



**FAKULTAS ILMU KOMPUTER  
UPN VETERAN JAKARTA**

# PROCEEDINGS



**4<sup>th</sup> INTERNATIONAL CONFERENCE**

# ICIMCIS

**INFORMATICS, MULTIMEDIA, CYBER, AND INFORMATION SYSTEM**

**ICIMCIS PROCEEDINGS 2022**

**2022**



2022 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS) | 978-1-6654-7327-9/22/\$31.00 ©2022 IEEE | DOI: 10.1109/ICIMCIS56303.2022.10017840

# **2022 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS)**

## **Organizing Committee International Advisory Committee**

- Dr. Ing Wahyudi Hasbi, S.Si, M.Kom. - IEEE IS Chair  
Prof. Dr. Ir. Gamantyo Hendranto, Ph.D. - IEEE IS Vice-Chair  
Ir. Linawati, M.Eng.Sc., Ph.D. - IEEE IS Secretary  
Dr. Karlisa Priandana, M.Eng - IEEE IS Vice Secretary  
Dr. Kemas Muslim Lhaksmana - IEEE IS Treasurer  
Dr. Prima Dewi Purnamasari, S.T., M.Sc - IEEE IS Vice Treasurer  
Dr. Anter Venus, MA, Comm – Rector Universitas Pembangunan Nasional Veteran Jakarta, Indonesia  
Dr. R. Dudy Heryadi, M.Si – Vice Rector for Academic Affairs Universitas Pembangunan Nasional Veteran Jakarta, Indonesia  
Dr. Ec. Prasetyo Hadi, SE., MM., CFMP – Vice Rector for General and Financial Affairs Universitas Pembangunan Nasional Veteran Jakarta, Indonesia  
Dr. dr. Ria Maria Theresa, Sp.KJ., MH. – Vice Rector for Student Affairs and Cooperation Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

## **Steering Committee**

- Prof. Teddy Mantoro – Universitas Sampoerna, Indonesia  
Prof. Achmad Nizar Hidayanto - Universitas Indonesia, Indonesia  
Prof. Dr. Achmad Benny Mutiara Q.N. – Universitas Gunadarma, Indonesia  
Prof. Dra. Sri Hartati, M.Sc., Ph.D – Universitas Gajah Mada, Indonesia  
Prof. Dr.Ir. Agus Buono, M.Si, M.Kom – IPB University, Indonesia  
Prof. Dr. Ir. Siti Nurmaini, MT – Universitas Sriwijaya, Indonesia  
Dr. Djuniadi, MT – Universitas Negeri Semarang, Indonesia  
Dr. Ermatita, M.Kom – Universitas Sriwijaya, Indonesia  
Dr. Didit Widiyanto – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia  
Dr. Tjahjanto – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia  
Dr. Widya Cholil, S.Kom., M.IT – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia  
Dr. Bambang Saras – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia  
Dr. Deris Setiawan - Universitas Sriwijaya, Indonesia

## **General Chair**

- Dr. Widya Cholil, S.Kom., M.IT – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

## **General Co-Chairs**

- M. Octaviano Pratama, S.Kom, M.Kom. – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

### **Secretarial**

Kraugusteeliana, M.Kom., MM – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Diyah Retnowati, S.Kom – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Saimin, S.Kom – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

### **Event, Publicity, Website & Documentation Division**

Ati Zaidiah, S.Kom., MTI – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Andhika Octa Indarso, MMSI – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Astrianto Afandi, Amd.Kom – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Didit Suryahartono, S.Kom – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Mochammad Fariz Setyawan, S.Kom – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

### **Proceeding Division**

Erly Krisnanik, S.Kom, MM – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Artika Arista, S.Kom., MMSI – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Ika Nurlaili Isnainiyah, S.Kom, M.Sc – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Helena Nurramdhani Irmada, S.Pd., M.Kom. – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Muhammad Adrezo, S.Kom, M.Sc – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Ria Astriratma, S.Kom, M.Cs - Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Neny Rosmawarni, M.Kom - Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Muhammad Panji Muslim, S.Pd., M.Kom. - Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Mustofa Galih Pradana, M.Kom - Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Triando Damiri Burlian, S.Kom, M.S.Eng, M.Sc. – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Novi Trisman Hadi, S.Pd., M.Kom. - Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

### **Financial**

Rudhy Ho Purabaya, SE., MMSI – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Yami - Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Suryadi, Amd.Kom - Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

### **Administration & Logistic**

Musenah, S.Pd, M.Kes – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Zaenudin – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

Abdul Rahman – Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

[2022 International Conference on Informatics, Multimedia, Cyber and Information System \(ICIMCIS\)](#) took place November 16th – 17th, 2022 in virtual, Indonesia.

ISBN: 978-1-6654-7327-9 (ART) / 978-1-6654-7326-2 (USB)

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For reprint or republication permission, email to IEEE Copyrights Manager at [pubs-permissions@ieee.org](mailto:pubs-permissions@ieee.org). All rights reserved. Copyright ©2022 by IEEE.

## Table of Content

<b>IT Capabilities Analysis Towards the Organization Performance in the Virtual Organization: A Case Study of ABC Multifinance Company in Indonesia.....</b>	<b>1</b>
Dewi Rokhmah Pyriana (University of Indonesia, Indonesia); Hidayat Akbar (Universitas Indonesia, Indonesia); Muhammad Muslim Rifa'i (University of Indonesia, Indonesia); Sandriyana Kusuma Wardani and Suci Inayah (Universitas Indonesia, Indonesia); Muhammad Rifki Shihab (Faculty of Computer Science, Universitas Indonesia, Indonesia) .....	
<b>E-Warung Systems Development .....</b>	<b>7</b>
Cornelia Tri Wahyuni (Universitas Bina Darma, Indonesia); Darius Antoni (Universitas Indo Global Mandiri, Indonesia); Widya WH Cholil, MIT (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia) .....	
<b>Diagnosing the Impact of Digital Resources and Remote Leadership on Telework Productivity .....</b>	<b>12</b>
Nopriadi Saputra (Bina Nusantara University, Indonesia); Kiki Sudiana (Telkom University, Indonesia) .....	
<b>Public Government Web Based Services Quality Assesment Using Webqual and Govqual in Palembang City Government.....</b>	<b>19</b>
Widya WH Cholil, MIT (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Lalilatur Rahmi (Politeknik Negeri Sriwijaya, Indonesia); Anita Muliawati, Jayanta Jayanta, Rio Wirawan and Helena Nurramdhani Irmanda (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia) .....	
<b>Empirical Review of M-Banking User Satisfaction Using End User Computing Satisfaction (EUCS) .....</b>	<b>25</b>
Dedy Syamsuar (Bina Nusantara University, Indonesia); Widya WH Cholil, MIT (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Rio Ramadhan (Universitas Bina Darma, Indonesia); Ruth Mariana Bunga Wadu (Jalan RS. Fatmawati Raya, Pd. Labu, Kec. Cilandak, Indonesia); Ati Zaidiah (UPN Veteran Jakarta, Indonesia); Nia Oktaviani (Universitas Bina Darma, Indonesia).....	
<b>Small Medium Enterprise Social Media Ranking Using Analytic Network Process ..</b>	<b>30</b>
Khairun Nisa Meiah Ngafidin, Citra Wiguna and Rona Nisa Sofia Amriza (Institut Teknologi Telkom Purwokerto, Indonesia) .....	
<b>Identifying Shill Bidder Presence in Online Auction Using Dynamic Detection Strategy .....</b>	<b>36</b>

Felesia Felesia, Ivanco Gratio Hartono, Monica Ruth Fabiola Winata, Henry Lucky and Andry Chowanda (Bina Nusantara University, Indonesia)..... 36

**Development of Mobile-Based Information Letter of Rukun Tetangga and Rukun Warga With Mern Stack Method..... 43**

Gregorius Wisnu Wijanarko Tiba and Haris Rangkuti, Mr (Bina Nusantara University, Indonesia)..... 43

**Development of E-Learning Applications to Support Student Learning..... 49**

Arvin Rizki Andriaputra, Dicky Bima Pradana Resmana, Nico Marzuki and Haris Rangkuti, Mr (Bina Nusantara University, Indonesia) ..... 49

**Use of Blockchain for Designing Digital Documents in Public Services..... 55**

Darius Antoni (Universitas Indo Global Mandiri, Indonesia); Muhammad Izman Herdiansyah (Universitas Bina Darma, Indonesia); Muhamad Akbar (Universitas Sriwijaya, Indonesia & Universitas Bina Insan, Indonesia); Widya WH Cholil, MIT (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Hadi Syaputra (Universitas Sriwijaya & Universitas Bina Darma, Indonesia) ..... 55

