that the RF model achieved the highest accuracy, with performance metrics such as precision, recall, F1-score, and the lowest false positive rate demonstrating its robustness in detecting DDoS attacks. These findings can serve as an understanding to further the research on enhancing IoT network security, contributing to advancing cybersecurity solutions.

Keywords: DDoS Detection, IoT, Machine Learning, SVM, DT, RF, LR, UNSW-NB15

1. Introduction

The widespread use of Internet of Things (IoT) devices has led to increased vulnerability to Distributed Denial of Service (DDoS) attacks, which disrupt critical services in IoT networks. Traditional intrusion detection systems (IDS) are ineffective against these evolving threats, especially in resource-constrained environments. This research explored a machine learning-based approach for detecting DDoS attacks in IoT networks by applying pre-processing techniques like data cleaning, normalization, and feature selection. The study evaluated models such as Random Forest, Support Vector Machine (SVM), Decision Trees, and Logistic Regression to improve detection accuracy and reduce false positives, offering an efficient solution for IoT security.

2. Methodology

This project used a machine learning-based approach to detect DDoS attacks in IoT networks, utilizing datasets like UNSW-2018 IoT Botnet and UNSW-NB15 to simulate real-world IoT traffic. Data pre-processing steps, including cleaning, normalization, and feature selection, were applied to improve model accuracy. Four machine learning models, Random Forest, Support Vector Machine (SVM), Decision Trees, and Logistic Regression which were trained on the processed data. The performance of each model was evaluated using accuracy, precision, recall, F1-score, and confusion matrix, allowing for a comprehensive comparison of their effectiveness in detecting DDoS attacks while minimizing false positives in resource-constrained IoT environments.

3. Result and Findings

The Random Forest (RF) model achieved the highest accuracy of 99.8119%, indicating its excellent ability to classify both normal traffic and DDoS attacks accurately. Other models also performed well, with the Support Vector Machine (SVM) achieving an accuracy of 99.1667%, Decision Tree at 99.7048%, and Logistic Regression at 99.0571%. Despite their high accuracy, the false positive rates (FPR) varied across models. The RF model had the lowest false positive rate of 0.0196%, ensuring minimal misclassification of legitimate traffic as attacks. In contrast, The Random Forest model had the lowest false positive rate of 0.0196%, ensuring minimal misclassification of legitimate traffic as attacks. A lower FPR, as demonstrated by RF, ensures a more reliable detection system that minimizes unnecessary intervention, making it particularly suitable for real-time IoT network security.

4. Novelty of Project

This project proposes a novel approach to DDoS detection in Internet of Things (IoT) networks by employing machine learning models, specifically customised to solve the unique problems of IoT settings. Unlike standard intrusion detection systems (IDS) that rely on signature-based methods, this study leverages advanced machine learning algorithms, such as RF, SVM, DT, and LR, to effectively categorise and detect DDoS attacks. A important part of the project is the examination of UNSW-NB15 dataset which are crucial in representing the dynamic and evolving nature of DDoS attacks in IoT networks. The understanding of preprocessing help to filter the raw data, minimise noise, and guarantee that only the most important features are utilised for training, ultimately boosting the detection capabilities and minimising the risk of false positives.

5. Conclusion and Future Work

This project demonstrates the effectiveness of machine learning models for DDoS detection in IoT networks, with Random Forest performing best. Future work will focus on optimizing these models for multiclass detection, real-time deployment in resource-constrained environments, and enhancing IoT security against evolving threats.

REFERENCE LIST

- Aysa, M. H., Ibrahim, A. A., & Mohammed, A. H. (2020). IoT DDoS attack detection using Machine Learning. 2020 4th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT), 1–7. <https://doi.org/10.1109/ismsit50672.2020.9254703>
- Bhattacharyya, D. K., & Kalita, J. K. (2016). DDoS attacks: Evolution, Detection, Prevention, Reaction, and Tolerance. CRC Press

SIMTRACKER: IOT-BASED REAL-TIME GEOLOCATION MOTION MONITORING FOR OUTDOOR ACTIVITIES

Syafiqah Batrisyia Mohd Zahir, Iman Hazwam Abd Halim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022821848@student.uitm.edu.com, hazwam688@uitm.edu.my

Abstract

Outdoor activities such as hiking, cycling, and jogging pose safety risks, particularly in remote areas where access to emergency assistance is limited. This project introduces SIMTRACKER, an IoT-based real-time geolocation and motion monitoring system designed to enhance user safety during outdoor excursions. The system integrates an ESP32 microcontroller, SIM808 module for GPS and GSM communication, and an MPU6050 sensor to detect abnormal motion patterns. When the total acceleration value falls within a predefined threshold, indicating a potential fall or prolonged inactivity, the device automatically sends an SMS alert with the user's GPS coordinates to predefined emergency contacts. This threshold-based alert mechanism enables reliable operation even in areas without internet connectivity. Additionally, a PHP-based web dashboard visualizes live data, including location, motion status, and historical logs, using tools such as Leaflet.js and Chart.js. The system was developed using the Waterfall methodology and evaluated through functionality testing, network performance analysis, and Technology Acceptance Model (TAM) assessments. The results demonstrate that SIMTRACKER delivers timely alerts, accurate location tracking, and positive user acceptance. This solution provides a practical, affordable, and internet-independent safety tool for outdoor enthusiasts.

Keywords: *IoT, Fall detection, ESP32, SIM808, GPS tracking, GSM network, TAM, Outdoor monitoring*

1. Introduction

Outdoor activities are becoming increasingly popular; however, they expose participants to significant risks such as falls, injuries, or loss of consciousness, particularly in remote locations where immediate assistance may not be available. Many existing tracking and safety alert systems depend heavily on internet connectivity, which limits their effectiveness in rural or off-grid areas. This project aims to develop SIMTRACKER, IoT-based safety device that enables real-time motion monitoring and geolocation tracking without the need for internet access. The objectives of this project are to detect abnormal motion patterns based on sensor-defined thresholds, to transmit emergency SMS alerts containing GPS coordinates to selected emergency contacts, and to present user activity and location data through a real-time web-based dashboard. The project is primarily intended for individuals involved in outdoor activities such as hiking or cycling, as well as for vulnerable groups such as the elderly. The scope includes hardware and software integration, system development, data monitoring, and system evaluation under outdoor conditions.

2. Methodology

This project was developed using the Waterfall methodology, comprising the phases of initiation, planning, design, implementation, and testing. The system integrates an ESP32 microcontroller, SIM808 module, and MPU6050 motion sensor. The ESP32 collects motion and location data, identifies anomalies based on predefined acceleration thresholds, and triggers the SIM808 to send SMS alerts containing GPS coordinates to emergency contacts without internet access. When connected to Wi-Fi, the system transmits sensor data to a MySQL database via HTTP POST, enabling real-time monitoring through a PHP-based dashboard. JavaScript, Leaflet.js, and Chart.js are used to visualize motion status, user location, and historical logs. Field testing was conducted in campus

outdoor areas to simulate real-world conditions. The system's functionality was verified by assessing motion detection accuracy and GPS reliability. Network performance was evaluated based on SMS transmission speed and consistency under varying GSM signal strengths. Additionally, user perception was measured through the Technology Acceptance Model (TAM) to determine usefulness, ease of use, and overall acceptance.

3. Results / Findings

The SIMTRACKER prototype successfully fulfilled its functional requirements. During field testing, the device effectively detected abnormal motion conditions such as falls and periods of inactivity using the MPU6050 sensor. Upon detection, the ESP32 processed the input and triggered the SIM808 to send emergency SMS alerts with precise GPS coordinates to the assigned contact numbers. These alerts were consistently delivered within areas with GSM signal, demonstrating the system's capability to operate without internet access. The web dashboard accurately visualized live motion status, current location mapping, and historical log entries. Evaluation through the Technology Acceptance Model indicated strong user satisfaction, with 93 percent of respondents agreeing on the usefulness of the system and 87 percent indicating it was easy to use. These results validate SIMTRACKER as a reliable and user-friendly tool for enhancing safety during outdoor activities.

4. Novelty of Research / Product / Project

The novelty of SIMTRACKER lies in its ability to perform fall detection and location tracking in real time without relying on internet connectivity. This distinguishes it from most existing solutions, which depend on mobile data or Wi-Fi to function. SIMTRACKER utilizes GSM communication via SMS, enabling critical alerts to be sent even in rural or off-grid environments. In addition, the system uniquely integrates motion sensing, GPS tracking, and real-time visualization into a single, compact unit. The use of affordable and widely accessible components such as the ESP32 microcontroller, SIM808 communication module, and MPU6050 motion sensor contributes to its practicality and scalability. The system is also designed with low power consumption, making it suitable for outdoor use over extended periods. Its modular design allows for potential future expansion, such as integration with environmental sensors or mobile application support. These features collectively position SIMTRACKER as a novel and cost-effective solution for real-time safety monitoring in outdoor environments.

5. Conclusion or Future Work

SIMTRACKER successfully demonstrates a reliable IoT-based safety system for outdoor users with no dependency on internet access. Future work will focus on integrating a mobile application, improving fall detection accuracy using machine learning, and expanding the system for multi-user monitoring to support search and rescue operations.

REFERENCE LIST

- Maind, Prof. C. M. (2025). Women Safety Device with GPS Tracking and SMS Alerts. *International Journal for Research in Applied Science and Engineering Technology*, 13(4), 118–121.
<https://doi.org/10.22214/ijraset.2025.67334>
- Vasuthavan, K., & Nafis Ismail, M. (2023). IoT Based Falling Detection System. *Evolution in Electrical and Electronic Engineering*, 4(1), 501–508.
<https://doi.org/10.30880/eeee.2023.04.01.059>

SMART ATTENDANCE SYSTEM USING FINGERPRINT RECOGNITION FOR STUDENT COMPUTER SCIENCE IN UiTM ARAU, PERLIS

Mohamad Amirul Helmi Bin Samsul Kamal, Iman Hazwam Abd Haliim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022739065@student.uitm.edu.my, hazwan688@uitm.edu.my

Abstract

The Smart Attendance System using fingerprint recognition for Student Computer Science UiTM Arau Perlis was developed to address issues of proxy attendance and enhance the accuracy and integrity of attendance records. While cost-effective and easy to implement, traditional methods like RFID and QR code systems are susceptible to security vulnerabilities such as card sharing and duplication. These methods compromise the reliability of attendance data and necessitate additional verification measures. The project's motivation stems from needing a more secure, reliable, and user-friendly biometric system. The methodology involved designing and developing a comprehensive system integrating fingerprint recognition with a robust backend infrastructure, ensuring real-time updates and seamless user interaction. The system's development phase included rigorous testing to verify its functionality, reliability, and security. Findings from the project indicate that fingerprint recognition significantly enhances the accuracy of attendance tracking and prevents unauthorized access, effectively addressing the shortcomings of existing methods. The integration of wireless technology facilitates real-time monitoring and user-friendly operation, contributing to higher user acceptance and satisfaction. Additionally, the project includes comprehensive user training and support mechanisms to ensure smooth implementation and transition from manual systems. The novelty of this project lies in its balanced emphasis on advanced biometric features and user privacy, providing a practical alternative to more intrusive systems like facial recognition. By ensuring seamless integration, real-time functionality, and high security, the project successfully addresses the specific needs of UiTM Arau Perlis, setting a precedent for future implementations of biometric attendance systems in educational institutions. This innovative approach improves security and data integrity and demonstrates a practical and efficient solution for modern attendance management.

Keywords: *Fingerprint, biometric authentication, attendance system, automation, student records, UiTM*

1. Introduction

Traditional student attendance methods such as manual signing or calling names are inefficient and susceptible to manipulation. The objective of this project is to develop a Smart Attendance System that uses fingerprint recognition to record student attendance automatically and securely. The system aims to reduce administrative burdens, prevent proxy attendance, and ensure that accurate records are stored for academic tracking. This project focuses on Computer Science students at UiTM Arau, Perlis. The scope includes hardware integration, real-time database updates, and a user-friendly interface for both students and lecturers to monitor attendance status.

2. Methodology

The system architecture involves both hardware and software integration. A fingerprint scanner is used to capture student biometric data. The captured data is then processed through a minutiae-based matching algorithm for verification. The verified fingerprint is then linked to a student ID and attendance record stored in a local database. A front-end interface developed using Python and Tkinter or web-based frameworks allows lecturers to manage sessions and generate attendance

reports. Testing was conducted in a simulated classroom with 30 students to assess the speed and accuracy of the fingerprint matching process. Data validation and backup mechanisms were also included to ensure reliability. User feedback was collected to evaluate the system's usability and performance.

3. Results and Findings

The fingerprint-based attendance system successfully recognized and recorded attendance for the test group with over 95% accuracy. Students found the system easy to use and significantly faster than manual methods. Feedback from lecturers highlighted the benefits of automated reporting and error-free data storage. The system also eliminated instances of proxy attendance, addressing a long-standing challenge in attendance tracking. Overall, the results demonstrate that biometric solutions like fingerprint recognition can enhance administrative efficiency, reduce workload, and improve the accuracy of attendance records in academic institutions.

4. Novelty of Project

This project introduces a practical and cost-effective implementation of biometric fingerprint recognition in the academic environment, which is still relatively underutilized in Malaysian universities. The novelty lies in its real-time verification, seamless integration with student data, and potential scalability across faculties and campuses. Unlike conventional attendance systems, this solution ensures unique user identification, improving both security and accountability. The use of fingerprint data provides a non-transferable and fast method of authentication, making it ideal for classroom settings. The system's modular design allows for future integration with UiTM's existing academic platforms and cloud services, marking a step toward digital transformation in higher education management.

5. Conclusion or Future Work

The smart fingerprint attendance system has proven to be a reliable and effective solution for managing student attendance. Future enhancements will include cloud integration, mobile notification features, and multi-classroom scalability to further improve system performance and accessibility for lecturers and administrators.

REFERENCE LIST

- Adetunmbi, A. O., & Fashoto, S. G. (2016). Enhancing University Administration through Biometric-Based Attendance Monitoring System. *Journal of Computer Sciences and Applications*, 4(3), 49–55.
- Han, Y., & Lee, H. (2021). Efficient Fingerprint Matching Algorithm for Embedded Biometric Systems. *Sensors*, 21(4), 1352. <https://doi.org/10.3390/s21041352>
- Jain, A. K., Ross, A., & Prabhakar, S. (2004). An introduction to biometric recognition. *IEEE Transactions on Circuits and Systems for Video Technology*, 14(1), 4–20. <https://doi.org/10.1109/TCSVT.2003.818349>
- Karthikeyan, L., & Saravanan, M. (2019). Biometric Attendance System Using Fingerprint Recognition. *International Journal of Scientific & Technology Research*, 8(10), 3275–3279.
- Rani, S., & Bhattacharya, A. (2020). Design and Implementation of Fingerprint-based Attendance Management System. *International Journal of Computer Applications*, 176(20), 8–13.

OWASP WEB APPLICATION VULNERABILITIES SCANNER

Afiqah Asyikin Arbain, Muhamad Arif Hashim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: afiqahasyikin24@gmail.com, muhamadarif487@uitm.edu.my

Abstract

The “OWASP Web Application Vulnerabilities Scanner” is a solution designed to enhance web application security by addressing critical vulnerabilities such as SQL Injection and Cross-Site Scripting (XSS). This project aims to achieve three primary objectives, to design and develop a web-based tool for identifying and categorizing vulnerabilities, to integrate real-time vulnerability detection with a user-friendly dashboard, and to evaluate the system’s effectiveness through usability testing and functionality testing. Using the Waterfall methodology, the project includes phases of requirements analysis, design, development, testing, and documentation. The system offers key features such as real-time vulnerability scanning, detailed reports of security risks, a severity-based categorization of vulnerabilities, and an interactive dashboard for visualizing scan results. Findings from usability testing with 30 participants and functionality validation by IT professionals confirm the tool’s effectiveness, ease of use, and positive user satisfaction. The tool is well-received for its intuitive interface and actionable insights. Future enhancements will focus on enabling multi-scan capabilities, improving scalability, and enhancing deployment flexibility. This project contributes significantly to strengthening web application security practices by providing a practical, scalable, and user-friendly tool for developers to proactively identify and address security risks.

Keywords: OWASP, Web Application Security, Vulnerability Scanner, Interactive Dashboard, Waterfall methodology

1. Introduction

With the increasing complexity of web applications and the rising threats posed by cyberattacks, the need for proactive security tools has become more urgent than ever. This project introduces the OWASP Web Application Vulnerabilities Scanner, designed to address common vulnerabilities such as SQL Injection, Cross-Site Scripting (XSS), and Broken Authentication listed in the OWASP Top 10. The main objective is to develop an automated scanner integrated with a real-time interactive dashboard, enabling developers to detect and visualize vulnerabilities efficiently. The system is built using OWASP ZAP, Python, and React.js to support small to medium-sized applications. The scope covers detection, categorization, and real-time presentation of vulnerabilities to support secure web development practices (Alazmi & De Leon, 2022).

2. Methodology

This project employed the Waterfall Model to systematically develop the OWASP Web Application Vulnerabilities Scanner, encompassing five key phases: requirement analysis, design, development, testing, and documentation (Senarath, 2021). In the requirement phase, OWASP Top 10 guidelines were analyzed to define core system functionalities. The design phase used Draw.io and Figma to outline flowcharts, ERDs, and UI prototypes. Development involved integrating OWASP ZAP with a Python-based backend and a React.js frontend to enable real-time scanning and dashboard visualization. MySQL was used to manage scanned URLs, vulnerabilities, and scan history data. Testing involved functionality validation with IT professionals and usability testing with 30 users, capturing feedback on efficiency and ease of use. The scanner was tested using OWASP Juice Shop as a benchmark to ensure accuracy and relevance. This structured methodology ensured that the scanner met its objectives in identifying and displaying web vulnerabilities in a user-friendly manner.

3. Results / Findings

The OWASP Web Application Vulnerabilities Scanner was tested through functionality and usability evaluations. Functionality testing, conducted by IT administrators, confirmed that the scanner successfully detected vulnerabilities such as SQL Injection and Cross-Site Scripting (XSS) from test applications like OWASP Juice Shop. All major features, URL scanning, result visualization, severity categorization, and scan history logging functioned without errors. Usability testing involved 30 participants, including students and IT professionals, who assessed the system's accessibility, efficiency, and design. Results showed strong user satisfaction, with most respondents rating the system highly for clarity, ease of use, and learnability. The dashboard's real-time visualization and intuitive layout were praised, especially by users with limited cybersecurity knowledge. Expert review further validated the tool's readiness for academic and development use. Overall, findings indicate that the scanner is reliable, user-friendly, and effective for identifying and managing web application vulnerabilities.

4. Novelty of Research / Product / Project

The OWASP Web Application Vulnerabilities Scanner offers a novel integration of real-time vulnerability detection with an interactive, user-friendly dashboard, specifically designed to assist developers with minimal cybersecurity expertise. Unlike traditional scanners that provide static reports or require advanced configuration, this tool simplifies the process by automating vulnerability scans through OWASP ZAP and visualizing the results using React.js and Chart.js in real time. The inclusion of severity-based classification and scan history tracking further enhances decision-making during the development lifecycle. This project bridges a crucial gap for small to medium-sized applications that often lack access to enterprise-grade security solutions. By prioritizing accessibility, automation, and clarity, it empowers developers to act immediately on detected issues, thereby improving software security practices (Flores & Monreal, 2024). The scanner stands out as a practical, scalable, and educational tool aligned with current cybersecurity demands.

5. Conclusion or Future Work

The OWASP Web Application Vulnerabilities Scanner successfully enhances web security through automated detection and real-time visualization. Future work will focus on enabling concurrent scans, improving deployment flexibility, and integrating AI for smarter vulnerability analysis. These upgrades aim to support large-scale applications and streamline remediation efforts.

REFERENCE LIST

- Alazmi, S., & De Leon, D. C. (2022). A systematic literature review on the characteristics and effectiveness of web application vulnerability scanners. *IEEE Access*, 10, 33200–33219. <https://doi.org/10.1109/access.2022.3161522>
- Flores, N. C. P., Jr. (2024). Evaluation of common security vulnerabilities of state universities and colleges websites based on OWASP. *Deleted Journal*, 20(5s), 1396–1404. <https://doi.org/10.52783/jes.2471>
- Senarath, U. S. (2021). Waterfall Methodology, Prototyping and Agile Development. <https://doi.org/10.13140/RG.2.2.17918.72001>

MOBILE APPLICATION FOR EXPENSES TRACKER

Ahmad Zahidi Bin Azmi, Hanisah Binti Ahmad

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023627574@student.uitm.edu.my, hanisahahmad@uitm.edu.my

Abstract

This project will explain SpendBuddy, an expenses tracker for mobile applications. It will simplify the process for the user to track their expenses by creating an intuitive interface for CRUD process, reporting in chart and optical character recognition (OCR) technology to extract texts from receipts. Key terms such as OCR, Firestore, usability testing and functionality testing were used as guidance in the development process. OCR is used to extract text from receipt images such as name, quantity, and total price. Firestore is used to store data from manual typing from the user and text from images. Usability testing and functionality testing were used to get feedback about interface and main features of the mobile application. The mobile application was developed using Flutter framework, Google Cloud Document AI where the text was extracted from images, Firestore to store the data and Firebase Callable Function act as middleware. Evaluation was done by using questionnaires that target users from varied backgrounds. The usability testing focused on consistency, readability, efficiency and error prevention of the mobile application. The functionality testing focused on a series of step descriptions that need to be done to measure the main features. Results showed the majority of the user report that the application made tracking expenses easier and more organized.

Keywords: *Expense Tracker, Mobile Application, Optical Character Recognition (OCR), Firestore, Usability Testing*

1. Introduction

Most of the youths in Malaysia find it difficult to live within their daily budget as it is not uncommon that they just spend their money until they run out (Darshini Sundra Kumar et al., 2022; Nurazleena Ismail et al., 2022). Conventional techniques such as the use of notebooks or spreadsheets are slow and prone to errors (Kok Wei Jin, 2021). In this project, a mobile expense tracker, SpendBuddy, is presented that integrates familiar manual input options with Google Cloud Document AI-based OCR receipt scanning. The app automates logging the expenses and offers graphical reports that summarize monthly expenses to enable the user to gain a better grasp of his/her spending. SpendBuddy is designed to encourage working professionals and young adults to improve their finances using convenience, automation, and usability.

2. Methodology

The project has five phases that it used in the waterfall model. The requirement analysis phase includes identifying the problems, defining the project scope, and setting objectives. This step played a critical role in making wise decisions to proceed into the next step. The drawing of sitemap design, flowchart to describe how the application will work, entity relationship design to describe how the database will work, and interface design of the application are some of the phases of design. The developmental phase started with Flutter framework and Android Studio to build prototypes. Firebase used to store the data and Google Cloud Document AI was used through Firebase Cloud Functions to process the images of receipts. During the testing phase, usability testing was done to check system reliability and user experience when they are using the application. Functionality testing was done to make sure all features work as intended. Lastly, the documentation phases compiled all the information into a report.

3. Results / Findings

Usability testing was done on 12 respondents to test the mobile application according to the 4 main UI design principles that included consistency, readability, efficiency, and error prevention. All these questions were measured on a 5-point Likert scale. The findings indicated that the majority of the respondents scored 4 (Agree) with a number scoring 5 (Strongly Agree) particularly in the domains of the layout consistency and text readability. The most highly rated principle was a consistency which means that the interface was considered by the users intuitive and consistent in various activities like adding, editing, and deleting expenses. The readability and efficiency also scored high and indicated that users could do tasks with the least effort. Prevention of error had positive feedback albeit a little lower with the indication that proper button location and clarity of messages should be improved. Two respondents were used to conduct functional testing by providing a test script. Each of the core features such as manual entry, scanning based on OCR, and report generation worked as expected with no critical problems reported.

