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ChatGPT in Scopus Indexed Articles from Indonesia, Malaysia and Singapore

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ABSTRACT

Singapore, Malaysia, and Indonesia are the main subjects of this study's bibliometric examination. This study focuses on Singapore, Malaysia, and Indonesia using bibliometric analysis of papers indexed in the Scopus database. The study looks at the number of yearly publications, leading research institutes, lead authors, and prestigious journals to show the growing scientific interest in ChatGPT across disciplines. The study was conducted using Biblioshiny, which involves data retrieval, filtering, visualization, and interpretation techniques, in order to identify noteworthy patterns and emerging issues. The analysis's findings indicate that research on ChatGPT has grown significantly, rising from 69 papers in 2023 to 86 in 2024 at a growth rate of 24.64%. The highest production is from the National University of Singapore (NUS), which is followed by Nanyang Technological University (NTU) and Universiti Sains Malaysia (USM). Prominent scholars like Rudolph Jürgen, Roe Jasper, and Perkins Mike have made significant contributions to the field. The theme mapping indicates that current research is concentrated on human-computer interaction, assessment studies, and AI accuracy, with growing interest in semantics and quality control. The transdisciplinary benefits of ChatGPT in management, healthcare, and education are highlighted in the most often cited publications. The Journal of Public Health and the Journal of Applied Learning and Teaching are two of the most prominent publication sources that highlight ChatGPT's engagement with technology and applied research. As evidenced by the subject's explosive growth, the study highlights the need for interdisciplinary cooperation, ethical considerations, and policy development to maximize the use of ChatGPT research across industries in Southeast Asia. Long-term studies on ChatGPT should be conducted in the future. Furthermore, as the application of AI grows, appropriate integration of AI-based technologies is required to maximize its societal impact.

1. Introduction

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Recent advances in AI and NLP have made ChatGPT a vital technology. Deep learning-driven NLP and generative AI enable ChatGPT to write human-like prose and participate in authentic dialogues [1]. Deep learning transforms natural language inputs into human-like language responses in this advanced language model. It can preserve conversational styles and create realistic dialogues [2]. ChaGPT uses complex algorithms to assess massive amounts of publicly available digital content data to generate writing that sounds like human language and is convincingly original on a wide range of topics [3]. AI technologies like ChatGPT have changed education, research, and healthcare. NLP has advanced with ChatGPT's human-language answers. It could change diagnoses, personalized therapy, and online learning administration [4-6]. ChatGPT's natural language processing models, such as medical question answering, have shown potential in various disciplines [7].

ChatGPT can transform student-teacher interactions. It provides personalized learning, automated evaluation and feedback, virtual assistants, content creation, and research support [8]. ChatGPT's advanced natural language processing (NLP) abilities are also helping with healthcare information, continuous renal replacement therapy alarms, and pathology diagnostics [5, 9-10]. ChatGPT's strengths and limits in language translation, text summarization, and dialogue generation have been extensively studied. ChatGPT has shown promise in many applications in these experiments. As ChatGPT improves, ethical implications, limits, and future usage across multiple domains must be considered [11]. The use of ChatGPT technology in education is gaining popularity. ChatGPT's ability to generate language that closely resembles human writing has sparked discussions about its potential uses in university education, software development for higher education institutions, and its pros and cons. ChatGPT is an education case study on chatbots [12-14]. The study reveals that ChatGPT can write like humans and have realistic conversations. This may enhance learning [1]. The use of ChatGPT in schools has prompted questions regarding its impact and capacity to improve teaching [15].

Researchers have examined ChatGPT's ability to improve student-teacher relations in university settings. ChatGPT may mimic human text answers. This lets it tailor learning, provide automatic feedback, and help with various educational tasks [12]. ChatGPT's capacity to write like humans is useful in higher education software programming. It is said to boost coding and computer science learning [13]. ChatGPT technology can generate intelligent and coherent texts, making it useful for writing, communication, and education [14]. ChatGPT generates human-like text using natural language processing and generative AI. Maintains conversational styles and allows genuine dialogues. Thus, it improves educational communication and learning [1]. ChatGPT reflects a shift toward innovative pedagogical methods that use AI to engage students and promote learning [15]. Southeast Asian AI and NLP research developments match global interest. Thailand-based research has shown the importance of AI technologies like NLP in digital marketing. These technologies analyse client behaviour using machine learning and predictive analytics [16]. Southeast Asian banks have increased operational efficiency, risk management, and customer experience thanks to technology, particularly AI [17]. AI-powered language models have shown promise in drug discovery and development, suggesting that AI-driven NLP tools could change healthcare and pharmaceutical research [18]. AI-powered NLP solutions like ChatGPT have revolutionized natural language processing. ChatGPT-3 to GPT-4 shows that language models are improving in AI-powered NLP systems [19]. These advances show Southeast Asia's growing interest and investment in AI and NLP technologies, matching the global trend of using AI in various industries.

This study investigates the progression of ChatGPT research in Southeast Asia, analyzing the increase in yearly publications and the principal institutions facilitating this research. It identifies prominent researchers, pertinent academic journals, and extensively cited articles to assess their

influence. Furthermore, it examines thematic trends, emphasizing fundamental, emergent, and niche domains that are influencing the future of the discipline.

