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Modern Linguistics: Bibliometric Analysis based on Scopus and Google Scholar (2019-2023) using VosViewer

Haeruddin[1], Fitriani[2], & Zuhriah [3]
[1,2,3]Universitas Hasanuddin, Indonesia

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Abstract

The development of modern linguistics is spurred by technological advances and research methodologies, which encourage the utilization of new approaches such as corpus linguistics and bibliometric analysis. This method is essential for understanding the complexity of language in social and cultural contexts and identifying trends in research and scientific collaboration. This study aims to map the development of modern linguistics with a bibliometric approach using data from Scopus and Google Scholar from 2019 to 2023. The main objective of this study is to identify patterns of publications, scientific collaborations, and thematic clusters in linguistics. The methods used include bibliometric analysis with VOSviewer software to visualize the data. The analysis results reveal four main clusters in the Scopus data: traditional linguistics, computational linguistics, applied linguistics, and corpus linguistics. Meanwhile, an analysis from Google Scholar shows five clusters that show significant contributions from developing countries, especially in Southeast Asia. The United States and Western European countries were identified as the dominant centers of scientific collaboration, while the involvement of developing countries was limited. These findings highlight the integration between linguistics and technology and a shift in research focus towards interdisciplinarity. This research provides important insights for understanding the modern linguistic scientific landscape. It offers strategic implications for researchers, journal editors, and policymakers in designing research directions more responsive to global challenges.

*E-mail:
[1]haeruddin@unhas.ac.id
[2]fitriani@unhas.ac.id
[3]zuhriah@unhas.ac.id

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INTRODUCTION

In recent years, there has been a significant increase in publications in modern linguistics, which can be observed through trends using bibliometric tools such as VOSviewer. Practical reasons for observing these trends include understanding how modern linguistic theory is applied in a dynamic and multicultural global environment. This trend can also be driven by interviews and interactions with academics, which highlight recent developments and the need to explore underresearched areas in linguistics. Practical examples of bibliometric analysis using VOSviewer in various fields emphasize the importance of such software, as seen in studies on bioenergy (Soegoto et al., 2022) and service innovation (Kumar et al., 2024). Theoretically, the use of bibliometric analysis tools such as VOSviewer in modern linguistic studies is supported by the need to document and analyze the development of linguistic studies from a holistic perspective. As noted in studies on neuromarketing technology and biospectroscopy (Alsharif et al., 2023)The tool allows for the integration of theory with empirical data, aids in the identification of research trends, and provides insight into future research directions. Analysis of the literature in other fields, such as IoT in households, also demonstrates the value of bibliometric approaches in providing thematic maps and clustering of knowledge (Wang & Kim, 2023). Researchers can devise more effective and theoretically relevant research programs by better understanding the alignment of previous academic and industry trends. Using bibliometric analysis in modern linguistics can reveal rich insights into the evolution and dynamics of scholarly literature. Through a combination of practical and theoretical insights, the tool facilitates a deeper understanding of how the field is evolving and adapting in a broader educational context. As such, it provides valuable guidance to new and existing researchers regarding relevant research themes and directions.

The development of modern linguistics is a field of study that continues to transform along with technological advances and the development of research methodologies. New technologies and methods have changed how we understand and analyze language in this context. One approach that is gaining increasing attention is corpus linguistics, which offers a new way to explore the use of language in actual contexts. This type of research not only provides a deeper understanding of the structure and use of language, but also facilitates grammar learning that is more relevant to today's communicative realities (Zhang, 2022); (Herpindo et al., 2023).

In academia, new approaches involving interdisciplinary methods are becoming essential for understanding the dynamics of language and meaning in broader social contexts, including a more comprehensive understanding of how language plays a role in those contexts (Halim et al., 2024). In addition, the methodological aspect of linguistic research has also evolved. Research shows that traditional methodologies are often inadequate to handle the complexity of language in today's information age. For example, context-oriented approaches, including semantic theory, have been introduced to improve understanding of how meaning is produced and interpreted in social interactions (Halim et al., 2024); (Zein et al., 2022). In addition, achievements in the field of digitalization have enabled more efficient language analysis, which makes linguistic research more comprehensive and practical (Zein et al., 2022).

The awareness of the importance of research methods responsive to the times is increasing, encouraging researchers to combine theoretical understanding with field practice. This is done to dig deeper into the interconnectedness between language and its use in social contexts and create more contextual and practical language education for a diverse audience (Wagiati et al., 2023); (Rif'ah, 2023). Therefore, integrating technology with innovative research methodologies is key to navigating the ever-evolving field of modern linguistics. In conclusion, the development of modern linguistics as an ever-evolving field of study is not only driven by technological advances and research methodologies, but also by the need to adapt and respond to increasingly complex social and cultural contexts. This drive creates synergy between theory and practice in understanding and teaching language in this modern era. Given its dynamic nature, comprehensive mapping is needed to understand the research trends, concept developments, and research directions that dominate modern linguistics. One of the effective methods in identifying publication patterns, scientific collaboration, and the influence of research in a discipline is bibliometric analysis.

