

THE 2023 IEEE INTERNATIONAL CONFERENCE OF COMPUTER SCIENCE
AND INFORMATION TECHNOLOGY (ICOSNIKOM)

BOOK OF PROCEEDING
ICOSNIKOM
2023

**The Role Of Artificial Intelligence Technology In Human And
Computer Interactions In The Industrial Era 5.0**

SPONSOR



HOST :



STMIK KAPUTAMA



APTIKOM

CO HOST :



The 7th International Conference of SNIKOM 2023 (Hybrid) (ICoSNIKOM 2023) took place Sinabung Hills Berastagi, Jl. Kolam Renang, Gundangling I, Kec. Berastagi, Kab. Karo, North Sumatera, Indonesia (Hybrid) at November 10th, 2023

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CONFERENCE INFORMATION

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The 7th 2023 International Conference of Computer Science and Information Technology (ICoSNIKOM)

Binjai, Indonesia, November 10-11, 2023

CONFERENCE PROGRAM

Time	Program
Friday, November 10th, 2023	
07.30-08.00	Registration and preparation
08.00-08.05	Opening by MC Zoom Link: https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
08.05-08.15	Opening ceremony Traditional dance performance from STMIK Kaputama
08.15-08.20	National Anthem "Indonesia Raya"
08.20-08.25	5' Opening speech from the Representative of ICOSNIKOM 2023 (Dr. Akim MH Pardede, ST., M.Kom)
08.25-08.30	5' Prof. Poltak Sihombing, M.Kom., Ph.D, Head of Aptikom North Sumatra
08.30-08.35	5' Prof. Dr. Ir. Ford Lumban Gaol, S.Si., M.Kom IEEE Computer Society Coordinator (Indonesia)
08.35-08.40	5' Welcoming speech from the Head of STMIK Kaputama (Dr. Relita Buaton, ST., M.Kom)
08.40-08.50	5' Dr. Parlindungan Purba, SH., MM, Foundation of YPTIM
08.50-09.20	30' Keynote Speaker I – Dr. Aaron Loh, MSc, PhD (University of Thailand)
09.20-09.50	30' Keynote Speaker II – Prof. Dr. Putra Sumari (Universiti Sains Malaysia)
09.50-10.20	20' Keynote Speaker III – Prof. Dr. rar.net Achmad Benny Mutiara (Universitas Guna Darma)
10.20-10.45	15' Question and Answer
10.45-10.55	10' Invite Speaker I – Prof. Dr. Syahril Efendi, S.Si, M.IT (Universitas Sumatera Utara)
10.55-11.05	10' Invite Speaker II – Prof. Dr. Hailiza Kamarulhaili (Universiti Sains Malaysia)
11-05-11.15	10' Invite Speaker III – Dr. Humuntal Rumapea (Universitas Methodist Indonesia)
11.15-11.25	10' Invite Speaker IV – Dr. Dedy Hartama (STIKOM Tunas Bangsa)
11.25-12.00	Photo session and Closing

Time	Program					
12.00 -14.00	ISHOMA					
14.00-16.00	Parallel Session I					
	Parallel 1	Parallel 2	Parallel 3	Parallel 4	Parallel 5	Parallel 6
16.00-16.30	Closing, Memento Presentation and Best Paper Announcemnet					
APTIKOM SUMUT Meeting						
18.00-19.00	Registration and preparation					
19:00-19.10	Opening Ceremony					
19.10-19.15	Indonesia Raya + Mars Aptikom					
19.15-19.35	Opening and Annual Report from Regional Head of Aptikom (Prof. Poltak Sihombing, M.Kom., Ph.D,)					
19.35-19.45	MoU Signing-Memento Presentation-Photo Session					
19.45-20.00	Speech - Prof. Dr. rar.net Achmad Benny Mutiara (Center Head of Aptikom)					
20.00-21.30	Meeting of APTIKOM SUMUT					
21.30-21.40	Closing					
Saturday, November 11st, 2023 : Hiking to Taman Nasional Gunung Leuser						
07.30-08.30	Guest pick up to hotel					
08.30-12.30	Visit to Taman Lumbini and Fruit Market Brastagi					

THE 2023 IEEE International Conference of Computer Science and Information Technology (ICOSNIKOM)

PARALLEL SESSION

Friday, 10th November 2023

Parallel Session I: 14.00-16.00 (GMT+7)

