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Internet of Things and Health: A literature review based on Mixed Method

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Abstract

The integration of technological advances into health sciences has promoted their development, but also generated setbacks and difficulties for digital transformation. In different areas, technology has modified the processes of diagnosis, teaching and learning, treatment and monitoring, which is why the study of new technologies and the models that support their introduction is essential. Internet of Things is one of these models, which, in turn, includes different models, devices and applications. Due to its breadth of exploitation options and benefits, in the health area this concept has been adopted and particularized as the Internet of Medical Things. With the purpose of achieving an approximation to the main trends and characteristics, a literature review study was conducted, based on mixed methods. Two studies were carried out with a sequential strategy, the first being bibliometric and the second a scoping review. The main results allowed us to describe the main trends in terms of bibliometric indicators, a thematic analysis in terms of areas, populations, benefits and limitations. It is concluded that there is a need for new interdisciplinary studies and lines for future research are presented.

Keywords: Internet of Things; Health; mixed methods.

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1. Introduction

The Health Sciences, influenced by the socioeconomic context in which they are produced, have undergone multiple changes. [1 2 3]. Areas such as rehabilitation, medicine and nursing, to name a few, have been modified by the irruption, not always organized and planned, of technology. [4 5 6 7].
Although there are many disciplines and processes to point out, some of them stand out, such as teaching and learning in virtual environments. [8 9 10 11 12 13]the use of artificial intelligence for various purposes [5 14 15 16]telemedicine and health services in virtual environments, or through technology, to improve quality and broaden access. [17 18 19 20 21 22 23]among others. However, these advances are accompanied by challenges, among which are the study of psychological and social factors. [24 25 26 27 28 29]technology acceptance and barriers to technology integration [30 31 32 33]The establishment of human relationships, collaboration networks and the transfer of processes to digital environments. [34 35 36 37 38 39 40]the proper handling of data in decision making [41 42]

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[43 44 45 46 47 48 49]as well as others that point to novelty and uniqueness as cornerstones of multi- and interdisciplinary innovation in the human sciences and especially in the health sciences. [50 51 52 53 54 55 56].

Whether from constructivist and human-centered perspectives or from positivist approaches, these challenges must be addressed in order to better understand their impact, as well as their efficiency and effectiveness in achieving new results and transformations.[57] Therefore, it is vital to study both the models that guide the introduction and integration of new technologies and their influence on individuals, groups, organizations and communities. [58]

In this sense, although multiple models, approaches or platforms in themselves can be highlighted, a particular concept that has gained both popularity and validity stands out: *Internet of Things* (IoT). [59 60 61 62 63]. This has generated a lot of attention, both in the health area and in other related or unrelated areas, due to the wide range of options for its exploitation, as well as the variety of industries that are linked to its development. [64 65 66].

During Covid-19, IoT technologies gained prominence in the area of healthcare. [67 68 69 70 71 72 73]. This, although due to different factors related to the complex global scenario experienced, is especially related to the benefits offered, which, in addition to offering a set of individual benefits, also contributes to alleviate the pressure on local and regional health services. [59 67 74 75 76]. In addition to measuring certain variables, obtaining metrics, both in real time and in standard storage in a cloud, IoT technology provides facilities for decision making in integrated systems, quality control of environmental values, allows the longitudinal study of the behavior of several variables and promises to assist in the near future the *delivery of* various forms of medical action. [77 78 79 75].

The concept of IoT, although diverse and scattered, brings together several key words: data, electronic devices, sensors, cloud, monitoring. [80]. While some authors claim that the concept offers ample opportunities, but is far from being a "real" solution to the problems facing global health, the key idea is the use of information provided by electronic devices connected to the Internet. [81]The key idea is the use of information provided by electronic devices connected to the Internet. [82]

Although some studies support the idea that the realization of IoT models in the health sector does not occur in a singular way, but is another area of technological application, the truth is that its variety of formats and modes of use have led to the widespread use of related concepts such as Internet of Medical Things (IoMT). [83 84 85]. This *framework* includes applications for monitoring the general state of health, specific vital signs, remote or app-assisted diagnostics, special care systems for the elderly, medication dosing or the execution of medical procedures,[86] the dosage of medications or the precise execution of medical treatments. [67 87 88 89 90 91].

As can be seen, the possibilities are vast and its popularity and impact has increased in various areas, primarily in medicine, nursing and rehabilitation, although the convergence in the sports area also stands out due to the multiple uses given to IoT-based technology. However, its introduction in specialized medical services or as a personalized healthcare service offering has faced, and still faces, several limitations. [92 93]. Among the most notable are the lack of an adequate model for its use, the uncritical or ad-hoc application of IoT-based technologies, issues related to the security and use of data, effective integration with human systems, acceptance by users and specialists, among others. [59 94 95 96].

Thus, it is essential to achieve a better understanding of the behavior of the field and its trends; the identification of journals, authors and institutions interested in the subject, as well as to achieve a mapping of the main disciplines, keywords and future areas of attention.[97] In addition, a better understanding of the internal trends, main topics of interest and other aspects of the use of IoT-based technology in the Health Sciences is vital.

2. Methods

In order to achieve the purposes established for the study, a complex design with a mixed approach was conducted. To this end, two independent protocols were developed with sequential implementation, one a bibliometric study and the other a qualitative review with a broad design (scoping review). The methodological elements of each protocol are described below.

2.1. Bibliometrics study

It was decided to carry out a bibliometric analysis of the field of study due to the breadth of sources identified during the first phase of the research (*screening*). Due to the results of this approach, the large amount of bibliometric data available and the need to establish the academic structure of the field, a protocol aimed at indicators was chosen. [98 99 100 101 20]. The final design was based on previous studies with similar goals. [102 103 98 104 105 77 106 107].

Table 1. Indicators, bibliometric analysis and questions.

Indicators and procedures	Objectives	Contributions to the field of study
Related to publication metrics	Identify temporal patterns in publications related to IoT and Health.	Exploration of the main publication trends (number of publications per year, location).
Related to publication citations	Identify the institutions most interested in scientific production in IoT and Health Sciences.	Contribution to the visibility of the main projects and their standardized impact.

Related to citation/publication metrics Network analysis (clustering/visualization)	Determining manuscript types and citation metrics Determine the main areas and relationships between disciplines	Evaluate the behavior of citation metrics and their behavior by areas. Assessment of the main areas of convergence, intersection and use of IoT in Health Sciences.

As a result, this study provided various metrics that facilitated a diagnosis of the evolution of the field in the period 2013-2022 in the Scopus database. We started with the analysis of the total number of publications and their distribution according to type of scientific production (*conference proceedings*, *article*, *review*, *etc.*), compared the citation impact of the field with respect to the world average and the expected behavior using the *Field-Weighted Citation Impact* metric, and paid specific attention to the cluster formed by the main categories, disciplines and interactions between areas of knowledge.

The Sci-Val and VOSviewer tools were used to visualize the data and process the information, based on an extensive review of similar studies, the use of a simple search strategy and the generation of a keyword database for the qualitative study (see Figure 1).

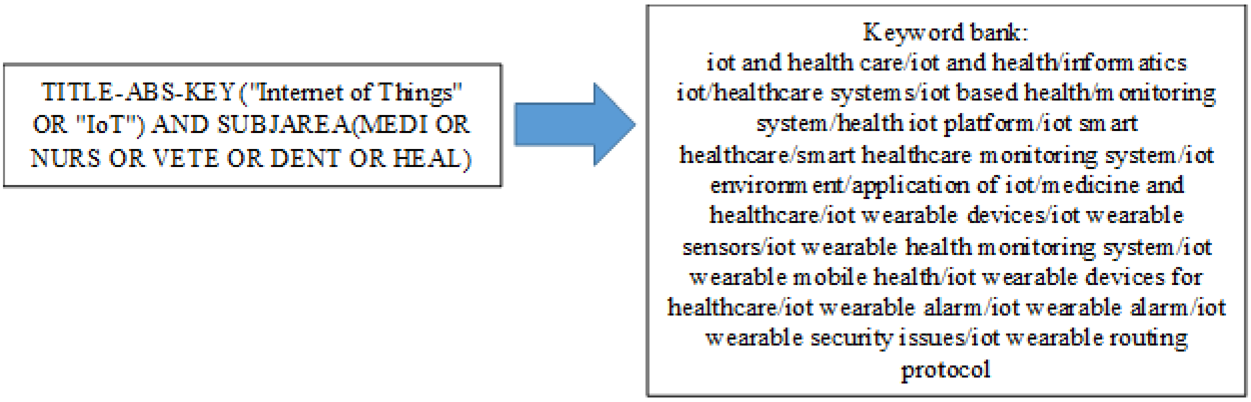

Figure 1. Search strategy.

