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Artificial intelligence in textile and fashion design: a bibliometric analysis

Selma Bulut[a,*], Beyza Buzol Mülayim[b]

[a]*Computer Programming, Kırklareli University, Vocational School of Technical Sciences, 39100, Türkiye.*
[b]*Fashion Design, Kırklareli University, Vocational School of Technical Sciences, 39100, Türkiye.*

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ABSTRACT

Textile and fashion design are among the disciplines where technological advancements are rapidly integrated, with artificial intelligence (AI) playing an increasingly vital role. AI-driven design software enhances fabric texture, color harmony, and pattern creation, while smart textiles and algorithms enable personalized clothing production. Additionally, AI-based analyses are being widely utilized in fashion trend forecasting and sustainable material development. Understanding the evolving research landscape in this field is crucial for future innovations. This study conducts a bibliometric analysis of 856 research articles on textile and fashion design published between 1980 and 2024. Using the Web of Science database and VOSviewer software, the study evaluates literature trends, influential studies, key authors, and emerging keywords. The results indicate that academic interest in this field peaked in 2024, with the most cited study being Dong, K.; Peng, X.; and Wang, ZL's research on fiber- and fabric-based nanogenerators for wearable electronics and AI applications. China emerges as the leading contributor to AI-driven fashion research, while Chengkuo Lee stands out as a key figure in the field. Keyword analysis highlights strong associations with concepts such as machine learning, artificial intelligence, computer vision, deep learning, and convolutional neural networks. The shift in 2024 towards keywords like "electronic textiles," "biomarkers," and "LLM" (large language models) reflects the growing intersection of AI, intelligent materials, and wearable health technologies. These findings underscore the increasing importance of AI in shaping the future of textile and fashion design, necessitating interdisciplinary collaborations. Despite the study's limitation of relying solely on the Web of Science database and not conducting content analysis, its findings provide a comprehensive overview of AI's evolving role in the sector. This research offers a valuable foundation for future studies, guiding researchers and industry professionals in leveraging AI technologies for innovative design, sustainable production, and enhanced consumer experiences.

I. INTRODUCTION

The origins of clothing are rooted in early human needs for protection, gradually evolving from simple animal skins to the production of yarn and fabric through the processing of wool fibers [1]. Over time, textile production evolved into a vital aspect of human civilization, laying the foundations for the development of fashion as a cultural and economic phenomenon. [2–5]. While textiles were traditionally defined as woven fabrics, today the term broadly encompasses knitting, nonwoven manufacturing methods, and the entire production cycle [6]. This historical development laid the foundation for fashion to emerge both as an economic driver and as a form of cultural expression [1, 7, 8].

In recent years, the textile, ready-to-wear, and fashion sectors have undergone a profound transformation with the integration of artificial intelligence (AI). AI technologies support designers during the creative process, optimize production and logistics workflows, and enhance customer engagement through personalized recommendations and virtual try-on experiences [9]. Leading brands such as Nike and The North Face have demonstrated AI's potential to improve fit accuracy, forecast demand, and increase operational efficiency [9]. Despite this rapid advancement, academic studies examining the role of AI in textile and fashion design remain limited in scope,

*Selma Bulut. Tel.: +90-533-6237380; e-mail: selma.bulut@klu.edu.tr

with much of the research focusing on isolated applications such as defect detection [10-12], trend analysis [13, 14], or production planning [10, 11]. In recent years, artificial intelligence (AI) has transformed the textile and fashion sectors by optimizing production workflows, enabling personalized design, and supporting sustainability initiatives through data-driven insights. While previous bibliometric studies have mapped general trends in AI applications within textiles, they often remain limited in scope, focusing either exclusively on manufacturing technologies or descriptive publication metrics. Consequently, there is a need for an integrated analysis that not only identifies research patterns but also explores the convergence of AI with fashion design, creative processes, and smart materials. Understanding these dynamics is essential as AI increasingly becomes a strategic tool to enhance competitiveness, reduce environmental impact, and meet the growing demand for personalized consumer experiences.

A critical review of the literature reveals that while earlier bibliometric studies have provided descriptive mappings of publication trends [13, 15], there is a lack of comprehensive analyses that integrate thematic clustering, trend forecasting, and evaluation of conceptual frameworks. Moreover, existing reviews often present findings in a purely descriptive manner without sufficiently linking them to broader theoretical discussions or sector-specific implications [13, 15, 16]. This creates a gap in understanding how AI not only supports operational processes but also redefines creative practices and professional competencies within the textile and fashion industries [17-19].

Furthermore, recent studies have offered diverse perspectives on the application of AI in textile design and production processes. These investigations cover a wide range of topics, including artificial neural networks and fuzzy logic approaches [20-22], sustainable fashion design [20, 23], generative deep learning applications [24, 25], personalized design experiences [26-28], automated defect detection and quality control systems [12, 28], the integration of AI in education [19], advanced visualization and production optimization [29, 30], and smart textile solutions [31, 32]. In this context, combining different techniques, models, and use cases enriches the knowledge base and provides a valuable foundation for future research in the field.

In addition, more recent studies have addressed a variety of emerging topics, including agile production models [33], e-commerce applications [34], computational creativity and generative design [34, 35], industrial case studies [36-38], the transformation of fashion retail [39], educational perspectives on AI [40, 41], deep learning developments [42], circular economy strategies [43], and sustainable manufacturing approaches [44, 45]. Collectively, these works further demonstrate the increasing convergence between artificial intelligence, advanced materials, and innovative design practices in the textile and fashion sectors.