2. Methodology

This study uses bibliometric analysis utilizing the Bibliometrix tool. We succeeded in retrieving all bibliographic information from papers published by the Scopus database without being limited by publication time. Publication data obtained from the Scopus database is then stored in three forms, there are *.bib, *.ris, and *.csv. We establish a scientometric network that represents productivity using biblioshiny. Bibliometric analysis in this work was carried out in 4 steps, which were: Data Harvesting; Data Filtering; Data Visualization; Data Analysis, and Data Interpretation. In the Data Harvesting stage, we employ a search query with keywords and proper selection criteria [20-22]. The search query we use incorporates certain terms such as "TITLE-ABS-KEY (chatgpt)" and criteria such as "LIMIT-TO (AFFILCOUNTRY, 'Singapore' OR 'Indonesia' OR 'Malaysia')" and "LIMIT-TO (DOCTYPE, 'ar')."

In the Data Filtering stage, we focused on using only articles. After that, we visualized using biblioshiny and evaluated and interpreted the data collected from the output obtained from biblioshiny. This technique allowed us to focus our inquiry on articles connected to the given issues and originating from the mentioned nations [23-27]. We obtained significant data for our bibliometric assessment using Scopus, which includes a wide range of scientific sources such as journals, books, and conference papers [28]. Furthermore, Scopus offers a comprehensive platform for our study, allowing us to track research tendencies, estimate publication impact, and identify outstanding contributors in a particular subject over a period of time [29].

3. Results and Discussion

3.1 Annual Production

According to the statistics from the Scopus database, there has been a significant rise in the yearly research output concerning ChatGPT in Southeast Asia. In 2023, the total count of articles published on this particular subject amounted to 69. The number of articles increased substantially to 86 in 2024, indicating a growth rate of around 24.64%. The significant surge in a span of only one year demonstrates a swift and escalating interest as well as a concentrated research emphasis on ChatGPT technology in the region. The increasing quantity of published works indicates a growing acknowledgement of the potential uses of ChatGPT in several domains, including education, customer service, and healthcare. The continuous increase in the number of publications indicates a growing interest in this technology, which is expected to persist as its usage becomes more prevalent and the technology advances.

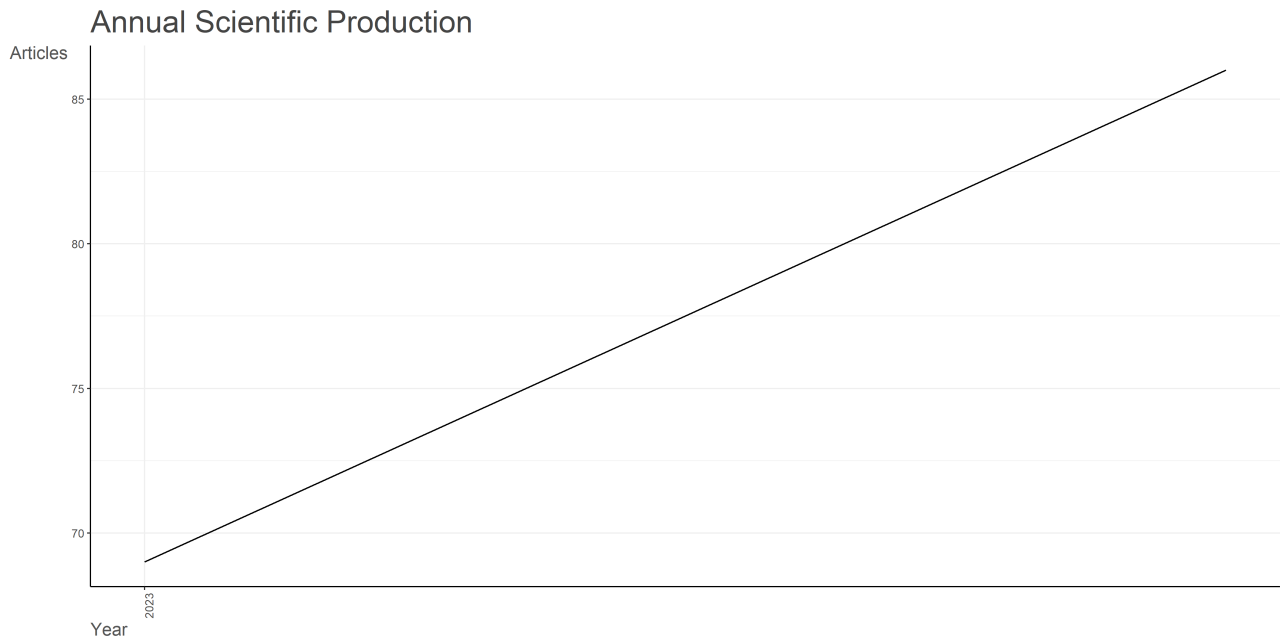

Fig. 1. Annual production

The burgeoning number of papers is clear evidence of the escalating scholarly output pertaining to ChatGPT in Southeast Asia. A research paper examining the use of ChatGPT in the field of medicine highlights its interdisciplinary character and its promise in the realm of digital health [30]. Moreover, studies on the influence of ChatGPT on higher education emphasise its revolutionary structure and adaptable uses in the educational domain [31]. The increasing number of publications on ChatGPT suggests a growing interest and acknowledgement of its potential uses. However, it is important to exercise caution while using ChatGPT, especially in the fields of medical education and research, to guarantee thorough evaluation and meticulous implementation [32].