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	Jamaluddin, S.Kom., M.Kom	2	Verdi Yasin, Ifan Junaedi, Anton Zulkarnain Sianipar, Ito Riris Immasari, Teri Mengkasrinal and Johan Johan	Intelligent System Concept of Integrated Education History in Single Identity Number Using Grid-Based Model (GBM)	Artificial Intelligence (AI)/ 10 minutes	Room I https://zoom.us/j/93232011049?pwd=ZzZYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
2		6	Khairul Umam Syaliman, Adli Abdillah Nababan, Miftahul Jannah, Arif Hamied Nababan, Ryan Dhika Priyatna and Erwin Panggabean	Latin Hypercube Sampling Approach to Improve K-Nearest Neighbors Performance on Imbalanced Data	Artificial Intelligence (AI)/ 10 minutes	
3		9	Sayuti Rahman, Dodi Siregar, Rahmad B.Y Syah, Heri Setiawan, Asep Erlan Maulana and Hamsiah Hamsiah	The Effective Breast Cancer Classification with the Random Forest Algorithm	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
4	Jamaluddin, S.Kom., M.Kom	11	M Miftakul Amin and Yevi Dwitayanti	Additive Ratio Assessment Model for Lecturer Performance Evaluation	Artificial Intelligence (AI)/ 10 minutes	Room I https://zoom.us/j/93232011049?pwd=zZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
5		32	Paska Marto Hasugian, Herman Mawengkang, Poltak Sihombing and Syahril Efendi	Review of High-Dimensional and Complex Data Visualization	Artificial Intelligence (AI)/ 10 minutes	
6		34	Andre Hasudungan Lubis, Rizki Muliono, Muhammad Khahfi Zuhanda and Desca Winta Harefa	The Impact of k-means on Association Rules Mining Algorithms Performance	Artificial Intelligence (AI)/ 10 minutes	
7		35	Muhammad Khahfi Zuhanda, Andre Hasudungan Lubis and Rahmad Syah	Bibliometric Analysis of Model Vehicle Routing Problem in Logistics Delivery: Trends, Country Contributions, and Recent Topics	Artificial Intelligence (AI)/ 10 minutes	
8		43	Anindya Ananda Hapsari and Devan Junesco Vresdian	Development of a Face Mask Type Detection with Multiclass Classification using Artificial Intelligence on Python	Artificial Intelligence (AI)/ 10 minutes)	
9		47	Erwin Halim, I Gusti Agung Ayu Agniera and Agus Putranto	Local Perceptions Towards Foreigners Digital Nomads in Bali	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
10		48	Ramadani Ramadani, B.Herawan Hayadi and Hartono Hartono	Comparative Analysis Of Algorithms Naive Bayes And C45 For Student Satisfaction With Administrative Services	Artificial Intelligence (AI)/ 10 minutes	Room 1 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
11		50	Faustina Odeta, Patrick Darien Augusto, Kezia Gloria Lie, Anderes Gui, Muhammad Shabir Shaharudin and Yuvaraj Ganesan	Analysis of Factors That Affect Users of Quick Response Indonesia Standard	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	Indra Hartarto Tambunan , ST., M.S.,Ph.D	53	Rahmadani Siregar, Hartono Hartono and Roslina Roslina	Determination of C4.5 algorithm performance based on training data and testing data in determining diseases in rice plants (case study: lubuk barumun district agriculture office padang lawas district)	Artificial Intelligence (AI)/ 10 minutes	Room 2 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
2		56	Rima Tamara Aldisa, Adian Fatchur Rochim and Agung Triayudi	Improving Student Learning Performance Prediction: A Systematic Literature Review of Machine Learning-Based Classification Methods	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
3	Indra Hartarto Tambunan, ST., M.S.,Ph. D	59	Maryam Alizadeh Zarei, Farahnaz Hosseini, Ali Mohammad Nickfarjam and Ting Xiao	Predicting User Interest using Hierarchical-based Clustering for Recommender Systems	Artificial Intelligence (AI)/ 10 minutes	Room 2 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
4		63	Prana Ugiana Gio, Herman Mawengkang, Muhammad Zarlis and Saib Suwilo	Generalized Lambda Distribution: Application on Financial Performance Data in The Indonesia Stock Exchange	Artificial Intelligence (AI)/ 10 minutes	
5		65	Mhd Jaka Prima Dona, Yudi Fernando, Ridho Ikhsan, Ika Sari Wahyuni-Td, Erick Fernando and Hartiwi Prabowo	Features, Conformance and Perceived Product Quality: A Social Security Mobile Apps	Artificial Intelligence (AI)/ 10 minutes	
6		66	Yulia Andini, Yudi Fernando, Ridho Ikhsan, Ika Sari Wahyuni-Td, Erick Fernando and Hartiwi Prabowo	A Study of an Indonesian Social Security Mobile Apps: E-Service Quality, Digital Features, and Customer Digital Satisfaction	Artificial Intelligence (AI)/ 10 minutes	
7		70	Maradona Jonas Simanullang, Dr. Hartono and Dr. Roslina	Combination of SOM, SVR, and LMKNN for Stock Price Prediction	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
8	Indra Hartarto Tambunan, ST., M.S., Ph.D	71	Sudianto Sudianto, Muhammad Rahaji Jhaerol, Muhamad Azrino Gustalika and Alon Jala Tirta Segara	Pre-Trained BERT Architecture Analysis for Indonesian Question Answer Model	Artificial Intelligence (AI)/ 10 minutes	Room 2 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
9		72	Muh Rizal H, Mochamad Hariadi and Yunifa Miftachul Arif	Multi-Criteria Decision Support System for Flood Alert Classification in Smart City	Artificial Intelligence (AI)/ 10 minutes	
10		78	Muhammad Syahputra Novelan, Syahril Efendi, Poltak Sihombing and Herman Mawengkang	Optimization Cavacity Vehicle Routing Problem with K- Nearest Neighbor in Classification of Goods Ditribution Route	Artificial Intelligence (AI)/ 10 minutes	
11		108	Arjon Turnip, Mardi Turnip, Ani Dijah Rahajoe and Alvito Dwinovan Wibowo	Brain Drug Effect Detection on Impulsivity with Ensemble Bagged Trees Method	Artificial Intelligence (AI)/ 10 minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	Albert Sagala, S.T, M.T	81	Tenia Wahyuningrum, Novian Adi Prasetyo, Gita Fadila Fitriana, Dimas Fanny Hebrasianto Permadi, Indah Puspitasari and Maulana Al Fatoni	Modified Agile User Experience for Developing Student Medical Report	Artificial Intelligence (AI)/ 10 minutes	Room 3 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
2		82	Humasak Tommy Argo Simanjuntak, Heppy Maria Simanungkalit, Evola R. A. Tampubolon and Tri Dessy Natalia	Patients Clustering on BPJS Health Insurance Data Using Partition Clustering Algorithm	Artificial Intelligence (AI)/ 10 minutes	
3		83	Dendy Rosman, Trias Putranto and Ichwan Masnadi	Examining Customers' Attitude and Behavioural Intention Toward Drone Food Delivery	Artificial Intelligence (AI)/ 10 minutes	
4		84	Trie Maya Kadarina, Basari Basari and Dadang Gunawan	ML-Based Interpretation of Cardiotocography Data: Current State and Future Research	Artificial Intelligence (AI)/ 10 minutes	
5		85	Muhammad Zarlis, Tanty Oktavia, Ferda Ernawan and Relita Buaton	Minimizing the Number of Stunting Prevalence Using the Euclid Algorithm Clustering Approach	Artificial Intelligence (AI)/ 10 minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
6	Albert Sagala, S.T, M.T	87	Jeprin Talunohi, Zulfikar Sembiring, Nurul Khairina, Nanda Novita, Yuan Anisa and Rizki Muliono	Analysis of the Dijkstra Algorithm in Determining The Shortest Route to Tour the Beaches of Nias Island	Artificial Intelligence (AI)/ 10 minutes	Room 3 https://zoom.us/j/93232011049?pwd=ZzZY SXJBa3MzQlhy ckrZVNDMXh EZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
7		95	Kevin Trikusuma Dewo, Verdi Yasin, Thomas Budiman, Anton Zulkarnain Sianipar and Akmal Budi Yulianto	IT Infrastructure Dashboard Monitoring Application Development Using Grafana And Prometheus, a Case Study at Astra Polytechnic School	Artificial Intelligence (AI)/ 10 minutes	
8		100	Naikson Fandier Saragih, Hanifullah Hafidz Arrizal, Marzuki Sinambela, Yolanda Yulianti Pratiwi, Indra Kelana Jaya and Indra M Sarkis	Clustering Earthquakes in West Java Using Machine Learning Algorithm	Artificial Intelligence (AI)/ 10 minutes	
9		104	Riahna Naftali Situmeang, Jamaluddin Jamaluddin, Eviyanti Novita Purba and Eva Julia Gunawati Harianja	Designing Chatbot About Tourism Recommendations In North Sumatra	Artificial Intelligence (AI)/ 10 minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
10	Albert Sagala, S.T, M.T	105	Sabarish Raja Ramesh Raja, Sudarson B and Vasigaran K	Analyzing the computational efficiency of LLM models for NLP classification of tweets during emergency-crisis	Artificial Intelligence (AI)/ 10 minutes	Room 3 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
11		107	Arjon Turnip and Mardi Turnip	PPG Signal-Based Blood Pressure Classification With Ensemble Bagged Trees Method	Artificial Intelligence (AI)/ 10 minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	Dodi Siregar, M.Kom	28	Manisha Gedam and Swapnili Karmore	A lightweight blockchain framework for secure and efficient IoT data management	Machine learning/ 10 Minutes	Room 4 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
2		29	Albert Sagala, Deni Lumbantoruan and Ramot Lubis	RSSI Fingerprinting using Machine Learning for Position Estimation	Machine learning/ 10 Minutes	
3		30	Deni Lumbantoruan and Christine Sibarani	Red Chili Leaf Disease Identification via GLCM and SVM Analysis	Machine learning/ 10 Minutes	
4		31	Marwah Ghoben and Lamia Muhammed	Exploring the Impact of Image Quality on Convolutional Neural Networks: A Study on Noise, Blur, and Contrast.	Machine learning/ 10 Minutes	
5		38	Rahmad Syuhada and Muhathir Muhathir	VGG Deep Learning Architecture Analysis for Classification of Mushroom Types	Machine learning/ 10 Minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
6	Dodi Siregar, M.Kom	61	Hadi Prayitno, Eko Hariadi and Mochamad Cholik	Impact of Flight Simulator Training on Enhancing Situational Awareness among Aviation Vocational Education Cadets	Machine learning/ 10 Minutes	Room 4 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
7		86	Parmonangan R. Togatorop, Andika Meidy Fransius Tarigan, Agnes Hinsa Parina Sinaga and Ester Putri Dearest Sidabutar	Using Deep Learning and Word Embedding to Detect Clickbait in Indonesian Headline News	Machine learning/ 10 Minutes	
8		88	Alexander Hernandez, Randolph Sacdalan, Al Jason Gallardo, Ramil Allen Casagan and Maria Corazon Adriano	Determinants of Green Supply Chain Mangement in Small and Medium Enterprises in the Philippines: the role of Information Systems	Machine learning/ 10 Minutes	
9		90	Alexander Hernandez and Erlito Albina	Exploring Tourism and Hospitality Management Students Perception towards the Use of Generative Language Models in Service Organizations: the Case of ChatGPT	Machine learning/ 10 Minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
10	Dodi Siregar, M.Kom	91	Humuntal Rumapea, Marzuki Sinambela, Indra Kelana Jaya and Indra M Sarkis	Prediction of Rainfall in North Sumatera Using Machine Learning	Machine learning/ 10 Minutes	Room 4 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
11		103	Fahmi Fahmi, Wervyan Shalannanda, Muhammad Yazid and Erwin Sutanto	Initial Design of Wearable EEG Device for Epilepsy Patient Using Machine Learning and Mobile Application	Machine learning/ 10 Minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	Dr. Arnes Sembiring, M.Kom	8	Yowen Yowen, Jude Joseph Martinez and Ardimas Andi Purwita	Secure Mobile Facial Recognition Attendance System with Edge Computing: A Comparative Study of Face Recognition Models for Android Application Integration	Computing/ 10 minutes	Room 5 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
2		10	Istas Pratomo Manalu, Sari Muthia Silalahi, Gerry Italiano Wowiling, Marojahan Mula Timbul Sigiro, Rio Putrawan Zalukhu and Putri Kezia Nababan	Lora Communication Design and Performance Test (case study : Air Quality Monitoring System)	Computing/ 10 minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
3	Dr. Arnes Sembiring, M.Kom	39	Immanuel Maurice Darmawan Sitanggang, Damanik Joy Andrew Immanuel, Fajar Sam Hutabarat, Albert Sagala and Guntur Petrus Boy Knight	Website Monitoring For Disaster Victim Search and Rescue	Computing/ 10 minutes	Room 5 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
4		42	Cherindranath Reddy, Satyesh Das, Surya Narayana Murthy Babu Batchu and Gurram Venkata Yaswanth	Boosting Power Grid Efficiency: Meta-RL Approaches	Computing/ 10 minutes	
5		62	Muhamad Raffi and Erwin Halim	Recycling Application Usability Testing Using the Nielsen Attributes of Usability (NAU)	Computing/ 10 minutes	
6		73	Nadun Senarathna, Sachini Somathilaka, Udayanga Hemapala and Wijekoon Banda	Mitigating Intermittency in Solar Power Plants through Integrated Storage An Analysis of its Applicability to the Sri Lankan Power System	Computing/ 10 minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
7	Dr. Arnes Sembiring, M.Kom	76	Muhammad Aidiel Rachman Putra, Tohari Ahmad, Royyana Muslim Ijtihadie and Dandy Pramana Hostiadi	Detecting Botnet Spam Activity by Analyzing Network Traffic Using Two-stack Decision Tree Algorithms	Computing/ 10 minutes	Room 5 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
8		92	Roslina Roslina, Purwa Hasan Putra, Jasni Bt Mohamad Zain and Saiful Farik Mat Yatin	Design of SMART System for Controlling Ornamental Fish Farming Development Based on Internet of Things	Computing/ 10 minutes	
9		101	Fadli Sirait, Mulyono Mulyono, Akhmad Wahyu Dani, Arif Marsal and Muhammad Ainur Rofiq	An Energy-Aware Zone Routing Protocol Scheme Utilizing LSTM-RNN for 5G Wireless Backhaul Network	Computing/ 10 minutes	
10		106	Poltak Sihombing, Aya Shofia, Putra Sumari, Syahriell Efendi, Arjon Turnip and Yudi Muchtar	Smart Home Design Based on IoT and Context Aware Model (ICAM)	Computing/ 10 minutes	
11		99	Akim Manaor Hara Pardede and Muammar Khadapi	A Smart Public Service Optimization Model Using Linear Programming to Reduce the Number of Deaths	Computing/ 10 minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	<p>Indah Ambarita, SE., M.Si</p>	57	Bidru C.Enkomaryam, Igor A.Bessmertny and Adane L.Mamuye	Determining the Critical Factors of Antenatal Care Follow-Up Using Two-Phase Machine Learning	Machine learning/ 10 Minutes	<p>Room 6 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7</p>
2		109	Erwin Sitompul, Arjon Turnip and Mardi Turnip	Enhancing Comfort and Handling in Semi-Active Suspension Systems with Fuzzy Controller	Computer Vision 10 Minutes	
3		22	Jonson Manurung, Poltak Sihombing, Mohammad Andri Budiman and Sawaluddin Sawaluddin	Dynamic Rumor Control in Social Networks using Temporal Graph Neural Networks	Computer Vision 10 Minutes	
4		36	Saketh Kilaru, Anushka Shah and Swoichha Adhikari	Enhancing Classification in UTD-MHAD Dataset: Utilizing Recurrent Neural Networks in Ensemble-Based Approach for Human Action Recognition	Computer Vision 10 Minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
5		40	Muhlis Tahir, Abdul Azis Jakfar, Dian Budi Elnursa and Rio Meisya Resnanda	Performance Evaluation of Pre- trained Convolutional Neural Network and Transfer Learning for Classification of Spices and Herbal Medicines in Madura	Computer Vision 10 Minutes	<p>Room 6</p> <p>https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09</p> <p>ID Rapat: 932 3201 1049</p> <p>Kode Sandi: icosnikom7</p>
6		46	Decwind Skylar Susanto, Erwin Halim, Antonius Deni Paul Lega, Nelly Nelly and Yuliana Lisanti	The Impact of Online Course Design, Enjoyment, Usefulness, Ease of Use, and Interaction to Video-Based Learning System Usage	Computer Vision 10 Minutes	
7	Indah Ambarita, SE., M.Si	49	Shikha Yadav and Jeevan Bala	Convolutional Autoencoders- Based Image Watermarking Techniques	Computer Vision 10 Minutes	
8		52	Shyam Shanckin, Mayank, Anshuman Singh and Rahul Patwadi	Unveiling Latent Spaces with Variational Autoencoders	Computer Vision 10 Minutes	
9		75	Mochamad Ravy Raspati and Sudianto Sudianto	Analysis of Roasting Maturity Detection of Coffee Beans based on Image using YOLOv4	Computer Vision 10 Minutes	

