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# Application of Artificial Intelligence in Dementia: A Bibliometric Analysis

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## Abstract

Based on 1526 academic journal papers from the Web of Science Core Collection between 2005 and 2024, this study used CiteSpace and Excel to conduct a bibliometric analysis of the application of artificial intelligence in dementia research. Research shows that the number of publications in this field has grown significantly since 2018. The United States, China, and the United Kingdom are the main contributing countries, with the University of London and the University of California System being the most productive institutions. Key research hotspots include identification of dementia stages, early diagnostic screening, risk prediction, and disease progression forecasting. Deep learning has become a core technology in this field, while "natural language processing" represents a current research frontier. Future trends will focus on multimodal data integration and deep neural networks to support precise prediction and intervention of dementia.

## Subject Areas

Artificial Intelligence

## Keywords

Artificial Intelligence, Dementia, Machine Learning, Bibliometric Analysis, CiteSpace

## 1. Introduction

Dementia, a progressive neurodegenerative disease with no clear pathogenesis, has an insidious onset and long course, with symptoms of cognitive decline

and behavioral disorders in memory, language, executive function, and visuospatial areas. Its common types include Alzheimer's disease (AD), vascular dementia (VaD), fronto-temporal dementia (FTD), dementia with Lewy body (DLB), etc. It is divided into early, middle and late stages. There are 3 stages: early, middle and late stages. Early symptoms are often overlooked, but the need for care increases significantly when the symptoms progress to the middle stage, and in the late stage, the person needs to be completely dependent on others for care. In the United States, as of 2024, 6.9 million Americans aged 65 and older have Alzheimer's dementia. By 2060, that number could grow to 13.8 million [1]. In the UK, there are an estimated 944,000 people living with dementia and this number is expected to double by 2050 [2]. In India, the prevalence of dementia among adults over 60 years of age is estimated to be 7.4%, with about 8.8 million Indians over 60 years of age living with dementia [3]. Dementia, with a high incidence rate, fast-developing syndrome and large disease burden, raises challenges to global health and social systems [4]. Similarly, in China, community surveys over the past few decades have shown a significant increase in the prevalence of dementia [5]. In addition, caregivers face increasing psychological stress and negativity, placing a heavy and unsustainable burden on society and families [6]. Dementia not only brings great physical and psychological distress to the patients, but also brings great emotional and financial pressure to the family and society. At the same time, the diagnosis and treatment of dementia face major challenges [7]. The insidious onset of dementia makes early diagnosis particularly difficult. By the time clinical symptoms become apparent, the disease has often reached an irreversible stage, complicating early intervention and treatment. Despite recent advances in biomarker testing and neuroimaging, the diagnosis of dementia remains largely dependent on clinical presentation and neuropsychological assessment. Therefore, there is a clear need to improve the accuracy and reliability of these methods [8]. Despite extensive research efforts, there are still no effective treatment strategies to modify or halt the progression of dementia. Therefore, comprehensive research into the prevention, diagnosis and treatment of dementia, as well as the development of new treatments and technologies, remains a top priority for the medical and scientific communities.

In recent years, significant advances in artificial intelligence (AI) technology and its interdisciplinary and integrative applications in medicine have provided promising solutions to a number of key challenges that have long plagued medical research. Machine learning (ML) and deep learning (DL) are two fundamental subsets of AI [9]. The core principle of machine learning is the use of algorithms to derive rules from data in order to predict or categorize new data. The use of machine learning in electronic health records is becoming more common in medical research [10]. For example, in early diagnosis, AI-enhanced neuroimaging techniques, including MRI, PET, and CT scans, can accurately detect dementia biomarkers, and machine-learning models analyze these images to identify patterns indicative of early cognitive decline and lay the groundwork for early intervention

[11]. However, one of the challenges of machine learning, especially when dealing with large datasets, is that it relies on the time-consuming process of manual feature extraction, which increases the complexity of data analysis. DL is a branch of machine learning that overcomes this limitation by employing deep neural networks to mimic the way the human brain processes information. With multiple layers of nonlinear transformations, DL can automatically extract high-level features, making it particularly suitable for processing large-scale, high-dimensional datasets [12]. The emergence of DL technology has enabled researchers to develop DL-based AD prediction and diagnosis models [13]. These models have shown superior specificity and sensitivity compared to traditional ML methods, offering powerful technical support for early detection and accurate diagnosis of dementia. In a study by Chinese scholars, a total of 411 subjects, including 96 cognitively normal, 94 with mild cognitive impairment (MCI), 173 with AD, and 48 with non-AD dementia, were selected to measure fluid biomarkers with a single-molecule array and to develop an optimal diagnostic model consisting of cost-effective and noninvasive methods for AD diagnosis [14]. In conclusion, AI has great potential in the field of dementia and has a wide range of applications. With the development of technology and the advancement of research, it is expected that AI will continue to make significant breakthroughs and contribute to the advancement of human health.

A bibliometric study on the use of AI in brain disorders has been conducted [15]. Based on these findings and given current research trends, the goal is to conduct a more detailed and cutting-edge bibliometric analysis of the use of AI in dementia to uncover new insights and breakthroughs.

Therefore, this study employs bibliometric methods and literature visualization tools to provide a comprehensive analysis of global research on AI in dementia from 2005 to 2024. The aim is to identify the most productive countries, institutions, journals and authors, as well as key keywords and co-cited literature. Findings are visually mapped to reveal research hotspots and future trends in this rapidly evolving field.

## 2. Materials and Methods

### 2.1. Search Strategy

The Web of Science database is the leading platform for abstract indexing of interdisciplinary scholarly literature and contains more than 12,400 high-impact journals. It is widely used in bibliometric studies and provides important data for academic assessment. The data used in this study come from the Web of Science Core Collection, which includes citation indexes such as the Science Citation Index (SCI). The literature search was conducted on August 1, 2025. The term "TS" refers to "Topic Search", which allows searching in titles, abstracts and keywords of publications. The search strategy based on previous research was as follows: TS = ("Demetia" OR "Senile dementia" OR "Alzheimer's disease") AND TS = ("Artificial intelligence" OR "Machine learning" OR "Computational intelligence" OR

"Machine intelligence" OR "Deep learning" OR "Reinforcement learning" OR "Neural networks" OR "Natural language processing" OR "Large language models") The search was limited to English-language articles and review articles covering publications from January 1, 2005, to December 31, 2024, in order to ensure accuracy and reliability. To ensure accuracy and reliability, the search process was conducted independently by two researchers. Two independent screeners conduct initial and secondary literature screening according to predetermined criteria. Disagreements are first resolved through thorough consultation. If consultation fails to reach a resolution, a third independent reviewer with relevant research background is introduced. The final consensus is reached by integrating the opinions of all three parties to ensure the rigor and effectiveness of the literature inclusion process.

### 2.2. Inclusion and Exclusion Criteria

The inclusion criteria were as follows: 1) The study focused on dementia. 2) The study utilized AI-related techniques (deep learning, machine learning, neural networks, natural language processing, etc.).

The exclusion criteria were as follows: 1) The study was not concerned with dementia. 2) The study does not involve AI technology.

