Series: Advances in Engineering Research

Proceedings of the International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)

PREFACE

Conference: International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)
Date: 29-30 September 2025
Location: Kuala Lumpur, Malaysia (Hybrid)
Website: https://icar25.uptm.edu.my/

This volume presents the proceedings of Track 1 of the 3rd International Conference on Cross-Disciplinary Academic Research (ICAR 2025). Track 1 brings together research that applies computational, systems-based, and scientific approaches to address challenges across technology, engineering, and business-related contexts.

The papers in this volume reflect a diverse range of studies covering computing, information systems, data analytics, artificial intelligence, engineering applications, and applied mathematics. Importantly, several

contributions demonstrate how information technology, digital systems, analytical models are integrated within organisational and business environments, providing scientific evidence to support decision-making, innovation, and performance improvement.

Rather than focusing solely on technical development, the contributions in this track emphasise the use of rigorous scientific and quantitative methods to examine technology-enabled processes, system implementation, and digital transformation across multiple domains. This interdisciplinary perspective highlights the growing convergence between technology and business in contemporary research.

All papers included in this volume underwent a rigorous peer-review process to ensure academic quality, originality, and relevance. The editors would like to express their sincere appreciation to the reviewers for their valuable insights and to the authors for their scholarly contributions. It is hoped that this volume will serve as a meaningful reference for researchers and practitioners working at the intersection of technology, systems, and applied sciences.

Nisrin Ishak
Azwanis Azemi
Siti Munirah Mohd Ali
Noorraha Abdul Razak
Editors-in-Charges

Atlantis Press

Atlantis Press – now part of Springer Nature – is a professional publisher of scientific, technical & medical (STM) proceedings, journals and books. We offer world-class services, fast turnaround times and personalised communication. The proceedings and journals on our platform are Open Access and generate millions of downloads every month.

For more information, please contact us at: contact@atlantis-press.com

Series: Advances in Engineering Research

Proceedings of the International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)

ORGANIZERS

Organizing Chair

Muhammad Nizam Jali

Universiti Poly-Tech Malaysia, Malaysia

Program Chair

Farha Abdol Ghapar

Universiti Poly-Tech Malaysia, Malaysia

Secretaries

Anwary Syuhaily Rosly

Universiti Poly-Tech Malaysia, Malaysia

Norraidah Mat Som

Universiti Poly-Tech Malaysia, Malaysia

Nur Hidayah Zulkefli

Universiti Poly-Tech Malaysia, Malaysia

Treasurer

Azilawati Wan Ahmad

Universiti Poly-Tech Malaysia, Malaysia

Technical Chairs

Fatimah Bibi Hamzah

Universiti Poly-Tech Malaysia, Malaysia

Siti Masitah Ashar

Universiti Poly-Tech Malaysia, Malaysia

Zila Binti Zainal Abidin

Universiti Poly-Tech Malaysia, Malaysia

Mohd Amirul Asyraf Mohd Hanaffi

Universiti Poly-Tech Malaysia, Malaysia

Muhammad Amran

Universiti Poly-Tech Malaysia, Malaysia

Nursyahida Mokhtar

Universiti Poly-Tech Malaysia, Malaysia

Suzilawati Uyob

Universiti Poly-Tech Malaysia, Malaysia

Noor Aida Noh

Universiti Poly-Tech Malaysia, Malaysia

Mohd Zuri Ghani

Universiti Poly-Tech Malaysia, Malaysia

Siti Munirah Mohd Ali

Universiti Poly-Tech Malaysia, Malaysia

Madihatun Zainuddin

Universiti Poly-Tech Malaysia, Malaysia

Benazir Tanjung Fatur Rahman

Universiti Poly-Tech Malaysia, Malaysia

Publication Chairs

Shahri Abu Seman

Universiti Poly-Tech Malaysia, Malaysia

Siti Sakinah Sidik Binti Sidik Khan

Universiti Poly-Tech Malaysia, Malaysia

Noor Huzaiga Ahmad

Universiti Poly-Tech Malaysia, Malaysia

Proceedings Chairs

Nisrin Alyani Ishak

Universiti Poly-Tech Malaysia, Malaysia

Azwanis Azemi

Universiti Poly-Tech Malaysia, Malaysia

Noorraha Abdul Razak

Universiti Poly-Tech Malaysia, Malaysia

Siti Munirah Mohd Ali

Universiti Poly-Tech Malaysia, Malaysia

Publicity

Nan Zakiah Megat Ibrahim

Universiti Poly-Tech Malaysia, Malaysia

Nathasya Mohd Kamal

Universiti Poly-Tech Malaysia, Malaysia

Aida Zuliyana Ahmad Anuar

Universiti Poly-Tech Malaysia, Malaysia

Darlina Baharuddin

Universiti Poly-Tech Malaysia, Malaysia

Nurul Zaitul Itri Alias

Universiti Poly-Tech Malaysia, Malaysia

Azfa Izzah Roslan

Universiti Poly-Tech Malaysia, Malaysia

Innovation Chairs

Noor Maizatulshima Muhammad Sabri

Universiti Poly-Tech Malaysia, Malaysia

Suriza NoorFahmi Hashim

Universiti Poly-Tech Malaysia, Malaysia

Nor Hafiza AbdSamad

Universiti Poly-Tech Malaysia, Malaysia

Wan Rosnah Awang Isa

Universiti Poly-Tech Malaysia, Malaysia

Syatila Che Saruji

Universiti Poly-Tech Malaysia, Malaysia

International Chairs

Syafiq Dhamiri Ayop

Universiti Poly-Tech Malaysia, Malaysia

Ana Salwa Md Zin

Universiti Poly-Tech Malaysia, Malaysia

Muhammad Shazwan Ramli

Universiti Poly-Tech Malaysia, Malaysia

Registration Chairs

Suhaily Mohd Ramly

Universiti Poly-Tech Malaysia, Malaysia

Zaliza Azan

Universiti Poly-Tech Malaysia, Malaysia

Nur Ain Syazmeen Ahmad Zaki

Universiti Poly-Tech Malaysia, Malaysia

Siti Syahida Md Yusup

Universiti Poly-Tech Malaysia, Malaysia

Farihatul Syahidah Ahmad

Universiti Poly-Tech Malaysia, Malaysia

Protocol & Reception

Aida Suhana Abdul Hamid

Universiti Poly-Tech Malaysia, Malaysia

Wan Nor Hidayah Wan Afandi

Universiti Poly-Tech Malaysia, Malaysia

Farra Sha Wanne Jumuddin

Universiti Poly-Tech Malaysia, Malaysia

Siti Norshaheera Shahabuddin

Universiti Poly-Tech Malaysia, Malaysia

Mohd Azidee Mohammad Zin

Universiti Poly-Tech Malaysia, Malaysia

Logistic Chairs

Mohd Firdaus Osman

Universiti Poly-Tech Malaysia, Malaysia

Fazrul Radzi Shaharom

Universiti Poly-Tech Malaysia, Malaysia

Refresments Chairs

Norhaninah A Gani

Universiti Poly-Tech Malaysia, Malaysia

Hinissa Mohd Tahir

Universiti Poly-Tech Malaysia, Malaysia

Sponsorship Chairs

Azahari Jamaludin

Universiti Poly-Tech Malaysia, Malaysia

Mohamed Suhaimi Yusof

Universiti Poly-Tech Malaysia, Malaysia

Website & Design

Hafiz Al-Amirul Bin Mohd Zainal

Universiti Poly-Tech Malaysia, Malaysia

Amir Aarief Bin Amir Hussin

Universiti Poly-Tech Malaysia, Malaysia

IT Unit

Mohd Firdaus Mohamed Azmi

Universiti Poly-Tech Malaysia, Malaysia

Rasman Jumarlang

Universiti Poly-Tech Malaysia, Malaysia

Miswan Samri

Universiti Poly-Tech Malaysia, Malaysia

Md Fazil Shahibol Bahar

Universiti Poly-Tech Malaysia, Malaysia

Technical Committee

Rani Eka Diansari

Universitas PGRI Yogyakarta

H.Arsyad Junaiddin

University of Sulawesi Tenggara

Zuraini Hashim

University Kuala Lumpur-Malaysia France Institute

NURUL IZYAN MAT DAUD

Universiti Malaysia Kelantan

HJoko Tri Brata

Universitas Sulawesi Tenggara

Ilham

Universitas Sulawesi Tenggara

Samar Abdelaziz Adel Abdeen

University Of Taibah

Lou-Rena SBoquila

Pamatasan ng Lungsod ng Maynila

Reyiel Pela-Tecson

Pamantasan ng Lungsod ng Maynila, Philippines

Jennifer Monje

Pamantasan ng Lungsod ng Maynila, Philippines

Lalaine AIsip

Pamantasan ng Lungsod ng Maynila, Philippines

Reyiel Pela-Tecson

Pamantasan ng Lungsod ng Maynila, Philippines

Series: Advances in Engineering Research

Proceedings of the International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)

21 articles

Proceedings Article

Peer-Review Statements

Nisrin Alyani Ishak, Azwanis Azemi, S. Munirah Mohd Ali, Noorraha Abdul Razak

All of the articles in this proceedings volume have been presented at the International Conference on Multi-disciplinary Academic Research 2025 (ICAR2025) - Advances in Computing, Electronics, Engineering, and

Mathematics (Track 1) during 29-30 September 2025 in Kuala Lumpur Malaysia. These articles...