**The Role of Vlog Content and Vlog Enjoyment on Developing Marketable Travel E-Commerce to Millennial Audiences ..... 61**

Martinus Fieser Sitinjak (Bina Nusantara University, Indonesia); Azizah Omar (USM, Malaysia); Yopy Maulana (Bina Nusantara University, Indonesia) ..... 61

**A Systematic Review of Business Process Management in E-Commerce ..... 66**

Thalea Christy Nathaniela, Agung Purnomo and Satria Fadil Persada (Bina Nusantara University, Indonesia); Elsa Rosyidah (Universitas Nahdlatul Ulama Sidoarjo, Indonesia)..... 66

**Effectiveness Analysis of Using the Vehicle Tools Feature on ERP Systems With Delone & McLean Approach at PT. Putra Mulia Telecommunication..... 71**

Azizah Tsana Putri, Haffiz Galuh Pratama Pratama, Orchidea Safira and Sucianna Ghadati Rabiha (Bina Nusantara University, Indonesia) ..... 71

**Applying for E-Signature Approval With TOGAF Framework to Improve Productivity: Case Study SAP Document Management System..... 77**

Cynthia Dewi Tanuraharja, Kania Alma Tiara, Gunawan Wang and Hendra Alianto (Bina Nusantara University, Indonesia) ..... 77

**Analysis of Stakeholder Satisfaction Using ITILv4 for Data Management in Telkomsat ERP..... 82**

Nugroho Wibisono (Swiss German University & PT Telkom Satelit Indonesia (Telkomsat), Indonesia); Heru Ipung, Amin Soetomo and Eka Budiarto (Swiss German



University, Indonesia); Ayu Putri Sakinah (IPB University, Indonesia & PT Telkom Satelit Indonesia, Indonesia); Rian Fitriana (PT Telkom Satelit Indonesia, Indonesia)82

**A Literature Review Knowledge Management for Traditional Retail Business Strategies..... 88**

Dien Novita (Universitas Sriwijaya & Universitas MDP, Indonesia); Ermatita Ermatita (Sriwijaya University & Computer Science Faculty, Indonesia); Samsuryadi Samsuryadi and Dian Palupi Rini (Universitas Sriwijaya, Indonesia)..... 88

**Financial Auditor Efficiency and Effectiveness in Remote Audit Transition Due to Pandemic of Covid-19..... 94**

Bambang Leo Handoko and Ang Swat Lin Lindawati (Bina Nusantara University, Indonesia); Hery Harjono Muljo (School of Information Systems, Bina Nusantara University, Indonesia) ..... 94

**Functional Requirements and Traceability System Information Modeling on Java Preanger Coffee Supply Chain ..... 99**

Bonang W Ligar (Gunadarma University, Indonesia); Sarifuddin Madenda (Gundarma University, Indonesia); Sutrisno S Mardjan (IPB University, Indonesia); Tubagus Maulana Kusuma (Gunadarma University, Indonesia)..... 99

**Analysis and Design of Supply Chain Management System at CV Putra Nusantara Mandiri ..... 105**

Nomane Danke Zaidane, Sheline Rizkyka Giovani, Rizki Putra Bahari and Sucianna Ghadati Rabiha (Bina Nusantara University, Indonesia) ..... 105

**Identifying Value at Risk in the Real Estate Sector Through the Application of Monte Carlo Simulation ..... 111**

Dicky Hida Syahchari and Anggraeni Woro Hapsari (BINUS University, Indonesia)111

**Model for Detect Hand Sign Language Using Deep Convolutional Neural Network for the Speech/Hearing Impaired ..... 118**

Alfredo Lorentiar Santonanda, Fransisca Cicilia Margono, Rachmat Kurniawan, Henry Lucky and Andry Chowanda (Bina Nusantara University, Indonesia)..... 118

**A Preliminary Study of Decision Support Model of Photovoltaic for Village Area in South of Sumatera..... 124**

Feby Ardianto (Universitas Muhammadiyah Palembang, Indonesia); Ermatita Ermatita (Sriwijaya University & Computer Science Faculty, Indonesia); Armin Sofijan, AS (Sriwijaya University & Faculty of Engineering, Indonesia); Vina Ayumi (Universitas Mercu Buana Jakarta, Indonesia); Handrie Noprisson (Universitas Mercu Buana, Indonesia); Mariana Purba (Universitas Sjakhyakirti, Indonesia) ..... 124

**Identification of Meteorological Parameters Affecting Dengue Hemorrhagic Fever Incidences..... 130**





Faisal Asadi, Joko Pebrianto Trinugroho, Alam Ahmad Hidayat, Reza Rahutomo and Bens Pardamean (Bina Nusantara University, Indonesia) ..... 130

**Scientometric Analysis of Artificial Intelligence Research in Agriculture..... 136**

Fairuz Iqbal Maulana and Andi Pramono (Bina Nusantara University, Indonesia); Miftahul Hamim (Language Center, Bina Nusantara University, Indonesia); Sukeipah Yuli Prihatin (Politeknik Kota Malang, Indonesia); Rahman Arifuddin (University of Merdeka Malang, Indonesia)..... 136

**Indonesian Traditional Food Image Recognition Using Convolutional Neural Network ..... 142**

Gredion Prajena, Jeklin Harefa, Alexander Alexander, Bernhard Owen Josephus and Ardianto Hermawan Nawir (Bina Nusantara University, Indonesia) ..... 142

**Calculating the Similarity of Indonesian Sentences Using Latent Semantic Indexing Based on KBBI ..... 148**

Muhammad Panji Muslim (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Arief Fatchul Huda (Universitas Islam Negeri Bandung & Telkom University, Indonesia) ..... 148

**Evaluation of Software Quality Assurance Silampari Smart City of Lubuklinggau Based on ISO/IEC 25010:2011 Analysis Model ..... 154**

Yayan Indra Irawan (Bina Darma University, Indonesia); Edi Surya Negara (Universitas Bina Darma, Indonesia)..... 154

**Time-Series Analysis of Correlation Between Climatic Parameters and Dengue Fever in Indonesia..... 161**

Rudi Nirwantono (Binus University, Indonesia); Joko Pebrianto Trinugroho, Digdo Sudigyo, Alam Ahmad Hidayat and Bens Pardamean (Bina Nusantara University, Indonesia) ..... 161

**A Fatigue Detection Model Based on Convolutional Neural Network ..... 166**

Daniel Wijaya, Michael Stanley, Pascal Wilman, Henry Lucky and Andry Chowanda (Bina Nusantara University, Indonesia) ..... 166

**A Literature Review on the Impact of Effective Management in Cyber Security System Performance ..... 172**

Luis F Salim, Stephanus Harjono, Ferdinand Gunawan, Jurike Moniaga and Indra D Rianto (Bina Nusantara University, Indonesia) ..... 172

**Comparative Analysis of Usability, Performance, and Security of Open-Source, Windows-Based Password Manager Applications Based on ISO/IEC 25010..... 178**

Lettisia Nurdayenti (Badan Siber dan Sandi Negara, Indonesia); Amiruddin Amiruddin (Politeknik Siber dan Sandi Negara & Badan Siber Dan Sandi Negara, Indonesia) .. 178

**A Case Study of Digital Forensic Readiness Level Measurement Using DiFRI Model 184**

Ilham Zulfahmi Baiquni (Badan Siber dan Sandi Negara, Indonesia); Amiruddin Amiruddin (Politeknik Siber dan Sandi Negara & Badan Siber Dan Sandi Negara, Indonesia) ..... 184

**Cyber Threats and Scams in FinTech Organizations: A Brief Overview of Financial Fraud Cases, Future Challenges, and Recommended Solutions in Bangladesh ..... 190**

Md. Jafrin Hossain, Rejuan Haque Rifat and Mahadi H Mugdho (BRAC University, Bangladesh); Mohona Jahan (Mohakhali, Dhaka, Bangladesh); Annajiat Alim Rasel (Brac University, Bangladesh); Muhammad Abdur Rahman (BRAC University, Bangladesh)..... 190

**Impact Analysis of Crypto Miner Malware Attacks Using Android Debug Bridge (ADB) Vulnerabilities via TCP/IP on Android-Based Raspberry Pi 4 IoT Device ... 196**

Aidil Yusuf Priadi (National Cyber and Crypto Polytechnic, Indonesia); Arizal Arizal (Politeknik Siber dan Sandi Negara, Indonesia) ..... 196

