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Research Article

Emerging Trends of Artificial Intelligence and Human, Personal, or Customer Values using R Studio and Vos Viewer

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ABSTRACT

The objective of the research is to visually examine the emerging research trends pertaining to the connection of artificial intelligence and human, personal, or customer value on a global scale. The methodology of the research employs bibliometric approaches from the Scopus database (2018-2022), a total of 2094 documents. The analysis of the study utilizes the VOS Viewer software and R studio software. Based on the findings of the study, it has been observed that the University of California and Li Y are the top institution and author that exhibit the highest level of activity in the domain of artificial intelligence, which mainly infused with customer value. Secondly, the domains of artificial intelligence have witnessed significant exploration in the subject fields of computer science (CS). Lastly, the research found main research themes such as artificial intelligence, big data, and internet of things, which will be useful for future researchers.

Keywords: Artificial intelligence; Customer value; Bibliometric analysis; Systematic review; Keyword co-occurrence analysis.

1. INTRODUCTION

The word "artificial intelligence (AI)" refers a broad spectrum of complex analytics, apps, and logic-based methodologies that replicate various aspects of human or customer behaviour (Trunk et al., 2020). However, within the context of digital transformation, AI technologies present organizations with multiple opportunities to revolutionize their operations across all industries (Brock et al., 2019). Illustrative instances encompass the utilization of AI-powered decision-making techniques in the realms of sales predictions in shopping environment (Al-Surmi et al., 2022) and (Chowdhury et al., 2022). The facilitation of improved processes that foster constructive collaboration between customers and AI (Jarrahi, 2018). The implementation of digital strategies and its associated capabilities revolves around the provision of customer-centric services. The exponential growth of AI is facilitating the emergence of novel technologies, hence creating opportunities for both corporate entities and customers. Today, humanity finds itself undergoing a technological revolution that will fundamentally transform the modes of communication employed by companies and the methods through which customers access information. Furthermore, the process of AI, digital innovations enable organizations to enhance their control over their customer access information, operational processes, hence leading to an increase in the overall effectiveness of the firms (Christof Gellweiler et al., 2020). Nevertheless, the fundamental aspects and outcomes of AI remain ambiguous, resulting in significant uncertainty across diverse business sectors. AI serves as a supplementary catalyst for innovative digital solutions, aiming to substitute human cognitive capacities such as learning and reasoning with machine counterparts. The incorporation of AI with imitated customer values poses a significant challenge within the realm of digital innovation.

Hence, it is imperative to examine the function of AI in enhancing customer value, as highlighted by (Xie et al., 2008). Prior research has investigated several factors that influence customer motivations, and willingness, including individual personality traits, environmental factors, and brand-related considerations (Fuller, 2010), (Akman et al., 2019), (Palma et al., 2019) and (Zhao et al., 2019). Thus, it is clearly seen there is a lack about the AI and human or customer value combination aspects.

Bibliometric and text-based analyses have been conducted in order to examine the primary subjects, constructs, and trends. Hence, the present study objective is to clarify the fundamental nature of AI, with a specific emphasis on the values associated with human, personal, or customer (HuPCu) perspectives.

The basic objectives of this research are to examine the distribution patterns of articles on an annual basis. Additionally, the study aims to identify the main keyword trends employed by authors in their articles. The purpose of this study is to identify the authors, countries, top articles and institutional affiliations that are globally recognised in the field of research related to the keywords "AI" and "HuPCu." Furthermore, the study also aims to identify the emerging themes associated with these keywords.

The following research questions are answered to justify the objectives.

- Over the previous five years, has the number of published publications on the subject improved or dropped?
- Who is the subject matter (AI and HuCPu) top authors in the field?
- Which are the top institutions, emerging themes, articles publishing documents on the topic (AI and HuCPu)?

Addressing these research questions will offer significant perspectives to academicians who are interested in the subject matter AI and HuCPu, so contributing to the advancement of knowledge in the following manners:

• Acquiring valuable insights into contemporary research areas AI and HuPCu; • Knowing areas of research that require further investigation, which can be adopted to pursue future research directions.

2. THEORETICAL FRAMEWORKS

The theoretical framework will provide a comprehensive analysis of the fundamental principles underlying AI and human, personal and customer value. It will explain the advancements made in each separate study domain.

AI is frequently described as a technology that enables the generation of added value for customers. The aforementioned phenomenon arises from advancements in AI methodologies, which present prospects for mimicking the cognitive capabilities and automating the processes involved in resolving complicated issues (Lee et al., 2019).