Article details

Download article (PDF)

Proceedings Article

A Comparative Experimental Evaluation of YOLOv5, YOLOv7, and YOLOv8 for Object Detection

Airuddin Ahmad, Haw Ying Song

The purpose of this comparative study is to investigate the differences between the YOLOv5, YOLOv7, and YOLOv8 when detecting specific objects. Therefore, this study will focus on examining the precision performance, recall capabilities, IoU performance, and the balance between precision and recall of...

Article details

Download article (PDF)

Proceedings Article

Acceptance of TRIZ Methodology Problem-Solving in Computing Education: Qualitative Study

Nurkhuzaimah Fazreen Mohd Jalaluddin, Saffa Raihan Zainal Abidin, Nursyahida Mokhtar, Nor Anis Asma Sulaiman, Shaiful Bakhtiar Rodzman, Mohd Khairul Ikhwan Zolkefley

Advanced technology nowadays must be parallel with human ability to solve problems. However, some of the problem-solving approaches or methodologies must be used to overcome the advancement of technology. One of the methods that can be used is the theory of inventive problem solving which is TRIZ, that...

Article details

Download article (PDF)

Proceedings Article

AI4Ekonomi for Economic Empowerment in Malaysia

Nor Hafiza Haron, Nor Hafiza Abd Samad, Jihadah Ahmad, Nadiah Yusof, Khairatul Alyani Badari

Poverty remains a critical challenge for low-income households (B40) in Malaysia, with traditional economic aid often being too general to address the specific needs of these families. This paper proposes an Artificial Intelligence (AI)-based recommender system designed to empower low-income households...

Article details

Download article (PDF)

Proceedings Article

An Approach for a Low-Cost and Enhanced Safety of An Animal Feed Pellet-Making Machine for Small-Scale Users

Aniq Nor Rahimi Bin Abu Seman, Muhammad Sobri Bin Mohd Idzwan, Nadhirah Binti Ismail, Fadhil Ashraf Bin Muhammad, Siti Rohana Binti Ahmad

This project focuses on developing an improved animal feed pellet machine that is affordable, ergonomic, and safe for small-scale animal breeders and new-comers. It addresses the high cost and lack of safety features in existing machines. This project introduces a portable, electrically powered machine...

Article details

Download article (PDF)

Proceedings Article

C.A.T.E.: A Multimodal AI Agent for Context-Aware and Bilingual Learning in Technical Education

Siti Robaya Jantan, Ummi Haani Shahrul, Roslinda Murad

The new large language models (LLMs), it is impressive in their generality, remain inadequate in terms of context-awareness, tool integration, and real-time flexibility that technical education requires. We offer a solution to this problem by introducing C.A.T.E. (Compiler Assistant for Technical Enhancement),...

Article details
Download article (PDF)

Proceedings Article

Comparison of the Use of M-Bit Least Significant Bit Steganography Methods on WAV Files in Information Storage

Imelda Imelda, Mardi Hardjianto

Audio-based digital steganography involves embedding secret messages within audio content without causing noticeable changes to the original sound. This technique is important to ensure the security of digital audio data distribution in the era of massive information dissemination. The limitations of...

Article details
Download article (PDF)

Proceedings Article

Design and Pilot Evaluation of SmartCode Tutor (SCT): A Mixed-Methods Framework for AI-Assisted Introductory Programming in Higher Education

Nor Zakiah Lamin, Wan Nor Asnida Wan Jusoh, Wan Asiah Wan Muhamad Tahir, Siti Faizah Miserom, Abdullah Mohd Zin

Generative AI and AI coding assistants such as large language model–ba tutors and IDE copilots can provide immediate, personalized feedback fo novice programmers, but unstructured use risks shallow learning and academic integrity issues. This paper presents SmartCode Tutor (SCT), a structured, AI-enhanced...

Article details

Download article (PDF)

Proceedings Article

Development and Evaluation of an AI-Powered Text-to-Speech Application to Support Literacy and Dyslexia Awareness

Shima Sabri, Siti Robaya Jantan, Nor Hafiza Abd Samad, Hairul Haikal Haliza

Dyslexia is a neurodevelopmental condition characterized by persistent difficulties in reading, numeracy, and problem-solving skills. Although there is no specific medication to cure dyslexia, various intervention strategies have been developed to enhance affected individuals' learning abilities and...

Article details

Download article (PDF)

Proceedings Article

Enhancing Secondary Students' Conceptual Understanding of 3D Geometry through a Pedagogically-Driven Integration of Augmented Reality and Internet of Things

Mariani Mohd Dahlan, Zaharah Zainal Abidin, Siti Robaya Jantan, Ab Arif Sanusi Arifin, Syazalinah Wasli

This research investigates the integration of Augmented Reality (AR) and Internet of Things (IoT) technologies in teaching three-dimensional (3D) geometry to lower secondary students in Malaysia. By combining interactive AR features with real-time data from temperature sensors, the research aimed to...

Article details

Download article (PDF)

Proceedings Article

Experimental Analysis of Random Forest-Based Classification for Adaptive Network Attack Detection

Hillman Akhyar Damanik, Merry Anggraeni

The evolution of modern cyberattacks has introduced increasingly adaptive and dynamic behaviors that challenge conventional security mechanisms. Adaptive attacks employ strategies such as randomized timing intervals, unconventional source ports, and multi-vector techniques, allowing them to bypass traditional...

Article details

Download article (PDF)

Proceedings Article

Factors Affecting Electrical and Electronic Product Acceptance

Noraslinda Fauzi, Kamal Imran Mohd Sharif, Mohamad Ghozali Hassan, Mohamed Suhaimi Yusof, Syafiza Hanim Said

This study investigated factors influencing the acceptance of electrical and electronic products among Malaysian consumers, aiming to enhance awareness and understanding of these factors. Using quantitative analysis and quota sampling, data were collected from 488 respondents through questionnaires....

Article details

Download article (PDF)

Proceedings Article

Functionality, Reliability and Satisfaction: A Users' Retrospective Evaluation of the UPTM's Class Attendance Management & Monitoring (UCAM) System

Noornajwa Md Amin, Siti Robaya Jantan, Farah Farzana Abdul Aziz, Raznida Isa, Noraliza Azizan, Siti Fajar Jalal

This research paper is related to the evaluation of the UPTM Class Attendance Management & Monitoring (UCAM) system in assessing items related to system functionality, data reliability, perception of effectiveness, and user satisfaction, and its role in class monitoring using a purposive sampling...

Article details

Download article (PDF)

Proceedings Article

Gamified Blended Learning for Personalized Engagement in Smart Education- A Conceptual Paper

Mohd Khairul Nizar Maula Muhamad Akhir, Muhd Hafizuddin Azmi, Muhammad Rifdi Shah Che Dawud Adli

The Fourth Industrial Revolution (4IR) is reforming the educational landscape via integration of artificial intelligence (AI), virtual reality (VR), and gamification. Blended learning as an educational model combines face-to-face instruction with digital platforms, offers flexibility and accessibility...

Article details

Download article (PDF)

Proceedings Article

Hydro BloomSystem: Smart Greenhouses for Climate-Resilient Food

Mohammad Norouzzadeh, Sepideh Firoozeh

The accelerating global demand for food (Gerten et al. (2020) - Feeding Ten Billion People), dwindling natural resources, intensifying climate change, and

mounting pressure on land productivity have rendered traditional agricultural models increasingly inadequate. In response, innovative production systems...

Article details

Download article (PDF)

Proceedings Article

Identifying Factors Influencing Student Academic Performance Using Feature Selection Method by Weight in Private Higher Institution

Emi Amielda Binti Ahmad Mokhtar, Nik Nur Syazreen Binti Nik Rohaimi, Suriana Binti Ishak, Noor Farah Wahida Binti Abdul Rashid, Hazrina Binti Tajudin, Syahirah Binti Abdul Kadir

Low academic achievement is a significant issue for higher educational institutions, hindering their ability to equip students with the necessary skills to succeed in a competitive and rapidly evolving society. At private higher education institutions in Malaysia, students are required to achieve a minimum...

Article details

Download article (PDF)

Proceedings Article

Optimizing School Resource Allocation in Lima Puluh Kota Regency through Random Forest Classification of Clustered Student Enrollment Trends

Lestari Margatama, Yopie Hidayat, Indra Riyanto

The pattern of changes in student numbers in public elementary schools is a strategic issue that affects the effective distribution of educational resources, particularly in Lima Puluh Kota Regency. Imbalances in student growth or decline across schools can impact the need for teaching staff, classroom...

Article details

Download article (PDF)

Proceedings Article

Text Clustering as A Computational Approach for Analyzing the Framing of Election News on Detik.com

Atik Ariesta

This research develops a computational approach based on text clustering to analyze election news framing on the Detik.com portal. In the context of elections, media framing becomes an essential instrument in shaping public opinion towards political issues and actors. This research applies the K-Means...

