A BIBLIOMETRIC REVIEW ON THE POWER OF ARTIFICIAL INTELLIGENCE IN DEPRESSION TREATMENT AND DETECTION

Ashaar Alkafaween*[1], Ala'a M. Al-Momani[2], Mufleh Amin AL Jarrah[3], Khalil Alkhatib[4], Mohammed Moghazi Ezz Eldein Ahmed[5]

[1]Discipline of clinical pharmacy, School of Pharmaceutical Sciences Universiti Sains Malaysia , Faculty of Pharmacy, Mutah University, Al-Karak, Jordan
[2]Department of Management Information Systems, Faculty of Business, Amman Arab University, Jordan
[3]Department of Management Information Systems, Faculty of Business, Amman Arab University, Jordan
[4]Department of Management Information Systems, Faculty of Business, Amman Arab University, Jordan
[5]Department of Management Information Systems, Faculty of Business, Amman Arab University, Jordan

Ashar.kfaween@yahoo.com[1]
a.almomani@aau.edu.jo[2]
mufleh@aau.edu.jo[3]
K.alkhatib@aau.edu.jo[4]
202110442@aau.edu.jo[5]

Corresponding Author:Ashaar Alkafaween[1]*
[1]Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences,
Universiti Sains Malaysia
Ashar.kfaween@yahoo.com[1]

Abstract
In this systematic review we survey the playing field of artificial intelligence (AI) applications in depression detection and treatment from 1989 to September 2023, based on information retrieved from the Scopus database. This study contains multiple dimensions, in terms of publication distribution over years, leading authors, countries, affiliations, funding sponsors and co-occurring keywords. The results demonstrate the surge of publications in recent years due to the development of AI technologies. Authors such as U. Dannlowski and R.H. Perlis, and countries like the United States and China stand out as the most influential contributors. Affiliations such as Harvard Medical School and funding sources like the National Natural Science Foundation of China are important. Analysis of keywords highlights how ubiquitous words such as "machine learning" and "depression" are. Moreover, co-citation networks reveal influential authors, and the examination of highly cited papers provides an indication of research success. Recommendations for the future, focusing on the need for interdisciplinary collaboration, longitudinal research, field testing, and validation work, are described. Despite these important findings, the analysis was limited by the available data and the likelihood for bias in publication. All in all, this work offers a holistic summary of a shifting horizon at the AI and depression research crossway.

Introduction

Depression represents a major public health problem and is considered the second leading cause of disability worldwide, with significant contributions from the Institute for Health Metrics and Evaluation (2020). The disorder has recently been rated as the leading cause of global disability (World Health Organization, 2017) with an estimated prevalence of around 322 million people affected worldwide (7.5% of total years lived with disability; Moreno-Agostino et al., 2021). The consequences of depression are not limited to personal well-being, having a deep impact on the quality of life (Lepine and Briley, 2011) and standing as one of the main factors contributing to suicides, an important aspect that it's not adequately captured in global disease burden estimations (Vigo et al., 2016). Clinical symptoms of depression include low mood, loss of interest, low energy, sleep disturbance, appetite suppression, suicide ideation, and concentration loss (Tran et al., 2019). From 2001 to 2020, n =306 studies reported on global serio- usly too high reporting rate prevalences, VD / HA:

34% (95% CI: 0.30; 0.38). Middle East, Africa, and Asia had the highest frequency of elevated depressive symptoms, with elevated depressive symptoms being more frequently reported among female adolescents as compared to male adolescents (Shorey et al., 2022).

AI in medicine has a lengthy history beginning in 1950 s with physicians leading the way to start AI-based computer aid for diagnoses (Yang et al., 2019, Burton et al., 2019). The last decade saw an exponential interest and progress in medical AI applications, driven by significantly higher processing capabilities of present-day computers, while the availability of digital data to be recorded, transmitted, and analyzed exist (Meskò et al., 2017). Medicine is changing, albeit gradually, with AI disruption. Various AI medicate applications cover different medical specialties such as clinical, diagnostic, therapeutic, surgical, and predictive processes. Clinical management and disease diagnosis are essential areas of medicine which AI is shaping and influencing (Secinaro et al., 2021).

As an indigenous power modality, artificial intelligence (AI) has emerged as a disruptive force in healthcare and presents opportunities to support accurate diagnosis, improve treatment efficiency, and enhance cost-effectiveness in a variety of medical fields (Amann et al., 2020). Currently, AI is gradually integrating into clinical decision support systems (CDSS) involving algorithms learning directly from actual patient data to provide tailored suggestions for diagnosis and treatment, as opposed to conventional rule-based models. Big data analytics has driven the rapid development of AI -based healthcare innovations such as data-driven adaptive clinical decision intelligence and the movement toward value-based care (Chen, 2018; Duan et al., 2019; Dwivedi et al., 2020, 2021; Reddy, 2018). Today, AI has extended its impact beyond the hospital to patient self-management of chronic disease, adherence to protocols, precision medicine and acceleration of real-world drug discovery (Ahmed et al., 2018; Brisimi et al., 2018; Shareef et al., 2021; Wang et al., 2018).

There is a long history of AI in medicine, with some of the early work in the 1950s investigating how computational reasoning could aid in diagnosis (Ledley et al., 1959). Since then, AI has led to considerable enhancement in the timeliness, accuracy and quality of clinical decision-making across many clinical specialties, including radiology,dermatology and pathology (Liew et al., 2018; Qiu et al., 2018; Prado et al.,2018). In mental health, and in the context of depression diagnosis and treatment, AI-based approaches (including machine learning, deep learning, and natural language processing) have been used to predict patient trajectories, to classify likely treatment outcomes, and to identify biological and genetic markers associated with mood disorders (Gao et al., 2018; Dinga et al., 2018; Petal et al., 2018; Laksshman et al., 2017). Specifically, machine learning combined with neuroimaging has been applied to predict treatment response in MDD, and deep learning has revolutionized large-scale genetic analysis in relation to mood disorders. While making significant contributions, however, there is still much research that can be conducted. Prior reviews that explored the predictive capacity of AI for neuropsychiatric outcomes (Senders et al., 2018) and analysis of psychiatric symptoms using data from social networks (Wongkoblap et al., 2017) have been conducted. Nevertheless, no systematic bibliometric analysis has been performed to sketch the global research map between AI and depression. An examination of this kind is crucial in order to find out the most productive authors and institutions, countries and funding bodies in the field and to observe keyword trends, collaboration across research networks, and citation patterns to help us learn not only the thematic evolution of research, but also the methodological development of the research.

Bibliometric and visualization mapping represent tools which are capable to support this need: they allow the systematic analysis of publication trends, thematic clusters and geographic distribution of research (Hicks et al., 2013; Belter et al., 2015; Ellegaard and Wallin, 2015). These techniques will be used to give a comprehensive picture of the current

state of AI for depression prediction and treatment, the key papers and research communities involved in this field of study, and to identify potential avenues for future work. .

Implications and Objectives

The aims of the present bibliometric review include the identification of important under researched themes in the use of technology for depression intervention. It provides everything that's new in research, technologies and methods since 2019. A wider database (Scopus) is used, providing a more general overview of the international research field, and emphasizing based studies, core authors and collaboration trends, in addition to showing trends regarding main contributing elements over time. It also brings up overlooked areas and illustrates the dawn of interdisciplinarity in the growing field. This work represents an improvement on a previous bibliometric analysis on the issue (2019) that included only the Web of Science literature and selected research of more than two decades. With the wide coverage of Scopus, we are now able to gain more overview in how AI's application when managing depression is being applied. 85 This broader perspective does not only enhance the methodological rigor of the review but also permits perception in an informed manner of the complicated and interwoven paths of AI development as well as methods for addressing mental health needs which may influence future research and practice.

Methods

Gathering of data

We decided to use Scopus as a main source of information for retrieving publications. As a source of multidisciplinary abstract and citation database, it covers a broad range of subjects in the science field such as: Medicine, Pharmacy, and Health. Scopus, which is widely used and cited in the literary review and citation analysis (Aghaei Chadegani et al., 2013), was selected to obtain complete data in the present research. Scopus is the standard database used (Zyoud et al., 2022, Gou et al., 2023, Wang et al., 2022, Yang et al., 2023), and is compared widely to Web of Knowledge Recognized as a database of choice in bibliometric analysis, Scopus has many reasons in its favor (AlRyalat et al., 2019, Anker et al., 2019, Kulkarni et al., 2009). Useful for its easy to use bibliometric indicators including articles those are in Medline. Compared with Google Scholar and Web of Science, Scopus is a more comprehensive bibliometric data, involving social science and humanity. Unique characteristics (e.g., author attributes of the papers) enable better tracking and evaluating academic impact on certain topics. Moreover, Scopus makes possible a clear logical set of filters and sorting possibilities to support the explorations of research.

Search strategy

The Scopus database was searched using the search terms: 1)"Artificial intelligence" OR "Machine intelligence" OR "artificial neural network" OR "Machine learning" OR "Deep learn" OR "Natural language process" OR "Robotic" OR "thinking computer system" OR "fuzzy expert system" OR "evolutionary computation" OR "hybrid intelligent system" and 2) depress* OR "depression diagnosis" OR "depression treatment" OR "depression detection" OR "depression management" OR "depression screening" OR "Major depressive disorder" OR "MDD". In the last step, we joined queries 1 and 2 with the "AND" operator. The search covered the period of 1989–2023. Inclusion criteria were related to searched studies, article published in English and also were limited to medicine, neurosciences, psychology, computing orcompatible systems, biochemistry, molecularity genetics, molecular genetics, multidisciplinary science (DG); pharmacology pharnaukics, health care occupations (DFH), immunology, microbiology (DI) nursing (DH), materials science. Exclusion criteria were reviews, letters, briefings, book reviews, etcetera. A total of 785 eligible articles were include.