4. Novelty of Research / Product / Project

With this project, it presents a mobile application that integrates Google Cloud Document AI to ease tracking expenses. As opposed to conventional budgeting applications where one has to input data manually, SpendBuddy can read receipts and then extract other structured information like the name of an item, quantities and prices using OCR. Hybrid would be the strategy that automates and complements with manual input that would minimize the work on data entry and enhance precision. Expenses on the application will also be explained visually through the use of pie charts that will assist users in studying their expenditures trends. The idea of SpendBuddy is rather unique since this product is positioned as a friendly and easy-to-use tool that can be utilized by younger people who are just starting a financial life. The project combines cloud-based AI, Firebase real-time syncing, and the user-centered design offering a unique and effective approach to the problems that are unique to the generation of today due to their online habits.

5. Conclusion or Future Work

SpendBuddy shows how OCR and cloud technology can be used to make a mobile app easy and effective at tracking personal expenses. Future research will overcome the current limitations by enhancing OCR performance, performing more tests with wider demographics, increasing customization of the chart, and making the user interface more accessible.

REFERENCE LIST

- Darshini Sundra Kumar, Hafizah Sudin, Jaizah Othman, & Shahrullizuannizam Salehuddin. (2022). The Influence of Spending Behaviour Among University Students in Malaysia. *Asian Journal of Accounting and Finance*. <https://doi.org/10.55057/ajafin.2022.4.3.3>
- Kok Wei Jin. (2021). *Image Recognition Expense Extraction*.
- Nurazleena Ismail, Azzah Amran, & Wan Yusrol Rizal W. Yusof. (2022). Spending Patterns of Malaysian Youth during the COVID-19 Pandemic. In *ESTEEM Journal of Social Sciences and Humanities* (Vol. 6, Issue 2). <https://ejssh.uitm.edu.my>

E-MARKETPLACE FOR UNIVERSITY STUDENTS USING LARAVEL

Amin Naqiuddin bin Abdullah, Muhammad Nabil Fikri bin Jamaluddin

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022821952@student.uitm.edu.my, nabifikri@uitm.edu.my

Abstract

University communities often lack a dedicated and secure platform for internal commerce, leading students to use general marketplaces that introduce risks such as fraud, additional fees, and delivery delays. This project addresses these issues by developing a tailored e-marketplace web application for university members, built on the Laravel framework. The platform aims to create a localized, secure, and efficient environment for buying and selling goods within the campus community. Key features include user registration restricted to university email domains, categorized product listings, an integrated messaging system, and secure payment processing. The development follows a systematic process of design, implementation, and testing to ensure the platform is both functional and user-friendly. The expected outcome is an enhanced campus experience that promotes sustainability through the reuse of goods and provides a cost-effective, trusted trading solution for university students.

Keywords: *e-marketplace, Laravel, university students, web application, user acceptance testing*

1. Introduction

The increasing preference for online shopping among millennials and students has highlighted a significant gap within university ecosystems. Students often face security risks, including scams and fraudulent reviews, on popular e-commerce platforms. Furthermore, existing university-specific marketplaces often lack critical features like robust search functions and user reviews, diminishing user confidence. This project aimed to develop a reliable and convenient web-based marketplace to centralize and simplify the buying and selling process for a campus community. The scope includes user authentication via a university email, creating categorized product listings (e.g., books, electronics), and facilitating direct communication between buyers and sellers through an in-app messaging system.

2. Methodology

This research adapted a three-phase methodology from the Waterfall model, beginning with requirement identification, followed by design and development, and concluding with testing. Initial requirements were gathered through a review of existing literature and platforms to define essential e-marketplace features. The design phase utilized Figma to create user interface (UI) mockups for key pages like product listings and the shopping cart. The web application was developed using the Laravel framework for its robust Model-View-Controller (MVC) architecture and built-in security features, with MySQL serving as the database management system. To evaluate the system, both Functionality Testing and User Acceptance Testing (UAT) were conducted. The UAT involved 33 university students who tested the application and provided feedback via a structured questionnaire.

3. Results / Findings

The evaluation phase yielded positive results, confirming the viability and acceptance of the e-marketplace. The User Acceptance Test (UAT) produced a total mean score of 4.4 out of 5, indicating a high level of user satisfaction across all measured criteria, including Perceived Ease of Use (PEU), Perceived Usefulness (PU), and Attitude (ATT). Participants found the platform easy to navigate and the features helpful for making purchasing decisions. Functionality testing confirmed that core features—such as user registration with a validated university email, product Browse, and payment

processing via Stripe—performed as expected. However, the testing also identified limitations, including a non-functional hamburger menu in the mobile view, an inability to update the "My Orders" history, and a server error when an administrator attempts to create a new product category

4. Novelty of Research

The novelty of this project lies in the creation of a secure, closed-ecosystem e-marketplace exclusively for a university community, which directly mitigates the fraud and trust issues prevalent on open platforms. By mandating user registration with a verified university student email address (@student.uitm.edu.my), the system establishes a trusted environment for transactions. The application leverages the Laravel framework's built-in security functionalities to protect against common web vulnerabilities such as Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF), creating a safer trading space. Unlike generic solutions, this platform is specifically designed to enhance campus life by facilitating a localized economy, reducing transaction fees, and promoting entrepreneurship among students.

5. Conclusion or Future Work

The project successfully developed a functional and well-received campus marketplace that meets its core objectives. Future work will focus on addressing the limitations identified during testing. Key recommendations include implementing a mobile-first design to ensure full functionality on smartphones, integrating additional payment methods like FPX online banking and e-wallets, and adding a price filter to improve product discovery.

REFERENCE LIST

- Akhmadi, H., & Pratolo, S. (2021). Online Marketing of Food Products through Marketplace Platform: A Study of Community Based Online Marketplace of BEDUKMUTU. *E3S Web of Conferences*, 232. <https://doi.org/10.1051/e3sconf/202123202015>
- Castro-Schez, J. J., Grande, R., Herrera, V., Schez-Sobrino, S., Vallejo, D., & Albusac, J. (2024). E Marketplace State of the Art and Trends: VR-ZOCO—An Architectural Proposal for the Future. *Applied System Innovation*, 7(5), 76. <https://doi.org/10.3390/asi7050076>
- Hidajat, K., & Salini, S. S. (2024). Benefits of Using a Payment Gateway. 276–281. <https://doi.org/10.5220/0012579500003821>
- Sotnik, S., Shakurova, T., & Lyashenko, V. (2023). Development Features Web- Applications. In *International Journal of Academic and Applied Research* (Vol. 7, Issue 1).
- Subecz, Z. (2021). Web-development with Laravel framework. *Gradus*, 8(1), 211–218. <https://doi.org/10.47833/2021.1.csc.006>

WEB-BASED COUNSELLING APPOINTMENT SYSTEM WITH STRESS MANAGEMENT INTERVENTIONS

Anis Zulaiqah Abd Malek, Naemah Abdul Wahab

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Perlis Branch

e-mail:-aniszulaiqah77@gmail.com , naema586@uitm.edu.my

Abstract

Mental health challenges among university students are increasing due to academic pressure, social demands, and lifestyle changes. Traditional counselling services often face issues such as long wait times, limited availability, and stigma. To address these barriers, this project introduces StressWise, a web-based counselling appointment system with integrated stress management interventions. This project aims to enhance access to mental health services, reduce stigma, and provide early stress detection and intervention among university students. The platform offers stress level screening through the DASS-21 questionnaire and delivers tailored support based on results ranging from self-help tools to direct booking with university counsellors. Developed using Laravel and MySQL and following the Waterfall model, the system ensures secure data handling, easy navigation, and flexible appointment scheduling. Functionality and usability testing with responses from 30 participants revealed positive feedback regarding ease of use and usefulness. Future improvements include integrating a mobile-friendly version, adding real-time chat support with counsellors, and implementing a reminder system for upcoming appointments, positioning StressWise as a proactive, user-centric solution to bridge digital accessibility with mental health services.

Keywords: *Counselling System, Stress Management, Stress Intervention, DASS-21, Web Application, Laravel, Usability Testing, Functionality Testing*

1. Introduction

University students nowadays face growing stress levels from academic demands, financial pressure, and personal issues. Unfortunately, many hesitate to seek professional help due to stigma, inconvenient access, or uncertainty about their mental health status. **StressWise** aims to solve this by offering an accessible online platform that allows students to evaluate their stress levels through the DASS-21 questionnaire and receive tailored guidance from professionals. If results indicate moderate to severe stress, users are prompted to book a counselling session with available counsellors. For manageable stress, the system recommends suitable stress intervention tools. The scope includes students as primary users and counselors as administrators who manage appointment bookings, monitor stress scores, and review user progress (Mansoori et al., 2022).

2. Methodology

The development of StressWise followed the Waterfall Model, consisting of six structured phases: planning, analysis, design, implementation, testing, and documentation (Senarath, 2021). In planning, project goals and significance were shaped by reviewing digital mental health solutions (Mansoori et al., 2022). Analysis identified required hardware and software, including Laravel for secure, scalable development (Laravel, n.d.) and MySQL for managing user, appointment, and DASS score data (Erickson, 2024). The design phase involved developing the interface and database using tools like draw.io and Figma. Implementation focused on integrating the DASS-21 tool to classify users' stress levels, from normal to severe, and guide them to stress relief resources or counselling booking (Bhattacharjee, 2021). Testing included functionality validation and usability testing with 30 participants to assess system clarity and ease of use.

3. Results And Discussion

StressWise was evaluated through functionality and usability testing. All key modules such as registration, login, DASS assessment, result display, and appointment booking performed as expected. In usability testing, 30 students and staff completed guided tasks and a questionnaire. Most users rated the system between 4 and 5 across ease of use, interface design, and clarity. Participants found the system easy to navigate and appreciated the personalized stress feedback and direct access to counselling features. The total mean score above 4.5 for each usability dimension confirmed that the system was user-friendly, functionally reliable, and effective in promoting early stress intervention.

4. Novelty of Research/ Product

StressWise uniquely combines real-time stress screening with counselling appointment booking in a web platform designed for student use. Unlike generic mental health tools, it adapts support paths based on assessment outcomes while preserving user privacy. Laravel and MySQL ensure secure role-based access and data handling. The system enables counsellors to manage appointments more efficiently, helping bridge the gap between digital accessibility and meaningful mental health care.

5. Conclusion

StressWise demonstrates how web technologies can enhance mental health support through accessible, personalized interventions. It promotes early detection of stress and empowers students to take action based on their results. Future enhancements include mobile application development, video counselling, and external mental health services to provide more holistic, data-driven student support.

REFERENCES LIST

- Bhattacharjee, M. (2021). What is Counselling? A Complete Guide. Psychology Today. <https://www.psychologytoday.com>
- Erickson, J. (2024). MySQL Fundamentals: A Practical Approach to Database Design and Implementation. Packt Publishing.
- Laravel. (n.d.). The PHP Framework for Web Artisans. <https://laravel.com>
- Mansoori, A. H., Abdullah, M. F., & Kamaluddin, M. R. (2022). Web-based Mental Health Solutions for University Students: Review and Implications Post COVID-19. *Journal of Student Wellbeing*, 4(2), 22–35.
- Senarath, T. (2021). A Practical Guide to Waterfall Software Development Methodology. *Software Engineering Journal*, 8(2), 101–110.

FREELANCING MARKETPLACE PLATFORM FOR UNIVERSITY STUDENTS

Asyraf Ammar Bin Mahadi, Nurzaid Bin Muhd Zain

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: asyrafammar0806@gmail.com, nurzaid@uitm.edu.my

Abstract

The gig economy provides opportunities for university students to gain professional experience and financial independence, yet global platforms like Fiverr and Upwork often fail to address localized campus needs (Janadari & Preena, 2020). UNIGIGWORK, a web-based freelancing marketplace, connects Universiti Teknologi MARA (UiTM) Arau students with peers and local clients for services such as tutoring and graphic design. Developed using the Waterfall Model, the platform employs HTML, CSS, JavaScript, Laravel, and MySQL to ensure responsiveness, security, and usability. Features include gig posting, negotiation systems, and QR payment integration. User acceptance testing with 30 respondents (20 clients, 10 freelancers) showed high satisfaction, with mean scores of 4.49 for perceived ease of use, 4.51 for perceived usefulness, 4.49 for attitude toward using, and 4.56 for behavioral intention. Performance testing indicated fast load times (First Contentful Paint: 0.6 seconds) but highlighted mobile responsiveness issues. UNIGIGWORK fosters a self-sustaining freelancing ecosystem, enhancing students' economic and professional growth (Tura et al., 2018). Future improvements include mobile optimization and OAuth authentication.

Keywords: *Freelancing, Gig Economy, University Students, Web Platform, User Acceptance Testing*

1. Introduction

University students face barriers in accessing flexible, skill-based freelancing opportunities that suit their academic schedules (Lata et al., 2023). Global platforms like Fiverr and Upwork prioritize broad markets, overlooking localized campus communities (de la Vega, 2020). UNIGIGWORK, designed for UiTM Arau students aged 19-30, facilitates connections for services like tutoring and digital design. The objectives are to identify student-specific service needs, develop a tailored web platform, and evaluate its usability and performance. By creating a localized ecosystem, UNIGIGWORK enhances skill utilization, economic empowerment, and professional development (Tura et al., 2018). The platform incorporates secure payment systems and peer-verification to ensure trust and efficiency (Kaloge, 2025), addressing gaps in existing solutions and fostering a self-sustaining freelancing environment for students, thereby promoting entrepreneurship and employability within the campus community.

2. Methodology

UNIGIGWORK was developed using the Waterfall Model, a sequential approach ensuring structured development through phases like requirement analysis, design, development, testing, and documentation. Requirement analysis identified student needs via literature reviews and surveys, focusing on services like tutoring and graphic design (Lata et al., 2023). System design utilized Figma for user interface mock-ups, with sitemaps, flowcharts, Data Flow Diagrams, and Entity-Relationship Diagrams. The frontend was built with HTML, CSS, and JavaScript for responsiveness, while Laravel provided a secure backend, and MySQL managed the database efficiently. GitHub facilitated version control. User acceptance testing to evaluate perceived ease of use, usefulness, attitude, and behavioral intention via questionnaires. Performance testing used Google PageSpeed Insights to assess metrics like First Contentful Paint and Cumulative Layout Shift (Google Developers, 2025). The platform was deployed on a cPanel server with SSL encryption for secure HTTPS communication (Kaloge, 2025).

3. Results / Findings

UNIGIGWORK demonstrated strong usability and performance. User acceptance testing with 30 respondents yielded high satisfaction, with mean scores of 4.49 for perceived ease of use, 4.51 for perceived usefulness, 4.49 for attitude toward using, and 4.56 for behavioral intention. Clients valued QR payments (mean 4.60) and review systems (mean 4.45), while freelancers appreciated order request (mean 4.70) and due date features (mean 4.60). Performance testing showed excellent load times (First Contentful Paint and Largest Contentful Paint at 0.6 seconds), surpassing Google's benchmarks (Google, 2025). However, a Cumulative Layout Shift score of 0.6 (vs. recommended 0.1) indicated visual stability issues on mobile devices, requiring optimization. PageSpeed scores were 100/100 (desktop) and 93/100 (mobile). These results highlight UNIGIGWORK's potential to empower students economically and professionally by addressing localized freelancing needs (Tura et al., 2018), though mobile responsiveness needs improvement.

4. Novelty of Research / Project

UNIGIGWORK offers a novel freelancing marketplace tailored for university students, addressing limitations of global platforms like Fiverr by focusing on localized, campus-specific needs (de la Vega, 2020). Unlike existing solutions, it integrates student-centric features such as peer-verification via Google Workspace accounts and QR payment systems, enhancing trust and efficiency (Kaloge, 2025). Built with Laravel and MySQL for scalability and security, and Bootstrap 5 for responsive design. UNIGIGWORK creates a self-sustaining ecosystem that promotes economic empowerment and professional growth (Tura et al., 2018). Its negotiation system and review mechanisms ensure transparency and autonomy, distinguishing it from informal platforms like WhatsApp groups (Janadari & Preena, 2020). By enabling students to monetize skills like tutoring and graphic design, UNIGIGWORK fills a critical gap in providing flexible, legitimate freelancing opportunities, enhancing employability and entrepreneurial skills within the UiTM Arau community.

5. Conclusion or Future Work

UNIGIGWORK effectively connects UiTM Arau students with local freelancing opportunities, boosting economic and professional growth. Future enhancements include optimizing mobile responsiveness, implementing OAuth authentication, adding notification tabs, and introducing a reporting system to enhance usability, security, and user engagement (Kaloge, 2025).

REFERENCE LIST

- Janadari, M. P. N., & Preena, G. (2020). Gig economy and its impact on employment relations. *Journal of Business Studies*, 7(1), 45-60.
- Lata, M., et al. (2023). Freelancing platforms and their impact on skill development. *International Journal of Technology and Management*, 12(3), 112-125.
- Tura, N., et al. (2018). Platform design for gig economy: A case study. *Journal of Service Research*, 21(4), 456-472.
- de la Vega, R. (2020). Economic empowerment through localized freelancing platforms. *Economic Development Quarterly*, 34(2), 89-102.
- Kaloge, J. (2025). Web hosting security with cPanel. *Journal of Web Technologies*, 15(1), 23-30.

WEB-BASED MONITORING DASHBOARD FOR INVIGILATOR SURVEILLANCE

Azad Izzuddin Bin Zul Azmi, Mohd. Nizam Bin Osman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: azadizzuddinzulazmi@gmail.com, mohdnizam@uitm.edu.my

Abstract

This research develops the e-Invigilator System, a web-based dashboard that solves examination surveillance problems in universities. Traditional systems fail because invigilators miss surveillance slips and overlook email notifications about schedule changes. The system combines Power BI analytics with Telegram API messaging to create a unified platform. Built using the Laravel framework with MySQL database, it provides real-time schedule management, automated notifications, document distribution, and administrative control. Testing with 32 participants showed high satisfaction scores of 4.56-4.71 out of 5.0. Network testing revealed excellent desktop performance (with a 0.5-second response time) and acceptable mobile performance (1.3-1.6 seconds). Results confirm significant efficiency improvements and strong potential for user adoption in sustainable examination management in higher education.

Keywords: examination surveillance, dashboard analytics, Power BI Integration, Telegram API, Laravel Framework

1. Introduction

The Current examination management in universities faces serious problems in surveillance coordination and communication. Chen et al. (2021) state that examination timetabling poses significant challenges due to the complex resource allocation involved, which encompasses human resources, venues, and time constraints, while balancing both hard and soft constraints to achieve optimal solutions. Existing manual systems have critical weaknesses. Invigilators fail to receive surveillance slips from pigeonholes, frequently miss email communications, and remain unaware of urgent schedule changes. These failures damage examination integrity, increase administrative workload, and create uncertainty during assessment periods. This research develops the e-Invigilator System to address these problems through the integration of technology. The study has three main objectives: identifying requirements for centralised surveillance management, developing an integrated dashboard with Power BI analytics and Telegram API notifications, and conducting an evaluation through user acceptance testing and network performance analysis.

2. Methodology

This research employs the Waterfall System Development Life Cycle methodology, which consists of five phases: requirement analysis, feasibility study, system design, development, and testing, all accompanied by documentation. The system architecture utilises the Laravel framework, incorporating Model-View-Controller design patterns, PHP server-side processing, HTML/CSS frontend, and a MySQL database. Laravel's MVC architecture improves code organisation and efficiency compared to traditional methods. The database includes five tables: admins (administrative credentials), invigilators (user management), surveillance_timetables (schedule coordination), notifications (communication logging), and documents (file distribution). Technical implementation integrates Microsoft Power BI for dashboard visualisation and real-time monitoring. Telegram Bot API enables automated notifications with dynamic template variables. Development was conducted in the Laragon environment, using Visual Studio Code as the editor, and Hostinger as the hosting platform. Evaluation included User Acceptance Testing using Technology Acceptance Model

constructs with 32 participants from diverse academic backgrounds. Network performance testing used Google PageSpeed Insights metrics across desktop and mobile platforms.

3. Results

User acceptance testing yielded exceptional results across all dimensions of the Technology Acceptance Model. Perceived Ease of Use scored 4.66 for invigilators and 4.69 for administrators. Perceived Usefulness achieved 4.56 for invigilators and 4.64 for administrators. Attitude Towards Technology scored 4.66 for invigilators and 4.67 for administrators. Behavioural Intention achieved the highest scores at 4.63 for invigilators and 4.71 for administrators. Network performance testing revealed excellent system reliability. The desktop achieved optimal metrics, with First Contentful Paint, Largest Contentful Paint, and Speed Index all at 0.5 seconds. Mobile platforms demonstrated acceptable performance, with loading times ranging from 1.3 to 1.6 seconds. The cumulative layout shift remained minimal, at 0.002 for desktop and 0.165 for mobile. The system successfully eliminated communication barriers through automated Telegram notifications. It established centralised document distribution, reducing administrative overhead. The system provided comprehensive surveillance schedule management with real-time adaptability for emergency changes.

4. Novelty of Project

The e-Invigilator System represents the first integration of business intelligence analytics with instant messaging technologies for academic examination management. This research uniquely combines Power BI embedded analytics with Telegram API automation within a unified Laravel-based web application. Unlike existing fragmented approaches, this system provides complete integration. It features dynamic template variables for personalised notifications, real-time schedule adaptability, and centralised administrative oversight through analytical dashboards. Kaddoura et al. (2022) identify the critical need for systematic approaches in online learning and examination systems, as well as exceptionally reliable monitoring and authentication features for maintaining academic integrity. The implementation of automated notification workflows with custom template variables represents a significant advancement in educational communication systems. The seamless integration of multiple API technologies within the Model-View-Controller architecture demonstrates innovative technical implementation. The system's ability to accommodate last-minute scheduling changes while maintaining complete surveillance coverage establishes new standards for technology-enhanced examination management. It provides scalable solutions for institutional deployment across diverse academic environments.

5. Conclusion or Future Work

The e-Invigilator System successfully demonstrates enhanced examination surveillance management through strategic technology integration and comprehensive validation. Future enhancements include the implementation of a responsive mobile interface, expansion of multi-channel communication, document preview capabilities, and integration of biometric authentication for enhanced security.