NO	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
10	Indah Ambarita, SE., M.Si	44	Benny Hutagaol, Mohammad Andri Budiman and Herman Mawengkang	Hybrid Cryptosystems MRC-4 algorithm and RSA Dual Modulus to secure data	Security 10 minutes	Room 6 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
11		60	Taupan Syah Putra, Mohammad Andri Budiman and Saib Suwilo	Signcryption Techniques For Digital File Security Using The RSA Multi-Factor Algorithm And The Esign Algorithm	Security 10 minutes	
12		55	Muammar Khadapi, A M H Pardede, Novriyenni	Providing Recommendations to New ILMCI Edu Voucher Customers Using the Market Basket Analyst Algorithm	Data Mining 10 Minutes	

Conference Technical Instruction

1. The 2023 IEEE International Conference of Computer Science and Information Technology (ICOSNIKOM) will be held on 10-11 November. The conference will take place for one day on 10th November 2023
2. On the conference day, there will only be 1 parallel sessions which will start at 08.00 WIB. Please check the time difference (on your part) so that you won't miss the conference.
3. Participants can mute and unmute audio if needed, as well as turn on video during the activity.
4. Participants who want to ask questions to the keynote speakers in the plenary session can write questions via the question link or through the chat room.
5. The plenary session attendance link will be shared via Zoom chat column towards the end of the plenary session.
6. The attendance link to get e-certificate will be sent via chat column during the parallel session.
7. During break time, participants are allowed to leave the zoom meeting room.
8. After break time, participants enter the zoom link according to the parallel session schedule in this guidebook.
9. Participants are requested to enter the parallel session room at least 5 minutes before the schedule.
10. Non-presenting participants can enter a parallel session according to the field of interest.
11. The committee has the right to disable participants from the conference sessions if they violate the rules that have been determined.

Parallel Technical Instruction

1. Parallel sessions will be led by one or two moderator(s) in each room. Moderators may come from the participants for the parallel session. Parallel sessions will be attended by speakers and non-presenters.
2. Each presenter is given 10 minutes (5 minutes for paper presentation and 5 minutes for question-and-answer session).
3. Kindly submit your presentation on November 5th, 2023 (latest submission).
Link to submit your powerpoint presentation:
<https://bit.ly/ICOSNIKOM2023-FileSubmission>
4. For online presentation session, please download your conference background at https://bit.ly/icosnikom2023_bg_zoom
5. All online participants and presenters must follow display name format as below:

Role	Format	Example
For Participant	Par_Name	Par_Melda Sitompul
For Presenter	Pre_PaperID_N_Name;	Pre_11_Melda Sitompul

Presentations Rules

1. The Session chairs will conduct the parallel session, they will be helped by an assistant as an administrator and a timekeeper.
2. You must attend to the webinar at least 5 minutes before the opening session will be started. Kindly report to the session chair when you arrive at virtual meeting before the session is started.
3. The presentation time is 15 minutes per presenter, including question and answer. Session chair will interrupt and stop the presentation if the time is over.
4. Presentation slide and speech must be delivered in English, the presentation template can be downloaded [here](#).
5. Question and answer must be delivered in English.

Technical Suggestions

1. Presentation using laptop/computer is preferable.
2. You should look for comfortable and quite place to avoid any disturbance for the whole session.
3. Before the conference, make sure that your connection, audio, video, and any other technical function in your zoom application running properly.
4. Having back up/alternative internet connection is preferable.
5. Please note that the schedule follows the Jakarta Time (GMT+7)

PREFACE



Chairman of ICOSNIKOM 2023

Dr. Akim Manaor Hara Pardede, ST., M.Kom

It is an honor to be here and welcome you all to The 7th International Conference SNIKOM 2023 organized by STMIK KAPUTAMA, Binjai city, North Sumatera.

Artificial intelligence is one of the main technologies driven by computer science in Industry 5.0. AI enables machines to perform tasks that previously could only be performed by humans. AI can also analyze vast amounts of data quickly and accurately, providing insights and predictions that would be impossible for humans to generate on their own. This capability has led to significant advances in fields such as healthcare, finance, education and transportation.

For this reason, as a computer - based campus ,STMIK Kaputama is holding ICOSNIKOM 2023 takes the theme "The Role Of Artificial Intelligence Technology In Human And Computer Interactions In The Industrial Era 5.0" which aims to ensure that Indonesian society continues to contribute to the development of machine intelligence.

It is a pleasure for us to be able to organize ICOSNIKOM 2023, which is held in a hybrid manner that can accommodate all writers from all cities and countries. The latest research published at this international seminar will continue to be developed, especially in the fields of Computer Science and Information Technology.

We hope this conference will be an excellent forum for researchers around the world to engage and share their latest contributions in research and innovation.

Thank you to all authors and speakers who have contributed to this conference and hope you have fun and enjoy the conference. We express our appreciation to APTIKOM for allowing us to be The Host of this conference as part of the APTIKOM Coordination Forum in North Sumatra.

We also express our appreciation to our sponsors, namely IEEE The Indonesia Section Computer Society Chapter Mr. Prof. Dr. Ir. Ford Lumban Gaol, S.Sc., M.Kom. SMIEEE, IEEE Indonesia, and we thank to our co-hosts DEL Institute of Technology, Methodist University, STMIK Jayakarta, and Medan Area University who have also supported us in implementing ICOSNIKOM 2023

That is all for now and thank you for this great event.

Horas!

Menjuah-juah!

Yahowu!

Thank you

Dr. Akim Manaor Hara Pardede, ST., M.Kom

PREFACE



Chairman of STMIK Kaputama

Dr. Relita Buaton, ST., M.Kom

Peace be upon you, mercy, and blessings of Allah.
Good morning and best wishes to all of us

Whom I respect

1. Prof.Dr. Rer.Nat, Achmad Benny Mutiara, S. SI, S. Kom, **as a chair of Central APTIKOM and also as our keynote speaker today**
2. Prof. Dr. Putra Sumari, **our keynote speaker from University Sains Malaysia**
3. Dr.Aaron Loh, M.Sc, Ph.D., **our keynote speaker from Assumption University of Thailand**
4. Prof. Dr. Ir. Ford Lumban Gaol, M. Kom, selaku IEEE Commputer society Indonesian Chapter, **as the IEEE Computer Society Indonesian Chapter**, who has helped us a lot as a committee
5. Prof. Dr. Poltak Sihombing, M. Kom, **as the chairman of APTIKOM SUMUT** who gave us his trust as the Host of ICoSNIKOM and has given us a lot of guidance in organizing ICoSNIKOM 2023
6. Dr. Parlindungan Purba, SH, MM., **as a founder of STMIK Kaputama** who always support us in carrying out and improving research and development of science and technology.
7. Drs. Irwanto Tampubolon, M.Pd, **as a chairman of YPTIM foundation** who always supports the implementation of Tri Dharma at STMIK Kaputama
8. **Rector or dean from universities.**
9. **APTIKOM SUMUT Organization and**
10. **all of audience who I can not mention.**

We praise and thank God for the presence of Almighty God for all his blessings and protection so that we can hold the international conference today at Sinabung Hills Berastagi.

STMIK Kaputama continues to work hard to realize its vision and mission to become a superior university in North Sumatra and Indonesia, so today's activities are a form of STMIK Kaputama in achieving its vision and mission where the aim of this conference is to encourage scientific discussions, encourage research collaboration, and publish findings the latest research, building and expanding relationships, with the hope that lecturers and students in Indonesia, especially North Sumatra will get many benefits which will bring together many participants from various parts of the world to be able to exchange information, so that graduates will be truly qualified and well received in society and the world of work

The life we live today is a very complex world in accordance with technological developments in the Industrial Revolution 4.0 era, namely artificial intelligence, big data, data science, machine learning, deep learning, which are the characteristics of life wherever and whenever we are in the industrial revolution era. 4.0 currently. We believe that we can immediately integrate ourselves with the environment, take advantage of and create opportunities, and be able to compete in a healthy and sporty manner, especially preparing the skills of students and lecturers in the 21st century, namely Critical thinking, Creativity, Collaboration, Communication, Information literacy, Media literacy, Technology literacy , Flexibility Leadership, Initiative Productivity and Social skills

Finally, I would like to say that I hope that today's scientific meeting will provide benefits for us, can develop science and technology, can help society and solve problems that exist in society to create a prosperous society.

On this occasion I'd also like to express my thanks to the parties that I cannot mention one by one who have supported and helped the implementation of IcoSNIKOM 2023

Thank You.

Berastagi , 10 th November 2023

Head of STMIK Kaputama

Dr. Relita Buatun, ST., M.Kom

PREFACE



Chair of APTIKOM – SUMUT Region

Prof. Poltak Sihombing, M.Kom, Ph.D

Welcome to ICOSNIKOM 2023,

ICOSNIKOM is an annual international conference agenda which is organized by APTIKOM of North Sumatra Province in collaboration with several APTIKOM member universities, where the STMIK KAPUTAMA is the host this year.

APTIKOM is the Association of Informatics and Computer Universities in Indonesia which is centre based in Jakarta. APTIKOM is a forum for us to share information and synergize, especially in the fields of Computer Science and Information Technology. APTIKOM of North Sumatra region fully supports the activities of this Conference.

Through this conference, all participants can collaborate to conduct better research in the future. The latest findings of the authors and speakers can be developed in the fields of Computer Science and Information Technology. We hope this conference will be an excellent forum for researchers around the world to engage and share their latest contributions in research and innovation. Thank you to all the authors and speakers willing to contribute to this conference and hope you have fun and enjoy the conference.

We express our appreciation all of the Keynote and Invited Speakers, to Management of STMIK KAPUTAMA as the host and other universities who participated as co-hosts. Special thanks to Dr. Parlindungan Purba, S.H, M.H, and Drs. Irwanto Tampubolonn, M.Pd as the Founder of STMIK KAPUTAMA, Dr. Realita Buatun, M.Kom as the Cancelor of STMIK KAPUTAMA, Dr. Akim Manaor Pardede, M.Kom as the Chairman of this Conference, and the academic community of STMIK KAPUTAMA Binjai.

Our appreciation also to all Reviewers, to IEEE Indonesia Section and IEEE Computer Society.