Researchers have varying perspectives on customer value theory and articulate differences in their views on customer value. However, despite these differences, the theoretical principles and fundamental research points remain consistent. The development of customer value concept has positioned the customer and their value as the central focus for marketing studies, representing a significant advancement in marketing theory (Paananen et al., 2013). There is a need for study to know the recent trends of customer value and AI this research gathers the last five-year research studies.

Thus, the study theoretical concept is the combination of both AI and human, personal and customer values.

3. METHODOLOGY

A large database of all the literature is used for bibliometric analysis in this work. The survey came up with keywords that are related to the AI and human, personal and customer value (HuPCu) study and can be used to look for and find related articles in the worldwide Scopus database. Scopus is the major source of details for investigators because it is thought to be a trustworthy database of peer-reviewed documents by academicians.

For the current investigation, in the keyword title, abstract category "AI", "human", "personal", "customer", AND "value" is used to retrieve the necessary information from the Scopus database. The following search query options (TITLE-ABS-KEY ("AI" AND human OR personal OR customer AND value)) AND it limits to time frame (2018-2022), subject area (computer science, social science, business, engineering) and publication stage (final stage). During this phase, the investigation has identified a total of 2094 scholarly articles published throughout the

timeframe of five years, spanning from 2018 to 2022. In this particular study, the metadata of Scopus results was extracted and stored in the CSV dataset format.

The Scopus database includes an analysis R tool for searches that presents bibliometric data for relevant publications. Researchers, institutions, and countries' publication output were analysed and visualized using this R studio tool. In addition, this function is for tracking how many articles are published each year, how often they are referenced, and what percentage of topics and primary documents are covered (Purnomo et al., 2020a) and (Purnomo et al., 2020a)

In the subsequent phase, the researcher conducted an analysis of the gathered documents utilizing VOS viewer version 1.6.16 in order to examine keyword co-occurrences. In this work, the application of keyword co-occurrence analysis has been employed, utilizing the keyword analysis unit and a comprehensive computational systematic technique, specifically employing VOS Viewer. Its goal was to get co-occurrences of author keywords. The present study conducts a comprehensive examination of keywords and employs a rigorous computational approach, utilizing VOS Viewer, to develop a network of keyword mappings that effectively depict diverse research themes (Van Eck et al., 2020).

4. ANALYSIS, RESULTS AND DISCUSSSION

4.1. Most prominent institutional affiliations in the field of AI and HuPCu (Human/Personal/Customer) value keyword research.

A total of 160 linked institutions have conducted research on articles regarding to the value of AI and Human/ Personal/Customer (HuPCu) keywords. The University of California, USA (n = 48), Sun Yat-Sen University, China (n = 38), Stanford University School of Medicine, USA (n = 28), Imperial College London, UK (n = 26), the Chinese University of Hong Kong, Hong Kong (n = 26), University of South Australia, Australia (n = 26), Stanford University, USA (n = 25), Emory University, USA (n = 24), Northeastern University, USA (n = 23), Taipei Medical University, Taiwan (n = 23), University of Toronto, Canada (n = 23), and Zhejiang University, China (n = 23) are the most prominent affiliates in the AI and HPC value research, as depicted in Figure 1.