3.2 Most Relevant Affiliations

According to the data, the National University of Singapore (NUS) is the top institution in Southeast Asia in terms of the number of papers linked to ChatGPT. NUS has contributed 40 articles, making it the most significant contributor in this study area in the region. Universiti Sains Malaysia (USM) has generated 17 papers, demonstrating a significant amount of research effort in Malaysia, following the example set by NUS. Nanyang Technological University (NTU) is a prominent participant with 15 articles, indicating its significant emphasis on artificial intelligence (AI) and natural language processing (NLP) technology in Singapore. In addition, the National University Hospital (NUH) has authored 8 articles, indicating a growing interest in the healthcare applications of ChatGPT. The data indicates that prestigious universities and institutions in Southeast Asia are actively participating in and making significant contributions to the study and advancement of ChatGPT technology. NUS is at the forefront of these efforts, with USM and NTU following closely after. This trend highlights the region's robust dedication to advancing AI technology and their applications in diverse areas.

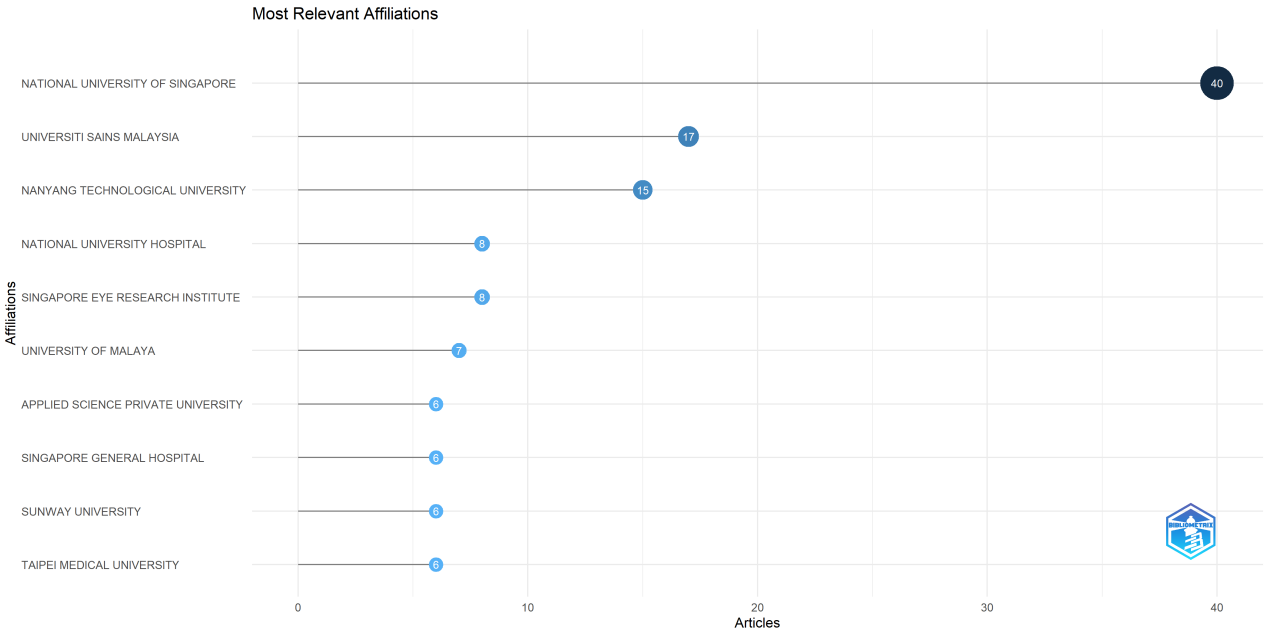

Fig. 2. Most relevant affiliations

The data reveals the notable involvement of institutions such as the National University of Singapore (NUS), Universiti Sains Malaysia (USM), Nanyang Technological University (NTU), and the National University Hospital (NUH) in relation to ChatGPT in Southeast Asia. NUS is at the forefront with 40 articles, demonstrating its research dominance [33]. The 17 articles published by USM demonstrate ongoing research activities in Malaysia [34]. NTU's 15 articles demonstrate a significant emphasis on artificial intelligence and natural language processing [35] The 8 articles published by NUH indicate an increasing focus on healthcare applications [36]. The findings highlight the region's strong dedication to expanding AI technologies, with NUS leading the way, followed by USM, NTU, and NUH, making major contributions to ChatGPT research [37].

3.3 Most Relevant Authors

The data reveals that Perkins Mike [38-42] and Roe Jasper [38-42] are the foremost contributors in the field of ChatGPT research in Southeast Asia, with each of them having authored five articles. Rudolph Jürgen closely trails behind them with an equal number of five articles [43-47]. While he has made numerous contributions, his impact may be significantly less significant compared to that of Perkins and Roe. This information emphasises the prominent figures who are leading the intellectual discussions on ChatGPT in Southeast Asia, emphasising the cooperative aspect of research in this swiftly developing domain.