2.2. Scoping review

This type of methodology has proven to be especially useful in emerging areas or as a tool to support or complement broad or positivist studies. [108]. For the design of this protocol, a PICO model was used as a basis, similar to the proposals made by previous studies. [109]. In this sense, a system of questions was used to adapt the PICO model to the field of study (see Table 2).

Table 2. Questions for adapting the PICO model.

Indicator	Ask
Development of indicators for future studies	What are the main trends, areas of health sciences and interactions with other areas?
Examine areas and determine possible gaps	What are the main populations under study? What are the main IoT formats used? What are the main benefits and the main limitations?
Explore areas for future study and establish research needs/objectives	What are the least explored areas in the integration of IoT models in Health Sciences? What essential elements should future studies consider in terms of their design? What questions stand out and should be answered in future approaches?

The search strategy was based on triangulation, specifically of sources and researchers. To this end, during the first phase, authors 1 and 2 conducted an independent search using the *keyword* identified with the help of the Google academic search engine, the use of the my library tool and the export of the most relevant studies identified to Sotero (N=33).

Once the database was created in Sotero, author 3 conducted an independent evaluation of the quality, relevance in terms of the questions and objectives, as well as the methodological rigor followed. The criteria established by the APA, specialists in mixed methodology and similar studies were used for this purpose. [110 111]. Following this evaluation, articles were discarded due to relevance (n=8) and due to the lack of a stated methodology (n=10). The remaining articles were subjected to a joint evaluation by the author team and a final sample was selected for in-depth analysis (n=9). [67 74 75 83 85 112 113 114 115].

A three-phase protocol was used for the thematic analysis, in order to triangulate the data and the perspectives of each researcher and to achieve an adequate integration and discussion of the main results.[116] We used an adaptation of the methodology for conducting thematic analysis in interdisciplinary health teams proposed by Saunders et al. [117]and the procedures were reviewed in terms of similar studies.

Table 3. Phases of the thematic analysis.

Phase	Procedures
Initial approach	1. Individual in-depth reading. 2. Key notes: memos, codes and proposed categories. 3. Elaboration of the individual thematic proposal. 4. Group discussion of the results of phase 1.
2. Coding and contrasting.	1. Initial assessment of data saturation 2. Comparison of the codes and preparation of the single codebook. 3. Review of the uncoded data and contrasting evidence.
3. Thematic analysis.	1. Closing of the analysis and determination of data saturation. 2. Individual proposal of topics, discussion of the proposal and closing of the thematic proposal. 3. Writing of the thematic synthesis.

3. Results

The following is a synthesis of the main results achieved by each study, as well as a synthesized contrast of both. The limitations of the study are also discussed, as well as assessments for future research.

3.1. Bibliometric study: IoT and Health

Analysis of the first bibliometric indicator yielded a total of 7612 documents retrieved and 24752 authors involved in research and manuscript writing. These data suggest a clear trend towards collaboration and scientific production based on research teams and the use of laboratories (Table 4). As can be seen, the importance of inter-author collaborations is confirmed, as single-author papers received fewer citations than expected, while international collaborations far exceed the expected average.

Type of collaboration	Ndoc	%Ndoc	Cpd	FWCI
International collaboration	1357	17.8%	14,4	2,62
Only national collaboration	2097	27.5%	7,4	1,65
Only institutional collaboration	3574	47.0%	6,5	1,35
No collaboration	584	7.7%	5,2	0,85

Table 4. Type of collaboration

Another important result found is that of geographical distribution, which showed significant regional development in Asia, Europe, the Middle East, Australia (Oceania cannot be mentioned) and North America. In Latin America, Brazil stands out, but there is little or no scientific activity in the remaining countries, which could be explained by the necessary technological infrastructure and the high costs in the production of *wearables* and other technologies required for IoT models.

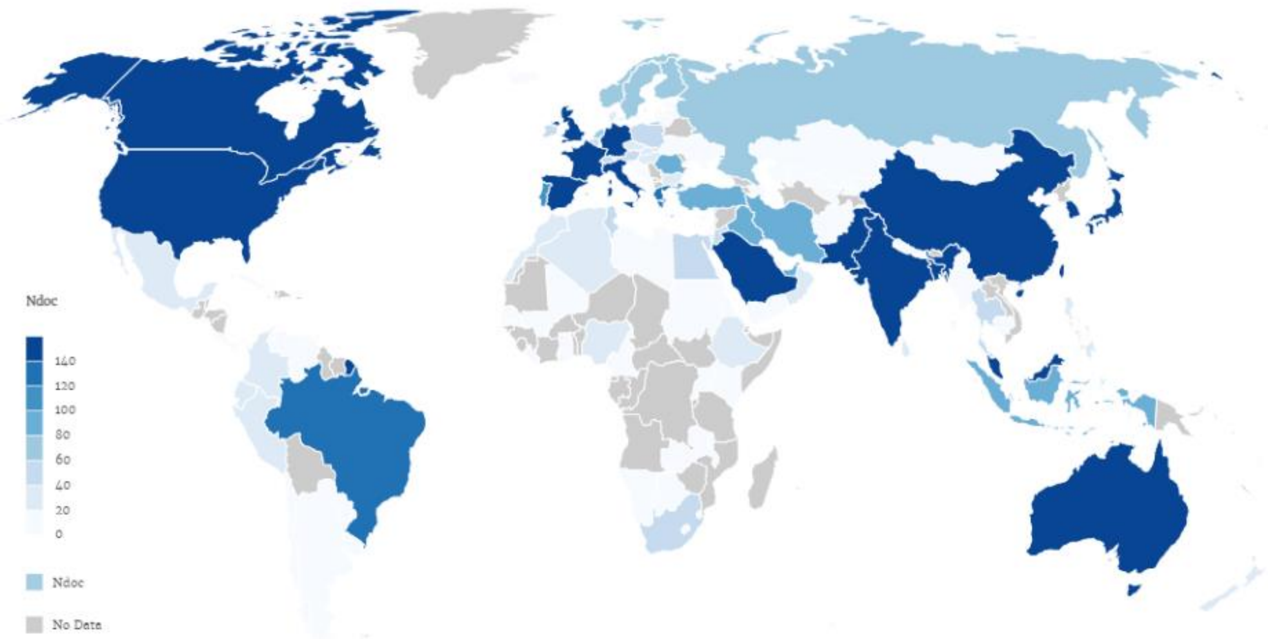

Figure 2. Geographic distribution.

In addition, a pronounced trend towards an increase in publications per year was identified in this indicator, especially in the period between 2019-2022. Another important data yielded by the bibliometric analysis of this indicator is the impact, measured by the number of publications in quartile 1 journals (scimagojr Q1), although this number represents about one third of the remaining publications combined (Q2, Q3, Q4) (see Figure 3).

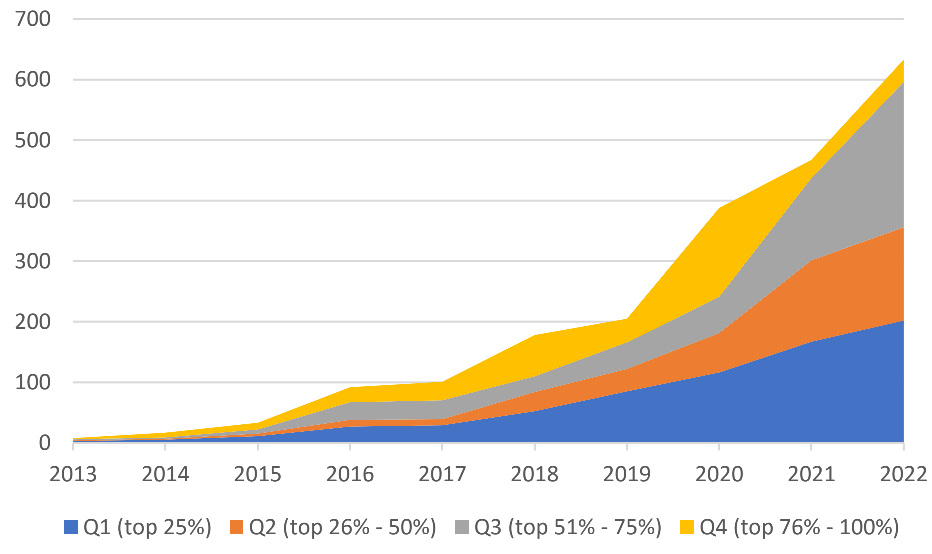

Figure 3. Distribution by years and quartiles.

Indicator 2 identified the main institutions in terms of scientific production (see Table 5). Except for one French government agency, the rest of the institutions are academic and located in India. These results are conditioned by the normalized impact, with a clear tendency to exceed the expected average number of citations.