### 2.3. Data Collection

After excluding duplicates and unpublished literature, 1443 publications were selected for further analysis. For each publication, the following basic data were collected: title, abstract, country or region, institution, author, keywords, journal and reference.

### 2.4. Data Analysis and Visualization

In this study, we used CiteSpace (v.6.3.R1 64-bit Advanced) and Scimago Graphica (1.0.45) for bibliometric and visual analysis.

CiteSpace, developed by Professor Chao-Mei Chen, is a specialized visual analysis software designed to identify research hotspots in the literature and predict future research trends [16]. Specifically, we used CiteSpace to accomplish the following tasks: institutional co-occurrence analysis, journal biplot overlay, citation burst analysis of references, and keyword clustering and burst detection. This paper references previous similar studies [4], and the parameters used in CiteSpace are as follows: time span: 2005-2024; slice length = 1; thresholds: g index (k = 7), LRF = 2.5, L/N = 10, LBT = 5, e = 1.0.

## 3. Results

### 3.1. Research Selection Process

After performing the initial search, we screened titles and abstracts to confirm article eligibility based on predefined inclusion and exclusion criteria. The manual exclusion criteria were: 1) the study did not focus on AD, and 2) the study did not

involve AI-related methods. The search process was conducted independently by two researchers to maximize the accuracy and reliability of the results. Based on these criteria, 1554 references were excluded after reviewing titles and abstracts. Duplicates and unpublished literature were then removed. Finally, 1526 articles were selected for further consideration. The literature search and screening process is shown in Figure 1.

### 3.2. Global Trends of Publication Outputs and Citations

By statistically analyzing the number of research papers published in different time periods, we can reveal the research trends and development dynamics in specific fields. Based on the established search strategy and screening process, we successfully collected a total of 1526 research papers related to the application of AI in dementia from the WOS database over the past 20 years (Figure 1). We then plotted publication trends over time (Figure 2), which clearly illustrates the significant growth of research on AI applications in dementia. Specifically, prior to 2012, research in this area was still in its early stages, with only a handful of papers published. However, between 2012 and 2019, the number of publications began to gradually rise. Notably, after 2019, the field experienced exponential growth, peaking at 365 publications in 2024. Furthermore, as of the search date, these papers have been cited 36,781 times, with an average of 24.1 citations per paper, highlighting the significant impact and academic significance of research in this field.