Bibliometric analysis has emerged as an important analysis in linguistics, allowing researchers to understand publication patterns, emerging research trends, and the relevance of scientific works. This method uses quantitative techniques to systematically evaluate the academic literature systematically, thereby providing insight into the dynamics of a particular field of research and revealing intellectual structures and trends over time. Historically, bibliometric techniques have been used to analyze various domains in

linguistics. For example, a study highlighted the growth of corpus linguistics from 2017 to 2021, which shows an increase in research results and scientific interest during this period. (Mahfudz et al., 2024). Similarly, Qin and Lei detailed research patterns in task-based language teaching from 1985 to 2020, demonstrating the effectiveness of bibliometric methods in mapping research trends and shedding light on significant areas of scientific activity (Qin & Lei, 2022). More broadly, bibliometric methods have gained traction in applied linguistics, as emphasized by Aryadoust, who emphasizes their usefulness in uncovering academic trends and facilitating comprehensive literature reviews (Aryadoust, 2023). In addition, the visualization capabilities of bibliometric analysis increase its usefulness in understanding complex networks and relationships within the field of research. Software such as VOSviewer allows researchers to create visual representations of citation and co-authorship patterns, explaining key trends and important contributors in various linguistic subfields, such as register studies (Sun & Wang, 2023). Through these visualizations, researchers can ascertain key themes and shifts in research focus, reflecting the evolution of the scientific landscape.

The importance of bibliometrics is more than just statistical analysis; Bibliometrics also provides a framework for identifying research gaps and determining future research directions. The study conducted by Yan and Zhang demonstrated the effectiveness of bibliometric analysis in determining "hot" topics in the language sciences, assessing widely cited papers to identify influential trends and contributors. In addition, the work of Syahid and Qodir shows how descriptive analysis and network analysis can uncover patterns of publication, citation, and authorship, thus providing insight into the collaborative nature of research in the field of linguistics (Syahid & Qodir, 2021).

Therefore, it is also necessary to conduct an analysis related to modern linguistic research trends. This study analyzes publication trends in modern linguistics based on Scopus and Google Scholar data from 2019 to 2023. Choosing the most recent time range, such as 2019-2023, ensures that the data used in the analysis is the most up-to-date and relevant. Understanding current trends and providing the most accurate picture of recent developments in modern linguistics is important. In addition, there have been rapid technological advancements in recent years, especially in data analysis tools and digital publications. Technologies such as the VosViewer software used in the analysis can leverage the latest data to create more accurate and informative network maps, which are invaluable in today's research scope (Martínez-Falcó, 2024).

Using bibliometric methods, this study identifies the most influential publication growth patterns, geographical distribution, and sources of publications to gain a more objective understanding of the dynamics of modern linguistic science. In addition, this study aims to identify the main keywords that dominate the modern linguistic literature as a basis for mapping research clusters. Using the VosViewer software, this analysis reveals the interconnectedness between concepts, evolving thematic trends, and research evolution in the studied period. Furthermore, this study analyzes the network of scientific collaboration, both at the individual, institutional, and interstate levels, to understand how academic cooperation in modern linguistics is formed and developed.

Previous studies in modern linguistics tend to focus more on theoretical and qualitative approaches, while bibliometrics-based quantitative analysis approaches are still minimal. Most previous studies have reviewed linguistic developments through systematic review methods without utilizing bibliometric techniques to identify research patterns, scientific collaboration, and the academic impact of a study. In addition, existing bibliometric research often uses only one database, such as Scopus, without considering the broader literature coverage of Google Scholar. Both become important databases. Scopus offers coverage of highly reputable journals with strict indexing standards, while Google Scholar includes more academic literature, such as conference proceedings and scholarly books. Therefore, combining these two databases, bibliometric-based analysis can provide broader insights into the dynamics of modern linguistic research. Therefore, no study has simultaneously analyzed data from these two databases in the context of modern linguistics. Furthermore, although VosViewer has been used in various disciplines for bibliometric analysis, its application in modern linguistic studies is still minimal. With this method, researchers can visually map the relationships between concepts, scientific collaboration networks, and research clusters that develop in a field of science.

This research offers a new approach by comparing data from two major academic databases, namely Scopus and Google Scholar, in modern linguistics. By integrating these two databases, the study provides a more holistic mapping of the development of modern linguistic science in recent years. In addition, this study uses VosViewer to perform bibliometric visualization,

an approach that is still rarely applied in modern linguistic studies. With this method, the study identifies key research clusters, relationships between concepts, and scientific collaboration networks. This can provide more in-depth insights into the patterns and directions of research development in this discipline. The results of this research are expected to help academics, journal editors, and academic policymakers understand the dynamics and direction of modern linguistic development. As such, the research not only makes a theoretical contribution to the study of modern linguistics but also offers practical benefits in academic and scientific policy contexts.

Modern Linguistics in the Context of the Development of Science and Technology

Modern linguistics is a branch of science that continues to develop rapidly along with technological advances and research methodologies. No longer limited to structural analysis, this field has become a multidimensional discipline that integrates cognitive, social, computational, and pragmatic perspectives. Innovative approaches such as computational linguistics, corpus linguistics, and discourse analysis play an important role in understanding the complexity of human language. For example, computational linguistics leverages mathematical modeling, artificial intelligence, and natural language processing (NLP) to automatically analyze language, while corpus linguistics supports real-data-driven empirical exploration. On the other hand, discourse analysis uncovers how meaning is constructed through social interactions and specific contexts, making modern linguistics relevant in a wide range of interdisciplinary studies.

The application of interdisciplinary approaches in modern linguistics is also seen in various fields. In general, modern linguistics is diverse in its scope and the methodology used, including aspects of syntax, phonology, and the influence of social and psychological context on language development (Fitriani, 2023); (Nasrullah & Budiman, 2022). In addition, its scope also includes language learning and the use of linguistics in various contexts, such as education and the social environment (Musahrain et al., 2023). With the advancement of technology and new methodologies, modern linguistics has undergone significant evolution. Linguistic research now often utilizes corpora and computational approaches, allowing for large-scale language data analysis. Research using computational analysis techniques, such as in studies related to corpus linguistics, shows that these tools strengthen our understanding of the structure and use of language (Almos et al., 2023); (Irham, 2022). This is demonstrated in studies that deal with affixation and reduplication through the corpus methodology (JR & Ermanto, 2023)shows the significant contribution of technology in deepening linguistic understanding.