This study aims to address this gap by conducting an in-depth bibliometric analysis of scholarly literature on AI applications in textile and fashion design. By combining data visualization techniques with a critical synthesis of emerging themes, the research offers a structured perspective on how AI transforms creative processes, production efficiency, and sustainability practices. In doing so, this work clarifies the intellectual landscape of the field and proposes directions for future studies to further integrate AI into design and manufacturing ecosystems. Unlike prior studies, this analysis highlights not only publication patterns but also the conceptual evolution of AI-assisted design practices, thereby offering new insights at the intersection of technology and creativity. While these findings provide valuable insights, it is important to acknowledge certain methodological considerations.

II.EXPERIMENTAL METHOD

2.1 Purpose of Research

The primary objective of this study is to conduct a systematic bibliometric analysis of scientific literature addressing the application of artificial intelligence in textile and fashion design. Focusing on publications indexed in the Web of Science database between 1980 and 2024, this research seeks to map the intellectual landscape of the field comprehensively. Although artificial intelligence has gained increasing significance across creative industries, no prior bibliometric investigation has specifically explored its role within textile and fashion design. To address this gap, the study identifies key contributors, research trends, thematic developments, and the evolution of conceptual frameworks over time. The findings are expected to enrich academic literature and provide a foundational basis for future inquiries into the integration of artificial intelligence within design-oriented disciplines. The study seeks answers to the questions below.

1. Intelligence in textile and fashion design in Web of Science by year and what are their publication types?
2. What is the distribution of citations to articles on the Web of Science on artificial intelligence studies in textile and fashion design by year?
3. Who are the authors who published artificial intelligence studies in textile and fashion design and conducted the Co-Author Analysis?
4. What is the citation analysis of authors who publish on artificial intelligence studies in textile and fashion design?
5. What is the citation analysis of countries that publish on artificial intelligence studies in textile and fashion design?
6. How is the keyword analysis of publications in artificial intelligence studies in textile and fashion design?
7. Intelligence studies in textile and fashion design?
8. What is the bibliographic matching analysis of authors who publish on artificial intelligence studies in textile and fashion design?
9. What is the co-citation analysis of authors who publish on artificial intelligence studies in textile and fashion Design?

2.2 Research Method

Bibliometric analysis is a type of research approach used to understand global research trends in a particular field through the output of academic publications in databases such as Scopus or Web of Science [46]. Its main steps include collecting data from relevant databases, cleaning and refining the data, and applying various bibliometric methods [47, 48]. The results of such analyses help researchers reveal emerging trends, the performance of journals, the most productive authors, and collaboration patterns [49].

In this study, the bibliometric analysis method was applied to investigate artificial intelligence studies in textile and fashion design. For this purpose, the keywords artificial intelligence, ChatGPT, machine learning, NLP, generative AI, natural language processing, fashion design, textile, fiber, yarn, and fabric were searched together in the Web of Science database on December 9, 2024, resulting in 10,987 initial records.

The search strategy combined broad AI-related terms ("artificial intelligence," "machine learning," "generative AI," "ChatGPT") with domain-specific keywords ("textile," "fashion design," "fabric," "yarn") to ensure comprehensive retrieval of both technical and applied research. The inclusion of emerging terms such as "LLM" was motivated by their growing relevance in creative design contexts.

The search query was formulated as follows: ("artificial intelligence" OR "ChatGPT" OR "machine learning" OR "AI" OR "generative AI" OR "natural language processing" OR "NLP") (All fields) AND ("fashion" OR "fashion design" OR "textile" OR "fibre" OR "yarn" OR "fabric") (All fields). *

Within the Web of Science category fields Material Sciences Multidisciplinary and Material Science Textile, and with the publication language restricted to English, 856 publications were selected for analysis. The earliest study was published in 1980, and the most recent in 2025 (early view).

After exporting the records, duplicate entries were identified and removed using VOSviewer's built-in cleaning functions and manual verification of titles and DOIs. Publications unrelated to textile or fashion design (e.g., studies focused exclusively on nanomaterials without design relevance) were excluded through title and abstract screening.

The cleaned dataset was analyzed in VOSviewer 1.6.20 to generate co-authorship networks, citation mappings, and keyword co-occurrence diagrams.

This study is limited by its exclusive use of the Web of Science database and its focus on English-language publications, which may have led to the omission of relevant works indexed in other repositories or published in other languages. Furthermore, findings are influenced by the software parameters and clustering methods applied in VOSviewer.

Figure 1 illustrates the overall research workflow adopted in the study. The process begins with data collection from the Web of Science (WoS) database, covering the time span from 1980 to 2024 and using a comprehensive combination of keywords related to artificial intelligence (e.g., "machine learning," "ChatGPT," "generative AI") and textile and fashion design (e.g., "fashion," "fabric," "yarn," "textile"). The search was limited to English-language publications within the categories of Material Sciences Multidisciplinary and Material Science Textile. In the second stage, bibliometric analysis was performed using the VOSviewer software, incorporating co-authorship networks, citation and co-citation analyses, keyword co-occurrence mapping, and bibliographic coupling of documents and authors. This multifaceted approach enabled the identification of publication trends, thematic developments, and collaboration patterns across 856 documents. Finally, the results were synthesized in the discussion and conclusion sections, providing insights into the evolution of research themes and outlining future directions for integrating artificial intelligence into textile and fashion design.

