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*Mapping Global Research on Industry 5.0 and Artificial Intelligence: A Bibliometric Review with VOSViewer**

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Abstract

The rise of Industry 5.0 signifies the move toward more human-centered, sustainable, and collaborative industrial processes. This new phase of industrial transformation has beyond Industry 4.0 and broad applications across multiple sectors. Artificial intelligence plays a central role in this transformation, enabling smarter decision making and personalized solutions. The aim of this study is to examine the publications on both artificial intelligence and Industry 5.0 between the years 2018 and mid-2025 with the bibliometric mapping technique via VOSviewer. In this context, Scopus database was selected because of multidisciplinary fields and search was conducted on 1,113 international scientific publications with the concepts of both "Artificial Intelligence" and "Industry 5.0". The results show that the keywords "Industry 4.0", "machine learning", and "sustainability" are listed in top five except "artificial intelligence" and "Industry 5.0". India has the highest number of citations and documents. As a number of citations, the United States has the second place and the Australia has the third. As a number of documents, the Italy has the second place and the United States has the third. According to the results of publications, the most cited document authored by Nahavandi (2019).

Keywords: industry 5.0, artificial intelligence, industry 4.0, sustainability, machine learning

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Endüstri 5.0 ve Yapay Zeka Üzerine Küresel Araştırmaların Haritalanması: VOSViewer ile Bibliyometrik Bir İnceleme

Öz

Endüstri 5.0'ın yükselişi, daha insan merkezli, sürdürülebilir ve iş birlikçi endüstriyel süreçlere doğru bir geçişi ifade etmektedir. Bu yeni sanayi dönüşümü evresi, Endüstri 4.0'ın ötesine geçmekte ve çok çeşitli sektörlerde geniş uygulama alanlarına sahiptir. Yapay zeka, bu dönüşümde merkezi bir rol oynamakta, daha akıllı karar alma süreçlerini ve kişiselleştirilmiş çözümleri mümkün kılmaktadır. Bu çalışmanın amacı, 2018 ile 2025'in ortaları arasındaki yapay zeka ve Endüstri 5.0 konulu yayınları VOSviewer aracılığıyla bibliyometrik haritalama tekniği kullnarak incelemektedir. Bu bağlamda, disiplinler arası alanları kapsaması nedeniyle Scopus veri tabanı seçilmiş ve "Yapay Zeka" ve "Endüstri 5.0" kavramlarını içeren 1,113 uluslararası bilimsel yayın üzerinde arama yapılmıştır. Sonuçlar, "Yapay Zeka" ve "Endustri 5.0" dışında, en çok kullanılan ilk beş anahtar kelime arasında "Endüstri 4.0", "makine öğrenimi" ve "sürdürülebilirlik" kavramlarının yer aldığını göstermektedir. Hindistan, en fazla atıf ve dokümana sahip ülkedir. Atıf saysıına göre, Birleşik Devletlet ikinci, Avustralya ise üçüncü sıradadır. Doküman sayısına göre ise, İtalya ikinci, Birleşik Devletler üçüncü sıradadır. Yayın sonuçlarına göre, en çok atıf alan çalışma Nahavandi (2019) tarafından yazılmıştır.

Anahtar Kelimeler: endüstri 5.0, yapay zeka, endüstri 4.0, sürdürülebilirlik, makine öğrenimi

1. INTRODUCTION

Rapid advances in Artificial Intelligence (AI) are significantly transforming industrial systems, increasing automation, strengthening data-driven decision-making processes, and supporting operational efficiency and sustainability (Mithas et al., 2022; Rajagopal et al., 2022; Tseng et al., 2021). As technological developments accelerate, the evolving notion of Industry 5.0 has put the human element back at the center of industrial innovation (Alves et al., 2023; Horvat et al., 2025). Industrial revolution has gained progress with Industry 4.0 and also received global recognition and adoption. It emphasizes machine-to-machine connectivity and smart systems, whereas Industry 5.0 (I5.0) underscores the collaboration between humans and advanced technologies like artificial intelligence to create sustainable, personalized, and resilient production systems (Golovianko et al., 2023; Xu et al., 2021).

Although there has been growing academic interest in both artificial intelligence and Industry 5.0, and several studies have been conducted on the intersection of these two fields, a comprehensive and systematic global understanding is still in progress (Chander et al., 2022; Han et al., 2017; Leng et al., 2024; Özdemir and Hekim, 2018; Trunina et al., 2023). Further research in this area is likely to provide valuable insights for future developments. In particular, the number of studies has increased sharply after 2024, which reflects the need to maintain scholarly knowledge current as well as the speed at which technology is developing. While numerous bibliometric studies have recently analyzed the development of Industry 5.0 and artificial intelligence, mostly independently, a comprehensive mapping of their intersection is still limited. Trunina et al. (2023) primarily examined the threats and challenges associated with the use of AI in Industry 5.0, without utilizing bibliometric or thematic clustering analysis. Ciucu-Durnoi et al. (2024) and Rejeb et al. (2024) defined tyhe extensive research environment of Industry 5.0, but did not explicitly consider AI as a primary analytical aspect. Fosso-Wamba and Guthrie (2024) similarly investigated AI inside the frameworks of Industry 4.0 and Industry 5.0, although they did not conduct a concentrated theme and cooperation network investigation.