The interdisciplinary role of modern linguistics is seen in more specific areas of study. For example, research on metaphors in the context of the pandemic shows the interaction between language and human thought (Rahmasari & Subiyanto, 2022). Other disciplines, such as forensic linguistics, are becoming increasingly relevant in legal and statutory contexts, showing how linguistics can be used to solve everyday problems (Nuryani & Soleha, 2023). This interaction is also seen in studies examining the influence of parenting styles on children's language development, underscoring the broad application of linguistics (Oktaviani et al., 2021); (Fono et al., 2023). The increasing number of scientific publications in modern linguistics indicates rapid growth in this field. With the increasing interest and attention to different aspects of language studies, there has been a significant increase in the literature that includes research on linguistic intelligence and language play in education that focuses on the development of language skills (Gunawan et al., 2020); (Gani & Puspita, 2023). This shows that linguistics has evolved from a traditional study to a more practical and applied direction, in line with the needs of today's society. Modern linguistics reflects language research's rich dynamics, highlighting the importance of new methods and interdisciplinary approaches to understanding language phenomena in a broader context. Taking advantage of technological advances and new analytical approaches, modern linguistics continues evolving to meet challenges and maintain relevance in addressing problems faced in everyday human communication.

Technological advancements, especially in the field of Natural Language Processing (NLP) and *big data*, have significantly boosted the research. Statistical and machine learning-based quantitative methodologies are increasingly applied in language studies, allowing for more precise and data-driven analysis. The utilization of this technology not only improves the efficiency of linguistic research but also expands its applications in various domains, such as machine translation, chatbots, and sentiment analysis in social media. In addition, modern linguistic studies increasingly emphasize an interdisciplinary approach, which links linguistics with cognitive psychology, sociology, computer science, and cultural studies. In cognitive psychology, for example, linguistics contributes to

understanding how humans process language, while in computer science, linguistics is the basis for developing NLP algorithms and text data processing. The main task of computational linguistics is to build computer programs that can process words and text in natural language (Zuhriah, 2022). Sociolinguistic perspectives are also growing, especially in researching digital communication dynamics and globalization's influence on language variation.

The increasing number of scholarly publications in modern linguistics reflects the growing interest of academics in data-driven research and quantitative methodologies. Academic databases such as Scopus and Google Scholar show a surge in publications in this field, such as journal articles, conference proceedings, and academic books. This indicates the urgency of systematically mapping research trends to understand the direction of development of this discipline in more depth.

Bibliometric Methods in Modern Linguistic Analysis

The bibliometric method is a quantitative approach widely used to analyze the pattern of scientific publications, assess the impact of research, and map scientific trends in a field. This method can provide a systematic picture of the dynamics of research development through indicators such as the number of publications, citations, the Hirsch index (h-index), and collaboration network analysis. In modern linguistics, the application of bibliometrics plays an important role in revealing research patterns, the level of collaboration between researchers, academic influence, the geographical distribution of publications, and the tendency of dominant research themes. Thus, bibliometric analysis not only provides information regarding productivity and scientific contributions, but also helps map the direction of the development of the discipline to support more targeted follow-up research (Purwo et al., 2024).

As a quantitative approach in analyzing scientific publications, bibliometric methods play an important role in understanding the dynamics of cross-disciplinary research, including linguistics. This approach allows researchers to analyze publication patterns, assess impact through citation counts, and explore collaborative networks among academics (Farsani et al., 2021). One of the most widely used techniques is *co-authorship* analysis, which helps map connectivity between researchers and institutions and shows how patterns of collaboration affect the development of a field (Farsani & Jamali, 2023). In the study of linguistics, this analysis is relevant to understanding the forms of scientific collaboration and their contribution to the quality and output of research (Avdeev, 2021).

Thematic trends and the geographical distribution of publications are important aspects of bibliometric studies. Using tools such as VOSviewer, researchers can map collaborative networks involving a wide range of researchers from different countries, creating a clearer picture of collaborative structures among cross-disciplinary academics (Srivastava & Saxena, 2023). In studies that focus on scientific collaboration, the emergence of such analyses is increasingly relevant given the globalization that drives interaction between diverse cultures and languages (Tang et al., n.d.). This mapping of academic networks reveals not only who is working together, but also emerging themes in linguistic research, providing a comprehensive picture of the future direction of research in this field (Farsani et al., 2021).

Furthermore, bibliometrics also support an understanding of the academic influence and relevance of various studies that have been published. Parameters such as the h-index and citation analysis provide an overview of an individual's contribution within the academic community. At the same time, a qualitative approach to collaboration can open up new understandings of how researchers interact and leverage their respective expertise in collaborative projects (He et al., 2021). For example, research that combines methodological orientation with bibliometrics can expose patterns of impact and collaboration within the scope of applied research, enriching narratives about how researchers interact in complex and sometimes unpredictable linguistic environments (Rasenberg et al., 2020). The bibliometric method provides a systematic approach to investigating the research ecosystem, showcasing diverse collaborations and research results in linguistics and other disciplines. By involving quantitative and qualitative analysis, bibliometrics provides a window into understanding academic interactions and their impact on creating new knowledge in an increasingly complex global context.