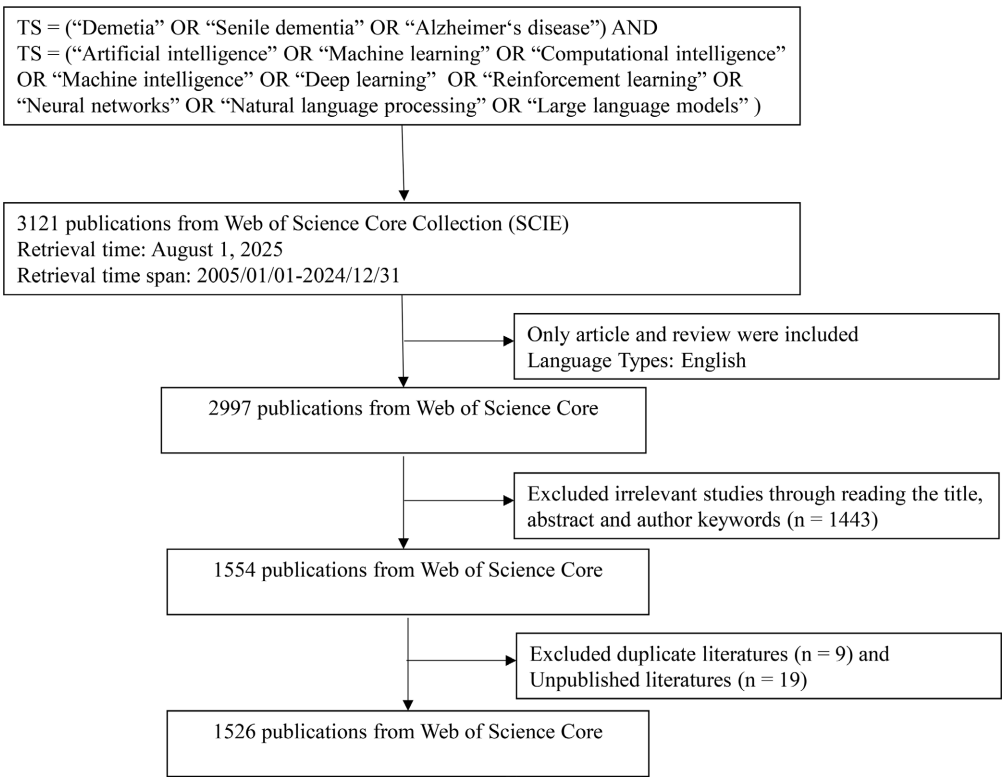


**Figure 1.** Flow chart of the literature screen.

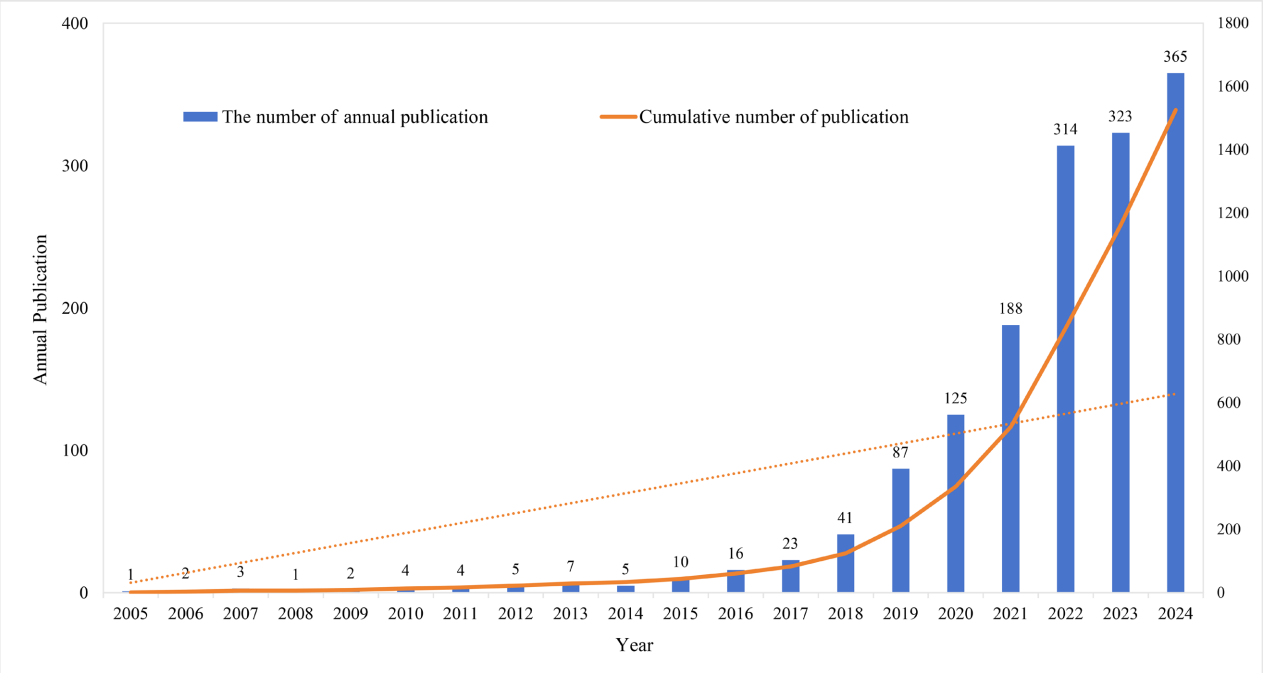


**Figure 2.** Annual publication trends.

### 3.3. Contributions of Countries/Regions

A total of 93 countries and regions have published relevant articles in this field. Figure 3 provides an overview of the global distribution of these studies, with circle size representing the number of publications per country. The figure shows that only the United States and China have published over 300 articles. Furthermore, from a collaboration perspective, we can clearly observe that the United States and China have collaborated with the majority of countries in this field. Table 1 details the top ten countries in scientific research output over the past 20 years. The table clearly shows that the United States and China have produced a significant volume of research in this field.

### 3.4. Contributions of Top Institutions

Figure 4 displays a collaboration network diagram of institutions engaged in research within this field, generated using CiteSpace's default settings. In this diagram, nodes represent the number of publications by each institution, with larger nodes indicating more articles. Links between nodes illustrate collaborative relationships among institutions. Table 2 lists the top 10 most productive institutions in this field. Harvard University ranks highest in productivity with 41 publications, followed by the Egyptian Knowledge Bank (38 publications). Institutions with high centrality include Harvard University (0.26), Sungkyunkwan University (0.18), and the University of California System (0.11).

### 3.5. Publication of Authors

A total of 297 authors have contributed to research in this field. Among them, 38

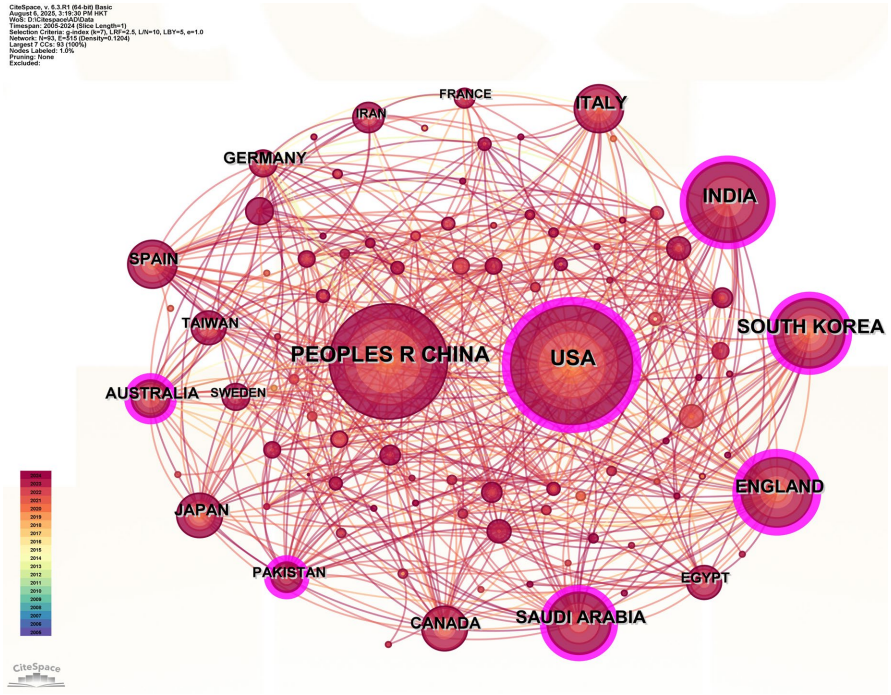


Figure 3. Geographical distribution of collaborations among countries regions.

Table 1. Top 10 countries with most publication.

| Rank | Author | Records | Centrality | Citations | Average Citations |
|---|---|---|---|---|---|
| 1 | USA | 372 | 0.24 | 13,310 | 35.8 |
| 2 | China | 356 | 0.12 | 10,768 | 30.2 |
| 3 | India | 173 | 0.13 | 3086 | 17.8 |
| 4 | South Korea | 153 | 0.1 | 5176 | 33.8 |
| 5 | England | 141 | 0.37 | 4593 | 32.6 |
| 6 | Saudi Arabia | 102 | 0.05 | 2056 | 20.2 |
| 7 | Italy | 92 | 0.05 | 3436 | 37.3 |
| 8 | Spain | 83 | 0.02 | 2577 | 31.0 |
| 9 | Canada | 75 | 0.04 | 2763 | 36.8 |
| 10 | Australia | 69 | 0.19 | 2675 | 38.8 |

authors have published three or more articles, as shown in Figure 5. Table 3 lists the top 10 authors by number of papers published in this field. In terms of average citations, Au, Rhoda ranks first, followed by Beg, Mirza Faisal and Popuri, Karteek. Collaboration among authors from different countries appears relatively weak. Therefore, authors in this field should strive to strengthen international cooperation and promote broader exchanges with larger networks of researchers.

### 3.6. Contributions of Top Journals

A total of 267 journals published relevant articles, with 243 journals publishing