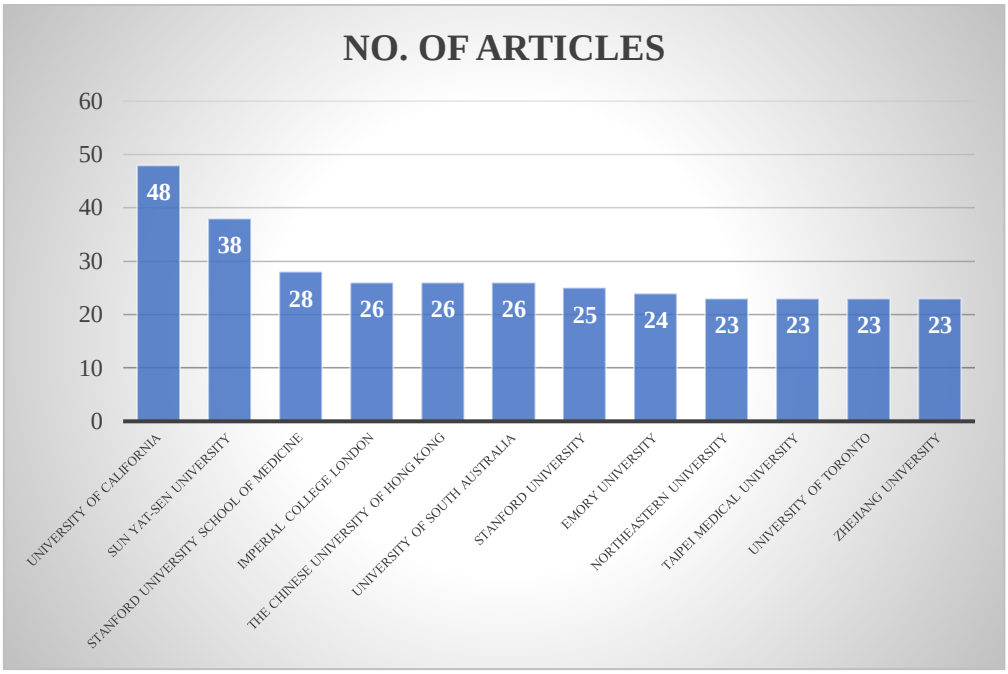

Figure 1 Number of AI and HuPCu value keyword Publications of Affiliate Institutions

Source: Top affiliated institutions for keyword AI and HuPCu from Scopus database prepared by authors (2023)

The analysis reveals that the majority of the research institutional affiliations that demonstrate high productivity in the AI and HPC value study are primarily affiliated with institutions in the U.S.A and China. The U.S.A has five institutions, while China has two. The funding for research and development, particularly in the areas of AI and HuPCu value keyword study, has been observed from countries such as the U.S.A and China.

4.2. Most Prominent Researcher in AI and HuPCu value keyword research

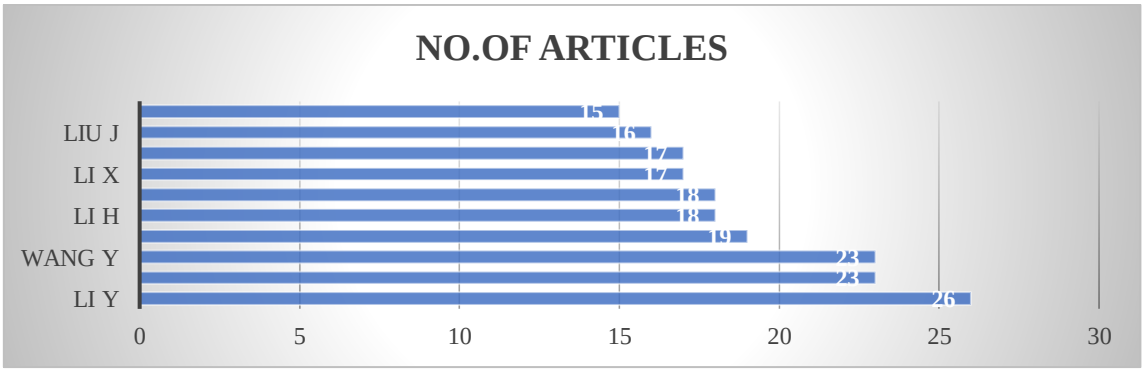

Figure 2 Most Prominent Authors of AI and HuPCu value research studies

Source: Prominent Authors of AI and HuPCu value research studies from Scopus database prepared by authors (2023)

There was 160 prominent researcher that has researched AI and HuPCu value keyword research. Figure 2 shows that the authors with the most documents in the domain of AI and HuPCu value keyword are Li, Y. from Shantou University Medical College, China (n = 26), Followed by Li J, Fuzhou University, China (n = 23), Wang Y, Harbin Institute of Technology, China (n=23), Wang J, Renmin Hospital of Wuhan University from China (n = 19), Li H from Michigan State University, U.S (n = 18), Zhang Y from Sichuan Agricultural University, China (n = 18), Li X, from Dalian University of Technology, China (n = 17), Wang L from Chung-Ang University, South Korea (n=17), Liu J from Xi'an Jiaotong-Liverpool University, China (n = 16), and finally Liu Y from Nanchang Normal College of Applied Technology, China (n = 15). It can be seen that the most prominent researcher in the AI and HuPCu value keyword research mostly come from the China (n = 8). Li Y, affiliated with Shantou University in China, emerged as the most prolific author in the area of AI and HuPCu value keyword research investigations, having published the highest number of publications.