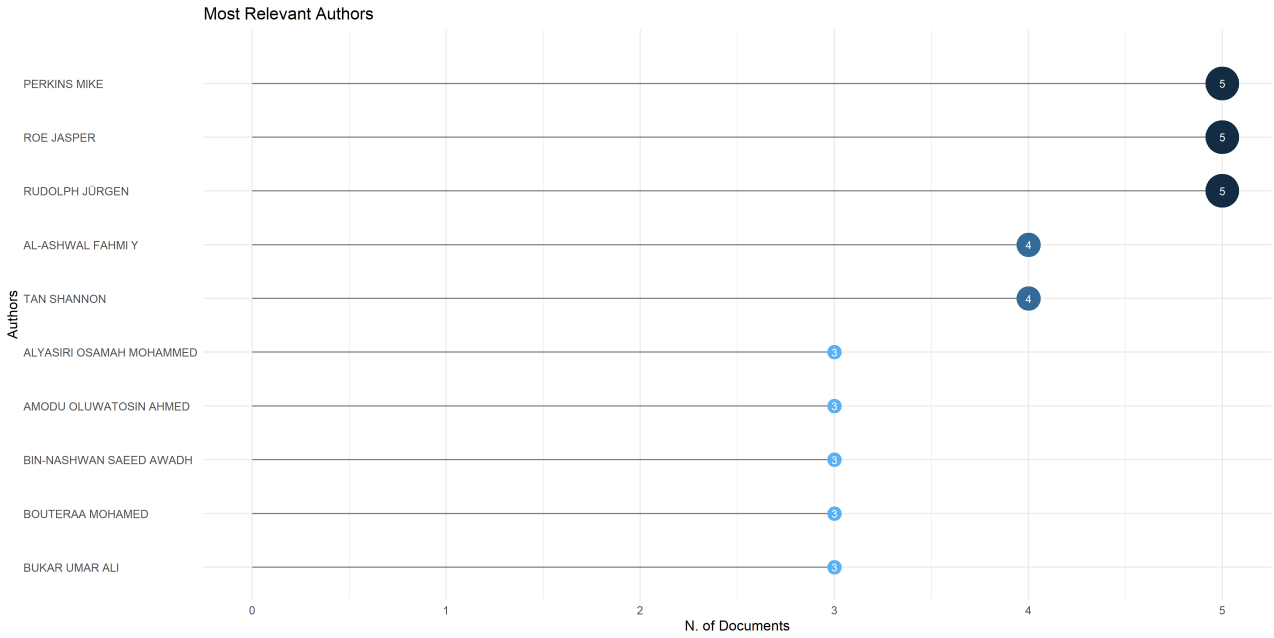

Fig. 3. Most relevant authors

Perkins Mike and Roe Jasper, distinguished scholars in ChatGPT research in Southeast Asia, have individually made noteworthy contributions through the publication of five articles each. Perkins and Roe are widely acknowledged as key figures in the discipline, and Rudolph Jürgen, who has also published five publications, also holds a significant position. Al-Ashwal Fahmi Y has made considerable contributions to collaborative efforts in the field, as evidenced by their four published works [48]. The research methodology employed in this study is consistent with the results of a study on e-Health research conducted in Southeast Asia. The study emphasises the significance of collaborative efforts in advancing knowledge and bridging research deficiencies [49]. In contrast, a research conducted on corporate sustainability reporting in Southeast Asia highlights the importance of individual authorship in maintaining accountability and openness in reporting methods [50].

3.4 Most Relevant Sources

The data indicates that the *Journal of Public Health (United Kingdom)* is the primary source for articles concerning ChatGPT in Southeast Asia. This journal has published six articles, demonstrating a notable focus on the public health implications and applications of ChatGPT, including health communication, telemedicine, and health education. The *Journal of Applied Learning and Teaching* features five articles that emphasise the educational uses of ChatGPT. These articles explore creative teaching techniques and learning resources. Both the journals *Education and Information Technologies* and *IEEE Access* have each contributed three papers. The former primarily investigates the convergence of education and technology, with a focus on how ChatGPT may enhance educational technologies. The latter specifically emphasises the technical and engineering components of ChatGPT research. The variety of sources highlights the complex and diverse nature of ChatGPT research, which encompasses health, education, and technology. It also indicates a wide academic interest in the region.