Last, but not least. congratulate to all of the Conference participants. Hopefully you will get a lot of benefits from this conference while enjoying the beautiful nature of the cool city of Berastagi. I close this speech with these words of wisdom: "Find what you love, what you believe makes great work. Great work is Loving what you do"

That's all for now and thank you for this wonderful event. Thank You

(Prof. Poltak Sihombing, M.Kom, Ph.D)



The 7th 2023 International Conference of Computer Science and Information Technology (ICoSNIKOM)

Binjai, Indonesia, November 10-11, 2023

CONFERENCE PROGRAM

Time	Program
Friday, November 10th, 2023	
07.30-08.00	Registration and preparation
08.00-08.05	Opening by MC Zoom Link: https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
08.05-08.15	Opening ceremony Traditional dance performance from STMIK Kaputama
08.15-08.20	National Anthem "Indonesia Raya"
08.20-08.25	5' Opening speech from the Representative of ICOSNIKOM 2023 (Dr. Akim MH Pardede, ST., M.Kom)
08.25-08.30	5' Prof. Poltak Sihombing, M.Kom., Ph.D, Head of Aptikom North Sumatra
08.30-08.35	5' Prof. Dr. Ir. Ford Lumban Gaol, S.Si., M.Kom IEEE Computer Society Coordinator (Indonesia)
08.35-08.40	5' Welcoming speech from the Head of STMIK Kaputama (Dr. Relita Buaton, ST., M.Kom)
08.40-08.50	5' Dr. Parlindungan Purba, SH., MM, Foundation of YPTIM
08.50-09.20	30' Keynote Speaker I – Dr. Aaron Loh, MSc, PhD (University of Thailand)
09.20-09.50	30' Keynote Speaker II – Prof. Dr. Putra Sumari (Universiti Sains Malaysia)
09.50-10.20	20' Keynote Speaker III – Prof. Dr. rar.net Achmad Benny Mutiara (Universitas Guna Darma)
10.20-10.45	15' Question and Answer
10.45-10.55	10' Invite Speaker I – Prof. Dr. Syahril Efendi, S.Si, M.IT (Universitas Sumatera Utara)
10.55-11.05	10' Invite Speaker II – Prof. Dr. Hailiza Kamarulhaili (Universiti Sains Malaysia)
11-05-11.15	10' Invite Speaker III – Dr. Humuntal Rumapea (Universitas Methodist Indonesia)
11.15-11.25	10' Invite Speaker IV – Dr. Dedy Hartama (STIKOM Tunas Bangsa)
11.25-12.00	Photo session and Closing

Time	Program					
12.00 -14.00	ISHOMA					
14.00-16.00	Parallel Session I					
	Parallel 1	Parallel 2	Parallel 3	Parallel 4	Parallel 5	Parallel 6
16.00-16.30	Closing, Memento Presentation and Best Paper Announcemnet					
APTIKOM SUMUT Meeting						
18.00-19.00	Registration and preparation					
19:00-19.10	Opening Ceremony					
19.10-19.15	Indonesia Raya + Mars Aptikom					
19.15-19.35	Opening and Annual Report from Regional Head of Aptikom (Prof. Poltak Sihombing, M.Kom., Ph.D,)					
19.35-19.45	MoU Signing-Memento Presentation-Photo Session					
19.45-20.00	Speech - Prof. Dr. rar.net Achmad Benny Mutiara (Center Head of Aptikom)					
20.00-21.30	Meeting of APTIKOM SUMUT					
21.30-21.40	Closing					
Saturday, November 11st, 2023 : Hiking to Taman Nasional Gunung Leuser						
07.30-08.30	Guest pick up to hotel					
08.30-12.30	Visit to Taman Lumbini and Fruit Market Brastagi					

THE 2023 IEEE International Conference of Computer Science and Information Technology (ICOSNIKOM)

PARALLEL SESSION

Friday, 10th November 2023

Parallel Session I: 14.00-16.00 (GMT+7)

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	Jamaluddin, S.Kom., M.Kom	2	Verdi Yasin, Ifan Junaedi, Anton Zulkarnain Sianipar, Ito Riris Immasari, Teri Mengkasrinal and Johan Johan	Intelligent System Concept of Integrated Education History in Single Identity Number Using Grid-Based Model (GBM)	Artificial Intelligence (AI)/ 10 minutes	Room I https://zoom.us/j/93232011049?pwd=ZzZYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
2		6	Khairul Umam Syaliman, Adli Abdillah Nababan, Miftahul Jannah, Arif Hamied Nababan, Ryan Dhika Priyatna and Erwin Panggabean	Latin Hypercube Sampling Approach to Improve K- Nearest Neighbors Performance on Imbalanced Data	Artificial Intelligence (AI)/ 10 minutes	
3		9	Sayuti Rahman, Dodi Siregar, Rahmad B.Y Syah, Heri Setiawan, Asep Erlan Maulana and Hamsiah Hamsiah	The Effective Breast Cancer Classification with the Random Forest Algorithm	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
4	Jamaluddin, S.Kom., M.Kom	11	M Miftakul Amin and Yevi Dwitayanti	Additive Ratio Assessment Model for Lecturer Performance Evaluation	Artificial Intelligence (AI)/ 10 minutes	Room I https://zoom.us/j/93232011049?pwd=zZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
5		32	Paska Marto Hasugian, Herman Mawengkang, Poltak Sihombing and Syahril Efendi	Review of High-Dimensional and Complex Data Visualization	Artificial Intelligence (AI)/ 10 minutes	
6		34	Andre Hasudungan Lubis, Rizki Muliono, Muhammad Khahfi Zuhanda and Desca Winta Harefa	The Impact of k-means on Association Rules Mining Algorithms Performance	Artificial Intelligence (AI)/ 10 minutes	
7		35	Muhammad Khahfi Zuhanda, Andre Hasudungan Lubis and Rahmad Syah	Bibliometric Analysis of Model Vehicle Routing Problem in Logistics Delivery: Trends, Country Contributions, and Recent Topics	Artificial Intelligence (AI)/ 10 minutes	
8		43	Anindya Ananda Hapsari and Devan Junesco Vresdian	Development of a Face Mask Type Detection with Multiclass Classification using Artificial Intelligence on Python	Artificial Intelligence (AI)/ 10 minutes)	
9		47	Erwin Halim, I Gusti Agung Ayu Agniera and Agus Putranto	Local Perceptions Towards Foreigners Digital Nomads in Bali	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
10		48	Ramadani Ramadani, B.Herawan Hayadi and Hartono Hartono	Comparative Analysis Of Algorithms Naive Bayes And C45 For Student Satisfaction With Administrative Services	Artificial Intelligence (AI)/ 10 minutes	Room 1 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
11		50	Faustina Odeta, Patrick Darien Augusto, Kezia Gloria Lie, Anderes Gui, Muhammad Shabir Shaharudin and Yuvaraj Ganesan	Analysis of Factors That Affect Users of Quick Response Indonesia Standard	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
1	Indra Hartarto Tambunan , ST., M.S.,Ph.D	53	Rahmadani Siregar, Hartono Hartono and Roslina Roslina	Determination of C4.5 algorithm performance based on training data and testing data in determining diseases in rice plants (case study: lubuk barumun district agriculture office padang lawas district)	Artificial Intelligence (AI)/ 10 minutes	Room 2 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
2		56	Rima Tamara Aldisa, Adian Fatchur Rochim and Agung Triayudi	Improving Student Learning Performance Prediction: A Systematic Literature Review of Machine Learning-Based Classification Methods	Artificial Intelligence (AI)/ 10 minutes	

No	Moderator	ID PAPER	AUTHORS	TITLE	SECTION/ Duration	ROOM
3	Indra Hartarto Tambunan, ST., M.S.,Ph. D	59	Maryam Alizadeh Zarei, Farahnaz Hosseini, Ali Mohammad Nickfarjam and Ting Xiao	Predicting User Interest using Hierarchical-based Clustering for Recommender Systems	Artificial Intelligence (AI)/ 10 minutes	Room 2 https://zoom.us/j/93232011049?pwd=ZzYSXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
4		63	Prana Ugiana Gio, Herman Mawengkang, Muhammad Zarlis and Saib Suwilo	Generalized Lambda Distribution: Application on Financial Performance Data in The Indonesia Stock Exchange	Artificial Intelligence (AI)/ 10 minutes	
5		65	Mhd Jaka Prima Dona, Yudi Fernando, Ridho Ikhsan, Ika Sari Wahyuni-Td, Erick Fernando and Hartiwi Prabowo	Features, Conformance and Perceived Product Quality: A Social Security Mobile Apps	Artificial Intelligence (AI)/ 10 minutes	
6		66	Yulia Andini, Yudi Fernando, Ridho Ikhsan, Ika Sari Wahyuni-Td, Erick Fernando and Hartiwi Prabowo	A Study of an Indonesian Social Security Mobile Apps: E-Service Quality, Digital Features, and Customer Digital Satisfaction	Artificial Intelligence (AI)/ 10 minutes	
7		70	Maradona Jonas Simanullang, Dr. Hartono and Dr. Roslina	Combination of SOM, SVR, and LMKNN for Stock Price Prediction	Artificial Intelligence (AI)/ 10 minutes	

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9		72	Muh Rizal H, Mochamad Hariadi and Yunifa Miftachul Arif	Multi-Criteria Decision Support System for Flood Alert Classification in Smart City	Artificial Intelligence (AI)/ 10 minutes	
10		78	Muhammad Syahputra Novelan, Syahril Efendi, Poltak Sihombing and Herman Mawengkang	Optimisation Cavacity Vehicle Routing Problem with K- Nearest Neighbor in Classification of Goods Ditribution Route	Artificial Intelligence (AI)/ 10 minutes	
11		108	Arjon Turnip, Mardi Turnip, Ani Dijah Rahajoe and Alvito Dwinovan Wibowo	Brain Drug Effect Detection on Impulsivity with Ensemble Bagged Trees Method	Artificial Intelligence (AI)/ 10 minutes	

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7		95	Kevin Trikusuma Dewo, Verdi Yasin, Thomas Budiman, Anton Zulkarnain Sianipar and Akmal Budi Yulianto	IT Infrastructure Dashboard Monitoring Application Development Using Grafana And Prometheus, a Case Study at Astra Polytechnic School	Artificial Intelligence (AI)/ 10 minutes	
8		100	Naikson Fandier Saragih, Hanifullah Hafidz Arrizal, Marzuki Sinambela, Yolanda Yulianti Pratiwi, Indra Kelana Jaya and Indra M Sarkis	Clustering Earthquakes in West Java Using Machine Learning Algorithm	Artificial Intelligence (AI)/ 10 minutes	
9		104	Riahna Naftali Situmeang, Jamaluddin Jamaluddin, Eviyanti Novita Purba and Eva Julia Gunawati Harianja	Designing Chatbot About Tourism Recommendations In North Sumatra	Artificial Intelligence (AI)/ 10 minutes	