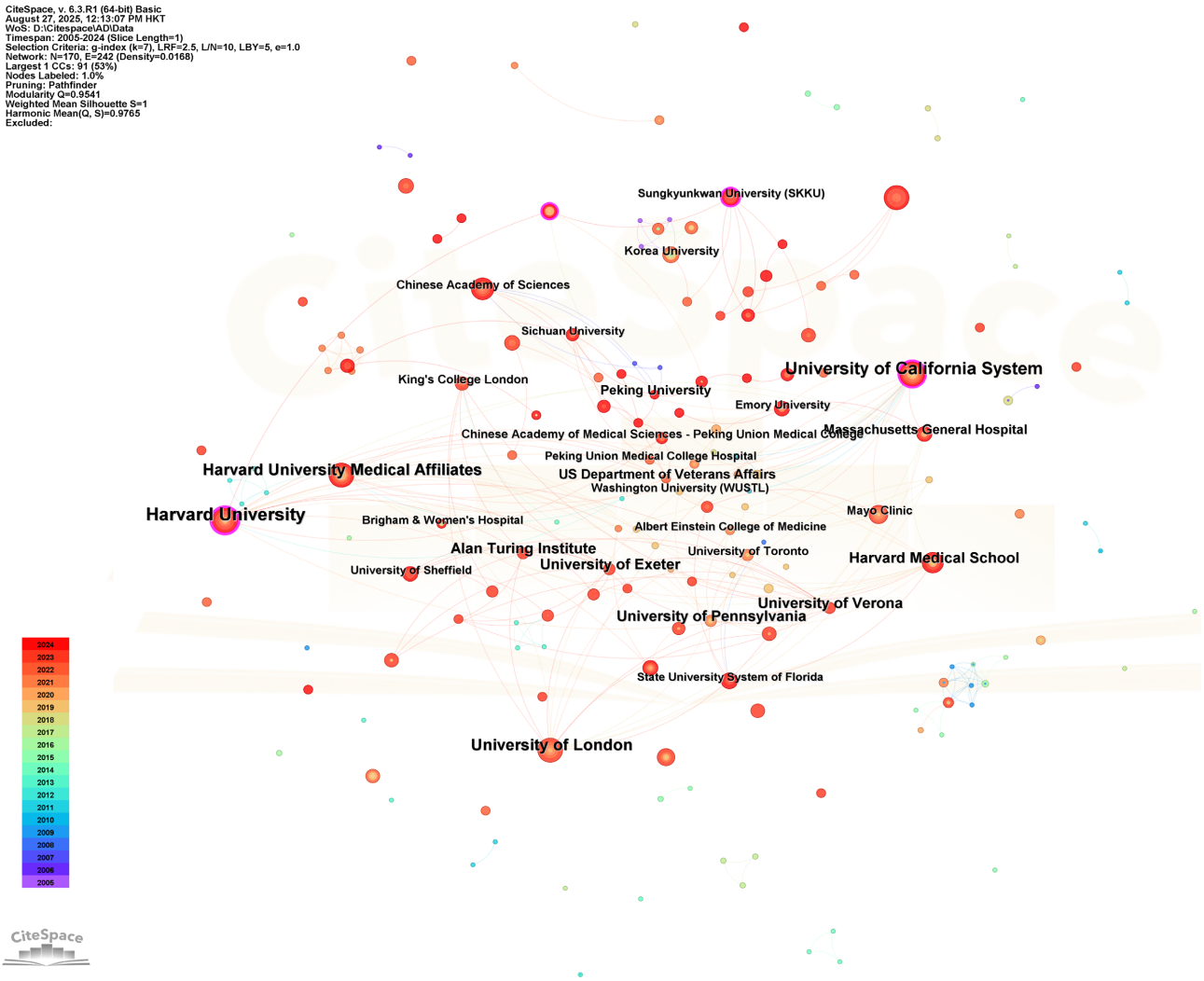


**Figure 4.** Network of institutions related to AI in dementia.

**Table 2.** Top 10 institutions with most publication.

| Rank | Institution | Records | Centrality |
|---|---|---|---|
| 1 | Harvard University | 41 | 0.26 |
| 2 | Egyptian Knowledge Bank (EKB) | 38 | 0.03 |
| 3 | University of California System | 34 | 0.11 |
| 4 | Harvard University Medical Affiliates | 34 | 0.03 |
| 5 | University of London | 33 | 0.06 |
| 6 | Chinese Academy of Sciences | 30 | 0.05 |
| 7 | Harvard Medical School | 25 | 0.03 |
| 8 | State University System of Florida | 18 | 0.02 |
| 9 | Massachusetts General Hospital | 18 | 0.03 |
| 10 | Sungkyunkwan University (SKKU) | 17 | 0.18 |

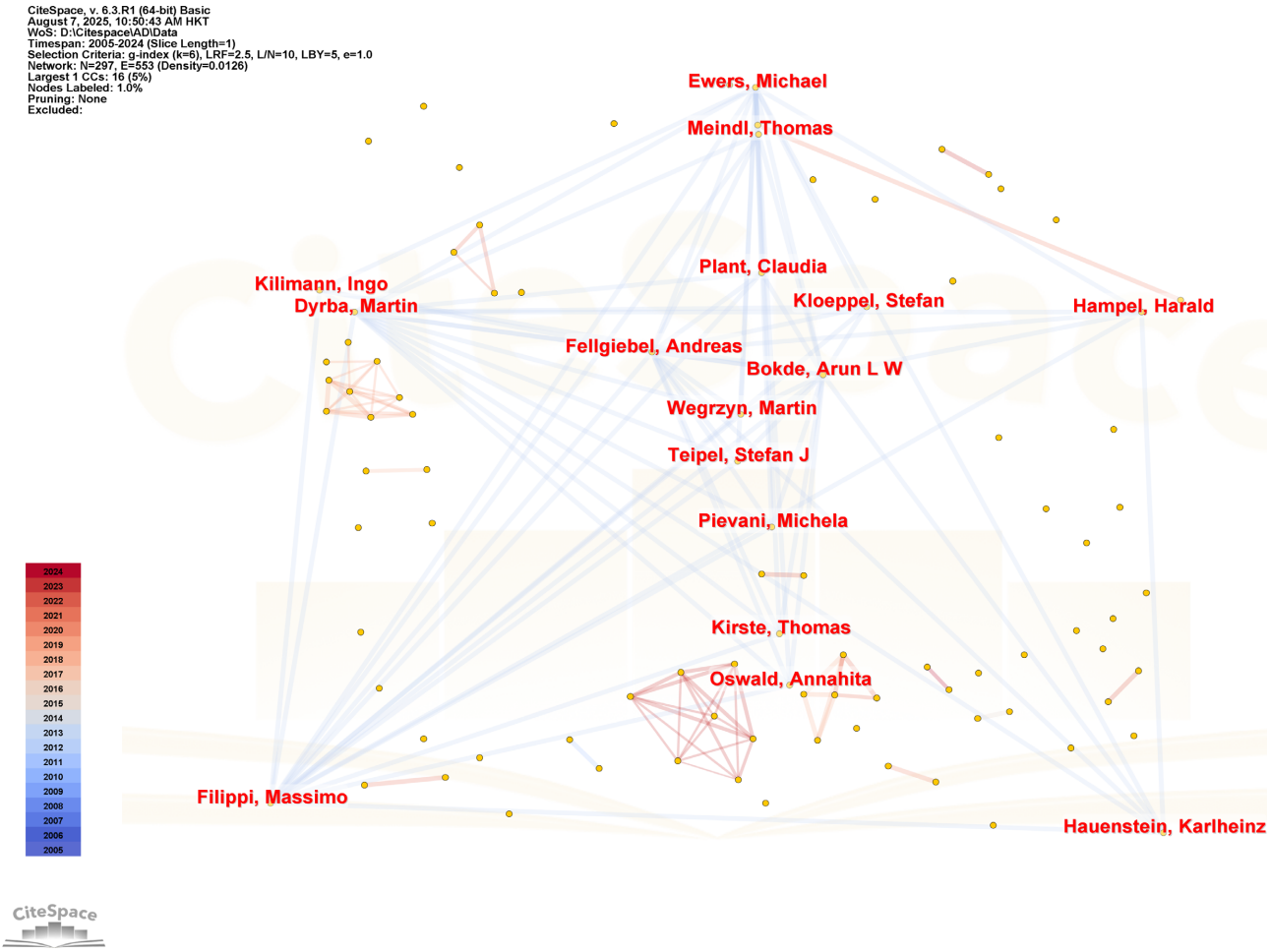


Figure 5. Network of authors related to AI in dementia.