Ongoing bibliometric evaluations are crucial to comprehensively developing research paths, collaborative patterns, subject developments. Therefore, this study distinguishes itself by conducting a bibliometric analysis to identify trends, significant publications, and collaboration networks that characterize the present state and future path of Industry 5.0 and Artificial Intelligence. This study addresses the research gap by performing an extensive bibliometric analysis of Scopus-indexed publications from 2019 to 2025, sprecifically focusing on the AI-Industry 5.0 relationship. This study employs keyword co-occurence, cooperation, and thematic cluster analysis via VOSviewer to offer a contemporary and comprehensive view of developing themes, knowledge, and research collaborations. It enriches the literature by offering an updated bibliometric mapping of Industry 5.0 and artificial intelligence, capturing recent growth in different fields of publications and identifying key research trends (Fosso-Wamba and Guthrie, 2024; Madsen et al., 2023). By focusing on the AI-Industry 5.0 interaction, it extends theoretical discussions on human-centricity and sustainability (Alves et al., 2023; Ivanov, 2023).

Initially, this study outlines the conceptual underpinnings of the keywords analyzed in the bibliometric assessment of the research, highlighting the position of the pertinent concepts within the literature, their evolution, and their significance within the study's context. The methodology section specifies the data gathering process, bibliometric analysis, and the application of VOSviewer for visualization and network analysis, thereby ensuring transparency and reliability (van Eck and Waltman, 2010). The findings section includes various indicators, such as changes in the number of publications over the years, the countries with the highest contributions and authors, prominent studies by citation count, and keyword matches. These analysis reveal thematic concentrations of academic production in the relevant field, interdisciplinary trends, and global collaboration networks. As a final point, the discussion and conclusion section evaluates the findings within the framework of existing literature. The strengths of the field, emerging subthemes, and gaps in understudied topics are discussed.

Within this framework, the study conducts systematic analysis of the scientific literature at the intersection of Industry 5.0 and Artificial Intelligence, with the aim of highlighting global research trends and contributing to the both theoretical understanding and practical applications in the field.

2. INDUSTRY 5.0 (I5.0) and ARTIFICIAL INTELLIGENCE (AI) OVERVIEW

The revolutions that took place in industry refer to a long evolutionary process extending from mechanization to digitalization. The First Industrial Revolution initiated mechanization with steam power, and the Second Industrial Revolution made mass production possible with the introduction of electric energy and assembly lines. The Third Industrial Revolution transformed manufacturing with electronics, computers, and automation technologies. Currently, Industry 4.0 enhances production processes through the integration of digital technologies, including cyber systems, the Internet of Things, and big data analytics (Rijwani et al., 2025; Zizic et al., 2022). Following the Fourth Industrial Revolution, which emphasized digitalization and automation, the concept of Industry 5.0 has emerged as a new paradigm that places humans at the core of production and promotes collaboration between people and intelligent machines (Li and Duan, 2025; Fogaça et al., 2025; Nahavandi, 2019).

Industry 5.0 does not only focus on the advancement of digital technologies but also addresses how these technologies can be integrated in a human-centric manner. In this context, synergy between human creativity and AI-supported automation systems plays a central role. Unlike Industry 4.0, which prioritizes connectivity and efficiency, Industry 5.0 emphasizes personalized production, adaptability, environmental sensitivity, and social responsibility (Xu et al., 2021). This new industrial vision incorporates human-machine collaboration not only as a technological interaction but also as an ethical, social, and ecological imperative (Alves et al., 2023).

One of the key enablers of Industry 5.0 is artificial intelligence (AI), which plays a transformative role in enhancing automation, strengthening data-driven decision-making, increasing productivity, and optimizing resource utilization (Rajagopal et al., 2022). Moreover, when AI is integrated with human-centered design principles, it enhances efforts aimed at building more sustainable and socially responsive production systems (Rožanec et al., 2023).

The interaction between Industry 5.0 and AI is frequently examined in the literature through themes such as human-machine collaboration (Nahavandi, 2019), adaptive manufacturing systems (Peruzzini et al., 2024), ethical algorithms (Ciobanu and Meşniţă, 2022), and cognitive automation (Patrício et al., 2025). This reflects the idea that Industry 5.0 represents not only technological progress but also a broader transformation encompassing social welfare, redefinition of labor roles, and digital inclusiveness (Horvat et al., 2025). Several studies in the literature have addressed this intersection in various ways. For instance, Lu et al. (2022) explored the innovations introduced by Industry 5.0 in human-centered production systems. Their theoretical and literature-based study emphasized that strengthening the interaction between humans and machines enhances flexibility, efficiency, and sustainability in industrial systems. They concluded that transforming technology in a way that prioritizes human well-being offers substantial contributions to collaboration and sustainable production. Similarly, Jefroy et al. (2022) investigated the links and distinctions between Industry 4.0 and Industry 5.0, particularly focusing on their impact on smart logistics. Employing a bibliometric analysis, their study classifies smart logistics within the context of Industry 5.0 into four main dimensions: intelligent automation, smart devices, smart systems, and smart materials.