REFERENCE LIST

- Chen, M. C., Sze, S. N., Goh, S. L., Sabar, N. R., & Kendall, G. (2021). A Survey of University Course Timetabling Problem: Perspectives, Trends and Opportunities. *IEEE Access*, 9, 106515-106529. <https://doi.org/10.1109/ACCESS.2021.3100613>
- Kaddoura, S., Popescu, D. E., & Hemanth, J. D. (2022). A systematic review on machine learning models for online learning and examination systems. *PeerJ Computer Science*, 8. <https://doi.org/10.7717/PEERJ-CS.986>

SOIL FERTILITY PREDICTION MODEL FOR HARUMANIS USING MACHINE LEARNING

Farah Madihah Binti Fuahaidi, Iman Hazwam Bin Abd Halim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

Mohd Ashraf Bin Zainol Abidin

Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: madihahfuahaidi@gmail.com, hazwam688@uitm.edu.my

Abstract

Soil fertility is one of the main topics that determine the successful production of Harumanis mango in Malaysia. Conventional soil analysis techniques can be prohibitively expensive, time-consuming and beyond the reach of the small-scale farmer. To overcome this problem, the project seeks to create a machine learning soil fertility prediction system, which can facilitate the rapid and data-based decision-making in the agricultural sector. The main parameters used, Nitrogen (N), Phosphorus (P), Potassium (K), temperature, and moisture. The system predicts levels of fertility of High, Moderate, or Low. The methodology was based on the CRISP-DM which initiated the project understanding and data sampling of the plot B in the Harumanis field. The data preparation stage consisted of feature selection and dividing the data into a training and testing dataset to 70% and 30% respectively. The accuracy, precision, recall, and F1-score were used to test three classification models, Random Forest, Support Vector Machine (SVM), and Logistic Regression. The imbalance of classes in the training set was addressed using SMOTE. The most successful model, Random Forest, obtained the accuracy of 99.37%, and SVM was just below 98.74% and Logistic Regression 94.96%. A basic Streamlit web application was created to demonstrate functionality and enable users to enter soil parameters with live fertility outcome predictions. The interface showcases the practicability of machine learning in precision agriculture. The project demonstrates the potential of using AI to improve soil management and minimize reliance on conventional practices to provide a strategy to the future of Harumanis mango farming.

Keywords: Soil Fertility Prediction, Harumanis Mango, Machine learning, CRISP-DM

1. Introduction

The project seeks to design a predictive machine learning model to predict soil fertility levels specific to Harumanis mangoes farming. The primary goals are finding the most appropriate machine learning algorithm, constructing the predictive model, and testing the model accuracy. The research topic centres on the soil samples of Plot B, the Harumanis field of UiTM Arau, Perlis. Parameters such as Nitrogen (N), Phosphorus (P), Potassium (K), temperature, and moisture are used as key parameters in the soil. It used Python and library packages like Scikit-learn, Pandas, and Matplotlib in a systematic development process. Real data was used to train and test the model, and a simple web interface was created with Streamlit as the showcase of the model activity. The project is a practical solution that will help researchers and agricultural stakeholders in adopting data-informed soil management decisions to aid sustainable mango farming in Harumanis.

2. Methodology

This project embraces the CRISP-DM approach, which comprises six steps, project understanding, data understanding, data preparation, modelling, evaluation, and deployment. The objective is to predict soil fertility of mango plantations in Harumanis. The data taken was soil data features nitrogen, phosphorus, potassium, temperature, and moisture in Plot B of the Harumanis field at UiTM Arau, Perlis. During the Data Preparation stage, the data was washed and formatted (Data Science

PM, 2025). Stratified sampling was later used to divide the data into 70% training and 30% testing to maintain a balance in the distribution of the classes. The development and evaluation of three classification models, including Random Forest, SVM and Logistic Regression were done. The training set was oversampled using SMOTE to deal with the class imbalance (Sarangi et al., 2024). The performance of models was evaluated with accuracy, precision, recall, and F1-score. The development of a simple web interface (Streamlit) to display the functionality of the models was designed. This enabled users to add soil information and have fertility predictions pop out. It shows that the model can be applicable in the real world in a user-friendly manner. This methodology helps in ensuring that the model is trained, tested, and operational in facilitating precision agriculture using machine learning.

3. Results / Findings

The performance of three machine learning models including Random Forest, SVM, and Logistic Regression were tested in predicting the classes of soil fertility (High, Moderate, Low) based on five machine learning features, nitrogen, phosphorus, potassium, temperature, and moisture. Random Forest was the most accurate model with 99.37% accuracy followed by SVM with 98.74% and Logistic Regression with 94.96%. All the models indicated high results especially their precision, recall and F1-score but Random Forest had higher results compared to the other classifiers making the best and most suitable model to use in this research (Asha S & Sony PS, 2023). To illustrate the functionality of the model, a Streamlit web interface was also developed. Individuals can enter soil values and have them instantly predicted. This interface confirms the practical applicability of the model in the agricultural field and the potential it has towards assisting farmers when making decisions regarding soil management without the complicated lab test.

4. Novelty of Research / Product / Project

The project aims to bring a practical machine learning method for soil fertility prediction of Harumanis mango cultivation. The model specifically used the data from Plot B of the Harumanis UiTM Arau. The novelty is not only in testing the need to apply machine learning to predict soil fertility but in comparative analysis of three models (Random Forest, SVM, and Logistic Regression) on real agriculture data. When compared to other studies that only utilize one algorithm or general soil datasets, this project offers a direct comparison that can be more transparent since performance measures are detailed. Moreover, this project develops a lightweight real-time Streamlit web interface. It illustrates the deployed model to operate in an intuitive manner and facilitates the connection between AI and final users.

5. Conclusion or Future Work

This project was able to form and test the machine learning models to predict soil fertility in Harumanis production. The areas of future work can include expanding data features, applying real-time sensors, and the usage of GenAI to simulate long term fertilization strategies to enhance agricultural decisions-making.

REFERENCE LIST

- Asha S, & Sony PS. (2023). Developing a Model for Accurate Prediction of Soil Fertility: A Comparative Study of Machine Learning Techniques. <https://academicjournal.ijraw.com>
- Data Science PM. (2025). Evaluating CRISP-DM for Data Science. www.datascience-pm.com
- Sarangi, A., Raula, S. K., Ghoshal, S., Kumar, S., Kumar, C. S., & Padhy, N. (2024). Enhancing Process Control in Agriculture: Leveraging Machine Learning for Soil Fertility Assessment. 31. <https://doi.org/10.3390/engproc2024067031>

FOOD RECOMMENDATION SYSTEM FOR METABOLIC SYNDROME PATIENT

Fatin Nabihah Shamsull Bahrin, Dr Zulfikri Paidi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: fatinnabihah0811f@gmail.com, fikri@uitm.edu.my

Abstract

Metabolic syndrome is a major public health concern characterized by interconnected risk factors such as high blood pressure, elevated blood sugar, and abnormal cholesterol levels, all of which increase the risk of cardiovascular disease and type 2 diabetes. While dietary intervention plays a critical role in managing these conditions, many individuals lack accessible, personalized tools to support safe and informed food choices based on clinical health data. This project introduces a web-based Food Recommendation System developed specifically for individuals with or at risk of metabolic syndrome. The system applies a rule-based filtering approach grounded in medical dietary guidelines to tailor meal suggestions according to users' health indicators, including blood pressure, blood sugar, cholesterol, weight, and height. Recipes are retrieved via the Spoonacular API and filtered in real time to reduce sugar, sodium, and saturated fat, while promoting nutrient-dense alternatives. Built using the Laravel framework and hosted on Render with PostgreSQL, the platform also includes secure user authentication, health profile management, and recipe bookmarking features. Usability and functionality testing with 30 participants revealed high system effectiveness, clarity, and user satisfaction. This system demonstrates potential as a practical, user-friendly tool that bridges the gap between clinical dietary advice and everyday nutrition decisions, supporting better self-management of metabolic syndrome.

Keywords: *Metabolic Syndrome, Rule-based Filtering, Spoonacular API, Food Recommendation System*

1. Introduction

Metabolic syndrome is a chronic condition involving multiple interrelated health risks that significantly increase the chance of developing cardiovascular disease and diabetes (Światkiewicz et al., 2021). Its prevalence in Malaysia is increasing due to poor diet and sedentary lifestyles. Many patients lack tools to receive personalized nutrition guidance based on clinical criteria (Reisinger et al., 2021). This project aims to provide a web-based food recommendation platform that generates meal suggestions tailored to users' health conditions, helping them make safer dietary decisions and reduce long-term health risks, and manage their diet anytime without constant professional supervision.

2. Methodology

This project adopted the Waterfall Model, which includes five sequential phases: Requirement Analysis, Design, Development, Testing, and Documentation. The Requirement Analysis phase involved identifying system objectives and user needs through a literature review on metabolic syndrome and food recommendation systems. The Design phase utilized Draw.io and Canva to create sitemaps, flowcharts, ERDs, DFDs, and interface mockups. Laravel was selected for development due to its MVC structure, along with Laravel Breeze for authentication. MySQL was used for local development, then migrated to PostgreSQL for deployment on Render. Recipes were retrieved through the Spoonacular API and filtered using a rule-based algorithm. Usability testing with 30 participants and task-based functionality testing confirmed the system's reliability and user satisfaction.

3. Results / Findings

Functionality testing involved two participants aged 51–60 who completed 12 core tasks such as login, health data entry, and recipe saving. All tasks were executed successfully without bugs or crashes, confirming system stability. Usability testing with 30 participants aged 31–60 used a 5-point Likert scale to assess interface clarity, navigation, and user satisfaction. Over 95% rated the system positively, with most scores above 4 on the scale. Participants appreciated the personalized recommendations, health data summary, and ease of use. Feedback suggested adding local food options, bilingual support, and a weekly planner. Overall, the system met its functionality and usability goals, supporting effective dietary planning for metabolic syndrome management.

4. Novelty of Research

This project presents a health-focused food recommendation system specifically designed for individuals with metabolic syndrome—a group often underserved by general nutrition platforms. The system uses a rule-based filtering approach grounded in clinical dietary guidelines to provide transparent, personalized, and medically appropriate meal suggestions (Arabella Matulessey & Baizal, 2024). Unlike systems driven by opaque AI models, this solution emphasizes explainability by basing recommendations on user health indicators such as blood pressure, blood sugar, and cholesterol. It dynamically updates suggestions as user data changes, ensuring ongoing relevance. While the current version features international recipes via the Spoonacular API, the system is built to support future integration of local Malaysian dishes. This direction strengthens trust, usability, and cultural relevance in digital health.

5. Conclusion or Future Work

The Food Recommendation System achieved its objective of delivering a personalized, secure, and user-friendly dietary tool for metabolic syndrome management. Future enhancements will include mobile app development, integration of Malaysian food databases, and customizable filtering options. These improvements aim to boost cultural relevance, personalization, and long-term user engagement, making the system more practical for everyday use. Ultimately, this direction supports healthier daily habits and empowers users to take greater control of their diet with confidence.

REFERENCE LIST

- Arabella Matulessey, S., & Baizal, Z. K. A. (2024). Food Recommendation with Balanced Nutrition Using Context-Aware Knowledge-Base. *2024 International Conference on Data Science and Its Applications, ICoDSA 2024*, 403–408. <https://doi.org/10.1109/ICoDSA62899.2024.10651995>
- Reisinger, C., Nkeh-Chungag, B. N., Fredriksen, P. M., & Goswami, N. (2021). The prevalence of pediatric metabolic syndrome—a critical look on the discrepancies between definitions and its clinical importance. In *International Journal of Obesity* (Vol. 45, Issue 1, pp. 12–24). Springer Nature. <https://doi.org/10.1038/s41366-020-00713-1>
- Świątkiewicz, I., Woźniak, A., & Taub, P. R. (2021). Time-restricted eating and metabolic syndrome: Current status and future perspectives. In *Nutrients* (Vol. 13, Issue 1, pp. 1–24). MDPI AG. <https://doi.org/10.3390/nu13010221>

E-ORDERING PLATFORM FOR MASMED

Iyaz Bin Ibrahim, Nurzaid Bin Muhd Zain

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: iyazbrhm@gmail.com, nurzaid@uitm.edu.my

Abstract

This project presents the development of a comprehensive e-ordering platform for the Malaysian Academy of SME and Entrepreneurship Development (MASMED) at Universiti Teknologi MARA. The platform addresses challenges faced by small and medium enterprises (SMEs) in reaching customers and provides students convenient access to university-affiliated businesses. Built using Laravel framework with MySQL database, the system incorporates responsive design, secure payment gateways, and notifications (Hasanuzzaman et al., 2021). Key features include user management, product catalogue browsing, shopping cart functionality, and administrative controls supporting three user roles: customers, sellers, and administrators. Evaluation through usability testing with 30 participants and functionality testing of 15 core features demonstrated high user satisfaction (4.83/5.0 overall rating) and 100% functionality success rate, validating the platform's effectiveness in supporting local entrepreneurship within the university ecosystem.

Keywords: *E-ordering Platform, Laravel Framework, SME Development, Web Application, Usability Testing*

1. Introduction

The digital transformation has created opportunities for SMEs to expand market reach through online platforms (Rosário & Raimundo, 2021). Global technological trends influence consumer purchasing behaviors, encouraging online purchases due to perceived convenience and reduced costs (Kedah, 2023). At UiTM, MASMED supports numerous SMEs through shop lot allocations and business development programs. However, these enterprises face challenges reaching target audiences while students encounter difficulties accessing university-affiliated businesses. The internet allows consumers to compare prices, access reviews, and search for various products (Kedah, 2023). This project develops a centralized e-ordering platform connecting MASMED entrepreneurs with the university community, facilitating seamless digital commerce while supporting local business growth and student convenience.

2. Methodology

The project was developed using Laravel 10.x backend framework, MySQL 8.0+ database, and HTML/CSS/JavaScript for responsive frontend. Core functionalities included user authentication, product catalogue management, shopping cart operations, and secure payment gateway integration. The platform was deployed on cPanel-based hosting with SSL certificate configuration. System evaluation employed comprehensive functionality testing using a fifteen-point checklist covering CRUD operations, payment processing, and error handling. Usability assessment involved 30 UiTM community participants (83.3% customers, 16.7% sellers) using a five-point Likert scale to evaluate interface consistency, readability, and efficiency. Performance analysis assessed system responsiveness across desktop and mobile platforms. Documentation compilation ensured thorough validation of both user experience and technical performance across all system components.

3. Results / Findings

Functionality testing confirmed that all 15 major system features worked reliably, including secure user authentication, product management, order processing, and payment integration. Usability scores were consistently high, averaging above 4.8/5 across consistency, readability, efficiency, and error prevention categories. Overall user satisfaction achieved 4.83/5 with 100% functionality success rate across all tested features. Performance evaluation revealed excellent desktop response times (95/100) but moderate mobile performance requiring optimization. User feedback highlighted the value of features such as intuitive navigation, secure payment options, and comprehensive seller dashboard, while suggesting improvements to mobile responsiveness and advanced filtering capabilities. These findings indicate the platform is effective, user-friendly, and provides a strong foundation supporting local entrepreneurship within the university ecosystem while meeting modern e-commerce standards for future enhancements.

4. Novelty of Project

This project presents a unique university-specific e-commerce solution addressing academic entrepreneurship ecosystem needs. Unlike generic platforms that remove listings without warning, MASMED's system provides full platform control with university branding and local payment preferences. The innovative three-tier Laravel MVC architecture separates customer, seller, and administrative functionalities while maintaining seamless integration. Notable features include real-time inventory management, comprehensive seller dashboard with earnings tracking, QR-based payments for Malaysian market preferences, two-factor authentication, and mobile-optimized responsive design. The system incorporates modern e-ordering technologies providing enhanced convenience over traditional methods. This creates a sustainable digital ecosystem supporting local entrepreneurship while addressing the shift toward e-ordering driven by digital technology growth and consumer convenience expectations within the university community.

5. Conclusion or Future Work

The MASMED e-ordering platform successfully achieved all objectives with high user satisfaction (4.83/5.0) and 100% functionality success rate. Future enhancements include mobile application development, AI-powered recommendations, real-time chat functionality, and expanded payment options. The modular Laravel architecture provides a solid foundation for continued improvements supporting university entrepreneurial initiatives.

REFERENCE LIST

- Hasanuzzaman, M., Fadilla, M. R., Angriani, W., & Ibrahim, A. (2021). MVC implementation in Laravel framework for development web-based e-commerce applications. *International Journal of Computer Applications Technology and Research*, 10(1), 15-22.
- Kedah, Z. (2023). Use of E-Commerce in The World of Business. *Startupreneur Bisnis Digital (SABDA)*, 2(1), 112-125. <https://doi.org/10.34306/sabda.v2i1.273>
- Rosário, A., & Raimundo, R. (2021). Consumer marketing strategy and e-commerce in the last decade: A literature review. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(7), 3003-3024. <https://doi.org/10.3390/jtaer16070164>

EDUCON-NECT: PROACTIVE COLLABORATIVE STUDY TOOLS USING MOBILE CLOUD COMPUTING

Khairil Hazmie bin Abdul Razak, Mohd. Nizam bin Osman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022697564@student.uitm.edu.my, mohdnizam@uitm.edu.my

Abstract

This project introduces *EduConnect: Proactive Collaborative Study Tools Using Mobile Cloud Computing*, a mobile application developed to address the organizational and collaborative challenges faced by university students. The application offers an all-in-one platform for academic management, incorporating group discussions, file sharing, task monitoring, a study timer, and a to-do list with calendar features. Developed using Android Studio with Java and Firebase, EduConnect ensures scalability, reliability, and real-time access through cloud technology. The development follows the Waterfall System Development Life Cycle (SDLC), emphasizing structured progression from requirements gathering to deployment. User acceptance testing involving selected university students was conducted to evaluate usability and effectiveness. Results showed a positive impact on student productivity, with improvements in task organization, collaboration, and study planning. The application addresses key issues such as poor time management and scattered study resources, promoting a more proactive and organized learning experience.

Keywords: *collaborative study, mobile cloud computing, task management, study timer, academic productivity, Android*

1. Introduction

University students often struggle to stay focused and organized in their studies. This project introduces *EduConnect*, a mobile app designed to support proactive learning through collaboration and cloud-based tools. The main goals are to explore effective study tools, develop the app with those features, and evaluate its performance through user feedback and network testing. *EduConnect* offers a user-friendly platform with features like group discussions, file sharing, study timers, and course-specific channels. It also includes real-time chat and peer-to-peer support to help students communicate and manage their studies more efficiently. With cloud technology, students can access materials anytime and stay productive. Mobile apps play an important role in inclusive education (Mirzakhmedova et al., 2023) and have become widely used in classrooms to boost engagement and learning (Hinze et al., 2023).

2. Methodology

This project used the Waterfall System Development Life Cycle (SDLC) to guide the development of *EduConnect*. Methodology refers to the structured use of tools and techniques to achieve specific project goals (Sileyew, 2020). The waterfall model was chosen for its step-by-step structure. The process started with identifying key student needs, such as group discussions, file sharing, to-do lists, Pomodoro-based study timers, and a simple interface. The design phase focused on layout and database planning using cloud technology. Development was done with Android Studio (Java), while Firebase handled backend tasks like login, data storage, and messaging.

During implementation, features like group chats, course channels, and calendar-based task scheduling were added. Testing involved performance tests to check app stability and user acceptance tests to gather feedback. This approach ensured the app met its goals and helped students' study more effectively.

3. Results / Findings

The user acceptance test showed that the app performed well in terms of usability. Four criteria were tested: ease of use, usefulness, attitude toward the app, and user intention, all scoring an average of 4.4 out of 5. This reflects positive feedback and satisfaction with the app's features. For technical testing, the app was used on five Android devices with both 4G and Wi-Fi connections. Latency ranged from 494 ms to 656 ms, with Wi-Fi generally being faster. Data throughput ranged from 0.5 KB/s to 4.2 KB/s for sending and 0.1–0.2 KB/s for receiving. Overall, the app showed reliable performance and smooth operation across different devices and networks, making it suitable for student use.

4. Novelty of Research / Product / Project

EduConnect is a unique mobile application that combines several study tools into one platform for university students. Unlike most apps that focus only on notes or schedules, EduConnect includes real-time group chats, file sharing, Pomodoro study timers, and course-specific channels. It supports both solo and group learning, making it flexible for different users. Using Firebase, it ensures real-time updates and smooth cloud access. The app also encourages peer-to-peer support and active collaboration, helping students stay engaged. This combination of features in one user-friendly app makes EduConnect stand out as a complete study companion designed to improve learning, time management, and productivity in a simple and connected way.

5. Conclusion or Future Work

EduConnect achieved its goals by enhancing student collaboration and study efficiency through integrated tools. User testing confirmed its reliability and usefulness. Future improvements include enhancing the interface, adding live streaming, and organizing study materials more effectively to create a better and more engaging learning experience.

REFERENCE LIST

- Mirzakhmedova, K. V., Omonov, Q. Sh., Rikhsieva, G. Sh., Nasirova, S. A., Khashimova, S. A., & Khalmurzaeva, N. T. (2023). *Use of mobile applications in establishing inclusive education in pedagogy*. *Journal of Law and Sustainable Development*, 11(12), e2376. <https://doi.org/10.55908/sdgs.v11i12.2376>
- Hinze, A., Vanderschantz, N., Timpany, C., Cunningham, S. J., Saravani, S. J., & Wilkinson, C. (2023). *A study of mobile app use for teaching and research in higher education*. *Technology, Knowledge and Learning*, 28(3), 1271–1299. <https://doi.org/10.1007/s10758-022-09599-6>
- Sileyew, K. J. (2020). *Research methodology: Tools and techniques*. Google Books. [https://books.google.com.my/books?hl=en&lr=&id=Egf8DwAAQBAJ&oi=fnd&pg=PA27&dq=methodology+can+be+defined+as+a+collection+of+techniques+gathered+to+fulfill+a+specific+aim+and+purpose+of+a+research+of+work+\(sileyew](https://books.google.com.my/books?hl=en&lr=&id=Egf8DwAAQBAJ&oi=fnd&pg=PA27&dq=methodology+can+be+defined+as+a+collection+of+techniques+gathered+to+fulfill+a+specific+aim+and+purpose+of+a+research+of+work+(sileyew)

TEACHING AND LEARNING INVENTORY MANAGEMENT WEB APPLICATION FOR UITM PERLIS

Meor Muhammad Hakimi Meor Sukri, Assoc. Prof. Dr. Shukor Sanim Mohd Fauzi
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: meormsukri@gmail.com, shukorsanim@uitm.edu.my

Abstract

This project describes a web-based inventory system for the management of teaching and learning assets at UiTM Perlis. Previously, processes relied on manual operations leading to misplaced inventory, prolonged verification tracking processes, and varying degrees of custodianship. The system was developed with Laravel as the backend framework and MySQL as the database while also including features for scanning via QR codes, custodianship logging, and integrating with Google Maps. The site was implemented using Namecheap and source controlled using GitHub, and functions as a single repository for inventory details, improving record management and ease of work for all staff. Basic usability and functionality testing by users indicated that users were extremely satisfied with the usability of the site for visibility of assets, navigation, response speeds, and content. The most satisfactory features however were listed as the QR redirection and the ability to log custodianship/role. While the site does not currently include mobile and accessibility features, the project gives a guiding framework for scalable inventory asset management support for any academic institution. The project improved traceability of assets and systemization and automation of processes to improve the wasted downtime and replaceability of assets. Future integrations could include maintenance tracking and mobile-first responsive usability.

Keywords: *Inventory System, Web Application, Laravel, Teaching and Learning Assets, Asset Tracking, QR Code*

1. Introduction

Manual systems that track teaching assets in higher education can result in inefficiencies, misplacement of assets, or even lack of accountability. Paper systems are subject to mistakes from human tracking and do not provide timely visibility. A centralized, accessible and role-based online system for asset tracking has increased in demand, more so in an academic context where shared equipment is commonplace. This project develops an online platform that will be responsive to users, promote custodianship, improve traceability and yield administrative clarity (Osypenko, 2022; Timotheou et al., 2023).

2. Methodology

The system was built using Waterfall methodology. The initial requirements were elicited using interviews with asset officers, determining pain points for tracking shared equipment (LCD projectors, screens). During design and development, the following tools were used: Figma (for UI mockup), Draw.io (data flow and ERD), Laravel (backend logic), and MySQL for the relational database. Please see the use of GitHub, for version control, and Name Cheap as the platform to host the system. Usability testing relied on Likert-scale questionnaires that derived from methodologies developed by researchers, which evaluated user satisfaction, consistency, and control (Keenan et al., 2022). Functionality testing evaluated QR scanning, CRUD functionality, location redirection, and role-based access restrictions. The system was then deployed in a functioning, real world, UiTM environment for testing its practical deployment and performance.