Article details

Download article (PDF)

Proceedings Article

The Al-Qur'an Skyline Model for the Horizon of High-Rise Buildings in Urban Areas: A Case Study of the Nusantara Capital City (IKN) Region, Kalimantan

S. Anggraeni Dyah, Putri Suryandari

The development of Indonesia's new capital city (IKN) in Kalimantan presents an opportunity to introduce an architectural approach that is not only modern and sustainable but also reflects spiritual values and local cultural identity. This study proposes the concept of the "Al-Qur'an Skyline" as a city...

Article details

Download article (PDF)

Proceedings Article

The Ethical Use of AI Technology Applications among IPM Students in Malaysia

Mohammad Khairuddin Majidillah, Mohd Erfino Johari, Adila Abdullah, Norfarahin Amat Adnin, Saifuddin Mohtaram, Norazmi Anas, Amran Abdul Halim, Anaztasia Natasha Muhamad Ramlan

The increasing use of artificial intelligence (AI) applications in education presents both benefits and ethical challenges. This study investigates the ethical use of AI among students in institutions under the Majlis Amanah Rakyat Education System (IPMA), including UPTM, UniKL, KPTM, and KPM. A quantitative...

Article details
Download article (PDF)

Proceedings Article

The Impact of Perceived Ease of Use on Digital Marketing Adoption Among Malaysian SME

Hidayahtul Khusna Binti Abdul Malik, Zaidatulnisha Ab Jalil, Norhaninah Binti A. Ghani

This study investigates the impact of perceived ease of use (PEOU) on digital marketing adoption among Malaysian small and medium enterprises (SMEs). While digital marketing offers significant opportunities for business growth, adoption among SMEs remains uneven, particularly due to individual perceptions...

Article details
Download article (PDF)

Series: Advances in Engineering Research

Proceedings of the International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)

PUBLISHING INFORMATION

Bibliographic information:

Title
Proceedings of the International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)

Editors
Nisrin Alyani Ishak
Azwanis Azemi
Siti Munirah Mohd Ali
Noorraha Abdul Razak

Part of series
AER

Volume
296

ISSN
2352-5401

ISBN
978-94-6239-636-4

Indexing

All articles in these proceedings are submitted for indexation in **CPCI**, **CNKI** and **Google Scholar**. Note that in case you need information about the indexation of these proceedings, please check with the organizers of the conference as we cannot reply to messages received from participants.

Free Access

In order to increase the visibility of this conference and of the papers from its participants, this conference has chosen to sponsor the online publication of the conference papers. Therefore, all conference papers can be read and downloaded **for free**; no subscription or other payment is required.

Copyright

DOIs

Each article that is published in these proceedings is assigned a **Digital O Identifier** (DOI). DOIs are standardized digital identities which can be use cite and link to electronic content. A DOI is guaranteed to never change, so can be used as a persistent identifier to permanently link to an electronic article no matter where it is stored. More information on how to cite and use DOIs can be found here.

Permanent Archiving

Atlantis Press is committed to the **permanent availability** and **preservation** of scholarly research and to ensure **accessibility** to this research by converting and upgrading digital file formats to comply with new technology standards. Besides maintaining its own digital archive, Atlantis Press therefore collaborates with the National Library of the Netherlands which permanently archives all Atlantis Press content in their "**e-Depot**". All proceedings are uploaded to this e-Depot after publication to guarantee permanent archiving of the articles.

Print Copies

In case you wish to have **printed copies** of these proceedings you can order these directly from our partner Curran Associates.

Text Clustering as A Computational Approach for Analyzing the Framing of Election News on Detik.com

Atik Ariesta

Budi Luhur University, South Jakarta 12260, Indonesia
atik.ariesta@budiluhur.ac.id

Abstract. This research develops a computational approach based on text clustering to analyze election news framing on the Detik.com portal. In the context of elections, media framing becomes an essential instrument in shaping public opinion towards political issues and actors. This research applies the K-Means algorithm to group news based on the similarity of text patterns in news titles, using TF-IDF weighting for feature representation. Data were collected through web scraping from the news.detik.com/pemilu channel between June 2023 and January 2024, resulting in more than 16,000 news items for analysis. This research also includes the development of a web application prototype using the Flask framework, which automates the text clustering process and supports framing analysis. This application offers features for exploring clustering results and word cloud visualization, enabling researchers to identify framing elements based on Entman's theory—specifically, defining problems, diagnosing causes, making moral judgments, and recommending treatments. Cluster quality evaluation was conducted using the Davies-Bouldin Index (DBI), which yielded consistent cluster results and warranted further analysis. The results indicate that the clusters formed represent various news patterns, such as candidate support narratives, coalition dynamics, and election regulations. This research not only offers a quantitative approach to media framing analysis but also produces an intelligent system-based tool that can be replicated in other political text studies. The findings broaden the understanding of the application of text mining techniques for media framing analysis in the realm of digital political communication.

Keywords: text clustering, media framing, election, k-means, web application

1 Introduction

The media plays a vital role in shaping public understanding of political issues, especially during elections. Framing in news reporting is a technique that highlights certain aspects of reality while minimizing others to influence how the public views an issue. Entman (1993) Framing theory identifies four main functions in media discourse: defining problems, diagnosing causes, making moral judgments, and proposing solutions.

In the context of reporting on the 2024 Indonesian general election, Detik.com, a leading online news outlet, has become a primary source of political information for the public. The media plays a vital role in shaping public perceptions of candidates,

N. A. Ishak et al. (eds.), *Proceedings of the International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)*, Advances in Engineering Research 296,
https://doi.org/10.2991/978-94-6239-636-4_18

political issues, and election results. As one of the most influential news sites in Indonesia, Detik.com significantly influences public opinion. According to data from Similarweb, Detik.com ranks second in the News & Media Publisher category for website visits.

Although online news media have a significant influence on political perceptions, research on elections in Indonesia has focused mainly on qualitative framing analysis or text classification methods such as sentiment analysis. Few studies have integrated computational unsupervised learning classification methods with framing theory to identify framing in election headlines. This gap is evident in the context of Indonesian-language media and large-scale online news outlets.

This research used an unsupervised learning approach, specifically the K-Means algorithm, because this algorithm is one of the most popular and easily understood clustering methods (Hasan et al., 2022; Ikotun et al., 2023). Previous research has shown that K-Means is effective in clustering Bangla-language news documents using the TF-IDF approach. Simanjuntak et al. (2023) Also applied K-Means to analyse clusters of text data from social media, specifically Twitter. Their results showed dominant clusters related to economics, politics, social issues, and sports. The analysis was conducted using Orange Data Mining, including lexicon-based sentiment analysis. Disayiram & Rupasingha (2022) examined the application of clustering algorithms to group English-language news articles into five main categories: politics, sports, health, technology, and business. News articles were converted into vectors using the TF-IDF method, then clustered using three algorithms: Expectation-Maximization (EM), Simple K-Means, and Hierarchical Clustering. Evaluation using WEKA showed that the EM algorithm provided the highest accuracy of 88.5%. This research also concluded that news content provided more accurate clustering results than using news headlines alone. Hamami & Dahlan (2024) developed an online news segmentation system based on the K-Means algorithm combined with the Elbow method. This system groups news based on content similarity from the Detik news portal. The number of clusters changes daily following emerging topic trends, and the segmentation results are visualized through a web application, making it easier for users to access popular topics without having to read the entire news story.

Although previous research has demonstrated the effectiveness of clustering algorithms such as K-Means for topic detection and news segmentation, most studies have emphasized thematic grouping rather than media interpretation. This results in clustering results rarely being linked to framing construction. Integrating classification with Entman's framing theory enables the identification of framing structures beyond topic clustering.

Ashfaq et al. (2022) examined the use of framing in Pakistani media coverage of political protests spread on Twitter. They collected 498 tweets from three major media outlets (Dawn, The News, and Express Tribune) between October 20 and November 20, 2019. They conducted a quantitative framing analysis based on thematic and episodic categories, tweet types, and subject matter. Meanwhile, a study by Anggoro et al. (2023) analyzed media framing of women's representation as Indonesian presidential candidates in 2024 using Robert Entman's model and a qualitative approach. The analysis was conducted on articles from Republika.com and Sindonews.com. The results

show that Sindonews.com highlights the presence of female candidates positively, but is still limited to gender stereotypes as vice presidential candidates. At the same time, Republika.com places greater emphasis on electability and objective party support. Both media outlets contribute to shaping public perception of female candidates, despite bias in their reporting.

Existing framing research has largely relied on manual analysis and qualitative interpretation, yielding rich contextual insights but limiting scalability and efficiency. In contrast, computational approaches allow for large-scale processing of news data. However, research aligning clustering results with framing theory for Indonesian online news media remains rare.

In general, framing analysis is still primarily conducted manually, which is time-consuming and tends to be subjective. Therefore, computational approaches such as text clustering are needed to provide a more efficient and objective analysis alternative. Furthermore, the development of a web-based application prototype that can automate news processing and facilitate systematic framing analysis is also needed.

Therefore, this study aims to apply the K-Means Clustering algorithm to group Detik.com news headlines related to the 2024 Indonesian elections, use the Clustering results to identify framing using Entman's framing theory, and develop a web-based prototype to support the Clustering process and framing analysis. The contribution of this study is to operationalize framing theory within a computational framework and to apply unsupervised learning and text mining to political communication analysis.