Visualization analysis

Network maps between words in title or abstract and cross-national collaboration were illustrated using VOS Viewer software, version 1.6.19 (van Aken et al., 2011, van Unit et al., 2013. A CUM phenomenal analysis tool, Vos Viewer, was used to support the creation of the knowledge network. It makes scientific sense for previewing of the research hotspots and the observation of the development of multiple research areas in the future [25–27]. By co-habiting words, the Vos viewer assigns different colors to each cluster, which makes it easier to identify and analyze the research s hotspots. It provides for visualization and interpretation of new patterns, where conditions are shown as nodes and relations them as lines or links. The thickness of these lines is proportional to the intimacy between the conditions.

RESULTS

Development and development of publication

The use of AI applications in depression and treatment have been developed step-by-step from 1989 to December 2023, but first. During the early years (1989–2011) of the time markers, the publishing output was low, mirroring a nascent stage of AI and Mental Health. The long lack of bursts of activity, and in particular 1990–1992 and 1994–2008, might be a result of barriers such as insufficient fundings, some technical limitation or the impotance of AI not enough recognized.

The publications are escalating quickly, starting in 2018. This rise happens during an era of exponential growth in AI technology - notably machine learning and natural language processing – that is vying for global domination whilst revolutionising mental health. This advance has facilitated more extensive and deeper studies on AIS for mental health treatment. Much as they are the spicier alternative, the actual gains can only be achieved through serious R & D and learned clinical experience. Further research should more comprehensively consider take up and use, functioning (including fertility, ability to work and perform function in family), to be able to translate progress into clinically relevant advances in care in depression. The overall publication profile thus reflects a growing field of study which strengthens the argument for the need to integrate interdisciplinary collaboration, ethical conduct and the practical use of research in delivering mental health interventions within ecologically valid realms of practice.
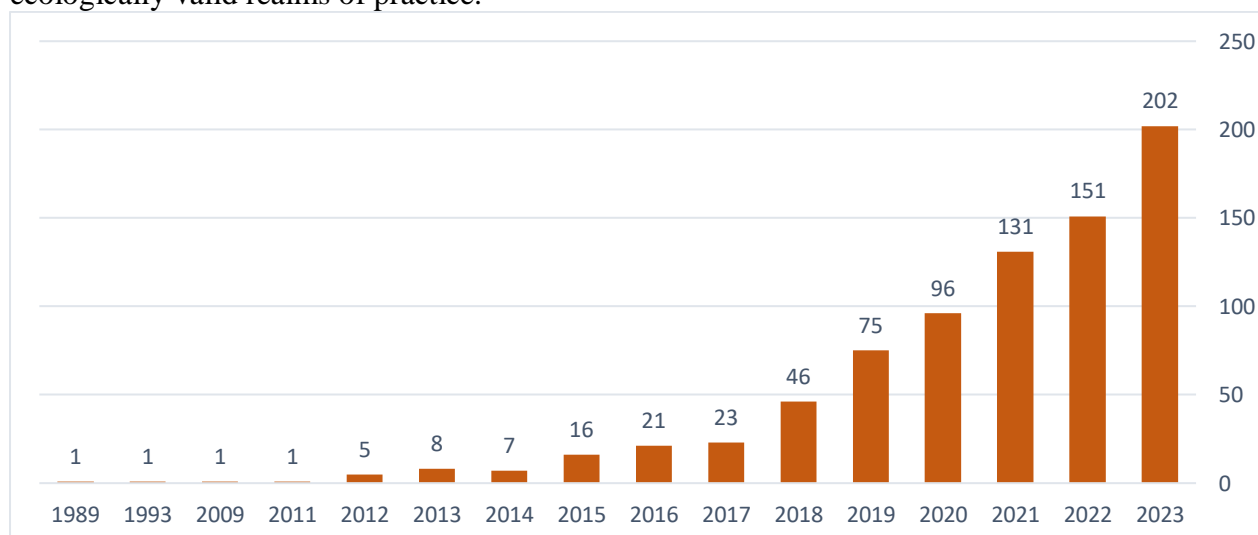

Figure 1: Number of articles analyzed in a bibliometric study focused on the global application of AI in depression treatment and detection related publications between 1989-2023.

Top Active Author

The review of the 15 most prolific authors publishing AI applications in depression and treatment gives an open account of the most relevant contributors to the field until December 2023. In preparation U. Dannlowski and R.H. Plas there is Parlis ('thirteen' in the Swansea dialect) each with 13 publications, again a remarkable and steady presence in this area of investigation. Close B.N Fri G, Turaki S.H., Kennedy S. m.h. Trivedi Y. Yuan Z. Zhang As regular practitioners, along with other close m, such as B.N. Fri,G. Turaki, S.H. Kennedy, m.h. Trivedi *, Y. Yuan, Z. Zhang, who have shown a continuous commitment in pursuing the field for so long, is a sort of so thanks to the previous generations to continue this discipline. (M. Many authors, including Mimura, have published 8-10 people as big AI provides a new way and new concept for AI to participate in the research of depression. And unique skill sets of these writers --growing neuroscience each have fulfilled across psychology, and now psychotherapy ---encounter the multi -political nature of this region, which is important in handling the more versatile and much more complex demands of melancholy.Data also indicate significant potential for synergy, especially between authors of same publication version in order to further enhance quality and impact of research. Global representation of top authors indicates access to AI in Mental Health Research internationally, culturally informed research and prevention of generalizations. This list has evolved over the years as the names on it have changed to reflect the region's power dynamics and new entrants to power. In general, these researchers are service devotion around the clock by their own body and the more youth bringer important work in the field of play.

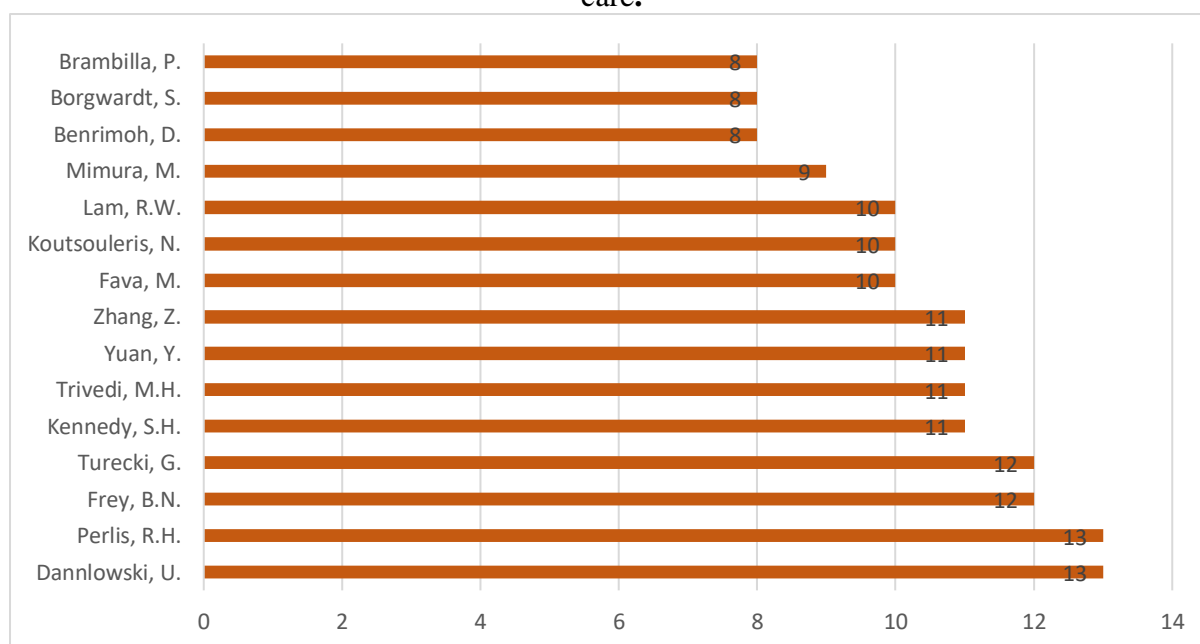diversity and collaborative operational innovation at the intersection ofAI and depression care**.**

Figure 2:Top 15 authors with the highest number of article publications on AI and depression worldwide.

Top active country

Among the 15 leading countries as mentioned above in their applications of AI on DR from 1989 to December, 2023 is displayed in Figure 3, which presents the global contribution in research. USA is top in this list where with 300 publications and also excited to use the AI through the powerful academic federative infrastructure, large funding investments in not only research but also mental health prob-lems too. Two hundred publications watch China

and spotted the rapid pace of technological development and rise in national AI investment. UK and Canada also displays high contributions (91, 90 papers) and is consistent with their strong role in AI framework for depression. 6 EU is emulating performance (for analysis including Germany, Netherlands, Switzer- land, Italy, France and Australia) and team work in and from or to research (EU and the continent). Asia There's tons of really important contributions, really valuable contributions, from South Korea, Japan, Taiwan, India to a degree they all do their kind of like extremely valuable regional efforts and operations. With 25 documents, Brazil represents the growing interest of AI and mental health in Latin America.