Nahavandi (2019) introduced the concept of Industry 5.0 by examining how human-machine cooperation can be made more efficient and how sustainable production environments can be achieved. The study emphasized that Industry 5.0 is not only about technological development but also about redefining the role of humans in production, with the goal of enhancing workforce quality and well-being. Leng et al. (2024), in their systematic literature review, assessed how AI technologies are utilized in closed-loop supply chain management. Their analysis reveals that AI contributes significantly to improving both environmental and economic efficiency in reverse logistics systems. Another remarkable study was made by Martini et al. (2024) and they examined a human-centric AI approach within the framework of Industry 5.0 and the circular economy. Their study, focusing on additive manufacturing, indicates that human-centered AI applications enable the transformation of production systems toward greater flexibility and sustainability, and offers specific policy recommendations to support this transformation.

Bécue et al. (2024) investigated the influence of AI on innovation capacity within the scope of Industry 5.0. Using a bibliographic and content analysis of 333 studies, they found that the impact of artificial intelligence on innovation varies by context and may be synergistic, misleading, or substitutive depending on its application. Lastly, Nalbant and Aydın (2025) analyzed the contribution of AI and metaverse technologies to Industry 5.0 using theoretical

and literature-based methods. Their findings revealed that these technologies play a decisive role in enabling personalized, efficient, and human-centric industrial processes, particularly in relation to human-machine collaboration and sustainable production goals.

In light of the above, the interaction between Industry 5.0 and artificial intelligence is expected to shape the production environments of the future in ways that are not only effectual but also aligned with human values. While human creativity, knowledge, and skills remain central to this transformation, AI technologies serve as enabling tools that support and enhance this potential (Özdemir and Hekim, 2018).

3. RESEARCH METHOD

Within the framework of Industry 5.0, the extensive reach of Scopus offers a significant advantage. Innovative concepts arise not in prestigious journals but in conference proceedings, which are frequently chosen in disciplines such as engineering and computer science (Madsen and Berg, 2021). In this context, Scopus was selected as a database for this research due to its functionality scientific search engine, offering access to millions of documents across various disciplines (Burnham, 2006; Chadegani et al., 2013; Schotten et al., 2017).

To summarize the data collection process, the search was carried out in the Scopus database using the keywords “Industry 5.0” AND “Artificial Intelligence” within the fields of article title, abstract, and keywords, covering publications between 2018 and 2025. Duplicate and irrelevant records were removed before conducting the analysis in VOSviewer. Moreover, this database is easier than other scientific databases to output and read in VOSviewer to visualize the research areas. The aim of this study is to investigate publications on both artificial intelligence (AI) and Industry 5.0. There are no publications before 2017 on the use of these concepts. For this reason, data were taken on 30th of July 2025 from Scopus and publications between 2018 and 2025 have been examined. Besides, 2026 has been removed from the table because it has not yet been published. There were 1,113 publications found in the database which depend on different types of documents (Table 1).

Table 1. Type of documents published in Scopus

Document Type	No. of Documents
Article	356
Conference Paper	278
Book Chapter	272
Review	127
Book	40
Conference Review	27
Editorial	9
Short Survey	2
Retracted	1
Letter	1

Bibliometric analysis was first proposed by Paul Otlet who is considered the father of information science, Alan Pritchard played a key role in popularizing the term "bibliometrics" in 1969 (Kumar, 2025). A bibliometric analysis is a method that defines the study landscapes and emphasizes significant theme areas within research topics (Leal Filho, 2025). It is a significant research methodology that applies statistical and numerical techniques to explore trends in published academic literature. It provides a systematic path to the researchers to identify patterns, trends, and impacts within a field. In addition, it allows researchers to manage and analyze large datasets, enables the visualization of the innovations and trends in the emerging field, and helps to explore the gap in literature (Donthu et al., 2021).

The most important issue when conducting an analysis is applying the main steps during the analysis process. First of all, defining the scope of the study may introduce a reliable publication for the researchers. After reaching the scientific database to search, the bibliometric technique should be selected depending on the appropriate objective of the study (Passas, 2024). In this study, "Artificial Intelligence" and "Industry 5.0" were searched within "Article Title, Abstract, Keywords" to prevent the exclusion of any possible relevant publications. The collection of data is also important for presenting the studies. In this study, Scopus is the database to collect the data and the data was cleaned before analyzing in VOSviewer. The criterion was the year of the publication, which has been limited until 2025. The remaining filters were used without excluding any items. In this study, VOSviewer was utilized, which is one of the mapping bibliometric data analysis to visualize the co-occurence of the keyword, citations of the authors, documents, and also countries. It also helps to identify the network among the keywords, countries and so on.

4. FINDINGS

In this study, "Artificial Intelligence" and "Industry 5.0" were searched within "Article Title, Abstract, Keywords". The intersection of the concepts was applied in the Scopus database to find out the most used keywords, related documents and authors, highest citations of the documents and also countries. It also provides a network among documents, authors, and countries for the researchers to explore the fields deeply.

According to the database obtained from Scopus, first publication related with the concepts published in 2018. Afterwards, Figure 1 indicates that there was a sudden increase since 2022 with 101 publications in one year. Last year had the highest number of publications of all time, with 480 publications. When we compare this result with the previous years, it seems that there was a bounce from 2023 (194 publications) to 2024 (480 publications). Lastly, considering the data was collected in mid of 2025, 294 publications had been published in Scopus by that time, reflecting the research activity up to that point. This amount shows that there is an intention to study on these concepts nowadays due to digitalization and sustainability.