Table 5. Main Institutions.

Institution	Sector	Country	Ndoc	Cpd	FWCI

Anna University	academic	India	404	5,2	2,3
Vellore Institute of Technology	academic	India	134	6,6	2,64
University of Pune	academic	India	84	6,5	3,05
SRM Institute of Science and Technology	academic	India	78	3,1	1,23
Amrita Vishwa Vidyapeetham	academic	India	74	6,9	1,71
Amity University, Noida	academic	India	72	5,7	2,23
CNRS	government	France	69	5,9	1,28
University of Mumbai	academic	India	50	5,6	1,38
Uttaranchal University	academic	India	48	0,8	1,36
Chitkara University	academic	India	45	6,2	2,61

Regarding the third indicator, there is a significant accumulation of manuscripts in conference format, with a total number of publications that far exceeds the other publication formats combined (see Table 6). These data suggest a gradual process of teaching the main models, discussion of opportunities and challenges, as well as other necessary assessments during the consolidation of a field or discipline.

Table 6. Types of publication

Publication types	Ndoc
Conference Paper	5126
Article	1290
Chapter	595
Review	296
Conference Review	112
Editorial	61
Book	35
Others	97

In terms of areas, as expected, medicine stands out, although other disciplines such as dentistry, nursing, health professions, psychology and neurosciences are also present (see Table 7). The social sciences and decision-making studies also stand out. As will be seen below, this is a truly complex field, with multidisciplinary contributions, dispersed and in a period of consolidation, which points to the need for future studies to generate true interdisciplinary approaches and not mere applications of imported knowledge or technologies.

Table 7. Main areas.

Subject Area	Ndoc	Ncit	Naut	Cpd	FWCI
Medicine	6989	57815	22887	8,3	1,69
Computer Science	5882	37181	18530	6,3	1,57
Engineering	3345	21112	11165	6,3	1,77
Decision Sciences	2649	13240	8720	5	1,67
Social Sciences	1269	10250	4148	8,1	1,43
Health Professions	1022	12365	3484	12,1	1,36
Energy	919	3200	3205	3,5	1,8
Physics and Astronomy	849	5462	3033	6,4	1,7
Mathematics	731	2971	2429	4,1	1,61
Business, Management and Accounting	463	4490	1523	9,7	2,42
Biochemistry, Genetics and Molecular Biology	306	5383	1357	17,6	2,08
Agricultural and Biological Sciences	185	1348	707	7,3	3,08
Environmental Science	183	2178	677	11,9	1,23
Nursing	134	1683	501	12,6	1,82
Materials Science	115	2507	590	21,8	2,13
Chemical Engineering	103	2624	517	25,5	2,94
Neuroscience	65	1067	241	16,4	1,76

Pharmacology, Toxicology and Pharmaceutics	52	318	201	6,1	1,03
Psychology	41	503	124	12,3	1,39
Immunology and Microbiology	34	346	155	10,2	1,7
Economics, Econometrics and Finance	33	269	86	8,2	2,14
Veterinary	27	347	123	12,9	1,81
Arts and Humanities	15	97	38	6,5	1,19
Dentistry	15	280	56	18,7	4,9
Chemistry	10	390	40	39	1,57
Earth and Planetary Sciences	1	0	1	0	0

Figure 4 shows precisely the accumulation of relevant studies in specific areas, especially mathematics, computer science and physics, although the contribution of chemical and materials sciences is also evident. Contrasting these results with those of indicator 2 confirms the need to produce interdisciplinary science and advanced studies that transcend the application of general principles.

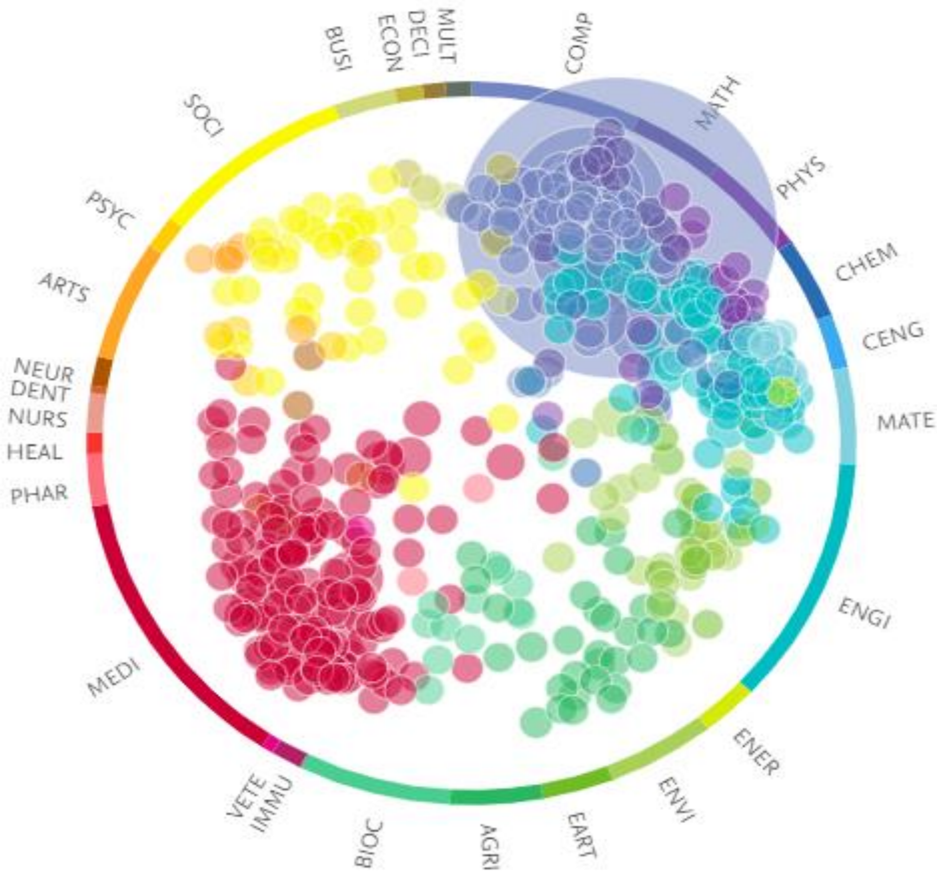

Figure 4. Cluster by topics.

Figure 5, elaborated from the co-occurrence of terms, shows that the main keywords are associated with or used in computer science. This phenomenon could be explained from the analysis of the conceptual and technological components of IoT models and the technologies produced from them. However, the poor co-occurrence represented in thin lines, the dispersed distribution of topics and the poor consolidation of topics stand out.

In general, the analysis and visualization of bibliometric data point to a field in consolidation, to the need for interdisciplinary studies and greater collaboration between related disciplines. In addition, it is vital to encourage the development of conceptual and technological solutions specific to the Health Sciences, with the participation of specialists and complex approaches, gradually replacing proposals made from a single discipline or external disciplines.

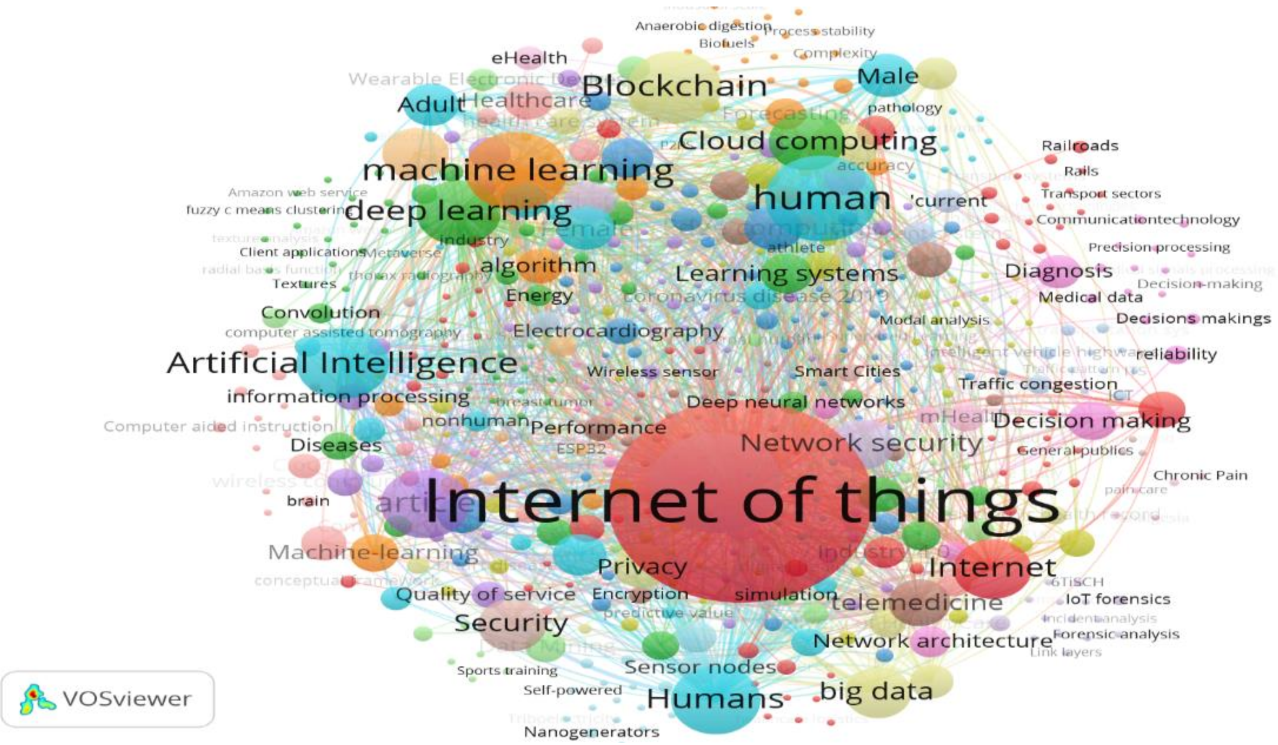

Figure 5. Co-occurrence of terms.