The geo-specific variability of this study, helped identify preferences, cultural contexts and approaches that will enrich the spectrum of AI and depression and create a comprehensive global overview on the topic. It further showcases the scope for deep international collaboration, where nations with similar lines of research filter resources and skills to address global challenges. However, it is important that research production and its dissemi- nation does not merely reßectscientiÞceda but contributes to policy decisions on mental health and clinical practice. It can be the more developed countries that have been in the strongest position to incorporate the AI tool into their health systems to enable the application of more focused, context sensitive forms of depression screening and treatment.
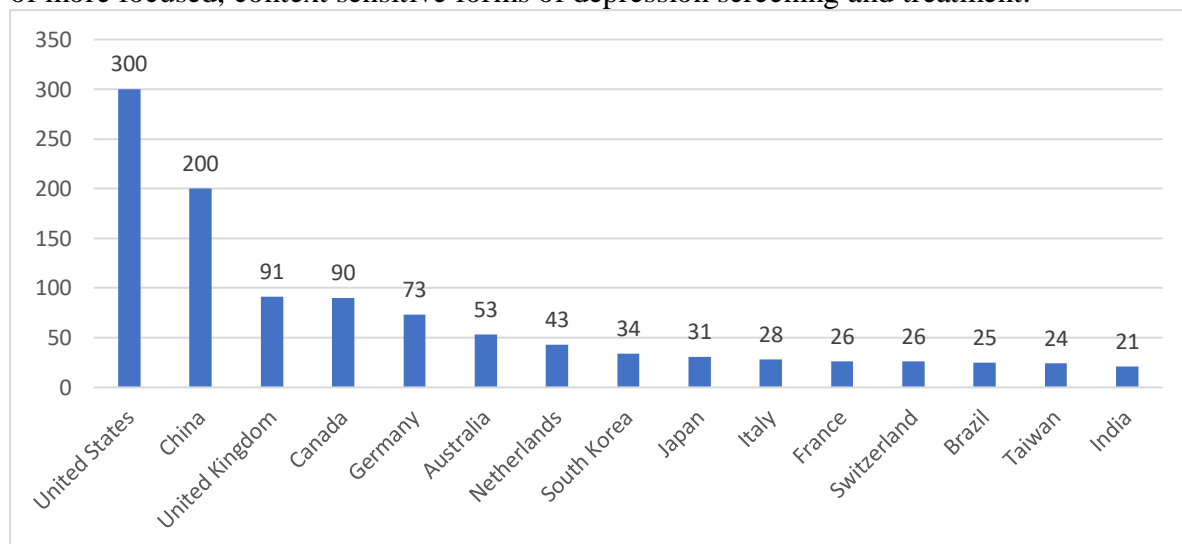

Figure 3:Top 15 countries ranked by article output on AIand depression treatment and detection from 1989-2023.

Contributing Institutions or Affiliations

The analysis of the top-15 contributing institutions in the 2019-2023 years, based on "AI applications for detection and treatment of depression between Jauanry 1989 and December 2023", also confirmed the wide global spread of the knowledge underpinning the new field of research. The institution with the highest publication is Harvard Medical Schools and Massachusetts General Hospital that has 51 and 40 publications respectively, this emphasizes their leadership position in shaping the research on its intersection with AI and Mental Health. He is then closely followed by Toronto University (39 Publishing) closely followed by King's College London (30 Publishing) who has both produced enough contribution in the dissemination of such AI dedicated approaches to depression. There are also the significance of individuals at Chinese institutions add up to 77 published works as Chinese Sciences from People's Republic of China start of Ministry of Education in South East University. This indicates China's strategic intension to promote AI system into mental health research. Major partners Melbourne University, Pennsylvania University, Columbia University, University of

Munter, Stanford University, Universite McGill and McLean Hospital are all involved in interdisciplinary research and have a strong publication history.

Special stations for mental health (addiction and mental health, and also the McLeen Hospital center of the hospital – the innovation is right there), unique clinical approaches help to fold down the gap between AI and real (clinical) work. The diversity of contributors demonstrates their own strengths with each organisation (i.e. computational, clinical and translational research). The times during which these preferences emerge and transfer to new contributions chronologically reveals not only flowing research preference, but also emerging building blocks for deeper collaboration and knowledge sharing that will guide the future role of AI in depression detection and treatment.
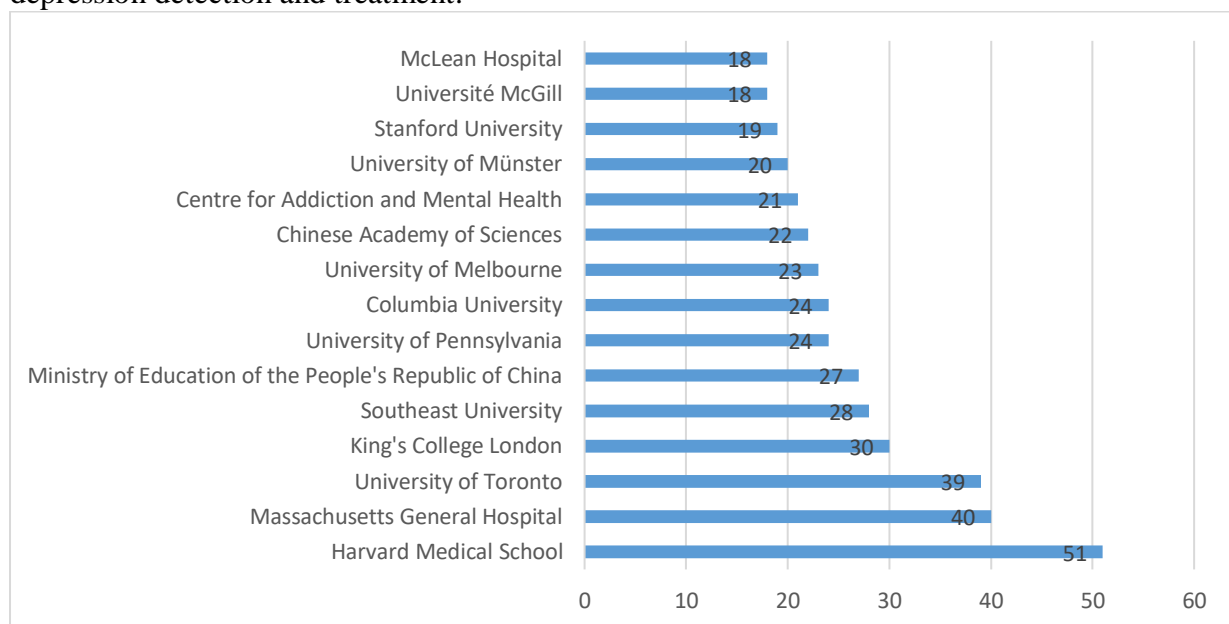

Figure 4:Top 15 institutions with the highest frequency of article publications on AI and depression treatment worldwide.

Distribution of Documents by Funding Sponsor

How AI is reshaping research – and how to ensure research is shaped by AI The 15 Orgs Funding the Most AI Applications Research A global, diverse, small money network of research funding (Aashish Gupta and Andrew Zerzan / Open Society Foundations) AJSA and Erowid Detection and Treatment (1989–2023): How one botanist is using artificial intelligence to forecast coffee crop changes An analysis of 15 organizations leading the AI applications research The AI transition (Tanya Bub and Cameron Rinker / Brandeis International Business School) AI AI applications research (Dhaouadi et al) Applicaton of deep learning technology products into primary school AI applications research Charging the hammerhead ape index of tipping based on the cost of ownership The value of insect and disease forecasts in research and professional use can now be clearly identified on the basis of this logic. The first and second Chinese funding scroller demonstrating in the list written in English is Chinese National Natural Science Foundation and Chinese National Head Research and Development Programs, with the number of the corresponding publication is 130 and 41. Their strong performance, in generalized anxiety and elsewhere, dilutes a carefully-honed Chinese investment in guiding AI-focused mental health studies. Within the US, more than 124 and 97 sponsored- publications (to-date) have been listed under National Institute of Mental Health and National Institute of Health that reflects their strong support as guideline to shape the AI-TH research road-map. Other big donors also include; Canadian