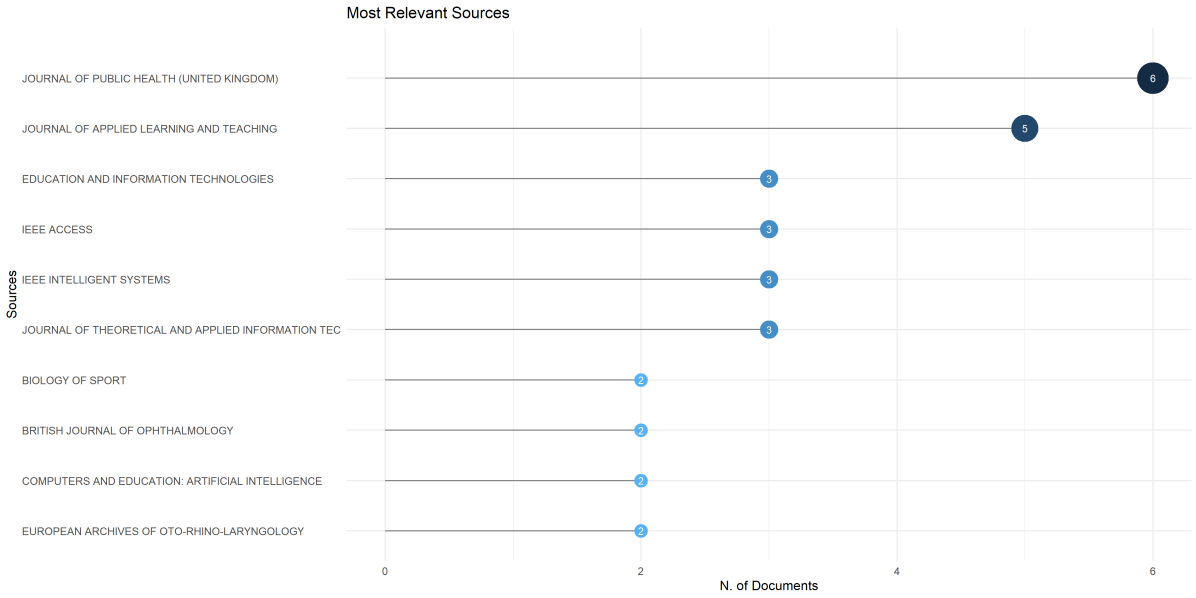

Fig. 4. Most relevant sources

The main references for ChatGPT papers in Southeast Asia, such as the *Journal of Public Health (United Kingdom)* and the *Journal of Applied Learning and Teaching*, exhibit a wide-ranging interest in the technology's utilisation in the fields of health, education, and technology. Greetings (2023). The first study emphasises the impact of ChatGPT on public health, namely in the areas of health communication and telemedicine. The second study stresses the use of ChatGPT in education, specifically in demonstrating new and creative teaching techniques [51]. This multidisciplinary approach aligns with a study that explores the potential advantages of ChatGPT in improving teaching and learning, with a specific focus on its educational function [52]. Nonetheless, a comprehensive evaluation of ChatGPT's application in the healthcare sector has expressed reservations, underscoring the significance of tackling ethical concerns such as precision and intellectual property infringement while implementing this technology [53].

3.5 Most Global Cited Documents

The data regarding the most frequently cited documents related to ChatGPT in Southeast Asia emphasises a number of key papers. The study authored by Dwivedi YK, which was published in the *International Journal of Information Management* in 2023, has garnered a noteworthy total of 826 citations [54]. This substantial number of citations serves as evidence of the paper's considerable influence and pertinence in the realm of information management, particularly in relation to the utilisation of ChatGPT. Rudolph J has authored two publications that have received significant attention, both of which were published in the *Journal of Applied Learning and Teaching* in 2023. The first paper has accumulated 348 citations [46], while the second paper has garnered 189 citations [47]. These numbers establish Rudolph J as a prominent player in the field of ChatGPT research, specifically in the area of applied learning and teaching. In 2023, Lim WM's paper published in the *International Journal of Management Education* has received a total of 200 citations [55], indicating its significant influence on the use of ChatGPT in educational management. The extensive citation of these papers highlights the substantial academic interest and impact of ChatGPT research in diverse domains across Southeast Asia.

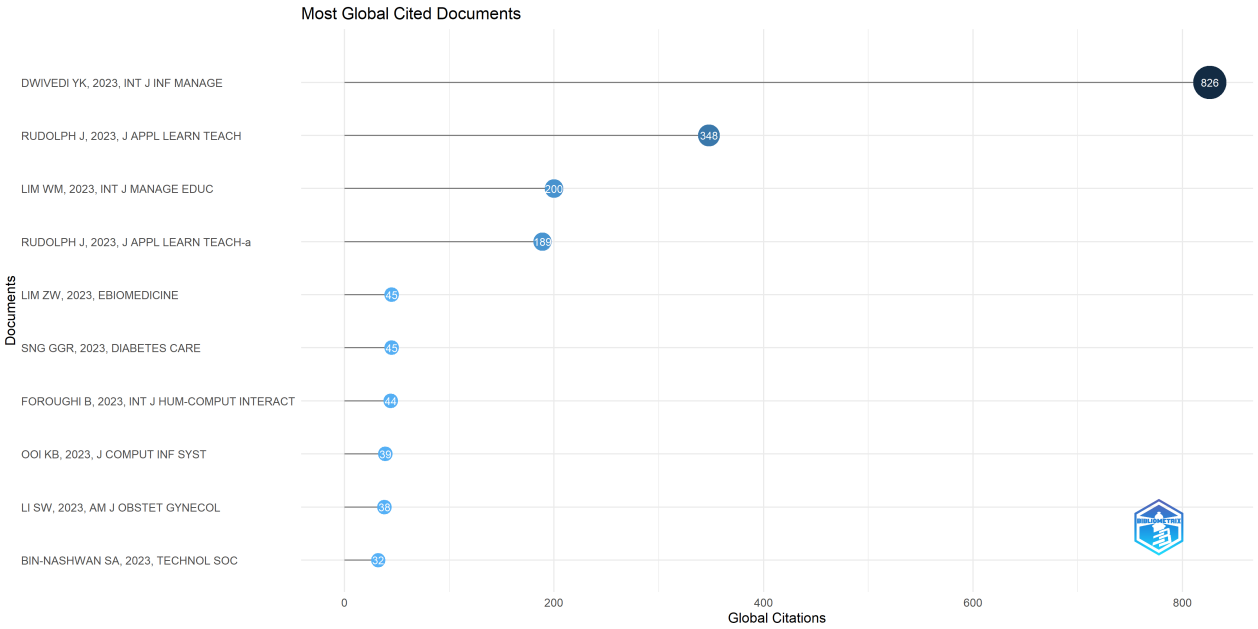

Fig. 5. Most global cited documents

The scholarly works on ChatGPT in Southeast Asia, including Dwivedi YK's publication, Rudolph J's papers, and WM's paper, have had a substantial influence on the field. These papers highlight the scholarly significance and impact of ChatGPT research in different industries in Southeast Asia. Furthermore, a research study on the progression of supply chain ripple effects underscores the significance of bibliometric and meta-analytic perspectives in comprehending concepts, thus emphasising the necessity for thorough analyses in research.