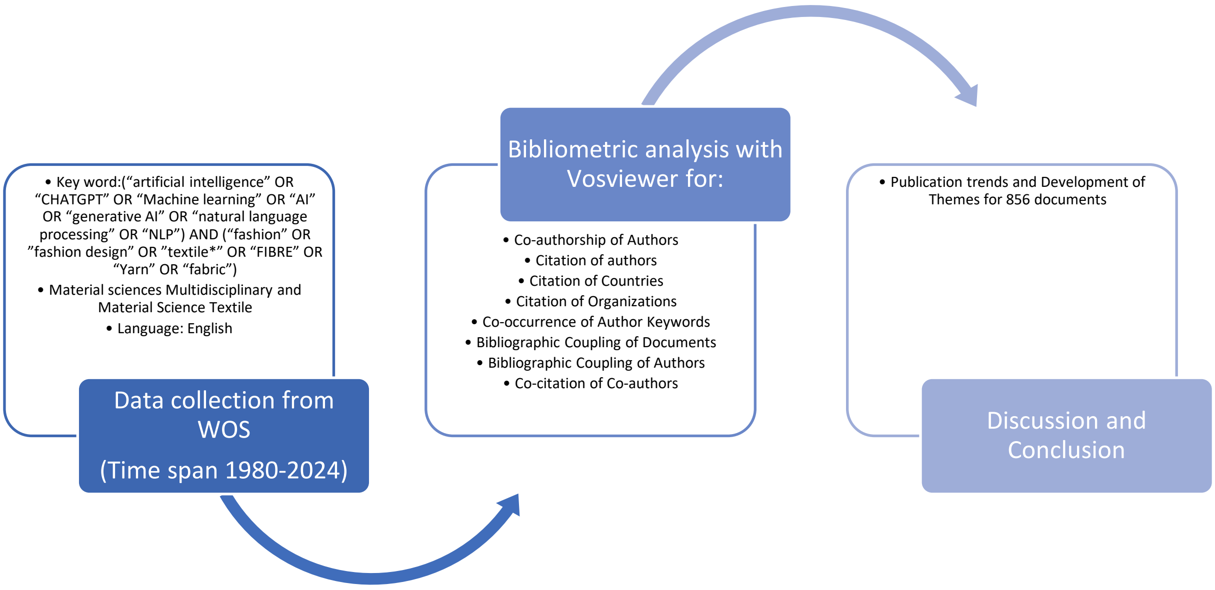

Figure 1. Bibliometric analysis stages of the study

III. RESULTS AND DISCUSSIONS

In the research, firstly, the distribution of studies by year, the distribution of citations by year, the most cited authors, journals, total citation and average citation numbers, the distribution of publications by countries, the distribution of authors with the most publications were included. Co-author analysis, co-author analysis of countries, co-citation analysis, citation analysis of countries and common word analysis were performed with the Vosviewer program regarding the literature on artificial intelligence studies in textile and fashion design.

3.1 Distribution by year and types of publications

Intelligence studies in textile and fashion design between 1980-2024 in the Web of Science database there are 856 published English studies (Figure 2). It has been determined that these publications were written by 3960 authors. Artificial intelligence studies in textile and fashion design there are 787 institutions and 63 countries. Artificial intelligence studies in textile and fashion design were found that it was published in 236 different journals.

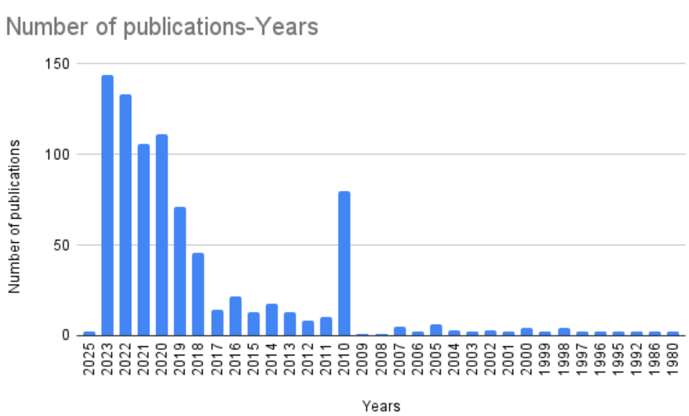

Figure 2. Number of publications year

Figure 3 illustrates the annual distribution of publications related to the application of artificial intelligence in textile and fashion design between 1980 and 2025. The data reveals a pronounced growth trend, particularly after 2010. Notably, the number of publications surged sharply from 2019 onward, reaching a peak of 144 in 2023. This significant increase reflects the rapidly expanding interest in AI-driven solutions within the creative industries, driven by technological advances and the growing availability of big data. The marked rise after 2020 may also be associated with the acceleration of digital transformation initiatives in response to the COVID-19 pandemic, which compelled many organizations to adopt AI technologies to enhance resilience and operational efficiency. The low figures in 2024 and 2025 are probably because data collection for these years has not yet been completed. Overall, this temporal trend underscores the relevance and timeliness of conducting a bibliometric analysis to capture the current research landscape.

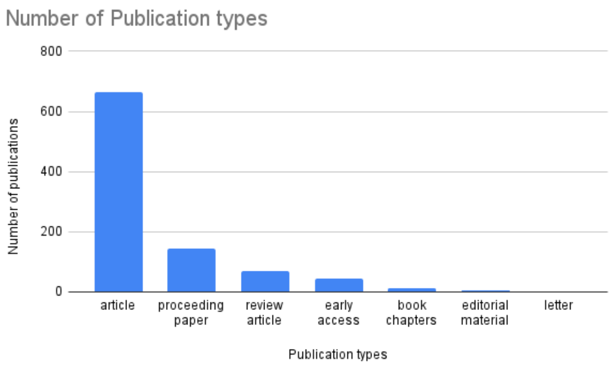

Figure 3. Number of types of publications by year

Figure 3 presents the distribution of publication types in the corpus analyzed. Most of the documents are research articles (n=663), which account for the largest share of contributions on artificial intelligence in textile and fashion design. This is followed by conference proceedings (n=144) and review articles (n=68), indicating a substantial volume of peer-reviewed scholarship as well as knowledge dissemination through academic conferences. The relatively smaller proportion of early access articles (n=45), book chapters (n=13), editorials (n=5), and letters (n=1) suggest that while AI is an emerging field in this domain, it has primarily been explored through empirical and applied research studies. The dominance of full-length articles also underscores the maturity and depth of scholarly engagement with AI applications in creative industries.