2 Methodologies

2.1 Research Framework

This research adopts the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology, which consists of: Business Understanding, Data Understanding, Data Preparation, Modelling, Evaluation, and Implementation (Wirth & Hipp, 2000).

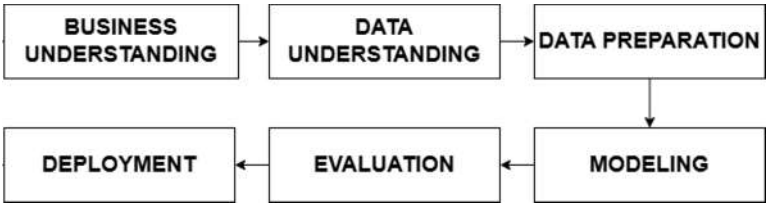

Fig. 1. CRISP-DM Steps

The first step is business understanding. In this step, the researcher determines the research objectives and identifies the problem to be solved. In this research, the problem identification is the clustering of election news for the analysis of election news framing on the election news website, news.detik.com/pemilu. Framing is conducted to under-

stand how the mass media actively selects and emphasizes certain aspects to shape public perception (Yazmi et al., 2024). This step will result in the determination of the main research problem related to the clustering of election news texts for framing analysis.

The second step is data understanding. Election news was collected from news.detik.com/pemilu using web scraping. The procedure for automatic extraction of data from websites using software (Khder, 2021). The tool used is a web scraper, an add-on for Google Chrome. The data to be collected covers news from June 2023 to January 2024. This timeframe was chosen because this period is the lead-up to the presidential and vice-presidential elections, which are characterized by escalating political issues, campaign strategies, and high media attention to the democratic process.

The third step is data preparation. Researchers conduct text processing, consisting of tokenization, stop word removal, and stemming (Jo, 2019). The text to be processed is a news headline. Tokenization involves removing special characters and numbers, converting to lowercase, and breaking the text based on whitespace. Stop word removal involves removing irrelevant words that frequently appear in the text, such as prepositions and conjunctions. Stemming is performed based on the results of stop word removal. Stemming converts each token containing an affix into its root form. The stemming process uses Sastrawi, the most appropriate stemmer for Indonesian (Firman Sodiq et al., 2022). After data processing, researchers weigh words using Term Frequency-Inverse Document Frequency (TD-IDF). The output of the third step is a news headline that has undergone text processing and a TF-IDF weight matrix for each word in the headline. After the processing stage, the dataset is checked for duplicate titles and incomplete notes. The inspection results indicated that no duplicate data was identified, and all collected news titles met the criteria to move to the next stage. As a result, the total number of news titles remains unchanged after pre-processing, totaling 16,259 titles from June 2023 to January 2024.

The fourth step is modelling. Researchers cluster the headlines, which have already received their weighted values. Before carrying out the clustering process, the optimal k value is determined using the elbow method. The elbow shape of the elbow method graph is the k value that will be used to determine the cluster value. The output of this step is the optimal number of clusters determined using the elbow method, and news title clustering is carried out based on the TF-IDF value. The K-Means algorithm works by randomly initializing k cluster centers and then allocating each data item to a cluster based on its proximity to the nearest cluster center (Widaningrum et al., 2022).

Although K-Means is more efficient and widely used, it has several limitations, including sensitivity to the initial selection of centroids, which can cause clustering results to vary over the course of the process. Additionally, K-means assumes spherical cluster shapes and equal cluster sizes, so it does not fully capture the semantic relationships in political news headlines. Research by Khan et al. (2024) emphasize that K-Means is strongly influenced by outliers and requires determining the number of clusters (K), which affects the quality of clustering and the level of interpretation. Furthermore, research by Li et al. (2024) and Semoglou et al. (2025) stated that the K-Means algorithm is less suitable for high-dimensional text data without determining appropriate parameters. Therefore, the existing limitations are taken into consideration when interpreting the results and framing the analysis.

The fifth step is evaluation. Clustering results are evaluated using the Davies-Bouldin Index (DBI) to measure the quality and suitability of the clusters generated by the K-Means algorithm. The DBI for a given cluster is calculated as the ratio of Intra-Cluster Dispersion to Inter-Cluster Distance using Euclidean Distance (Anita & Aliando, 2022). The result of this step is the DBI value for each dataset. DBI offers an objective and quantitative way to evaluate clustering by measuring the similarity and separation of clusters. This approach is suitable for the K-Means Clustering method (Chicco et al., 2025). DBI has been demonstrated as a useful tool for assessing clustering performance in text data by identifying clusters that are internally scattered and close to other clusters (Ikotun et al., 2025). According to Hassan et al. (2024), the clustering validity index, including DBI, is a key tool for determining the optimal number of clusters and comparing classification results. Using DBI for evaluation ensures that the chosen clustering method has good internal cohesion and separation, which supports interpretation in text-based analysis.

The sixth step is deployment. In this step, researchers select the cluster with the most significant amount of data each month. From these selected clusters, researchers identify the framing dimensions and framing elements. The framing dimensions include issue selection and aspect emphasis. The framing elements include defining the problem, diagnosing the cause, making moral judgments, and recommending treatment. Defining the problem involves clarifying the issue, showing how a research issue can be viewed, and identifying the nature of the problem. Diagnosing the cause involves estimating the source of the problem, understanding the events caused by other events, and pinpointing the actors responsible. Making moral judgments involves evaluating the moral values used to legitimize or delegitimize actions. Treatment recommendations consist of proposed solutions and pathways to address the issue (Boer et al., 2020). The outcome of this step is the framing dimensions and framing elements in election news. Alignment between cluster themes and Entmant's framing theory is conducted to enhance the validity of framing analysis results and minimize subjective bias in the qualitative interpretation of cluster findings.

2.2 Prototype

A web-based prototype was developed using the Flask framework. It features tools for text processing, text clustering, and framing data analysis. The prototype serves as a platform for exploring framing patterns in political news. The prototype integrates several functional modules, including media input data management, text preprocessing (tokenization, stop word removal, and stemming), TF-IDF vectorization, K-Means clustering, and framing analysis visualization. The system architecture allows users to upload news data, run a dynamic clustering process, and examine dominant clusters and their corresponding framing elements. This prototype is designed to support reproducibility and facilitate exploratory analysis for researchers and media analysts.

3 Result and Discussion

3.1 Data Collection

Data shows a significant upward trend from June 2023 to January 2024, with the initial count of 1,194 cases almost tripling to 3,111. A sharp spike happened from September to December 2023, indicating rapid growth during that period. Overall, the total for the eight months reached 16,259.

Table 1. Number of news stories per month

No	Month Year	Amount
1	Juni 2023	1.194
2	Juli 2023	1.279
3	Agustus 2023	1.613
4	September 2023	1.910
5	Oktober 2023	2.308
6	November 2023	2.185
7	Desember 2023	2.659
8	Januari 2024	3.111
Total		**16.259**

Table 2 presents the attributes produced from web scraping on the Detik.com website, specifically news.detik.com/pemilu. Eight attributes were collected using the Google Chrome web scraper tool.

Table 2. Attribute Scrapping

No	Attribute	Description
1	*web-scrapper-order*	The sequence of web scraper tools scraping news data
2	*web-scrapper-start-url*	The initial URL link of the web scraper scraping news data
3	News	Contains the date and title of the scraped news story
4	news-href	The URL link of the scraped article/news story
5	Title	The title of the scrapped article
6	Date	The date of the scrapped article
7	NewsPicture-*src*	The main image link of the scraped news story
8	PictureCaption	The short text of the main image scraped
9	NewsContent	The content of the scraped news story
10	Page	The page of the scrapped news story in the news list
11	Page-*href*	The URL link of the scraped news story

Table 3 lists the attributes used for clustering: News Date, News Title, News Link, News Image Link, and News Content. These attributes were chosen based on the requirements of the news framing analysis. The clustering focused on the news title at-

tribute because titles often include keywords and the media's perspective, which indicate framing direction. As a result, titles are very useful for identifying the topic and framing elements in the analysis.

Table 3. Attributes Used

No.	Dataset Attribute	Description
1	Date	News Date
2	Title	News Title
3	News Link	News Link
4	Picture Link	News Main Image Link
5	News Content	News Content

Table 4 is the Detik news dataset for June 2023, which represents one of the eight datasets generated.

Table 4. Detik News Research Dataset for June 2023

Date	Title	News Link	Image Link	News Content
6/1/2023	Romahurmuziy: Sandiaga Uno Sudah 96 Persen Gabung PPP	https://news.detik.com/pemilu/d-6749932/romahurmuziy-sandiaga-uno-sudah-96-persen-gabung-ppp	https://akcdn.detik.net.id/community/media/visual/2023/06/01/romahurmuziy_169.jpeg?w=700&q=90	Jakarta - The Chairman of the United Development Party (PPP) Advisory Council, Romahurmuziy, stated that Sandiaga Uno is just waiting for the right moment to join the PPP. Romy also stated that Sandi is 96 percent certain to join the PPP…….
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
6/30/2023	Beredar SE Walkot Depok Soal Penertiban Spanduk hingga Atribut Partai	https://news.detik.com/pemilu/d-6799957/beredar-se-walkot-depok-soal-penertiban-spanduk-hingga-atribut-partai	https://akcdn.detik.net.id/community/media/visual/2023/06/23/walkot-depok-m-idris-devi-detikcom_169.jpeg?w=700&q=90	Jakarta - The Chairman of the United Development Party (PPP) Advisory Council, Romahurmuziy, stated that Sandiaga Uno is just waiting for the right moment to join the PPP. Romy also stated that Sandi is 96 percent certain to join the PPP…….