**Flubot Malware Hybrid Analysis on Android Operating System..... 202**

Hanifah Salsabila (Poltek Siber dan Sandi Negara, Indonesia); Syafira Mardhiyah (Politeknik Siber Dan Sandi Negara, Indonesia); Raden Budiarto Hadiprakoso (Poltek Siber dan Sandi Negara, Indonesia) ..... 202

**Implementation of Rail Fence Cipher and Myszowski Algorithms and Secure Hash Algorithm (SHA-256) for Security and Detecting Digital Image Originality ..... 207**

Rojali Rojali, Zulfany Rasjid and Justin Cliff Matthew (Bina Nusantara University, Indonesia)..... 207

**Implementation of PRESENT Algorithm on Contactless Access Control Using Raspberry Pi..... 213**

Nazela Khairani Putri and Dion Ogi (Politeknik Siber dan Sandi Negara, Indonesia)213

**Comparison of IPv6 Dynamic Routing Protocols on Routing Hole Handling ..... 219**

Novi Trisman Hadi (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)219

**Comparison of Machine Learning Techniques on Snort for Predicting Realtime DoS and Probe Attack ..... 224**

Achmad Husein Noor Faizi, Dimas Febriyan Priambodo and Fika Dwi Rahmawati (Politeknik Siber dan Sandi Negara, Indonesia) ..... 224

**Waterfall Model for Design and Development Coffee Shop Website at Malang..... 230**

Andreas Yan Ardhiansyah, Dion Lamilga Sudiono Putra, Jsven Septian K, Nadya Budhianto and Fairuz Iqbal Maulana (Bina Nusantara University, Indonesia) ..... 230

**Low Fidelity Prototype Design to Facilitate BEELIC Website Navigation Process for Information Center ..... 235**

Hervina Aprilia (Universitas Bina Nusantara, Indonesia); Arsa Widitiarsa Utoyo (Bina Nusantara University & Bina Nusantara University - School of Design, Indonesia); Tobias Warbung (BINUS University & Towa Design, Indonesia); Titik Endahyani (Queensland University of Technology, Indonesia); Axel Juan Sukmawan (Bina Nusantara University, Indonesia) ..... 235

**Hybrid Protege Training Program in Corporate Setting: An Evaluative Case Study 239**

Nurul Hijja Mazlan (Universiti Teknologi MARA, Malaysia); Nor Zanariah Talib (INSTITUT AMINUDDIN BAKI, Malaysia); Nur Aqilah R M Kamal (Universiti Teknologi MARA, Malaysia) ..... 239

**A User-Centered Design of Natural Language Processing for Maternal Monitoring Chatbot System ..... 244**

Sandra Hakiem Afrizal (Universitas Binawan, Indonesia); Nashrul Hakiem (Universitas Islam Negeri Syarif Hidayatullah, Indonesia); Adhistya Erna Permanasari (Universitas Gadjah Mada, Indonesia); Hadid Albab (UIN Syarif Hidayatullah, Indonesia); Guardian Yoki Sanjaya and Lutfan Lazuardi (Universitas Gadjah Mada, Indonesia)..... 244

**Manufacturing Company Innovative Level Assessment Case Study of Volta Indonesia Semesta Incorporated ..... 249**

Bambang Purwanggono and Ratna Purwaningsih (Diponegoro University, Indonesia); Arfan Bakhtiar (Technical University of Berlin-Germany & Diponegoro University-Indonesia, Germany); Febrina Agusti (Duta Bangsa University, Indonesia); Kumara Pinasthika Dharaka (University of Bina Nusantara, Indonesia)..... 249

**User Interface Design of Seminar and Workshop Information Mobile Apps for Self-Development ..... 254**

Jeremy Nathanael Wijaya and Yudhistya Ayu Kusumawati (Bina Nusantara University, Indonesia) ..... 254

**Concatenate Word Embedding for Text to Image Through Generative Adversarial Network..... 259**

Rakhmi Khalida, rkhalida (Universitas Gunadarma, Indonesia); Sarifuddin Madenda (Gundarma University, Indonesia); Suryadi Harmanto (Gunadarma University, Indonesia); I Made Wiryanana (Gundarma University, Indonesia)..... 259

**Analysis of SMEs Consideration in Adopting New Technology Using Technology Acceptance Model ..... 265**

Iston Utama, Mulyani Karmagatri, Dian Kurnianingrum and Okky Rizkia Yustian (Bina Nusantara University, Indonesia) ..... 265

**The Usability Analysis of Human Resource Information System (HRIS) Using Usability Scale System and Concurrent Think Aloud..... 270**

Ismayana Teguh Pratama, Rahmatika Putri and Rian Fernanda (Universitas Bina Nusantara, Indonesia); Sunardi Action (Bina Nusantara University, Indonesia)..... 270

**Comparison of Machine Learning Methods in Sentiment Analysis PeduliLindungi Applications..... 276**

Widya WH Cholil, MIT (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Febriyanti Panjaitan (Universitas Sriwijaya & Universitas Bina Darma, Indonesia); Ferdiansyah Ferdiansyah (Universitas Bina Darma & Universiti Teknologi Malaysia, Indonesia); Artika Arista, Ria Astriratma and Tri Rahayu (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia) ..... 276

**Performance Comparison of Rabin-Karp Algorithm and Winnowing Algorithm for Document Abstraction Similarity Detection ..... 281**

Anggit Dwi Hartanto and Yoga Pristyanto (Universitas Amikom Yogyakarta, Indonesia); Andy Saputra (Amikom University Yogyakarta, Indonesia); Eli Pujastuti, Atik Nurmasani and Ika Asti Astuti (Universitas Amikom Yogyakarta, Indonesia).. 281

**Improved Chest X-Ray Image Quality Using Median and Gaussian Filter Methods287**

Lucky Indra Kesuma (Universitas Sriwijaya & Universitas Sjakhyakirti Palembang, Indonesia); Ermatita Ermatita (Sriwijaya University & Computer Science Faculty, Indonesia); Erwin E and Purwita Sari (Universitas Sriwijaya, Indonesia); Rudhy Purabaya (UPN Veteran Jakarta, Indonesia)..... 287

**Implementation of Reinforcement Learning in 2D Based Games Using Open AI Gym ..... 293**

Bayu Setiaji (Universitas AMIKOM Yogyakarta, Indonesia); Eli Pujastuti and Muhammad Fairul Filza (Universitas Amikom Yogyakarta, Indonesia); Ahlihi Masruro (Universitas AMIKOM Yogyakarta, Indonesia); Yusuf Ashidicki Pradana (Universitas Amikom Yogyakarta, Indonesia) ..... 293

**Improved Support Vector Machine (SVM) Performance on Go-Jek Service Review Classification Using Particle Swarm Optimization (PSO)..... 298**

Windha MP Duhita (Universitas AMIKOM Yogyakarta, Indonesia); Haryoko Haryoko (University of AMIKOM Yogyakarta, Indonesia)..... 298

**Machine Learning Model for Detecting Fake News Content in Indonesian-Language Online Media ..... 302**

Inggrid Yanuar Risca Pratiwi (Politeknik Masamy Internasional, Indonesia); Anggit Ferdita Nugraha (Universitas AMIKOM Yogyakarta, Indonesia); Yoga Pristyanto, Rifda Faticha Alfa Aziza and Jeki Kuswanto (Universitas Amikom Yogyakarta, Indonesia); Ibnu Hadi Purwanto (Universitas AMIKOM Yogyakarta, Indonesia) .... 302

**Problem Identification on Cardiovascular Disease Prevention Using Artificial Intelligence: A Literature Review ..... 308**

Boby Siswanto (Bina Nusantara University, Indonesia)..... 308

**UI Pattern Analysis in Obtaining Highest Success Rate in University Admission Website..... 314**

Arroyan Cahyaning Ratri and Eli Pujastuti (Universitas Amikom Yogyakarta, Indonesia); Muh Hanafi (Universitas Amikom Yogyakarta, Indonesia & Time Excellindo, Malaysia); Nuri Cahyono (Universitas Amikom Yogyakarta, Indonesia)314

**Teman Berlingdung: Mobile-Based Student Counseling Service Application ..... 320**

Muhammad Fahrizal, Muhammad Raehan M Safitroh, Hanifa W Damayanti and Ihrom Wahyuni (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Chaerul Ilmi Al Ahyari (JL RS. FATMAWATI & UPN Veteran Jakarta, Indonesia); Ria Astriratma (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)..... 320

**BERT-Based Topic Modeling Approach for Malaria Research Publication..... 326**

Alam Ahmad Hidayat (Bina Nusantara University, Indonesia); Rudi Nirwantono (Binus University, Indonesia); Arif Budiarto and Bens Pardamean (Bina Nusantara University, Indonesia)..... 326