3.2. Number of Citations by Year

Figure 4 shows the temporal evolution of both the number of publications and citations related to artificial intelligence applications in textile and fashion design between 1980 and 2024. The data indicates that while the volume of publications remained relatively low until 2010, a significant and sustained increase occurred in the last decade. The most pronounced growth is visible between 2020 and 2023, reflecting a heightened scholarly and industry focus on AI-driven innovations. Correspondingly, citation counts—represented by the blue curve—demonstrate a sharp rise starting around 2018, suggesting that not only the quantity but also the influence and impact of the research have expanded considerably. This trend underlines the growing recognition of AI as a transformative force within design-oriented disciplines. It also highlights the timeliness and necessity of bibliometric analyses to map this rapidly evolving body of knowledge.

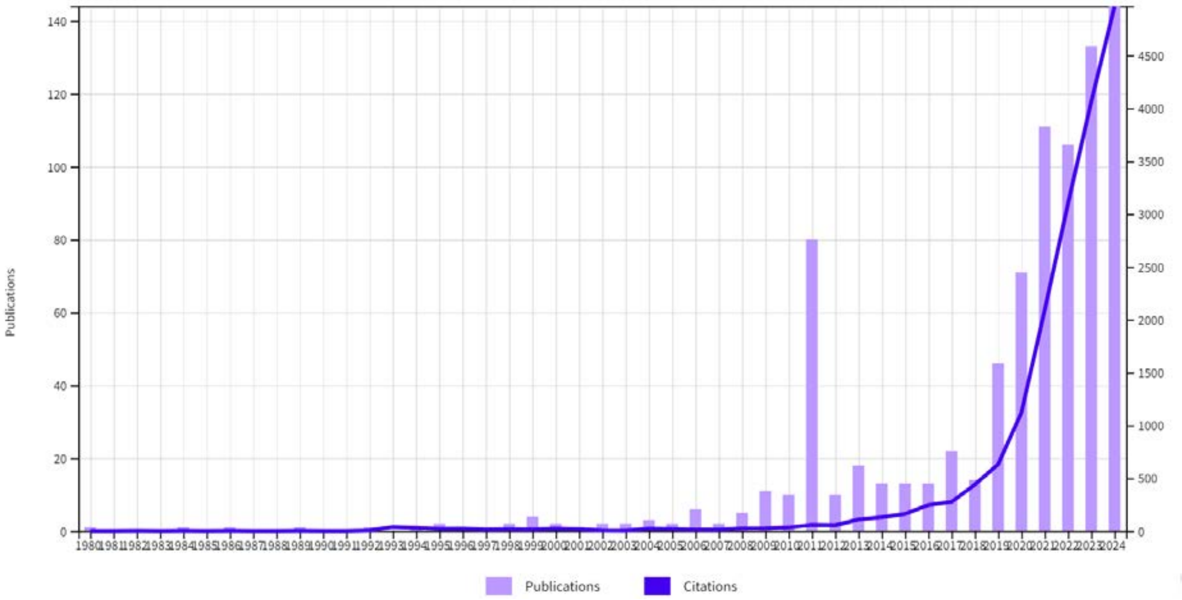

Figure 4. Number of citations by year

Table 1 shows the most cited publications. The article titled "Fiber/Fabric Based Piezoelectric and Triboelectric Nanogenerators for Flexible/Stretchable and Wearable Electronics and Artificial Intelligence" [50] received 956 citations, the article titled "Smart Textiles - Integrated Microelectronic Systems for Wearable Applications" [51] received 514 citations, and the article titled "End-to-End Design of Wearable Sensors" [52] received 508 citations, making it one of the top three most cited articles. The fact that the first four articles were in 2020 and were related to wearable technologies shows the importance of artificial intelligence in wearable technologies in that year.

Table 1. Most cited publications

No	Publication year	Name of the Study	Authors	Total number of citations
1	2020	Fiber/ Fabric-Based Piezoelectric and Triboelectric Nanogenerators for Flexible / Stretchable and Wearable Electronics and Artificial Intelligence	Dong, K.; Peng, X and Wang, Z.L.	956
2	2020	Smart Textile-Integrated Microelectronic Systems for Wearable Applications	Shi, J.D.; Liu, S.; (...); Tao, X.M.	514
3	2020	End to end design of wearable sensors	Ates, HC; Nguyen, PQ; (...); Dincer, C.	508
4	2020	Emerging Materials and Strategies for Personal Thermal Management	Hu, R; Liu, Y.D.; (...); Luo, X.B.	384
5	2013	Scalable One -Step Wet-Spinning of Graphene Fibers and Yarns from Liquid Crystalline Dispersions of Graphene Oxide: Towards Multifunctional Textiles	Jalili, R; Aboutalebi, S.H.; (...); Wallace, G.G.	369

3.3. Co - authorship of Authors

By determining the criteria of at least 1 publication and at least 1 citation, a network map was created to identify the most connected and collaborating authors. According to the analysis made among the names with the highest connection, 15 names were combined into a single cluster and a total of 224 connections were seen.

Figure 5 illustrates the co-authorship network among researchers contributing to studies on artificial intelligence applications in textile and fashion design. Each node represents an author, and the size of the node indicates the volume of their publications or the strength of their collaborative ties. Distinct colors correspond to different clusters of collaboration, highlighting groups of authors who frequently publish together.

The most connected name in the given clusters is Chengkuo Lee with 9 publications and 478 citations. Jun Chen comes next with 8 publications and 451 citations, and Tianyiyi He with 7 publications and 437 citations. The most cited authors are Zhong Lin Wang with 729 citations, Chengkuo Lee with 478 citations, Jun Chen with 451 citations, and Tianyiyi He with 437 citations. The number of connections for these works is 42, 46, 43, and 42, respectively.