4.3. Country-specific documents on AI and HuPCu value keyword research Studies.

More than of 100 countries have been recognized as actively engaging in research pertaining to AI and HuPCu in keyword research investigations. According to the findings presented in Figure 3, it can be observed that China has the highest number of contributions (n = 438) in terms of publishing research works focused on the keywords AI and HuPCu value. Following U.S (n = 393), India (n = 211), United Kingdom (n = 185), Italy (n = 106), Germany (n = 104), Australia (n = 95), South Korea (n = 87), and Canada (n = 81). The majority of scientific articles on keyword research studies in the domain of AI and (HuPCu) were mostly authored by researchers from advanced economies characterized by high indicators of human development and a well-established research ecosystem.

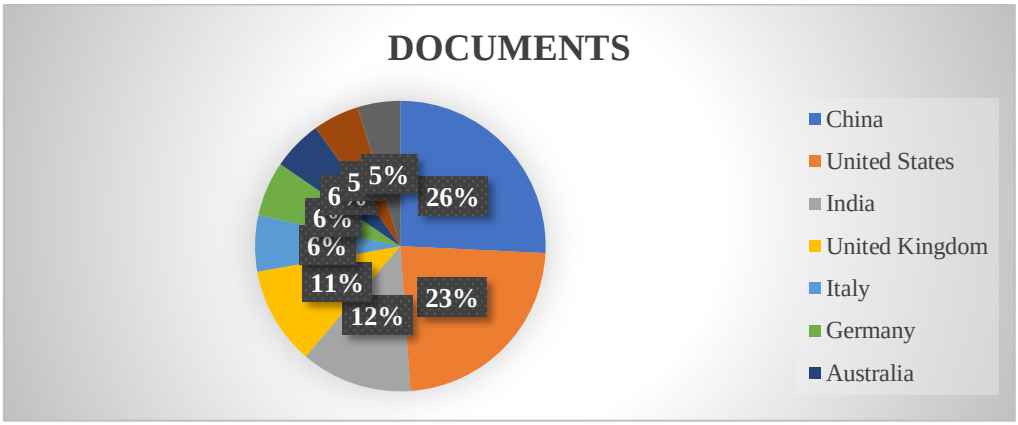

Figure 3 Analysis of the number of documents by country in the field of AI and HuPCu value research studies

Source: Top countries of AI and HuPCu value research studies from Scopus database prepared by authors (2023)

4.4. Subject Area publications of AI and HuPCu value research studies

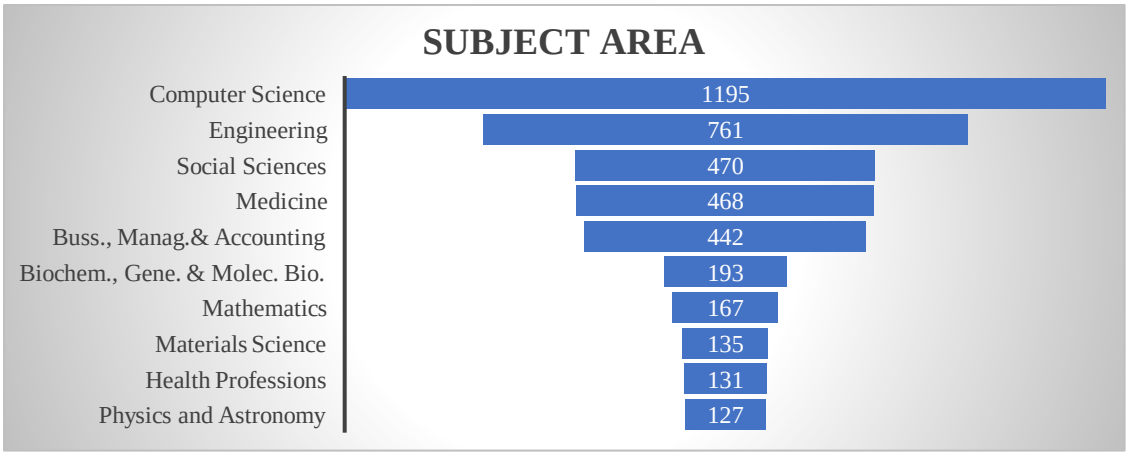

Figure. 4. Subject Area publications of AI and HuPCu value research studies

Source: Top Subject areas of AI and HuPCu value research studies from Scopus database prepared by authors (2023)

Research investigations on the value of AI and HuPCu have been conducted across various academic disciplines. The predominant subject area for the majority of international academic papers in the field of AI and HuPCu research projects was computer science, which constituted 29% (n = 1195) of the articles; engineering (n = 761 or 19%); social sciences (n = 470 or 12%); medicine (n= 468 or 11%); buss., manag. and accounting (n = 442 or 11%); biochem., gene. and molec. bio. (n=193 or 5%); mathematics (n = 167 or 4%); materials science (n = 135 or 3%); health professions (n=131 or3%); and physics and astronomy (n=127 or 3%).