Institute of Health Research, the UK Medical Research Council, Australia's NMHRC as well as the aforementioned European Commission hinting that where public funding for this area is concerned, it's worldwide.There is quite a presence of industry, Janssen Pharmaceuticals being one of the major private sponsors. This joint venture between industry and academia can greatly accelerate the translation of research into actual clinical tools. Last, the selection of sponsors with public bodies and international organizations are able to identify the private profiles - AI: a multi-technology approach for depression care. "This broad support is not just a sign of global solidarity for mental health but it provides the political clout, best practice projects and research strategic direction required around the world.
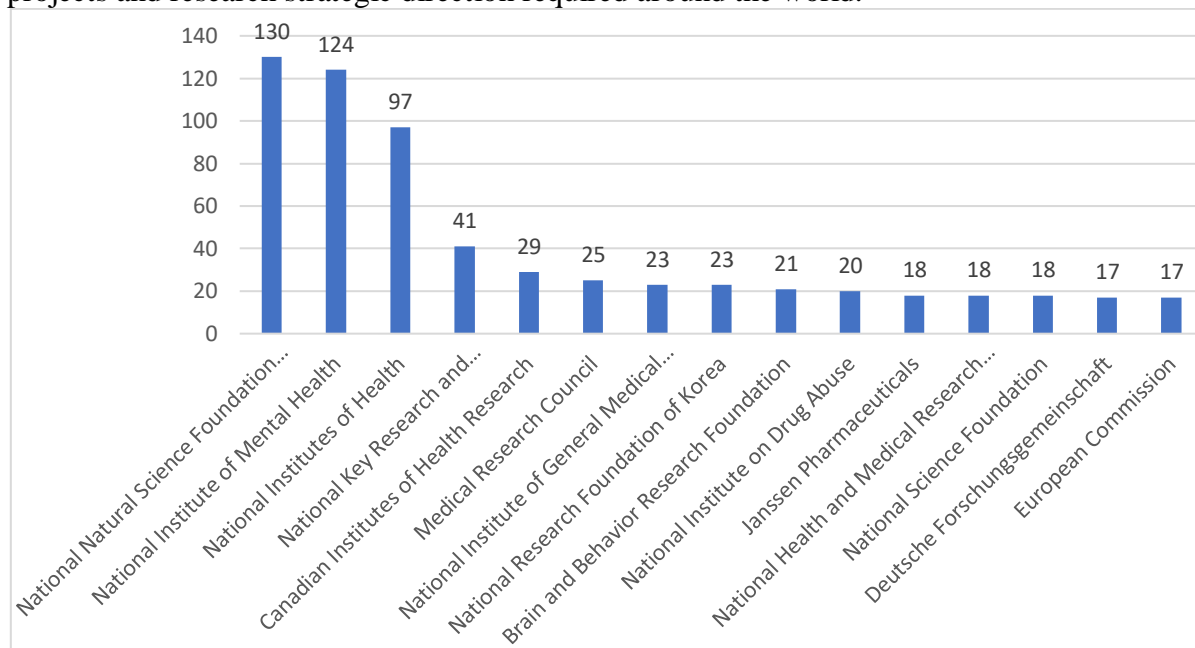

Figure 5: Top 15 funding agencies with the highest number of research publications on AI and depression treatment between 1989 and 2023.

Keyword Analysis (The Co-occurrence of Author Keywords)

The top 10 co-authored authors in the most frequent author keyword (1989–2023) of the papers on AI applications for detecting and treatment of depression The top 10 trend topics that contain the most relevant information regarding the region based on communities (SCG) AssemblyCompanytoPromiseToReturn 3 (most frequent author) were used to highlight the most critical challenges that define the area. The ranked list is then up to "machine learning" that is mentioned in 284 (18% events) and highlights its pivotal role in the context of AI solutions for mental health. "Depression" is ranked second, followed by itself in 184 (12%) documents that is the turning point for the new approach, which tries to Face the situation. MDD 178 (11%) (most followed up) coincidences) as a permanent attention FD until clinical and medical encounter on them subsets. tissue* deep learning 47(3%) In forty-six (3%) of the documents "deep learning" (a more sophisticated and complicated nerve tight) is found, which confirms that advanced function of AI draws more attention. A further notable feature, in addition to the dull depression, is the presentation of the "bipolar disorder" in 38 (2%) documents that provides an understanding of the varied mood disorders in the present study.

In fact, the generic expression "artificial intelligence" is mentioned as part of 2% of the events. Among the key phrases we found "EEG" (29 documents, 2%) which indicate the continued tendency to analyze neurophysiological data, and "classification" (26 documents, 2%) which are evidence of maintain effort on clinical classification. Meanwhile, the term "schizophrenia" is visualized in 24 papers (2%), signifying a parallel with the general AI

work in the area of mental health. In fact, these patterns of keywords not only indicate the main research points, but also display the function and growth of the topic. They may provide valuable insights for future survey and invisible AI -Frem step to clinical implement ability.
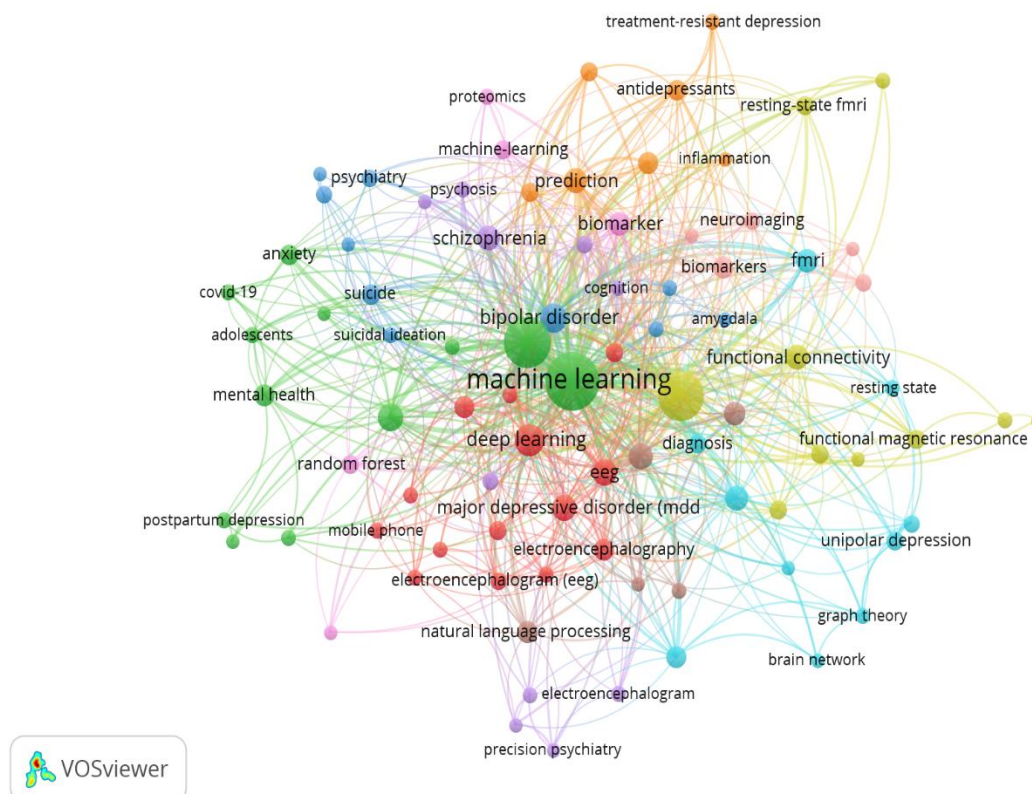

Figure 6:Network visualization of Co-occurrence of author keyword with a minimum number of frequency 5 times.

Co-Citation Analysis (Minimum 50 Citations)

Ana author for early identification and intervention of depression the top 10 most frequently co-accrued authors (1989–2023)stratifythewriters who influence the field. listMHTRIVEDI(351 quotes), AJRush(334quotes), and RCCallers(314 quotes)whose work has contributed in a lasting way to both science on and clinical developments in AI in mental health. Also at 265 is M. Fava who highlights the large contribution in the search for the intersections psychiatry and AIS. 1 This list in fact reflects the global scholarly world, and some of the most influential Chinese scholars such as Y. Wang, Y. Lee, Y. Zhang, J. Wang, X. Wang is the most similar. Their inclusion is indicative of the increasing cross-fertilization and global dialogue that now defines the field.

The procedures also secure the identification process of the authors who have at least the sufficient (not less than 50) of quotes making reliable (and acknowledged) quotes. ^ResultSet reporting The reported results not only reveal the extraordinary personalities, but also the intellectual connections and co-operates who drive innovation in the region. Such trends often signal that it's high time for a new partnership of kindred, sophisticated writers whose combined work could help depave the way to faster AI solutions to depression and their introduction to clinical practice. The findings emphasize admixed, interdisciplinary, and international considerations of that research 'geography' and reveal that the most influential researchers in fields ranging from psychiatry, neurology, psychology and computer science would collectively carve the course into AI applications across mental health care.
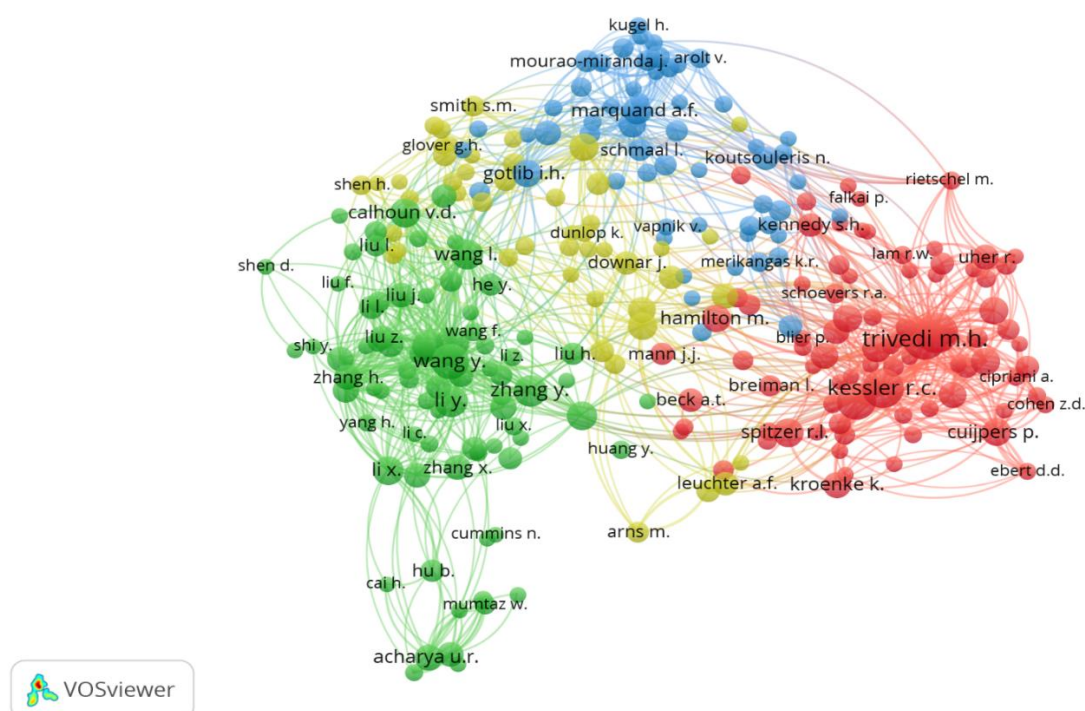
Figure 7: Network visualization of Co-citation with cited- authors with a minimum of 50 published articles related to AI and depression detection and treatment.