3.2 Text Processing

Text processing started with tokenization, stop word removal, and stemming. The attribute used in the study was the title. Table 5 shows an example of removing special characters and numbers, converting to lowercase, and tokenization (Jo, 2019).

Table 5 shows the text processing of the initial title, which is then transformed by removing special characters and numbers and converting it to lowercase. The Transform Text column displays the removal of special characters such as double quotation marks ("") and colons (:), and the text has been converted to all lowercase. The Tokenization column shows the results of splitting the news titles into tokens based on whitespace.

Table 5. Transform and Tokenize News Titles

Initial Title	Transform Text	Tokenization
Criticizing Jokowi, Puskapol UI: The Excuse of "cawe-cawe" Pilpres is for "Nation and State" a Cliché Excuse	criticizing jokowi puskapol ui excuse cawecawe pilpres for nation and state cliché excuse	[‘criticizing’, ‘jokowi’, ‘puskapol’, ‘ui’, ‘excuse’, ‘cawecawe’, ‘pilplres’, ‘for’, ‘nation’, ‘and’, ‘state’, ‘cliché’, ‘excuse’]

Table 6 shows the results of tokenization, which will undergo stopword removal. As seen in the Stopword Removal column, the words "untuk," "cawecawe," and "dan," which are conjunctions, are no longer present. Stemming also merges tokens into a single sentence.

Table 6. Stopword Removal News Title

Tokenization	Stopword Removal
[‘criticizing’, ‘jokowi’, ‘puskapol’, ‘ui’, ‘excuse’, **‘cawecawe’**, ‘pilplres’, **‘for’**, ‘nation’, **‘and’**, ‘state’, ‘cliché’, ‘excuse’]	[‘criticizing’, ‘jokowi’, ‘puskapol’, ‘ui’, ‘excuse’, ‘pilplres’, ‘nation’, ‘state’, ‘cliché’, ‘excuse’]

Table 7. Stemming News Title

Stopword Removal	Stemming
[‘criticizing’, ‘jokowi’, ‘puskapol’, ‘ui’, **‘excuse’**, ‘pilplres’, ‘nation’, ‘state’, ‘cliché’, ‘excuse’]	criticizing jokowi puskapol ui excuse pilpres nation state cliche excuse

Table 7 displays the stemming results after stop word removal and combining each token into a sentence. Following stemming, the word "alasan" is replaced with its root word, "alas," as shown in the stemming column.

The next step in text processing is to weight the words in the news titles. Table 8 shows an example of TF-IDF results from three news items: News 1, News 2, and News 3. Cells with a number indicate the news item contains the word corresponding to the

column, while cells with a zero indicate the news item does not contain the word corresponding to the column. News 1 contains the words "ada", "anies", "democrat", "shock", "pacitan", and "sby". News 2 contains the words "electability", "ganjar", "litbang", "win", "prabowo", "overtake", "relax", "moment" and "survey". News 3 has the words “Airlangga”, “open”, “caleg”, “want”, “claim”, “PDIP”, “election”, “propotional”, “system”.

3.3 Clustering

The clustering process starts by determining the number of clusters. Then, it proceeds with the clustering using the K-Means algorithm. Finally, the evaluation is done with the DBI algorithm.

Table 8. Term Frequency – Inverse Document Frequency (TF-IDF) News Title

Words	News 1	News 2	News 3
ada	0,4041	0	0
airlangga	0	0	0,3842
anies	0,2317	0	0
caleg	0	0	0,3438
claim	0	0	0,3484
democrat	0,2427	0	0
electability	0	0,2733	0
election	0	0	0,2328
ganjar	0	0,1448	0
litbang	0	0,3609	0
meet	0,2661	0	0
moment	0	0,3783	0
open	0	0	0,3394
overtake	0	0,4028	0
pacitan	0,4774	0	0
pdip	0	0	0,1956
prabowo	0	0,2171	0
propotional	0	0	0,3586
relax	0	0,3783	0
sby	0,357	0	0
shock	0,4774	0	0
suestion	0,2647	0	0
survei	0	0,2809	0
system	0	0	0,3277
want	0	0	0,4114
win	0	0,2634	0

Figure 2 displays eight elbow method graphs from Datasets 9 to 16 for Detik News. The first graph (top left) shows the elbow for the optimal cluster in June with a value

of k = 12. The second graph (top right) shows the elbow for the optimal cluster in July with a value of k = 24. The third graph (second row, left) displays the elbow for August with k = 12. The fourth graph (second row, right) depicts the elbow for September with k = 24. The fifth graph (third row, left) illustrates the elbow for October with k = 20. The sixth graph (third row, right) shows the elbow for November with k = 14. The seventh graph (fourth row, left) presents the elbow for December with k = 13. The eighth graph (fourth row, right) displays the elbow for January with k = 15.