The computer's digital technology executes control over the components of AI and HuPCu research investigations. AI is a specialized field within the broader domain of computer science. AI endeavors to facilitate the replication of human intelligence by computers, with the aim of addressing complex issues and making scalable, reproducible decisions. Computer science encompasses various disciplines such as software as well as hardware technology, information technology, and the engineering of computers. These areas of study are utilized in the creation, execution, and upholding of research projects focused on AI and HuPCu value research studies. This is one reason why computer science is the predominant field of study in AI and HuPCu research investigations.

4.5. The Type of Document Often Published in AI and HuPCu value research publication

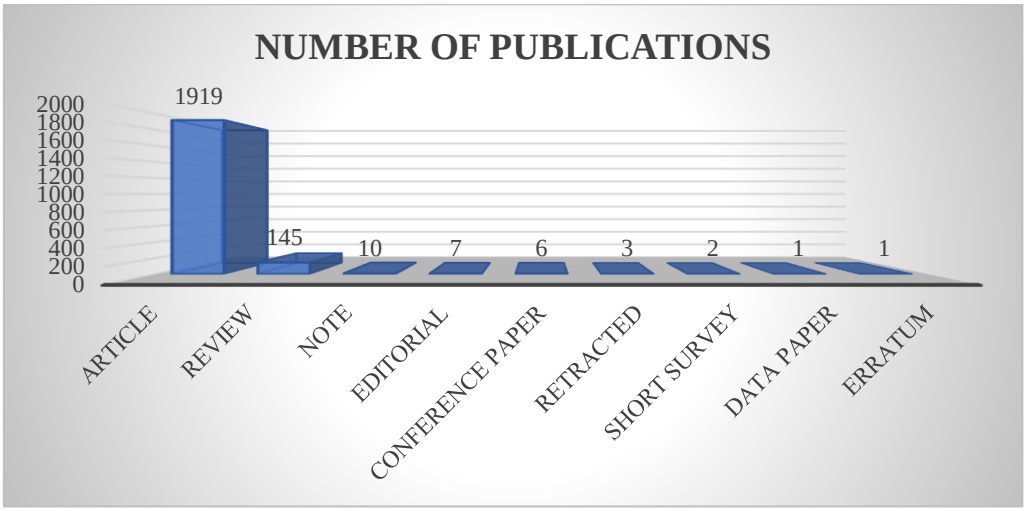

Fig. 5. The documents Often Published in AI and HuPCu value research publication

Source: Top Documents areas of AI and HuPCu value research studies from Scopus database prepared by authors (2023)

AI and HuPCu value research works have been summed up in a number of different types of documents. Based on the category of document, the AI and HuPCu value research journal had 1919 articles, 145 reviews, 10 notes, 7 editorials, 6 conference papers, 3 retractions, 2 short surveys, 1 data paper, and 1 erratum.