Table 3. Top 10 authors with most publication.

| Rank | Author | Records | Citations | Average Citations |
|---|---|---|---|---|
| 1 | Abuhmed, Tamer | 8 | 268 | 33.5 |
| 2 | Popuri, Karteek | 8 | 578 | 72.3 |
| 3 | El-sappagh, Shaker | 8 | 384 | 48.0 |
| 4 | Beg, Mirza Faisal | 7 | 532 | 76.0 |
| 5 | Ranson, Janice M | 7 | 154 | 22.0 |
| 6 | Tamburin, Stefano | 6 | 114 | 19.0 |
| 7 | Lourida, Ilianna | 6 | 131 | 21.8 |
| 8 | Llewellyn, David J | 6 | 143 | 23.8 |
| 9 | Tanveer, M | 6 | 239 | 39.8 |
| 10 | Au, Rhoda | 5 | 481 | 96.2 |

more than 10 articles, as shown in Figure 6. Table 4 lists the top 10 journals ranked by the number of published articles. In terms of citation counts, the top three

journals were Alzheimer's & Dementia, Neuro Image and Journal of Alzheimer's Disease.

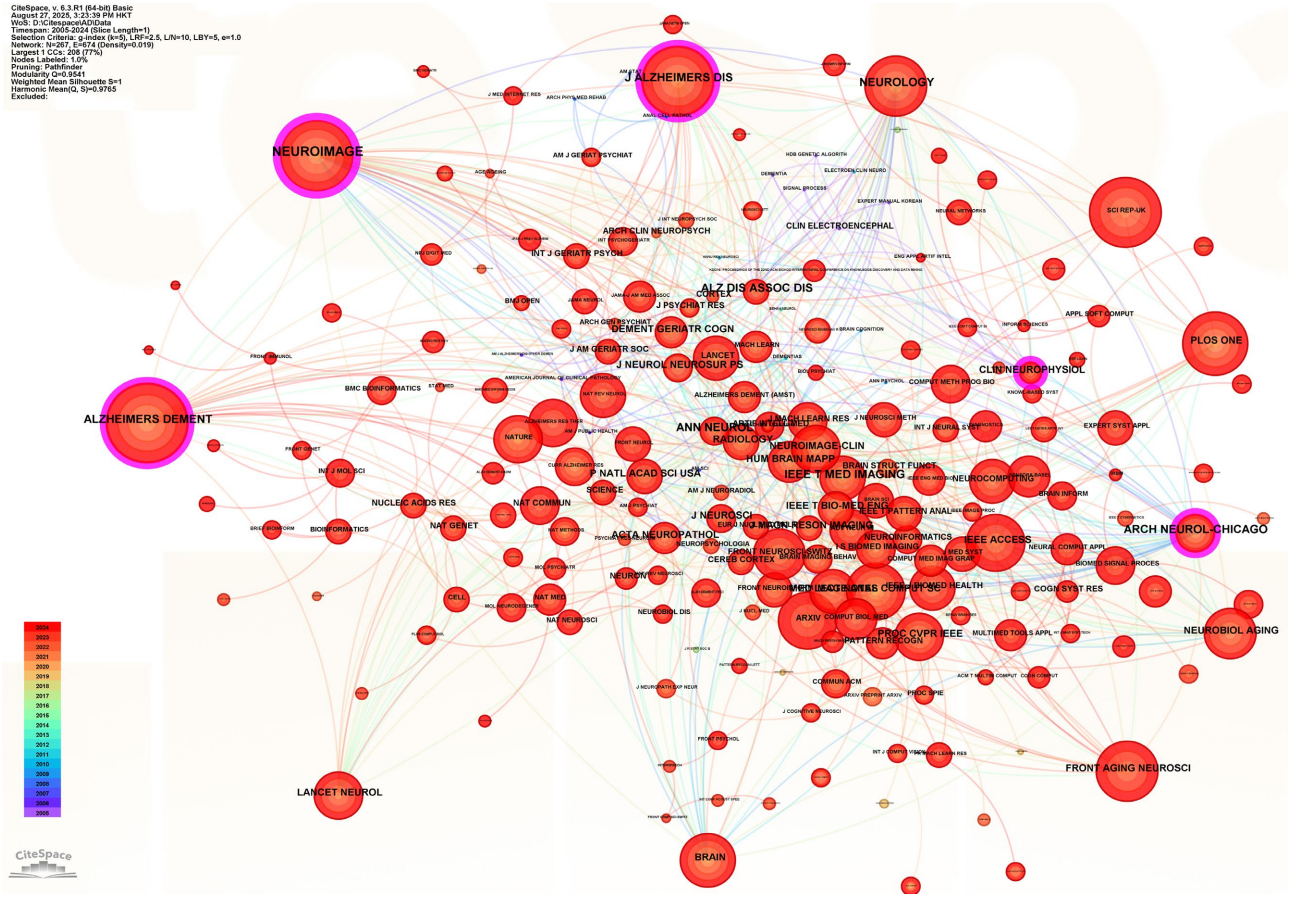


**Figure 6.** Network of journals related to AI in dementia.

**Table 4.** Top 10 most productive journals.

| Rank | Journals | Records | Citation | Average Citations |
|---|---|---|---|---|
| 1 | Alzheimer's & Dementia | 948 | 27,806 | 29.3 |
| 2 | Neuro Image | 804 | 28,919 | 36.0 |
| 3 | Journal of Alzheimer's Disease | 754 | 21,109 | 28.0 |
| 4 | Neurology | 660 | 20,874 | 31.6 |
| 5 | Scientific Reports | 631 | 15,327 | 24.3 |
| 6 | PLOS ONE | 607 | 18,381 | 30.3 |
| 7 | Neurobiology of Aging | 514 | 18,499 | 36.0 |
| 8 | Frontiers in Aging Neuroscience | 511 | 12,000 | 23.5 |
| 9 | Brain | 469 | 16,518 | 35.2 |
| 10 | The Lancet Neurology | 433 | 12,996 | 30.0 |

### 3.7. Keyword Co-Occurrence and Burst Detection

Keywords play a crucial role in emphasizing the core content of an article. Analyzing keywords can identify research hotspots and emerging trends in specific fields. In this study, a knowledge graph-based clustering method was adopted, and CiteSpace software was used to analyze keywords. The clustering results indicate that the research field can be divided into 12 clusters, as shown in Figure 7. The validity and effectiveness of these clustering results were determined based on the modularity Q and Silhouette S metrics. According to previous studies [17], $Q > 0.3$ indicates a significant clustering structure, $S > 0.5$ indicates reasonable clustering results, and $S > 0.7$ indicates high confidence in the clustering results. The results show that $Q = 0.7903 > 0.3$ and $S = 0.8628 > 0.7$, indicating that the keyword clustering results are both significant and reasonable. The top 5 clusters include: #0 alzheimers disease, #1 mild cognitive impairment, #2 deep learning, #3 magnetic resonance imaging, #4 natural language processing.

To clarify the relationship between dementia and AI, we conducted an in-depth analysis of the initially screened keywords, focusing on the top high-frequency keywords (Figure 8). Based on the analysis results in Figure 8, we compiled the top 50 popular keywords, as detailed in Table 5.