3. Results and Discussion

Findings from the usability tests indicate that users were in significant agreement regarding user interface elements including consistency throughout the system, ease of navigation, and easily accessible responsiveness. All functional testing was completed with all major features successfully tested including login, QR redirection, and sorting. Participants' analysis confirmed that the asset details were visible, and the history of actions performed were recorded based on their role. Because confirming the identities of assets was an arduous manual effort, the participants viewed the centralization of these details as having the greatest benefit. Although a mobile app component did not exist, and no accessibility testing was included, the design delivered on its aims of preventing asset confusion and improving tracking. Google Maps supported the ability of physical accessibility with QR linking identities characteristics that prevented the duplication of assets. This finding supports previous findings noted by Al-Mamary (2022), and Osypenko (2022), finding that centralization tracking is important for institutional effectiveness.

4. Novelty of Research / Product

This system created a higher education centered approach to inventory management, utilizing the combination of asset registration, QR code identity, and custodian responsibility under a simple web interface. Typical industry options and static spreadsheets do not relate each item to a role, log history, or history user action, establishing better accountability. Inventory access features such as scan-to-view, log approval automation, and integration with tools like Google Maps are atypical in higher education contexts (Paliwal et al., 2020). Unlike "IoT-heavy" or image-based design projects, this system's straightforwardness, combined with its reference back to the user (the role associated with an item), provides heightened flexibility for being practical for distributed deployment strategies, either across other faculties or institutions. There are three levels of access established for the system, which means administrators, users, and guest users can interact with the system securely and appropriately.

5. Conclusion

The online system enhanced asset tracking and custodian transparency at UiTM Perlis. The possibilities in terms of reducing the manual workload and sustainable features in the web version alone (for instance, QR tracking and real-time logs) are quite vast. The system, in its future, in more portably ways (example: mobile) described might be able to improve with accessible features.

REFERENCE LIST

- Al-Mamary, Y. H. (2022). The significance of ICT in post-COVID education.
Keenan, A., Maher, C., & Zheng, L. (2022). Practical usability testing techniques for web platforms.
Osypenko, A. (2022). Inventory management essentials.
Paliwal, P., Sharma, R., & Singh, M. (2020). Blockchain technology in inventory management: A systematic review. *Journal of Supply Chain Innovation*, 5(2), 110–123.
Timotheou, K., Demetriou, A., & Loizou, L. (2023). ICT integration in education systems worldwide: Post-pandemic trends. *Educational Technology Research*, 12(1), 44–58.

ANOMALY-BASED INSIDER THREAT DETECTION USING UEBA AND ELASTIC STACK WITH MACHINE LEARNING

Mohamad Nazzeen Bin Mohd Rizal, Muhamad Arif Bin Hashim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022675116@student.uitm.edu.my, muhamadarif487@uitm.edu.my,

Abstract

This project addresses the escalating challenge of insider threats, risks traditional methods often miss due to their authorised nature, by introducing an advanced detection framework. The core approach is anomaly-based detection, which focuses on identifying deviations from established normal behaviour rather than relying on predefined signatures. This is achieved through User and Entity Behaviour Analytics (UEBA), which creates dynamic baselines of user and system activities to flag suspicious actions. The system's architecture integrates the Elastic Stack for robust data ingestion, analysis, and visualisation of security events. The methodology followed a structured, two-stage workflow; an offline analysis phase was conducted in a Jupyter Notebook to preprocess a synthetic dataset from Carnegie Mellon University, engineer both baseline and enriched UEBA features, and train three unsupervised machine learning models (Isolation Forest, One-Class Support Vector Machine (SVM), and Local Outlier Factor (LOF)). The resulting anomaly scores were then ingested into the Elastic Stack, enabling dynamic dashboards and automated alerting. The system's effectiveness was rigorously validated through comprehensive evaluation testing. Performance was quantified using a confusion matrix to calculate metrics like precision and recall, while a Receiver Operating Characteristic (ROC) curve analysis was used to compare model performance, which confirmed the superiority of the UEBA-enhanced models over baseline. Finally, a formal expert review affirmed the framework's practical relevance, usability, and potential for real-world application.

Keywords: *Anomaly Detection, Insider Threats, UEBA, Elastic Stack, Machine Learning*

1. Introduction

Insider threats are a significant challenge, as traditional security is often ineffective against authorised users. Data describing these activities is typically rare, making detection (Le & Zincir-Heywood, 2021). This study introduces an anomaly-based detection system integrating UEBA, the Elastic Stack, and machine learning to identify high-risk behaviours (Sharma et al., 2024). Its objectives were to identify behavioural indicators, develop an integrated detection system, and evaluate its performance. The scope involved using a large, synthetic dataset for testing and was structured around a two-stage workflow: offline model training in a Jupyter Notebook, followed by ingesting the results into the Elastic Stack for visualisation and alerting against predefined threat scenarios.

2. Methodology

This research employed the waterfall model of the System Development Life Cycle (SDLC). It began with the synthetic CERT Insider Threat Dataset from Carnegie Mellon University, which required extensive data cleaning and preprocessing. Raw logs were transformed and aggregated to a daily granularity to form a baseline feature set. Following this, advanced UEBA features were engineered to provide deeper behavioural context. The core of the methodology was a comparative analysis of three unsupervised models: the tree-based Isolation Forest (IF), One-Class SVM, and the density-based LOF. This entire analysis, from data processing to model scoring, was conducted offline in a Jupyter Notebook. The final, scored dataset was ingested via a Logstash pipeline into Elasticsearch

for indexing, with Kibana used for interactive dashboards and automated alerts (Subramanian & Meng, 2021).

3. Results / Findings

The implementation and evaluation of the detection system showed a primary finding. Engineered UEBA-enhanced features significantly improved the performance of all machine learning models over the baseline. The ROC curve analysis identified the UEBA-enhanced One-Class SVM as the top-performing model, achieving the highest Area Under the Curve (AUC) of 0.904. A detailed per-scenario recall analysis further validated these findings; UEBA models achieved perfect recall (1.0) in detecting a sudden data exfiltration threat that baseline models completely missed. This aligns with related work showing information fusion improves detection rates. Furthermore, functional testing confirmed the "UEBA Playground" web application and Kibana alert system were effective. Finally, a formal expert review by cybersecurity professionals affirmed the project's practical relevance and design.

4. Novelty of Research / Product / Project

This project's novelty lies in its integrated framework, which uniquely combines UEBA, unsupervised machine learning, and the Elastic Stack for insider threat detection. Unlike many academic models, it empirically proves the value of advanced behavioural features by quantitatively comparing a baseline model against a UEBA-enhanced model, demonstrating significant performance gains. The system employs an innovative two-stage architecture that separates complex offline analysis from online visualisation and alerting. A key product novelty is the development of an interactive "UEBA Playground" web application, allowing for dynamic feature engineering and model comparison. Finally, the research's validity is strengthened by a formal expert review, which moves beyond standard technical metrics to confirm the system's practical relevance and usability.

5. Conclusion or Future Work

This project successfully developed an insider threat detection framework, proving UEBA-enhanced features significantly improve model performance. Future work will focus on validating the system with real-world data, transitioning to a real-time streaming architecture, and exploring advanced machine learning models to further enhance detection capabilities.

REFERENCE LIST

- Le, D. C., & Zincir-Heywood, N. (2021). Anomaly Detection for Insider Threats Using Unsupervised Ensembles. *IEEE Transactions on Network and Service Management*, 18(2), 1152–1164. <https://doi.org/10.1109/TNSM.2021.3071928>
- Sharma, G., Thakur, A., & Tiwari, C. (2024). Developing a Comprehensive Framework for UEBA: Integrating Advanced Machine Learning and Contextual Insights. *Journal of Communication Engineering & Systems*, 14. <https://doi.org/10.37591/JoCES>
- Subramanian, K., & Meng, W. (2021). Threat Hunting Using Elastic Stack: An Evaluation. *2021 IEEE International Conference on Service Operations and Logistics, and Informatics, SOLI 2021*. <https://doi.org/10.1109/SOLI54607.2021.9672347>

PALM N TRACK: AN ESTATE COMMODITY, MACHINERY AND EQUIPMENT INVENTORY WEB APPLICATION

Muhammad Arif Hakimi Bin Yusman, Nurzaid B Muhd Zain

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023643238@student.uitm.edu.my, nurzaid@uitm.edu.my

Abstract

Full adoption of recent technologies by small-scale plantation estates is still at a low level because most of them have partial or no access to such technology. Traditional methods used by many plantation estates normally lead to problems such as inaccurate record-keeping. This results in the management team being unable to monitor and manage the estate efficiently. In this project, a web-based inventory application, which is called “Palm N Track”, for a palm oil estate was developed. This application can track the inventory of a palm oil estate. The Waterfall model was used during the development process. This application uses Laravel and PHP as a framework to generate the backend, while HTML and CSS to create a user-friendly interface on the frontend, followed by MySQL to manages the database. Key features in this application include role-based access, CRUD operations, and the ability to generate PDF reports for inventory order purposes. Findings from users using usability testing revealed high satisfaction, with mean scores of 4.5–7.8 on a 5-point Likert Scale across four sections. Specifically, 80% of respondents rated navigation as intuitive, and 85% found the system efficient for stock updates. Network performance testing showed desktop scores above 90 and mobile scores of 80–89, indicating good performance. Future enhancements will focus on expanding accessibility by developing a mobile application or Progressive Web App to support field operations. Additional features that can be added are QR or barcode scanning, multilingual support, real-time stock alerts, and implementing two-factor authentication for the application.

Keywords: *Inventory Management, Palm Oil Estate, Web-Based Application, Waterfall Model, Role-Based Access*

1. Introduction

Inventory systems in palm oil estates are often managed manually, which causes inefficiencies in tracking commodities, machinery, and equipment. These traditional practices contribute to operational delays, inaccurate stock data, and resource mismanagement (Ismail & Manani, 2021). This project proposes Palm N Track, a web-based inventory application tailored for plantation operations. The system aims to improve stock monitoring and automate inventory tasks while offering role-based access to Admin and Staff. Its objectives include identifying key inventory issues, developing a web-based solution using modern tools, and evaluating its effectiveness and usability. By focusing on real-time data visibility and accessibility, the system supports accurate inventory logging and improves plantation productivity (Fauzi & Septanto, 2024).

2. Methodology

The project adopted the Waterfall Model for its structured, sequential approach. Requirement Analysis identified functional needs and non-functional needs. Design created Entity Relationship Diagrams, Data Flow Diagrams, system architecture, and sitemap. Laravel and PHP used as a framework to generate the backend, while HTML and CSS to create a user-friendly interface on the frontend, and lastly hosted on cPanel. Key features included stock tracking, usage records, and PDF generation using Laravel’s dompdf package. Functionality and usability testing was conducted on 15 plantation workers using Likert Scale surveys, and network performance was conducted using Google

PageSpeed Insights. Documentation was completed using Microsoft Word and Mendeley, ensuring maintainability. Testing confirmed system reliability, with minor mobile optimization issues noted.

3. Results / Findings

Usability testing with 15 plantation workers aged between 18 to 24 years old and 1 to 5 years' experience yielded high satisfaction scores between 4.5 to 4.7 on a Likert scale. These workers praised the intuitive navigation and consistent layouts. Network performance testing showed excellent desktop scores above 90 but the mobile only managed to score between 80 to 89, which means it still needs space for optimization. These results show that Palm N Track meets user expectations and enhances real-time stock management. It has reduced over-reliance on manual systems, improved accountability, and strengthened digital literacy among plantation staff. Feedback suggested adding a registration page, improving mobile responsiveness, and integrating QR or barcode scanning.

4. Novelty of Research / Product / Project

Palm N Track introduces a domain-specific inventory system tailored to palm oil estates, unlike general inventory platforms. The system offers centralized inventory tracking for commodities, machinery, and equipment, which is rare in agricultural settings. By integrating CRUD functions, form for purchasing new stock which can be downloaded as a PDF, and role-based access, it improves task delegation and accountability. Most existing plantations rely on spreadsheet-based methods that are not scalable (Conceição et al., 2021). Palm N Track bridges this gap by delivering a lightweight, Laravel-based web solution suitable for users with low digital literacy. Additionally, it is hosted via cPanel and structured for potential transformation into a Progressive Web App (PWA) to improve mobile access and field usage.

5. Conclusion or Future Work

The application successfully enhances palm oil estate inventory management while improving the efficiency and transparency. Future work includes developing a mobile app, integrating QR or barcode scanning, adding multilingual support, and implementing real-time alerts to enhance accessibility and functionality for diverse users.

REFERENCE LIST

- Conceição, J., de Souza, J., Gimenez-Rossini, E., Risso, A., & Beluco, A. (2021). Implementation Of Inventory Management In A Footwear Industry. *Journal of Industrial Engineering and Management*, 14(2), 360–375. <https://doi.org/10.3926/jiem.3223>
- Fauzi, R. A., & Septanto, H. (2024). Design Of A Web-Based Inventory System At Pt. Tainan Enterprises Indonesia Ho. *Jurnal Informatika Dan Teknik Elektro Terapan*, 12(3). <https://doi.org/10.23960/jitet.v12i3.4955>
- Ismail, S. Z., & Manani, F. (2021). Enhancing Palm Oil Inventory Control Support Analytic Tools. *Journal of Modern Manufacturing Systems and Technology*, 5(1), 46–50. <https://doi.org/10.15282/jmmst.v5i1.6105>

GAMIFICATION IN MOBILE LEARNING ARABIC VOCABULARY FOR NON-NATIVE SPEAKERS

Muhammad Fakhrullah Bin Ahmad Subki, Mohd. Nizam bin Osman

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022458616@student.uitm.edu.my, mohdnizam@uitm.edu.my

Abstract

This project introduces *Arabysis*, a gamified mobile learning application developed to facilitate and provide assistance to non-native speakers in learning Arabic vocabulary and pronunciation. *Arabysis* has been developed using Android Studio (Java) and integrates Firebase. The app turns traditional learning of Arabic into a self-paced, interactive process. It is based on motivators such as points, badges, and leaderboards, and addresses the immediacy of feedback using learning content to motivate learners, specifically university students in UiTM Perlis who are currently taking Arabic Level 1. The project was developed using the Waterfall Software Development Life Cycle (SDLC) model and consisted of the requirements, system design, implementation, testing, and deployment phases. A User Acceptance Test (UAT) was conducted with 30 responders, and the UAT questionnaire was related to four criteria: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward the Platform (ATT), and Behavioral Intention (BI). All four criteria received relatively strong user satisfaction, with an overall mean satisfaction score of 4.5 out of 5.0, which indicates the platform is usable and contributed to student learning. The app was most recently tested on 5 devices and examined under Wi-Fi and 4G. In both conditions learning latency and throughput was well within reasonable and stable ranges for learning.

Keywords: *Arabysis*, Arabic vocabulary, gamification, mobile learning, Firebase, Android Studio, pronunciation, non-native speakers

1. Introduction

Arabic is a linguistically complex language that poses a challenge for non-native learners when learning to pronounce the words and keeping vocabulary in their memories. Characters like ‘ع’ (‘ayn) and ‘غ’ (ghayn) are incredibly difficult to pronounce starting out, and traditional methods of teaching using textbooks and passively memorizing words does not engage learners authentically. This project presents *Arabysis*, a mobile learning app which gamifies the learning of Arabic through audio-enhanced quizzes, achievement-based progression, and real-time feedback. Gamification is apparently a trend in many areas (Huang et al., 2023) so the learning feature is founded upon the Zichermann & Cunningham gamification framework, which has relevance in the domain of educational technology. The goal is to make learning more attractive, especially for students who are digital natives. Mobile learning is becoming increasingly utilized (Hao et al., 2023) and *Arabysis* addresses the issue of pronunciation in an innovative and relevant way.

2. Methodology

The project of *Arabysis* utilized the Waterfall System Development Life Cycle (SDLC) to inform the methodology of the project framework. The established methodology referred to the productive deployment of applicable tools and stages to address intended objectives (Sileyew, 2020). The Waterfall model was chosen for its methodical step-by-step approach. The project initially identified the challenges that non-native Arabic learners experience when acquiring pronunciation and the ability to recall vocabulary. The design stage concentrated on user interface placement and gamification plan deployment. The development phase utilized Android Studio (Java) to build the application and Firebase to develop authentication, cloud storage, and user progress tracking. The implementation incorporated prototype capabilities, specifically audio-supported quizzes, point

systems with badges. Testing incorporated user acceptance testing and network performance to ensure user testing could demonstrate that the app operates stably, and that the use of the app is clear to the user and meets learners' requirements.

3. Results / Findings

The user acceptance tests determined that the app performed well in usability and user engagement. The user acceptance tests were tested on four criteria: ease of use, usefulness, attitude towards the platform, and intention to use the average rating for all four criteria was 4.5 out of 5. Perceived usefulness and user attitude were rated to be the highest criteria, which means almost all participants agreed, which indicated that they were satisfied with the app. Participants suggested engagement features like quizzes, badges, or the ability of audio playback were all significant to their engagement with the app. In addition, other features participants wanted included their data on their progress, pronouncing a word like a native speaker, and content options for an advanced learner. The technical test portion was conducted on five different Android devices utilizing both 4G connections and wi-fi connections. The user experience latency tested was between 501 ms to 650 ms, while throughput was fairly stable for sending at 0.1 - 3.8 KB/s, and receiving at 0.1 - 0.2 KB/s. Overall, *Arabysis* was consistently acceptable in performance, utilized gamification mechanics appropriately, and the user experience was acceptable; *Arabysis* was shown to be a suitable app for non-native Arabic learners in a mobile learning environment.

4. Novelty of Research / Product / Project

Arabysis is a specially designed mobile application to learn Arabic vocabulary for non-Arabic speakers, using simple but successful tools to engage the learners' already developed vocabulary knowledge. Unlike most other language applications there are general paths offered for learners based on their usage of the application, but *Arabysis* focuses on engaged learning of a beginner level of Arabic. Features include audio-supported quizzes, ability to playback pronunciation, points, badges and milestones of progress. The nature of the tools allows for both individual learning and self-paced exploration, accommodating many types of learners. It is built using Firebase technology that provides a centralization of resources of vocabulary and sounds, for responsive capacity to track progress. *Arabysis* uses immediate feedback and gamification-based elements to help maintain motivation.

5. Conclusion or Future Work

Arabysis successfully introduces non-native speakers to Arabic vocabulary acquisition, sustaining motivation and engagement through gamified content. User testing confirmed a high satisfaction rate among learners.

REFERENCE LIST

- Hao, S., Dennen, V. P., & Mei, L. (2023). Influential factors for mobile learning acceptance among Chinese users. *Educational Technology Research and Development*, 65(1), 101–123. <https://doi.org/10.1007/S11423-016-9465-2/TABLES/7>
- Huang, X., Xiang, X., Liu, Y., Wang, Z., Jiang, Z., & Huang, L. (2023). The Use of Gamification in the Self-Management of Patients With Chronic Diseases: Scoping Review. *JMIR Serious Games*, 11, e39019. <https://doi.org/10.2196/39019>
- Sileyew, K. J. (2020). *Cyberspace - Google Books*. [https://books.google.com.my/books?hl=en&lr=&id=eqf8DwAAQBAJ&oi=fnd&pg=PA27&dq=Sileyew,+K.+J.+\(2020\).+Research+methodology:+Tools+and+techniques.+Google+Books.&ots=cLR_6UfdLa&sig=8N2j1boQdZ2vtwqzZ7yGFtUPUCU#v=onepage&q&f=false](https://books.google.com.my/books?hl=en&lr=&id=eqf8DwAAQBAJ&oi=fnd&pg=PA27&dq=Sileyew,+K.+J.+(2020).+Research+methodology:+Tools+and+techniques.+Google+Books.&ots=cLR_6UfdLa&sig=8N2j1boQdZ2vtwqzZ7yGFtUPUCU#v=onepage&q&f=false)

REAL-TIME IOT-DRIVEN TODDLER TEMPERATURE MONITORING SYSTEM USING MOBILE APPLICATION ALERTS

Muhammad Firdaus Zuhairi bin Zailani, Ros Syamsul bin Hamid

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022455736@student.uitm.edu.my, rossyamsul@uitm.edu.my

Abstract

The Real-Time IoT-Driven Toddler Temperature Monitoring System Using Mobile Application Alerts addresses the critical need for continuous, non-invasive temperature monitoring in toddlers, particularly during sleep. Fever in young children can lead to severe complications, such as febrile seizures (Eilbert & Chan, 2022), and traditional monitoring methods often disrupt sleep and lack real-time alerts (Health Sense, 2023). This project integrates an IoT device (MLX90614 infrared sensor, DHT11 environmental sensor, and NodeMCU ESP8266 microcontroller) with a Flutter-based mobile application to provide caregivers with live temperature updates, historical data tracking, and instant notifications when temperatures exceed safe thresholds ($\geq 38^{\circ}\text{C}$) or custom value set by the user. The system was developed using the Waterfall model, encompassing requirement analysis, design, development, testing, and documentation. The mobile app features a user-friendly interface with real-time temperature gauges, alert logs, and supplementary tools like AI-powered health advice (Gemini API) and PDF report generation. The IoT device measures temperature without physical contact, ensuring comfort for toddlers. Evaluation testing involved 31 participants (parents, caregivers, and healthcare staff) assessing usability, functionality, and sensor accuracy. Results showed high satisfaction: attractiveness (mean 4.70/5), dependability (4.77/5), and novelty (4.68/5). Key strengths included intuitive navigation, real-time alerts, and customizable features. This project highlights the potential of IoT and mobile technology to enhance paediatric care by combining non-contact monitoring, real-time data synchronization, and user-centric design, offering a reliable solution for proactive toddler health management.

Keywords: *IoT temperature monitoring, real-time alerts, MLX90614 sensor, non-contact thermometry.*

1. Introduction

Fever in toddlers can escalate quickly, particularly during sleep when symptoms often go undetected. Traditional temperature monitoring methods, such as manual thermometers, are disruptive and fail to provide real-time alerts, leaving parents anxious about their child's condition (Health Sense, 2023). To address this issue, this project develops an IoT-based real-time temperature monitoring system that continuously tracks a toddler's body temperature and instantly notifies caregivers of any abnormalities. The primary goal of this system is to enable non-invasive, 24/7 fever monitoring for toddlers using an infrared temperature sensor (MLX90614) and a mobile app. The IoT device measures body temperature without physical contact, while the app provides live updates, historical trends, and emergency alerts when temperatures exceed safe levels. Designed for children under three years old, the system ensures prompt detection of fever, allowing parents to take immediate action and prevent complications. By integrating IoT technology with mobile alerts, this project offers a reliable, user-friendly solution for proactive toddler healthcare.

2. Methodology

This project applied the Waterfall model for development due to its clear, step-by-step structure. The process included Requirement Analysis, Design, Implementation, Testing, and Deployment (Kirvan, 2024). Key requirements such as real-time monitoring and alert functions were defined early. Hardware components like the MLX90614, DHT11, and NodeMCU ESP8266 were selected, and the system was built using Flutter and Firebase. After implementation, functionality and user experience

testing were conducted with 31 participants. The structured nature of the Waterfall model ensured smooth project execution and clarity at each development stage.