4.6. Documents adapted from the sources of the AI and HuPCu value research study

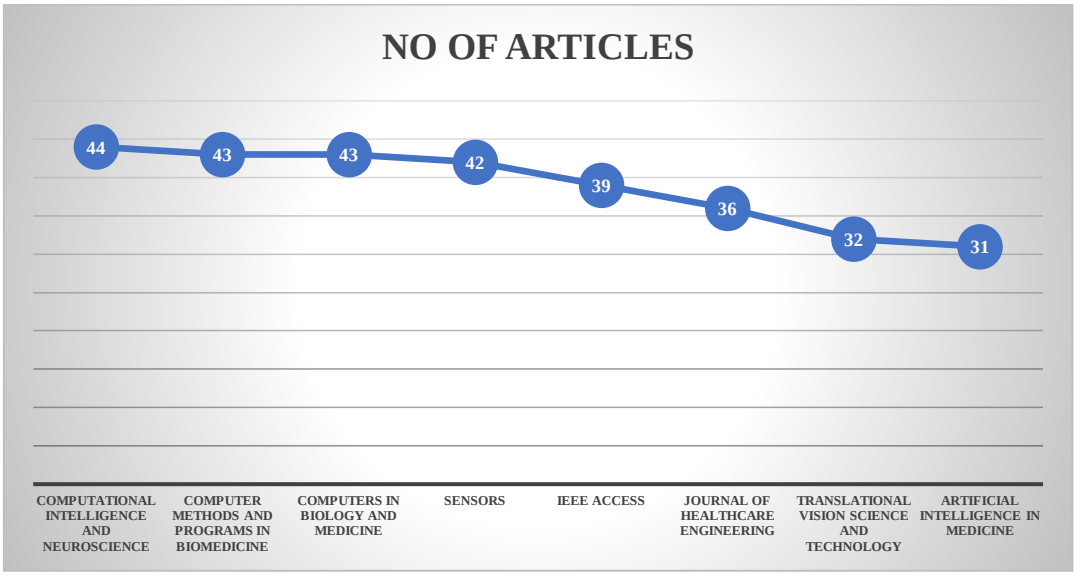

Fig. 6. The Document Often Published in AI and HuPCu value research publication

Source: Top sources of AI and HuPCu value research studies from Scopus database prepared by authors (2023)

160 literature sources have contributed research on the value of AI and HuPCu. Top most articles/year depending on sources in the AI and HuPCu value research works was “Computational intelligence and Neuroscience”, (n = 44); “Computer methods and programs in biomedicine”, (n = 43); “Computers in biology and medicine”, (n = 43); “Sensors”, (n = 42); “IEEE Access”, (n = 39); “Journal of Healthcare engineering”, (n=36); “Translational vision science and technology”, (n=32) and “Artificial intelligence in medicine”, (n=31).

4.7. AI and HuPCu value research studies – Annual Publications

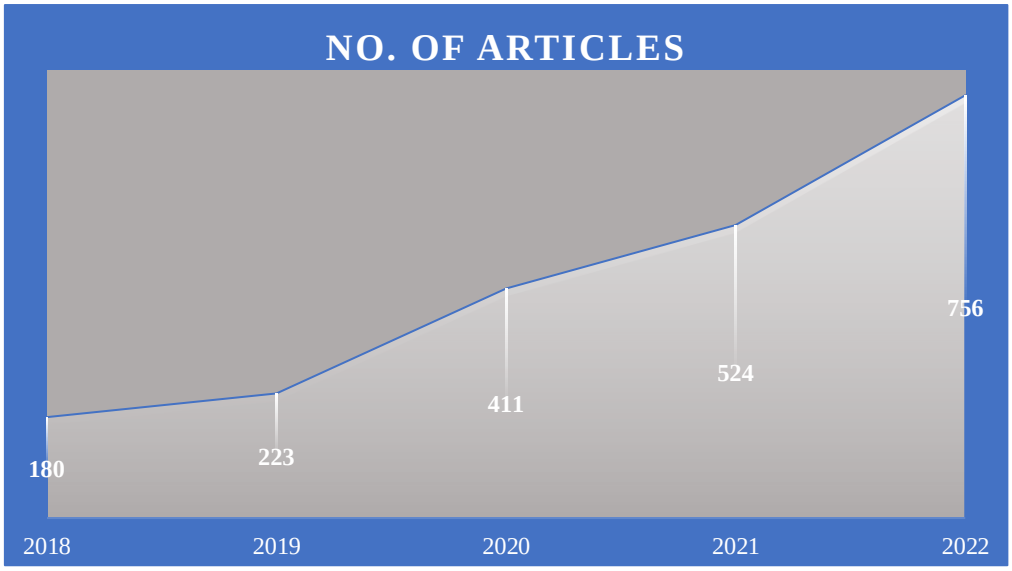

Fig. 7. Annual Publications (2018-2022)

Source: Annual publications of AI and HuPCu value research studies from Scopus database prepared by authors (2023)

There appears to be a growing tendency in the number of annual publications focused on research studies pertaining to AI and HuPCu values. Figure 7 illustrates the most prominent publishing peak in the year 2022, with a total of 756 papers. Since 2018, scholars have been doing research on the intersection of AI and HuPCu values in academic publications. The AI and HuPCu value research publication has 254 papers in 2021, 411 papers in 2020, 223 papers in 2019, and 180 papers in 2018. Thus, the overall annual growth between these years is 43.16%.