Figure 1. Distribution of number of publications taken from Scopus database between 2018 and 2025

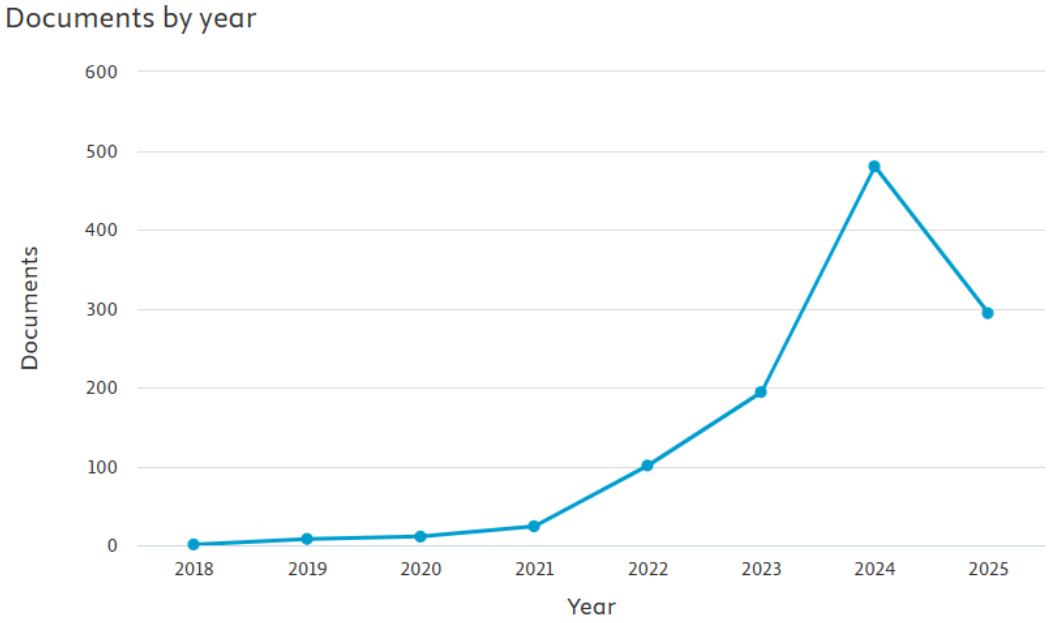
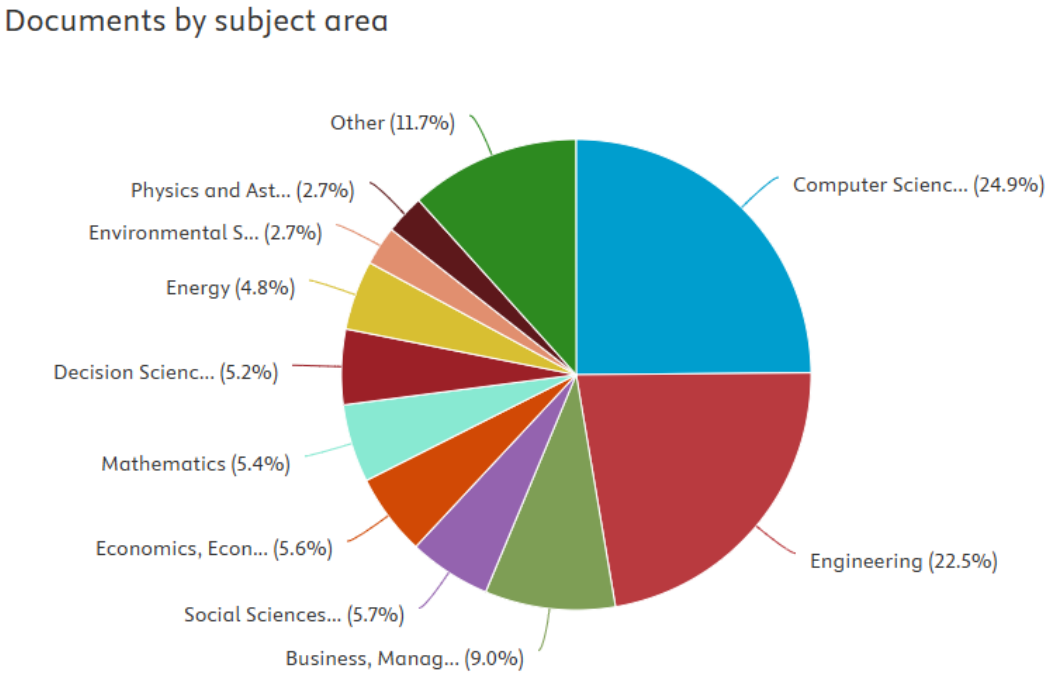


Figure 2 illustrates the percentage of subject area of documents. The highest percentage belongs to Computer Sciences with 24.9% and second area is engineering with 22.5%. It reveals that these areas are using the concepts of AI and Industry 5.0 mostly, but also other areas such as social sciences, business, physics and so on also study on these concepts. The finding of this analysis demonstrate the value of multidisciplinary collaboration.