3. Results / Findings

User experience testing was conducted to evaluate the overall usability and satisfaction of the Real-Time IoT-Driven Toddler Temperature Monitoring System (Longe, 2025). A total of 31 participants were involved in the testing process, providing feedback through a questionnaire based on six UX factors: Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty. The findings revealed positive user perceptions across all categories. The highest mean score was recorded for Dependability (4.77), followed by Attractiveness (4.70) and Novelty (4.68), indicating that users found the system reliable, visually appealing, and innovative. Efficiency (4.56) and Perspicuity (4.57) scores showed that users were able to navigate and understand the system with ease. Stimulation also scored well at 4.65, suggesting the app was engaging and encouraging to use. Overall, the UX results confirmed that the system successfully met user expectations in terms of design, performance, and usability, making it suitable for real-world application in toddler health monitoring.

4. Novelty of Research

This project offers a unique real-time, non-contact temperature monitoring system for toddlers by integrating IoT technology with a mobile app. It uses the MLX90614 infrared sensor for safe measurement and includes features like live temperature gauge, customizable alerts, summary trends, note-taking, and an AI chatbot (Gemini API). The system also allows users to customize notifications and export summaries as PDF, providing a modern and innovative solution for toddler health monitoring.

5. Conclusion or Future Work

The project successfully developed a reliable, real-time temperature monitoring system for toddlers using IoT and mobile technology. Future improvements include integrating camera support, enabling offline data syncing, adding multi-user and multi-child profiles, and developing a web dashboard to enhance usability and caregiver accessibility.

REFERENCE LIST

- Eilbert, W., & Chan, C. (2022). Febrile seizures: A review. In *JACEP Open* (Vol. 3, Issue 4). John Wiley and Sons Inc. <https://doi.org/10.1002/emp2.12769>
- Health Sense. (2023, July). *Infrared Thermometers vs. Traditional Thermometers: Pros and Cons*. <https://healthsense.in/blogs/news/infrared-thermometers-vs-traditional-thermometers-pros-and-cons>
- Kirvan, P. (2024, November). *What is a Waterfall model? Definition and guide*. <https://www.techtarget.com/searchsoftwarequality/definition/waterfall-model>
- Longe, T. (2025, March 2). *UX Testing - Methods & Tools to Test User Experience*. <https://uxcam.com/blog/ux-testing/>

WEB-BASED REAL-TIMES SCORE MALAYSIA FOOTBALL INFORMATION SYSTEM

Muhammad Harris bin Pairus , Hanisah Binti Ahmad

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia *e-mail:*

2023679774@student.uitm.edu.my , hanisahahmad@uitm.edu.my

Abstract

Football is one of the most popular sports in Malaysia, yet there is no centralized platform dedicated to delivering real-time information for local football leagues. Most existing digital platforms focus on international leagues, leaving a gap in access to localized content such as match scores, team standings, player statistics, and fan engagement features. This project introduces a Web-Based Real-Times Score Malaysia Football Information System to address that gap. Built using Laravel, PHP, MySQL, and integrated with Football API, the system provides live match updates, team information, league tables, player data, and interactive features such as fantasy football, prediction games, polls, forums, and match highlights. The system targets football fans, analysts, and coaches, aiming to enhance the local football experience and promote digital engagement with Malaysian football. Functionality and usability testing confirmed that the system is reliable and user-friendly, with strong potential for future expansion.

Keywords: *Real-time Football Scores, Football API, Malaysian Football, Fantasy Football, Interactive Engagement, Sports Data.*

1. Introduction

While Malaysian football remains culturally significant, the digital ecosystem supporting local leagues is underdeveloped. Fans often struggle to find accurate, real-time information on Malaysian matches, and existing apps mainly cater to European or global competitions. This project aims to fill that void by offering a centralized and interactive platform focused entirely on Malaysian football. The system is designed to provide live match updates, player and team statistics, league standings, and engagement tools for users such as fantasy games and forums. It also supports Malaysia's national goal of increasing sports participation and technological development.

2. Methodology

The project follows the Waterfall Software Development Life Cycle (SDLC), consisting of five key phases: requirement analysis, system design, development, testing, and documentation. During the analysis phase, user needs were identified to guide system features. In the design phase, data flow diagrams, ERD, and user interfaces were created. Development used Laravel as the backend framework, PHP for scripting, and MySQL as the database. Real-time match data was retrieved from Football API via secure HTTP requests, with JSON responses integrated into the system. Testing involved both functionality and usability testing using Google Forms, with user feedback collected and evaluated. The final phase involved detailed documentation of the entire system.

3. Results / Findings

The final system successfully met its objectives. Key modules include a live score dashboard, team and player stats, prediction and fantasy pages, user profiles, and admin management tools. Testing results showed that users were able to easily navigate the system and access relevant football information. Usability testing revealed high satisfaction in clarity, responsiveness, and content structure. The system was also successfully hosted online using Hestia Control Panel, supporting both desktop and mobile access.

4. Novelty of Research

This project offers a novel contribution to the development of real-time football information systems by focusing specifically on Malaysian football leagues, including the Malaysia Super League, FA Cup, and Malaysia Cup. Unlike existing platforms that emphasize international leagues, this system targets local users by providing a centralized, web-based solution developed using Laravel, PHP, and MySQL, and integrated with Football API to deliver live match updates, team standings, player statistics, and match history.

5. Conclusion or Future Work

This study concludes that the Web-Based Real-Time Score Malaysia Football Information System successfully addresses the lack of localized digital platforms for Malaysian football. By integrating real-time data from the Football API and offering features such as live scores, player statistics, team standings, and interactive modules including fantasy football, prediction pages, forums, and match highlights, the system enhances fan engagement and supports the digital transformation of local sports coverage. Usability testing with 12 users confirmed the system's functionality and ease of use.

REFERENCE LIST

- Afiifah, K., Fira Azzahra, Z., Anggoro, A., & Redaksi, D. (2022). Universitas Negeri Jakarta; Jl. Rawamangun Muka Raya No.11 RW.14 Rawamangun. *JURNAL INTECH*, 3(2), 4898486.
- Adenowo, A., & Adenowo, B. (2020). Software Engineering Methodologies: A Review of the Waterfall Model and Object-Oriented Approach Software Engineering Methodologies: A Review of the Waterfall Model and Object- Oriented Approach. *International Journal of Scientific & Engineering Research*, 4(7).
- Aleryani, A. Y. (2024). Analyzing Data Flow: A Comparison between Data Flow Diagrams (DFD) and User Case Diagrams (UCD) in Information Systems

WEB-BASED STOCK MARKET PRICE PREDICTION USING MACHINE LEARNING LSTM

Muhammad Imran Bin Mohamad Tarmizi, Nora Yanti Binti Che Jan

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: imrantarmizi2002@gmail.com, noray084@uitm.edu.my

Abstract

This project centers on the development of a web-based system for stock market price prediction by utilizing machine learning, specifically the Long Short-Term Memory (LSTM) model. The system is designed to forecast stock prices of selected companies, namely Apple and Amazon, based on historical data patterns. Key technologies include Google Colab for model training and development, the Polygon.io API for accessing real-time and historical stock data, and Laravel as the backend framework for building the interactive web dashboard. The primary objective is to equip users with an intuitive and dynamic platform that enables real-time stock monitoring, AI-based prediction, and a built-in profit calculator. The dashboard also allows seamless switching between company views, enhancing user experience and accessibility. To evaluate the reliability and efficiency of the system, comprehensive usability, functionality, and network performance tests were conducted. For assessing the accuracy of predictions, standard statistical metrics were applied, including Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and the R^2 score. Results indicate that the LSTM model effectively captures sequential patterns in time-series stock data and demonstrates promising predictive accuracy. Despite some limitations such as the narrow scope of stock selections and the absence of sentiment analysis integration the system proves the potential of merging AI and web technologies for real-world financial forecasting applications. This platform not only assists investors in making informed trading decisions but also serves as a foundation for future enhancements in predictive financial analytics.

Keywords: *Machine Learning, LSTM, Accuracy, AI-based prediction*

1. Introduction

This project focuses on developing a web-based system for stock market price prediction using machine learning, specifically Long Short-Term Memory (LSTM) models. The primary goal is to utilize historical market data to predict future stock prices for selected companies such as Apple and Amazon. These companies were chosen due to their global relevance, consistent market activity, and the availability of extensive historical data. The system provides users with an interactive dashboard that visualizes real-time and predicted trends to support investment decisions (Brownlee, 2020; Shah et al., 2021). It aims to enhance financial forecasting accessibility by integrating machine learning with a user-friendly web interface.

2. Methodology

The methodology of this project follows a clear sequence: data collection, preprocessing, model development, and system integration. Historical stock data for Apple and Amazon is retrieved from the Polygon.io API and pre-processed to handle missing values and normalize the data. The cleaned data is structured into sequences to be used in a time-series model. A Long Short-Term Memory (LSTM) model is built using Google Colab due to its suitability for sequential data and long-term trend learning. The model is trained on a portion of the dataset and evaluated using Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R^2 score to measure prediction accuracy. Once trained, the LSTM model is integrated into a web-based system developed with Laravel. The system includes features such as real-time data display and a profit calculator. XAMPP is used to manage the

MySQL database, and the entire application undergoes usability, functionality, and network testing for performance evaluation.

3. Results / Findings

The LSTM model demonstrated promising performance in capturing sequential stock price trends for Apple and Amazon. By learning from historical closing prices, the model was able to predict future prices with a reasonable degree of accuracy. To evaluate the performance of the model, key statistical metrics were used, including Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and the R^2 score. The relatively low RMSE values suggest minimal deviation between predicted and actual prices, while high R^2 scores indicate that the model could explain a significant portion of the variance in stock movements. These results highlight the LSTM model's strength in modelling non-linear and time-dependent data. As supported by Livieris et al. (2021), LSTM models have been shown to provide effective and reliable forecasting in volatile financial markets. In addition to the model's quantitative accuracy, qualitative evaluation through usability testing revealed that users found the system easy to navigate. The dashboard's features such as the ability to switch between company stocks, calculate potential profits, and view predictions clearly enhanced the overall user experience and usability of the application.

4. Novelty of Research

This project introduces a hybrid approach by combining machine learning with real-time web deployment. The use of LSTM, which can retain long-term dependencies and manage non-linear, noisy data, gives this system a competitive edge over traditional models like ARIMA (Yadav & Shukla, 2021). The implementation of a responsive Laravel-based dashboard connected with live stock data adds practical utility to the system. Unlike static prediction tools, this project features integrated live updates, multi-company dashboards, and profit calculators tools that provide a holistic experience for financial decision-making. This makes the system not only technically sound but also user-oriented in real-world investment contexts (Rouf et al., 2021).

5. Conclusion or Future Work

This project successfully demonstrates the use of LSTM in predicting stock prices through a web-based system. Future work may involve expanding stock coverage, integrating sentiment analysis, and enabling real-time trading simulations to improve accuracy and usability for broader financial decision-making applications.

REFERENCE LIST

- Livieris, I. E., Pintelas, E., & Pintelas, P. (2021). A CNN–LSTM model for gold price time-series forecasting. *Neural Computing and Applications*, 33(9), 4741–4752. <https://doi.org/10.1007/s00521-020-05221-x>
- Yadav, A., & Shukla, R. (2021). A study on prediction of stock market using LSTM model. *International Journal of Scientific Research in Engineering and Management*, 5(12), 1–5. <https://doi.org/10.1109/IEMTRONICS51293.2021.9422662>
- Rouf, A., Chowdhury, N. A., & Rahman, M. M. (2021). Financial stock market prediction using hybrid deep learning models. *Applied Soft Computing*, 101, 107064. <https://doi.org/10.1016/j.asoc.2020.107064>

WEB-BASED EVENT MANAGEMENT TICKETING SYSTEM FOR UiTM

Muhammad Imran Bunyamin Bin Mohd Suder, Naemah Binti Abdul Wahab

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

Email: muimrn.bnymn@gmail.com , naema586@uitm.edu.my

Abstract

Web-Based Event Management Ticketing System for UiTM aims to modernize the way events are managed within the university by replacing manual processes with a secure, efficient, and user-friendly digital platform. The system is built with Laravel, PHP, HTML, CSS and JavaScript. The fundamental features supported are online ticket purchases, generating QR code to check-ins, the use of TomyibPay as the payment, and sending email-based tickets. The major modules incorporate independent dashboards and management tools of the participants, organizers and admins. A total of 30 respondents were tested in the usability testing, which included UiTM students, UiTM staff, and outsiders. Findings from the testing presented high satisfaction with respect to usefulness of system features, system readability, consistency as well as ease of usage. The network performance testing demonstrated normal load speed as well through devices. Future improvements suggested from the feedback include the e-certificate generation, different prices of tickets, the possibility of an export of the attendance reports, and the automatic reminders function. To sum up, the system is effective in achieving its goals and deriving a scalable solution that would improve event management inside UiTM.

Keywords: *Event Management, Web-Based System, Laravel, QR Code, Usability Testing, UiTM*

1. Introduction

Managing campus events manually often results in inefficiencies such as duplicated tickets, long check-in queues, and disorganized attendance tracking—problems that hinder both event organizers and participants (Ashfaq, 2014). Additionally, reliance on paper-based ticketing increases costs and contributes to environmental issues (Atlantic, 2024; Sonar et al., 2024). To address these concerns, this study introduces the Web-Based Event Management Ticketing System for UiTM, a centralized digital platform designed to streamline event operations. Developed using Laravel, PHP, HTML, CSS, and JavaScript, the system offers core functionalities like online ticket booking, QR-based check-ins, payment integration via TomyibPay, and email ticket delivery. It aims to modernize how events are promoted, registered, and managed within UiTM by replacing repetitive manual tasks with a secure, efficient solution (Wibisono et al., 2019). This project targets UiTM organizers, students, staff, and public participants to ensure a more seamless and sustainable event experience.

2. Methodology

This project followed the Waterfall Model for system development (Adam et al., 2022). In the requirement analysis phase, relevant journals and existing systems were reviewed to identify problems, define objectives, and gather suitable content. The design phase focused on modeling the system using DFDs, ERDs, sitemaps, flowcharts, and UI mockups—created with tools like Draw.io and Canva. During the development phase, the system was built using Laravel and MySQL, transforming designs into a working web application. In the testing phase, the system's usability and network performance were evaluated to ensure efficiency and user satisfaction. Finally, the documentation phase involved compiling detailed records of the system's development for future reference and improvement.

3. Results / Findings

The Web-Based Event Management Ticketing System for UiTM was evaluated through usability testing and network performance assessment. A total of 30 respondents including UiTM students, staff, and outsiders participated in the usability test. The feedback showed high satisfaction, with total mean scores exceeding 4.00 across categories like system features, readability, consistency, and overall usability. Network performance was tested using Hostinger's tools, confirming the system loads efficiently on both desktop and mobile devices. These findings indicate that the system is not only functional and user-friendly but also performs reliably under real-world usage.

4. Novelty of Research / Product / Project

The Web-Based Event Management Ticketing System for UiTM offers a modern and paperless solution to streamline event organization on campus. This system will replace the traditional ways which involve the manual check-in and printing of tickets, with the new forms of secure QR-based check-ins, digital ticket cards sent on an email, as well as online payment processing via the ToyyibPay system. It has a role-based panel that divides functions into groups: participants, organizers, and admins; the organization of events becomes well-structured and customizable. The system is also constructed on Laravel and can be scaled and performed efficiently. Combining the level of real-time check-in tracking and automation, not only contributes to the increase of accuracy, but also helps in environmental matters, as many papers will be minimally consumed. This renders the system a novel, sustainable, and feasible system of campus events.

5. Conclusion or Future Work

With digital ticketing and QR check-ins, the Web-Based Event Management Ticketing System for UiTM effectively optimises event procedures. To further improve usability and organiser flexibility, future enhancements might include automated e-certificates, ticket pricing options, attendance report generation, and email/SMS reminders.

REFERENCES

- Adam, N. L., Mansor, M. A. H. C., Pauzi, M. F., & Soh, S. C. (2022). Document and event record management system: A prototype. *2022 12th IEEE Symposium on Computer Applications and Industrial Electronics (ISCAIE)*, 223–227. <https://doi.org/10.1109/ISCAIE54458.2022.9794525>
- Ashfaq, A. (2014). *Event management system*.
- Atlantic. (2024, June 12). How unnecessary printing impacts the environment and your bottom line. Retrieved from <https://tomorrowsoffice.com/blog/how-unnecessary-printing-impacts-the-environment-and-your-bottom-line/>
- Sonar, L., Gite, T., Taralkar, T., Bendale, P., Bansode, S., & Salunke, D. (2024). Secure and efficient public transport management through smart QR code authentication. *2024 International Conference on Information Processing and Computer Networks (ICIPCN)*, 173–177. <https://doi.org/10.1109/icipcn63822.2024.00036>
- Wibisono, Y. P., Primasari, C. H., & Kesuma, A. (2019). E-Vent: Support system for event registration. *IEEE*.

CPFIT: A PERSUASIVE MOBILE APPLICATION OF PHYSICAL EXERCISE FOR CEREBRAL PALSY PATIENTS

Muhammad Ridzuan Bin Amir, Umi Hanim Bt Mazlan,

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

2023627742@student.uitm.edu.my, umihanim426@uitm.edu.my

Abstract

Cerebral palsy (CP) is a complex neuromotor disorder often associated with movement impairment and long-term health complications such as cardiovascular disease, obesity, and fatigue. Despite the well-documented benefits of physical activity in managing CP symptoms, accessible and tailored exercise solutions remain limited, especially for adults. This project introduces CPFit, a persuasive mobile application designed specifically for adults with cerebral palsy. The application offers adaptive fitness routines, exercise tracking, and persuasive elements, including rewards and achievement badges, all to motivate consistent engagement. Developed using Flutter and Firebase and guided by the Waterfall System Development Life Cycle (SDLC), CPFit integrates user-centred design and persuasive technology principles. Evaluation through functionality testing and a User Acceptance Test (UAT) showed high success and acceptance rates among users. CPFit demonstrates the feasibility of technology-assisted rehabilitation by empowering users with Cerebral Palsy to lead more active lifestyles, enhancing their health, motivation, and quality of life.

Keywords: *cerebral palsy, physical activity, persuasive technology, mobile health, adaptive exercise, Flutter*

1. Introduction

Adults with cerebral palsy face a higher risk of secondary health issues, including cardiovascular diseases and premature aging, due to sedentary lifestyles and reduced mobility (McPhee et al., 2019; Lai et al., 2021). However, mainstream fitness applications often fail to provide the necessary accessibility, personalization, or motivational features suited to their needs. This study addresses this gap by developing CPFit, a persuasive fitness mobile application for Cerebral Palsy users. CPFit incorporates behavior change strategies such as rewards and gamification Fogg (2009) to enhance long-term engagement with physical activity. A preliminary study involving 15 CP respondents revealed low levels of exercise awareness and mobile app usage, confirming the need for a customized digital intervention.

2. Methodology

The application was developed using the Waterfall model, progressing through analysis, design, development, testing, and documentation Thesing et al., 2021). Requirements were gathered through literature review and survey findings. Flutter was used to design the UI, while Firebase managed authentication and real-time data storage. The exercise modules were designed based on adaptive routines appropriate for Cerebral Palsy patients, who were all of the respondents Paul et al., (2022). Persuasive design features such as tailoring, praise, and rewards were integrated by Sutcliffe, (2022). Functionality testing verified the integrity of core features, and a UAT based on the Technology Acceptance Model (TAM) assessed usability.

3. Results / Findings

CPFit achieved a 100% pass rate in functionality testing, with all modules including login, exercise tracking, progress summary, and gamification functioning as expected. User acceptance testing showed strong approval across all TAM constructs: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward Using (ATT), and Intention to Use (ITU). Over 86% of respondents agreed that the app improved their exercise motivation and made fitness more accessible. The persuasive design elements significantly enhanced user satisfaction and encouraged repeated app usage.

4. Novelty of Research

CPFit distinguishes itself from generic fitness apps by targeting adults with cerebral palsy, which is a population underrepresented in digital health solutions. It combines persuasive technology, adaptive exercise content, and a simplified interface tailored to Cerebral Palsy-related impairments (Wobbrock et al., 2018). Unlike existing tools limited to appointment booking or basic tracking (e.g., Special Strong), CPFit empowers users to independently manage their exercise routines, track achievements, and stay motivated. Its use of Firebase enables real-time tracking and cloud-based progress storage, while the persuasive interface supports self-efficacy and continuity.

5. Conclusion or Future Work

CPFit successfully demonstrates that a persuasive mobile application can facilitate improved physical activity among adults with cerebral palsy. The integration of adaptive exercise routines and motivational features significantly enhanced user acceptance and app functionality. Future enhancements may include body part-based exercise recommendations, better health and vitals assistance, and social community features to support broader inclusion. The project provides a scalable model for developing digital interventions for other special needs populations.

REFERENCE LIST

- Fogg, B. J. (2009). Creating persuasive technologies: An eight-step design process. Stanford University.
- Khan, M., & Sutcliffe, A. (2022). Attractive user interface agents in persuasive health apps. *International Journal of Human-Computer Studies*, 159, 102750. <https://doi.org/10.1016/j.ijhcs.2021.102750>
- Lai, B., Young, H. J., Bickel, C. S., Motl, R. W., & Rimmer, J. H. (2021). Current trends in exercise and physical activity research for individuals with cerebral palsy: A scoping review. *Disability and Rehabilitation*, 43(6), 797–807. <https://doi.org/10.1080/09638288.2019.1645012>
- McPhee, P. G., Cameron, J. I., & Gorter, J. W. (2019). Physical activity for adults with cerebral palsy: Clinical practice considerations. *Disability and Rehabilitation*, 41(3), 309–316. <https://doi.org/10.1080/09638288.2017.1393513>
- Paul, A., Ahmed, S. U., & Jahan, M. U. (2022). Types of cerebral palsy: A clinical overview. *Journal of Pediatric Neurology*, 20(2), 123–130. <https://doi.org/10.1055/s-0042-1757554>
- Thesing, T., Feldmann, N., & Böhmman, T. (2021). Managing the agile transformation: A framework for agile capability development. *Information Systems and e-Business Management*, 19, 51–86. <https://doi.org/10.1007/s10257-020-00476-x>
- Wobbrock, J. O., Kane, S. K., Gajos, K. Z., Harada, S., & Froehlich, J. (2018). Ability-based design: Concept, principles, and examples. *ACM Transactions on Accessible Computing (TACCESS)*, 3(3), 1–27. <https://doi.org/10.1145/1952383.1952384>

SMART SOIL FERTILITY DETECTION USING INTERNET OF THINGS

Muhammad Rizal Bin Ismail, Iman Hazwam Bin Abd Halim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

Mohd Ashraf Bin Zainol Abidin

Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: rizalismail2111@gmail.com, hazwam688l@uitm.edu.my

Abstract

Soil fertility act a vital role in crop productivity, yet traditional methods are often labour-intensive, costly, and lack of real-time insight. By growing concerns over environmental impact and inefficient of fertilizer use, this project introduces a Smart Soil Fertility Detection using Internet of Things (IoT) technologies to reading the soil values and to monitoring real-time conditions of agricultural soils. This project design and development use of an IoT-based system that integrates SN-300-TR-ECTHNPK-N01 which is multi-parameters soil sensor, LoRa32 microcontroller to enable long-range communication, and NEO-6M GPS module to locate the location of device. The software uses Firebase Realtime Database and a Laravel-based dashboard to visualize all the data that being read by soil sensor and GPS module. The website interfaces include soil data cards, graph trend, location mapping, and downloadable sensors logs. Functionality testing showed that all the component and features in this project was working as expected but have an issue about soil sensor accuracy because of non-industrial soil sensor that being used in this project. Meanwhile for usability testing with 15 respondents indicated that over 73% found the system easy to use, 66.7% agreed the dashboard was intuitive, and 93.3 believe it could reduce manual or traditional method.