3.2. Thematic synthesis

The qualitative analysis performed yielded results similar to those of the bibliometric study, while the coding showed that the texts analyzed refer mainly to complex mathematical algorithms, learning models based on computerized processes and other similar ones.[118] For the analysis of the main trends, areas of health sciences and interactions with other areas, the most common codes were computer science and materials science. However, it should be noted that this coding was done with the support of the *scope of* the journals, keywords and other markers within each article, due to the complexity of the proposals.

One of the main trends analyzed was related to data, its extraction, processing, protection and dependence on the concept of ubiquity, as it is one of the most important conceptual cores of IoT models. Among the main issues discussed were data privacy and the requirements for maintaining data security; the need to perfect the underlying technology and computer algorithms to achieve real-time transmission; and the possibility of data exchange and integration through the input of multiple devices connected by the same IoT model.

Regarding the main populations, the articles analyzed do not show a clear internal trend, but rather the applications of the IoT models and technologies studied are aimed at specific purposes. That is, rather than producing devices for a specific population (age group, profession), IoT models are designed based on objectives such as measuring, diagnosing, monitoring, etc. Based on these objectives, the models are applied according to the characteristics of the target populations, with a distinguishable tendency towards pathologies or conditions of various types (cardiovascular diseases, Covid-19 infection, chronic non-communicable diseases). A key aspect is that the literature shows a projection towards the integration of IoT models, either in the daily life of ordinary people or in specialized processes, with emphasis on monitoring the general state of health.

The formats include *wearables*, i.e. devices designed to be worn by the user, although the importance of other applications, mainly for monitoring the quality of environmental conditions, is also noted. Among the *wearables*, the breadth of types is highlighted, ranging from smart textiles to subcutaneous implants. This diversity of formats has a common design based on sensors, microcontrollers, communication channels, cloud, mobile application or control center for data visualization and analysis.

Among the main benefits are the possibility of diagnosis, measurement and treatment in real time; the possibility of collecting data remotely; the enhancement of the processes of adherence to treatment and control of metrics or vital signs in at-risk populations; among others. The main limitations and future challenges are related to data, but references are also made to others such as the adjustment of models and technologies to individual biological and environmental differences, connectivity and the challenges of ubiquity, production cost, safety in the use of technology and design errors.

As for the future, the main thematic lines converge on two key aspects: improved design and refinement of conceptual models. The former refers to issues related to battery durability, improvements in the appearance or presentation of products, improvement of individual components and expansion of capabilities, especially in terms of data (security, privacy, processing, real-time processing, visualization).

In the second case, reference is made to the conceptual aspects of the exploitation of devices, the incorporation of new technologies and complex learning models through AI (*machine learning, neural networks, cognitive model*). It is worth noting the scarce importance given in the texts consulted to interdisciplinary dialogue and cooperation between teams from different disciplines, despite the fact that several of the limitations, especially those related to integration into everyday life, could be solved through these collaborations.

4. Discussion

In general, it can be stated that the IoMT constitutes a metamodel that includes different conceptual approaches to the use of technology. In the future, these models and associated devices are expected to change the way Health Sciences are understood, especially the monitoring and dosing of treatments. However, it should be noted that the adoption of models and technology must be carefully examined, tested and evaluated before they become widespread [119 120 121 122].

Despite the tremendous importance of the technological aspects related to IoT models and their transformation into IoMT, the human aspects of their technological integration need to be deepened in order to limit the impact of barriers and promote digital transformation. [123 124 125]. This means giving greater importance to learning processes, raising awareness of the use of technologies and their benefits, designing schemes and strategies for their effective integration, among others.

In addition, it is important to highlight the main limitations of this study, given its general nature, the selection of a single database, and the insufficient depth in terms of trends and themes within the main lines [126]. Future studies are suggested along the following lines: interdisciplinary nature, integration into everyday life, unique design of the IoMT model and evaluation of the socio-psychological particularities of its implementation.

5. Conclusions

The study concluded that Health Sciences can benefit significantly from the introduction of IoT models and their correct adaptation to the needs and particularities of the environment. Especially in terms of improving access and the quality of data-driven decision making, the incorporation of IoT-based devices could result in greater efficiency and improved functioning of healthcare systems. In addition, the use of this technology could favor health education, self- and collective health awareness, intelligent monitoring of personal and environmental metrics, among other benefits.

However, in order to achieve these advances, it is necessary to achieve an adequate integration of the technology, substantiate its inclusion in the processes, explore its acceptance by professionals and users in general, as well as assess the limitations of such integration. In conclusion, it is necessary to direct new studies, with an interdisciplinary approach, towards a better understanding and development of IoMT models.

References

[1] Rojas-Concepción AA, Herrera-Miranda GL, Arteaga-Prado Y. Pedagogical model for the methodological work of the specialization in General Comprehensive Medicine. Sal Cienc Tec 2022;2:72. https://doi.org/10.56294/saludcyt202272.

[2] Valencia-Contrera M, Rivera-Rojas F, Villa-Velásquez J, Ardiles-Irarrazabal R, Febré N, Valenzuela-Suazo S. Methodological strategies for the generation of conceptual models in nursing. Salud Cienc Tecnol 2023:315. https://doi.org/10.56294/saludcyt2023315.

[3] Toconas LDC. Empathy in nursing professionals for care subjects with depression. Community and Interculturality in Dialogue 2023;3:67. https://doi.org/10.56294/cid202367.

[4] Silva Infantes M, Sánchez Soto JM, Astete Montalvo MA, Ruiz Nizama JL, Velarde Dávila L, Dávila-Morán RC, et al. Analysis of the perception of health professionals regarding the incorporation of emerging technologies in their practice. Salud, Ciencia y Tecnología 2023;3:565. https://doi.org/10.56294/saludcyt2023565.

[5] Winkler-Schwartz A, Bissonnette V, Mirchi N, Ponnudurai N, Yilmaz R, Ledwos N, et al. Artificial Intelligence in Medical Education: Best Practices Using Machine Learning to Assess Surgical Expertise in Virtual Reality Simulation. Journal of Surgical Education 2019;76:1681-90. https://doi.org/10.1016/j.jsurg.2019.05.015.

[6] Gonzalez-Argote J. Use of virtual reality in rehabilitation. Interdisciplinary Rehabilitation / Rehabilitacion Interdisciplinaria 2022;2:24. https://doi.org/10.56294/ri202224.

[7] Gómez Cano CA, Sánchez Castillo V. Knowledge structure in rehabilitation within and outside the area of Medicine: Bibliometric Perspectives of the categories "Physical Therapy, Sports Therapy and Rehabilitation" and "Rehabilitation." Interdisciplinary Rehabilitation / Rehabilitacion Interdisciplinaria 2022;2:22. https://doi.org/10.56294/ri202222.

[8] Catrambone R, Ledwith A. Interdisciplinary approach in the accompaniment of academic trajectories: teacher and psycho-pedagogical training in action. Interdisciplinary Rehabilitation / Rehabilitacion Interdisciplinaria 2023;3:50. https://doi.org/10.56294/ri202350.

[9] Veloz Montano MDLN, Keeling Alvarez M. The educational and pedagogical intervention in scientific research. Community and Interculturality in Dialogue 2023;3:70. https://doi.org/10.56294/cid202370.

[10] Wu T-C, Ho C-TB. A scoping review of metaverse in emergency medicine. Australasian Emergency Care 2023;26:75-83. https://doi.org/10.1016/j.auec.2022.08.002.