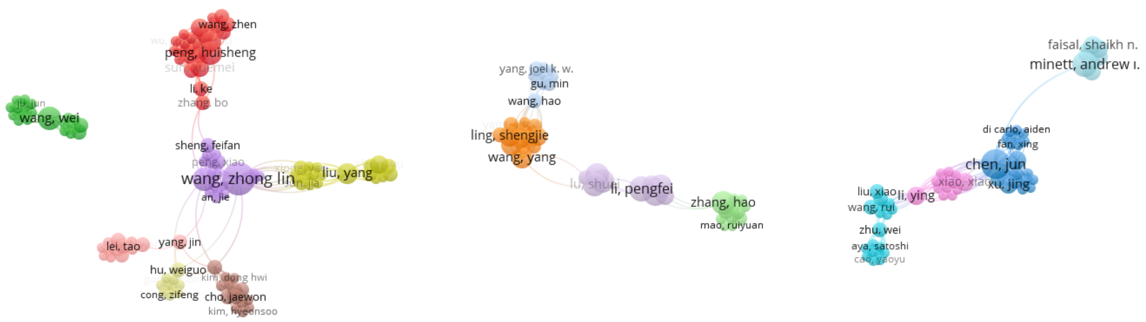

Figure 5. Co-authorship of authors

The analysis reveals several prominent clusters. Notably, Wang Zhong Lin occupies a central and highly connected position within the network, indicating a pivotal role in coordinating and disseminating research in this domain. Similarly, Chen Jun and Zhou Ying appear as leading figures within another densely interconnected group. The presence of several isolated clusters suggests that while collaboration has increased overall, research efforts are still somewhat fragmented, with multiple teams operating independently rather than within a single cohesive network.

This pattern underscores both the diversity of expertise contributing to the field and the opportunity for further cross-collaboration between research groups. Mapping such networks helps identify influential authors, potential partners for future projects, and gaps where interdisciplinary cooperation could be strengthened.

3.4. Citation Analysis of Authors

To identify citation networks, a network map was created for author citation analysis with at least 1 publication and at least 1 citation criteria. In the analysis conducted on 325 units that were seen to be connected to each other, a total of 14 clusters, 2320 connections and a total connection strength of 2642 were detected.

Figure 6 displays the co-authorship network among researchers working on artificial intelligence applications in textile and fashion design. The network reveals a prominent central cluster where several leading authors—particularly Wang Zhong Lin, Chen Jun, and Minett Andrew I.—occupy highly connected positions, indicating their significant influence in fostering collaborative research.

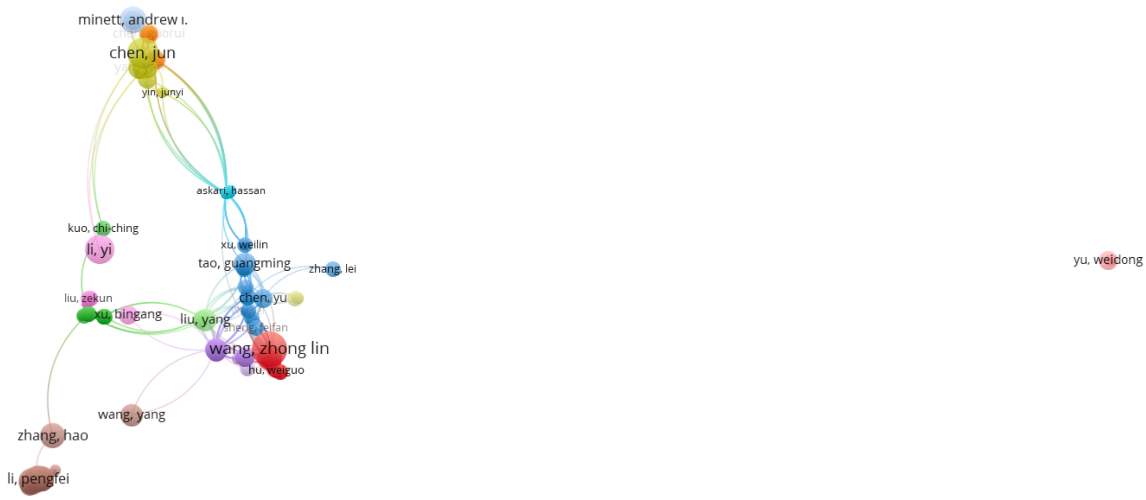

Figure 6. Citation analysis of authors

Kai Dong, who has the highest number of links, has 5 publications and 237 citations. Zhong Lin Wang comes next with 10 publications and 729 citations, and Jun Chen comes next with 8 publications and 451 citations. When we look at the number of citations, Zhong Lin Wang has the highest number of citations with 10 publications, while H. Ceren Ates, James J. Collins, Can Dincer and Laura Gonzalez- Macia reached 505 citations with only 1 publication.

The size of the nodes reflects the productivity or centrality of the authors within the network, while the links represent co-authored publications. The strong interconnections among these key contributors demonstrate that a core group of researchers is actively shaping the field through extensive collaboration.

Interestingly, Yu Weidong appears as an isolated node with no links to the main cluster, suggesting independent research efforts or limited integration into the broader academic community on this topic. This pattern highlights both the concentration of influence among central actors and the presence of peripheral researchers who may benefit from increased engagement and collaboration opportunities.

Mapping such structures provides valuable insights into the dynamics of knowledge production and identifies potential avenues for future interdisciplinary partnerships.

3.5. Citation Analysis of Countries

To create a network map regarding the citations received by the publications according to their countries of origin, an analysis was conducted on 22 observation units that were related to each other within the scope of the criterion of at least 1 work published and 1 citation received by a country. 12 clusters, 36 connections and 101 total connection strengths were identified.