**A Video Filtering Method Using Greyscale and Canny Edge Detector in LabVIEW332**

Putri Wulandari (University of Al Azhar Indonesia, Indonesia); Dwi Astharini (Universitas Al Azhar Indonesia, Indonesia); Wahyu Caesarendra (Universiti Brunei Darussalam & Diponegoro University, Brunei Darussalam); Triwiyanto Triwiyanto (Health Polytechnic Ministry of Health Surabaya, Indonesia); Maciej Sulowicz (Cracow University of Technology, Poland); Tjahjanto Tjahjanto (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)..... 332

**Comparison Analysis of Data Sending Performance Using the Cayenne and ThingSpeak IoT Platform ..... 337**

Kirana Astari Pranoto (Universiti Brunei Darussalam, Brunei Darussalam); Yogi Reza Ramadhan (CV. Rekeyasa Desain Manufaktur, Indonesia); Wahyu Caesarendra (Universiti Brunei Darussalam & Diponegoro University, Brunei Darussalam); Triwiyanto Triwiyanto (Health Polytechnic Ministry of Health Surabaya, Indonesia); Adam Glowacz (AGH University of Science and Technology, Poland); Santanu Kumar Dash (Vellore Institute of Technology, India); Bambang T Wahyono (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia) ..... 337

**Naive Bayes Classification Framework Model for Optimizing Prediction of Agrotourism Products Orange Gerga..... 343**

Yogi Isro Mukti, YIM (Institut Teknologi Pagar Alam & Teknik Informatika, Indonesia); Vike Itteridi and Iskandar Sulaini (Institut Teknologi Pagar Alam,

Indonesia); Yuni Widiastiwi (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)..... 343

**Comparison ADAM-Optimizer and SGDM for Classification Images of Rice Leaf Disease.....348**

Pujo Hari Saputro (Sam Ratulangi University, Indonesia); Dhina Puspasari Wijaya Action (Alma Ata University, Indonesia); Musthofa Galih Pradana (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Dyah Listianing Tyas (Universitas Trinita Manado, Indonesia); Wahyuni Fithratul Zalmi (Universitas Sam Ratulangi, Indonesia)..... 348

**Ensemble Learning on Sentinel-1A Imagery for Garlic Field Classification.....354**

Imas Sukaesih Sitanggang (Bogor Agricultural University, Indonesia); Muhammad Asyhar Agmalaro, Ahmad Al Banjaran Coeur d'Alene and Annisa Annisa (IPB University, Indonesia) ..... 354

**Sperm Cell Classification System Carrying X or Y Chromosome in Human With CNN Algorithm..... 360**

I Gede Susrama Mas Diyasa (Universitas Pembangunan Nasional Veteran Jawa Timur, Indonesia); Kraugusteeliana Tambunan (Universitas Pembangunan Nasional, Indonesia); Wahyu S J Saputra (University of Pembangunan Nasional Veteran Jawa Timur, Indonesia)..... 360

**Detection of Ovarian Cancer Risk Level Using the Web-Based Dempster Shafer Method ..... 365**

Kraugusteeliana Tambunan (Universitas Pembangunan Nasional, Indonesia); Nursaka Putra (STIKES Al-Insyirah Pekanbaru, Indonesia); Miandhani Denniz Yuniar (Universitas Selamat Sri, Indonesia); Dasril Aldo (Institut Teknologi Telkom Purwokerto, Indonesia); Anik Rahmawati and Viro Dharma Saputra (Universitas Selamat Sri, Indonesia) ..... 365

**English-To-Sundanese Translation Using Neural Machine Translation: Collection and Analytics..... 370**

M. Octaviano Pratama (UPN Veteran Jakarta, Indonesia); Pamela Kareen (BISA AI Academy, Indonesia); Ermatita Ermatita (Sriwijaya University & Computer Science Faculty, Indonesia); Peng Choo and Miroslav Kosteki (STEMSEL Australia, Australia); Desmond Devendran (Logical Operation, USA) ..... 370

**The Effect of Imbalanced Classes on Retinal Blood Vessel Segmentation .....375**

Ahmad Fauzi and Raju Wandira (UIN Imam Bonjol, Indonesia); Kraugusteeliana Tambunan (Universitas Pembangunan Nasional, Indonesia) ..... 375

**Comparison the New Computer Sciences Study Programs in Indonesia Using PyTrends..... 379**





Tora Fahrudin (Telkom University, Indonesia); Asniar Asniar (Telkom University);  
 Muhammad Faizul Ula (Telkom University, Indonesia) ..... 379

**Fine-Tuned MobileNetV2 and VGG16 Algorithm for Fish Image Classification ..... 384**

Devi Fitriannah, Kristien Suryaningrum and Noviyanti Tri Mareta Sagala (Bina Nusantara University, Indonesia); Vina Ayumi (Universitas Mercu Buana Jakarta, Indonesia); Siew Mooi Lim (Tunku Abdul Rahman University College, Malaysia) . 384

**Development of Educational Application About Mental Disorders With Augmented Reality for Android..... 390**

Jonathan Frederik Maringka, Rahadian Hargyo Pambuko and Mochammad Haldi Widiyanto (Bina Nusantara University, Indonesia) ..... 390

**Implementation of Feature Selection Based on Particle Swarm Optimization and Genetic Algorithm on Support Vector Regression Algorithm to Predict Student Performance ..... 395**

M. Riki Apriyadi (Doctoral Student of Engineering Science, Faculty of Engineering University of Sriwijaya Palembang, Indonesia); Ermatita Ermatita (Sriwijaya University & Computer Science Faculty, Indonesia); Dian Palupi Rini (Sriwijaya University & Computer Science Faculty, Indonesia); Yulnelly Yulnelly (UPN Veteran Jakarta, Indonesia)..... 395

**Maturity Classification of Golek Mango Using Fuzzy C Means Clustering Method Based on HSI and YCbCr Color Space Transformation ..... 401**

Ibrohim Habiburrohman (Universitas Sebelas Maret, Indonesia); Esti Suryani (University of Sebelas Maret, Indonesia); Wiharto Wiharto (Universitas Sebelas Maret, Indonesia)..... 401

**Implementation of Convolutional Neural Network Algorithm for Android-Based Classification of Taekwondo Martial Arts ..... 407**

Fauzan Akmal Mahdi and Desta Sandya Prasvita (UPN Veteran Jakarta, Indonesia); Theresiawati Theresiawati (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)..... 407

**Chatbot Application to Automate Services in FnB Business Using Seq2Seq LSTM 413**

Ethan Wang and Winata Liadylova Putera (BINUS University, Indonesia); Henry Lucky and Andry Chowanda (Bina Nusantara University, Indonesia)..... 413

**Analysis Performance of Support Vector Regression (SVR) for Congestion Prediction..... 418**

Nindy Irzavika (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Putri Saptawati (Bandung Institute of Technology, Indonesia)..... 418

**A Combination of Image Enhancement and U-Net Architecture for Segmentation in Identifying Brain Tumors on CT-SCAN Images ..... 423**

Anita Desiani (Universitas Sriwijaya, Indonesia); Muhammad Adrezo (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Nyayu Chika Marselina (Universitas Sriwijaya, Indonesia); Muhammad Arhami (Politeknik Negeri Lhokseumawe, Indonesia); Aulia Salsabila and Muhammad Gibran Al Filambany (Universitas Sriwijaya, Indonesia) ..... 423

**Implementation of Big Data Analytics for Machine Learning Model Using Hadoop and Spark Environment on Resizing Iris Dataset..... 429**

Tresna Maulana Fahrudin, Prismahardi Aji Riyantoko and Kartika Maulida Hindrayani (Universitas Pembangunan Nasional Veteran Jawa Timur, Indonesia) ..... 429

**Comparison of Kernel Support Vector Machines in Conducting Sentiment Analysis Review of Buying Chips on the Shopee E-Marketplace in Indonesian..... 435**

Muhammad Eka Purbaya, Diovianto Putra Rakhmadani, Maliana Puspa Arum and Luthfi Zian Nasifah (Institut Teknologi Telkom Purwokerto, Indonesia) ..... 435

**Application of Median Filter Method for Classification of Oil Palm Tree on LiDAR Images ..... 441**

Sabila Rafani Aliandra and Desta Sandya Prasvita (UPN Veteran Jakarta, Indonesia)441

**Application of Genetic Algorithm K-Means Clustering of Villagers Characteristics for Smart Economy..... 445**

Eneng Tita Tosida (IPB University & Universitas Pakuan, Indonesia); Indra Permana Solihin (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Fajar Delli Wihartiko (IPB University & Universitas Pakuan, Indonesia); Farhan Naufal (Pakuan University, Indonesia) ..... 445