Figure 2. Percentage of subject area of publications taken from Scopus database between 2018 and 2025



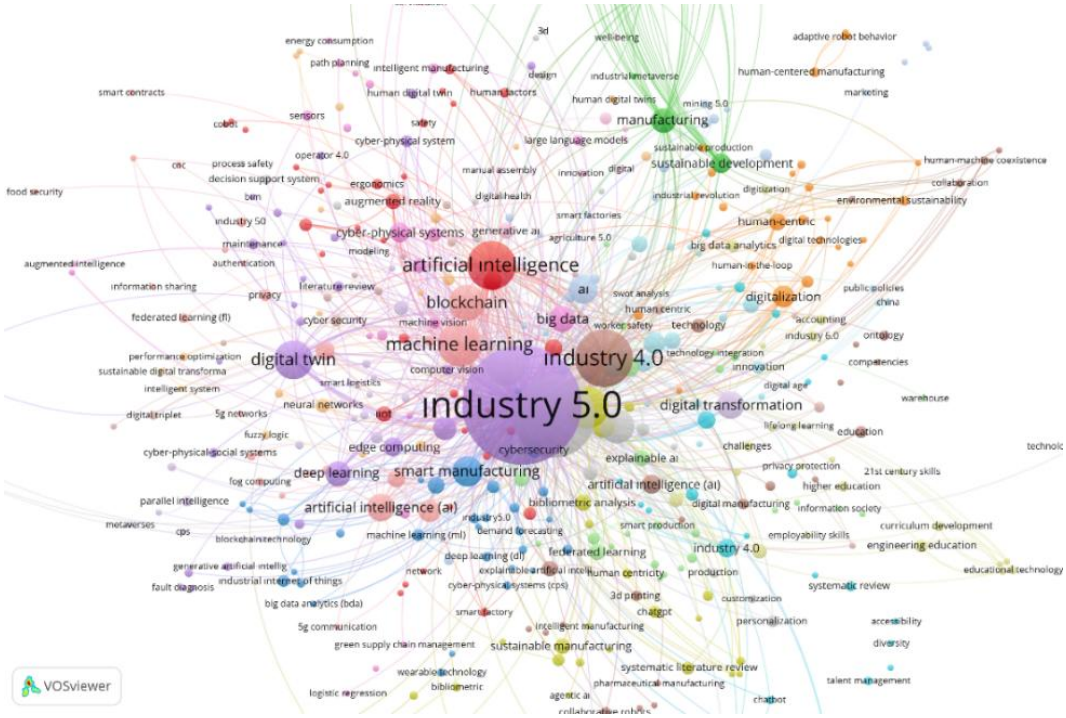
In this section, bibliometric analysis was made in VOSviewer program to visualize some points about the subject.

4.1. Keyword Co-occurrence Analysis

Keywords are essential for scientific publications as they clarify the research field. It provides a pattern for the researchers to reach subject area easily and quickly (Huang et al., 2022). VOSviewer is one of the mapping techniques for the bibliometric analysis which have several capabilities and one of them is helping to specify the most used keywords. In this context, at the first step Scopus database were uploaded in the programme, then co-occurrence of the authors' keyword was selected. Afterwards, the number of this occurrence which is a threshold have been adjusted 2. The aim of this adjustment is because keywords appear only once are often contextually insignificant and random. So, this might be not giving appropriate network among keywords of the analysis.