Figure 7 visualizes the international co-authorship network among countries contributing to research on artificial intelligence applications in textile and fashion design. Each node represents a country, and its size indicates the volume or impact of publications originating from that country. The lines illustrate collaborative relationships, reflecting co-authored publications between countries.

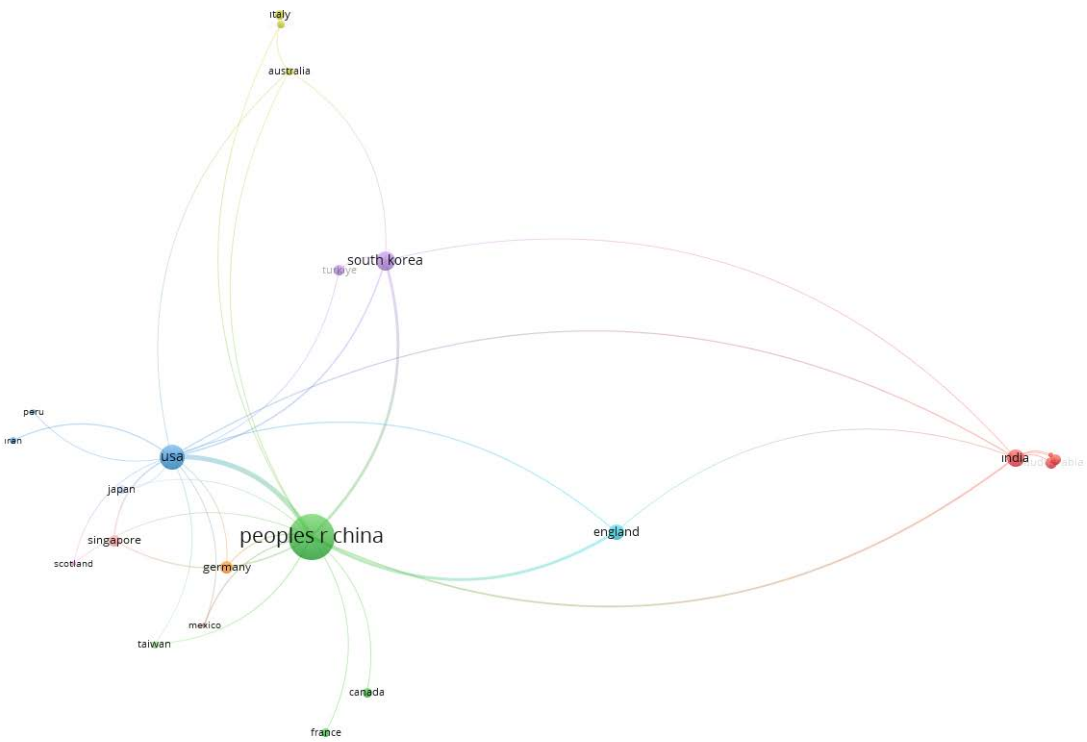

Figure 7. Citation analysis of countries

According to Figure 6, the countries with the most citations are China (4313 citations), the USA (2358 citations), and South Korea (560 citations). These countries are in the top three in terms of total link strength. The top five countries in terms of the number of works are China (242 publications), the USA (71 publications), South Korea (43 publications), India (36 publications), and the UK (27 publications).

The network shows that China and the United States are the most central and influential contributors, maintaining extensive collaborations with other nations across Asia, Europe, and the Americas. The prominent position of China highlights its leading role in driving research outputs in this field, while the USA also acts as a major hub connecting to diverse regions. Other countries such as India, England, South Korea, Germany, and Italy form secondary clusters, underscoring their importance as regional centers of research activity.

Interestingly, the graph also reveals the presence of smaller nodes—such as Peru, Iran, and Singapore—that, despite limited publication volume, are linked to the global network through partnerships with larger research economies. Turkey appears connected primarily through collaborations with South Korea and other Asian countries, indicating emerging participation in this research domain.

Overall, this collaboration map underscores the highly internationalized nature of the field and the key role played by transnational partnerships in advancing knowledge and innovation.

3.6. Co-occurrence of Author Keywords

As a result of the analysis conducted with 72 observation units that were seen at least 3 times and had relationships between them, a total of 13 clusters, 182 connections and 249 total connection strengths were detected.

Figure 8 depicts the keyword co-occurrence network derived from the analyzed publications, highlighting the thematic structure and research foci in the field of artificial intelligence applications in textile and fashion design. Each node represents a keyword, with node size proportional to its frequency of appearance. Links indicate co-occurrences, showing how concepts are interconnected in literature.