**Implementation of Multiple Discriminant Analysis (MDA) for Clustering Smart Village in West Java Based Podes (Potensi Desa) Database ..... 451**

Eneng Tita Tosida (IPB University & Universitas Pakuan, Indonesia); Indra Permana Solihin (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Roni Jayawinangun and Deden Ardiansyah (Pakuan University, Indonesia) ..... 451

**Clustering of Tidal Swamp Soil Based on NPK Macronutrients Using the FCM Method ..... 457**

Suryati Suryati (Universitas Sriwijaya, Indonesia & Universitas Indo Global Mandiri, Indonesia); Ermatita Ermatita (Sriwijaya University & Computer Science Faculty, Indonesia); Dian Palupi Rini and Dedik Budianta (Universitas Sriwijaya, Indonesia)457

**Comparison of Multi Layer Perceptron, Random Forest & Logistic Regression on Students Performance Test ..... 462**

Musthofa Galih Pradana (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Kenneth Palilingan (Sam Ratulangi University, Indonesia); Yuri Vanli Akay





(University of Sam Ratulangi, Indonesia); Dhina Puspasari Wijaya Action (Alma Ata University, Indonesia); Pujo Hari Saputro (Sam Ratulangi University, Indonesia) ... 462

**Investment Feasibility Analysis of Base Transceiver Station (BTS) Tower Using Cost-Benefit Analysis on PT. XYZ ..... 467**

Arvy Muhammad Muhammad Reyhan and Sarah Shafira (Institute Technology of Sepuluh Nopember, Indonesia); Apol Pribadi Subriadi (Institut Teknologi Sepuluh Nopember, Indonesia) ..... 467

**Public Services Point Network Design for Local Government..... 473**

Darius Antoni (Universitas Indo Global Mandiri, Indonesia); Muhammad Izman Herdiansyah (Universitas Bina Darma, Indonesia); Muhamad Akbar (Universitas Sriwijaya, Indonesia & Universitas Bina Insan, Indonesia); Muhamad Taufiq (Universitas Bina Darma, Indonesia); Bayu Hananto, Didit Widiyanto and I Wayan Widi Pradnyana (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)..... 473

**Information System Management of Palm Agriculture Using Laravel Framework 478**

Muhammad Ilham Alhari, Muharman Lubis and Faisal Budiman (Telkom University, Indonesia) ..... 478

**Investigation Learning Model for Physics Courses Using Web Application With Case-Based Approach ..... 484**

Anindita Mardiani, Erly Krisnanik, Bayu Wibisono and Bambang Saras Yulistiawan (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)..... 484

**Knowledge Management Model Review in Relation to Marketing and Branding.... 490**

Fransiska Prihatini Sihotang (Sriwijaya University & Universitas MDP, Indonesia); Ermatita Ermatita (Sriwijaya University & Computer Science Faculty, Indonesia); Samsuryadi Samsuryadi and Dian Palupi Rini (Universitas Sriwijaya, Indonesia).... 490

**The Determinant Factors of In-App Purchase Intention of International Genshin Impact Player Mediated by Perceived Value and Game Loyalty ..... 496**

Wiwin Lestari (Universitas Bina Nusantara, Indonesia); Sofia Ranti, Nadaffa Aisy Nozwar and Arta Moro Sundjaja (Bina Nusantara University, Indonesia)..... 496

**Implementation of Haversine Algorithm and Geolocation for Travel Recommendations on Smart Applications for Backpackers in Bali ..... 504**

I Gede Susrama Mas Diyasa, Dwi Arman Prasetya, Mohammad Idhom and Anggraini Puspita Sari (Universitas Pembangunan Nasional Veteran Jawa Timur, Indonesia); Anuar Bin Mohamed Kassim (Universiti Teknikal Malaysia Melaka, Malaysia)..... 504

**The Positive Impact of ERP Usage on Business Process Outcomes and Organizational Agility ..... 509**



Ahmad Syamil (Bina Nusantara University, Indonesia); Fajar Setiadi (PT Telkom Indonesia Tbk, Indonesia); William Valente (STIE, Indonesia)..... 509

**Sustainability of Key Performance Indicators (KPI) Halal Eco-Tourism Information System ..... 514**

Muhammad Syarif Hartawan (University of Krisnadwipayana Indonesia & ICT Departement Asia E University Malaysia, Indonesia); Maya DD Maharani (Sahid University, Indonesia); Erly Krisnanik (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Hoga Saragih (Bakrie University & Indonesia, Indonesia); Aedah Abd Rahman (Universiti Kuala Lumpur, Malaysia)..... 514

**Impact of Service Communication Technology, and Effectiveness on Public Service Performance by Chatbot Service on Ticket Sales Services at PT KAI..... 518**

Tiurida Anita (Bina Nusantara University, Indonesia); Athea Sarastiani (University of Trisakti, Indonesia); Ruddy Awaluddin (Trisakti University, Indonesia) ..... 518

**Digital Technology in Health Education Trend Mapping Through Bibliometrics Analysis..... 523**

Fairuz Iqbal Maulana (Bina Nusantara University, Indonesia); Dian Lestari (Airlangga University, Indonesia); Vandha Widartha (Telkom University, Indonesia); Nirwana Hari (Universitas Madura, Indonesia); Wahyu Dirgantara (University of Merdeka Malang, Indonesia)..... 523

**Energy Saving Method in an Illumination System for Brawijaya Museum Display 529**

Andi Pramono, M. Febriantono, Ida Ananta Wijaya and Tiara Ika Widia Primadani (Bina Nusantara University, Indonesia); Miranti Nurul Huda (Bina Nusantara University & Yayasan Bina Nusantara, Indonesia); Satrio Arif Budiman (University of Brawijaya, Indonesia)..... 529

**The Smart Lighting System in the Coworking Space's Meeting Room..... 534**

Anastasya Krisna Putri (School of Design & BINUS University, Indonesia); Andi Pramono (Bina Nusantara University, Indonesia); Diah Maharani Yasmin (Binus University, Indonesia); Bela Ayu Safitri (BINUS University, Indonesia); Yukiko Safira Zaharani and Felix Franklin Zebua (Binus University, Indonesia)..... 534

**You-Topia: Virtual World Game Mobile App to Improve Creativity ..... 539**

Ivana Clarissa Soegiarto, Yudhistya Ayu Kusumawati and Cuk Tho (Bina Nusantara University, Indonesia) ..... 539

**Factors Influencing Indonesian Consumers to Use Digital Banking ..... 546**

Christine Tanika and William William (BINUS University, Indonesia); Michael Putra Hartanto (Bina Nusantara University, Indonesia); Miranda Tanjung (BINUS University, Indonesia)..... 546



**Systematic Literature Review of Augmented Reality and Virtual Reality Development in Education..... 552**

Jevon Danaristo, Julian Jearsen, Yonathan Faitho, Jurike Moniaga and Bakti Amirul Jabar (Bina Nusantara University, Indonesia)..... 552

**Augmented Reality Assisted Healthy Drinking Water Products Promotion and Literacy: A Development and Evaluation ..... 557**

Athika Dwi Wiji Utami, Trias W Andari, Putra Uji Deva Satrio and Sonhaji Arif (Universitas Nahdlatul Ulama Sidoarjo, Indonesia)..... 557

**A Systematic Review of M-Learning and Entrepreneurship ..... 563**

Agung Purnomo (Bina Nusantara University, Indonesia); Mega Firdaus and Elsa Rosyidah (Universitas Nahdlatul Ulama Sidoarjo, Indonesia); M Meiryani and Fairuz Iqbal Maulana (Bina Nusantara University, Indonesia); Evaristus Didik Madyatmadja (Bina Nusantara University & School of Information Systems, Indonesia) ..... 563

**Improving Education Quality in Cloud Education Environment..... 568**

Kosasih Ali Abu Bakar (Hefei University of Technology & Ministry of Education, Culture, Research, and Technology, Indonesia); Erly Krisnanik and Bambang Saras Yulistiawan (Universitas Pembangunan Nasional Veteran Jakarta, Indonesia); Ren Minglun (Hefei University of Technology, China)..... 568

# Comparison of Multi Layer Perceptron, Random Forest & Logistic Regression on Students Performance Test

1<sup>st</sup> Musthofa Galih Pradana  
Computer Faculty  
UPN Veteran Jakarta  
Jakarta, Indonesia  
[musthofagalihpradana@upnvj.ac.id](mailto:musthofagalihpradana@upnvj.ac.id)