Table 2: The following list highlights the top 10 most cited publications in research of AI applications on depression detection and treatment between 1989 and 2023.

Title	Authors	Journal title	Publication year	Total citation
Single subject prediction of brain disorders in neuroimaging: Promises and pitfalls	Arbabshirani, M.R.,Plis, S. , Sui, J., Calhoun, V.D.	NeuroImage	2017	578
Harnessing context sensing to develop a mobile intervention for depression.	Burns, M.N., Begale, M., Duffecy, J., Giangrande, E., Mohr, D.C.	Journal of Medical Internet Research	2011	449
Cross-trial prediction of treatment outcome in depression: A machine learning approach.	Chekroud, A.M.,Zotti, R.J.,Shehzad, Z , Krystal, J.H., Corlett, P.R.	The Lancet Psychiatry	2016	417
Automated EEG-based screening of depression using deep convolutional neural network.	Computer Methods and Programs in Biomedicine	American Journal of Kidney Diseases,	2018	390
Accelerated brain aging in	Koutsouleris,	Schizophrenia	2014	284

schizophrenia and beyond: A neuroanatomical marker of psychiatric disorders.	N., Davatzikos, C.,Borgwardt, S.,Pantelis, C., Meisenzahl, E.	Bulletin		
Can voxel-based morphometry, manual segmentation and automated segmentation equally detect hippocampal volume differences in acute depression?	Bergouignan, L.,Chupin, M., Czechowska, Y.,Colliot, O., Fossati, P.	NeuroImage	2009	219
Scaling tree-based automated machine learning to biomedical big data with a feature set selector	Le, T.T., Fu, W., Moore, J.H.	Bioinformatics	2020	211
Prediction Models of Functional Outcomes for Individuals in the Clinical High-Risk State for Psychosis or with Recent-Onset Depression: A Multimodal, Multisite Machine Learning Analysis	Koutsouleris, N., Kambeitz-Ilankovic, L., Ruhrmann, S.,Brambilla, P., Borgwardt, S.	JAMA Psychiatry	2018	211
A small number of abnormal brain connections predicts adult autism spectrum disorder.	Yahata, N.,Morimoto, J.,Hashimoto, R.,Watanabe, T., Kawato, M.	Nature Communications	2016	200
Prediction of individual response to electroconvulsive therapy via machine learning on structural magnetic resonance imaging data	Redlich, R.,Opel, N., Grotegerd, D., Kugel, H., Dannlowski, U.	JAMA Psychiatry	2016	196

XIV.The 10 most cited papers in AI application for depression detection and treatment (1989–2023).This ranking illustrates the 10 studies which most contributed to the field. Top of the list is Single Subject Prediction of Brain Disorders in Neuroimaging: Promises and Pitfalls (Arbabshirani et al). (2017), whichappeared in NeuroImage, with an incredible 578 citations. This work highlights the importance of personalised solutions in neuroimaging, which could also be used towards precision diagnosis and treatment. Second was Harnessing Context Sensing to Develop a Mobile Intervention for Depression, by Burns et al. (2011, Journal of Medical Internet Research), with 449 citations, continues to illustrate the relevance of mobile health technologies and context-aware interventions. A cross-trial prediction of treatment outcome in depression: a machine learning approach by Chekroud et al. (2016, The

Lancet Psychiatry) (417 citations), faces the task of predicting treatment response, demonstrating the potential of machine learning for personalized mental health care.

Other high-profile topics include automated EEG-based depression assessment, accelerated brain aging as a neuropsychiatric biomarker, voxel-based morphometry analysis for neuroanatomical comparison, and scaling machine-learning for big-data biomedical research. Together, these studies are a menagerie of methods – everything from neuroimaging studies, mobile health, computational modeling, big data analytics - that in combination have helped to shape the AI in depression field into what it is today. The high citation also means the continuing long-lasting impact and founder of the later development in this field.

Co-Authorship with Countries

The second co-authorship figure illustrates that The AI health related research for depression detection and treatment has involved a closely knitted worldwide collaboration. Leader the United States with 298 co-authoring papers, while 8,822 quotes-more reflecting research productivity and impact for the region. China China arrives with 202 papers and 3,387 citations, reflecting its increasing investment and influence in AI-enabled mental health research. Overall, the UK, Germany, Netherlands and Italy have production capacity between them – a lesson in intra-European solidarity. Canada and Australia are also major players with 90 and 53 publications, respectively and they are in a international cooperation. In Asia-Pacific, South Korea (34 papers) and Japan (31 papers) signify increasing contributions of the field in the AI + mental health intersection.

Large geographical distribution underlines the worldwide dimension of this region in which differences in culture and science enhance the welfare of investigation. High citation calculation aside, not only does it represent a lot of behind the scene work, but quality and notability in the scientific community. This reciprocal functioning community of researchers provides a rich soil for exchange of knowledge, new, emerging and sustainable innovative and innovative, encourages innovation, cross border approach to IT-based systems and assessment of depression treatment.
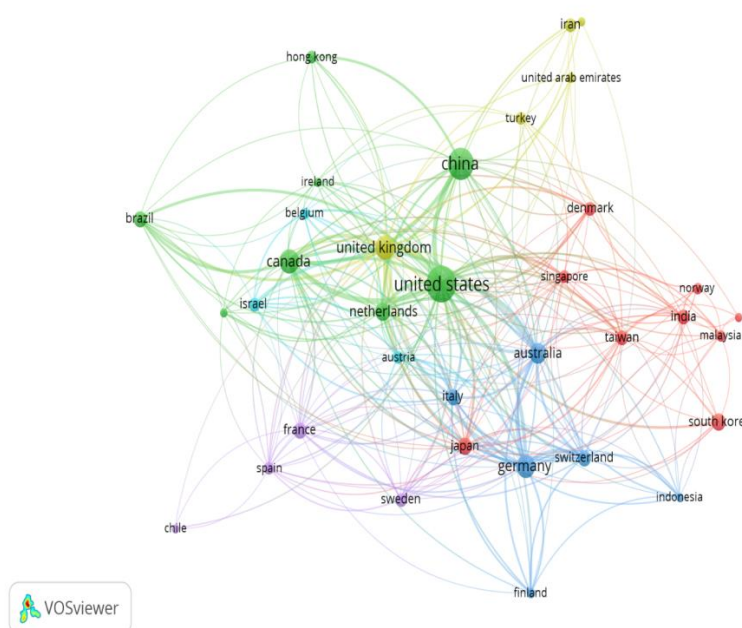

Figure 7: Network visualization of co-authorship with countries of the minimum number of 5 documents a country.

Discussion

A publication trend analysed from 1989 to December 2023, found and focused in the use of artificial intelligence (AI) in the therapy, shows a good course. In earlier years, 1989-2012, there is a smaller production, indicating increasing awareness of AI in mental health. Reports provided scant evidence of an effect by transient interval variables, such as low research funding or technical obstacles. But we have seen strong and steady growth in publications since 2018, which matches the pace of evolution of AI technologies. Expanding the BELL has potential to facilitate global focus on mental health concerns and social necessity to find new ways. The study emphasises the importance of a balance between quality and quantity of research to make a valuable contribution to mental health practice. The analysis of the 15 best spread of authors in the area, shows who are the contributors more active. U. Dannlowski and R.H as a Perlis welcome; both then underscores their combined impact, despite each having 13 titles. Among participants contributed the new leaders with 8–10 papers, as M. Fava and N. Catsularis, and which have strong anima to insights on AI and depression research field. Reflecting the interdisciplinary nature of the field, the author covers neurology, psychiatry and psychology. Authors addresses of affiliation representation of AI prevalence is in line with the internationl influence of AI in depression research applications, which fosters collaboration while considerable easing the-following the-understanding at related principles considering the cultural aspects.

The partner landscape is also shown in the de- cision which country produces research in all countries 96th 608 8-8 co Q 15 Source: Own calculations based on WoS database. United States (n = 300) and China (n = 200) dominate, with substantial global spread capturing research production in partner landscapes, country by country. Dominance of United States and China can be seen with maximum number of documents, that is, 300 and 200, which gave the reasonable contribution because of academic, infrastructure and research investments. Similarly, the importance of European countries, Canada and Australia should not be forgotten and they highlight the importance of an international perspective for AI research in mental health. The top 15 offers a dense picture tissue of ways of working and approaches, capable of addressing those complex matrices of countries, those overall problems. Observing the highest 15 connecting edges, we have shown top contributors with Harvard Medical School and Massachusetts General Hospital. Role of ChinaThe fact that South East University and Chinese Sciences Academy were two of the main institutions & findings such as China's strategic interest in mental health research suggests that the involvement of China was major. International Bi-Party Actor Shows Ally-Compressing And Multi-Compressing Of International Effort To Fight The Depression WithThe Mech AI App. The picture of prosperity painted by the 15 major sponsors or publications represent many contributions. In this work, we mainly focus the following: facilitating two largest organizations in China and Hizi) have and IEEE portfolio in AI investment application and pain research. Multilateralization is confidence-insured by us Govt bodies, Canadia and EU agencies and industrial cooperation. In addition to reflecting global engagement, such diversity in funding landscape also has political and practice relevance for mental health.