3.6 Thematic Map

The thematic map illustrates the progression and significance of different themes in ChatGPT research conducted in Southeast Asia, organising them into four quadrants. The Motor Themes quadrant consists of prominently developed and central themes, including "human," "article," "evaluation study," and "accuracy." These themes indicate a substantial amount of attention and established research, which are essential for the advancement of ChatGPT. Foundational and extremely important, basic themes such as "ChatGPT," "artificial intelligence," and "natural language processing" suggest significant possibilities for considerable future research. Niche Themes, such as "cross-sectional study" and "algorithm," imply specialised and comprehensive investigations, whilst Emerging or Declining Themes like "semantics" and "quality control" reflect evolving areas of interest or diminishing attention. This map showcases the diverse and complex nature of ChatGPT research. It emphasises the Motor and Basic Themes as the main areas of focus, while the Niche Themes represent specialised studies. The Emerging or Declining Themes indicate areas with potential for growth or reduced attention.

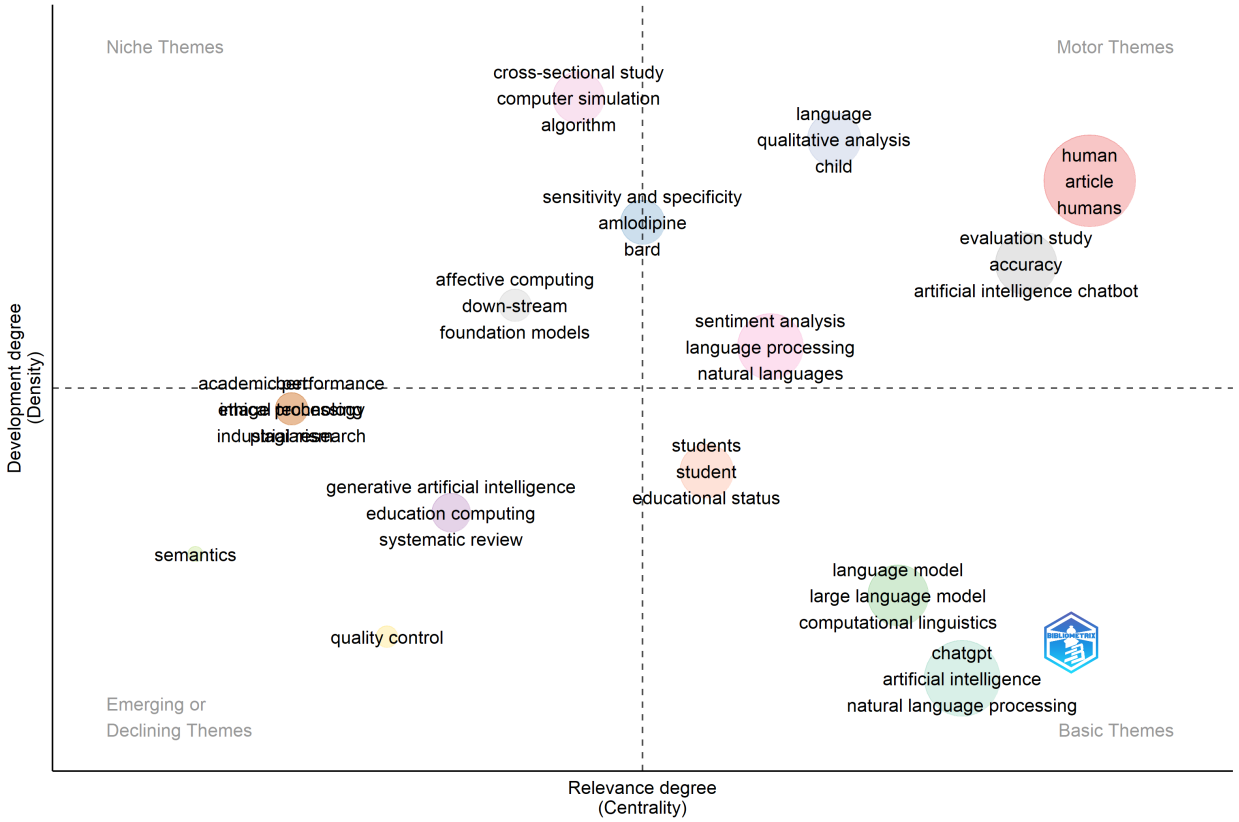

Fig. 6. Thematic map

The thematic map illustrating ChatGPT research in Southeast Asia classifies themes into four quadrants, emphasising Motor, Basic, Niche, and Emerging or Declining Themes. This detailed analysis offers valuable insights on the evolution and significance of different issues, highlighting the diverse character of ChatGPT research in the region. The map provides a systematic method for comprehending the present state of ChatGPT research and pinpointing prospective avenues for future investigation by classifying themes according to their level of advancement and importance.