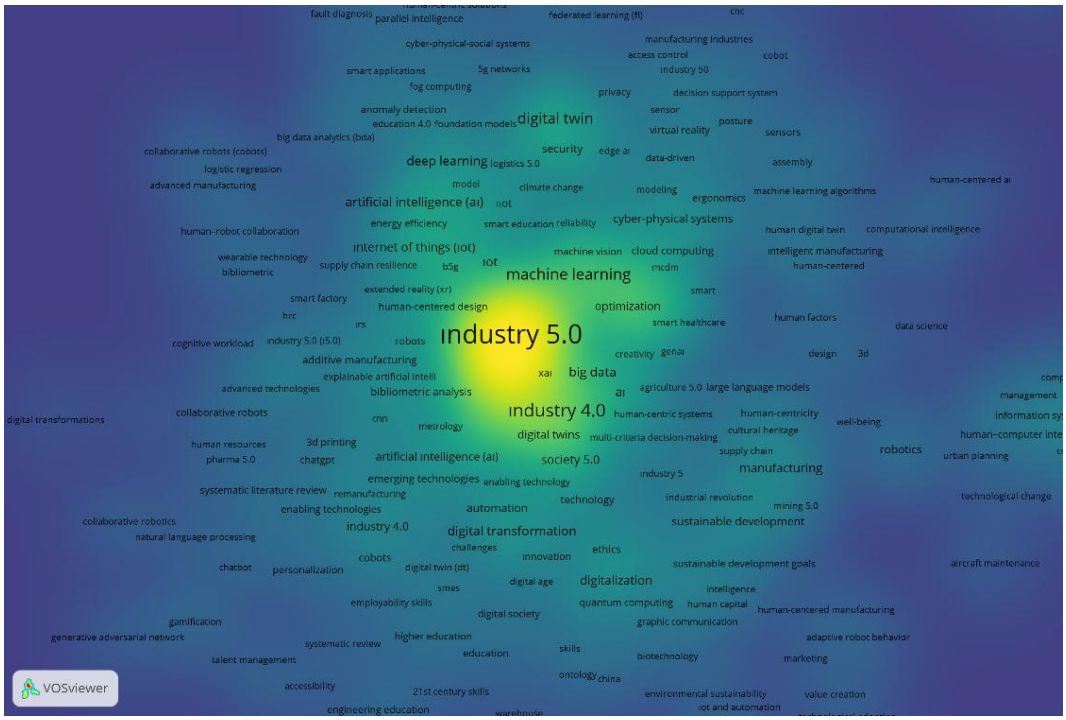
Figure 3 illustrates the visualization of most used keywords for the concept of "Artificial Intelligence" and "Industry 5.0". The results indicate that the most used keyword is "industry 5.0" with 513 occurrences, second one is "artificial intelligence" with 247 and the third one is "industry 4.0" with 126 occurrences. According to the list, keywords such as "machine learning", "sustainability", "internet of things", "digital twin", and "blockchain" have also highest ranking among all the keywords. It is understandable that the most commonly used keyword parallels with the searched keyword; yet, other relevant keywords also show up explicitly. Moreover, before creating the map, the list also shows the ranking list of the total link strength. For instance, in addition to similar keywords, the keyword "machine learning" is ranked fourth and the keyword "sustainability" fifth in the list. The map also indicates the network between keywords. Clusters show the collaboration between them. The findings show that the keywords such as "artificial intelligence" and "industry 5.0" might be written as different type. For instance, "industry 5.0" and also "ındustry 5.0" occurred at the same time in the map. Therefore, clusters that they include have similar connections. For example, in the purple cluster the keyword "ındustry 5.0" has a network with digital twin. Similarly, the concept of artificial intelligence is written as an "aı" and it has a connection with the keyword "ındustry 4.0".

Figure 3. Visualization of most-used keywords



The visualization also shows the density of the keywords. The color of density changes depends on the strength of the link. It gets much brighter yellow and it refers high density in the map (Figure 4).

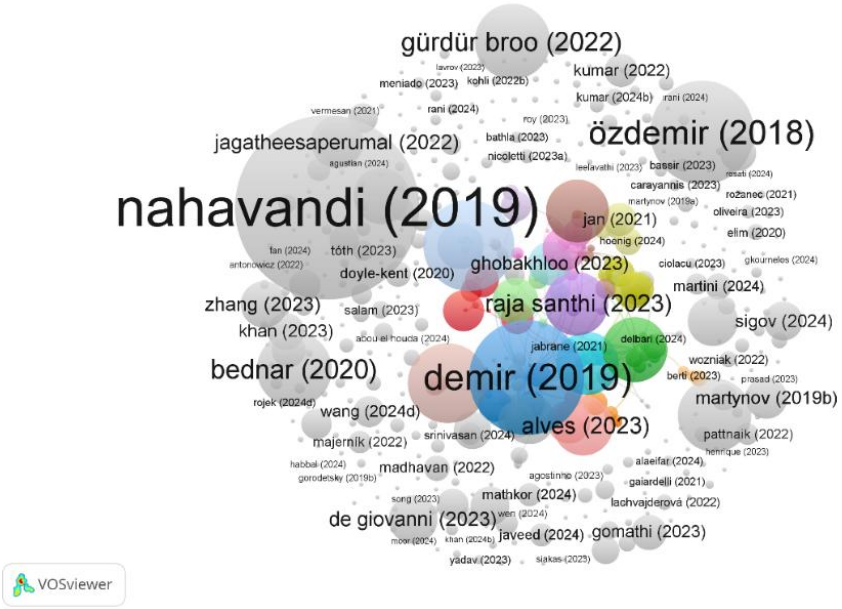
Figure 4. Density of keywords



4.2. Citation Analysis of Documents in the Literature

In bibliometric analysis, publications on research area are important to explore the research field and understand the subject. In this study, the number of citations depend on Scopus database. Figure 5 illustrates the citation map of documents. Big scale of the nodes represents the highest link strength. According to the results, Nahavandi (2019) has the most cited document with 1068 citations. This study mentioned about the collaboration between human and robot with the aid of artificial intelligence. This refers to Industry 5.0 and it provides to increase the productivity including human abilities to the technological skills. Demir et al. (2019) have 539 citations and are in the second place in the ranking. They discussed the organizational aspects of the collaboration between humans and robots. They predicted that it would become popular to work closely with robots in companies. Özdemir and Hekim (2018) have 465 citation and at the third place. They mentioned about the usage of Industry 5.0. As a safer and more balance solution to the concerns of extreme automation driven by AI, IoT, and smart manufacturing. Choi et al. (2022) are at the fourth place with 384 citations and they reviewed key technologies of Industry 4.0 on operations management. They also mentioned the benefits and potential conflicts of human-machine collaboration, which introduces Industry 5.0.