4.8. Cluster Analysis (Keyword co-occurrence)

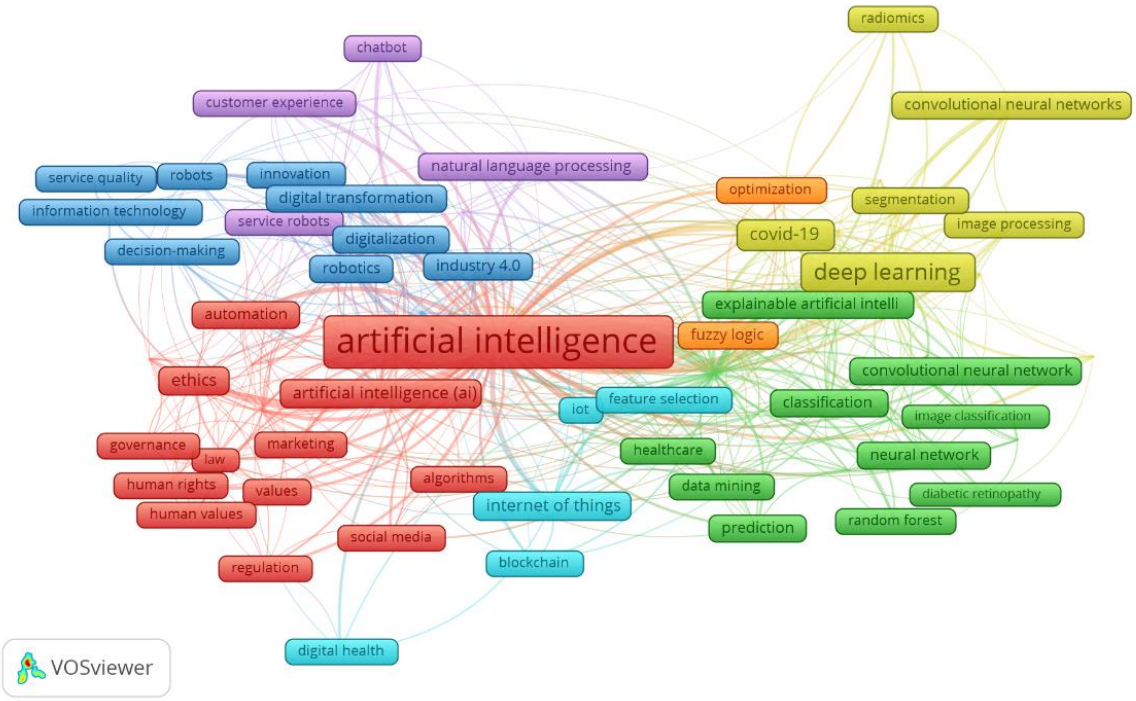

Figure 8 Keyword co-occurrences (Author keywords)

Source: Keyword co-occurrences (Author keywords) of AI and HuPCu value research studies from VOS Viewer prepared by authors (2023)

Keyword co-occurrence cluster analysis is an approach that aims to find research articles in the discipline of AI and HuPCu value by examining the connections among publications depending on the co-occurrence of keywords. The VOS Viewer application was employed to assess and visually represent the keyword structure development pertaining to the AI and HuPCu value within the study's themes. The minimal number of papers connected to keywords necessitated five repetitions. Consequently, a total of 70 keywords, out of a pool of 6376, satisfied the standards set forth. The figure 8 symbolizes the grouping of research topics in academic publications on AI and HuPCu value research. These themes have been simplified and abbreviated to ACBDIF research themes using relevant research keywords.

1. AI – (cluster red) – Cluster Red contains AI, automation, ethics, governance, human values, marketing, social media, technology, values. The majority of these keywords were associated with these clusters.
2. Convolutional neural network (CNN) – (cluster green) – This cluster contains CNN, data mining, decision support system, image classification, machine learning, prediction, healthcare. The majority of these keywords were associated with these clusters.
3. Big Data – (cluster blue) – This cluster contains decision-making, digital transformation, industry 4.0, service quality, information technology. The majority of these keywords were associated with these clusters.
4. Deep learning – (cluster yellow) – This cluster contains CNN, image processing, covid 19, segmentation. The majority of these keywords were associated with these clusters.
5. Natural language process- (cluster purple)- This cluster contains chatbot, customer experience, service robots, trust. The majority of these keywords were associated with these clusters.