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3		30	Deni Lumbantoruan and Christine Sibarani	Red Chili Leaf Disease Identification via GLCM and SVM Analysis	Machine learning/ 10 Minutes	
4		31	Marwah Ghoben and Lamia Muhammed	Exploring the Impact of Image Quality on Convolutional Neural Networks: A Study on Noise, Blur, and Contrast.	Machine learning/ 10 Minutes	
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6	Dodi Siregar, M.Kom	61	Hadi Prayitno, Eko Hariadi and Mochamad Cholik	Impact of Flight Simulator Training on Enhancing Situational Awareness among Aviation Vocational Education Cadets	Machine learning/ 10 Minutes	Room 4 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
7		86	Parmonangan R. Togatorop, Andika Meidy Fransius Tarigan, Agnes Hinsia Parina Sinaga and Ester Putri Dearest Sidabutar	Using Deep Learning and Word Embedding to Detect Clickbait in Indonesian Headline News	Machine learning/ 10 Minutes	
8		88	Alexander Hernandez, Randolph Saccalan, Al Jason Gallardo, Ramil Allen Casagan and Maria Corazon Adriano	Determinants of Green Supply Chain Mangement in Small and Medium Enterprises in the Philippines: the role of Information Systems	Machine learning/ 10 Minutes	
9		90	Alexander Hernandez and Erlito Albina	Exploring Tourism and Hospitality Management Students Perception towards the Use of Generative Language Models in Service Organizations: the Case of ChatGPT	Machine learning/ 10 Minutes	

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11		103	Fahmi Fahmi, Wervyan Shalannanda, Muhammad Yazid and Erwin Sutanto	Initial Design of Wearable EEG Device for Epilepsy Patient Using Machine Learning and Mobile Application	Machine learning/ 10 Minutes	ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7

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1	Dr. Arnes Sembiring, M.Kom	8	Yowen Yowen, Jude Joseph Martinez and Ardimas Andi Purwita	Secure Mobile Facial Recognition Attendance System with Edge Computing: A Comparative Study of Face Recognition Models for Android Application Integration	Computing/ 10 minutes	Room 5 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09
2		10	Istas Pratomo Manalu, Sari Muthia Silalahi, Gerry Italiano Wowiling, Marojahan Mula Timbul Sigiro, Rio Putrawan Zalukhu and Putri Kezia Nababan	Lora Communication Design and Performance Test (case study : Air Quality Monitoring System)	Computing/ 10 minutes	ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7

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3	Dr. Arnes Sembiring, M.Kom	39	Immanuel Maurice Darmawan Sitanggang, Damanik Joy Andrew Immanuel, Fajar Sam Hutabarat, Albert Sagala and Guntur Petrus Boy Knight	Website Monitoring For Disaster Victim Search and Rescue	Computing/ 10 minutes	Room 5 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
4		42	Cherindranath Reddy, Satyesh Das, Surya Narayana Murthy Babu Batchu and Gurram Venkata Yaswanth	Boosting Power Grid Efficiency: Meta-RL Approaches	Computing/ 10 minutes	
5		62	Muhamad Raffi and Erwin Halim	Recycling Application Usability Testing Using the Nielsen Attributes of Usability (NAU)	Computing/ 10 minutes	
6		73	Nadun Senarathna, Sachini Somathilaka, Udayanga Hemapala and Wijekoon Banda	Mitigating Intermittency in Solar Power Plants through Integrated Storage An Analysis of its Applicability to the Sri Lankan Power System	Computing/ 10 minutes	

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7	Dr. Arnes Sembiring, M.Kom	76	Muhammad Aidiel Rachman Putra, Tohari Ahmad, Royyana Muslim Ijtihadie and Dandy Pramana Hostiadi	Detecting Botnet Spam Activity by Analyzing Network Traffic Using Two-stack Decision Tree Algorithms	Computing/ 10 minutes	Room 5 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
8		92	Roslina Roslina, Purwa Hasan Putra, Jasni Bt Mohamad Zain and Saiful Farik Mat Yatin	Design of SMART System for Controlling Ornamental Fish Farming Development Based on Internet of Things	Computing/ 10 minutes	
9		101	Fadli Sirait, Mulyono Mulyono, Akhmad Wahyu Dani, Arif Marsal and Muhammad Ainur Rofiq	An Energy-Aware Zone Routing Protocol Scheme Utilizing LSTM-RNN for 5G Wireless Backhaul Network	Computing/ 10 minutes	
10		106	Poltak Sihombing, Aya Shofia, Putra Sumari, Syahriell Efendi, Arjon Turnip and Yudi Muchtar	Smart Home Design Based on IoT and Context Aware Model (ICAM)	Computing/ 10 minutes	
11		99	Akim Manaor Hara Pardede and Muammar Khadapi	A Smart Public Service Optimization Model Using Linear Programming to Reduce the Number of Deaths	Computing/ 10 minutes	

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2		109	Erwin Sitompul, Arjon Turnip and Mardi Turnip	Enhancing Comfort and Handling in Semi-Active Suspension Systems with Fuzzy Controller	Computer Vision 10 Minutes	
3		22	Jonson Manurung, Poltak Sihombing, Mohammad Andri Budiman and Sawaluddin Sawaluddin	Dynamic Rumor Control in Social Networks using Temporal Graph Neural Networks	Computer Vision 10 Minutes	
4		36	Saketh Kilaru, Anushka Shah and Swoichha Adhikari	Enhancing Classification in UTD-MHAD Dataset: Utilizing Recurrent Neural Networks in Ensemble-Based Approach for Human Action Recognition	Computer Vision 10 Minutes	

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5		40	Muhlis Tahir, Abdul Azis Jakfar, Dian Budi Elnursa and Rio Meisya Resnanda	Performance Evaluation of Pre- trained Convolutional Neural Network and Transfer Learning for Classification of Spices and Herbal Medicines in Madura	Computer Vision 10 Minutes	<p>Room 6</p> <p>https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09</p> <p>ID Rapat: 932 3201 1049</p> <p>Kode Sandi: icosnikom7</p>
6		46	Decwind Skylar Susanto, Erwin Halim, Antonius Deni Paul Lega, Nelly Nelly and Yuliana Lisanti	The Impact of Online Course Design, Enjoyment, Usefulness, Ease of Use, and Interaction to Video-Based Learning System Usage	Computer Vision 10 Minutes	
7	Indah Ambarita, SE., M.Si	49	Shikha Yadav and Jeevan Bala	Convolutional Autoencoders- Based Image Watermarking Techniques	Computer Vision 10 Minutes	
8		52	Shyam Shanckin, Mayank, Anshuman Singh and Rahul Patwadi	Unveiling Latent Spaces with Variational Autoencoders	Computer Vision 10 Minutes	
9		75	Mochamad Ravy Raspati and Sudianto Sudianto	Analysis of Roasting Maturity Detection of Coffee Beans based on Image using YOLOv4	Computer Vision 10 Minutes	

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10	Indah Ambarita, SE., M.Si	44	Benny Hutagaol, Mohammad Andri Budiman and Herman Mawengkang	Hybrid Cryptosystems MRC-4 algorithm and RSA Dual Modulus to secure data	Security 10 minutes	Room 6 https://zoom.us/j/93232011049?pwd=ZzZYsXJBa3MzQlhyclkrZVNDMXhEZz09 ID Rapat: 932 3201 1049 Kode Sandi: icosnikom7
11		60	Taupan Syah Putra, Mohammad Andri Budiman and Saib Suwilo	Signcryption Techniques For Digital File Security Using The RSA Multi-Factor Algorithm And The Esign Algorithm	Security 10 minutes	
12		55	Muammar Khadapi, A M H Pardede, Novriyenni	Providing Recommendations to New ILMCI Edu Voucher Customers Using the Market Basket Analyst Algorithm	Data Mining 10 Minutes	

Additive Ratio Assessment Model for Lecturer Performance Evaluation

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Lecturers have a major contribution to the quality of higher education. One indicator of lecturer productivity is by looking at the performance that has been carried out. The higher the performance of lecturers, the higher the productivity and performance of education institutions levels. This study aimed to develop a lecturer performance evaluation model, as another alternative in evaluating lecturer performance, in addition to using the Lecturer Performance Load (BKD) which has been carried out every semester. The method used in this study was the Additive Ratio Assessment (ARAS). Based on the intuitive principle that the alternative must have the largest ratio to produce the optimal solution. This study used 5 alternatives, namely teaching activities, research activities, community service activities, supporting activities, and discipline. The results obtained show that this model has been able to provide recommendations in the form of lecturer performance rankings, from those with the highest performance to the lowest. The model succeeded in providing recommendations with the highest value of 0.852 and the lowest value of 0.591. The research that has been done, indicated that this model can be an alternative for higher education management to see the performance of lecturers.

Keywords—additive ratio assessment, lecturer performance, decision support system

I. INTRODUCTION

One of the factors that supports the progress of Higher Education is the human resources in it [1]. Lecturers are human resources and an important asset in Higher Education. This encourages management in tertiary institutions to see the performance of lecturers in carrying out the duties of higher education tridharma [2]. Performance is a person's achievements related to his duties. Performance monitoring is used to examine, analyze, and evaluate the performance that has been achieved. Performance measurement can assist management in monitoring and improving performance and can focus on organizational goals to meet the demands of public accountability [3].

The performance of lecturers in tertiary institutions can be seen from the extent to which lecturers carry out the duties of higher education tridharma [4]. Lecturer performance needs to be evaluated regularly thus it can improve lecturer performance [5]. In fact, according to [6] in Higher Education, the process of evaluating the performance of Lecturers is carried out by the Quality Assurance unit. Decision support systems can be used to build lecturer performance evaluations using several methods and algorithms as sub-system models [7]. In general, the use of a decision support system in evaluating lecturer performance will produce recommendations in the form of ranking values from the highest to the lowest [8].

Research conducted by [9] has developed a model to determine the best extension officer using the Additive Ratio

Assessment method. This study uses 5 alternative data and 13 criteria. This study has succeeded in ranking with the highest value of 0.8310 and the lowest ranking value of 0.4734.

The Additive Ratio Assessment method has also been implemented in selecting English course branch locations [10]. A total of 5 criteria are used in this study, namely population density level, access to locations, crowd level, rental costs, and population income. The largest ranking value obtained is 0.1778 and the smallest value is 0.1496.

Selection of the best SMA and SMK has also been carried out by [11] using the additive ratio assessment method. A total of 7 criteria were used to select 8 schools. These criteria are school facility, accreditation status, graduate quality, student achievement, school location, professional human resources, and extracurricular activities. The largest value obtained is 0.122477 and the smallest value is 0.081908.