Using software such as VosViewer in bibliometric analysis provides deeper insights into the linguistic research landscape. Using *co-occurrence* analysis, it is possible to identify keywords frequently appearing in modern linguistic research, thus allowing the mapping of major research clusters and thematic evolution in this discipline. In addition, *co-authorship* analysis allows for mapping networks of scientific

collaboration between researchers and institutions, while citation analysis can uncover publications with significant academic impact. This method allows for more objective and data-driven exploration than traditional literature reviews, which are often subjective. In bibliometric studies, selecting academic databases greatly determines the scope and validity of the analysis results. Scopus is one of the most recognized databases, with high-quality content curation, including scientific journals, conference proceedings, and academic books that meet strict indexing standards. Meanwhile, Google Scholar offers a broader range of literature, including dissertations, research reports, and other academic sources. Combining the two allows for a more comprehensive mapping of research trends, covering high-quality academic literature and publications that have a broader impact on the scientific community.

Although the bibliometric method has been widely applied in various disciplines, its application in modern linguistics is still limited, especially in more in-depth quantitative data-driven analysis. Many previous studies have relied on only one database in bibliometric analysis, either Scopus or Google Scholar, which can limit the representation of the literature analyzed. In addition, previous studies have rarely utilized analysis software such as VosViewer to visually map the research network and the evolution of concepts in modern linguistics. Therefore, a more systematic bibliometric study with a software-based approach is needed to identify research patterns, research clusters, and publication growth dynamics in modern linguistics more objectively and data-driven.

METHODS

Bibliometric analysis is used to measure and analyze various aspects of the scientific literature quantitatively. This method involves using statistical techniques to assess authors' publication patterns, citations, and productivity in a particular field. Bibliometric analysis can identify research trends, the most discussed topics, influential journals, and collaborative networks between authors or institutions. In addition, this analysis can also help evaluate the impact of research and direct research policy more effectively. By adopting a bibliometric approach, researchers and decision-makers can gain in-depth insights into the structure and dynamics of a particular field of research.

This study uses bibliometric analysis to evaluate publications in the field of modern linguistics during the period 2019 to 2023. This analysis leverages two central databases, Scopus and Google Scholar, to ensure comprehensive coverage. This approach is in line with previous research that has successfully combined various databases to expand the scope of bibliometric studies (Sahid et al., 2023). Bibliometric analysis was chosen for its ability to provide a quantitative picture of the landscape of scientific knowledge, including publication trends, the level of scientific collaboration, and the influence of specific works. This approach is relevant to the research objectives of mapping the dynamics of modern linguistic science in the last five years.

The data collection stage was carried out systematically by extracting publication metadata, including titles, abstracts, author names, affiliated institutions, keywords, and the number of citations. The data obtained is then cleaned up to avoid duplication and eliminate irrelevant articles based on manual review of abstracts and keywords. Data analysis was carried out using VOSviewer, a bibliometric software that allows visual mapping of research networks. Several analysis techniques are applied, including *co-occurrence* analysis to identify the relationships between keywords in modern linguistic research, *co-authorship* analysis to evaluate academic collaboration between authors and institutions, and citation analysis to measure the impact and influence of a publication in the scientific community. The analysis results are visualized through network mapping to reveal this field's dominant relationship patterns and clusters.

To ensure the validity and reliability of the results, this study compared data from Scopus and Google Scholar to identify gaps and biases in indexing coverage. In addition, search methods and data processing scripts are transparently documented to ensure reproducibility and allow this research to be replicated by subsequent studies. With this systematic approach, this research contributes significantly to understanding the development of modern linguistics through a bibliometric lens. It offers insights for academics and researchers exploring future research directions in this field.

Data and Data Sources

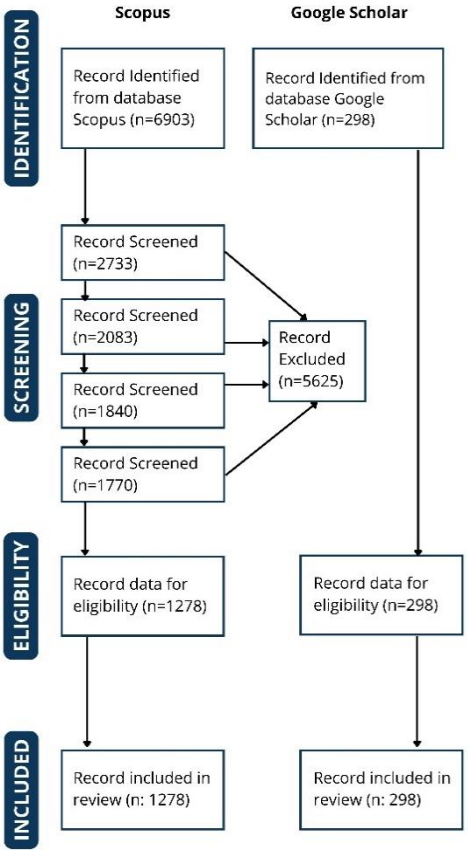

Figure 1. PRISMA Flowchart for Data Search and Selection Process

The literature search process was done through two central databases, Scopus and Google Scholar. In the identification stage, 6,903 publication data were obtained from Scopus, and 298 were obtained from Google Scholar with the help of Publish and Perish software. Furthermore, at the screening stage, the identification data was selected gradually based on the criteria that had been set, where the number of publications from Scopus was reduced from 2,733 to 2,083, 1,840, and finally 1,770 data after being selected based on the year of publication 2019 to 2023, document type, and language that only focused on English and Arabic, while overall 5,625 data were excluded because they were not relevant to the focus of the research. At the Eligibility stage, publications that passed the screening were checked for completeness of data, resulting in 1,278 decent publications from Scopus and 298 publications from Google Scholar. The data on Google Scholar is not reduced because it was filtered at the beginning of the search by applying the criteria, as with Scopus. In the final stage, all publications that meet the eligibility requirements are included in the Inclusion stage to be further analyzed in the bibliometric study.