Keywords: *Internet of Things, Soil Fertility, LoRa, Soil Sensor, NPK.*

1. Introduction

Nowadays, inconsistent and insufficient soil nutrient level become a major challenge in modern agriculture. Traditional methods are often time-consuming, costly, and unsuitable for real-time use (Karuna et al., 2024). The objective of this project was identifying the nutrient composition and environmental conditions in the soil using Internet of Things to improve productivity of farm output, develop and design the network architecture for smart soil fertility detection using the Internet of Things components, and evaluate user acceptance of smart soil fertility detection using functionality testing and usability testing. This project scope focused on the farming unit at the Universiti Teknologi MARA Perlis Branch as well as staff and students of the Faculty of Plantation and Agrotechnology.

2. Methodology

This project was developed using the Waterfall model which one of the Software Development Life cycle models (Pargaonkar, 2023). It started by requirement analysis, design, development, testing and documentation. This project goals were defined to monitor soil fertility through real-time data collection using Internet of Things (IoT) technology. The design phase involved developing the system architecture, selecting hardware components (LoRa32, soil sensor, and NEO-6M GPS module), and planning the network communication using LoRa technology. In the development phase, Arduino IDE used to program the microcontroller, while Firebase Realtime Database configured to store and sync the sensors data. A Laravel-based web dashboard developed to visualize sensor readings, including nitrogen, phosphorus, potassium, temperature, and moisture, as well as the latitude and longitude. The dashboard displayed live data through cards, line graphs, a map, and a data table with export capability. The testing that used in this project were functionality and usability testing. Functionality testing verified the sensor accuracy, signal strength of LoRa transmission to

determine LoRa reliability in outdoor field conditions (Azhar Muzafar et al., 2022), and successful GPS integration. Usability testing involved 15 respondents from staff or student under Faculty of Plantation and Agrotechnology at UiTM Perlis, who evaluated the system on ease of use, interface clarity, and real-farm applicability. Feedback was collected using questionnaires and interpreted using visual charts.

3. Results / Findings

The functionality testing confirmed that the system accurately detected and transmitted temperature and moisture values using LoRa over distances up to 200 meters. The GPS module successfully recorded location data, enabling sensor mapping and positioning on the dashboard. However, the soil sensor failed to detect nitrogen (N), phosphorus (P), and potassium (K) levels throughout all tests, consistently returning a value of 0 for all three nutrients. This limitation was attributed to the non-industrial grade quality of the sensor. Usability testing involved 15 respondents, primarily students from the Faculty of Plantation and Agrotechnology at UiTM Perlis. Of those surveyed, 73.3% found the system easy to use, 66.7% rated the dashboard as intuitive, and 93.3% agreed the system reduced manual workload. All respondents expressed satisfaction and willingness to recommend the system.

4. Novelty of Research / Product / Project

This project presents a novel integration of low-cost IoT components for real-time environmental soil monitoring using LoRa communication, GPS tracking, and cloud-based visualization. While many existing systems rely on manual testing or expensive equipment, this solution leverages affordable microcontrollers (LoRa32), GPS modules (NEO-6M), and soil sensors to create a wireless, cloud-connected soil monitoring system. What sets this project apart is its end-to-end modular design, combining real-time sensor data collection, long-range transmission using LoRa, and Firebase-based synchronization with a custom-built Laravel web dashboard. Users can track live data, trends, geolocation, and historical records without the need for specialized tools or software.

5. Conclusion or Future Work

This project was successfully developed a real-time soil monitoring system using Internet of Things (IoT) and LoRa technologies. While nitrogen, phosphorus and potassium detection were limited, temperature and moisture monitoring performed well. Future improvements include integrating industrial-grade sensors, expanding network coverage, and enhancing mobile accessibility to support broader adoption in smart agriculture and research environments.

REFERENCE LIST

- Azhar Muzafar, M. I. Z., Mohd Ali, A., & Zulkifli, S. (2022). A Study on LoRa SX1276 Performance in IoT Health Monitoring. *Wireless Communications and Mobile Computing*, 2022. <https://doi.org/10.1155/2022/6066354>
- Karuna, G., Ram Kumar, R. P., Sanjeeva, P., Deepthi, P., Saeed, H. Y., Asha, V., Kansal, L., & Praveen. (2024). Crop recommendation system and crop monitoring using IoT. *E3S Web of Conferences*, 507. <https://doi.org/10.1051/e3sconf/202450701063>
- Pargaonkar, S. (2023). A Comprehensive Research Analysis of Software Development Life Cycle (SDLC) Agile & Waterfall Model Advantages, Disadvantages, and Application Suitability in Software Quality Engineering. *International Journal of Scientific and Research Publications*, 13(8), 120–124. <https://doi.org/10.29322/ijsrp.13.08.2023.p14015>

MITIGATION OF THE GREENHOUSE EFFECT IN SMART AGRICULTURE USING IOT FOR CHINESE CABBAGE

Noor Haziq Aiman bin Noor Aizam, Ros Syamsul bin Hamid, Mohd Ashraf Zainol Abidin
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2023696128@student.uitm.edu.my, rossyamsul@uitm.edu.my

Abstract

This project introduces an IoT-based greenhouse effect mitigation system for Chinese cabbage farming, developed to address climate-induced challenges in traditional agriculture practices. The SMARTDash mobile application provides real-time environmental monitoring, predictive alerts, historical analysis, and mitigation recommendations using ESP32 microcontroller with DHT22 (temperature/humidity) and SCD41 (carbon dioxide) sensors. Developed using Waterfall SDLC methodology with Flutter and Firebase Realtime Database, the system enables farmers to monitor conditions every 30 minutes and receive automated alerts when environmental parameters exceed optimal thresholds. User acceptance testing with 30 participants achieved exceptional Technology Acceptance Model scores, with 96.7-100% positive responses. Functionality testing demonstrated 100% success rate across all features, while network performance testing showed optimal latency (70-249ms) and 100% transmission reliability. The system validates IoT-based environmental monitoring as an effective solution for sustainable agriculture, enabling proactive greenhouse gas reduction through optimized resource utilization.

Keywords: *IoT, smart agriculture, greenhouse effect mitigation, environmental monitoring, Chinese cabbage, ESP32, mobile application.*

1. Introduction

Traditional agriculture practices exacerbate greenhouse effects through excessive resource consumption and manual monitoring, while Chinese cabbage farmers face climate-induced challenges from rising carbon dioxide levels, temperature fluctuations, and humidity variations impacting crop quality (Mumuh et al., 2021). This study introduces SMARTDash, an IoT-based mobile application designed to mitigate greenhouse effects in Chinese cabbage cultivation around Universiti Teknologi MARA (UiTM) Arau. The system integrates ESP32 microcontroller with environmental sensors to provide real-time monitoring, predictive alerts, and historical analysis. The research objectives include investigating requirements for greenhouse effect mitigation devices, developing an IoT-based monitoring system, and evaluating system performance through functionality, user acceptance, and network performance testing. The scope focuses on Chinese cabbage farmers with limited technical skills, emphasizing user-friendly interfaces and automated environmental management to optimize growing conditions while minimizing carbon footprint through data-driven agricultural practices.

2. Methodology

This research employs the Waterfall System Development Life Cycle (SDLC) methodology through five phases: requirement analysis, design, development, testing, and documentation (Pargaonkar, 2023). The system integrates ESP32 microcontroller with DHT22 sensors for temperature/humidity monitoring and SCD41 sensors for CO₂ detection. The mobile application was developed using Flutter framework with Firebase Realtime Database for cloud-based data management. Testing involved three evaluations: User Acceptance Testing with 30 participants using Technology Acceptance Model criteria (Nnaji et al., 2023), Functionality Testing across all system features, and Network Performance Testing measuring latency and reliability. The methodology ensured systematic development while maintaining focus on user accessibility for farmers with varying technical expertise levels.

3. Results / Findings

User Acceptance Testing achieved unanimous positive results with 30 participants. Scores included Perceived Ease of Use (4.65/5.0), Perceived Usefulness (4.69/5.0), Attitude Towards Platform (4.70/5.0), and Behavioral Intention (4.72/5.0). Functionality testing achieved 100% success rate across all components including sensor readings, data synchronization, and report generation. Network performance evaluation showed optimal reliability with 70-249ms latency, 100% data transmission success rate, and 100% network reconnection reliability, ensuring continuous operation in rural agricultural environments.

4. Novelty of Research / Product / Project

SMARTDash represents a novel IoT integration specifically designed for greenhouse effect mitigation in Chinese cabbage farming. Unlike generic agricultural systems, it provides crop-specific environmental thresholds with intelligent condition assessments categorized as safe, warning, or dangerous levels. The system features multi-channel notifications (mobile alerts, in-app notifications, Telegram messaging) and predictive analytics with automated PDF report generation. The user-centric design accommodates farmers with limited technical expertise through intuitive interfaces and automated recommendations. Real-time Firebase cloud synchronization with offline capability ensures continuous monitoring during network interruptions, creating a comprehensive solution addressing immediate agricultural needs and long-term sustainability goals.

5. Conclusion or Future Work

SMARTDash successfully demonstrates IoT-based greenhouse effect mitigation viability in smart agriculture, achieving all research objectives. Future enhancements include advanced AI-powered predictive algorithms, automated climate control integration, soil pH monitoring, and machine learning for yield optimization and early disease detection.

REFERENCE LIST

- Mumuh, M. Z., Herlina, N., Falah, M., Saringendyanti, E., Sofianto, K., & Zin, N. M. (2021). Impact of climate change on agriculture sector of Malaysia. *International Journal of Energy Economics and Policy*, 11(6), 138–144. <https://doi.org/10.32479/ijeep.10939>
- Nnaji, C., Okpala, I., Awolusi, I., & Gambatese, J. (2023). A SYSTEMATIC REVIEW OF TECHNOLOGY ACCEPTANCE MODELS AND THEORIES IN CONSTRUCTION RESEARCH. In *Journal of Information Technology in Construction* (Vol. 28, pp. 39–69). International Council for Research and Innovation in Building and Construction. <https://doi.org/10.36680/j.itcon.2023.003>
- Pargaonkar, S. (2023). A Comprehensive Research Analysis of Software Development Life Cycle (SDLC) Agile & Waterfall Model Advantages, Disadvantages, and Application Suitability in Software Quality Engineering. *International Journal of Scientific and Research Publications*, 13(8), 120–124. <https://doi.org/10.29322/ijsrp.13.08.2023.p14015>

LEVERAGING DATA VISUALIZATION TO EVALUATE SOIL FERTILITY IN HARUMANIS CULTIVATION

Nur Amira Syazwani Ishak, Iman Hazwam Abd Halim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022498792@student.uitm.edu.my, hazwam688@uitm.edu.my, ashrafzainol@uitm.edu.my

Mohd Ashraf Zainol Abidin

Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: ashrafzainol@uitm.edu.my

Abstract

Harumanis mango is a special fruit in Malaysia, especially in Perlis. To grow healthy Harumanis, farmers need to take good care of the soil, especially during the early stage of growth called the vegetative phase. One of the problems is that it is not easy to check the soil condition all the time. This project was created to solve that problem by building a web-based dashboard that helps farmers, researchers, and educators see the soil condition in real time and over time. The idea came from the high demand for Harumanis mangoes and the need to use technology to improve farming. The system was built using the Waterfall model, which includes planning, designing, building, testing, and documentation. It uses Python with the Flask framework, PostgreSQL to manage the database, and Power BI to show data in charts. The dashboard shows important soil information like nitrogen, phosphorus, potassium, humidity, and temperature. It also includes records of fertilizer use and gives suggestions to improve soil health. The design is simple so that even users without technical knowledge can use it easily. The system was tested, and results showed that it helped users understand and manage the soil better. By using this dashboard, farmers can save time, avoid mistakes, and make better decisions about fertilizers. This project shows that web and data tools can make farming smarter and help grow better Harumanis mangoes.

Keywords: *visualization, Harumanis, Soil Fertility, Web-Based Dashboard*

1. Introduction

Harumanis mango is a premium fruit in Malaysia, especially in Perlis, and requires proper soil management during its vegetative phase to ensure healthy growth (Hafiz A et al., 2020). However, consistently monitoring soil fertility can be difficult. This project aims to address that challenge by developing a web-based dashboard to visualize soil fertility using real-time and historical data. The dashboard was built using Flask as the web framework, Power BI for data visualization, and PostgreSQL as the database, with data initially sourced from Excel and transferred through DBeaver. It displays key nutrient levels, such as nitrogen, phosphorus, potassium, as well as humidity and temperature. The system provides fertilizer recommendations and allows users to track fertility logs. It is designed for users in the agricultural field, such as farmers and researchers. To ensure the dashboard's usefulness, functionality and usability testing were conducted, confirming that the system is easy to use, informative, and supports better decision-making in Harumanis cultivation.

2. Methodology

The Web-Based Soil Fertility Status Dashboard was developed using a combination of design principles and modern web technologies. The dashboard followed the principles of Simplicity and User-Friendly Design, where the layout was made clean and easy to navigate. Clear labels, icons, and consistent page structure helped users, especially those without technical background, find information quickly and perform tasks with minimal guidance (Synodus, 2023). To address

Handling Data Complexity and Visual Clarity, the dashboard used charts, colour coding, and filters to organize large sets of soil data. This allowed users to view and compare real-time and historical readings such as nitrogen, phosphorus, potassium, humidity, and temperature without feeling overwhelmed. The system was built using the Flask web framework in Python to manage the application structure, login system, and data operations. PostgreSQL was used as the database to store soil data and fertilizer logs. For visualizing the data, Power BI was embedded into the dashboard to present interactive graphs and recommendations that support better decision-making in Harumanis cultivation.

3. Results / Findings

Functionality testing showed the dashboard worked well overall. Users could register, log in, view soil data, and manage fertilizer logs with proper validation. Though real-time data came from historical sources due to sync issues, recommendations remained accurate. Admins successfully managed users and logs with full functionality. The usability testing's questionnaire results indicate a high level of user satisfaction across all four categories. The Navigation category received the highest average score 4.82, suggesting that users found the dashboard easy to explore and well-organized. Both Simplicity and User-Friendly Design and Handling Data Complexity and Visual Clarity scored equally high 4.75, demonstrating that the interface design and data presentation were well-received by users. The Admin Side Efficiency scored slightly lower 4.52, which still indicates a strong performance but may highlight minor areas for future improvement in administrative functionalities.

4. Novelty of Research / Product / Project

This project introduces a web-based dashboard specifically designed to monitor soil fertility for Harumanis mango cultivation, with a unique focus on the vegetative growth phase. Unlike general farming software, this dashboard offers targeted features tailored to the needs of Harumanis growers. It combines real-time and historical soil data, covering key nutrients like nitrogen, phosphorus, potassium, as well as humidity and temperature into simple and interactive visuals. The integration of Power BI for data visualization, along with Flask and PostgreSQL for web development and database management, ensures the system is both functional and easy to use. What sets this system apart is not only its specialization in Harumanis farming but also the inclusion of fertilizer recommendations and a log system to track nutrient application over time. Designed with user-friendliness in mind, the dashboard supports farmers, researchers, and educators by simplifying complex data, promoting better soil management, and improving decision-making in sustainable Harumanis cultivation.

5. Conclusion or Future Work

The dashboard supports Harumanis cultivation by visualizing soil and fertilizer data using Flask, PostgreSQL, and Power BI. Functionality and usability testing confirmed its effectiveness and ease of use. It helps users make informed decisions, with future improvements suggested including mobile access, better interactivity, and export features for enhanced functionality.

REFERENCE LIST

- Hafiz A, Mahmad Noor Jaafar, Mohd Asrul Sani, & Hartinee Abbas. (2020). Growth Performance of Different Mango (*Mangifera indica* L.) Varieties as Rootstock for Harumanis Planting Material Production. *Journal of Tropical Plant Physiology*, 12(1), 8. <https://doi.org/10.56999/jtpp.2020.12.1.5>
- Synodus. (2023, December 28). *Data Visualization Best Practices for Clear, Impactful Visuals*. Synodus. <https://synodus.com/blog/big-data/data-visualization-best-practice/>

A WEB-BASED CAMPUS CLUB MANAGEMENT APPLICATION

Nur Liyana Syamimi Ahmad, Zulfikri Paidi

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: liyanasyamimi7603@gmail.com, fikri@uitm.edu.my

Abstract

The management of campus clubs is often fragmented, with various manual processes and unorganized systems in place. This project develops a web-based campus club management application to address these issues and streamline club operations. The application allows students to browse, register, and track their participation in clubs, while providing club presidents with tools to manage memberships and oversee events. Administrative staff can monitor club performance and manage data across the platform. The application is built using the Laravel framework for backend development, MySQL for data storage, and HTML, CSS, and JavaScript for the user interface design. The system follows key design principles like usability and flexibility, ensuring ease of use for students, club presidents, and staff. The development process involved requirement analysis, design, implementation, and testing. Usability testing was conducted to evaluate user satisfaction, and the feedback from users indicated that the application significantly improved the ease of managing club-related tasks. This web-based platform offers a centralized solution for campus club management, improving efficiency and encouraging greater student engagement in extracurricular activities.

Keywords: *Campus Club Management, Laravel, Web-Based Application, Student Engagement*

1. Introduction

The management of campus clubs is a critical aspect of student life, but existing systems often rely on fragmented tools and manual processes. This lack of integration leads to inefficiencies, miscommunication, and challenges in club management (Hariprasad et al., 2023). This study introduces a Web-Based Campus Club Management Application to address these issues, centralizing membership management, event tracking, and club data. The system integrates features like club categorization, registration, and performance tracking, enhancing efficiency and engagement. Built with Laravel for backend development, MySQL for data storage, and HTML, CSS, and JavaScript for the frontend, the application provides an intuitive and scalable solution to improve club management and increase student involvement in extracurricular activities.

2. Methodology

This research develops a web-based campus club management application using a structured methodology, including requirement analysis, design, development, and testing. The backend was built using the Laravel framework, selected for its scalability and security features (Pargaonkar, 2023). MySQL is used as the relational database management system to store user profiles, club data, and membership records. The frontend utilizes HTML, CSS, and JavaScript to create a responsive, user-friendly interface. The development followed an iterative approach, incorporating continuous user feedback to ensure usability. Key features like club registration, membership tracking, and event management were prioritized in the design phase. Functionality and usability testing were conducted with students, club presidents, and administrative staff. A survey based on the System Usability Scale (SUS) was used to evaluate the ease of use and user satisfaction (Hariprasad et al., 2023). The system's performance was further evaluated through functionality tests, where users interacted with features like browsing clubs, registering, and updating membership details. This approach helped validate the application's effectiveness in simplifying club management tasks and ensuring a positive user experience.

3. Results / Findings

The implementation of the Web-Based Campus Club Management Application demonstrated its effectiveness in streamlining the management of campus clubs. The system successfully enabled students to browse, register, and track participation in clubs. Club presidents efficiently managed memberships, events, and club data through their dedicated dashboards. Usability testing revealed that most users found the system easy to navigate, with positive feedback on its intuitive interface and clear design (Zhang Wenjie et al., 2023). The system's features, such as club categorization and real-time data updates, significantly improved the management and visibility of club activities. Administrative staff appreciated the centralized platform, which allowed them to monitor club performance and streamline reporting processes. Overall, the results highlight the system's potential to enhance student engagement, improve administrative efficiency, and foster a more organized campus environment.

4. Novelty of Research / Product / Project

This project introduces a novel web-based campus club management application that centralizes club data and streamlines administrative processes. Unlike traditional methods relying on fragmented tools, this system integrates features for students, club presidents, and staff into a single cohesive platform. Students can easily browse clubs, register for memberships, and track participation, while club presidents manage memberships, events, and club data. The system uses the Laravel framework for scalability and security, MySQL for data storage, and HTML, CSS, and JavaScript for a responsive, user-friendly frontend. This application significantly improves efficiency, simplifies tasks for all users, and fosters greater student engagement, offering a more organized and integrated solution compared to existing campus club management methods.

5. Conclusion or Future Work

Future improvements will focus on enhancing scalability, optimizing cloud resources, and conducting stress testing. Advanced data analytics, mobile accessibility, and integration with university systems will further enhance user experience. Additionally, implementing personalized notifications and recommendations based on user interests will boost engagement and participation in campus clubs.

REFERENCE LIST

- Hariprasad, M., Neha, N., Dey, N., Pratiba, D., & Kumar P, R. (2023). College Club Activity Management System. 7th IEEE International Conference on Computational Systems and Information Technology for Sustainable Solutions, CSITSS 2023 - Proceedings. <https://doi.org/10.1109/CSITSS60515.2023.10334208>
- Pargaonkar, S. (2023). A Comprehensive Research Analysis of Software Development Life Cycle (SDLC) Agile & Waterfall Model Advantages, Disadvantages, and Application Suitability in Software Quality Engineering. *International Journal of Scientific and Research Publications*, 13(8), 120–124. <https://doi.org/10.29322/ijsrp.13.08.2023.p14015>
- Zhang Wenjie, Ji Qingnan, Xie Haojie, Hong Xuyang, Liu Huanyu, & Wu Jiatong. (2023). Information Release Organization Platform for University Campus Clubs Based on MVC Architecture Mode. *HansJournal*. <https://www.hanspub.org/journal/paperinformation?paperid=77671>

WEB-BASED CALORIE-CONSCIOUS MEAL RECOMMENDATION SYSTEM

Nurin Ismahani Noor Halizan, Naemah Binti Abdul Wahab

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: nurinismahani04@gmail.com, naema586@uitm.edu.my

Abstract

The Web-Based Calorie-Conscious Meal Recommendation System is a digital platform designed to help users make informed dietary choices by offering personalized meal suggestions based on individual health metrics. Utilizing user-provided data such as weight, height, age, and gender, the system calculates Body Mass Index (BMI) and estimates daily caloric requirements using the Mifflin-St Jeor Equation (Frankenfield, 2013). The system then recommends suitable meals for breakfast, lunch, and dinner, complete with nutritional details including calories, protein, fat, and carbohydrates. Users can save, view, and manage their meal choices to track their daily intake more effectively. On the admin side, the system supports full CRUD operations on meals and user profiles, with a dashboard that displays total users, meals, and activity statistics. The system was developed using the Waterfall Model within the System Development Life Cycle (SDLC) (Pargaonkar, 2023), applying tools such as Laravel and MySQL. Usability and functionality tests were conducted with 30 participants, assessing areas like clarity, feedback, navigation, satisfaction, and performance. Results showed high levels of user satisfaction, with mean scores exceeding 4.0 in all categories. While the system successfully supports healthier eating habits, it currently lacks advanced features such as weekly meal planning, integration with physical activity tracking, or allergy-specific alerts. These were identified as potential areas for future enhancement. Overall, the system presents a practical, accessible tool for users aiming to adopt a healthier lifestyle through structured nutritional guidance.

Keywords: *Calorie Tracking, Meal Recommendation, Body Mass Index, Nutrition System, Laravel, Web-Based Application*

1. Introduction

The Web-Based Calorie-Conscious Meal Recommendation System was developed to assist users in maintaining a healthier diet by offering personalized meal suggestions based on their BMI and daily caloric needs. The objective of the system is to promote healthy eating habits through a user-friendly platform that calculates and tracks calorie intake using individual data such as weight, height, age, and gender. According to the World Health Organization, unhealthy dietary habits have contributed to a global rise in obesity, affecting over 890 million adults worldwide (World Health Organization, 2024). The system's scope includes user-side features such as BMI calculation, meal recommendations, and calorie tracking, as well as an admin panel for managing meals and users efficiently.