2<sup>nd</sup> Kenneth Palilingan  
Computer Engineering Faculty  
Sam Ratulangi University  
Yogyakarta, Indonesia  
[kennethpalilingan@unsrat.ac.id](mailto:kennethpalilingan@unsrat.ac.id)

3<sup>rd</sup> Yuri Vanli Akay  
Engineering Faculty  
Sam Ratulangi University  
Manado, Indonesia  
[yuriakay@unsrat.ac.id](mailto:yuriakay@unsrat.ac.id)

4<sup>th</sup> Dhina Puspasari Wijaya  
Computer Engineering Faculty  
Alma Ata University  
Yogyakarta, Indonesia  
[dhina.puspa@almaata.ac.id](mailto:dhina.puspa@almaata.ac.id)

5<sup>th</sup> Pujo Hari Saputro  
Engineering Faculty  
Sam Ratulangi University  
Manado, Indonesia  
[pujoharisaputro@unsrat.ac.id](mailto:pujoharisaputro@unsrat.ac.id)

**Abstract**—The test is one thing that can be taken to measure a person's ability to understand a material or a competency. In general, there is a final test taken by students at the school level, before reaching the final test, usually students will take a series of preparatory tests. In reality, of course, not all students can take the test preparation well. therefore of course the school has data related to test preparation. From this test preparation data, a classification technique can be used to classify the data of students who have completed the preparatory test and students who have not completed the preparatory test, so that schools can prepare the best strategy. To assist in classifying data, data classification techniques are needed, in this study the Multi-Layer Perceptron, Random Forest and Simple Logistics algorithms were used. These three methods produce different accuracy when used for the data classification process. For testing the data, scenarios are used using cross-validation. The results of this test scenario show that the Logistic Regression method is superior to the Random Forest and Multi-Layer Perceptron methods with an accuracy of 73.9%. The best Root Mean Square Error results are in the Multi-Layer Perceptron method with the smallest value of 0.363.

**Keywords**—Classification, Multi-Layer Perceptron, Random Forest, Logistic Regression

## I. INTRODUCTION

The test is one thing that can be taken to measure a person's ability to understand the material or a competency. The test produces a numerical value that represents how well a person's understanding is described by the score. In schools, various types of tests are usually carried out to measure students' abilities. With this test, it is hoped that it can describe the abilities and results of understanding related to the material and students' knowledge. Of the many types of tests, schools will usually have a final test that is used as the main measure of student success in learning. Before arriving at the final test, the school will hold a series of tests to prepare students more mature in completing their final test.

A series of tests are held within a certain period and are also carried out in stages and continuously. Of course in preparation, not all students complete the test preparation well. The data of students who take the preparatory test can be done with a classification technique to be able to classify the data of students who have completed the preparatory test and students who have not completed the preparatory test. This test grouping data can be used to prepare the best strategy for the school to achieve better results related to students final test

results. To classify data, it is necessary to apply data mining, namely classification. The classification technique performs data grouping, the data is grouped based on the relationship or data related to the sample data [1].

In this study, the dataset used is a student performance dataset based on several test scores and test preparation scores. The data will be processed using classification techniques, or in other words, the data will be classified using the Multi-Layer Perceptron, Random Forest, and Simple Logistic Classifier algorithms. These three classification methods will be compared with each other and look for the one with the highest accuracy in classifying the data.

The technique used in testing the data in this study is to use cross-validation. Cross-validation is the process of randomly dividing data into several parts. From this test, it will be found how much truth the algorithm has in classifying the data appropriately according to its class. The testing parameters of the three algorithms are the value of precision, recall, and F-Measure

The reason for using these three methods is that there has been no research on the detailed comparison of the three methods that will be tested and compared the results, namely Multi-Layer Perceptron, Random Forest, and Logistic Regression. This is what distinguishes it from previous relevant reference research, in reference research, there is no detailed research that compares these three methods.

## II. STATE OF THE ART

The relevant research referred to is that of Kanish Shah and the team who made comparisons with the classification of texts. The results show that the logistic regression classifier using the TF-IDF vectorizer function achieves the highest accuracy of 97% on the data set. This algorithm has been proven to be the most stable classifier on small data sets [2].

More research from Jaime Lynn Speiser and the team who wrote a comparison of random forest variable selection methods for classification prediction modeling. Comparison of results of available methods for randomly selecting forest variables in the context of classification using 311 data sets freely available online. Preference was given to the method with the lowest out-of-bag error rate, computation time, and several variables [3].

Mohammad Reza Sheykhoumousa wrote a systematic review Support Vector Machine vs. Random Forest for

Remote Sensing Image Classification. The result challenges, recommendations, and Possible directions for future research are also discussed in detail. Additionally, a summary of the results is provided Researchers can tailor their efforts to achieve maximum results Accurate results based on theme application [4].

Random Forest vs Logistic Regression Kasichtten by Kaitlinof Kirasich. The result of each case study 1000 simulations and model performance consistently showed this Statistical False Positive Rate for Random Forest with 100 Trees It is different from logistic regression. In all four cases, logistic regression and Random forest achieved different relative classification scores among different Simulated recording conditions [5].

Random forest for big data classification in the internet of things using optimal features writing by S. K. Lakshmanprabu. The result of research observed by the implementation of the maximum accuracy of the proposed method was 94.2%. Validate the effectiveness of the proposal The method analyzes various key performance indicators and compares them with existing methods [6].

Shalin Savalia published research on Cardiac Arrhythmia Classification by Multi-Layer Perceptron and Convolution Neural Networks. As a result, the accuracy of MLP was 88 the and 83.5% accuracy of CNN. The expected method performance is Decent, but the problem of arrhythmia diagnosis is still not resolved. has many complications The algorithm can efficiently diagnose various cardiovascular diseases with an accuracy of 88.7 [7].

Weibiao Qiao experiments with his research classification using local wavelet acoustic patterns and Multi-Layer Perceptron neural networks. Based on the results obtained, more It classified the sonar data as 1.2891 better than GMDH. Score along with other classifications. Overall, the use of MLP-more A study of the classification of passive sonar targets shows this. This algorithm can be used to classify different high grades A dimensional underwater data sets [8].

Image classification is written by Zhifei Lai using the method Multi-Layer Perceptron. We base our model on neural networks and merge the different feature groups obtained in the first and second steps. we rate them The approach proposed for his two benchmark medical image datasets of HIS2828 and ISIC2017. achieve global classification with 90.1% and 90.2% higher accuracy than currently successful methods [9].

Method Multi-Layer Perceptron was also used by M. Khishe with object sonar dataset classification. Used a sonar dataset and compared the results obtained using PSO, ACO, ES, and GA benchmark algorithms. The result is, SFS with a simple structure and powerful search ability In the utilization phase, it can bring better results. Convergence speed, confinement to local minima, and classification accuracy Compared with benchmark algorithms [10].

Adhien Kenya published research also about comparison logistic regression. The result shows that the k-means clustering model results (22%) are much lower than the logistic regression model results (91%) [11].

Method logistic regression for prediction customer churn written by Arno De Caigny. LLM provides more accurate results, as evidenced by this customer benchmark study. Models using LR and DT building blocks as standalone [12].

Implementation logistic regression in papers Fadi Thabtah machine learning autism classification. The results obtained show that the machine learning technique was able to generate an acceptable classification system. Above all performance in terms of sensitivity, specificity, and accuracy [13].

Abrar Ahmed research about logistic regression for Scene Classification. Using the proposed system object segmentation. The problem was investigated using two robust algorithms, MFCS and MSS. Also, object similarity was studied by multiple kernel learning. We used logistic regression to classify complex scenes. Experimental evaluation shows that the proposed system consistently outperforms other state-of-the-art systems A system of calculations, divisions, and precision [14].

### III. METODOLOGY

#### A. Research Stage

The stage of this research start from collecting data, the data has been classified using 3 different methods, and the result the is accuracy of each method, the accuracy results will be compared and the best accuracy from the three methods. The testing parameters of the three algorithms are the value of precision, recall, and F-Measure. Details are shown in **Error! Reference source not found.**

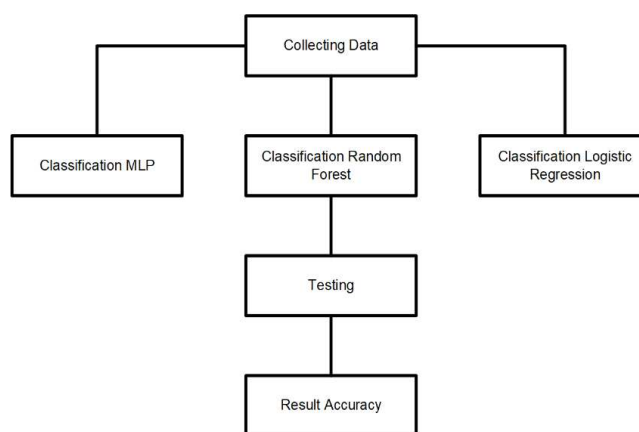


Fig. 1. Research Stage

#### B. Random Forest

A random forest is a combination of all good trees combis ined into a model. A random forest relies on random vector values that have the same distribution in all trees, and each decision tree has maximum depth. A random forest consists of trees  $\{h(x, k), k = 1..[15]$ .