Research conducted by [12] has developed a selection model of popular mobile games using the Additive Ratio Assessment method. 5 criteria consisting of not containing violence, there being no pornography element, entertainment, game graph, and creativity were used to select 15 games. The largest value is 0.070553 and the smallest value is 0.051287.

Lecturer performance evaluation has also been carried out by [13] who developed a lecturer performance evaluation model using the TOPSIS method. A total of 4 criteria are used in the model, namely educational qualification, learning, number of researches, and the amount of community service. The results showed that, of the 10 alternatives selected, the highest value was 0.704 and the smallest value was 0.185.

II. RESEARCH METHOD

A. Research Stages

Some of the stages carried out in this study can be seen in Fig. 1. The research begins with collecting relevant data, determining criteria and alternatives, determining weighting, decision-maker assessment, additive ratio assessment implementation, and finally the results and evaluation.

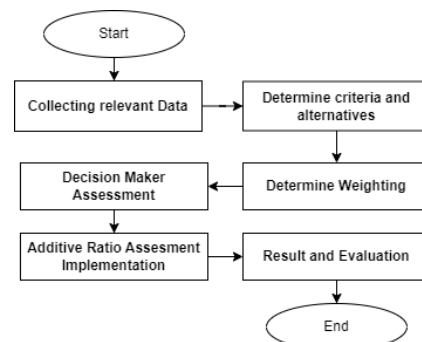


Fig. 1. Research Stages

B. Additive Ratio Assessment Method

The Additive Ratio Assessment (ARAS) method was developed by [14] in 2010. This method is based on the intuitive principle that the alternative must have the largest ratio to produce the optimal solution. In the ARAS method, the value of the utility function determines the relative efficiency of the complex of feasible alternatives directly proportional to the relative effect of the value and weight of the main criteria considered in determining the best alternative. According to [15] stated that the ARAS method is part of the Multiple Criteria Decision Making (MCDM). The stages in the ARAS method can be described as follows.

1. Determine the value of the criteria, weights, alternatives, and the optimum value. Giving the optimum value (X_{0j}) by taking into account the criteria for benefits using formula (1) and costs using formula (2).

$$X_{0j} = \frac{Max}{1} \quad (1)$$

$$X_{0j} = \frac{Min}{1} \quad (2)$$

2. Formation of the Decision Making Matrix (DMM), as can be seen in formula (3).

$$X = \begin{bmatrix} x_{01} & \dots & x_{0j} & \dots & x_{0n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & \dots & x_{ij} & \dots & x_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{m1} & \dots & x_{mj} & \dots & x_{mn} \end{bmatrix} \quad (3)$$

Where m is the number of alternatives, and n is the number of criteria. X_{ij} is the criterion value of alternative i , and X_{0j} is the optimum value of criterion j .

3. Normalization of the decision matrix for all criteria uses formula (4) for benefit criteria, and formula (5) for cost criteria. The purpose of normalization is to unite each matrix element thus the elements in the matrix have a uniform value.

$$X_{ij} = \frac{x_{ij}}{\sum_{i=0}^m x_{ij}} \quad (4)$$

$$X_{ij} = \frac{1}{x_{ij}^*}; X_{ij} = \frac{x_{ij}}{\sum_{i=0}^m x_{ij}} \quad (5)$$

4. Calculating the utility value by first determining the optimum value using formula (6) and determining the degree of utility using formula (7).

$$S_i = \sum_{j=1}^n X_{ij}; i=0,m \quad (6)$$

$$K_i = \frac{S_i}{S_0}; i = 0, m \quad (7)$$

5. Determine the results and ranking calculations.

III. RESULTS AND DISCUSSION

A. Collecting Relevant Data

At this stage, observation of data related to lecturer performance is carried out. Higher education tridharma activities are the main focus in evaluating lecturer

performance. In addition, lecturer performance is also related to academic and disciplinary support activities and responsibilities in carrying out various assignments given.

B. Determine Criteria and Alternatives

In this study, several selected criteria were used, as can be seen in Table I. In determining the criteria, the benefit and cost criteria were considered. The benefit criterion is a criterion that the higher the value the better and the cost criterion is a criterion that the higher the value, the worse or lower the value. All selected criteria are categorized in benefits because it is expected that all of them will contribute to high performance. As for the alternatives in the developed model, as many as 5 alternatives are used for model testing.

TABLE I. SELECTED CRITERIA

Criteria	Information	Category
C1	Teaching activities	Benefit
C2	Research activity	Benefit
C3	Community service activities	Benefit
C4	Supporting activities	Benefit
C5	Discipline and Responsibility	Benefit

C. Determine Weighting

Referring to Table II, the highest weight is considered in teaching activities 0.30. Then the next priority is on research and community service activities of 0.20. Meanwhile, in supporting activities, discipline and responsibility have the lowest priority of 0.15. All weights have a value of 1.00.

TABLE II. CRITERIA WEIGHT

Criteria	Information	Weight
C1	Teaching activities	0.30
C2	Research activity	0.20
C3	Community service activities	0.20
C4	Supporting activities	0.15
C5	Discipline and Responsibility	0.15
Total		1.00

D. Decision Maker Assessment

In giving preference values by decision makers using values as in Table III. Table IV shows the preference of decision makers from 5 alternatives that have been normalized.

TABLE III. SCORE PREFERENCES

Score	Information
81 - 100	Very good
61 - 80	Good
41 - 60	Enough
21 - 40	Poor
0 - 20	Very poor

TABLE IV. DECISION MAKER PREFERENCES

Alternatives	Criteria				
	C1	C2	C3	C4	C5
A1	0,50	0,90	0,70	0,70	0,80
A2	0,80	0,70	1,00	0,50	1,00
A3	1,00	0,30	0,40	0,70	1,00
A4	0,20	1,00	0,50	0,90	0,70
A5	1,00	0,70	0,60	1,00	1,00

E. Additive Ratio Assessment Implementation

1) Determine the criteria value, criteria weight, alternative, and optimum value

Establishment of the optimum value in row A0 for criteria C1, C2, C3, C4, and C5 using formula (1). All of the selected criteria are benefit criteria. Table V is the distribution of values in model formation.

TABLE V. OPTIMUM VALUE

Alternatives	Criteria				
	C1	C2	C3	C4	C5
A0	1.00	1.00	1.00	1.00	1.00
A1	0.50	0.90	0.70	0.70	0.80
A2	0.80	0.70	1.00	0.50	1.00
A3	1.00	0.30	0.40	0.70	1.00
A4	0.20	1.00	0.50	0.90	0.70
A5	1.00	0.70	0.60	1.00	1.00
Category	Benefit	Benefit	Benefit	Benefit	Benefit

2) Changing the value of the criteria into a decision matrix

All values in each criterion are represented as a decision matrix. Formula (3) is used in making matrices. As a result, this can be seen in the X matrix.

$$X = \begin{bmatrix} 1.00 & 1.00 & 1.00 & 1.00 & 1.00 \\ 0.50 & 0.90 & 0.70 & 0.70 & 0.80 \\ 0.80 & 0.70 & 1.00 & 0.50 & 1.00 \\ 1.00 & 0.30 & 0.40 & 0.70 & 1.00 \\ 0.20 & 1.00 & 0.50 & 0.90 & 0.70 \\ 1.00 & 0.70 & 0.60 & 1.00 & 1.00 \end{bmatrix}$$

3) Normalization of the decision matrix for all criteria

The selected criteria used in the model are all benefit criteria, thus only formula (5) is used.

Criteria C1:

$$X_{01} = \frac{1.00}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{1.00}{4.50} = 0.222$$

$$X_{11} = \frac{0.50}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{0.50}{4.50} = 0.111$$

$$X_{21} = \frac{0.80}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{0.80}{4.50} = 0.178$$

$$X_{31} = \frac{1.00}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{1.00}{4.50} = 0.222$$

$$X_{41} = \frac{0.20}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{0.20}{4.50} = 0.044$$

$$X_{51} = \frac{1.00}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{1.00}{4.50} = 0.222$$

Criteria C2:

$$X_{02} = \frac{1.00}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{1.00}{4.60} = 0.217$$

$$X_{12} = \frac{0.90}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.90}{4.60} = 0.196$$

$$X_{22} = \frac{0.70}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.70}{4.60} = 0.152$$

$$X_{32} = \frac{0.30}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.30}{4.60} = 0.065$$

$$X_{42} = \frac{1.00}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{1.00}{4.60} = 0.217$$

$$X_{52} = \frac{0.70}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.70}{4.60} = 0.152$$

Criteria C3:

$$X_{03} = \frac{1.00}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{1.00}{4.20} = 0.238$$

$$X_{13} = \frac{0.70}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.70}{4.20} = 0.167$$

$$X_{23} = \frac{1.00}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{1.00}{4.20} = 0.238$$

$$X_{33} = \frac{0.40}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.40}{4.20} = 0.095$$

$$X_{43} = \frac{0.50}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.50}{4.20} = 0.119$$

$$X_{53} = \frac{0.60}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.60}{4.20} = 0.125$$

Criteria C4:

$$X_{04} = \frac{1.00}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{1.00}{4.80} = 0.208$$

$$X_{14} = \frac{0.70}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.70}{4.80} = 0.146$$

$$X_{24} = \frac{0.50}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.50}{4.80} = 0.104$$

$$X_{34} = \frac{0.70}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.70}{4.80} = 0.146$$

$$X_{44} = \frac{0.90}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.90}{4.80} = 0.188$$

$$X_{54} = \frac{1.00}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{1.00}{4.80} = 0.208$$

Criteria C5:

$$X_{05} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

$$X_{15} = \frac{0.80}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{0.80}{5.50} = 0.145$$

$$X_{25} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

$$X_{35} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

$$X_{05} = \frac{0.70}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{0.70}{5.50} = 0.127$$

$$X_{55} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

Then the results are obtained in the form of a normalized matrix as in the following matrix.

$$X_{ij}^* = \begin{bmatrix} 0.222 & 0.217 & 0.238 & 0.208 & 0.182 \\ 0.111 & 0.196 & 0.167 & 0.146 & 0.145 \\ 0.178 & 0.152 & 0.238 & 0.104 & 0.182 \\ 0.222 & 0.065 & 0.095 & 0.146 & 0.182 \\ 0.044 & 0.217 & 0.119 & 0.188 & 0.127 \\ 0.222 & 0.152 & 0.143 & 0.208 & 0.182 \end{bmatrix}$$

Referring to Table II, there is a weight for each criterion as follows.

$$W = [0.30 \ 0.20 \ 0.20 \ 0.15 \ 0.15]$$

To obtain a weighted normalized matrix like the following matrix.