The transformative impact of ChatGPT, particularly across the domains of education and healthcare, is rooted in its advanced capabilities in artificial intelligence (AI) and natural language processing (NLP). The rapid advancements in these technologies have positioned ChatGPT as a crucial tool for generating human-like text and facilitating meaningful interactions, leading to enriched user experiences across various applications [56]. This study aims to explore how ChatGPT can enhance communication, learning, and decision-making processes. The originality of this work lies in its comprehensive examination of ChatGPT's potential, particularly in educational settings, where it promises to augment personalized learning experiences and support educators in fulfilling their teaching responsibilities [57]. This exploration reveals significant opportunities for integrating AI into pedagogical strategies that could transform educational landscapes. It is crucial to assess the implementation challenges and ethical considerations that accompany their use.

Employing a multidimensional approach, this study analyzes ChatGPT's influence on student-teacher interactions and its potential to revolutionize educational practices. Results indicate that ChatGPT serves as an efficient virtual assistant for both students and educators, demonstrating an ability to generate contextually relevant responses and maintain conversational coherence throughout interactions [58]. This finding underscores the importance of developing AI tools that support academic inquiry and foster more profound relationships in educational contexts. The insights could lead to more personalized educational experiences, potentially reshaping traditional

pedagogical methodologies. Integrate AI tools like ChatGPT into their curricula; they may find new opportunities for enhancing student engagement and collaboration.

Additionally, the implications of ChatGPT's capabilities extend to the healthcare sector, where its NLP functionalities can enhance patient interactions, refine clinical decision-making, and aid medical professionals in managing complex information [59,60]. By focusing on both education and healthcare, this study emphasizes ChatGPT's versatility and its ability to address pressing challenges within these critical industries. The integration of AI solutions like ChatGPT in healthcare can drive efficiencies that may ultimately result in improved patient outcomes, making it a vital area for future exploration.

Nonetheless, the study also critically addresses the ethical concerns and limitations that accompany the integration of AI technologies, including ChatGPT. Issues of data privacy, algorithmic bias, and the potential for misuse in educational and therapeutic environments necessitate urgent attention as the model evolves [61,62]. The broader implications of AI integration in everyday workflows. It is crucial that as we harness the capabilities of AI, we also implement robust frameworks to mitigate risks associated with these ethical dilemmas.

This research enhances the understanding of the implications of integrating AI into daily activities by identifying these challenges. Furthermore, the analysis of ChatGPT's applications in Southeast Asia indicates a growing regional interest in AI technologies, reflecting global trends and the necessity for localized research to inform future policy and practice [63]. The regional focus shines a light on the cultural and contextual factors that may influence the adoption of AI technologies, suggesting that further investigation is needed to tailor applications to local needs effectively.

This study delineates ChatGPT's contributions to education and healthcare while offering a critical evaluation of its techniques, purposes, and ethical implications. By positioning ChatGPT within the broader framework of AI advancements, this research highlights its transformative potential for improving interactions and outcomes across various sectors. Anticipated outcomes from this study could guide future research trajectories and practical implementations, fostering a more effective and ethical utilization of AI technology in society [64,65]. Continued investigation into the deployment of ChatGPT is essential for unlocking its full potential while addressing the complexities inherent to its use. Moreover, a nuanced understanding of user experiences and ethical considerations will be vital in ensuring that ChatGPT evolves in a manner that benefits all stakeholders.

4. Conclusions

The analysis confirms a significant rise in publications across the three countries from 2023 to 2024. This rise signifies the growing scholarly interest in ChatGPT across several disciplines. This discipline has progressed due to institutions including NUS, USM, and NTU, along with researchers such Perkins Mike, Roe Jasper, and Rudolph Jürgen. Publications include the Journal of Public Health, Journal of Applied Learning and Teaching, and IEEE Access indicate that ChatGPT research encompasses artificial intelligence, computer science, health, education, and management. The most referenced documents demonstrate their academic importance in information management and practical learning. Thematic analysis indicates that the majority of research on ChatGPT concentrates on accuracy, evaluation studies, and the integration of artificial intelligence. Consequently, to optimize the advantages of AI across various industries, policymakers must formulate ethical standards for the appropriate implementation of AI. Future research should investigate its long-term implications in the domains utilizing ChatGPT.

References

[1] Tlili, Ahmed, Boulus Shehata, Michael Agyemang Adarkwah, Aras Bozkurt, Daniel T. Hickey, Ronghuai Huang, and Brighter Agyemang. "What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education." *Smart learning environments* 10, no. 1 (2023): 15. https://doi.org/10.1186/s40561-023-00237-x

[2] Dave, Tirth, Sai Anirudh Athaluri, and Satyam Singh. "ChatGPT in medicine: an overview of its applications, advantages, limitations, future prospects, and ethical considerations." *Frontiers in artificial intelligence* 6 (2023): 1169595. https://doi.org/10.3389/frai.2023.1169595.

[3] Grassini, Simone. "Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings." *Education sciences* 13, no. 7 (2023): 692. https://doi.org/10.3390/educsci13070692.

[4] Al Yakin, Ahmad, Muthmainnah Muthmainnah, Eka Apriani, Ahmed J. Obaid, and Ahmed A. Elngar. "Transforming online learning management: generative models on ChatGPT to enhance online student engagement scale (OLE)." *Idarah: Jurnal Pendidikan dan Kependidikan* 7, no. 2 (2023): 135-148. https://doi.org/10.47766/idarah.v7i2.1514.