The combination of Scopus and Google Scholar allows this study to produce a more representative coverage of the dynamics of scientific publications in modern linguistics. This approach aligns with previous research that has successfully combined various databases to expand the scope of bibliometric studies (Sahid et al., 2023). With its strict indexing system, Scopus provides quality assurance regarding journal reputation and metadata accuracy. At the same time, Google Scholar contributes to expanding the reach of literature by including publications from non-traditional sources. This approach is expected to identify the latest research trends and map academic collaborations developing in the last five years.

Data was collected through a planned search strategy, using the main keyword "modern linguistics". These keywords are calibrated to cover various contemporary linguistic aspects relevant to the research focus. The search is focused on the title, abstract, and keyword fields to ensure that each netted publication is directly related to the research theme. The time span is set between 2019 and 2023, so the analysis can capture the latest developments and be relevant to modern linguistic dynamics.

In addition, this study applies strict selection criteria to maintain the accuracy and validity of the data. Only documents in the form of journal articles and conference proceedings are considered. At the same time, other publications such as books, book chapters, or technical reports are excluded because they are considered less relevant to this bibliometric focus. Further selection is done manually by reviewing abstracts and keywords to ensure that only publications that truly fit the scope of the research are included in the analysis. A systematic and comprehensive approach in this research is expected to make a real contribution to mapping the trends of modern linguistic research.

Data Collection and Validation Techniques

The data collection process is carried out systematically using two central academic databases, Scopus and Google Scholar, to ensure a wide and comprehensive coverage of publications in the field of modern linguistics (Swacha, 2021). In Scopus, the search is carried out by applying modern linguistics keywords in title, abstract, and keywords with a publication year limit of 2019–2023. Another technical parameter applied is the minimum *threshold* for the occurrence of keywords twice for *co-occurrence* analysis. Meanwhile, on Google Scholar, data was extracted using Publish or Perish software with similar keywords and the same year limit, and the number of citations was considered to assess the publication's relevance.

The next stage is data cleaning and filtering to ensure the quality of the analysis. Removing duplication is an important first step, especially for publications that appear in both databases. After that, metadata verification is carried out carefully, including checking the title, abstract, author's name, affiliation, and publication source, to ensure the consistency and accuracy of the information. Articles that are not relevant to modern linguistic themes, either because they do not fit the keywords or are outside the scope of the study, are systematically excluded from the final dataset. The verified data results are then visualized using VOSviewer, a bibliometric network analysis software. VOSviewer analyzes data to map author collaboration networks, identify relationships between keywords, and visualize overall research trends. The validation process is carried out through cross-verification between databases to minimize the risk of data errors and increase the reliability of the results.

Through this comprehensive procedure, the research is expected to produce a comprehensive picture of the dynamics of modern linguistic research in the last five years. This approach not only emphasizes the accuracy and relevance of the data but also guarantees the reliability of bibliometric analysis in uncovering key trends, patterns of collaboration, and significant academic contributions to the future development of modern linguistics (Swacha, 2021).

Data Analysis with VOSviewer

The data collected and filtered is analyzed using quantitative bibliometric approaches and network analysis with the help of the VOSviewer software. Quantitative analysis measured the number of publications annually to identify research growth trends in modern linguistics from 2019 to 2023. In addition, the distribution of publications is analyzed based on the journal where the publication is published and the author's affiliated country to understand the geographical distribution and influence of specific journals on the development of this discipline. In addition to quantitative analysis, this study also applies bibliometric network analysis to uncover patterns of relationships in the modern linguistic research ecosystem, *co-occurrence analysis* that focuses on thematic relationships between concepts or keywords, and *co-authorship analysis* to highlight collaboration networks between authors or institutions (Martínez-Falcó, 2024).

VOSviewer is used as a primary tool in data visualization to improve the interpretation of results. The software allows the creation of network maps that represent the relationships between keywords, collaboration between authors, and thematic distributions in modern linguistics. Through this mapping, key research clusters can be identified, providing deeper insights into the structure and dynamics of this field in the past five years.