[11] Veloz Montano MDLN, González Martínez MDLC, Pérez Lemus L. Rehabilitation of occupational stress from the

perspective of Health Education. Community and Interculturality in Dialogue 2023;3:71. https://doi.org/10.56294/cid202371.
[12] Kaul V, Gallo De Moraes A, Khateeb D, Greenstein Y, Winter G, Chae J, et al. Medical Education During the COVID-19 Pandemic. Chest 2021;159:1949–60. https://doi.org/10.1016/j.chest.2020.12.026.
[13] Gonzales Tito YM, Quintanilla López LN, Pérez Gamboa AJ. Metaverse and education: a complex space for the next educational revolution. Metaverse Basic and Applied Research 2023;2:56. https://doi.org/10.56294/mr202356.
[14] Chaparro-Montoya EE, Vera-Alcázar MM, Herrera-Córdova FB, Barahona-Sánchez JC. Use of efficient microorganisms for composting from organic wastes. Syncretismo 2020;1.
[15] Mejías M, Guarate Coronado YC, Jiménez Peralta AL. Artificial intelligence in the nursing field. Implications in care, administration and education. Sal Cienc Tec 2022;2:88. https://doi.org/10.56294/saludcyt202288.
[16] Madkar S, Pardeshi S, Kumbhar MS. Machine learning based efficient routing protocol in wireless sensor network. Health Sci Tech 2022;2:195. https://doi.org/10.56294/saludcyt2022195.
[17] Rifaldo Sebo TA, Aryobimo Oentarto AS, Biondi Situmorang DD. "Counseling-Verse": A Survey of Young Adults from Faith-Based Educational Institution on the Implementation of Future Mental Health Services in the Metaverse. Metaverse Bas App Res 2023:42. https://doi.org/10.56294/mr202342.
[18] Silva EA. Digital transformation and knowledge management: relationships in scientific production. In: Rodrigues Dias TM, editor. Advanced Notes in Information Science, vol. 2, ColNes Publishing; 2022. https://doi.org/10.47909/anis.978-9916-9760-3-6.107.
[19] Laplagne Sarmiento C, Urnicia JJ. B-learning protocols for information literacy in Higher Education. Reg Cient 2023:202373. https://doi.org/10.58763/rc202373.
[20] Araujo-Inastrilla CR, Vitón-Castillo AA. Blockchain in health sciences: Research trends in Scopus. Iberoamerican Journal of Science Measurement and Communication 2023;3. https://doi.org/10.47909/ijsmc.56.
[21] Vitón-Castillo AA, Fajardo Quesada AJ, Romero Valdes YDLC, Batista Rivero L. Metaverse: an emerging research area. Metaverse Bas App Res 2022:3. https://doi.org/10.56294/mr20223.
[22] Alonso Galbán P, Izquierdo Pamias T. Integration of web 2.0 tools in specialty and health topic sites for the development of virtual communities of practice in the Infomed network. Salud Cienc Tecnol 2022;2:121. https://doi.org/10.56294/saludcyt2022121.
[23] Lepez CO, Simeoni IA. Pedagogical experience with Public Health campaigns from the design of socio-educational projects with insertion in the local territory. Community and Interculturality in Dialogue 2023;3:74. https://doi.org/10.56294/cid202374.
[24] Gonzalez-Argote J. A Bibliometric Analysis of the Studies in Modeling and Simulation: Insights from Scopus. Gamification and Augmented Reality 2023;1:5–5. https://doi.org/10.56294/gr20235.
[25] Gonzalez-Argote J. Analyzing the Trends and Impact of Health Policy Research: A Bibliometric Study. Health Leadership and Quality of Life 2023;2:28–28. https://doi.org/10.56294/hl202328.
[26] Inastrilla CRA. Big Data in Health Information Systems. Seminars in Medical Writing and Education 2022;1:6–6. https://doi.org/10.56294/mw20226.
[27] Petrona Aguirre JI, Marsollier R, Vecino J. Teaching Burnout: a conceptual cartographic review. AWARI 2020;1:e021. https://doi.org/10.47909/awari.82.
[28] Duarte Mascarenhas HA, Rodrigues Dias TM, Mascarenhas Dias P. Adoption of Network Analysis Techniques to Understand the Training Process in Brazil. AWARI 2020;1:e004. https://doi.org/10.47909/awari.63.
[29] Romero Torres ME, Gamero De La Espriella P. Creation of a techno-pedagogical model for the strengthening of the Emberá Katío language through ancestral customs at the El Rosario educational institution in Tierralta. Reg Cient 2023:202398. https://doi.org/10.58763/rc202398.
[30] Cardoza W, Rodriguez C, Pérez-Galavís A, Ron M. Work psychosocial factors and stress in medical staff in the epidemiology area of a public institution. Interdisciplinary Rehabilitation / Rehabilitacion Interdisciplinaria 2023;3:52. https://doi.org/10.56294/ri202352.
[31] Gómez Cano CA, Sánchez Castillo V, Clavijo Gallego TA. Mapping the Landscape of Netnographic Research: A Bibliometric Study of Social Interactions and Digital Culture. Data & Metadata 2023:25. https://doi.org/10.56294/dm202325.
[32] Linares Cánovas LP, Linares Cánovas LB, Pereda Rodríguez Y, Gallardo Hernández B, Pérez Martín MM, Linares Montano A. Evaluation of Burnout Syndrome and associated factors in primary care health personnel. Community and Interculturality in Dialogue 2023;3:73. https://doi.org/10.56294/cid202373.
[33] Cervantes Martínez L, Farías Rojas GA, Villota Oyarvide W, Del Campo Saltos G. Knowledge generation in the telecommunications era and its impact on education and economic development in Latin American. Salud Cienc Tecnol 2023:363. https://doi.org/10.56294/saludcyt2023363.
[34] Lizcano PAC, Quintero YCM, Cano CAG. Analysis of the impact on the implementation of electronic invoicing in the automotive sector in the city of Florencia, Caquetá. Revista Científica Empresarial Debe-Haber 2023;1:25-40.
[35] Luiz Pinto A, De Carvalho Segundo WLR, Dias TMR, Vivian Santos Silva, Gomes JC, Quoniam L. Brazil Developing Current Research Information Systems (BrCRIS) as data sources for studies of research. Iberoamerican Journal of Science Measurement and Communication 2022;2. https://doi.org/10.47909/ijsmc.135.
[36] Ron M, Perez A, Hernandez-Runque E. Health risk level and prediction of musculoskeletal pain in workers under telework conditions: A matrix approach. Interdisciplinary Rehabilitation / Rehabilitacion Interdisciplinaria 2023;3:40. https://doi.org/10.56294/ri202340.
[37] Gutiérrez EM, Larrosa JMC. Popularity in Facebook Pages: What role network structural variables play? AWARI 2020;1:e005. https://doi.org/10.47909/awari.68.
[38] Vera JJ, Barroso N. Addressing problematic consumption: an action research experience from the Social Network Analysis. AWARI 2020;1:e022. https://doi.org/10.47909/awari.83.
[39] Díaz-Chieng LY, Auza-Santiváñez JC, Robaina Castillo JI. The future of health in the metaverse. Metaverse Bas App Res 2022;1:1. https://doi.org/10.56294/mr20221.
[40] Dos Santos JH, De Macedo DDJ. Behavioral analysis of indicators related to the user profiles of the Mettzer platform. In: Rodrigues Dias TM, editor. Advanced Notes in Information Science, vol. 2, ColNes Publishing; 2022. https://doi.org/10.47909/anis.978-9916-9760-3-6.102.