2. Methodology

This system was developed using the Waterfall model under the System Development Life Cycle (SDLC), which consists of five phases: requirement analysis, system design, development, testing, and maintenance (Pargaonkar, 2023). The backend was built using Laravel, a PHP framework, with MySQL as the database management system. In the first phase, functional and non-functional requirements were gathered to design user-friendly interfaces for both end users and administrators. Next, in system design, the system architecture, data flow, user interfaces, and database schema were structured to ensure scalability, functionality, and ease of use. In the development phase, the system calculates caloric needs using the Mifflin-St Jeor Equation, which is widely accepted for estimating Basal Metabolic Rate (BMR) in healthy individuals. Based on this calculation, the system generates meal suggestions tailored to the user's nutritional needs. Admin functionalities include adding,

editing, and deleting users and meals, while users can register, log in, update their profile and BMI data, and view or save recommended meals. The testing phase included functionality testing through five use cases and usability testing with 30 participants using structured questionnaires.

3. Results / Findings

Functionality testing showed that all five test cases were executed successfully, achieving a 100% passing rate. This confirmed that key features such as user registration, BMI calculation, meal recommendation, and meal saving, performed according to design. Usability testing evaluated eight categories: consistency, clarity, feedback, navigation, error handling, satisfaction, user efficiency, and admin efficiency. The average mean score across all categories exceeded 4.5, reflecting high user satisfaction. These findings align with previous studies which show that web-based nutrition systems improve user awareness and encourage healthier food choices (Ferrara et al., 2019). Feedback also suggested enhancements, such as daily meal planning and activity tracking, for better personalization.

4. Novelty of Research / Product / Project

This system is unique in combining personalized meal recommendations, BMI-based calorie calculation, and real-time nutrient tracking within a single platform. Unlike many calorie tracker applications, this system is designed to be accessible to users with little or no nutritional background, while still offering essential dietary planning tools. It also features an admin dashboard that allows efficient management of users and meals. Similar applications often lack admin control or do not tailor meal suggestions to caloric requirements. By addressing these gaps, the system offers a more structured and complete approach to managing individual nutrition digitally.

5. Conclusion or Future Work

The system successfully meets its goals of providing personalized meal suggestions and promoting healthier eating. Future enhancements may include multi-day meal planning, integration with physical activity trackers, and expansion of the meal database to include local and allergy-sensitive options. These improvements would increase personalization, usability, and health impact to users.

REFERENCE LIST

- Ferrara, G., Kim, J., Lin, S., Hua, J., & Seto, E. (2019). A focused review of smartphone diet-tracking apps: Usability, functionality, coherence with behavior change theory, and comparative validity of nutrient intake and energy estimates. *JMIR MHealth and UHealth*, 7(5). <https://doi.org/10.2196/mhealth.9232>
- Frankenfield, D. C. (2013). Bias and accuracy of resting metabolic rate equations in non-obese and obese adults.
- Pargaonkar, S. (2023). A Comprehensive Research Analysis of Software Development Life Cycle (SDLC) Agile & Waterfall Model Advantages, Disadvantages, and Application Suitability in Software Quality Engineering. *International Journal of Scientific and Research Publications*, 13(8), 120–124. <https://doi.org/10.29322/ijsrp.13.08.2023.p14015>
- World Health Organization. (2024). Obesity and overweight.

RENTAL HOME FINDER APPLICATION USING FACE RECOGNITION

Nuruddin Al Hilmi Bin Elahami, Siti Sarah Binti Md Ilyas

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022455636@student.uitm.edu.my, sarahilyas@uitm.edu.my

Abstract

The Rental Home Finder Application was developed to address the increasing concern of rental fraud experienced by UiTM Perlis students seeking off-campus accommodation. This mobile application integrates face recognition technology, specifically implemented as one-to-one face verification using biometric features to provide secure user authentication during rental activities. Using the Waterfall model as the development approach, the system was built with Android Studio (Java), Firebase, and the Google ML Kit Face Detection API. Facial features such as eye distance, nose-to-eye distance, and mouth width were extracted and normalized, then compared using a custom weighted scoring mechanism. An authentication process was implemented, allowing users to verify their identity using either facial biometric verification or PIN entry during profile editing, property booking, and posting. The application underwent usability testing with 27 participants, functionality testing by the developer, and network performance testing across multiple mobile devices. Usability testing showed positive user feedback in terms of learnability, memorability, effectiveness and satisfaction. Functionality testing validated the system's expected behaviour, while network testing demonstrated system responsiveness. Future enhancements may include integration with Google Maps API, real-time notifications, and local payment options to improve user experience.

Keywords: Rental Fraud, Google ML Kit, Face Verification, Custom Weighted Scoring Mechanism

1. Introduction

The Rental Home Finder Application was developed to provide UiTM Perlis students with a safer, more trustworthy alternative for securing off-campus accommodation. In response to rising incidents of rental scams on unsecured platforms such as Facebook Marketplace, this application incorporates facial biometric verification and PIN-based alternatives to authenticate users before allowing them to post or book properties. Upon registration, users submit facial biometric data, which is subject to admin approval. Verified users may then log in via face recognition or a fallback PIN, maintaining both accessibility and security. The app, developed using Android Studio and Firebase, integrates Google ML Kit to support accurate on-device facial landmark extraction and verification. This solution addresses key challenges identified in earlier studies, such as fraudulent listings and identity misuse among students seeking affordable rentals (Morhan, 2023).

2. Methodology

The application was developed using the Waterfall model, which provided a structured development process with sequential stages. Waterfall model is used since it is suitable for creating a system that has a clear flow (Herawati.et.al,2021). During the requirement analysis phase, Google ML Kit was selected for implementing facial landmark detection, and Firebase was adopted for real-time database and user authentication. A custom scoring mechanism was used to compare facial features captured during booking, posting and profile editing with those saved during registration, ensuring accurate one-to-one identity verification. In the design phase, tools such as Figma and Draw.io helped visualize role-based interfaces and system architecture. Usability testing involved 27 participants, and functionality testing validated secure workflows across tenant, homeowner, and admin roles. The approach emphasized biometric reliability while maintaining flexibility with PIN fallback options.

3. Results / Findings

Evaluation of the application confirmed its usability and functionality across all core components. Usability testing results showed strong mean scores in learnability (4.37), memorability (4.31), effectiveness (4.30), and satisfaction (4.33), indicating user confidence in both the facial verification process and interface design. Functionality testing demonstrated that essential operations such as face registration, home posting, and property booking were correctly gated by either face or PIN authentication, preventing unauthorized access. These results highlight the system's capacity to minimize fraudulent behaviour, which was a core objective given the vulnerabilities identified in traditional housing search platforms (Hamilton-War, 2024). Furthermore, the inclusion of an admin-controlled verification step added an extra layer of trust for both students and property owners.

4. Novelty of Research

This project presents a novel approach by integrating real-time facial verification within a rental application designed specifically for university students. Unlike general-purpose platforms, which often lack secure user authentication, this application incorporates both facial recognition and a PIN fallback to ensure accessibility without compromising safety. A key innovation is the use of on-device facial landmark extraction via Google ML Kit, which allows fast, private biometric verification without relying on external servers (Kapase et al., 2023). Moreover, the inclusion of a manual admin approval step for face registration introduces an additional trust layer that balances biometric automation with human oversight. Compared to other existing rental or biometric-enabled applications, this system introduces a more robust and verification-focused workflow, enhancing both security and user accountability in the digital rental process.

5. Conclusion or Future Work

The Rental Home Finder Application has successfully addressed the gap in secure off-campus housing by embedding face verification. Future enhancements will focus on Google Maps integration, real-time notifications, face recognition accuracy and in-app payment feature to further improve usability and functionality.

REFERENCE LIST

- Hamilton-War, C. (15 January, 2024). *Facebook Marketplace Rental Scams: How To Avoid Getting Scammed*. Retrieved from goConfirm: <https://www.goconfirm.com/blog/facebook-marketplace-rental-scams>
- Herawati, S., Negara, Y. D., Febriansyah, H. F., & Fatah, D. A. (2021, January). Application of the Waterfall Method on a Web-Based Job Training Management Information System at Trunojoyo University Madura. *E3S Web of Conferences*, 328.
- Kapase, S., Hande, R., Teke, S., Yash, H., & Rajhans, P. (2023). Driver Drowsiness Detection System using Google ML Kit Face. *International Research Journal of Engineering and Technology (IRJET)*, 905-909.
- Morhan, S. (2023, October 12). Rental Scams: Fraudsters Target Students Looking House For Rent. Retrieved from The sun: <https://thesun.my/malaysia-news/rental-scams-IH11612921>

VEHICLE MONITORING SYSTEM USING UHF RFID

Siti Nur Fatihah Mohd Suki, Dr Ahmad Yusri Dak

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: sitinurfatihah1281@gmail.com, ahmadyusri@uitm.edu.my

Abstract

Nowadays, it is crucial to monitor vehicle activities in the residential area due to the increasing concern over house break-ins and theft. Unauthorized vehicles entering these areas could have the potential loss of property and a feeling of uneasiness among residents. However, there are many residential areas especially in small towns that still lack a reliable monitoring system without properly recorded vehicle movement. Therefore, this project aims to develop a web-based Vehicle Monitoring System using UHF RFID, ESP32 microcontroller, PIR motion sensor, Laravel and MySQL, designed to monitor and record vehicle entry and exit. The integration of UHF RFID technology enables a contactless verification method, capable of verifying the vehicle's status from a distance of up to 10 meters. This eliminates the need for manual checks that are usually time-consuming and prone to human error. In addition, the use of PIR motion sensors enhances the system by detecting vehicle movement that occur near the residential area. This system was developed using Laravel, where ESP32 sends the RFID tag ID to the Laravel backend. The system then compares it with the registered tag ID in the MySQL database for vehicle verification. The system was evaluated using functionality and user experience testing through questionnaires. The results show that over 60% of respondents were satisfied with the system, noting its ease of use and its benefits in speeding up the process and reducing workload. Overall, the system successfully achieved its main objectives and received positive feedback.

Keywords: UHF RFID, PIR Motion Sensor, ESP32, Laravel Web-based Development, IoT, Vehicle Monitoring System

1. Introduction

According to the Department of Statistics Malaysia (2024), 11,557 cases of house break-ins were reported nationwide in 2023. This record highlights the security weakness in the residential area. Most residential areas in small towns still rely on manual methods to monitor vehicle access, which are time-consuming and inefficient. This project aims to develop a Vehicle Monitoring System that uses UHF RFID technology to detect authorized and unauthorized vehicles from a distance of up to 10 meters. The objectives of this project are to explore the use of RFID in vehicle monitoring, develop a functional system, and evaluate its performance through functionality and user experience testing. Feedback was gathered from residents, security personnel, and residential management to assess the system's benefits and ease of use in a real residential environment.

2. Methodology

This project followed the Software Development Life Cycle (SDLC) using the Waterfall model to ensure a structured and organized development process. The methodology included identifying system requirements, selecting appropriate hardware and software. The design phase involves planning the overall system structure to visualise how the system works. The development phase focused on developing the Vehicle Monitoring System using UHF RFID, ESP32, and PIR motion sensors. Laravel and MySQL were used to develop a minimalist web interface and manage data storage. Functionality and user experience testing were conducted to ensure the system worked properly, system's usability and effectiveness. Feedback from residents and security personnel helped evaluate the system's usability. All progress and findings were documented, and Gantt charts were used to track project milestones across both semesters.

3. Results / Findings

The Vehicle Monitoring System was evaluated through functionality and user experience tests. Functionality testing confirmed the system could accurately detect RFID tag IDs within 10 seconds, display vehicle status clearly, and trigger visual alerts via the PIR motion sensor. While most features worked as expected some inconsistencies in motion alerts were noted, possibly due to sensor sensitivity. User experience testing involved 30 respondents, including residents, security personnel, and residential management. The results showed that most respondents found the system easy to use, responsive to admin actions, and that administrative features were accessible and easy to use. Overall, 63.3% rated their satisfaction at the highest level, indicating that the system provides a reliable, efficient, and user-friendly solution for managing vehicle access in residential areas.

4. Novelty of Research / Product / Project

The Vehicle Monitoring System represents a novel integration of UHF RFID technology in a web-based system designed to improve vehicle verification processes in residential areas. Unlike traditional systems that rely on manual logbooks or visual inspections, this system provides contactless verification of vehicles from a distance of up to 10 meters (Rahman et al., 2021). This means that vehicles do not need to stop or wait for approval at the entrance, which helps speed up the entry process (Wang et al., 2022). The system automatically reads the RFID tag as the vehicle approaches, making the process seamless for both residents and security personnel. Additionally, the RFID tag can be securely attached to the vehicle body, such as on the windshield or license plate. This eliminates the need for residents to carry an access card or sticker, reducing the chances of misplacement or missing. This system not only improves daily operations but also reduces the workload of security staff by automating vehicle checks.

5. Conclusion or Future Work

The project successfully developed a UHF RFID-based Vehicle Monitoring System for residential areas, achieving all objectives in study the use of RFID technology, system development, and user evaluation. Future improvements include integrating CCTV, a visitor registration mobile app, and a barrier gate to enhance safety and ensure safer residential environments.

REFERENCE LIST

- Department of Statistics Malaysia. (2024). Crime Statistics, Malaysia, 2024. In Ministry of Economy Department of Statistics Malaysia. <https://www.dosm.gov.my/portal-main/release-content/crime-statistics-malaysia->
- Rahman, M. M., Aziz, T., & Ryu, H. G. (2021). UHF RFID Wireless Communication System for Real Time ECG Monitoring. International Conference on Ubiquitous and Future Networks, ICUFN, 2021-August, 276–279. <https://doi.org/10.1109/ICUFN49451.2021.9528649>
- Wang, X., Wang, X., Yan, Y., Liu, J., & Zhao, Z. (2022). RF-Access: Barrier-Free Access Control Systems with UHF RFID. Applied Sciences (Switzerland), 12(22). <https://doi.org/10.3390/app122211592>

AUTOMATED VISITOR REGISTRATION SYSTEM USING HF RFID

Sofea Balqis Mohamad Ali, Dr Ahmad Yusri Dak

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: pyasofeabalqis@gmail.com , ahmadyusri@uitm.edu.my

Abstract

Rising crime rates in Malaysia, with 11,557 house break-ins in 2023 and a 9.2% increase in 2024, highlight the urgent need for enhanced residential security solutions. The current visitor registration systems often suffer from slow processing, poor record-keeping, and limited visitor categorization which makes them ineffective for modern security needs. This study introduces an Automated Visitor Registration System (AVRS) that utilizes High-Frequency (HF) RFID technology to improve efficiency, accuracy, and monitoring in residential areas for visitors. The AVRS was developed using a Laravel-based web platform that is connected to a MySQL database, integrated with NodeMCU (ESP8266) for connectivity, using MFRC522 RFID reader for tag detection, and a MyKad reader for automatic data entry. Security personnel register visitors by scanning MyKad, assigning RFID tags, and entering information such as visitor type, vehicle number, and house number. RFID tags are used to manage entry and exit and are supported by a buzzer system for real-time feedback. An interactive dashboard displays key analytics such as visitor frequency, types, and peak hours for neighbourhood management. Results showed that 90% of respondents had agreed the system was easy to use, reduced manual workload, and improved registration speed and accuracy. Most users supported the idea of replacing logbooks with this digital system, and many expressed interests in expanding it for broader use, including visibility for homeowners. Overall, the AVRS offers a scalable, secure, and user-friendly solution that addresses the current limitations of visitor registration systems and significantly enhances safety and efficiency in residential areas.

Keywords: *HF RFID, Visitor Registration System, Visitor Management, Laravel Web-Based Development, IoT-based access control, MyKad reader integration*

1. Introduction

Traditional visitor registration methods are often inefficient, prone to human error, and incapable of distinguishing between types of visitors, which increases the likelihood of unauthorized access and compromises residential security (Heizel T, 2021). To address these limitations, this research introduces an Automated Visitor Registration System (AVRS) that incorporates High-Frequency (HF) RFID technology. The aim is to automate and improve the accuracy of visitor data collection and management. Key objectives include identifying user requirements, developing an integrated RFID-based system, and assessing its usability in a residential context. The system was implemented at a guarded neighborhood in Perlis, designed with scalability in mind. To ensure ethical data handling, the AVRS automatically deletes stored visitor records after six months. This enhances both efficiency and privacy in residential visitor management.

2. Methodology

This project used the Waterfall Model for systematic development of the Automated Visitor Registration System. Scope of the methodology encompassed Requirements Analysis and Design, Development, Testing, and finally Documentation. For this project, requirements were gathered based on literature reviews and a user needs analysis where problems such as slow registration and absence of visitor categorization were identified. (Foni Agus Setiawan et al., 2024). Flow charts and ERDs are created using Draw.io. The website was created in Laravel and has a MySQL database backend. It has been integrated with a MyKad reader for automatic data-entry and an MFRC522 RFID reader. Wi-Fi communication is handled by the NodeMCU ESP8266. Guards scan MyKads, assign inactive RFID tags and enter vehicle and house numbers. Check-ins and outs are managed by RFID tags with

buzzers providing feedback. Functional testing was performed with 8 developers and 2 guards, while user experience testing was done with a total of 30 users: 12 guards, 10 admins, and 8 visitors. Visitor frequency and trends are displayed on the dashboard that was created using Chart.js.

3. Results / Findings

The core functions of extracting MyKad data, assigning RFID tags, logging, and alarm triggering all performed as intended. Issues such as the buzzer disconnecting were fixed. Of the 30 tested, 90% agreed the system was easy to use and 27 users rated their satisfaction as a 4 or 5. Guards praised the speed of check-ins, admins valued the analytics provided, and visitors appreciated the efficiency of the process. A few guards struggled managing RFID cards and suggested the use of colored stickers as labels. With classification by type of visitor, precision improved while lessened manual effort, thereby enhancing security and management at the neighborhood level.

4. Novelty of Research / Product / Project

AVRS integrates HF RFID technology with MyKad scanning for the automated and secure registration of visitors. The categorized tracking of “delivery” or “family” visitors is helpful for improving residential safety, which is uncommon in most systems (Rodrigo et al., 2023). For small communities, the system's Laravel-MySQL-NodeMCU framework is scalable and cost-efficient. Its use for communities is a practical solution. The framework has Chart.js for real-time data visualization and auto-deletion of records after six months, supporting ethical data handling. Systems are affordable and privacy compliant. The combination of MyKad integration, real-time analytics, and privacy compliance is better than traditional logbook systems.

5. Conclusion or Future Work

Integration of High Frequency RFID with MyKad enhances security in Automated Visitor Registration Systems. Future modifications include interactive tutorials on visit purpose logging as well as homeowner visibility and customizable coloured RFID stickers, enhancing ergonomic usability, scalability and community adoption in residential areas.

REFERENCE LIST

- Foni Agus Setiawan, Freza Riana, & Muhammad Rifqi Fadhilah. (2024). Prototype Of A Website-Based Visitor Data And Payment Management System At Universitas Ibn Khaldun Bogor.
- Heizel T. (2021). Can A Security Guard Keep Your Driver's License Or IC in Malaysia? IProperty. <https://www.iproperty.com.my/guides/can-a-security-guard-keep-your-drivers-license-or-ic-in-malaysia-63549?msocid=2e90e043602c646a26c1f56e61bb6505>
- Rodrigo, E. S., Aban, V. E., Estoesta, A. M. A., Valencia, E. J. E., & Zaguirre, F. J. F. (2023). SQUATS: Web-Based Security System for Sta. Philomena Residences Dormitel Using QR Code Technology with Analytics. 10th International Conference on ICT for Smart Society, ICISS 2023 - Proceeding. <https://doi.org/10.1109/ICISS59129.2023.10291946>

WEB-BASED LOST AND FOUND WITH IMAGE RECOGNITION SYSTEM

Yusof Abbad Bin Abdul Aziz, Hanisah Binti Ahmad,

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: yusofabbad7@gmail.com, hanisahahmad@uitm.edu.my

Abstract

This study presents the design, development, and evaluation of a campus-based Lost and Found System enhanced with image recognition. The objective is to enable fast, reliable reporting and searching of lost items using a web-based platform. Developed with Laravel, Google Vision API, and Google Maps API, the system streamlines lost item management through AI-driven image matching and precise location tagging. Functionality, usability, and network performance were systematically tested with 30 student participants. Results demonstrated all core features performed as intended, with usability scores above 4.7/5 and average image recognition accuracy of 84%. However, the Google Vision API could not recognize student cards or persons, highlighting an area for future enhancement. Overall, the project shows that integrating AI and modern web technologies in a user-focused design can substantially improve campus lost and found services.

Keywords: *Lost and Found, Image Recognition, Google Vision API, Web-Based Laravel, Google Maps API.*

1. Introduction

Many students and staff frequently lose or misplace items on campus, often leading to stress and wasted time for students and staff. Existing manual systems are inefficient and rarely leverage modern technology. This project introduces a web-based Lost and Found System that combines AI-powered image recognition with location-based services to streamline the process of reporting, searching, and claiming items. The primary objectives are to reduce search times, improve the accuracy of item matching, and provide a seamless experience for users. By focusing on campus users, the system is designed to meet the unique needs of the university community, with features that address both convenience and reliability.

2. Methodology

The project used the waterfall development model, which contained requirement analysis, design, development, testing, and documentation. Core features were built using Laravel as the backend framework, MySQL for data storage, and Google Vision API for image-based matching. Google Maps API was integrated for precise location tagging. Functionality was evaluated using a ten-point checklist covering validation, CRUD, AI detection, and error handling. Usability testing was conducted with 30 students from various faculties, using a five-point Likert scale to assess accessibility, navigation, and interface consistency. Network performance was assessed using Hostinger and Pingdom tools on both desktop and mobile platforms. These methods ensured thorough validation of both user experience and technical performance.

3. Results / Findings

Functionality testing confirmed that all major system features worked reliably, including secure login, item submission, image recognition, and claim management. Usability scores were consistently high, averaging above 4.7/5 across accessibility, navigation, and consistency categories. Average image recognition accuracy was 84%, although the system failed to recognize student cards and persons. Network performance tests showed excellent desktop response times and acceptable performance on

mobile. User feedback highlighted the value of features such as image-based search and integrated chat, while also suggesting improvements to search filters and mobile navigation. These findings indicate the system is effective, user-friendly, and provides a strong foundation for future enhancements.

4. Novelty of Research / Project

This project represents an integration of Google Vision API-based image recognition within web-based lost and found management at the campus level. Unlike traditional text-based systems, this solution allows users to search and match items using images, with the potential to improve both speed and accuracy. The addition of location tagging and chat functionalities further distinguishes the system from typical offerings. The project's focus on user-centered design, evidenced by high usability ratings, demonstrates the practical benefits of combining AI and modern web tools to enhance campus operations. Moreover, the comprehensive evaluation process and transparent reporting of limitations establish a model for future campus IT solutions.

5. Conclusion or Future Work

The Lost and Found System demonstrates that AI and modern web technologies can effectively improve lost item recovery on campus. Future work will address current limitations by expanding user testing, enhancing mobile functionality, exploring alternative AI models, and implementing advanced security and notification features.