#### C. Multi-Layer Perceptron

Multilayer Neural Networks, also known as Multilayer Perceptron. It is a further development of the single-layer perceptron. to learn. Using a delta algorithm called Error Backpropagation Training Algorithm, input arguments are compared forward during the process. Uses learning in addition to forward propagation Backpropagation. If the result does not match the target, the weight. It is updated during the learning cycle process until the error value is reached. Expected minimum or output equals target. [1]

#### D. Logistic Regression

Logistic regression is a technique used to describe the relationship between input and output variables. Input



variables are considered independent variables and output variables are called dependent variables. A dependent variable can only take on a fixed set of values. These values correspond to problem classification classes.

The goal is to identify the relationship between independent and dependent variables by estimating probabilities using the logistic function. A logistic function is a sigmoid curve used to construct functions with various parameters. This is closely related to general linear model analysis, which tries to fit a line to as many points as possible to minimize error. [15]

IV. RESULT

A. Data Preparation

The data used in this study such as test preparation data which contains completed and none completed means that you have taken the preparatory exam, if none means that you have not taken the preparation test, as well as test scores for each subject such as math score, writing score and The detailed reading score is shown in **Error! Reference source not found.**

	test preparation course	math score	writing score	reading score
0	none	72	74	72
1	completed	69	88	90
2	none	90	93	95
3	none	47	44	57
4	none	76	75	78
...	...	...	...	...
995	completed	88	95	99
996	none	62	55	55
997	completed	59	65	71
998	completed	68	77	78
999	none	77	86	86

[1000 rows x 4 columns]

Fig. 2. Datasets

B. Multi-Layer Perceptron

Classification using the Multi-Layer perceptron method, testing using cross-validation technique. The results of the classification test using a multi-layer perceptron are shown in **Error! Reference source not found.**

TABLE I. CLASSIFICATION RESULT MLP

No	K-Fold	Accurate	Precision	Recall	F-Measure
1	10	66,9	0,788	0,788	0,754
2	15	64,7	0,718	0,741	0,730
3	20	65,2	0,716	0,759	0,737
4	25	66,2	0,721	0,773	0,746

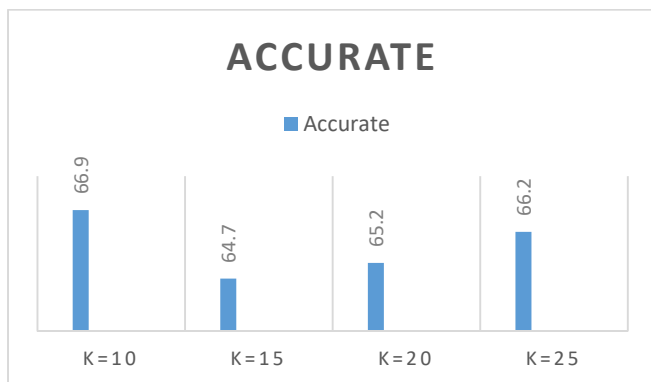


Fig. 3. Chart Accuracy MLP

The best accuracy in the Multi-Layer Perceptron method is at k-fold 10, with an accuracy of 66.9. Apart from the accuracy data, the next data from the Root Mean Square Error is shown in **Error! Reference source not found.**

TABLE II. RMSE RESULT MLP

No	K-Fold	Root Mean Square Error
1	10	0,496
2	15	0,363
3	20	0,514
4	25	0,506

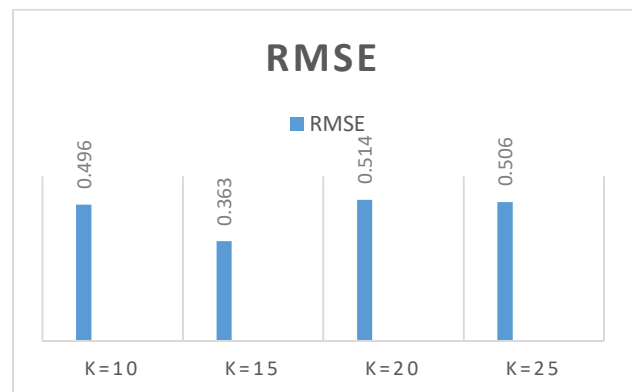


Fig. 4. Chart RMSE MLP

Root Mean Square Error value, the best value is at k-fold 15 with a value of 0.363.

C. Random Forest

Classification using the random forest method, testing using a cross validation technique. The results of the classification test using a random forest are shown in **Error! Reference source not found.**

TABLE III. CLASSIFICATION RESULT RANDOM FOREST

No	K-Fold	Accurate	Precision	Recall	F-Measure
1	10	65,3	0,696	0,815	0,751
2	15	65,8	0,701	0,816	0,754
3	20	64,8	0,640	0,808	0,747
4	25	65,8	0,699	0,819	0,755

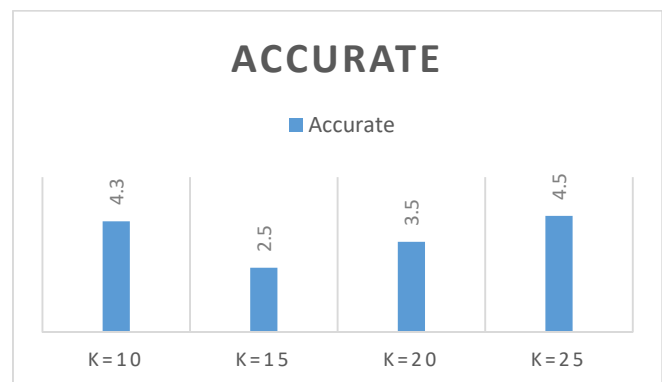


Fig. 5. Chart Accuracy Random Forest

The best accuracy in the Random Forest method is at k-fold 15 and k-fold 25, with an accuracy of 65.8. Apart from the accuracy data, the next data from the Root Mean Square Error is shown in **Error! Reference source not found.**

TABLE IV. RMSE RESULT RANDOM FOREST

No	K-Fold	Root Mean Square Error
1	10	0,470
2	15	0,470
3	20	0,472
4	25	0,467

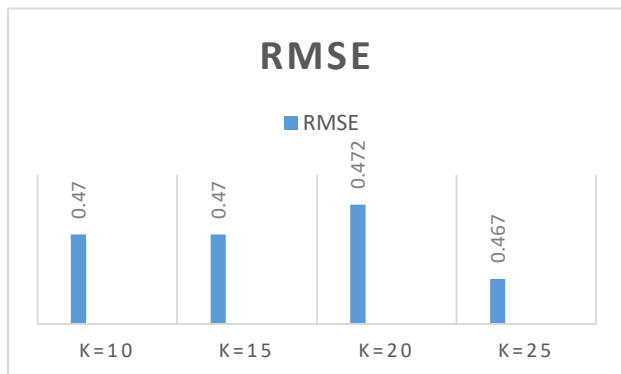


Fig. 6. Chart RMSE Random Forest

Root Mean Square Error value, the best value is at k-fold 25 with a value of 0.467.