Keyword Association can also reveal what are today's hot topics like "machine learning," "depression," and, "major depressive disorder." Based on co-citation analysis, well-established leading authors including M.H. Trivedi and A.J. Rush (both top 50 cited) illustrate discipline structure and shared influence among authors. The 10 most cited papers are indicative of multiple sustained impacts and large contributions to the foundational literature on AI applications to depression. There are several further directions of investigations that are suggested for the future in the prospective area of AI applications to

detection and treatment of depression. Emphasis is placed on interdisciplinary research as a hallmark of unification, bringing researchers in psychology, neuroscience, computer science, and psychiatry in close proximity. The idea is that working together will provide a clearer picture of depression and support the development of new AI-based tools. Longitudinal studies are indicated to elucidate whether AI mediated depression interventions have an impact on long term outcomes and have relevance to practice, policy and research. But the emphasis is on applying the research out in the field: Research findings must be applied in the real world. The inclusion of the participation of integrations with health professionals, clinicians and technology developers is believed to be vital in integrating AI applications into existing mental health care systems. Through it all, we hear the call for validation and standardisation, the desire for the field to strive for robust and standardised performance metrics for AI models for depression detection. The purpose of this quest was to enhance trust and cross-comparison between AI methods and to further help shaping a more comprehensive and attractive image for the usage of artificial intelligence for depression treatment. Finally, the analysis provides a sweeping view of the current AI landscape of applications in depression research, discusses the need for international collaboration, the importance of ethical considerations, and translation of research results into clinical practice and services that will propel the future of this nascent endeavor in the intersecting fields of AI and mental health."

conclusion

The overview (of the excavated landscape).The snapshot of the research landscape of mouse books, with AI detection and treatment, from 1989 to 2023, also contains the landscape that is being continuosly carved (there is a big jump in the speed of discovery post-2018). This 'bounce' reflects the fast pace of AI-driven tool development and an emerging international consensus about the potential of AI to tackle a range of mental health problems. This is a novel interdisciplinary domain whose text is brought together written by top authors in psychotherapy, computer, neurology and psychology science. The key institutions influencing development identified were, US, China, UK and Canada and the Organization and institution of Harvard Medical School has played significant roles.

Weak interest by both Chinese and US heard funders today but belated strong interest and the need for global, coordinated action were stressed. Search Orderalysis "Machine Learning," "Depression" and "Major Depressive Disorder" Research Subjects pointing as most relevant, the fundamental importance of life forward modeling is highly supported by AI-Manual future. Celebrated authors - m.h. TRIVEDI, A.J. Rush, R.C. Casler- honored for their enormous contribution in region. Further investigation is needed in terms of interdisciplinary cooperation, long-term observational research, clinical use of the real world and the moral, legal, and effectiveness of depression worldwide in the future.

Limitations

This speculative research imagination describes an AI depression care landscape, yet there are limitations that acknowledge that. The fact that the present review is limited to articles indexed in Scopus has two main limitations: the fact that the analysis may not have been sufficiently broad, since other articles published elsewhere could have been missed; and the inherent limitations of these databases. This restriction means that our results may not represent all forms of international research. The second limitation is that the use of peer-reviewed published literature may generate some publication bias as it excluded conference proceeding, preprint and other gray literature. It is possible that these 'missing' items may influence the coverage of existing or emerging trends in research. These limitations should be

considered when interpreting the results and highlight the need for further analyses of different databases and all forms of publications for a better understanding.

RREFERENCES:

1. Aghaei Chadegani, A., Salehi, H., Yunus, M., Farhadi, H., Fooladi, M., Farhadi, M., & Ale Ebrahim, N. (2013). A comparison between two main academic literature collections: Web of Science and Scopus databases. *Asian Social Science, 9*(5), 18–26. https://ssrn.com/abstract=2257540

2. Ahmed, M. A., Eckert, C., &Teredesai, A. (2018). Interpretable machine learning in healthcare. *International Conference on Bioinformatics, Computational Biology, and Health Informatics*, 559–560.

3. AlRyalat, S. A. S., Malkawi, L. W., & Momani, S. M. (2019). Comparing bibliometric analysis using PubMed, Scopus, and Web of Science databases. *Journal of Visualized Experiments*. https://doi.org/10.3791/58494

4. Amann, J., Blasimme, A., Vayena, E., Frey, D., Madai, V. I., & Precise4Q Consortium. (2020). Explainability for artificial intelligence in healthcare: A multidisciplinary perspective. *BMC Medical Informatics and Decision Making, 20*(1), 310. https://doi.org/10.1186/s12911-020-01332-6

5. Anker, M. S., Hadzibegovic, S., Lena, A., & Haverkamp, W. (2019). The difference in referencing in Web of Science, Scopus, and Google Scholar. *ESC Heart Failure, 6*(6), 1291–1312. https://doi.org/10.1002/ehf2.12583

6. Belter, C. W. (2015). Bibliometric indicators: Opportunities and limits. *Journal of the Medical Library Association, 103*(4), 219–221. https://doi.org/10.3163/1536-5050.103.4.014

7. Brisimi, T., Chen, R., Mela, T., Paschalidis, C. H., & Shi, W. (2018). Federated learning of predictive models from federated electronic health records. *International Journal of Medical Informatics, 112*, 59–67. https://doi.org/10.1016/j.ijmedinf.2018.01.007

8. Burton, R. J., Albur, M., Eberl, M., & Cuff, S. M. (2019). Using artificial intelligence to reduce diagnostic workload without compromising detection of urinary tract infections. *BMC Medical Informatics and Decision Making, 19*(1), 171. https://doi.org/10.1186/s12911-019-0885-y

9. Chen, N. (2018). *Are robots replacing routine jobs?* Cambridge, MA.

10. Dinga, R., Marquand, A. F., Veltman, D. J., Beekman, A. T. F., Schoevers, R. A., van Hemert, A. M., Penninx, B. W. J. H., &Schmaal, L. (2018). Predicting the naturalistic course of depression from a wide range of clinical, psychological, and biological data: A machine learning approach. *Translational Psychiatry, 8*(1), 241. https://doi.org/10.1038/s41398-018-0289-1

11. Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of big data: Evolution, challenges and research agenda. *International Journal of Information Management, 48*, 63–71. https://doi.org/10.1016/j.ijinfomgt.2019.01.021

12. Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., & Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

13. Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., & Wang, Y. (2020). Setting the future of digital and social media marketing research:

Perspectives and research propositions. *International Journal of Information Management*, 102168. https://doi.org/10.1016/j.ijinfomgt.2020.102168

14. Ellegaard, O., & Wallin, J. A. (2015). The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics, 105*(3), 1809–1831. https://doi.org/10.1007/s11192-015-1645-z

15. Gao, S., Calhoun, V. D., & Sui, J. (2018). Machine learning in major depression: From classification to treatment outcome prediction. *CNS Neuroscience & Therapeutics, 24*(11), 1037–1052. https://doi.org/10.1111/cns.13084

16. Gou, Y., Fu, Y., Li, Y., & Liu, C. (2023). Research of targeted therapy for renal cancer from 2006 to 2022: A bibliometric and visualized analysis. *Translational Andrology and Urology, 12*(3), 455–465. https://doi.org/10.21037/tau-23-128

17. Hamid, S. (2016). The opportunities and risks of artificial intelligence in medicine and healthcare. Retrieved from http://www.cuspe.org/wp-content/uploads/2016/09/Hamid_2016.pdf

18. Hicks, D., & Melkers, J. (2013). Bibliometrics as a tool for research evaluation. In *Research Handbook on Innovation and Technology Management* (pp. 323–349). https://doi.org/10.4337/9780857932402.00019

19. Institute for Health Metrics and Evaluation. (2015). *GBD Compare*.

20. Kulkarni, A. V., Aziz, B., Shams, I., & Busse, J. W. (2009). Comparisons of citations in Web of Science, Scopus, and Google Scholar for articles published in general medical journals. *JAMA, 302*(10), 1092–1096. https://doi.org/10.1001/jama.2009.1307

21. Laksshman, S., Bhat, R. R., Viswanath, V., & Li, X. (2017). DeepBipolar: Identifying genomic mutations for bipolar disorder via deep learning. *Human Mutation, 38*(9), 1217–1224. https://doi.org/10.1002/humu.23264

22. Ledley, R. S., & Lusted, L. B. (1959). Reasoning foundations of medical diagnosis. *Science, 130*(3366), 9–21. https://doi.org/10.1126/science.130.3366.9

23. Liew, C. (2018). The future of radiology augmented with artificial intelligence: A strategy for success. *European Journal of Radiology, 102*, 152–156. https://doi.org/10.1016/j.ejrad.2018.03.019

24. Meskó, B., Drobni, Z., Bényei, E., Gergely, B., & Győrffy, Z. (2017). Digital health is a cultural transformation of traditional healthcare. *mHealth, 3*, 38. https://doi.org/10.21037/mhealth.2017.08.07

25. Moreno-Agostino, D., Wu, Y. T., Daskalopoulou, C., Hasan, M. T., Huisman, M., & Prina, M. (2021). Global trends in the prevalence and incidence of depression: A systematic review and meta-analysis. *Journal of Affective Disorders, 281*, 235–243. https://doi.org/10.1016/j.jad.2020.12.035

26. Panch, T., Szolovits, P., & Atun, R. (2018). Artificial intelligence, machine learning and health systems. *Journal of Global Health, 8*(2), 020303. https://doi.org/10.7189/jogh.08.020303

27. Patel, M. J., Khalaf, A., &Aizenstein, H. J. (2015). Studying depression using imaging and machine learning methods. *NeuroImage: Clinical, 10*, 115–123. https://doi.org/10.1016/j.nicl.2015.09.004

28. Prado, G., & Kovarik, C. (2018). Cutting edge technology in dermatology: Virtual reality and artificial intelligence. *Cutis, 101*(3), 236–237.