Figure 5. Citation map of documents



4.3. Citation Analysis of Countries in the Literature

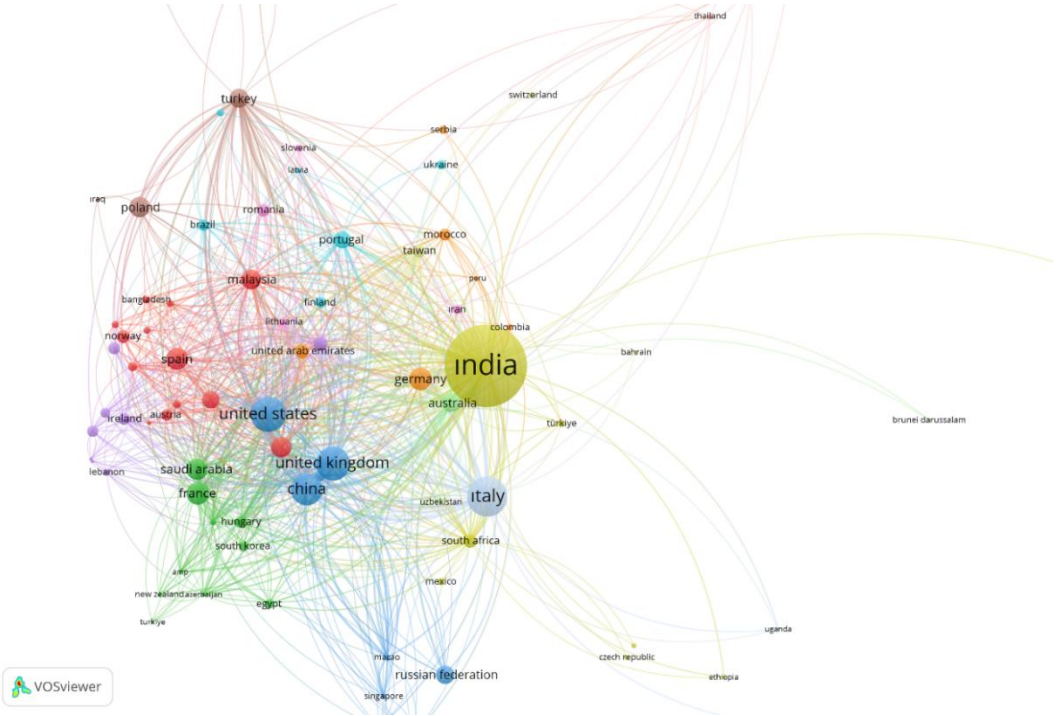
An analysis was conducted with at least one publication and received one citation, in order to create a network map of citations based on the countries of origin of publications. Table 2 listed top ten countries of the highest citations. The countries that received the highest number of citations were India (4,210 citations), United States (2,841 citations), Australia (2,160 citations), Italy (1,865 citations), and United Kingdom (1,638 citations) (Figure 6). According to the total link strength, the sequencing of the countries varies. For instance, while Australia

ranks second place, United Kingdom ranks third, Italy fourth, United States fifth, and China sixth. Particularly, although Sweden ranks 15th in terms of citation count, it rises to seventh place based on total link strength.

Table 2. Top ten cited countries

Country	Documents	Citations	Total Link Strength
India	315	4210	467
United States	88	2841	232
Australia	36	2160	259
Italy	109	1865	247
United Kingdom	83	1638	249
Turkey	35	1608	179
China	77	1574	220
Saudi Arabia	42	1036	107
Portugal	31	857	70
Spain	45	855	63

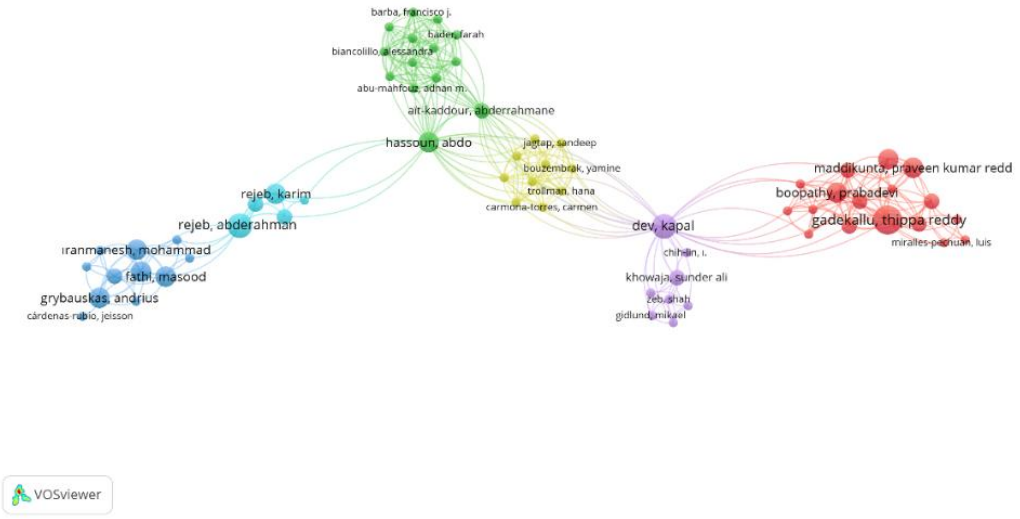
Figure 6. Citation map of countries



4.4. Analysis of Co-authorship of Authors

Figure 7 illustrates the visualization of network of authors. Based on the analysis, a network map was created to identify the most connected and collaborative authors, using the criteria of at least one document and one citation. According to the results, there are 6 clusters, 65 items, and 333 links. It observed that the most citations of authors or documents are not clustered in co-authorship analysis of authors. For example, Nahavandi has 1960 citations, but the researcher does not appear among the most connected authors.