$$X_{ij}^* \cdot W = \begin{bmatrix} 0.067 & 0.043 & 0.048 & 0.031 & 0.027 \\ 0.033 & 0.039 & 0.033 & 0.022 & 0.022 \\ 0.053 & 0.030 & 0.048 & 0.016 & 0.027 \\ 0.067 & 0.013 & 0.019 & 0.022 & 0.027 \\ 0.013 & 0.043 & 0.024 & 0.028 & 0.019 \\ 0.067 & 0.030 & 0.029 & 0.031 & 0.027 \end{bmatrix}$$

4) Calculating Utility Value

This utility value is obtained using formula (6) and formula (7). Table VI shows the calculation results of the utility value (Si) and utility degree (Ki) of each criterion and alternative.

$$S_0 = 0.067 + 0.043 + 0.048 + 0.031 + 0.027 = 0.216$$

$$S_1 = 0.033 + 0.039 + 0.033 + 0.022 + 0.022 = 0.149$$

$$S_2 = 0.053 + 0.030 + 0.048 + 0.016 + 0.027 = 0.174$$

$$S_3 = 0.067 + 0.013 + 0.019 + 0.022 + 0.027 = 0.148$$

$$S_4 = 0.013 + 0.043 + 0.024 + 0.028 + 0.019 = 0.128$$

$$S_5 = 0.067 + 0.030 + 0.029 + 0.031 + 0.027 = 0.184$$

$$K_1 = 0.149 / 0.216 = 0.691$$

$$K_2 = 0.174 / 0.216 = 0.806$$

$$K_3 = 0.148 / 0.216 = 0.684$$

$$K_4 = 0.128 / 0.216 = 0.591$$

$$K_5 = 0.184 / 0.216 = 0.852$$

TABLE VI. UTILITY VALUE AND UTILITY DEGREES

Alternatives	C1	C2	C3	C4	C5	Si	Ki
A0	0.067	0.043	0.048	0.031	0.027	0.216	
A1	0.033	0.039	0.033	0.022	0.022	0.149	0.691
A2	0.053	0.030	0.048	0.016	0.027	0.174	0.806
A3	0.067	0.013	0.019	0.022	0.027	0.148	0.684
A4	0.013	0.043	0.024	0.028	0.019	0.128	0.591
A5	0.067	0.030	0.029	0.031	0.027	0.184	0.852

5) Determine the ranking of the calculation results

The final result of the calculation can be seen in Table VII.

TABLE VII. RANKING ALTERNATIVES

Alternatives	Ki	Ranking
A1	0.691	3
A2	0.806	2
A3	0.684	4

A4	0.591	5
A5	0.852	1

F. Result and Evaluation

Fig. 2 shows that alternative A5 ranks with the largest value of 0.852, then the second-ranking alternative A2 with a value of 0.806, alternative A1 ranks 3rd with a value of 0.691, 4th alternative A3 ranks with a value of 0.684, and the smallest value is A4 of 0.591.

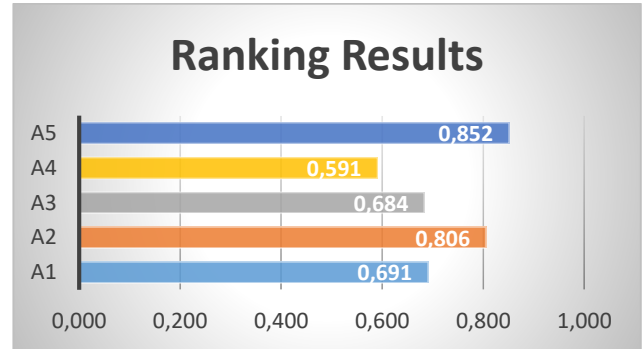


Fig. 2. Ranking Graph Result

IV. CONCLUSION

The results of the study show that the Additive Ratio Assessment method can provide recommendations in the form of ranking lecturers with performance values from the highest to the lowest. The criteria used in this study are benefit criteria, where in determining the model the higher the criterion value will make a better contribution to the model. Furthermore, the model can be implemented in the application, making it easier for users to use the model that has been developed.

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Additive Ratio Assessment Model for Lecturer Performance Evaluation

by M Miftakul Amin

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Additive Ratio Assessment Model for Lecturer Performance Evaluation

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Lecturers have a major contribution to the quality of higher education. One indicator of lecturer productivity is by looking at the performance that has been carried out. The higher the performance of lecturers, the higher the productivity and performance of education institutions levels. This study aimed to develop a lecturer performance evaluation model, as another alternative in evaluating lecturer performance, in addition to using the Lecturer Performance Load (BKD) which has been carried out every semester. The method used in this study was the Additive Ratio Assessment (ARAS). Based on the intuitive principle that the alternative must have the largest ratio to produce the optimal solution. This study used 5 alternatives, namely teaching activities, research activities, community service activities, supporting activities, and discipline. The results obtained show that this model has been able to provide recommendations in the form of lecturer performance rankings, from those with the highest performance to the lowest. The model succeeded in providing recommendations with the highest value of 0.852 and the lowest value of 0.591. The research that has been done, indicated that this model can be an alternative for higher education management to see the performance of lecturers.

Keywords—additive ratio assessment, lecturer performance, decision support system

I. INTRODUCTION

One of the factors that supports the progress of Higher Education is the human resources in it [1]. Lecturers are human resources and an important asset in Higher Education. This encourages management in tertiary institutions to see the performance of lecturers in carrying out the duties of higher education tridharma [2]. Performance is a person's achievements related to his duties. Performance monitoring is used to examine, analyze, and evaluate the performance that has been achieved. Performance measurement can assist management in monitoring and improving performance and can focus on organizational goals to meet the demands of public accountability [3].

The performance of lecturers in tertiary institutions can be seen from the extent to which lecturers carry out the duties of higher education tridharma [4]. Lecturer performance needs to be evaluated regularly thus it can improve lecturer performance [5]. In fact, according to [6] in Higher Education, the process of evaluating the performance of Lecturers is carried out by the Quality Assurance unit. Decision support systems can be used to build lecturer performance evaluations using several methods and algorithms as sub-system models [7]. In general, the use of a decision support system in evaluating lecturer performance will produce recommendations in the form of ranking values from the highest to the lowest [8].

Research conducted by [9] has developed a model to determine the best extension officer using the Additive Ratio

Assessment method. This study uses 5 alternative data and 13 criteria. This study has succeeded in ranking with the highest value of 0.8310 and the lowest ranking value of 0.4734.

The Additive Ratio Assessment method has also been implemented in selecting English course branch locations [10]. A total of 5 criteria are used in this study, namely population density level, access to locations, crowd level, rental costs, and population income. The largest ranking value obtained is 0.1778 and the smallest value is 0.1496.

Selection of the best SMA and SMK has also been carried out by [11] using the additive ratio assessment method. A total of 7 criteria were used to select 8 schools. These criteria are school facility, accreditation status, graduate quality, student achievement, school location, professional human resources, and extracurricular activities. The largest value obtained is 0.122477 and the smallest value is 0.081908.

Research conducted by [12] has developed a selection model of popular mobile games using the Additive Ratio Assessment method. 5 criteria consisting of not containing violence, there being no pornography element, entertainment, game graph, and creativity were used to select 15 games. The largest value is 0.070553 and the smallest value is 0.051287.

Lecturer performance evaluation has also been carried out by [13] who developed a lecturer performance evaluation model using the TOPSIS method. A total of 4 criteria are used in the model, namely educational qualification, learning, number of researches, and the amount of community service. The results showed that, of the 10 alternatives selected, the highest value was 0.704 and the smallest value was 0.185.

II. RESEARCH METHOD

A. Research Stages

Some of the stages carried out in this study can be seen in Fig. 1. The research begins with collecting relevant data, determining criteria and alternatives, determining weighting, decision-maker assessment, additive ratio assessment implementation, and finally the results and evaluation.

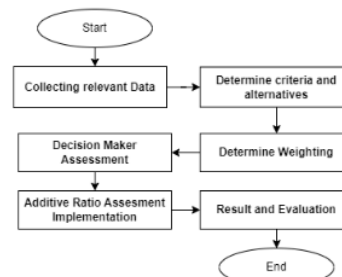


Fig. 1. Research Stages

B. Additive Ratio Assessment Method

The Additive Ratio Assessment (ARA) method was developed by [14] in 2010. This method is based on the intuitive principle that the alternative must have the largest ratio to produce the optimal solution. In the ARAS method, the value of the utility function determines the relative efficiency of the complex of feasible alternatives directly proportional to the relative effect of the value and weight of the main criteria considered in determining the best alternative. According to [15] stated that the ARAS method is part of the Multiple Criteria Decision Making (MCDM). The stages in the ARAS method can be described as follows.

1. Determine the value of the criteria, weights, alternatives, and the optimum value. Giving the optimum value (X_{0j}) by taking into account the criteria for benefits using formula (1) and costs using formula (2).

$$X_{0j} = \frac{Max}{1} \quad (1)$$

$$X_{0j} = \frac{Min}{1} \quad (2)$$

2. Formation of the Decision Making Matrix (DMM), as can be seen in formula (3).

$$X = \begin{bmatrix} x_{01} & \dots & x_{0j} & \dots & x_{0n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & \dots & x_{ij} & \dots & x_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{m1} & \dots & x_{mj} & \dots & x_{mn} \end{bmatrix} \quad (3)$$

Where m is the number of alternatives, and n is the number of criteria. x_{ij} is the criterion value of alternative i , and X_{0j} is the optimum value of criterion j .

3. Normalization of the decision matrix for all criteria uses formula (4) for benefit criteria, and formula (5) for cost criteria. The purpose of normalization is to unite each matrix element thus the elements in the matrix have a uniform value.

$$X_{ij} = \frac{x_{ij}}{\sum_{i=0}^m x_{ij}} \quad (4)$$

$$X_{ij} = \frac{1}{x_{ij}^*}; X_{ij} = \frac{x_{ij}}{\sum_{i=0}^m x_{ij}} \quad (5)$$

4. Calculating the utility value by first determining the optimum value using formula (6) and determining the degree of utility using formula (7).

$$S_i = \sum_{j=1}^n X_{ij}; i=0, m \quad (6)$$

$$K_i = \frac{S_i}{S_0}; i = 0, m \quad (7)$$

5. Determine the results and ranking calculations.

III. RESULTS AND DISCUSSION

A. Collecting Relevant Data

At this stage, observation of data related to lecturer performance is carried out. Higher education tridharma activities are the main focus in evaluating lecturer

performance. In addition, lecturer performance is also related to academic and disciplinary support activities and responsibilities in carrying out various assignments given.

B. Determine Criteria and Alternatives

In this study, several selected criteria were used, as can be seen in Table I. In determining the criteria, the benefit and cost criteria were considered. The benefit criterion is a criterion that the higher the value the better and the cost criterion is a criterion that the higher the value, the worse or lower the value. All selected criteria are categorized in benefits because it is expected that all of them will contribute to high performance. As for the alternatives in the developed model, as many as 5 alternatives are used for model testing.