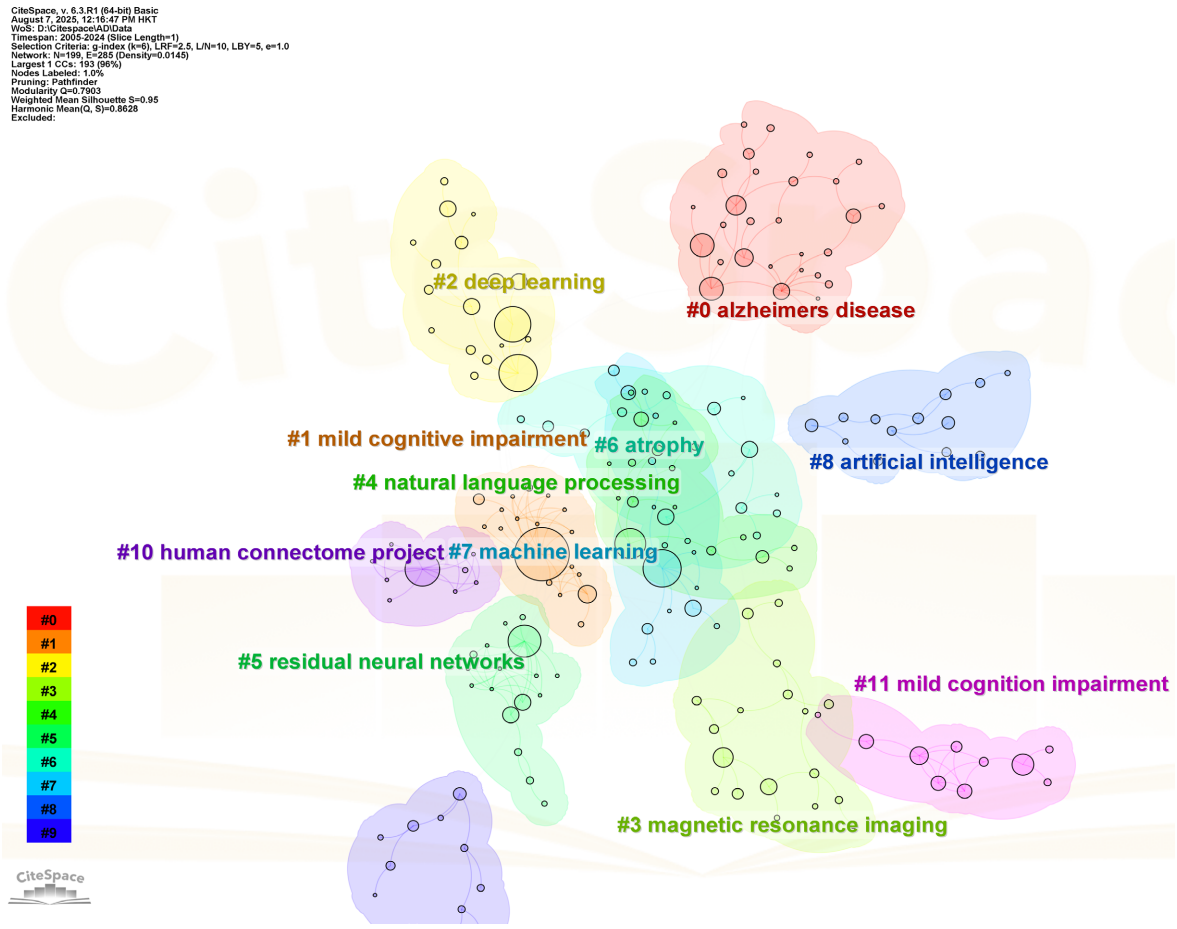


Figure 7. Keyword clustering knowledge graph in the field of AI in dementia.

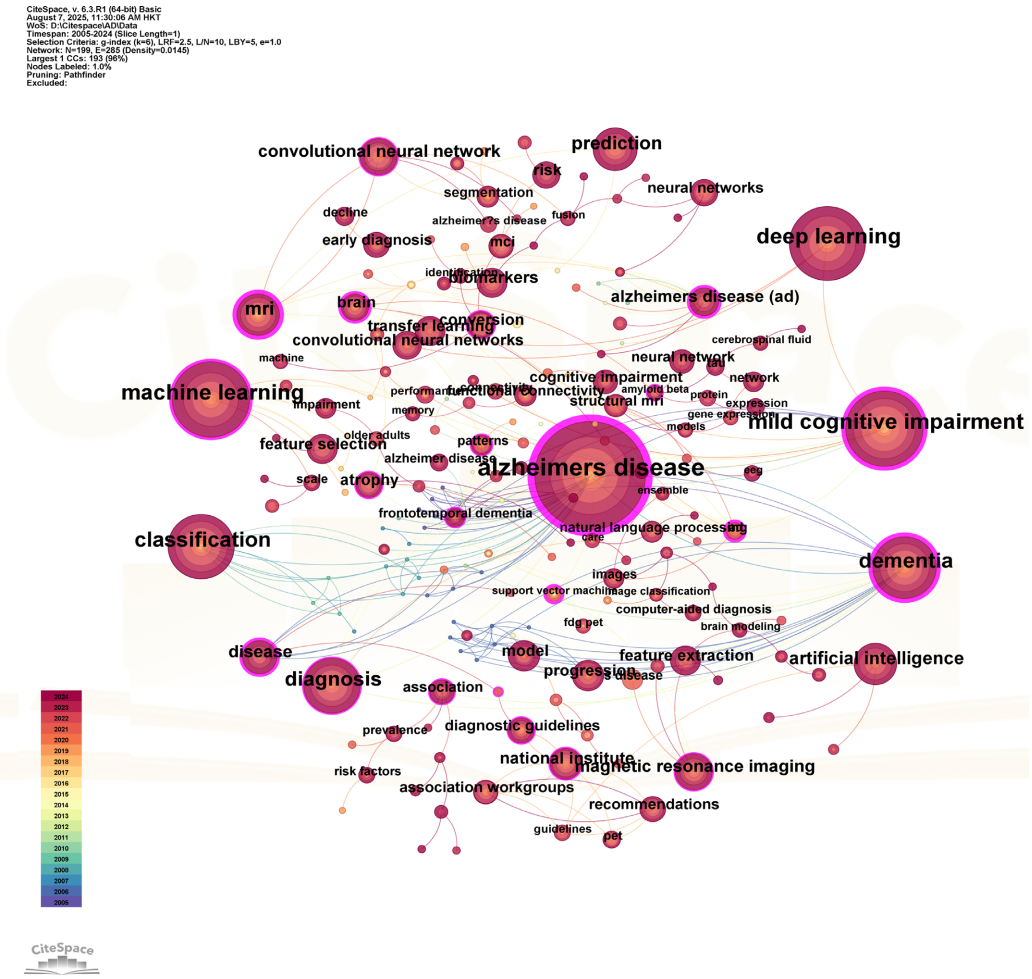


**Figure 8.** Network of keywords related to AI in dementia.

**Table 5.** Top 50 keywords in the field of AI for dementia.

| Rank | Keywords | Records | Rank | Keywords | Records |
|---|---|---|---|---|---|
| 1 | alzheimers disease | 844 | 26 | transfer learning | 65 |
| 2 | mild cognitive impairment | 433 | 27 | recommendations | 60 |
| 3 | machine learning | 423 | 28 | association workgroups | 59 |
| 4 | deep learning | 372 | 29 | diagnostic guidelines | 57 |
| 5 | classification | 326 | 30 | early diagnosis | 55 |
| 6 | dementia | 314 | 31 | neural networks | 54 |
| 7 | diagnosis | 259 | 32 | cognitive impairment | 52 |
| 8 | prediction | 154 | 33 | neural network | 46 |
| 9 | mri | 150 | 34 | functional connectivity | 46 |
| 10 | artificial intelligence | 125 | 35 | mci | 46 |
| 11 | convolutional neural network | 107 | 36 | association | 46 |
| 12 | magnetic resonance imaging | 105 | 37 | structural mri | 44 |