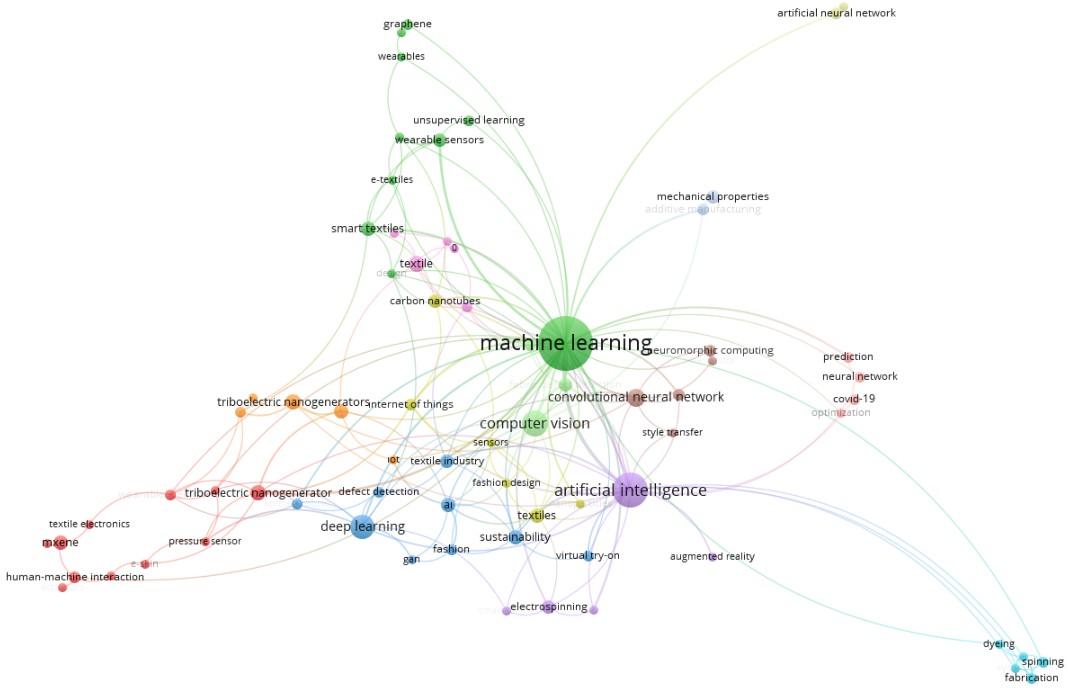

Figure 8. Keyword analysis (co-occurrence of author keywords)

According to Figure 8, when we look at the most frequently used keywords in the study, “machine learning” with 98 repetitions, “artificial intelligence” with 40 repetitions, “computer vision” with 43 repetitions, “deep learning” with 20 reps and “convolutional neural network” with 12 repetitions are in the lead. The strongest expressions in terms of total connection strength were again in the same order.

The visualization reveals that machine learning serves as the central hub, reflecting its foundational role in this domain. Closely linked concepts such as deep learning, computer vision, artificial intelligence, and convolutional neural network illustrate the technological underpinnings of recent advancements.

Clusters are associated with smart textiles, wearable sensors, and e-textiles underscore the integration of AI with next-generation textile materials and connected devices. Other prominent themes include sustainability, virtual try-on, and fashion design, indicating growing interest in both environmental and user-centered applications.

Interestingly, specialized clusters related to triboelectric nanogenerators, graphene, and human-machine interaction suggest a convergence of materials science and AI-driven innovation. The presence of keywords like COVID-19 highlights the influence of contextual factors driving research priorities in recent years.

Overall, this network map demonstrates a diverse and interconnected research landscape, emphasizing both technological development and interdisciplinary collaboration.

3.7. Bibliographic Matching Analysis of Texts Coupling of Documents

The case of citing a common work cited by two independent sources is called Bibliographic matching. According to the analysis made with 304 units of works selected with the criterion of having at least 1 citation and having a connection between them, 12 clusters, 3397 connections and 7687 total connection strengths were obtained.

Figure 9 displays the document co-citation network derived from the analyzed corpus. Each node represents a publication, with the node size indicating the number of times the document has been cited. The edges reflect co-citation relationships, meaning that two documents are frequently cited together in subsequent literature.

Figure 9. Bibliographic matching analysis of texts coupling of documents

According to Figure 9, the publications with the highest number of bibliographic matches were Ates (2022) with 505 citations, Luo (2020) with 250 citations, Fang (2023) with 245 citations, and Chao (2021) with 240 citations. The works with the highest total strength were Shi (2022), Chen (2023a) and Zhang (2024a).

The visualization reveals that Ates (2022), Luo (2020), and Jiang (2021) are the most influential contributions, forming the central hubs of the network. These studies likely represent foundational or highly cited research that has shaped current knowledge in AI applications within textile and fashion design.

Clusters of documents, shown in different colors, indicate distinct thematic areas of scholarship. The dense cluster on the left suggests a group of studies focusing on similar subtopics or methodologies, while the sparser nodes on the right (e.g., Ye (2023), Tang (2018)) appear more specialized or less integrated into the core literature.

Overall, this co-citation map highlights both the intellectual structure of the field and the key works that have driven its development. It also points to potential gaps and opportunities for future research to bridge disconnected areas.

3.7 Co -citation of Co- authors

Different sources cited in a publication are called co-citations. By selecting a minimum of 10 citations, a total of 5 clusters, 17225 connections and 2147 total connection strengths were identified based on the analysis conducted on 263 units.

Figure 10 visualizes the co-authorship network of researchers contributing to the field of artificial intelligence in textile and fashion design. Each node represents an author, with the node size corresponding to the author's productivity or centrality in the network. The edges show co-authorship relationships, while colors highlight clusters of researchers who frequently collaborate.

According to Figure 10, the authors with the most co-citations were identified as K. Dong (90), Y. Wang (67) and ZL Wang (62). When the ranking is examined in terms of link strength, it is seen that the same authors have similar rankings. This situation reveals that the authors in question are central to their research fields and are frequently referenced in literature.

The visualization reveals a highly interconnected structure with several prominent clusters. Notably, Dong K. leads a dense red cluster, indicating an active group with significant collaborative output. In the center, a large green cluster organized around Wang H. and multiple authors with the surname Zhang demonstrates extensive cooperation among researchers working on related subtopics.

On the right, the yellow cluster includes well-known contributors to machine learning and deep learning (such as LeCun Y. and Goodfellow I.), underscoring the technological foundations driving innovations in this area. Additional smaller clusters in purple and blue represent more specialized research communities or regional collaborations.