29. Qiu, J. X., Yoon, H. J., Fearn, P. A., &Tourassi, G. D. (2018). Deep learning for automated extraction of primary sites from cancer pathology reports. *IEEE Journal of Biomedical and Health Informatics, 22*(1), 244–251. https://doi.org/10.1109/JBHI.2017.2736543

30. Reddy, S. (2018). Use of artificial intelligence in healthcare delivery. In *eHealth – Making Health Care Smarter* (pp. 81–97). IntechOpen. https://doi.org/10.5772/intechopen.74360

31. Scopus. (2023). *Why Scopus*. Elsevier. https://www.elsevier.com/solutions/scopus

32. Secinaro, S., Calandra, D., Secinaro, A., Muthurangu, V., & Biancone, P. (2021). The role of artificial intelligence in healthcare: A structured literature review. *BMC Medical Informatics and Decision Making, 21*(1), 125. https://doi.org/10.1186/s12911-021-01488-9

33. Senders, J. T., Staples, P. C., Karhade, A. V., Zaki, M. M., Gormley, W. B., Broekman, M. L. D., Smith, T. R., & Arnaout, O. (2018). Machine learning and neurosurgical outcome prediction: A systematic review. *World Neurosurgery, 109*, 476–486. https://doi.org/10.1016/j.wneu.2017.09.149

34. Shareef, M. A., Kumar, V., Dwivedi, Y. K., Kumar, U., Akram, M. S., & Raman, R. (2021). A new health care system enabled by machine intelligence: Elderly people's trust or losing self-control. *Technological Forecasting and Social Change, 162*, 120334. https://doi.org/10.1016/j.techfore.2020.120334

35. Shorey, S., Ng, E. D., & Wong, C. H. (2022). Global prevalence of depression and elevated depressive symptoms among adolescents: A systematic review and meta-analysis. *British Journal of Clinical Psychology, 61*(2), 287–305. https://doi.org/10.1111/bjc.12320

36. Tagliaferri, S. D., Angelova, M., Zhao, X., Owen, P. J., Miller, C. T., Wilkin, T., & et al. (2020). Artificial intelligence to improve back pain outcomes and lessons learnt from clinical classification approaches: Three systematic reviews. *NPJ Digital Medicine, 3*, 93. https://doi.org/10.1038/s41746-020-0290-1

37. Tran, B. X., Vu, G. T., Ha, G. H., Vuong, Q.-H., Ho, M.-T., Vuong, T.-T., & et al. (2019). Global evolution of research in artificial intelligence in health and medicine: A bibliometric study. *Journal of Clinical Medicine, 8*(3), 360. https://doi.org/10.3390/jcm8030360

38. Tran, B. X., McIntyre, R. S., Latkin, C. A., Phan, H. T., Vu, G. T., Nguyen, H. L. T., Gwee, K. K., Ho, C. S. H., & Ho, R. C. M. (2019). The current research landscape on the artificial intelligence application in the management of depressive disorders: A bibliometric analysis. *International Journal of Environmental Research and Public Health, 16*(12), 2150. https://doi.org/10.3390/ijerph16122150

39. van Eck, N. J., & Waltman, L. (2011). Text mining and visualization using VOSviewer. *arXiv preprint* arXiv:1109.2058. https://doi.org/10.48550/arXiv.1109.2058

40. Fraihat, B. A. M., Alhawamdeh, H., Younis, B., Alkhawaldeh, A. M. A., & Al Shaban, A. (2023). The Effect of Organizational Structure on Employee Creativity: The Moderating Role of Communication Flow: A Survey Study

41. Selvasundaram, K., Jayaraman, S., Chinthamani, S. A. M., Nethravathi, K., Ahmad, A. Y. B., &Ravichand, M. (2024). Evaluating the Use of Blockchain in Property Management for Security and Transparency. In Recent Technological Advances in Engineering and Management (pp. 193-197). CRC Press.

42. Ramadan, A., Maali, B., Morshed, A., Baker, A. A. R., Dahbour, S., & Ahmad, A. B. (2024). Optimizing working capital management strategies for enhanced profitability in the UK furniture industry: Evidence and implications. Journal of Infrastructure, Policy and Development, 8(9), 6302.

43. Fouzdar, A. S., Yamini, S., Biswas, R., Jindal, G., Ahmad, A. Y. B., & Dawar, R. (2024). Considering the Use of Blockchain for Supply Chain Authentication

Management in a Secure and Transparent Way. In Recent Technological Advances in Engineering and Management (pp. 259-264). CRC Press.

44. Feng, Y., Ahmad, S. F., Chen, W., Al-Razgan, M., Awwad, E. M., Ayassrah, A. Y. B. A., & Chi, F. (2024). Design, analysis, and environmental assessment of an innovative municipal solid waste-based multigeneration system integrating LNG cold utilization and seawater desalination. Desalination, 117848.

45. Zhang, L., Ahmad, S. F., Cui, Z., Al Razgan, M., Awwad, E. M., Ayassrah, A. Y. B. A., & Shi, K. (2024). Energy, exergy, hermoeconomic analysis of a novel multi-generation system based on geothermal, kalina, double effect absorption chiller, and LNG regasification. Desalination, 117830.

46. Iqbal, S., Tian, H., Muneer, S., Tripathi, A., & Ahmad, A. Y. B. (2024). Mineral resource rents, fintech technological innovation, digital transformation, and environmental quality in BRI countries: An insight using panel NL-ARDL. Resources Policy, 93, 105074.

47. Geetha, B. T., Gnanaprasuna, E., Ahmad, A. Y. B., Rai, S. K., Rana, P., & Kapila, N. (2024, March). Novel Metrics Introduced to Quantify the Level of Circularity in Business Models Enabled by Open Innovation. In 2024 International Conference on Trends in Quantum Computing and Emerging Business Technologies (pp. 1-6). IEEE.

48. Geetha, B. T., Kafila, K., Ram, S. T., Narkhede, A. P., Ahmad, A. Y. B., & Tiwari, M. (2024, March). Creating Resilient Digital Asset Management Frameworks in Financial Operations Using Blockchain Technology. In 2024 International Conference on Trends in Quantum Computing and Emerging Business Technologies (pp. 1-7). IEEE.

49. Naved, M., Kole, I. B., Bhope, A., Gautam, C. S., Ahmad, A. Y. B., & Lourens, M. (2024, March). Managing Financial Operations in the Blockchain Revolution to Enhance Precision and Safety. In 2024 International Conference on Trends in Quantum Computing and Emerging Business Technologies (pp. 1-6). IEEE.

50. Y. A. B. Ahmad, N. Verma, N. M. Sarhan, E. M. Awwad, A. Arora and V. O. Nyangaresi, "An IoT and Blockchain-Based Secure and Transparent Supply Chain Management Framework in Smart Cities Using Optimal Queue Model," in IEEE Access, vol. 12, pp. 51752-51771, 2024, doi:10.1109/ACCESS.2024.3376605

51. Bani Ahmad, A. Y., Fraihat, B. A. M., Hamdan, M. N., Ayasrah, F. T. M., Alhawamdeh, M. M., & Al-Shakri, K. S. (2024). Examining the mediating role of organizational trust in the relationship between organizational learning and innovation performance: A study of information systems and computer science service firms.

52. Almarshad, M. N., Alwaely, S. A., Alkhawaldeh, B. Y., Al Qaryouti, M. Q. H., & Bani Ahmad, A. Y. (2024). The Mediating Role of Energy Efficiency Measures in Enhancing Organizational Performance: Evidence from the Manufacturing Sector in Jordan.

53. AlKhawaldeh, B. Y. S., Al-Smadi, A. W., Ahmad, A. Y., El-Dalahmeh, S. M., Alsuwais, N., &Almarshad, M. N. (2024). Macroeconomic determinants of renewable energy production in Jordan. International Journal of Energy Economics and Policy, 14(3), 473-481.

54. Ahmad, A. Y., Jain, V., Verma, C., Chauhan, A., Singh, A., Gupta, A., & Pramanik, S. (2024). CSR Objectives and Public Institute Management in the Republic of Slovenia. In Ethical Quandaries in Business Practices: Exploring Morality and Social Responsibility (pp. 183-202). IGI Global

55. Mahafzah, A. H., &Abusaimeh, H. (2018). Optimizing power-based indoor tracking system for wireless sensor networks using ZigBee. International Journal of Advanced Computer Science and Applications, 9(12).