TABLE I. SELECTED CRITERIA

Criteria	Information	Category
C1	Teaching activities	Benefit
C2	Research activity	Benefit
C3	Community service activities	Benefit
C4	Supporting activities	Benefit
C5	Discipline and Responsibility	Benefit

C. Determine Weighting

Referring to Table II, the highest weight is considered in teaching activities 0.30. Then the next priority is on research and community service activities of 0.20. Meanwhile, in supporting activities, discipline and responsibility have the lowest priority of 0.15. All weights have a value of 1.00.

TABLE II. CRITERIA WEIGHT

Criteria	Information	Weight
C1	Teaching activities	0.30
C2	Research activity	0.20
C3	Community service activities	0.20
C4	Supporting activities	0.15
C5	Discipline and Responsibility	0.15
Total		1.00

D. Decision Maker Assessment

In giving preference values by decision makers using values as in Table III. Table IV shows the preference of decision makers from 5 alternatives that have been normalized.

TABLE III. SCORE PREFERENCES

Score	Information
81 - 100	Very good
61 - 80	Good
41 - 60	Enough
21 - 40	Poor
0 - 20	Very poor

TABLE IV. DECISION MAKER PREFERENCES

Alternatives	Criteria				
	C1	C2	C3	C4	C5
A1	0.50	0.90	0.70	0.70	0.80
A2	0.80	0.70	1.00	0.50	1.00
A3	1.00	0.30	0.40	0.70	1.00
A4	0.20	1.00	0.50	0.90	0.70
A5	1.00	0.70	0.60	1.00	1.00

E. Additive Ratio Assessment Implementation

1) Determine the criteria value, criteria weight, alternative, and optimum value

Establishment of the optimum value in row A0 for criteria C1, C2, C3, C4, and C5 using formula (1). All of the selected criteria are benefit criteria. Table V is the distribution of values in model formation.

TABLE V. OPTIMUM VALUE

Alternatives	Criteria				
	C1	C2	C3	C4	C5
A0	1.00	1.00	1.00	1.00	1.00
A1	0.50	0.90	0.70	0.70	0.80
A2	0.80	0.70	1.00	0.50	1.00
A3	1.00	0.30	0.40	0.70	1.00
A4	0.20	1.00	0.50	0.90	0.70
A5	1.00	0.70	0.60	1.00	1.00
Category	Benefit	Benefit	Benefit	Benefit	Benefit

2) Changing the value of the criteria into a decision matrix

All values in each criterion are represented as a decision matrix. Formula (3) is used in making matrices. As a result, this can be seen in the X matrix.

$$X = \begin{bmatrix} 1.00 & 1.00 & 1.00 & 1.00 & 1.00 \\ 0.50 & 0.90 & 0.70 & 0.70 & 0.80 \\ 0.80 & 0.70 & 1.00 & 0.50 & 1.00 \\ 1.00 & 0.30 & 0.40 & 0.70 & 1.00 \\ 0.20 & 1.00 & 0.50 & 0.90 & 0.70 \\ 1.00 & 0.70 & 0.60 & 1.00 & 1.00 \end{bmatrix}$$

3) Normalization of the decision matrix for all criteria

The selected criteria used in the model are all benefit criteria, thus only formula (5) is used.

Criteria C1:

$$X_{01} = \frac{1.00}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{1.00}{4.50} = 0.222$$

$$X_{11} = \frac{0.50}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{0.50}{4.50} = 0.111$$

$$X_{21} = \frac{0.80}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{0.80}{4.50} = 0.178$$

$$X_{31} = \frac{1.00}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{1.00}{4.50} = 0.222$$

$$X_{41} = \frac{0.20}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{0.20}{4.50} = 0.044$$

$$X_{51} = \frac{1.00}{1.00+0.50+0.80+1.00+0.20+1.00} = \frac{1.00}{4.50} = 0.222$$

Criteria C2:

$$X_{02} = \frac{1.00}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{1.00}{4.60} = 0.217$$

$$X_{12} = \frac{0.90}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.90}{4.60} = 0.196$$

$$X_{22} = \frac{0.70}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.70}{4.60} = 0.152$$

$$X_{32} = \frac{0.30}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.30}{4.60} = 0.065$$

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$$X_{52} = \frac{0.70}{1.00+0.90+0.70+0.30+1.00+0.70} = \frac{0.70}{4.60} = 0.152$$

Criteria C3:

$$X_{03} = \frac{1.00}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{1.00}{4.20} = 0.238$$

$$X_{13} = \frac{0.70}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.70}{4.20} = 0.167$$

$$X_{23} = \frac{1.00}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{1.00}{4.20} = 0.238$$

$$X_{33} = \frac{0.40}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.40}{4.20} = 0.095$$

$$X_{43} = \frac{0.50}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.50}{4.20} = 0.119$$

$$X_{53} = \frac{0.60}{1.00+0.70+1.00+0.40+0.50+0.60} = \frac{0.60}{4.20} = 0.125$$

Criteria C4:

$$X_{04} = \frac{1.00}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{1.00}{4.80} = 0.208$$

$$X_{14} = \frac{0.70}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.70}{4.80} = 0.146$$

$$X_{24} = \frac{0.50}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.50}{4.80} = 0.104$$

$$X_{34} = \frac{0.70}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.70}{4.80} = 0.146$$

$$X_{44} = \frac{0.90}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{0.90}{4.80} = 0.188$$

$$X_{54} = \frac{1.00}{1.00+0.70+0.50+0.70+0.90+1.00} = \frac{1.00}{4.80} = 0.208$$

Criteria C5:

$$X_{05} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

$$X_{15} = \frac{0.80}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{0.80}{5.50} = 0.145$$

$$X_{25} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

$$X_{35} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

$$X_{05} = \frac{0.70}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{0.70}{5.50} = 0.127$$

$$X_{55} = \frac{1.00}{1.00+0.80+1.00+1.00+0.70+1.00} = \frac{1.00}{5.50} = 0.182$$

Then the results are obtained in the form of a normalized matrix as in the following matrix.

$$X_{ij}^* = \begin{bmatrix} 0.222 & 0.217 & 0.238 & 0.208 & 0.182 \\ 0.111 & 0.196 & 0.167 & 0.146 & 0.145 \\ 0.178 & 0.152 & 0.238 & 0.104 & 0.182 \\ 0.222 & 0.065 & 0.095 & 0.146 & 0.182 \\ 0.044 & 0.217 & 0.119 & 0.188 & 0.127 \\ 0.222 & 0.152 & 0.143 & 0.208 & 0.182 \end{bmatrix}$$

Referring to Table II, there is a weight for each criterion as follows.

$$W = [0.30 \ 0.20 \ 0.20 \ 0.15 \ 0.15]$$

To obtain a weighted normalized matrix like the following matrix.

$$X_{ij}^* \cdot W = \begin{bmatrix} 0.067 & 0.043 & 0.048 & 0.031 & 0.027 \\ 0.033 & 0.039 & 0.033 & 0.022 & 0.022 \\ 0.053 & 0.030 & 0.048 & 0.016 & 0.027 \\ 0.067 & 0.013 & 0.019 & 0.022 & 0.027 \\ 0.013 & 0.043 & 0.024 & 0.028 & 0.019 \\ 0.067 & 0.030 & 0.029 & 0.031 & 0.027 \end{bmatrix}$$

4) Calculating Utility Value

This utility value is obtained using formula (6) and formula (7). Table VI shows the calculation results of the utility value (Si) and utility degree (Ki) of each criterion and alternative.

$$S_0 = 0.067 + 0.043 + 0.048 + 0.031 + 0.027 = 0.216$$

$$S_1 = 0.033 + 0.039 + 0.033 + 0.022 + 0.022 = 0.149$$

$$S_2 = 0.053 + 0.030 + 0.048 + 0.016 + 0.027 = 0.174$$

$$S_3 = 0.067 + 0.013 + 0.019 + 0.022 + 0.027 = 0.148$$

$$S_4 = 0.013 + 0.043 + 0.024 + 0.028 + 0.019 = 0.128$$

$$S_5 = 0.067 + 0.030 + 0.029 + 0.031 + 0.027 = 0.184$$

$$K_1 = 0.149 / 0.216 = 0.691$$

$$K_2 = 0.174 / 0.216 = 0.806$$

$$K_3 = 0.148 / 0.216 = 0.684$$

$$K_4 = 0.128 / 0.216 = 0.591$$

$$K_5 = 0.184 / 0.216 = 0.852$$

TABLE VI. UTILITY VALUE AND UTILITY DEGREES

Alternatives	C1	C2	C3	C4	C5	Si	Ki
A0	0.067	0.043	0.048	0.031	0.027	0.216	
A1	0.033	0.039	0.033	0.022	0.022	0.149	0.691
A2	0.053	0.030	0.048	0.016	0.027	0.174	0.806
A3	0.067	0.013	0.019	0.022	0.027	0.148	0.684
A4	0.013	0.043	0.024	0.028	0.019	0.128	0.591
A5	0.067	0.030	0.029	0.031	0.027	0.184	0.852

5) Determine the ranking of the calculation results

The final result of the calculation can be seen in Table VII.

TABLE VII. RANKING ALTERNATIVES

Alternatives	Ki	Ranking
A1	0.691	3
A2	0.806	2
A3	0.684	4

A4	0.591	5
A5	0.852	1

F. Result and Evaluation

Fig. 2 shows that alternative A5 ranks with the largest value of 0.852, then the second-ranking alternative A2 with a value of 0.806, alternative A1 ranks 3rd with a value of 0.691, 4th alternative A3 ranks with a value of 0.684, and the smallest value is A4 of 0.591.

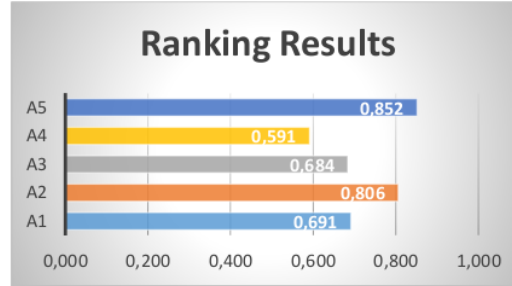


Fig. 2. Ranking Graph Result

IV. CONCLUSION

The results of the study show that the Additive Ratio Assessment method can provide recommendations in the form of ranking lecturers with performance values from the highest to the lowest. The criteria used in this study are benefit criteria, where in determining the model the higher the criterion value will make a better contribution to the model. Furthermore, the model can be implemented in the application, making it easier for users to use the model that has been developed.

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