6. Internet of things – (cluster sky blue) - This cluster contains digital health, Block chain, feature selection, IOT. The majority of these keywords were associated with these clusters.
7. Fuzzy Logic – (cluster orange) - This cluster contains artificial neural networks, optimization, sustainability. The majority of these keywords were associated with these clusters.

4.9. Documents Cited on AI and HuPCu value research studies

Table 1 Top Document citations of AI and HuPCu value research studies

Paper	DOI	Total Citations	TC per Year
WIRTZ J, 2018, J SERV MANAGE	10.1108/JOSM-04-2018-0119 (Wirtz et al., 2018)	649	108.167
BUHALIS D, 2019, J SERV MANAGE	10.1108/JOSM-12-2018-0398 (Buhalis et al., 2019)	236	47.2
CATH C, 2018, SCI ENG ETHICS	10.1007/s11948-017-9901-7 (Cath et al., 2018)	216	36
QIN C, 2018, BIOMED ENG ONLINE	10.1186/s12938-018-0544-y (Qin et al., 2018)	189	31.5
POPKOVA EG, 2020, J INTELLECT CAP	10.1108/JIC-09-2019-0224 (Popkova et al., 2020)	184	46
DONG D, 2021, IEEE REV BIOMED ENG	10.1109/RBME.2020.2990959 (Dong et al., 2020)	180	60
NAYAK SR, 2021, BIOMED SIGNAL PROCESS CONTROL	10.1016/j.bspc.2020.102365 (Shlyannikov et al., 2016)	174	58
AMANN J, 2020, BMC MED INFORMATICS DECIS MAK	10.1186/s12911-020-01332-6 (Amann et al., 2020)	174	43.5

Source: Top Document citations of AI and HuPCu value research studies from Scopus database prepared by authors (2023)

The topmost cited publications on AI and HuPCu value research studies were described in Table 1. Highly cited global AI and HuPCu value research studies were the work of Wirtz J in 2018 with 649 citations. Secondly, Buhalis D in 2019 with 236 citations. Thirdly, Cath C in 2018 with 216 citations. Fourth, Qin C in 2018 with 189 citations. Fourth, Popkova E G in 2020 with 184 citations. Fifth highly cited document with 180 citations, the author's name is Dong D in 2021. The top sixth document is Nayak S R in 2021 with 174 citations. Lastly, Amann J in 2020 with 174 citations.

5. CONCLUSION

Based on the findings, there has been a consistent annual growth in the quantity of publications pertaining to research studies on AI and HuPCu value, along with the exploration of maps and visual patterns. China is the country that exhibits the most significant involvement in the production of research papers pertaining to AI and the valuation of HuPCu values, as evidenced by a total of 438 publications published. With 28 papers published in AI and HuPCu value research studies, the top affiliated institutional was the University of California. Li Y was the most prominent academic researcher in AI and HuPCu value research studies, with 15 articles. The discipline of computer science exhibited the highest level of intensity in terms of topic area within AI and HuPCu value publications, comprising a total of 1195 documents, accounting for 29% of the total. In the year 2022, the field of AI and HuPCu study witnessed a significant volume of academic publications, with a total of 756 papers being published globally. In 2018, Wirts J's publications gained a total of 649 citations, making them the most highly cited among their works.

This study presents a novel framework for classifying the convergence axis, encompassing publications in the domains of AI and HuPCu research investigations. The aim is to characterize the collection of information produced in the last five years of academic publications based on its contribution to the existing knowledge base: Artificial intelligence, Convolutional neural network, big data, Deep learning, Internet of things, and Fuzzy logic abbreviated as ACBDIF research themes. In order to obtain a comprehensive understanding of the needs and gaps in the arenas of AI and HuPCu value, it is imperative to conduct practical studies that focus on identifying key themes. These studies will serve to elucidate the background and general subjects related to AI and HuPCu value, hence facilitating a clearer comprehension of the aforementioned needs and gaps. This will lead to the emergence of new avenues for development and study, specifically focusing on the absence of expertise and doing deeper analysis within these areas. The review of the possible impact of AI and HuPCu on several domains such as digital advertising, e-commerce business, and human (customer) values is an often-explored subject in academic research. Acquiring knowledge regarding emerging topics and issues is crucial in enabling professionals to formulate strategic strategies for the future.

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