[41] Álvarez Loyola C. The NOOCs as a training strategy for teachers in the use of technological tools in primary education. Reg Cient 2023:202362. https://doi.org/10.58763/rc202362.
[42] Gil Oloriz MA, Roche Beltrán C, Campos Sánchez CM. Trends in health telematics and telemedicine services. Data Metadata 2022;1:16. https://doi.org/10.56294/dm202216.
[43] Campos Sánchez CM, Guillén León LA, Acosta Yanes RC, Gil Oloriz MA. Metaverse: the future of medicine in a virtual world. Metaverse Bas App Res 2022;1:4. https://doi.org/10.56294/mr20224.
[44] Eslava Zapata R, Chacón Guerrero E, Gómez Ortiz E, Mogrovejo Andrade J. Decision-making in organizations: process and strategies. Data and Metadata 2022;1:19. https://doi.org/10.56294/dm202219.
[45] De Sousa RPM, Shintaku M. Data privacy policy: relevant observations for its implementation. In: Rodrigues Dias TM, editor. Advanced Notes in Information Science, vol. 2, ColNes Publishing; 2022. https://doi.org/10.47909/anis.978-9916-9760-3-6.112.
[46] Galetsi P, Katsaliaki K, Kumar S. Big data analytics in health sector: Theoretical framework, techniques and prospects. International Journal of Information Management 2020;50:206-16. https://doi.org/10.1016/j.ijinfomgt.2019.05.003.
[47] Da Silva Justino T, Morato Do Amaral R, Lopes De Faria LI, Cardoso De Brito AG. Scientific collaboration analysis of Brazilian postgraduate programs in information science. AWARI 2021;2:e024. https://doi.org/10.47909/awari.85.
[48] Gontijo MCA, Hamanaka RY, De Araujo RF. Research data management: a bibliometric and altmetric study based on Dimensions. Iberoamerican Journal of Science Measurement and Communication 2021;1:1-19. https://doi.org/10.47909/ijsmc.120.
[49] Robaina Castillo JI. Identifying promising research areas in health using bibliometric analysis. Data & Metadata 2022:10. https://doi.org/10.56294/dm202210.
[50] Ledesma F, Malave González BE. Bibliometric indicators and decision making. Data & Metadata 2022:9. https://doi.org/10.56294/dm20229.
[51] Tang M, Liao H. From conventional group decision making to large-scale group decision making: What are the challenges and how to meet them in big data era? A state-of-the-art survey. Omega 2021;100:102141. https://doi.org/10.1016/j.omega.2019.102141.
[52] Becerra MDC, Aballay A, Romagnano M. Reflections on Healthcare Document Management in the Age of 4.0 Technologies. Data Metadata 2023;2:52. https://doi.org/10.56294/dm202352.
[53] Gupta BM, Kappi M, Walke R, Bansal M. Covid-19 research in Bangladesh: A scientometric analysis during 2020-23. Iberoamerican Journal of Science Measurement and Communication 2023;3. https://doi.org/10.47909/ijsmc.445.
[54] Universidade Federal de Santa Catarina, Luiz Mendes E, Minghelli M. Digital Humanities and university extension in information science. Advanced Notes in Information Science, Pro-Metrics; 2023. https://doi.org/10.47909/anis.978-9916-9906-1-2.36.
[55] Machuca-Contreras F, Canova-Barrios C, Castro MF. An approach to the concepts of radical, incremental and disruptive innovation in organizations. Reg Cient 2023:202324. https://doi.org/10.58763/rc202324.
[56] Martín Ferron L. Jumping the Gap: developing an innovative product from a Social Network Analysis perspective. AWARI 2022;2:e026. https://doi.org/10.47909/awari.128.
[57] Witt AS, Fabiano Couto Corrêa Da Silva S. Analysis of citizen science in Brazil: A study of the projects registered in the Civis platform. Iberoamerican Journal of Science Measurement and Communication 2022;2. https://doi.org/10.47909/ijsmc.162.
[58] Guardado RT, Carmona EA, Verver Y Vargas HGL, Hernández ISJ, Martínez NGP, Trejo BYV. Opportunities and applications of smart contracts: A vision from the business, academic and scientific literature. Iberoamerican Journal of Science Measurement and Communication 2022;2. https://doi.org/10.47909/ijsmc.v2i2.32.
[59] Mariano AG, Prats GM. Technological capabilities in emerging social enterprises: a social impact pathway. Scientific Region 2023;2:2023111-2023111.
[60] Rodríguez FAR, Flores LG, Vitón-Castillo AA. Artificial intelligence and machine learning: present and future applications in health sciences. Seminars in Medical Writing and Education 2022;1:9-9. https://doi.org/10.56294/mw20229.
[61] Inastrilla CRA. Data Visualization in the Information Society. Seminars in Medical Writing and Education 2023;2:25–25. https://doi.org/10.56294/mw202325.
[62] Medina-Reverón M, Pérez-Galavís A, Ron M, Páramo-Colmenares M. Thermal Stress and Impact on Health in Workers of Refrigeration. Health Leadership and Quality of Life 2023;2:31–31. https://doi.org/10.56294/hl202331.
[63] Quintana-Honores M, Corvalán P, Gironda-Gurán J. Family integration and skin-to-skin contact with the newborn favors the recovery of the hospitalized patient: experiences of its implementation in an Obstetric Critical Care Unit. Health Leadership and Quality of Life 2023;2:33–33. https://doi.org/10.56294/hl202333.
[64] Rodríguez FAR, Flores LG, Vitón-Castillo AA. Artificial intelligence and machine learning: present and future applications in health sciences. Seminars in Medical Writing and Education 2022;1:9–9. https://doi.org/10.56294/mw20229.
[65] Moreira DHB. Accounting for the future. Revista Científica Empresarial Debe-Haber 2023;1:1-2.
[66] Sorri K, Mustafee N, Seppänen M. Revisiting IoT definitions: A framework towards comprehensive use. Technological Forecasting and Social Change 2022;179:121623. https://doi.org/10.1016/j.techfore.2022.121623.
[67] Huifeng W, Kadry SN, Raj ED. Continuous health monitoring of sportsperson using IoT devices based wearable technology. Computer Communications 2020;160:588-95. https://doi.org/10.1016/j.comcom.2020.04.025.
[68] Kim E, Han S. Investigating the digital health acceptance of Korean baby boomers: Comparative study of telemedicine and wearable healthcare devices. Health Policy and Technology 2023;12:100727. https://doi.org/10.1016/j.hlpt.2023.100727.
[69] Ardalan S, Hosseinifard M, Vosough M, Golmohammadi H. Towards smart personalized perspiration analysis: An IoT-integrated cellulose-based microfluidic wearable patch for smartphone fluorimetric multi-sensing of sweat biomarkers. Biosensors and Bioelectronics 2020;168:112450. https://doi.org/10.1016/j.bios.2020.112450.
[70] Nahavandi D, Alizadehsani R, Khosravi A, Acharya UR. Application of artificial intelligence in wearable devices: Opportunities and challenges. Computer Methods and

Programs in Biomedicine 2022;213:106541. https://doi.org/10.1016/j.cmpb.2021.106541.

[71] Cay G, Solanki D, Rumon MAA, Ravichandran V, Hoffman L, Laptook A, et al. NeoWear: An IoT-connected e-textile wearable for neonatal medical monitoring. Pervasive and Mobile Computing 2022;86:101679. https://doi.org/10.1016/j.pmcj.2022.101679.

[72] Gonzalez-Argote D, Gonzalez-Argote J. Generation of graphs from scientific journal metadata with the OAI-PMH system. Seminars in Medical Writing and Education 2023;2:43–43. https://doi.org/10.56294/mw202343.

[73] Rodríguez RD, Heredia RH, Imbert IC, Orphee RO. Historical analysis of the formation of professional skills in the Bachelor's degree in Nursing. Health Leadership and Quality of Life 2023;2:41–41. https://doi.org/10.56294/hl202341.

[74] Romero-Carazas R. Prompt lawyer: a challenge in the face of the integration of artificial intelligence and law. Gamification and Augmented Reality 2023;1:7–7. https://doi.org/10.56294/gr20237.

[75] Zhang M, Wang X, Feng H, Huang Q, Xiao X, Zhang X. Wearable Internet of Things enabled precision livestock farming in smart farms: A review of technical solutions for precise perception, biocompatibility, and sustainability monitoring. Journal of Cleaner Production 2021;312:127712. https://doi.org/10.1016/j.jclepro.2021.127712.

[76] Chang V, Doan LMT, Ariel Xu Q, Hall K, Anna Wang Y, Mustafa Kamal M. Digitalization in omnichannel healthcare supply chain businesses: The role of smart wearable devices. Journal of Business Research 2023;156:113369. https://doi.org/10.1016/j.jbusres.2022.113369.

[77] Javaid M, Khan IH. Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic. Journal of Oral Biology and Craniofacial Research 2021;11:209-14. https://doi.org/10.1016/j.jobcr.2021.01.015.

[78] Al Bassam N, Hussain SA, Al Qaraghuli A, Khan J, Sumesh EP, Lavanya V. IoT based wearable device to monitor the signs of quarantined remote patients of COVID-19. Informatics in Medicine Unlocked 2021;24:100588. https://doi.org/10.1016/j.imu.2021.100588.

[79] Lima YD, Vásquez RM. Analysis of the presence of microplastics in the sand of beaches on the southern coast of Peru. Syncretism 2021;2.

[80] Rahman MdS, Peeri NC, Shrestha N, Zaki R, Haque U, Hamid SHA. Defending against the Novel Coronavirus (COVID-19) outbreak: How can the Internet of Things (IoT) help to save the world? Health Policy and Technology 2020;9:136-8. https://doi.org/10.1016/j.hlpt.2020.04.005.