REFERENCE LIST

- Aleryani, A. Y. (2024). Analyzing Data Flow: A Comparison between Data Flow Diagrams (DFD) and User Case Diagrams (UCD) in Information Systems Development. *European Modern Studies Journal*, 8(1), 313–320. [https://doi.org/10.59573/emsj.8\(1\).2024.28](https://doi.org/10.59573/emsj.8(1).2024.28)
- Amft, S., Höltervenhoff, S., Huaman, N., Krause, A., Simko, L., Acar, Y., & Fahl, S. (2023). “We’ve Disabled MFA for You”: An Evaluation of the Security and Usability of Multi-Factor Authentication Recovery Deployments. *CCS 2023 - Proceedings of the 2023 ACM SIGSAC Conference on Computer and Communications Security*, 3138–3152. <https://doi.org/10.1145/3576915.3623180>
- Amjoud, A. B., & Amrouch, M. (2023). Object Detection Using Deep Learning, CNNs and Vision Transformers: A Review. *IEEE Access*, 11, 35479–35516. <https://doi.org/10.1109/ACCESS.2023.3266093>
- Aquino, M. L. C., Kimberly Rose B, & Araña, J. M. P. (2019). *Asset Locator with Distance and Altitude Measurement Using GPS and BLE for Future IoT Applications*. Institute of Electrical and Electronics Engineers.
- Fatiehah Ilias. (2020). *UNIVERSITI TEKNOLOGI MARA A WEB BASED SYSTEM FOR LOST AND FOUND ITEMS SYSTEM USING RFID AND EMAIL NOTIFICATION NUR FATIEHAH IYLIA BINTI MUHAMAD ILIAS*. <https://ir.uitm.edu.my/id/eprint/45937/>
- González-Cabañas, J., Cuevas, Á., Cuevas, R., & Maier, M. (2021). Digital contact tracing: Large-scale geolocation data as an alternative to bluetooth-based apps failure. *Electronics (Switzerland)*, 10(9). <https://doi.org/10.3390/electronics10091093>

BAITIJANNATI: A MOBILE APPLICATION FOR ORGANIZING HOUSEHOLD CHORES

Yusuf Firdaus Bin Othman, Rashidah Ramle

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: yusuffirdaus@gmail.com, rashidahramle@uitm.edu.my

Abstract

The management of household chores is a common source of domestic conflict, stemming from challenges like uneven task distribution, poor communication, and a lack of accountability. Traditional methods such as physical chore charts or simple messaging apps are often ineffective as they lack real-time tracking and structured assignment capabilities. To address these issues, the BaitiJannati mobile application was developed as a dedicated solution to promote fairness, collaboration, and efficiency in household management. The primary objectives were to investigate user requirements, develop a robust mobile application, and evaluate its performance and user acceptance. The application was built using the Flutter framework for cross-platform compatibility and Google's Firebase for real-time database and authentication services. The project followed a structured Waterfall Methodology, covering all phases from requirement analysis to documentation. Evaluation was conducted through comprehensive functionality testing and User Acceptance Technology (UAT) surveys. The findings confirmed that BaitiJannati successfully streamlines chore management, enhances household harmony, and provides a user-friendly platform for organizing daily tasks, ultimately fostering a more balanced and stress-free living environment.

Keywords: *Household Chores, Mobile Application, Flutter, Firebase, User Acceptance Technology (UAT)*

1. Introduction

In many households, the lack of a structured system for managing chores leads to uneven workloads, forgotten tasks, and resentment among members. This disorganization creates a stressful and inefficient living environment. The BaitiJannati project was initiated to resolve these challenges by creating a user-friendly mobile application. The core objectives were to investigate the specific requirements for a household chore management application; to develop a mobile app that facilitates efficient task assignment, tracking, and scheduling; and to evaluate the application's performance through rigorous functionality testing and a User Acceptance Technology (UAT) assessment. The project's scope is focused on family members, utilizing Flutter for Android development and Firebase for the backend database to create a centralized and collaborative platform.

2. Methodology

The development of the BaitiJannati application followed the Waterfall Methodology, a sequential model ensuring that each phase is completed before the next begins. The process consisted of six distinct phases: requirement analysis, design, development, testing, analysis, and documentation. In the initial phase, user requirements were investigated through reviews of related works and interviews. The design phase involved creating flowcharts, sitemaps, and user interface mockups using tools like Drawio and Figma. Development was executed using Flutter for building the cross-platform application and Firebase was implemented for the backend, providing a real-time NoSQL database, user authentication, and storage. The final stages involved comprehensive testing, including module-based functionality tests and a User Acceptance Technology (UAT) survey to evaluate the application's usability and performance against its objectives.

3. Results

The evaluation of the BaitiJannati application yielded exceptionally positive results. The functionality testing phase, which comprised 98 distinct test scenarios covering all modules from user registration to task management and logout, achieved a 100% success rate, confirming the application's stability and reliability. The User Acceptance Testing (UAT), conducted with 32 respondents, revealed a high level of user satisfaction and acceptance. The mean scores for all four measured constructs were in the "High" category (above 4.0 on a 5-point scale). Perceived Usefulness scored consistently high, with users agreeing the app improved organization (4.50) and task distribution (4.44). Perceived Ease of Use was also highly rated, especially for the straightforward setup process (4.44) and intuitive layout (4.43). This translated into a positive user Attitude (4.53) and a strong Intention to Use (4.41) and recommend the application.

4. Novelty of Research

The novelty of the BaitiJannati application lies in its creation of a dedicated, real-time, and collaborative system specifically designed to solve the persistent challenges of household chore management. Unlike traditional, static methods like paper charts or generic tools like messaging apps, BaitiJannati provides a dynamic solution with features such as real-time task tracking, automated notifications, and history logs for accountability. The integration of a round-robin system for recurring task assignments ensures fair and equitable distribution of labor over time, directly addressing a primary source of household conflict. Developed using a modern tech stack Flutter for cross-platform compatibility and Firebase for a scalable, real-time backend the application offers a seamless and responsive user experience that existing, less specialized solutions lack. This focus on a holistic, technology-driven approach to fostering fairness and collaboration in the home is its key innovation.

5. Conclusion or Future Work

The BaitiJannati application successfully meets its goal of providing an effective and user-friendly tool for organizing household chores. Future enhancements will focus on implementing a more persistent reminder system, and integrating a gamification system to boost user motivation and engagement.

REFERENCE LIST

- Avitasari, I., & Sulistyarin, D. (2024). The Role of Family Communication and Parenting on Children's Social Behavior. <https://doi.org/10.47772/IJRISS>
- Aliyah Aliyah, Nahrin Hartono, & Asrul Azhari Muin. (2024). Penggunaan User Acceptance Testing (UAT) Pada Pengujian Sistem Informasi Pengelolaan Keuangan Dan Inventaris Barang. *Switch : Jurnal Sains Dan Teknologi Informasi*, 3(1), 84–100. <https://doi.org/10.62951/switch.v3i1.330>
- Giovanni MALNATI Ing Fabio FERRERO, S. (2021). The Flutter Framework: Analysis in a Mobile Enterprise Environment.

EVENTIFY: CAMPUS EVENT MANAGEMENT WEB APPLICATION SYSTEM

Athirah Batrisyia Badrulisham, Iman Hazwam Abd Halim

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: batrisyiaa33@gmail.com, hazwan688@uitm.edu.my

Abstract

This project presents Eventify, a comprehensive web-based event management system designed to address the challenges of organizing and promoting campus activities and managing both technical and non-technical events. The platform provides a centralized digital solution that enables students to discover events through an intuitive interface while offering administrators robust tools for event creation in campus instead of many tedious manual methods. Students can look for upcoming events displayed on their dashboard and register for the events they wish. Developed using PHP for server-side operations and MySQL for data management, the system incorporates responsive web design principles to ensure accessibility across devices. The system ensures that every student is well-informed about upcoming events by notifying them, encouraging active participation, fostering a more engaging and enriched event experience.

Keywords: *Event Management System, Campus Activities, Participations, PHP-MySQL, Web-based.*

1. Introduction

Organizing campus events is often challenging due to scattered information, low participation, and manual processes. Eventify is a web-based system designed to simplify event management for students and administrators. It provides a centralized platform where students can easily discover and register for events, while admins can create, promote any events that are held on campus. The scope is specifically tailored for university environments, focusing exclusively on academic events (lectures, workshops) and extracurricular activities (sports, cultural festivals) Nimje et al., (2024).

2. Methodology

The development of Eventify followed the Waterfall methodology, progressing through sequential phases, comprising requirement analysis, design, development, testing, and documentation phases Pargaonkar, S. (2023). The system was designed with PHP/MySQL for backend operations and HTML/CSS/JavaScript for a responsive frontend. Development implemented core features like event creation, ticketing, and dashboards using XAMPP for local hosting. Testing included User Experience Testing (UET) via Google Forms with 30 participants evaluating functionality and interface intuitiveness.

3. Results / Findings

The implementation of Eventify successfully demonstrated its ability to simplify campus event management through its centralized platform. The system successfully enabled students to register, browse events discovery, and track participation in campus events. Admin managed to control the system and update any upcoming events on campus. Most users found the interface intuitive to navigate, with key features like real-time event updates, simplified registration processes, and mobile accessibility significantly enhancing user engagement. The results highlight system effectiveness in bridging the gap between event organizers and participants, while addressing critical pain points in information accessibility and administrative workload. These findings position Eventify as a viable solution for improving campus event participation of students and management efficiency, (K, 2023).

4. Novelty of Research

This project introduces an innovative web-based campus event management system that revolutionizes traditional approaches through its comprehensive integration of real-time updates, tracking, and dual-interface design for students and administrators. Unlike existing solutions that rely on fragmented social media platforms or manual processes, our system offers a unified platform with unique features. The technical innovation lies in its PHP/MySQL architecture specifically designed for campus usage, coupled with a responsive interface that maintains functionality across all devices.

5. Conclusion or Future Work

Eventify successfully enhances decision-making campus event management through its centralized platform, improving efficiency and engagement. Future enhancements will include additional map integration for venue navigation, a mobile application for on-the-go access, and push notifications for real-time updates directly through phone calendar. These enhancements will further bridge the gap between organizers and participants while fostering campus connectivity.

REFERENCE LIST

- K, N. B. (2023). College Event Management System. *Indian Scientific Journal Of Research In Engineering And Management*. <https://doi.org/10.55041/ijsrem25182>
- Pargaonkar, S. (2023). A Comprehensive Research Analysis of Software Development Life Cycle (SDLC) Agile & Waterfall Model Advantages, Disadvantages, and Application Suitability in Software Quality Engineering. *International Journal of Scientific and Research Publications*, 13(8), 120-124. <https://doi.org/10.29322/ijsrp.13.08.2023.p14015>
- Nimje, V., Admane, T., Patil, S. K., Nalkar, V., & Utikar, A. A. (2024). Club Event Management System. *International Journal of Advanced Research in Science, Communication and Technology*, 426–431. <https://doi.org/10.48175/ijarsct-22465>

WEB-BASED SPORTS EVENT MANAGEMENT SYSTEM (SAFMS)

Mohamad Farizal bin Mohd Hafiz, Ros Syamsul Hamid

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: 2022916985@student.uitm.edu.my, rossyamsul@uitm.edu.my

Abstract

The Web-Based Sport Event Management System (SAFMS) is designed to streamline the management of faculty-level sports tournaments, specifically for the Sukan Antara Fakulti (SAF) organized by UiTM Perlis. The system provides centralized features for handling tournament setup, event registration, bracket management, and medal tally tracking. Developed using the Waterfall SDLC model, SAFMS was built with Laravel for backend development and MySQL for database management. The system supports multiple user roles, including administrators and participants, each with tailored functionalities such as team and athlete registration, result submissions, and system settings. To ensure system functionality and user satisfaction, comprehensive testing was conducted. Functionality testing using predefined test cases verified that core features operated as intended. User Acceptance Testing (UAT) with expert users and student participants validated the system's reliability in real usage scenarios. Usability Evaluation Testing (UET) was also performed through heuristic evaluations and interactive user sessions to assess interface design, navigation, and user-friendliness. The results confirmed that SAFMS is functionally complete, efficient, and user-centered.

Keywords: *Event Management System, Campus Activities, Participations, PHP-MySQL, Web-based.*

1. Introduction

SAFMS addresses the limitations of manual sports event coordination at the faculty level, where inefficiencies in registration, result management, and communication often disrupt event flow. The system offers a structured and intuitive platform for managing sports tournaments by digitizing these processes. SAFMS is particularly tailored for the Sukan Antara Fakulti at UiTM Perlis, supporting goals aligned with student engagement and digital transformation in higher education. According to Mohamad et al. (2021), many local universities still rely on fragmented tools to manage sports events, resulting in duplication and confusion. The proposed system bridges these issues through role-based access and real-time updates.

2. Methodology

The system was developed using the Waterfall SDLC model, with Laravel as the backend, Vue.js for the frontend, and MySQL for database management. It includes core features such as tournament setup, registration, bracket generation, result entry, and medal tally updates. To ensure reliability and user satisfaction, three testing approaches were applied: functionality testing using predefined test cases, User Acceptance Testing (UAT) with UiTM staff and students to assess real-world suitability, and Usability Evaluation Testing (UET) through expert heuristic reviews and direct student interaction to evaluate interface clarity and overall usability.

3. Results / Findings

Functional testing showed that SAFMS met all design specifications. Expert evaluations (from UiTM staff) highlighted strengths in system consistency, layout clarity, and admin control. Regular users (students) found the interface intuitive, with minimal errors or confusion. Key components such as bracket visualization, medal tally integration, and sport-specific registrations operated efficiently. User Acceptance Testing confirmed that the system functioned reliably in real use cases, while Usability Evaluation Testing highlighted a high level of user satisfaction with interface design and navigation.

The testing confirmed that SAFMS reduces administrative workload while improving transparency and reliability in tournament management.

4. Novelty of Research

Unlike generic event platforms (e.g., Challonge or Google Sheets), SAFMS provides a custom-built solution for academic-level multi-sport tournaments with full admin control, participant authentication, dynamic bracket creation, and automatic medal tallying. It also offers mobile responsiveness and role-based dashboards for clarity. According to Pargaonkar (2023), the Waterfall model provides a structured approach suitable for systems requiring clear documentation and staged evaluation. By applying this approach, SAFMS ensures system completeness and traceability. In addition, the use of Laravel and Vue.js ensures a modern web application framework that is both scalable and secure (Frankenfield, 2013).

5. Conclusion or Future Work

The Web-Based Sports Event Management System (SAFMS) has proven to be a practical, secure, and scalable solution for managing faculty-level sports tournaments at UiTM Perlis. By digitizing essential processes such as athlete registration, bracket generation, result tracking, and medal tally management, the system significantly enhances administrative efficiency, data accuracy, and participant engagement. To further improve the system's functionality and user experience, several future enhancements are proposed. These include the development of a dedicated mobile application to deliver real-time notifications and updates for athletes and officials, integration of advanced analytics dashboards for performance tracking and player statistics, and support for live match streaming to increase accessibility and visibility. Additionally, the system could be expanded to support automated scheduling, sensor-based performance tracking, and multi-campus tournament management to broaden its institutional impact. Overall, SAFMS provides a strong foundation for modernizing sports event management in higher education and aligns well with UiTM's goals for digital transformation and student engagement.

REFERENCE LIST

- Frankenfield, D. C. (2013). *Bias and accuracy of resting metabolic rate equations in non-obese and obese adults*.
- Mohamad, A. A., Khalid, M., & Ibrahim, R. (2021). Development of sports event management system using web-based technology. *Journal of ICT Research and Applications*, 15(2), 147–158.
- Pargaonkar, S. (2023). A comprehensive research analysis of Software Development Life Cycle (SDLC) Agile & Waterfall model: Advantages, disadvantages, and application suitability in software quality engineering. *International Journal of Scientific and Research Publications*, 13(8), 120–124.

IOT-BASED TODDLER PRESENCE DETECTION IN VEHICLES

Muhammad Aiman Hafizuddin Bin Fauzi, Ros Syamsul Bin Hamid

Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perlis Branch, Malaysia

e-mail: aimanhafizuddin14@gmail.com, rossyamsul@uitm.edu.my

Abstract

Toddler vehicular heatstroke incidents pose a critical safety challenge, with 52.5% of child deaths in vehicles caused by being forgotten by parents or guardians. This project introduces an IoT-based toddler presence detection system that integrates multiple sensors, real-time monitoring, and automated alert mechanisms to prevent Forgotten Baby Syndrome (FBS). The system utilizes ESP32 microcontroller interfaced with HX711 weight sensors, DHT22 temperature sensors, and MC-38 magnetic door sensors. A Flutter-based mobile application provides immediate notifications, while Bulk360 SMS API ensures emergency contact escalation. The automated cooling system activates when cabin temperature exceeds 35°C. System development followed the waterfall methodology within the SDLC framework. Comprehensive evaluation included functionality testing achieving 100% success rate, user experience testing with 20 participants yielding four point five two overall satisfaction score, and network performance testing demonstrating reliable data transmission. The multi-layered safety approach addresses critical gaps in current child safety solutions by providing redundant alert mechanisms and automated environmental control, contributing to the prevention of tragic vehicular heatstroke incidents.

Keywords: *IoT, Toddler Safety, Vehicle Monitoring, Firebase, Emergency Alert System, Child Protection*

1. Introduction

Vehicular heatstroke incidents involving children represent a critical safety concern, with temperatures reaching 70°C within 20 minutes (Saleh et al., 2022). Forgotten Baby Syndrome affects parents due to stress and routine changes, contributing to preventable child deaths. This study introduces an IoT-based toddler presence detection system. Objectives include identifying essential IoT components, developing integrated hardware-software solutions using weight sensors and magnetic door sensors with mobile alerts, and evaluating system performance through comprehensive testing.

2. Methodology

This research employs the System Development Life Cycle (SDLC) using the waterfall methodology, encompassing requirement analysis, design, development, testing, and documentation phases. The hardware architecture centers on ESP32 microcontroller integration with HX711 load cell sensors configured with 3kg threshold for toddler presence detection, DHT22 temperature sensors for environmental monitoring, and MC-38 magnetic door sensors for vehicle access tracking. The automated cooling system utilizes DC 5V fans controlled through relay modules when temperatures exceed 35°C. Software development integrates Arduino IDE for microcontroller programming, Flutter framework for mobile application development, and Firebase Realtime Database for data synchronization. The Bulk360 SMS API provides emergency contact escalation when primary mobile notifications remain unacknowledged within 60 seconds. System logic implements decision algorithms where weight detection combined with door closure triggers immediate mobile alerts, followed by SMS escalation to emergency contacts. Testing methodology includes functionality testing, user experience testing with 20 participants evaluating six UX dimensions, and network performance testing.

3. Results / Findings

The IoT-based toddler presence detection system demonstrated exceptional performance across all evaluation criteria. Functionality testing achieved 100% success rate for hardware components including accurate weight detection above 3kg threshold, reliable temperature monitoring with automatic cooling activation at 35°C, and consistent door status tracking. Network performance testing revealed stable data transmission with average response times of 1143ms, ensuring reliable real-time communication between ESP32 microcontroller and Firebase database. User experience evaluation with 20 participants yielded outstanding results with an overall satisfaction score of 4.52 on a 5-point scale (Nakamura et al., 2022). Specific UX categories achieved: attractiveness (4.58), perspicuity (4.43), efficiency (4.60), dependability (4.65), stimulation (4.42), and novelty (4.43). Participants unanimously recommended the system to others, with 100% recommendation rate. The dual-notification system successfully escalated alerts through SMS API, while the automated cooling system provided immediate environmental protection.

4. Novelty of Research

This project represents novel IoT integration addressing toddler vehicular safety through multi-sensor fusion and intelligent algorithms. Unlike existing single-detection solutions, this system combines weight-based presence detection, environmental monitoring, and vehicle access tracking for comprehensive coverage. The dual-channel alert mechanism provides redundant communication pathways during system failures. Automated cooling integration offers immediate protection during alert escalation, addressing critical incidents involving children accidentally trapped in vehicles, particularly during hot weather in tropical climates (Bashir et al., 2023). Firebase real-time synchronization enables instantaneous data sharing and remote monitoring not found in traditional safety devices. The scalable ESP32-based architecture allows cost-effective deployment while maintaining robust performance, establishing new IoT-based child safety benchmarks.

5. Conclusion or Future Work

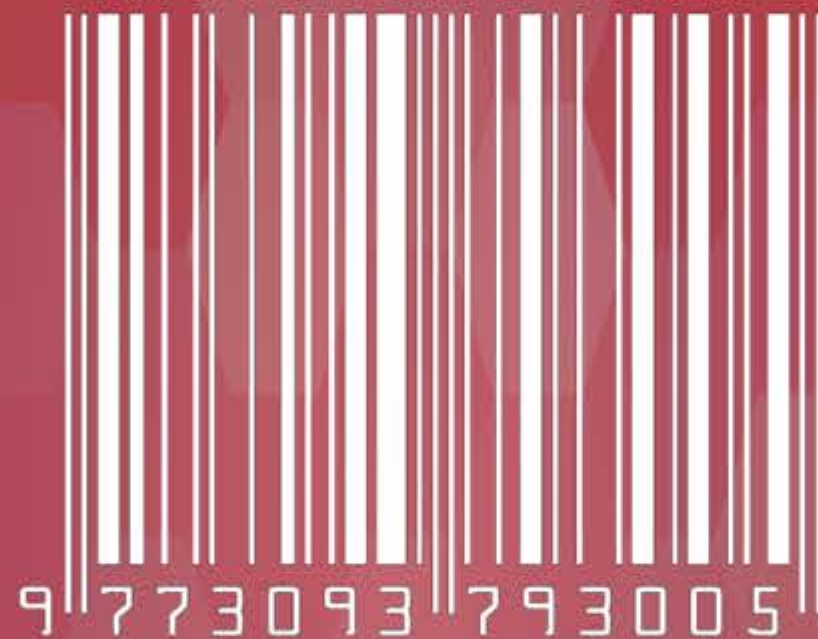
The IoT-based toddler presence detection system successfully prevents vehicular heatstroke incidents through comprehensive monitoring and automated response mechanisms. Future enhancements include GPS integration for location-based emergency services, cellular connectivity for network independence, and machine learning algorithms for improved detection accuracy and reduced false alarms.

REFERENCE LIST

- Bashir, A., Faisal, T., Alhammadi, M., & Habib, I. (2023). IoT enabled Vehicles Auto Kids Recognition System. *2023 Advances in Science and Engineering Technology International Conferences, ASET 2023*. <https://doi.org/10.1109/ASET56582.2023.10180634>
- Nakamura, W. T., de Oliveira, E. C., de Oliveira, E. H. T., Redmiles, D., & Conte, T. (2022). What factors affect the UX in mobile apps? A systematic mapping study on the analysis of app store reviews. *Journal of Systems and Software*, 193, 111462. <https://doi.org/10.1016/J.JSS.2022.111462>
- Saleh, M., Charkie, F., Al-Hamad, R., & Almisned, F. (2022). Designing a Smart Alarm System to Prevent Child Heatstroke in Vehicles. *2022 International Conference on Smart Systems and Power Management, IC2SPM 2022*, 58–63. <https://doi.org/10.1109/IC2SPM56638.2022.9988856>

Proceedings of Research Exhibition in Mathematics and Computer Sciences

eISSN 3093-7930



**Faculty of Computer and Mathematical Sciences
Universiti Teknologi MARA, Perlis Branch**



وَيْبُورَسِيَّتِي تَيْكُونُ لَوِي مَارَا
UNIVERSITI
TEKNOLOGI
MARA