56. Bani Atta, A. A., Ali Mustafa, J., Al-Qudah, S. S., Massad, E., & Ahmad, A. B. (2023). The effect of macroprudential regulation on banks' profitability during financial crises [Specialissue]. Corporate Governance and Organizational Behavior Review, 7(2), 245-258.

57. Cheng, Congbin, Sayed Fayaz Ahmad, Muhammad Irshad, Ghadeer Alsanie, Yasser Khan, Ahmad Y. A. Bani Ahmad (Ayassrah), and Abdu Rahman Aleemi. 2023. "Impact of Green Process Innovation and Productivity on Sustainability: The Moderating Role of Environmental Awareness" Sustainability 15, no. 17: 12945. https://doi.org/10.3390/su151712945

58. Atta, A., Baniata, H., Othman, O., Ali, B., Abughaush, S., Aljundi, N., & Ahmad, A. (2024). The impact of computer assisted auditing techniques in the audit process: an assessment of performance and effort expectancy. International Journal of Data and Network Science, 8(2), 977-988.

59. ALLAHHAM, M., SHARABATI, A. A. A., HATAMLAH, H., AHMAD, A. Y. B., SABRA, S., & DAOUD, M. K. Big Data Analytics and AI for Green Supply Chain Integration and Sustainability in Hospitals.Magboul, I., Jebreel, M., Dweiri, M., Qabajeh, M., Al-Shorafa, A., & Ahmad, A. (2024). Antecedents and outcomes of green information technology Adoption: Insights from an oil industry. International Journal of Data and Network Science, 8(2), 921-934.

60. Daoud, M. K., Al-Qeed, M., Ahmad, A. Y. B., & Al-Gasawneh, J. A. (2023). Mobile Marketing: Exploring the Efficacy of User-Centric Strategies for Enhanced Consumer Engagement and Conversion Rates. International Journal of Membrane Science and Technology, 10(2), 1252-1262.

61. Daoud, M., Taha, S., Al-Qeed, M., Alsafadi, Y., Ahmad, A., &Allahham, M. (2024). EcoConnect: Guiding environmental awareness via digital marketing approaches. International Journal of Data and Network Science, 8(1), 235-242.

62. Fraihat, B. A. M., Ahmad, A. Y. B., Alaa, A. A., Alhawamdeh, A. M., Soumadi, M. M., Aln'emi, E. A. S., &Alkhawaldeh, B. Y. S. (2023). Evaluating Technology Improvement in Sustainable Development Goals by Analysing Financial Development and Energy Consumption in Jordan. International Journal of Energy Economics and Policy, 13(4), 348

63. Al-Dweiri, M., Ramadan, B., Rawshdeh, A., Nassoura, A., Al-Hamad, A., & Ahmad, A. (2024). The mediating role of lean operations on the relationship between supply chain integration and operational performance. Uncertain Supply Chain Management, 12(2), 1163-1174.

64. Lin, C., Ahmad, S. F., Ayassrah, A. Y. B. A., Irshad, M., Telba, A. A., Awwad, E. M., & Majid, M. I. (2023). Green production and green technology for sustainability: The mediating role of waste reduction and energy use. Heliyon, e22496.

65. K. Daoud, D. . Alqudah, M. . Al-Qeed, B. A. . Al Qaied, and A. Y. A. B. . Ahmad, "The Relationship Between Mobile Marketing and Customer Perceptions in Jordanian Commercial Banks: The Electronic Quality as A Mediator Variable", ijmst, vol. 10, no. 2, pp. 1360-1371, Jun. 2023

66. Mohammad Jebreel, Mohammad Alnaimat, Amjad Al-Shorafa, Majed Qabajeh, Mohammad Alqsass, & Ahmad Bani Ahmad. (2023). The Impact of Activity Ratios on Change in Earnings (Case Study:Based on Jordanian Food Companies). Kurdish

Studies, 11(2), 4551–4560. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/1044

67. Mohammad Alqsass, Munir Al-Hakim, Qais Al Kilani, Lina Warrad, Majed Qabajeh, Ahmad Y. A.Bani Ahmad, & Adnan qubbaja. (2023). The Impact of Operating Cash Flow on Earnings Per Share (Case Study Based on Jordanian Banks). Kurdish Studies, 11(2), 2718–2729. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/831

68. Mohammad Alqsass, Munir Al-Haki, Mohammad Dweiri, Majed Qabajeh, Dmaithanalmajali, Ahmad Bani Ahmad, & Adnan Qubbaja. (2023). The Impact of Current Ratio on Net Profit Margin (Case Study: Based on Jordanian Banks). Kurdish Studies, 11(2), 2894–2903. Retrieved from https://kurdishstudies.net/menu-script/index.php/KS/article/view/834

69. Mustafa, J. A., ATTA, A. A. B., AHMAD, A. Y. B., SHEHADEH, M., & Agustina, R. (2023). Spillover Effect in Islamic and Conventional Fund Family: Evidence from Emerging Countries. WSEAS Transactions on Business and Economics, 20, 1042-1058.

70. Mohsin, H. J., Hani, L. Y. B., Atta, A. A. B., Al-Alawnh, N. A. K., Ahmad, A. B., & Samara, H. H. (2023). THE IMPACT OF DIGITAL FINANCIAL TECHNOLOGIES ON THE DEVELOPMENT OF ENTREPRENEURSHIP: EVIDENCE FROM COMMERCIAL BANKS IN THE EMERGING MARKETS.

71. Ni, L., Ahmad, S. F., Alshammari, T. O., Liang, H., Alsanie, G., Irshad, M., ... &Ayassrah, A. Y. B. A. (2023). The role of environmental regulation and green human capital towards sustainable development: The mediating role of green innovation and industry upgradation. Journal of Cleaner Production, 138497.

72. Peng, Yixuan, Sayed Fayaz Ahmad, Ahmad Y. A. Bani Ahmad, Mustafa S. Al Shaikh, Mohammad Khalaf Daoud, and Fuad Mohammed Hussein Alhamdi. 2023. "Riding the Waves of Artificial Intelligence in Advancing Accounting and Its Implications for Sustainable Development Goals" Sustainability 15, no. 19: 14165. https://doi.org/10.3390/su151914165

73. Peiran Liang, Yulu Guo, Sohaib Tahir Chauhdary, Manoj Kumar Agrawal, Sayed Fayaz Ahmad, Ahmad Yahiya Ahmad Bani Ahmad, Ahmad A. Ifseisi, Tiancheng Ji,2024,"Sustainable development and multi-aspect analysis of a novel polygeneration system using biogas upgrading and LNG regasification processes, producing power, heating, fresh water and liquid CO2,"Process Safety and Environmental Protection,

74. Peiran Liang, Yulu Guo, Tirumala Uday Kumar Nutakki, Manoj Kumar Agrawal, Taseer Muhammad, Sayed Fayaz Ahmad, Ahmad Yahiya Ahmad Bani Ahmad, Muxing Qin, 2024. "Comprehensive assessment and sustainability improvement of a natural gas power plant utilizing an environmentally friendly combined cooling heating and power-desalination arrangement",Journal of Cleaner Production,Volume 436,,140387,

75. van Eck, N. J., & Waltman, L. (2013). *VOSviewer manual*. Universiteit Leiden.

76. Vigo, D., Thornicroft, G., & Atun, R. (2016). Estimating the true global burden of mental illness. *The Lancet Psychiatry, 3*(2), 171–178. https://doi.org/10.1016/S2215-0366(15)00505-2

77. Wang, C., Jiang, Z., Pang, R., Zhang, H., Li, H., & Li, Z. (2023). Global trends in research of Achilles tendon injury/rupture: A bibliometric analysis, 2000–2021. *Frontiers in Surgery, 10*, 1051429. https://doi.org/10.3389/fsurg.2023.1051429

78. Wang, Y., Kung, L., & Byrd, T. A. (2018). Big data analytics: Understanding its capabilities and potential benefits for healthcare organizations. *Technological*

Forecasting and Social Change, 126, 3–13. https://doi.org/10.1016/j.techfore.2015.12.019

79. Wongkoblap, A., Vadillo, M. A., &Curcin, V. (2017). Researching mental health disorders in the era of social media: Systematic review. *Journal of Medical Internet Research, 19*(6), e228. https://doi.org/10.2196/jmir.7215

80. World Health Organization. (2017). *Depression and other common mental disorders: Global health estimates* (No. WHO/MSD/MER/2017.2). World Health Organization.

81. Lépine, J. P., & Briley, M. (2011). The increasing burden of depression. *Neuropsychiatric Disease and Treatment, 7*(Suppl 1), 3–7. https://doi.org/10.2147/NDT.S19617

82. Yang, X., Wang, Y., Byrne, R., Schneider, G., & Yang, S. (2019). Concepts of artificial intelligence for computer-assisted drug discovery. *Chemical Reviews, 119*(18), 10520–10594. https://doi.org/10.1021/acs.chemrev.8b00728

83. Yang, Z., Ma, Y., Bi, W., & Tang, J. (2023). Exploring the research landscape of COVID-19-induced olfactory dysfunction: A bibliometric study. *Frontiers in Neuroscience, 17*, 1164901. https://doi.org/10.3389/fnins.2023.1164901

84. Zyoud, S. H. (2022). Global research on *Clostridium difficile*-associated diarrhoea: A visualized study. *World Journal of Gastroenterology, 28*(28), 3720–3731. https://doi.org/10.3748/wjg.v28.i28.3720