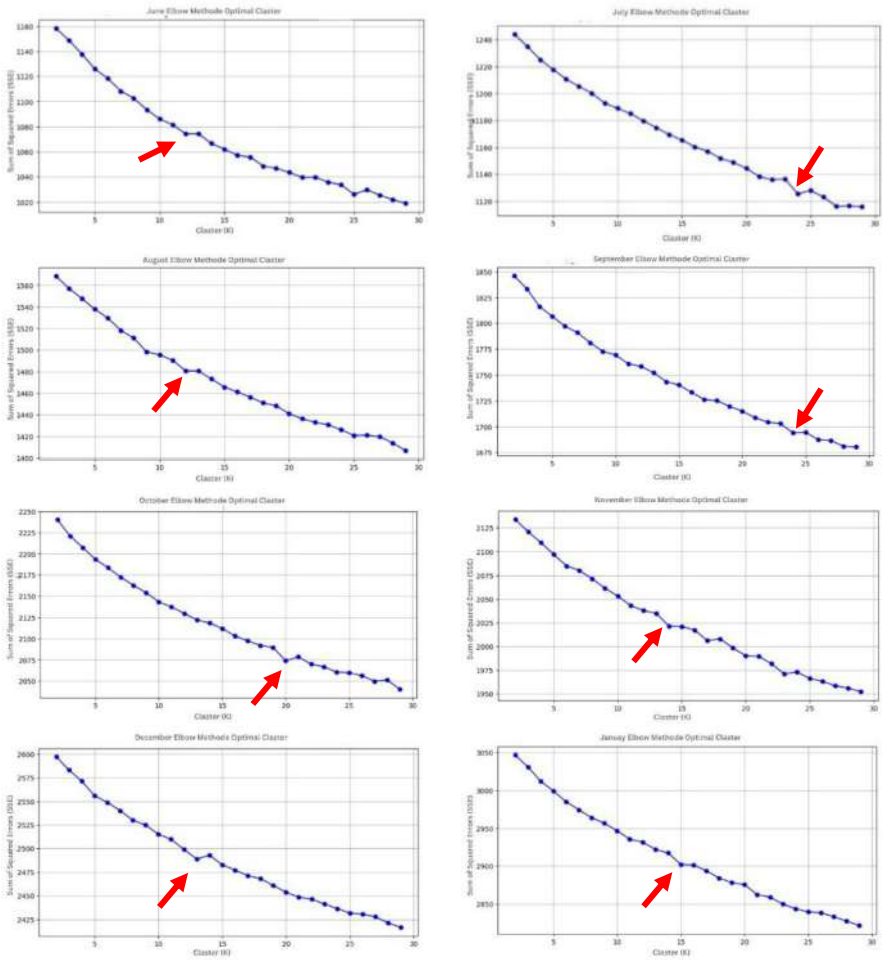

Fig. 2. Elbow Method Chart Detik News

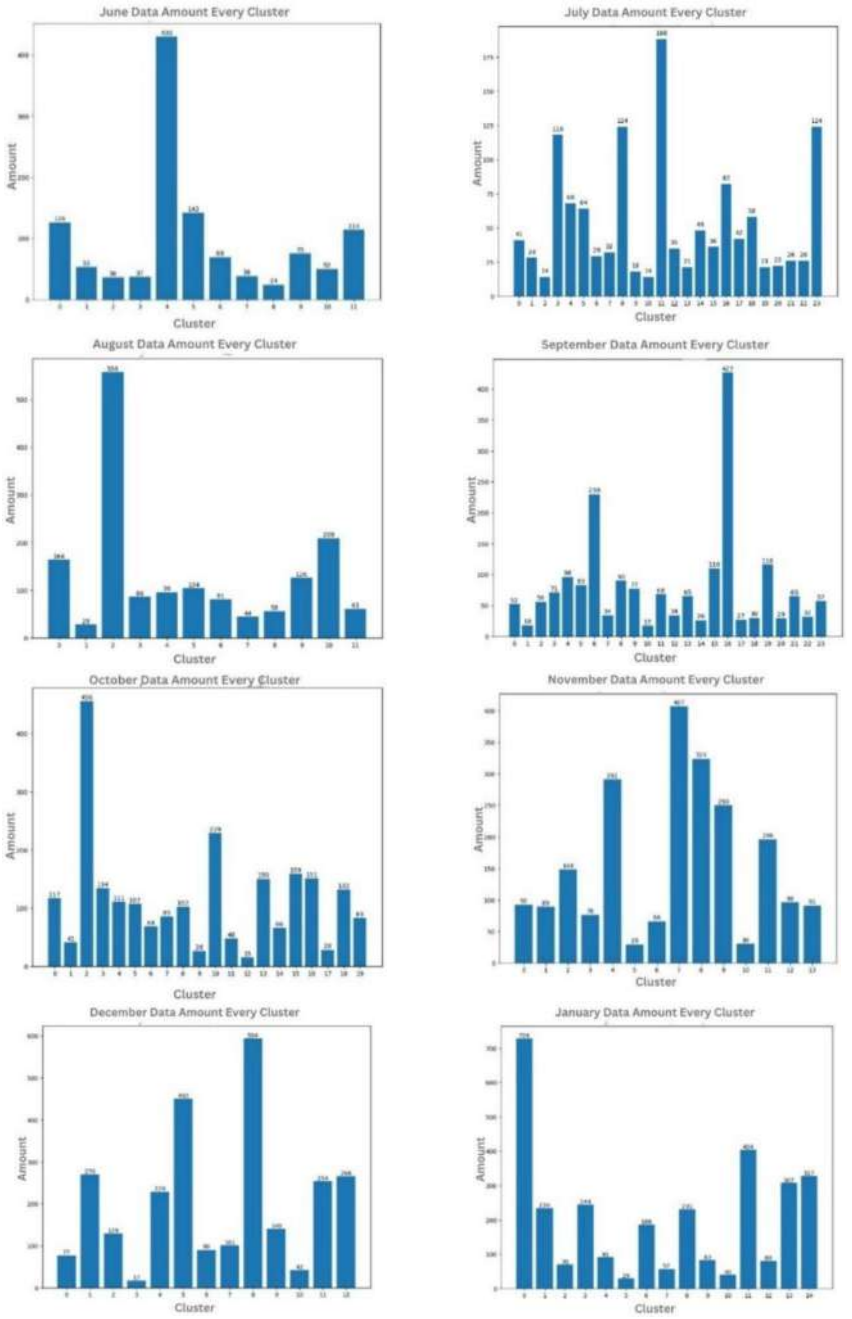

Fig. 3. Number of Data for Each Detik News Cluster

After determining the optimal number of clusters using the elbow method, each dataset was grouped with the chosen k value. Figure 3 displays eight images showing the

data size for each cluster from the Detik News Dataset. The first graph (top-left) shows the data for each cluster in June, from cluster 0 to 11 (12 clusters total). The second graph (top-right) depicts the data in July, from cluster 0 to 23 (24 clusters). The third graph (bottom-left) presents the data for August, from cluster 0 to 11 (12 clusters). The fourth graph (bottom-right) illustrates the data for September, from cluster 0 to 24 (25 clusters). The fifth graph (third row, left) shows the data for October, from cluster 0 to 189 (20 clusters). The sixth graph (third row, right) displays the total data for November, from clusters 0 to 13 (14 clusters). The seventh graph (fourth row, left) shows the total data for December, from clusters 0 to 12 (13 clusters). The eighth graph (fourth row, right) depicts the total data in January, from clusters 0 to 14 (15 clusters).

The clustering results were assessed using the Davies-Bouldin Index (DBI) to evaluate the quality and appropriateness of the clusters created by the K-Means algorithm. Table 9 presents the evaluation outcomes for each cluster. The DBI results indicate that each optimal cluster, determined by the elbow method, has the lowest DBI value.

Table 9. Davies-Bouldin Index (DBI) Value Detik News

No.	Dataset	*k*	Davies-Bouldin Index (DBI)
1	News Detik Juni 2023	12	5,38
2	News Detik Juli 2023	24	5,12
3	News Detik Agustus 2023	12	6,04
4	News Detik September 2023	24	5,29
5	News Detik Oktober 2023	20	5,77
6	News Detik November 2023	14	6,41
7	News Detik Desember 2023	13	6,95
8	News Detik Januari 2024	15	6,72

The DBI value in Table 9 is relatively high, but it was derived from news headline text. News headlines often share similar semantics, recurring political figures, and the same keywords. This leads to increased intra-cluster variance and decreased inter-cluster separation.

3.4 Data Presentation

Data presentation was conducted by selecting the cluster with the largest amount of data each month. These selected clusters were then analyzed for dimensions and framing elements. Figure 3 displays the clusters with the highest number of news items for each month. Table 10 displays the clusters with the highest number of news items from June 2023 to January 2024, based on the Detik news clustering results.

Table 10. Cluster with the Most News

No.	Month	Cluster	News Amount
1	June 2023	4	430
2	July 2023	11	188
3	August 2023	2	558

No.	Month	Cluster	News Amount
4	September 2023	16	427
5	October 2023	2	456
6	November 2023	7	407
7	December 2023	8	594
8	January 2024	0	728

Table 11 presents the results of the initial stage of framing dimensions, specifically, news issue selection. The issue selection process was based on clustering results, which include keyword frequency and topic coherence within each cluster. Prominent issues from each cluster were identified by examining the number of news items and frequently recurring words. To verify the accuracy of the framing dimension interpretation, political communication experts conducted the analysis.

Table 11. Detik Political News Issue Selection

No.	Month	Selecting Issue
1	Juni 2023	a. Elections and National Political Dynamics b. Internal Dynamics of Political Parties c. Support from Volunteers and Community Leaders d. Social and Government Issues e. Surveys and Electability
2	Juli 2023	a. Coalitions and Political Strategy b. Gender and Representation c. National Policies and Issues d. Viral Phenomena and Public Response e. Regional Head Elections f. Social and Cultural Issues
3	Agustus 2023	a. Presidential and Vice-Presidential Candidates b. Coalition Dynamics and Party Relations c. Election Strategy and Campaign d. Internal Controversy and Criticism e. Policies and Amendments f. Regional Issues and Local Figures
4	September 2023	a. 2024 Presidential Election Issues b. Identity Issues and Political Polarization c. Maneuvers of Political Parties and Political Figures d. Social Dynamics and Public Support e. Special Issues and Supporters
5	Oktober 2023	a. The Political Dynamics of the 2024 Presidential and Vice-Presidential Candidates b. The Battle of Narratives and Campaign Strategies c. External and Internal Party Conflicts d. Regulation and Neutrality in the Election e. Volunteer Visits and Declarations
6	November 2023	a. The Dynamics of Jokowi's Relationship with the Indonesian Democratic Party of Struggle (PDIP) b. Kaesang and the PSI's Political Maneuvers c. Election and Candidacy Context d. Internal and Cross-Party Conflict

No.	Month	Selecting Issue
		e. Megawati's Speeches and Statements
7	December 2023	a. Presidential Candidate Campaigns and Programs
		b. Elite Political Relations
		c. Social and Security Issues
		d. Surveys and Electability
		e. Regional-Specific Issues
8	Januari 2024	a. Political Campaigns and Promises
		b. Political Strategy and Elections
		c. Responses to National Issues
		d. Religion and Traditions
		e. Relationships with Other Figures and Parties

After selecting the cluster with the largest number of news items, the researchers analyzed the framing dimensions and elements. The framing dimensions involved choosing issues and emphasizing aspects. The framing elements included defining the problem, diagnosing the cause, making moral judgments, and suggesting treatment options. The analysis of the framing dimensions and elements involved interpretative factors influenced by the researcher's subjectivity. Therefore, this analysis was conducted systematically using Entman's framework, with input from several experts.

Table 11 shows a selection of issues for each month. From June 2023 to January 2024, significant developments in Indonesian politics occurred as the country moved toward the 2024 elections. The focus initially was on election preparations and internal party dynamics, then shifted to coalition building and political strategies after the announcement of presidential and vice-presidential candidates. As the election drew near, intense discussions centered on campaign tactics, narrative battles, and internal and cross-party conflicts. Key political figures and elite relations' dynamics dominated news, including matters related to election regulations and neutrality. Finally, as election day approached, attention moved to campaign promises, final strategies, and responses to national issues, marking a critical phase in political competition. January 2024 wrapped up the series with a focus on election campaigns, public figure involvement, and socio-economic and political controversies.

Table 12. Highlighting Aspects of Detik News

Date, News Title	Highlighting Aspects of Title Image	Emphasis on Word/Sentence Aspects
1 Juni 2023, "Ganjar Calls for United Support from Parties and Volunteers in the 2024 Presidential Election"		"Ganjar emphasized the importance of collaboration between various elements in winning the election. He called on all parties to work together to achieve a shared victory. "Today, we are demonstrating to the public how collaboration, cooperation, and mutual respect are carried out because we share the same goal: victory," he said.