RESULTS AND DISCUSSION

Modern Linguistic Research Collaboration Network

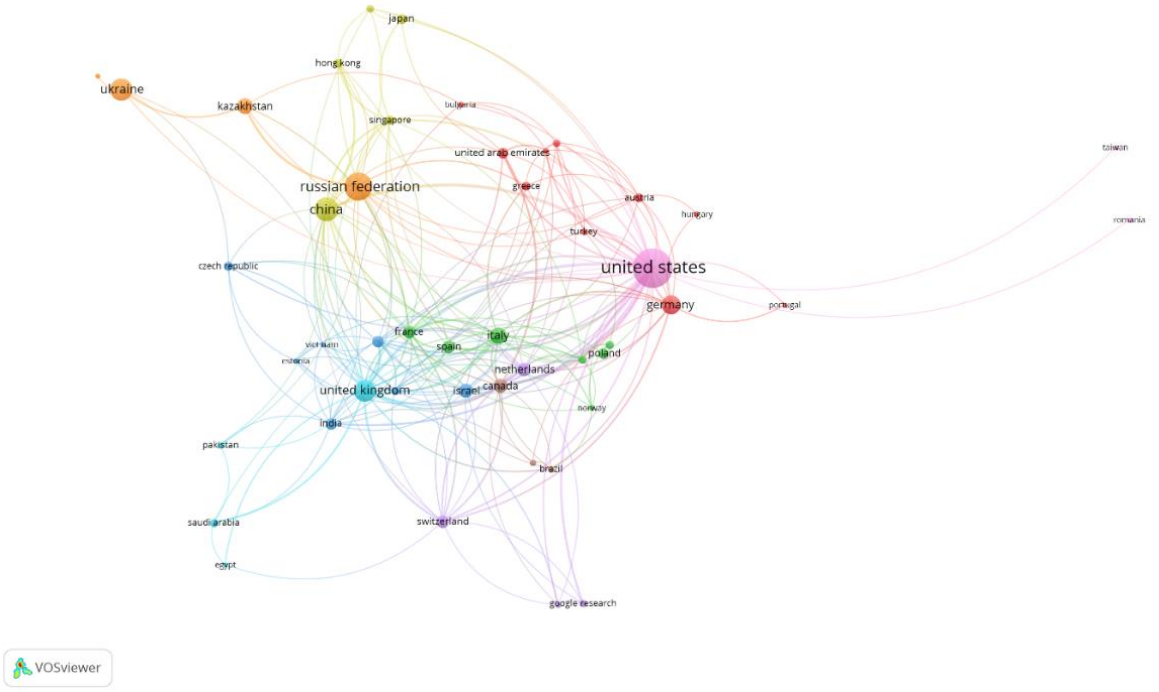

Figure 2. Network Visualization VosViewer "Jaringan Kolaborasi Penelitian Linguistik Modern"

The results of the analysis of modern linguistic research collaboration networks in Figure 2 show an international pattern. The United States emerged as the largest node in the network, signaling its dominance as a major center in modern linguistic research. Several main clusters, marked by different colors, indicate the existence of research groups that are geographically segmented but interconnected through intense collaboration. The blue cluster is dominated by Western European countries such as the UK, France, and the Netherlands, which show progress and high concentration in linguistic research in the region. Meanwhile, the red cluster involves countries such as the US, Germany, and some Eastern European countries, which shows a strong pattern of collaboration between developed countries in the Western and European hemispheres. The green cluster, which includes China and East Asian countries, indicates the emergence of Asia as an important player in modern linguistic research, with China as a significant hub in the region.

The connecting lines between nodes that describe the relationship between countries show varying intensities of collaboration. This highlights that despite significant progress in global collaboration, there is a gap in research productivity, with a clear dominance of developed countries, particularly in North America and Europe. The study also identified the important role of Google Research as one of the nodes in the network, suggesting that the platform plays a key role in the widespread dissemination of linguistic research results.

The trends seen from the analysis results show that collaboration between the US and Europe is powerful, with these two regions supporting each other in producing important publications. One of the proofs that the US and Europe have a strong network in modern linguistic research is the discovery of various studies that raise issues that are very relevant to the realm of modern linguistics, namely computational linguistics and corpus linguistics such as the research "Corpus Linguistics and the Social Sciences" by Tony McEnery and Gavin Brookes from Lancaster University, Lancaster, UK (McEnery & Brookes, 2024). Another research that is a form of collaboration between researchers from Russia and the USA is "Computational Linguistics and Discourse Complexology: Paradigms and Research Methods" by Solovyev et al. (2022) From Federal University, Kazan, Russia, and Arizona State University, Tempe, USA.

Meanwhile, China is emerging as a country that occupies an important position in linguistic research in Asia, signaling its increased contribution to regional research. However, developing countries still have limited connectivity in international collaboration networks. This shows a gap in access to research resources and networks. Based on these findings, this article suggests discussing global inequalities in the production of linguistic research, focusing on the factors that influence patterns of international collaboration. Further research also needs to emphasize the importance of strengthening collaboration with developing countries to create more inclusive networks. In addition, the role of digital platforms, such as Google Scholar, in supporting the development and distribution of modern linguistic research also needs to be further studied. However, limitations in this analysis should be noted, such as the potential for language bias in publications and the limitations of data coverage that does not cover all linguistic publications.

Scopus-Based Modern Linguistics Research Cluster

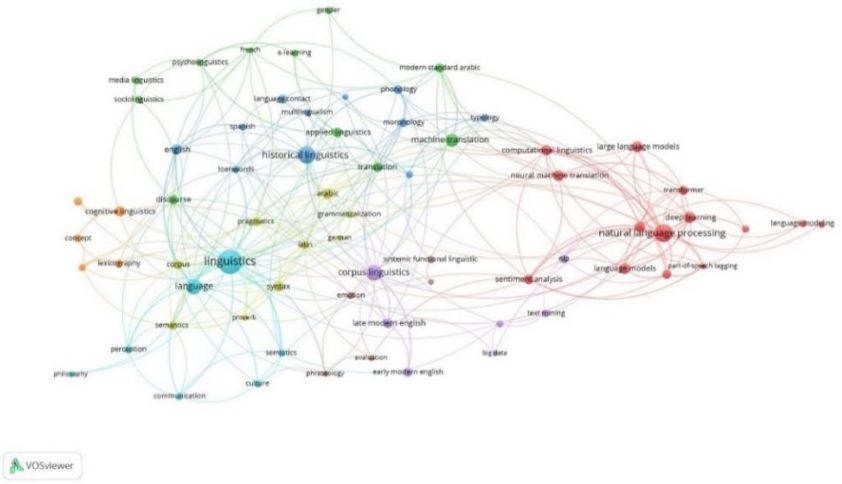

Figure 3. Network Visualization VosViewer "Scopus-Based Modern Linguistic Research Cluster"

Based on the results of the VOSviewer visualization in Figure 3, it can be seen that the network map of linguistic research topics forms several clusters that represent closely interconnected research themes. Clusters with light blue appear to dominate, with the central keyword "linguistics" strongly connected to basic topics such as *language, syntax, semantics*, and *discourse*. On the other hand, the red cluster shows themes centered on natural language processing (NLP), *deep learning,* and *large language models.* This pattern cannot be separated from technological developments that are in line with the results of bibliometric analysis by Kartal & Yeşilyurt (2024) This explains that AI technology is important in teaching a second language (L2) and applied linguistics, with increased studies on intelligent tutoring, natural language processing, and gamification in language education.