[81] Jayachitra VP, Nivetha S, Nivetha R, Harini R. A cognitive IoT-based framework for effective diagnosis of COVID-19 using multimodal data. Biomedical Signal Processing and Control 2021;70:102960. https://doi.org/10.1016/j.bspc.2021.102960.

[82] Barnawi A, Chhikara P, Tekchandani R, Kumar N, Alzahrani B. Artificial intelligence-enabled Internet of Things-based system for COVID-19 screening using aerial thermal imaging. Future Generation Computer Systems 2021;124:119-32. https://doi.org/10.1016/j.future.2021.05.019.

[83] Singh RP, Javaid M, Haleem A, Suman R. Internet of things (IoT) applications to fight against COVID-19 pandemic. Diabetes & Metabolic Syndrome: Clinical Research & Reviews 2020;14:521-4. https://doi.org/10.1016/j.dsx.2020.04.041.

[84] Otoom M, Otoum N, Alzubaidi MA, Etoom Y, Banihani R. An IoT-based framework for early identification and monitoring of COVID-19 cases. Biomedical Signal Processing and Control 2020;62:102149. https://doi.org/10.1016/j.bspc.2020.102149.

[85] Aghdam ZN, Rahmani AM, Hosseinzadeh M. The Role of the Internet of Things in Healthcare: Future Trends and Challenges. Computer Methods and Programs in Biomedicine 2021;199:105903. https://doi.org/10.1016/j.cmpb.2020.105903.

[86] Romero-Carazas R. The beginning of a new Scientific Accounting era. Revista Científica Empresarial Debe-Haber 2023;1:1-2.

[87] Haghi Kashani M, Madanipour M, Nikravan M, Asghari P, Mahdipour E. A systematic review of IoT in healthcare: Applications, techniques, and trends. Journal of Network and Computer Applications 2021;192:103164. https://doi.org/10.1016/j.jnca.2021.103164.

[88] Rejeb A, Rejeb K, Treiblmaier H, Appolloni A, Alghamdi S, Alhasawi Y, et al. The Internet of Things (IoT) in healthcare: Taking stock and moving forward. Internet of Things 2023;22:100721. https://doi.org/10.1016/j.iot.2023.100721.

[89] Castillo-Gonzalez W, Lepez CO, Bonardi MC. Augmented reality and environmental education: strategy for greater awareness. Gamification and Augmented Reality 2023;1:10–10. https://doi.org/10.56294/gr202310.

[90] Gonzalez-Argote D, Gonzalez-Argote J, Machuca-Contreras F. Blockchain in the health sector: a systematic literature review of success cases. Gamification and Augmented Reality 2023;1:6–6. https://doi.org/10.56294/gr20236.

[91] Sotomayor YR, Fernández AP, Abascal IEC, Rodríguez HMV. Integrative workshops for the reconciliation of work and family life as a quality factor in dental services. Health Leadership and Quality of Life 2023;2:40–40. https://doi.org/10.56294/hl202340.

[92] Rathi VK, Rajput NK, Mishra S, Grover BA, Tiwari P, Jaiswal AK, et al. An edge AI-enabled IoT healthcare monitoring system for smart cities. Computers & Electrical Engineering 2021;96:107524. https://doi.org/10.1016/j.compeleceng.2021.107524.

[93] Fouad H, Hassanein AS, Soliman AM, Al-Feel H. Analyzing patient health information based on IoT sensor with AI for improving patient assistance in the future direction. Measurement 2020;159:107757. https://doi.org/10.1016/j.measurement.2020.107757.

[94] Calvillo-Arbizu J, Román-Martínez I, Reina-Tosina J. Internet of things in health: Requirements, issues, and gaps. Computer Methods and Programs in Biomedicine 2021;208:106231. https://doi.org/10.1016/j.cmpb.2021.106231.

[95] Canova-Barrios C, Machuca-Contreras F. Interoperability standards in Health Information Systems: systematic review. Seminars in Medical Writing and Education 2022;1:7-7. https://doi.org/10.56294/mw20227.

[96] Swayamsiddha S, Mohanty C. Application of cognitive Internet of Medical Things for COVID-19 pandemic. Diabetes & Metabolic Syndrome: Clinical Research & Reviews 2020;14:911-5. https://doi.org/10.1016/j.dsx.2020.06.014.

[97] Sadoughi F, Behmanesh A, Sayfouri N. Internet of things in medicine: A systematic mapping study. Journal of Biomedical Informatics 2020;103:103383. https://doi.org/10.1016/j.jbi.2020.103383.

[98] Al-Turjman F, Nawaz MH, Ulusar UD. Intelligence in the Internet of Medical Things era: A systematic review of current and future trends. Computer Communications 2020;150:644-60. https://doi.org/10.1016/j.comcom.2019.12.030.

[99] Aveiro-Róbalo TR, Pérez-Del-Vallín V. Gamification for well-being: applications for health and fitness. Gamification and Augmented Reality 2023;1:16–16. https://doi.org/10.56294/gr202316.

[100] Barrios CJC, Hereñú MP, Francisco SM. Augmented reality for surgical skills training, update on the topic. Gamification and Augmented Reality 2023;1:8–8. https://doi.org/10.56294/gr20238.

[101] Canova-Barrios C, Machuca-Contreras F. Interoperability standards in Health Information Systems: systematic review. Seminars in Medical Writing and Education 2022;1:7–7. https://doi.org/10.56294/mw20227.

[102] Castillo JIR. Aumented reality im surgery: improving precision and reducing ridk. Gamification and Augmented Reality 2023;1:15–15. https://doi.org/10.56294/gr202315.

[103] Inastrilla CRA. Big Data in Health Information Systems. Seminars in Medical Writing and Education 2022;1:6-6. https://doi.org/10.56294/mw20226.

[104] Tartaglia E, Vozzella EA, Iervolino A, Egidio R, Buonocore G, Perrone A, et al. Telemedicine: A cornerstone of healthcare assistance during the SARS-Cov2 pandemic outbreak but also a great opportunity for the near future. Smart Health 2022;26:100324. https://doi.org/10.1016/j.smhl.2022.100324.

[105] Singh PD, Dhiman G, Sharma R. Internet of Things for sustaining a smart and secure healthcare system. Sustainable Computing: Informatics and Systems 2022;33:100622. https://doi.org/10.1016/j.suscom.2021.100622.

[106] Pravin Savaridass M, Ikram N, Deepika R, Aarnika R. Development of smart health monitoring system using Internet of Things. Materials Today: Proceedings 2021;45:986-9. https://doi.org/10.1016/j.matpr.2020.03.046.

[107] Santos MAG, Munoz R, Olivares R, Filho PPR, Ser JD, Albuquerque VHCD. Online heart monitoring systems on the internet of health things environments: A survey, a reference model and an outlook. Information Fusion 2020;53:222-39. https://doi.org/10.1016/j.inffus.2019.06.004.

[108] Alshammari HH. The internet of things healthcare monitoring system based on MQTT protocol. Alexandria Engineering Journal 2023;69:275-87. https://doi.org/10.1016/j.aej.2023.01.065.

[109] Montano M de las NV. Enhancing Pedagogic Practice: A Review of Educational Processes. Seminars in Medical Writing and Education 2023;2:29-29. https://doi.org/10.56294/mw202329.

[110] Coa YMF, Crisostomo NWF, Diaz-Barriga GE. Sustainable economic development under a social regime without ethical and moral precepts: forensic auditing as opposed to corruption. Revista Científica Empresarial Debe-Haber 2023;1:48-62.

[111] Gupta D, Rani S, Raza S, Faseeh Qureshi NM, Mansour RF, Ragab M. Security paradigm for remote health monitoring edge devices in internet of things. Journal of King Saud University - Computer and Information Sciences 2023;35:101478. https://doi.org/10.1016/j.jksuci.2022.12.020.

[112] Famá F, Faria JN, Portugal D. An IoT-based interoperable architecture for wireless biomonitoring of patients with sensor patches. Internet of Things 2022;19:100547. https://doi.org/10.1016/j.iot.2022.100547.

[113] Maddikunta PKR, Pham Q-V, Nguyen DC, Huynh-The T, Aouedi O, Yenduri G, et al. Incentive techniques for the Internet of Things: A survey. Journal of Network and Computer Applications 2022;206:103464. https://doi.org/10.1016/j.jnca.2022.103464.

[114] Rodríguez-Martínez C, Alvarez-Solano J, Pérez-Galavís AD, Ron M. Distance education during the COVID-19 pandemic: experience at a public university. Seminars in Medical Writing and Education 2023;2:32-32. https://doi.org/10.56294/mw202332.

[115] Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM. How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research 2021;133:285-96. https://doi.org/10.1016/j.jbusres.2021.04.070.