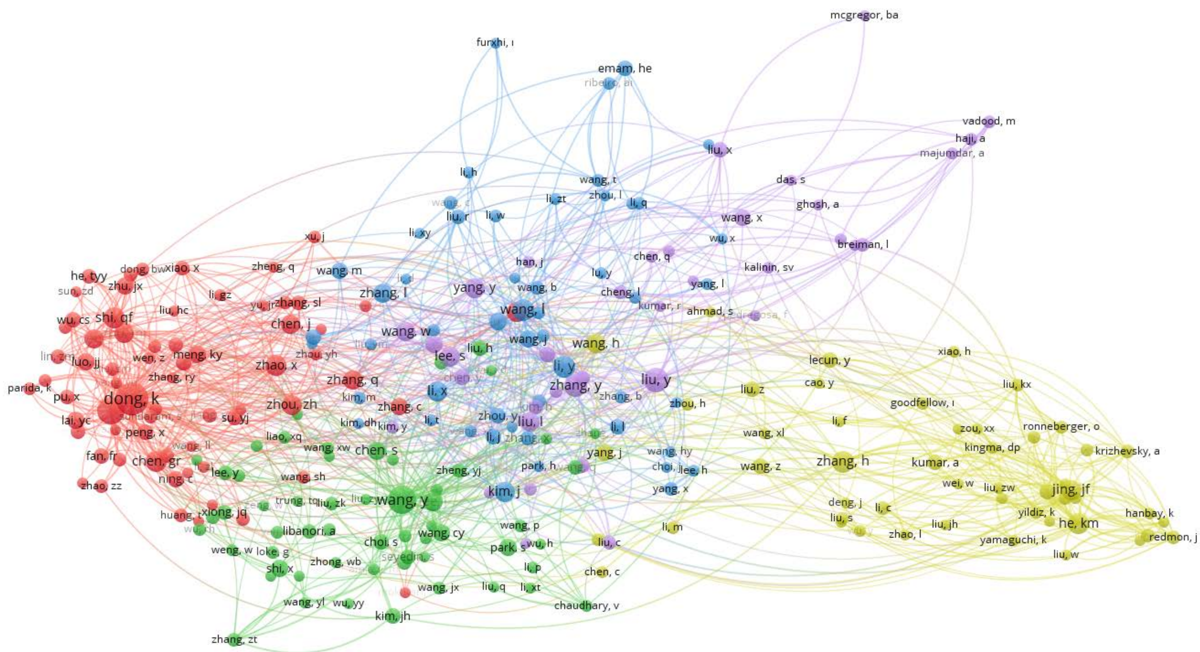

Figure 10. Co-citation analysis of co- authors

The high density of links across clusters highlights the strongly networked nature of the field and suggests that collaboration is a key driver of knowledge production. This interconnectedness provides a fertile ground for interdisciplinary innovation and the dissemination of new ideas across different areas of expertise.

IV.CONCLUSION

This study presented a comprehensive bibliometric analysis of 856 publications indexed in the Web of Science database between 1980 and 2024, exploring the applications of artificial intelligence (AI) in textile and fashion design. The findings confirm that AI has become an increasingly integral component of this interdisciplinary field, reshaping both production processes and creative practices.

The analysis revealed several key insights. First, there has been a pronounced surge in research activity since 2019, with 2024 marking the highest volume of publications and citations. This growth reflects not only technological advancements in AI but also the accelerating digital transformation across the textile and fashion industries. China and the United States have emerged as leading contributors, both in terms of output and citation impact, demonstrating strong institutional capacities and international collaborations.

Keyword co-occurrence analysis highlighted the central role of machine learning, computer vision, and deep learning, with recent shifts toward emerging topics such as electronic textiles, biomarkers, and large language models. These developments signal a broadening research agenda, bridging AI with smart materials, wearable health monitoring systems, and generative design tools.

While prior bibliometric studies (e.g., Wazarkar et al., 2020; Halepoto et al., 2022) have mapped general publication trends in AI for textiles, they typically focus only on technological aspects or limit their scope to specific regions. Consequently, there remains a need for an integrated and comparative perspective that also addresses the convergence of AI with design creativity, sustainability, and emerging smart textiles. Future research should address these constraints by incorporating additional databases (e.g., Scopus, IEEE Xplore) and applying systematic literature reviews or case study approaches to provide deeper conceptual understanding.

The implications of this study are twofold. For researchers, the mapping of publication trends, key contributors, and thematic clusters offers a clear reference point to identify knowledge gaps and prioritize future inquiries. For practitioners and industry stakeholders, the insights underline the growing strategic importance of integrating AI technologies to enhance innovation, sustainability, and personalization in design and production.

While these findings provide valuable insights, it is important to acknowledge certain methodological considerations. Future research should further explore this dynamic landscape, incorporate additional data sources such as Scopus and IEEE Xplore and address ethical considerations. In conclusion, this bibliometric analysis demonstrates that AI is not merely a supplementary tool but a transformative driver fundamentally reshaping textile and fashion design. The convergence of AI with smart textiles, big data analytics, and human-centered design signals a new era in which technology and creativity are increasingly intertwined. Future studies should pay particular attention to ethical considerations, cross-disciplinary collaborations, and the potential of AI to foster more sustainable and inclusive fashion systems.

Future research directions should consider integrating diverse data sources, including Scopus and IEEE Xplore, to enhance the robustness of bibliometric analyses. Additionally, combining quantitative mapping with qualitative methodologies such as case studies and expert interviews could offer richer insights into the evolving interplay between AI and creative design. Attention should be devoted to the ethical and environmental implications of AI adoption in fashion, including issues related to data privacy, energy consumption, and the preservation of human creativity. For example, the increasing use of generative AI raises concerns about data privacy in consumer personalization systems, potential biases embedded in training datasets, and challenges related to maintaining the authenticity and originality of creative work. Lastly, there is an opportunity to explore how AI technologies can be incorporated into fashion education and workforce development, equipping designers and practitioners with the skills needed to navigate an increasingly digital and data-driven landscape.

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