Date, News Title	Highlighting Aspects of Title Image	Emphasis on Word/Sentence Aspects
2 Juni 2023, "The PAN Chairman Will Visit PDIP Headquarters This Afternoon to Discuss Support for Ganjar?"		"PAN has handed over the presidential candidacy issue to Zulhas. "So, PAN will also have a meeting tomorrow night at the Central Executive Board (DPP), one of which will discuss current issues, including the presidential election contest, even though PAN has given its full mandate to the General Chairperson," Yandri said. "However, updates or current developments need to be discussed internally within the party, and we are still communicating with all parties."

After selecting the issues, the second and final stage of the framing dimension is aspect emphasis. Aspect emphasis is analyzed based on the use of specific words, sentences, images, and visuals presented by the media for audience consumption. Table 12 provides a sample of news aspect emphasis drawn from a selection of news issues from each month of Detik's election coverage.

In Table 12, the aspect highlighting is based on an analysis of news items that have been clustered and selected during the issue selection stage. This process involves identifying visual elements and the language used by the media, selecting news headlines, utilizing headline images, and incorporating sentences from the news content.

Table 13. Detik News Framing Elements

News Title	Define Problem	Diagnose Cause	Make a Moral Judgment	Treatment Recommendation
Ganjar Calls for United Support from Parties and Volunteers in the 2024 Presidential Election	Ganjar Pranowo called for collaboration between political parties and volunteers to win the 2024 presidential election. The main problem identified was the potential for disharmony or lack of coordination between political parties and volunteers in supporting presidential candidates, which could reduce campaign	While political parties have formal structures and organized strategies, volunteers are usually independent and more flexible, making it sometimes difficult to align the goals and working methods of the two parties.	Ganjar's call for collaboration between political parties and volunteers is a positive step, demonstrating the spirit of mutual cooperation (gotong royong) democracy. However, it is crucial to ensure that this collaboration is not solely aimed at political victory, but also reflects values that respect people's sovereignty,	Form a liaison team between political parties and volunteers to align campaign strategies. Ensure that all parties understand and consistently support the candidate's vision and mission. Most importantly, provide training to volunteers to effectively convey campaign messages without compromising democratic values.

News Title	Define Problem	Diagnose Cause	Make a Moral Judgment	Treatment Recommendation
	effectiveness and the chances of victory.		openness, and inclusiveness. A balance between party leadership and volunteer aspirations must be maintained to avoid alienating either party.	
PAN Chairman to Visit PDIP Headquarters This Afternoon to Discuss Support for Ganjar?	The meeting between PAN General Chair Zulkifli Hasan and PAN administrators with PDIP revealed efforts to gather support for presidential hopeful Ganjar Pranowo. The primary issue is the uncertainty about PAN's political stance in the 2024 presidential election, which could impact the party's internal unity and its relations with the coalition partners.	The presidential candidate's decision is entirely in the hands of the PAN General Chair, which can create internal tensions if it is not supported by party consensus	PAN's choice to engage in dialogue with PDIP is a positive move toward supporting democratic values through political communication. However, transparency with the public and consistency with coalition partners must be maintained to prevent confusion or the appearance of opportunism. The decision-making process should also involve inclusive party mechanisms to ensure collective agreement and avoid internal disagreements	PAN must choose its presidential candidate within a clear deadline, as promised by the Deputy Chairperson of PAN. This will give political certainty to party members and supporters

Table 13 provides an analysis of various election-related news stories in Indonesia using a framing approach with four dimensions: Define Problem, Diagnose Cause, Make Moral Judgment, and Treatment Recommendation. Each framing dimension is developed by examining news content. The analysis focuses on identifying news texts that address the main problem (Define Problems), explain the cause (Diagnose Cause), offer moral judgments (Moral Judgment), and suggest solutions or actions (Treatment Recommendation).

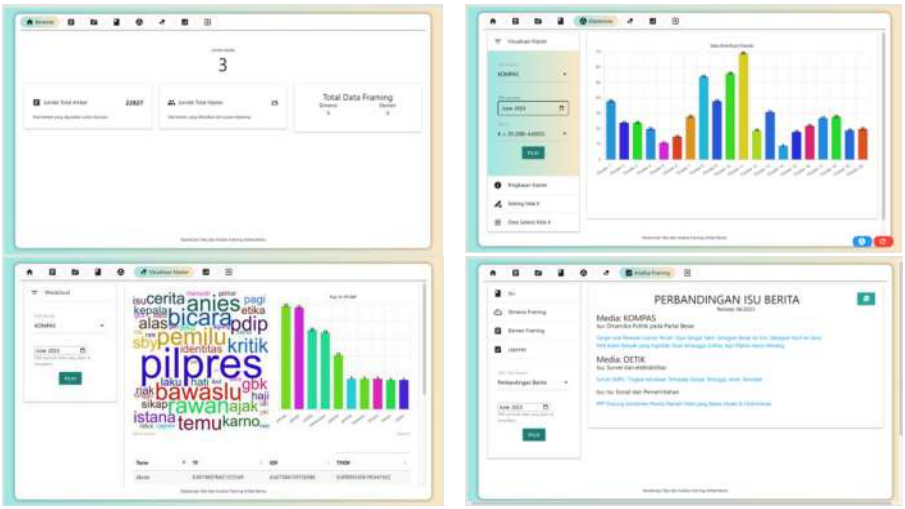

Fig. 4. Application Screenshot

Figure 4 shows a screenshot of the application interface to illustrate the system's functionality. While the main analysis centers on Detik.com headlines, the user interface screenshots in this paper display test data from Kompas.com for layout and visual validation. Compared to manual framing analysis, this computational method offers increased speed and scalability, while remaining interpretable through visualization and clustering validation.

3.5 Discussion

The clustering process using the K-Means algorithm showed successful results, although it still has some limitations. Using TF-IDF together with K-Means offers an efficient way to cluster news articles. The Silhouette Score indicates that the chosen number of clusters is optimal; however, despite the algorithm effectively grouping news headlines, overlaps still occurred. This issue is consistent with K-Means' known limitations, such as its inability to form spherical clusters and handle irregular semantic boundaries effectively.

Parameter setting, especially choosing k, is essential. The Elbow Method and Silhouette analysis were used to select k, but alternative clustering methods like DBSCAN or Hierarchical Clustering might produce different results, particularly for overlapping topics. The text preprocessing steps, including tokenization, stopword removal, and stemming, played a vital role in preparing the data for clustering. However, preprocessing can unintentionally exclude contextually important words, affecting the outcomes. From a practical standpoint, clustering results provide a useful basis for framing analysis. By grouping articles on election themes such as candidate competition, coalition dynamics, and regulatory issues, the K-Means algorithm helps enable a more struc-

tured interpretation of media framing patterns. Still, the accuracy of framing interpretation relies on qualitative analysis, underscoring the importance of combining computational techniques with domain expertise.

Future improvements might include integrating semantic embeddings like Word2Vec or BERT to better understand contextual relationships, as well as using semi-supervised clustering to include partial labels from framing experts. These enhancements could help balance computational efficiency with interpretative depth, resulting in outcomes that are both technically strong and meaningfully insightful.

4 Conclusion

The K-Means algorithm was effectively used to group election news on Detik based on text patterns, which were then employed for framing analysis. The findings show that the media actively select and emphasize certain aspects to influence public perceptions of political issues. The clustering results reveal a distribution of issues that mirror political dynamics, such as candidate competition, coalition matters, and election regulation policies. The framing elements offer a comprehensive view of how the media define problems, identify causes, make moral judgments, and suggest solutions.

Future research should expand news data collection across more media platforms and over a longer timeframe to achieve more representative results. Additionally, incorporating sentiment analysis or employing more advanced clustering algorithms can enhance accuracy and yield more profound insights. The use of interactive visualization techniques is also recommended to improve the interpretation of framing analysis results.

Acknowledgments. The authors gratefully acknowledge the Directorate of Research, Technology, and Community Service, Directorate General of Higher Education, Research, and Technology, Ministry of Education, Culture, Research, and Technology, for funding support through the 2024 Fiscal Year Beginner Lecturer Research program. Appreciation is also extended to the Directorate of Research and Community Service, Universitas Budi Luhur, for institutional support.