There has been a significant shift in linguistic research towards NLP technology and artificial intelligence-based language modeling. The close relationship between NLP keywords and terms such as *transformer* and *neural machine translation* shows how linguistic paradigms are now merged with cutting-edge computing approaches. This further confirms the position of linguistics as an adaptive field in responding to the challenges of the digital era, as also outlined by Abro et al. (2023) Which emphasizes that NLP (Natural Language Processing) is a promising technology with wide applications in understanding and processing human language in various sectors. Continuous research and innovation are essential to address the challenges at hand and realize the full transformative potential of NLP technologies in the future.

The green cluster highlights the themes of *historical linguistics*, *language contact,* and *interconnected multilingualism*. These findings underscore the importance of studying the history of language and the dynamics of cross-cultural language contact, as explained by Ranacher et al. (2021) which states that identifying the geographical regions where language contact occurred can provide insight into human interactions and migrations in the past, thus helping to weave together aspects of cultural evolution. In addition, the purple cluster focusing on *corpus linguistics, big data,* and *text mining* signals a shift in linguistic research methods towards using the digital corpus and large-scale data analysis. Although these three themes are a trend that continues to grow today, Mach-Król & Hadasik (2021) It is important to note that despite its great potential, challenges such as the limitations of temporal analysis in large-scale data mining remain important, so innovative methods are needed to make optimal use of this technology to gain comprehensive insights.

Overall, the intercluster interconnect-edness pattern indicates that modern linguistic research no longer stands in isolation, but is intertwined in a multidisciplinary approach. The theoretical foundations of classical linguistics continue to contribute to the development of NLP technology, while corpus and *big data approaches* open up research opportunities with a broader scope. This visualization provides an idea that the transformation of linguistic research from traditional to digital is increasingly fundamental, so qualitative deepening is needed, for example, through the analysis of the content of connected publications, in order to gain in-depth insights related to trends, research gaps, and potential for cross-disciplinary collaboration in the future.

Google Scholar-Based Modern Linguistics Research Cluster

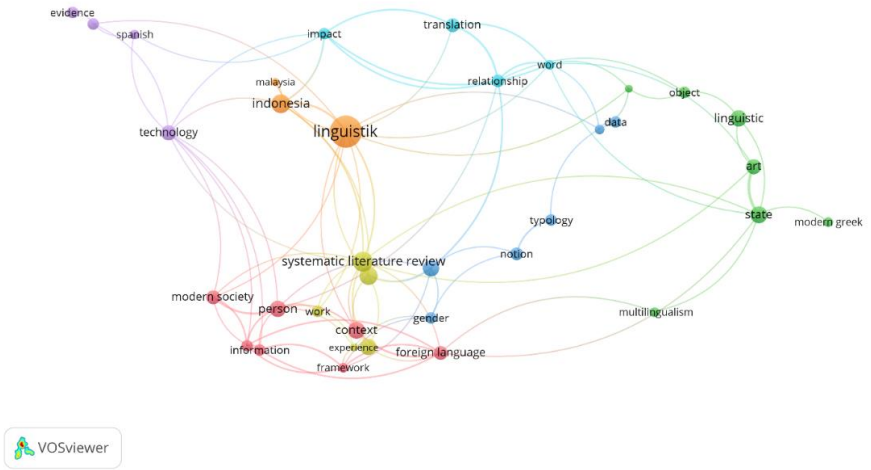

Figure 4. Network Visualization VosViewer "Google Scholar-Based Modern Linguistic Research Cluster"

The results of the network visualization in Figure 4 show that the theme of "linguistics" occupies a central position in the knowledge map, with wide connections to various important nodes such as Indonesia, systematic *literature review, technology,* and *foreign languages*. This central position indicates that linguistic research in the Google Scholar database, particularly in the last decade, has not only focused on developing pure theory but also emphasizes the relevance of local contexts, the application of technology, and systematic approaches in literature review. Interestingly, the connection of Indonesian and Malaysian keywords with linguistic nodes highlights the research contribution of the Southeast Asian region, especially in cross-linguistic and cross-cultural studies. Although both have geographical proximity and some historical attachments, they still focus differently in a cultural context. Cultural contexts profoundly influence the focus of linguistic research in both countries. In multicultural Malaysia, socio-cultural analysis emphasizes understanding how languages coexist and operate in society, emphasizing inter-ethnic communication and cultural identity. In Indonesia, research focuses more on managing linguistic diversity, maintaining local identity, and building a sense of national unity through language. This includes balancing the preservation of regional languages as well as the importance of *cultural heritage branding,* which is a tool that adds a layer of understanding related to cultural values (Ahmad Taha & Abdelfattah, 2023).

Meanwhile, the emergence of the *Systematic Literature Review* node with links to the keywords *framework, context,* and *experience* shows that the methodological approach in linguistic research is increasingly directed towards strengthening the validity of findings through systematic literature mapping. *Systematic Literature Reviews* (SLR) play an important role in linguistic research for several reasons. This approach provides a structured way to synthesize existing research, identify gaps, and provide direction for future research. Systematic reviews use rigorous methodologies, such as the PRISMA guidelines, to ensure that the data collected is comprehensive and representative of the field of study. For example, a systematic review of translanguaging in English teaching shows the usefulness of this methodology in gathering a diverse range of literature to provide an up-to-date picture of existing knowledge and to set future research priorities (Prilutskaya, 2021).

In the green cluster, the linkages between *linguistic, state, art,* and *modern Greek* show that linguistic research retains interest in studying typologies, linguistic objects, and specific languages in addition to applied approaches. Meanwhile, the red cluster on the lower left side, with keywords such as *modern society, person, information,* and *technology*, shows a shift in interest towards linguistic studies in the context of a modern technological society. The relationship between *technology*, information, and *context* shows that technology is positioned not only as a research tool but also as an object of study, especially in digital media. In addition, there are *foreign language nodes* connected to *context, experience,* and *gender* support that are still in the red cluster, which indicates that the study of foreign language learning can be associated with learning contexts, personal experiences, and gender factors.