**Continued**

| | | | | | |
|---|---|---|---|---|---|
| 13 | disease | 95 | 38 | segmentation | 37 |
| 14 | national institute | 88 | 39 | natural language processing | 36 |
| 15 | biomarkers | 84 | 40 | patterns | 33 |
| 16 | alzheimers disease (ad) | 79 | 41 | alzheimer disease | 32 |
| 17 | atrophy | 74 | 42 | network | 32 |
| 18 | feature selection | 73 | 43 | images | 31 |
| 19 | progression | 72 | 44 | decline | 31 |
| 20 | model | 72 | 45 | disease | 30 |
| 21 | conversion | 67 | 46 | frontotemporal dementia | 30 |
| 22 | brain | 67 | 47 | tau | 28 |
| 23 | convolutional neural networks | 66 | 48 | impairment | 27 |
| 24 | feature extraction | 65 | 49 | computer-aided diagnosis | 27 |
| 25 | risk | 65 | 50 | ad | 27 |

## 4. Discussion

### 4.1. General Information

This study conducted a comprehensive review of literature on artificial intelligence in dementia published between 2005 and 2024 using the Web of Science database. Following a rigorous screening process based on inclusion and exclusion criteria, 1526 high-quality papers were identified. These papers, authored by 297 researchers from 170 institutions across 93 countries/regions and published in 267 academic journals, provided a robust data foundation for our analysis.

The volume of scientific literature is often regarded as a primary indicator for assessing developmental dynamics within specific disciplinary fields. This study meticulously analyzed the research trends in AI applications for dementia from 2005 to 2024. Findings reveal a sustained upward trajectory in the field's literature volume, with 88% of publications occurring within the past five years. This significant growth is largely attributed to the rapid advancement of deep learning (DL). Further analysis reveals a sharp rise in publications since 2019, primarily driven by the introduction and practical application of various novel deep learning frameworks. Currently, AI applications in dementia represent a highly prominent topic in clinical medical research, with substantial research potential and diverse applications anticipated in the future.

A review of the global distribution of artificial intelligence research reveals that the United States holds a prominent position, having published 372 related papers, accounting for 24.4% of the global total. This makes it the country with the highest number of publications in this field. China follows closely behind with 356 papers, accounting for 23.3% of the total. Together, these two nations represent 47.7% of all published papers, underscoring their leadership in the intersecting field of AI

and dementia research. Notably, China has experienced the fastest growth in paper output, rising to become the world's second-largest contributor and establishing a robust collaborative bridge with the field's leader, the United States. As technology advances and research deepens, an increasing number of countries and researchers are expected to engage in interdisciplinary studies on dementia and artificial intelligence. This will drive progress in academic knowledge and practical applications within the field.

At the institutional level, the United States holds six of the top ten spots in research productivity. Harvard University leads the list with 41 publications, reflecting America's significant advantage in overall publication volume. Institutions from China, the United Kingdom, South Korea, and others also feature prominently. Harvard University and Sungkyunkwan University exhibit centrality indices of 0.26 and 0.18, respectively, indicating their more pivotal positions within academic exchange networks and broader scope of external collaboration. These findings underscore the importance of strengthening global academic cooperation. Collectively, research activities from the United States, China, and the United Kingdom stand out globally. American institutions, particularly Harvard University, lead in both research output and influence. To elevate their academic standing, institutions worldwide must intensify international collaboration to further advance scientific research.

Analysis of core authors reveals that the top 10 scholars predominantly hail from the United States, highlighting the nation's outstanding contributions in specific research domains—a finding consistent with prior institutional analyses. Among them, Abuhmed, Tamer, Popuri, Karteek, and El-sappagh, Shaker lead in publication volume. Notably, despite publishing fewer articles, Au, Rhoda ranks first in average citations, demonstrating profound academic influence. However, **Figure 5** also reveals limitations in current research collaboration, as many teams remain confined to domestic partnerships. This underscores the urgent need to strengthen international cooperation, which is crucial for advancing research progress and innovation in disease diagnosis and treatment.

## 4.2. Research Hotspots and Emerging Trends

### 4.2.1. Research Hotspots

A keyword co-occurrence analysis provides an accurate representation of the core themes, emerging hotspots, and development trends within a specific academic field [18]. After analyzing the frequency of occurrence (**Table 5**), the most significant keywords linking dementia and AI can be categorized into three themes: 1) Disease Classification and Progression: Alzheimer's disease, mild cognitive impairment, and dementia. 2) AI and ML Technologies: Machine learning, deep learning, convolutional neural networks, neural networks, transfer learning. 3) Medical imaging and auxiliary diagnosis technologies: MRI, structural MRI, functional connectivity, and computer-aided diagnosis.

Additionally, a timeline visualization based on co-occurring keyword networks

(Figure 9) illustrates the trajectory of artificial intelligence in dementia research. Initially, the focus was primarily on clinical applications [19]-[22]. However, with the continuous advancement of artificial intelligence technology and innovations in treatment methods, the focus of research has gradually shifted toward emerging fields such as early detection [23]-[26] and prognosis prediction [27] [28]. Based on the analysis of the above keywords, two primary research directions have emerged in the fields of dementia and AI: 1) Early identification and diagnosis of dementia; 2) Risk assessment and prediction of disease progression in dementia.

Early Identification and Diagnosis of Dementia: The progression of dementia is complex, involving multiple stages. Individuals diagnosed with MCI have a higher risk of developing dementia, with an annual conversion rate of approximately 15% [29]. Therefore, early and accurate diagnosis is crucial for slowing disease progression and improving treatment outcomes [30]. Initially, researchers were accustomed to using traditional machine learning techniques for dementia classification