[116] Silva Júnior EMD, Dutra ML. A roadmap toward the automatic composition of systematic literature reviews. Iberoamerican Journal of Science Measurement and Communication 2021;1:1-22. https://doi.org/10.47909/ijsmc.52.

[117] Vidal AAR de C. Modeling and analysis of the behavior of the variable: Electric Power Generation, in the Peruvian electric sector using the Box and Jenkins methodology, for the prediction of this resource. Syncretism 2020;1.

[118] Shettar I, Hadagali GS, Timanaykar R. Scientometric mapping of global publications on pulmonary embolism in Covid-19 research. Iberoamerican Journal of Science Measurement and Communication 2023;3. https://doi.org/10.47909/ijsmc.524.

[119] Linnenluecke MK, Marrone M, Singh AK. Conducting systematic literature reviews and bibliometric analyses. Australian Journal of Management 2020;45:175-94. https://doi.org/10.1177/0312896219877678.

[120] Diaz-de La Rosa C, Jiménez-Franco LE, Toledo Del Llano R, Vega-Cardulis E, Cardulis-Cárdenas O. Trends, collaboration and impact of Latin American scientific production in anesthesiology and pain medicine in Scopus and Web of Science. Data Metadata 2022;1:13. https://doi.org/10.56294/dm202213.

[121] Ledesma F, Malave González BE. Patterns of scientific communication on E-commerce: a bibliometric study in the Scopus database. Reg Cient 2022:202214. https://doi.org/10.58763/rc202214.

[122] Asencios-Trujillo L, Asencios-Trujillo L, Rosa-Longobardi CL, Gallegos-Espinoza D, Piñas-Rivera L. Level of resilience in nursing students doing their pre-professional internships at a university in northern Lima. Health Leadership and Quality of Life 2023;2:29–29. https://doi.org/10.56294/hl202329.

[123] Auza-Santiváñez JC, Díaz JAC, Cruz OAV, Robles-Nina SM, Escalante CS, Huanca BA. Bibliometric Analysis of the Worldwide Scholarly Output on Artificial Intelligence in Scopus. Gamification and Augmented Reality 2023;1:11–11. https://doi.org/10.56294/gr202311.

[124] Albino De Queiroz D, André Da Costa C, Aparecida Isquierdo Fonseca De Queiroz E, Folchini Da Silveira E, Da Rosa Righi R. Internet of Things in active cancer Treatment: A systematic review. Journal of Biomedical Informatics 2021;118:103814. https://doi.org/10.1016/j.jbi.2021.103814.

[125] Coimbra FS, Dias TMR. A process for the identification and analysis of scientific articles in conference proceedings. In: Rodrigues Dias TM, editor. Advanced Notes in Information Science, vol. 2, ColNes Publishing; 2022. https://doi.org/10.47909/anis.978-9916-9760-3-6.93.

[126] Murgas Téllez B, Henao-Pérez AA, Guzmán Acuña L. Real Options and their application in renewable energy projects. State-of-the-art review. Reg Cient 2023:202349. https://doi.org/10.58763/rc202349.

[127] Ruiz-Perez I, Petrova D. Scoping reviews. Another way of literature review. Clinical Medicine (English Edition) 2019;153:165-8. https://doi.org/10.1016/j.medcle.2019.02.026.

[128] Wilson C, Jones A, Schick-Makaroff K, Kim ES. Understanding the impact of group therapy on health-related quality of life of people with Aphasia: a scoping review. Speech, Language and Hearing 2023;26:88-101. https://doi.org/10.1080/2050571X.2021.1917216.

[129] Levitt HM, Bamberg M, Creswell JW, Frost DM, Josselson R, Suarez-Orozco C. Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. American Psychologist 2018;73:26-46. https://doi.org/10.1037/amp0000151.

[130] Harrison RL, Reilly TM, Creswell JW. Methodological Rigor in Mixed Methods: An Application in Management Studies. Journal of Mixed Methods Research 2020;14:473-95. https://doi.org/10.1177/1558689819900585.

[131] Pratap Singh R, Javaid M, Haleem A, Vaishya R, Ali S. Internet of Medical Things (IoMT) for orthopaedic in COVID-19 pandemic: Roles, challenges, and applications. Journal of Clinical Orthopaedics and Trauma 2020;11:713-7. https://doi.org/10.1016/j.jcot.2020.05.011.

[132] Alzubi JA. Blockchain-based Lamport Merkle Digital Signature: Authentication tool in IoT healthcare. Computer Communications 2021;170:200-8. https://doi.org/10.1016/j.comcom.2021.02.002.

[133] Elagan SK, Abdelwahab SF, Zanaty EA, Alkinani MH, Alotaibi H, Zanaty MEA. Remote diagnosis and detection of coronavirus disease (COVID-19) system based on intelligent healthcare and internet of things. Results in Physics 2021;22:103910. https://doi.org/10.1016/j.rinp.2021.103910.

[134] Auza-Santiváñez JC, Díaz JAC, Cruz OAV, Robles-Nina SM, Escalante CS, Huanca BA. Interactive formats: considerations for scientific publications. Seminars in Medical Writing and Education 2023;2:27–27. https://doi.org/10.56294/mw202327.

[135] Ali F, El-Sappagh S, Islam SMR, Ali A, Attique M, Imran M, et al. An intelligent healthcare monitoring framework using wearable sensors and social networking data. Future Generation Computer Systems 2021;114:23-43. https://doi.org/10.1016/j.future.2020.07.047.

[136] Auza-Santiváñez JC, Díaz JAC, Cruz OAV, Robles-Nina SM, Escalante CS, Huanca BA. Interactive formats: considerations for scientific publications. Seminars in Medical Writing and Education 2023;2:27-27. https://doi.org/10.56294/mw202327.

[137] Saunders CH, Sierpe A, Von Plessen C, Kennedy AM, Leviton LC, Bernstein SL, et al. Practical thematic analysis: a guide for multidisciplinary health services research teams engaging in qualitative analysis. BMJ 2023:e074256. https://doi.org/10.1136/bmj-2022-074256.

[138] Inastrilla CRA. Data Visualization in the Information Society. Seminars in Medical Writing and Education 2023;2:25-25. https://doi.org/10.56294/mw202325.

[139] Flores-Arocutipa J, Pérez RTC, Jinchuña-Huallpa J. Relationships, impacts and models abstracting from COVID 19, projections for Peru and Moquegua, March-May 2020. Syncretism 2020;1.

[140] Del Carpio F, Chacon AS. Analysis of the magnitude of the seismic waves energy transferred to the foundation of a building. Revista Ingenieria de Construccion 2022;37:131-46. https://doi.org/10.7764/RIC.00022.21.

[141] Romero-Carazas R, Ochoa-Tataje FA, Mori-Rojas G, Vilca-Cáceres VA, Gómez-Cáceres FY, del Carpio-Delgado F, et al. SERVICE QUALITY AND INSTITUTIONAL IMAGE AS PREDICTORS OF CUSTOMER SATISFACTION IN MUNICIPALITIES OF PERU. Journal of Law and Sustainable Development 2023;11. https://doi.org/10.55908/sdgs.v11i5.885.

[142] Florez-Salas JLT, Ramos-Saira EM, Joo-Garcia CE, Ramos-Alave R, Del Carpio-Delgado F, Laura-De La Cruz KM. Safety and Occupational Health Management System in Mining to Reduce Fatal Accidents in the Mining Industry. Smart Innovation, Systems and Technologies 2023;366:57-67. https://doi.org/10.1007/978-981-99-5414-8_7.

[143] Yarin A, Prado J, Pozo A, Carpiol FD, Patricio S, Surichaqui B. Quality Management and Customer Satisfaction in SMEs in the Textile Industry. Journal of Textile and Apparel, Technology and Management 2023;12.

[144] Ramón-Bautista MG, Lopez-Condeña WG, Romero-Carazas R, Valero-Ancco VN, Espíritu-Martínez AP, Chávez-Choque ME. COMPETENCY-BASED LEARNING ASSESSMENT IN ELEMENTARY SCHOOL STUDENTS: A BIBLIOMETRIC ANALYSIS. Libraries, Annals of Research 2023;19.

[145] Mamani-Jilaja D, Huayanca-Medina PC, Casa-Coila MD, Vilca-Apaza H-M, Romero-Carazas R. Bibliometric analysis of scientific production in collective sports. Retos 2023;49:853–61. https://doi.org/10.47197/RETOS.V49.99002.

[146] Ruiz-Mori I, Romero-Carazas R, Espíritu-Martínez AP, Mamani-Jilaja D, Valero-Ancco VN, Flores-Chambilla SG. BIBLIOMETRIC ANALYSIS OF SCIENTIFIC PRODUCTION ON DIGITAL COMPETENCE AND DIGITAL DIVIDE. Libraries, Annals of Research 2023;19:1-11.