References

Anggoro, A. D., Puspitasari, F. A., & Som, A. P. M. (2023). Robert Entman's Framing Analysis: Female Representation in 2024 Presidential Candidates on Republika.com and Sindonews.com. *Komunikator*, *15*(2), 211–224. https://doi.org/10.18196/jkm.19247

Anita, A., & Aliando, J. (2022). Pengelompokan Berita Kesehatan Pada Sosial Media Twitter Dengan Metode K-Means Clustering. *Ensiklopedia of Journal*, *4*(3), 116–124. https://doi.org/https://doi.org/10.33559/eoj.v4i3.877

Ashfaq, M., Shahid, N.-A., & Zubair, J. (2022). New Media and Political Protest: Framing Analysis of News Content on Twitter. *Asian Journal of Comparative Politics*, *7*(4), 1177–1189. https://doi.org/10.1177/20578911211067317

Boer, K. M., Pratiwi, M. R., & Muna, N. (2020). Analisis Framing Pemberitaan Generasi Milenial dan Pemerintah Terkait Covid-19 di Media Online. *Communicatus: Jurnal Ilmu Komunikasi*, *4*(1), 85–104. https://doi.org/10.15575/cjik.v4i1.8277

Chicco, D., Campagner, A., Spagnolo, A., Ciucci, D., & Jurman, G. (2025). The Silhouette coefficient and the Davies-Bouldin index are more informative than Dunn index, Calinski-Harabasz index, Shannon entropy, and Gap statistic for unsupervised clustering internal evaluation of two convex clusters. *PeerJ Computer Science*, *11*, e3309. https://doi.org/10.7717/peerj-cs.3309

Disayiram, N., & Rupasingha, R. A. H. M. (2022). A Comparative Study of Clustering English News Articles Using Clustering Algorithms. *2022 International Research Conference on Smart Computing and Systems Engineering (SCSE)*, 108–113. https://doi.org/10.1109/SCSE56529.2022.9905210

Entman, R. M. (1993). Framing: Toward Clarification of a Fractured Paradigm. *Journal of Communication*, *43*(4), 51–58. https://doi.org/10.1111/j.1460-2466.1993.tb01304.x

Firman Sodiq, S., Desena, W., & Wibowo, A. (2022). Penerapan Algoritma Stemming Nazief & Adriani Pada Proses Klasterisasi Berita Berdasarkan Tematik Pada Laman (Web) Direktorat Jenderal HAM Menggunakan Rapidminer. *Syntax : Jurnal Informatika*, *11*(02), 10–21. https://doi.org/10.35706/syji.v11i02.7192

Hamami, F., & Dahlan, I. A. (2024). Analyzing News Clustering with K-Means Algorithm: A Segmentation Perspective. *2024 4th International Conference on Electronic and Electrical Engineering and Intelligent System (ICE3IS)*, 42–46. https://doi.org/10.1109/ICE3IS62977.2024.10775603

Hasan, S. Al, Ruiqin, W., & Hussain, M. G. (2022). Clustering Analysis of Bangla News Articles with TF-IDF & CV Using Mini-Batch K-Means and K-Means. *2022 IEEE International Conference on Cybernetics and Computational Intelligence (CyberneticsCom)*, 17–22. https://doi.org/10.1109/CyberneticsCom55287.2022.9865339

Hassan, B. A., Tayfor, N. B., Hassan, A. A., Ahmed, A. M., Rashid, T. A., & Abdalla, N. N. (2024). From A-to-Z Review of Clustering Validation Indices. *Neurocomputing*, *601*, 128198. https://doi.org/10.1016/j.neucom.2024.128198

Ikotun, A. M., Ezugwu, A. E., Abualigah, L., Abuhaija, B., & Heming, J. (2023). K-means Clustering Algorithms: A Comprehensive Review, Variants Analysis, and Advances In the Era of Big Data. *Information Sciences*, *622*, 178–210. https://doi.org/10.1016/j.ins.2022.11.139

Ikotun, A. M., Habyarimana, F., & Ezugwu, A. E. (2025). Benchmarking Validity Indices For Evolutionary K-Means Clustering Performance. *Scientific Reports*, *15*(1), 21842. https://doi.org/10.1038/s41598-025-08473-6

Jo, T. (2019). *Text Mining Concept, Implementation, and Big Data Challenge* (Vol. 45). Springer International Publishing. https://doi.org/10.1007/978-3-319-91815-0

Khan, I. K., Daud, H. B., Zainuddin, N. B., Sokkalingam, R., Abdussamad, A., Museeb, A., & Inayat, A. (2024). Addressing Limitations Of The K-Means Clustering Algorithm: Outliers, Non-Spherical Data, And Optimal Cluster Selection. *AIMS Mathematics*, *9*(9), 25070–25097. https://doi.org/10.3934/math.20241222

Khder, M. (2021). Web Scraping or Web Crawling: State of Art, Techniques, Approaches and Application. *International Journal of Advances in Soft Computing and Its Applications*, *13*(3), 145–168. https://doi.org/10.15849/IJASCA.211128.11

Li, H., Sugasawa, S., & Katayama, S. (2024). Adaptively Robust and Sparse K-means Clustering. *Transactions on Machine Learning Research*. https://doi.org/10.48550/arXiv.2407.06945

Semoglou, A., Likas, A., & Pavlopoulos, J. (2025). *Silhouette-Guided Instance-Weighted k-means*. https://doi.org/10.48550/arXiv.2506.12878

Simanjuntak, H. T. A., Silaban, P. E. P., Manurung, J. K. S., & Sormin, V. H. (2023). Klasterisasi Berita Bahasa Indonesia Dengan Menggunakan K-Means Dan Word Embedding. *Jurnal Teknologi Informasi Dan Ilmu Komputer*, *10*(3), 641–652. https://doi.org/10.25126/jtiik.20231026468

Widaningrum, I., Mustikasari, D., Arifin, R., Tsaqila, S. L., & Fatmawati, D. (2022). Algoritma Term Frequency-Inverse Document Frequency (TF-IDF) dan K-Means Clustering Untuk Menentukan Kategori Dokumen. *Prosiding Seminar Nasional Sistem Informasi Dan Teknologi (SISFOTEK)*, 145–149.

Wirth, R., & Hipp, J. (2000). CRISP-DM: Towards a Standard Process Model for Data Mining. *4th International Conference on the Practical Applications of Knowledge Discovery and Data Mining*, 29–40.

Yazmi, R., Mala, A., Hasnan Afisah, F., Radika Sari, F., Hikam, I., Rendy Maulana, M., Rahima Orvala, A., & Ilmu Politik, P. (2024). Diskursus Politik Media Massa Indonesia: Analisis Framing Berita Pemilu 2024 dalam Surat Kabar Nasional Kompas. *Jurnal Majemuk*, *3*(4), 704–715.

Peer-Review Statements

Nisrin Alyani Ishak[1,*] Azwanis Azemi[1] S.Munirah Mohd Ali[1] Noorraha Abdul Razak[1]

[1]Universiti Poly-Tech Malaysia, Kuala Lumpur Malaysia

[*]Nisrin Ishak ICAR2025. Email: nisrin@uptm.edu.my

All of the articles in this proceedings volume have been presented at the International Conference on Multi-disciplinary Academic Research 2025 *(ICAR2025) - Advances in Computing, Electronics, Engineering, and Mathematics (Track 1)* during 29-30 September 2025 in Kuala Lumpur Malaysia. These articles have been peer reviewed by the members of the *Technical Committee* and approved by the Editor-in-Chief, who affirms that this document is a truthful description of the conference's review process.

1. REVIEW PROCEDURE

The reviews were single blind. Each submission was examined by two reviewer(s) independently.

The conference submission management system was ConfBay

All submissions were first screened for generic quality and suitability. Prior to the conference, authors were required to submit their manuscripts via the ConfBay system, after which each paper was assigned to anonymous reviewers based on their subject-matter expertise, with due consideration given to potential conflicts of interest. Following the initial peer-review process, authors were requested to revise their manuscripts in response to reviewers' comments. Revised papers underwent a final review by anonymous reviewers to verify compliance with academic standards, including content quality, formatting, referencing, and overall presentation.

A manuscript was considered for acceptance only upon receiving favourable recommendations from the reviewers. Authors of rejected submissions were given the opportunity to revise and resubmit after addressing the reviewers' comments. The acceptance or rejection of a revised manuscript was final.

N. A. Ishak et al. (eds.), *Proceedings of the International Conference on Cross- Disciplinary Academic Research 2025 - Track 1 Advances in Computing, Electronics, Engineering, and Mathematics (ICAR-T1 2025)*, Advances in Engineering Research 296,
https://doi.org/10.2991/978-94-6239-636-4_1

2. QUALITY CRITERIA

Reviewers were instructed to assess the quality of submissions solely based on the academic merit of their content along the following dimensions:

1. Relevance and originality, alignment with the conference scope, originality, novelty and contribution to the field. Pertinence of the article's content to the scope and themes of the conference;
2. Methodological rigor, soundness and transparency of research design, methods, analysis and results;
3. Ethical compliance, adherence to ethical standards and accepted academic practices;
4. Quality of presentation, clarity of language, coherence of structure and accuracy of figures, tables and references;

In addition to peer review, all manuscripts underwent an editorial screening process. The editorial team reviewed the overall content and conducted similarity checks to identify textual overlap. Where similarity levels exceed acceptable limits, authors were required to revised their manuscripts to reduce similarity to below 20% before final acceptance.

3. KEY METRICS

Total submissions	25
Number of articles sent for peer review	20
Number of accepted articles	20
Acceptance rate	80%
Number of reviewers	20

A total of 25 manuscripts were submitted to the conference. Following an initial editorial screening, 20 articles were deemed suitable and forwarded for peer review. After completion of the review and revision processes, 20 articles were accepted for publication. This results in an acceptance rate of 80%**,** calculated as the number of accepted articles divided by the total number of submissions. The peer-review process was supported by 20 reviewers, selected based on their subject expertise and availability.

4. COMPETING INTERESTS

Neither the Editor-in-Chief nor any member of the Scientific Committee declares any competing interest.