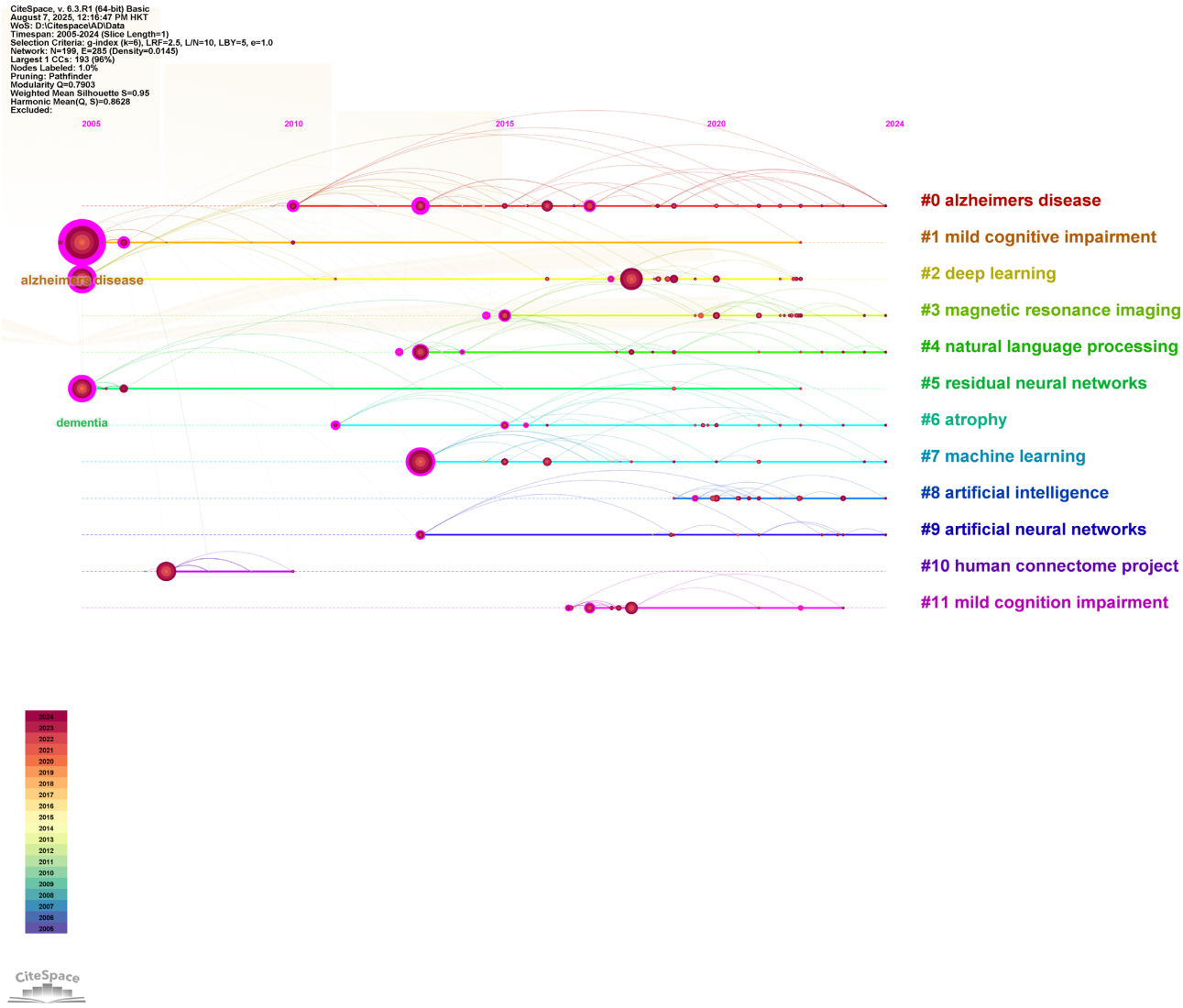


**Figure 9.** Network visualization graph of the cluster timeline view of keywords in the field of AI in dementia.

and diagnosis, typically with healthy individuals as controls [31]. Some have proposed a two-stage classification to distinguish MCI from dementia [32] [33]. In recent years, DL models have demonstrated tremendous potential in processing high-dimensional neuroimaging data due to their powerful feature extraction and classification capabilities [34]. Researchers have begun applying DL methods to achieve precise dementia diagnosis and early prediction [35]. Notably, Ávila-Jiménez *et al.* proposed a deep learning model to identify AD in clinical records [36]. The neural network model they developed demonstrated excellent performance and can serve as an accurate diagnostic aid for AD. In summary, the application of artificial intelligence in dementia research is becoming increasingly sophisticated, providing substantial support for early diagnosis, precision treatment, and prognosis prediction.

Risk assessment and prediction of dementia progression: Research indicates that pathophysiological changes associated with dementia occur long before clinical symptoms emerge, underscoring the necessity of early intervention [37]. In the absence of effective drug treatments, it is crucial to reduce the risk of dementia, delay its onset, or slow its pathological progression [30]. An AI-based risk prediction model offers a novel strategy for dementia management and prevention. For example, You *et al.* utilized ML to develop a novel dementia prediction model, UKB-DRP, which combines 10 readily accessible predictors [38]. This model demonstrates reliable predictive capability for dementia and AD occurrence over five, ten, or even longer timeframes, enabling the identification of individuals at high risk for dementia within the general population. Li *et al.* developed a dementia conversion prediction model for mild cognitive impairment that integrates plasma pTau181 and structural imaging features [39], enabling the prediction of dementia-specific pathological changes.

#### 4.2.2. Emerging Trends

Emerging keywords serve as key indicators of cutting-edge research hotspots, offering insights into emerging trends. Notably, "machine learning" is projected to become a critical focus area. Simultaneously, this reflects growing attention toward developing intelligent assessment tools capable of accurately predicting disease progression [40]-[42]. These advancements aim to provide robust data support for developing personalized treatment strategies. In summary, "machine learning" stands as a pivotal keyword in AI research related to dementia, reflecting the continuous evolution and progress of research methodologies in this field. With ongoing technological advancements and deepening research, further breakthroughs are anticipated in early disease detection, accurate diagnosis, effective treatment, predictive accuracy, and improved care and prognosis.

### 4.3. Limitations

This study has several limitations. First, due to inherent limitations of bibliometric tools and databases, it was not possible to effectively integrate and analyze data from multiple databases or languages. Second, this research focused solely on

English-language literature, excluding scholarly work in other languages. Additionally, the literature review spans from 2005 to 2024, potentially limiting consideration of earlier or most recent research. Consequently, some omissions or biases may exist in the data. To enhance the comprehensiveness and accuracy of future research, it is recommended to broaden data sources to include multilingual literature and a wider range of document types. Additionally, potential citation biases, such as self-citation inflating impact metrics and database language biases overlooking non-English works, impose further limitations on bibliometrics, thereby affecting the comprehensiveness and objectivity of results to some extent.

## 5. Conclusion

The findings of this study indicate a significant increase in publications and citations within this field, reflecting growing academic interest and attention. Strengthening this relationship is crucial for the field's further development. Our analysis also identified key research areas, including identifying different stages of dementia, early diagnostic screening, risk prediction, and forecasting disease progression. Future research will explore artificial intelligence methods, particularly machine learning, emphasizing the integration of multimodal data and the utilization of deep neural networks. These approaches aim to identify emerging risk factors—such as environmental influences on dementia onset—predict disease progression with high accuracy, and support the development of prevention strategies. Ultimately, AI-driven innovations will transform dementia management from a progressive, incurable condition into a more manageable and potentially reversible disease, thereby enhancing healthcare, rehabilitation, and long-term care solutions.

## Authors' Contributions

MW: Data curation, investigation, visualization, writing—original draft, and writing—review & editing. ML: Investigation, methodology, software, writing—original draft, and writing—review & editing. XK: Funding acquisition, project administration, supervision, writing—original draft, and writing—review & editing.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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