[5] Sheikh, Mohammad S., Charat Thongprayoon, Fawad Qureshi, Supawadee Suppadungsuk, Kianoush B. Kashani, Jing Miao, Iasmina M. Craici, and Wisit Cheungpasitporn. "Personalized medicine transformed: ChatGPT's contribution to continuous renal replacement therapy alarm management in intensive care units." *Journal of Personalized Medicine* 14, no. 3 (2024): 233. https://doi.org/10.3390/jpm14030233.

[6] Miao, Jing, Charat Thongprayoon, Supawadee Suppadungsuk, Oscar A. Garcia Valencia, Fawad Qureshi, and Wisit Cheungpasitporn. "Innovating personalized nephrology care: exploring the potential utilization of ChatGPT." *Journal of personalized medicine* 13, no. 12 (2023): 1681. https://doi.org/10.3390/jpm13121681.

[7] Wójcik, Simona, Anna Rulkiewicz, Piotr Pruszczyk, Wojciech Lisik, Marcin Poboży, and Justyna Domienik-Karłowicz. "Reshaping medical education: Performance of ChatGPT on a PES medical examination." *Cardiology Journal* 31, no. 3 (2024): 442-450. https://doi.org/10.5603/cj.97517.

[8] Nikolopoulou, Kleopatra. "Generative artificial intelligence in higher education: Exploring ways of harnessing pedagogical practices with the assistance of ChatGPT." *International Journal of Changes in Education* 1, no. 2 (2024): 103-111. https://doi.org/10.47852/bonviewijce42022489.

[9] Oon, Ming Liang, Nicholas L. Syn, Char Loo Tan, Kong-Bing Tan, and Siok-Bian Ng. "Bridging bytes and biopsies: a comparative analysis of ChatGPT and histopathologists in pathology diagnosis and collaborative potential." *Histopathology* 84, no. 4 (2024): 601-613. https://doi.org/10.1111/his.15100.

[10] Rogasch, Julian MM, Hans V. Jochens, Giulia Metzger, Christoph Wetz, Jonas Kaufmann, Christian Furth, Holger Amthauer, and Imke Schatka. "Keeping Up with ChatGPT: Evaluating Its Recognition and Interpretation of Nuclear Medicine Images." *Clinical Nuclear Medicine* 49, no. 6 (2024): 500-504. https://doi.org/10.1097/rlu.0000000000005207.

[11] Alawida, Moatsum, Sami Mejri, Abid Mehmood, Belkacem Chikhaoui, and Oludare Isaac Abiodun. "A comprehensive study of ChatGPT: advancements, limitations, and ethical considerations in natural language processing and cybersecurity." *Information* 14, no. 8 (2023): 462. https://doi.org/10.3390/info14080462.

[12] Luo, Ziyue. "Discussion of the Application of ChatGPT in University Learning." *Transactions on Social Science,* Education *and Humanities Research* (2024): 124-131, https://doi.org/10.62051/rqw0p780.

[13] Silva, Carlos Alexandre Gouvea da, Felipe Negrelle Ramos, Rafael Veiga De Moraes, and Edson Leonardo dos Santos. "ChatGPT: Challenges and benefits in software programming for higher education." *Sustainability* 16, no. 3 (2024): 1245. https://doi.org/10.3390/su16031245.

[14] Al-Ghonmein, Ali M., and Khaldun G. Al-Moghrabi. "The potential of ChatGPT technology in education: advantages, obstacles and future growth." *IAES International Journal of Artificial Intelligence (IJ-AI)* 13, no. 2 (2024): 1206-1213. https://doi.org/10.11591/ijai.v13.i2.pp1206-1213.

[15] Loos, Eugène, Johanna Gröpler, and Marie-Louise Sophie Goudeau. "Using ChatGPT in education: human reflection on ChatGPT's self-reflection." *Societies* 13, no. 8 (2023): 196. https://doi.org/10.3390/soc13080196.

[16] Kamkankaew, Pongsiri, Phithagorn Thanitbenjasith, Suteera Sribenjachot, Nateetip Sanpatanon, Vachiraporn Phattarowas, and Phiched Thanin. "How Artificial Intelligence is Helping Businesses Grow and Thrive: The Transformative Role of Artificial Intelligence in Thai B2C Digital Marketing." *International Journal of Sociologies and Anthropologies Science Reviews* 4, no. 1 (2024): 137-164. https://doi.org/10.60027/ijsasr.2024.3651.

[17] Khuan, Hendri, Loso Judijanto, Titiek Rachmawati, Tia Tanjung, and Arnes Yuli Vandika. 2024. "Bibliometric Analysis on the Use of Artificial Intelligence in Improving the Efficiency of Banking Financial Processes in Southeast Asian Countries". *West Science Interdisciplinary Studies* 2 (01):129-37. https://doi.org/10.58812/wsis.v2i01.597.

[18] Liu, Zhichao, Ruth A. Roberts, Madhu Lal-Nag, Xi Chen, Ruili Huang, and Weida Tong. "AI-based language models powering drug discovery and development." *Drug Discovery Today* 26, no. 11 (2021): 2593-2607. https://doi.org/10.1016/j.drudis.2021.06.009.