Figure 7. Co-authorship map of authors



5. DISCUSSION and CONCLUSION

Industry 5.0 enabled an impressive breakthrough in the field with the rapid development of artificial intelligence and the importance of sustainability globally. It emphasizes on human creativity and advanced AI technologies (Passalacqua et al., 2025). While AI and automation have the potential to greatly improve the productivity and efficiency, the core principle of Industry 5.0 is that these technologies include the importance of human input. Because of this, human centered artificial intelligence plays a crucial role in shaping the modern industrial age (Mentzas et al., 2024). The purpose of this study is to present an updated synthesis of the current state of Industry 5.0 and artificial intelligence. It also aims to offer insights into research trends and emerging themes in the field.

Within the scope of the study, the Scopus database was examined, and 1,113 international scientific publications containing the concepts of "Artificial Intelligence" and "Industry 5.0" in their keywords, titles, and abstract were analyzed. These studies cover the years between 2018 and mid-2025. A key limitation of the study is the restricted time period, as the dataset begins with a single publication in 2018 and the data collection concludes in July 2025, thus not covering the entire year. The analysis includes the distribution of the publications across different countries and disciplines, and were conducted using bibliometric mapping techniques via VOSviewer.

The European Commission released a report about Industry 5.0 and it revealed a milestone in research areas (European Commission, 2021). Also, Horizon Europe Project has significantly contributed to the increase of studies in this field through its innovative approaches to procedure knowledge management (European Commission, 2023a). When the sustainability takes in account, the Green Deal Industrial Plan is also helpful to highlight the role of artificial intelligence in sustainable production (European Commission, 2023b). These recent technological innovations and developments indicate a sharpe increase on research papers in

these fields. The preliminary findings of the study indicate a bounce on the number of publications from 2023 to 2024 clearly. Taking mid-2025 into account, there is also a progress with 294 publications. It has been observed that various research areas are interested on these concepts such as computer science, social sciences and so on. Among the reviewed literature, Nahavandi (2019), Demir et al. (2019), and Özdemir and Hekim (2018) have the most cited publications. The citation analysis by country reveals that India demonstrates clear leadership in all indicators such as documents, citations, and total link strength. When the second rank is considered, while the cited publications originating from the United States, it has been found that Italy ranks second in the number of publications. Moreover, it is observed that the ranking of citations, documents and link strength different from each other based on countries. When the most-used keywords considered, there has been different terms noticed except artificial intelligence and Industry 5.0. Although the search keywords are noticeable, it is also clear that the following concepts are highlighted: Industry 4.0, sustainability, and machine learning.

Industry 4.0 is a key point that also makes progress with artificial intelligence for the improvement of Industry 5.0. In other words, Industry 4.0 lays the groundwork for the emergence of Industry 5.0. This rapid emergence of Industry 5.0 supports sustainable developments and makes it core element of the technological progress (Ciucu-Durnoi et al., 2024). Sustainability is also relevant with the searching concepts due to its connection called "sustainability trilemma". This concept refers the connection between economic, social, and environmental issues in terms of industrial challenges (Raja Santhi and Muthuswamy, 2023). It has been found that AI- driven sustainability goals make progress with the help of human-AI interaction. For instance, 12% of the production of trash and 8% of CO_2 emissions has been reduced in terms of this collaboration (Valeriya et al., 2024). Lastly, machine learning is another most used keyword and one of the useful technique which plays a crucial role in enhancing human-AI interactions' scalability and adaptability (Xu et al., 2025).

The findings offer practical guidance for researchers, industry leaders, and academic institutions. By identifying global collaboration networks, key contributors, and emerging subjects, the results can support the design of human-centric and sustainable industrial challenges. Moreover, companies may use these insights to shape workforce transformation in line with Industry 5.0 and AI developments.

As a result, Industry 5.0 represents the interaction between human and artificial intelligence. This interaction supports sustainable movements to create better world to the future. Moreover, this human-centric approach distinguishes Industry 5.0 from its predecessors.

This study utilized data only from the Scopus database, chosen for its wide coverage, reliable information, and compatibility with bibliometric mapping tools such as VOSviewer. Databases like Google Scholar and Web of Science were excluded to prevent dıuplication, guarantee data consistency, and maintain a high standard of source reliability.

For the future studies, this bibliometric analysis will provide a path to investigate on these areas. This study is limited to data retrieved from the Scopus database and analyzed through VOSviewer mapping methods. It can be extended to other scientific database such as Google Scholar and Web of Science. On the other hand, this study offers a thorough bibliometric analysis of the merging between AI and Industry 5.0; however, future research could enhance the investigation from a sectoral viewpoint. For instance, the AI-driven revolution in the manufacturing, healthcare, and logistics sectors might be individually examined to clarify the adoption of Industry 5.0 concepts in various concepts.

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