The last cluster in blue shows the keywords *translation, word, relationship*, and *data*. This indicates a continued interest in translation, lexical analysis, and the use of linguistic data. *Transtation* has a dominant position related to the urgency of translation in language analysis on a global scale. Translation can be a translingual strategy that supports writing in additional languages, such as English. This study advances the understanding that translation strategies and translingual practices can integrate learners' linguistic resources to assist their writing in the context of learning in schools (Beiler & Dewilde, 2020).

Based on the results of network visualization that has been described from several clusters, it can be concluded that linguistic research in the last decade shows an increasingly multidimensional orientation with the theme of "linguistics" as a central node that is connected to various important topics such as the local context in Southeast Asia, *systematic literature review approaches, technology, foreign languages, and translation*. These findings indicate a balance between strengthening theory and practical application through technology and language policy. The overall map generally reflects the direction of interdisciplinary adaptive linguistic research.

Discussion

The results of this study comprehensively reveal the dynamics of modern linguistic research that is moving towards an increasingly complex, multidisciplinary, and adaptive pattern of international collaboration with technological developments. The analysis of collaborative networks in **Figure 2** shows how the dominance of the United States as the central node confirms the role of developed countries as the driving force of global linguistic research. The pattern of clusters

formed in Western Europe, Eastern Europe, and East Asia shows the existence of geographical segmentation, but it remains closely connected through intense cooperation between institutions. This is in line with the findings McEnery & Brookes (2024) and Solovyev et al. (2022), which shows that cross-border collaboration makes a real contribution to computational and corpus linguistics development.

However, this study also highlights global inequality, where developing countries still play a limited role in international research networks. This inequality must be considered a serious challenge because the diversity of perspectives can enrich linguistic discourse, especially related to local language preservation, language policy, and multilingual learning innovation. Strengthening collaboration with developing countries and using digital platforms such as Google Scholar has proven to be relevant as a strategy to expand access and visibility of research on a global scale.

At the theme level, the visualization results based on Scopus **Figure 3** show a significant transformation in the direction of linguistic research. The dominant clusters around the keywords NLP, *deep learning*, and *large language models* confirm that modern linguistics is increasingly integrated with artificial intelligence technologies. This paradigm supports the statement Abro et al. (2023) NLP has transformative potential in understanding human language across various sectors. The interconnectedness of keywords such as *transformers* and *neural machine translation* also proves how cutting-edge technology requires linguistics to adapt to new analytical approaches, without abandoning the theoretical roots of classical linguistics. In this case, the synergy between corpus linguistics*, big data*, and *text mining* also opens up new research paths that rely on massive data, although Mach-Król & Hadasik (2021) reminding of the need for methodological innovation to overcome temporal limitations and interpretation biases in large-scale data mining.

Meanwhile, the Google Scholar-based visualization **Figure 4** confirms the shift in research orientation to a contextual approach, highlighting the linkages between linguistics and the local Southeast Asian context, *systematic literature review, technology, foreign language*, and *translation*. These findings demonstrate the importance of a systematic literature review approach as a method for mapping knowledge gaps, as affirmed Prilutskaya (2021). In addition, the relationship between foreign language nodes and *context*, *experience*, and *gender* underlines the strengthening of sociocultural perspectives in foreign language learning. This aspect is important because it illustrates a research trend that emphasizes the technical aspects of language learning and pays attention to the psychosocial dimensions that shape the learning experience.

In another cluster, the relationship between *translation*, *word*, and *data* keywords showed a sustained interest in cross-language translation studies. Beiler & Dewilde (2020) emphasizes that translingual strategies can help learners integrate their linguistic resources in a global academic context. This shows how modern linguistic research opens up opportunities for interaction between theoretical, pedagogical, and digital technology approaches in supporting multilingual literacy.

Overall, the results of this study confirm that the development of modern linguistic research cannot be separated from the increasingly inclusive pattern of global collaboration, technological transformation that encourages the integration of NLP and big data, and the strengthening of local and multidisciplinary contexts. Thus, future linguistic research is required to build a solid theoretical framework and respond to changing social, technological, and policy dynamics. For this reason, qualitative deepening through case studies and analysis of the content of connected publications is needed to map in more detail the contribution of each cluster in building linguistic knowledge that is more equitable, inclusive, and relevant to global needs.

CONCLUSION

This study shows that data-based bibliometric analysis from Scopus and Google Scholar can provide a comprehensive mapping of the development of modern linguistics in the period 2019–2023. Based on the results of the analysis of collaboration networks and topic clusters, it can be concluded that modern linguistic research in the last decade is moving in an increasingly global, multidisciplinary, and adaptive direction to technological developments, with the United States and Western Europe remaining to dominate international collaboration networks, while Asia, especially China, is beginning to strengthen its position as a center for linguistic research. The intercluster interconnectedness pattern also shows that classical linguistic approaches remain relevant and, combined with cutting-edge methods such as NLP, big data, and systematic literature review, open up innovation opportunities in cross-language, cross-cultural studies and foreign language learning sensitive to social contexts and psychosocial factors. However, there is still a gap in access and productivity between developed and

developing countries, so a more inclusive collaboration strategy and optimization of the role of digital platforms in supporting the dissemination of linguistic knowledge globally are needed. These findings underscore the importance of synergy between strengthening theory, methodological innovation, and utilizing technology to address linguistic challenges in an increasingly complex digital age.

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