#### D. Logistic Regression

Classification using logistic regression method, testing using cross validation technique. The results of the classification test using a random forest are shown in **Error! Reference source not found.**

TABLE V. CLASSIFICATION RESULT LOGISTIC REGRESSION

No	K-Fold	Accurate	Precision	Recall	F-Measure
1	10	73,6	0,757	0,868	0,808
2	15	73,9	0,758	0,872	0,811
3	20	72,9	0,753	0,860	0,803
4	25	72,8	0,752	0,860	0,802

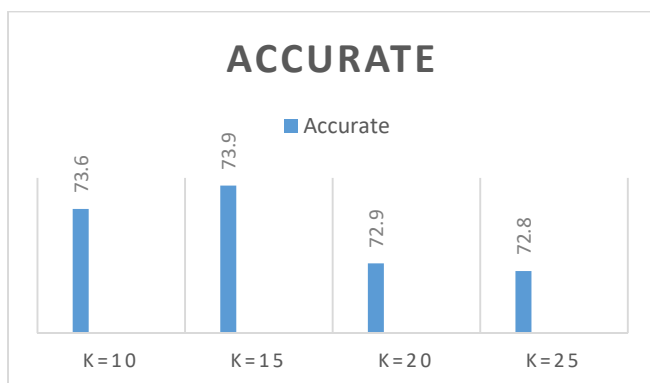


Fig. 7. Chart Accuracy Logistic Regression

The best accuracy in the Logistic Regression method is at k-fold 15, with an accuracy of 73.9. Apart from the accuracy data, the next data from the Root Mean Square Error is shown in **Error! Reference source not found.**

TABLE VI. RMSE RESULT LOGISTIC REGRESSION

No	K-Fold	Root Mean Square Error
1	10	0,417
2	15	0,418
3	20	0,417
4	25	0,417

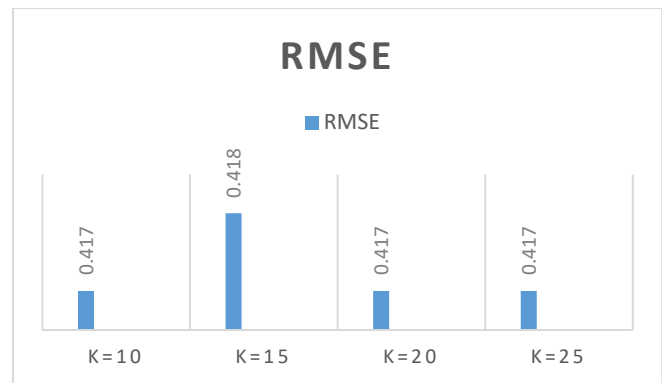


Fig. 8. Chart RMSE Logistic Regression

Root Mean Square Error value, the best value is k-fold 10, 20 and 25 with a value of 0.418.

#### E. Comparison

Based on the testing of each algorithm, be compared between the three methods used in classifying the algorithm that has the highest accuracy is logistic regression with an accuracy of K=15 of 73.9%. This shows that with not too many datasets with a data range of 1000 data, the classification method with logistic regression is more effective, because many at least can affect the accuracy of results. While the smallest RMSE value is an anomaly that occurred in the study. The details of the comparison of each accuracy result along with the best RMSE result or the smallest value in the multilayer perceptron method with a value of 0.363. This anomaly could have happened in the research conducted by Candra Dewi writing the comparison of neural network and ANFIS, the result is that the smaller RMSE value does not necessarily indicate a higher level of accuracy [16]. The result of the three methods is shown in **Error! Reference source not found.**

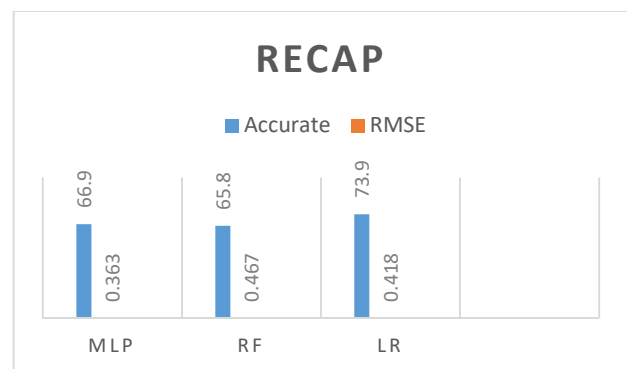


Fig. 9. Result

The results obtained are that the logistic regression value with better accuracy is due to the longer classification process compared to the other 2 methods, with a longer iteration process. Logistic Regression takes 10 ms, Multilayer perceptron 5 ms, and random forest 2 ms.

#### V. CONCLUSION

The conclusion that can be drawn from the research that has been done is, the best accuracy between the three methods is the logistic regression method with an accuracy of 73.9% followed by the multi-layer perceptron method with an accuracy of 66.9% and finally the random forest method with

an accuracy of 65.8%. While the root means square error value states that the best value is found in the multi-layer perceptron method with the smallest error value compared to the others of 0.363, the result of RMSE is an anomaly.

## REFERENCES

- [1] V. Kale, *Enterprise Performance Intelligence and Decision Patterns*. CRC Press, 2018.
- [2] K. Shah, H. Patel, D. Sanghvi, and M. Shah, "A Comparative Analysis of Logistic Regression, Random Forest and KNN Models for the Text Classification," *Augment. Hum. Res.*, vol. 5, no. 1, 2020, doi: 10.1007/s41133-020-00032-0.
- [3] J. L. Speiser, M. E. Miller, J. Tooze, and E. Ip, "A comparison of random forest variable selection methods for classification prediction modeling," *Expert Syst. Appl.*, vol. 134, pp. 93–101, 2019, doi: 10.1016/j.eswa.2019.05.028.
- [4] M. R. Mosavi, M. Khishe, M. J. Naseri, G. R. Parvizi, and M. Ayat, "Multi-layer perceptron neural network utilizing adaptive best-mass gravitational search algorithm to classify sonar dataset," *Arch. Acoust.*, vol. 44, no. 1, pp. 137–151, 2019, doi: 10.24425/aoa.2019.126360.
- [5] K. ; Kirasich, T. ; Smith, and B. Sadler, "Random Forest vs Logistic Regression: Binary Classification for Heterogeneous Datasets," *SMU Data Sci. Rev.*, vol. 1, no. 3, p. 9, 2018, [Online]. Available: <https://scholar.smu.edu/datasciencereview> Available at: <https://scholar.smu.edu/datasciencereview/vol1/iss3/9http://digitalrepository.smu.edu>.
- [6] S. K. Lakshmanaprabu, K. Shankar, M. Ilayaraja, A. W. Nasir, V. Vijayakumar, and N. Chilamkurti, "Random forest for big data classification in the internet of things using optimal features," *Int. J. Mach. Learn. Cybern.*, vol. 10, no. 10, pp. 2609–2618, 2019, doi: 10.1007/s13042-018-00916-z.
- [7] S. Savalia and V. Emamian, "Cardiac arrhythmia classification by multi-layer perceptron and convolution neural networks," *Bioengineering*, vol. 5, no. 2, 2018, doi: 10.3390/bioengineering5020035.
- [8] W. Qiao, M. Khishe, and S. Ravakhah, "Underwater targets classification using local wavelet acoustic pattern and Multi-Layer Perceptron neural network optimized by modified Whale Optimization Algorithm," *Ocean Eng.*, vol. 219, no. June 2020, p. 108415, 2021, doi: 10.1016/j.oceaneng.2020.108415.
- [9] Z. Lai and H. Deng, "Medical image classification based on deep features extracted by deep model and statistic feature fusion with multilayer perceptron," *Comput. Intell. Neurosci.*, vol. 2018, 2018, doi: 10.1155/2018/2061516.
- [10] M. Khishe, M. R. Mosavi, and A. Moridi, "Chaotic fractal walk trainer for sonar data set classification using multi-layer perceptron neural network and its hardware implementation," *Appl. Acoust.*, vol. 137, no. July 2017, pp. 121–139, 2018, doi: 10.1016/j.apacoust.2018.03.012.
- [11] A. Estetikha, D. H. Gutama, and M. G. Pradana, "Comparison of K-Means Clustering & Logistic Regression on University data to differentiate between Public and Private University," *Int. J. Informatics Inf. Syst.*, vol. 4, no. 1, pp. 21–29, 2021.
- [12] A. De Caigny, K. Coussement, and K. W. De Bock, "A new hybrid classification algorithm for customer churn prediction based on logistic regression and decision trees," *Eur. J. Oper. Res.*, vol. 269, no. 2, pp. 760–772, 2018, doi: 10.1016/j.ejor.2018.02.009.
- [13] F. Thabtah, N. Abdelhamid, and D. Peebles, "A machine learning autism classification based on logistic regression analysis," *Heal. Inf. Sci. Syst.*, vol. 7, no. 1, pp. 1–11, 2019, doi: 10.1007/s13755-019-0073-5.
- [14] A. Ahmed, A. Jalal, and K. Kim, "A novel statistical method for scene classification based on multi-object categorization and logistic regression," *Sensors (Switzerland)*, vol. 20, no. 14, pp. 1–20, 2020, doi: 10.3390/s20143871.
- [15] V. Kale, "Enterprise performance intelligence and decision patterns," *Enterp. Perform. Intell. Decis. Patterns*, pp. 1–262, 2017, doi: 10.4324/9781351228428.
- [16] C. Dewi and M. Muslikh, "Perbandingan Akurasi Backpropagation Neural Network dan ANFIS Untuk Memprediksi Cuaca," *J. Sci. Model. Comput.*, vol. 1, no. 1, pp. 7–13, 2013, [Online]. Available: <https://natural-a.uab.ac.id/index.php/natural-a/article/view/96>.