Mapping the Structure and Thematic Landscape of Latin American Engineering Journals Indexed in SciELO and Scopus

Mapeo de la estructura y el panorama temático de las revistas latinoamericanas de ingeniería indexadas en SciELO y Scopus

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**Abstract**

This study presents a comprehensive bibliometric and network-based analysis of engineering journals edited in Latin America that are indexed in SciELO and Scopus. The objective is to explore the structural, thematic, and citation-based interrelationships that shape the regional engineering research landscape. First, a cross-correlation map of Scopus subject areas is used to assess the disciplinary scope of the journals. Performance indicators for authors, institutions, countries, and journals are then examined to identify leading contributors and research hubs. Author keywords are analyzed to uncover thematic trends and terminological consistency. Inter-journal relationships are further investigated through a keyword-based correlation map, highlighting thematic proximity. Additionally, a citation network reveals direct referencing behaviors, while co-citation and bibliographic coupling networks offer insights into intellectual linkages across the journal set. Finally, a co-occurrence analysis of author keywords identifies dominant research themes and emerging clusters. The results provide a multidimensional understanding of Latin America’s engineering journals, emphasizing their role in regional scientific development, thematic specialization, and integration within the global scholarly ecosystem.

*Keywords*:.

**Resumen**

Este estudio presenta un análisis bibliométrico y de redes aplicado a revistas de ingeniería editadas en América Latina que se encuentran indexadas simultáneamente en SciELO y Scopus. El objetivo es explorar las interrelaciones estructurales, temáticas y de citación que configuran el panorama regional de la investigación en ingeniería. En primer lugar, se utiliza un mapa de correlación cruzada de las áreas temáticas de Scopus para evaluar el alcance disciplinar de las revistas. Luego, se analizan indicadores de desempeño de autores, instituciones, países y revistas para identificar los principales actores y núcleos de investigación. También se examinan las palabras clave de los autores con el fin de detectar tendencias temáticas y consistencia terminológica. Las relaciones entre revistas se exploran mediante un mapa de correlación basado en palabras clave compartidas, lo cual permite identificar proximidad temática. Adicionalmente, se analiza la red de citación directa entre revistas, así como las redes de co-citación y acoplamiento bibliográfico para revelar vínculos intelectuales. Finalmente, el análisis de coocurrencia de palabras clave permite identificar los temas dominantes y clústeres emergentes. Los resultados ofrecen una visión multidimensional de las revistas latinoamericanas de ingeniería, destacando su papel en el desarrollo científico regional, la especialización temática y su integración en el ecosistema científico global.

*Palabras clave*:.

# Introduction

The Scientific Electronic Library Online (SciELO) is a cooperative open-access publishing platform launched in 1998 to enhance the visibility, accessibility, and quality of scientific journals from Latin America and other regions in the Global South (Packer et al., 1998; Gómez et al., 2014). Developed by BIREME/PAHO and FAPESP, SciELO provides a robust infrastructure for indexing, publishing, and disseminating peer-reviewed scholarly content, strongly emphasizing regional integration and multilingual dissemination (Meneghini et al., 2006). It is vital to democratize access to scientific knowledge, particularly for researchers, institutions, and countries often underrepresented in mainstream citation databases like Web of Science and Scopus. Today, SciELO includes over a thousand journals across disciplines and has become a strategic platform for fostering scientific communication in Latin America. Its alignment with global indexing standards has increased international visibility, with many SciELO journals now also indexed in Scopus (Collazo-Reyes, 2014). Understanding the interrelationships between these journals offers valuable insights into regional collaboration, thematic specialization, and knowledge flows within and beyond Latin America.

Despite the recognized importance of SciELO in promoting regional scientific visibility, there is limited comprehensive research on the structural and thematic interrelationships among Latin American journals indexed simultaneously in SciELO and Scopus, particularly in engineering. This study aims to fill that gap by offering an in-depth bibliometric and network-based analysis of engineering journals edited in Latin America and appearing in both databases. The analysis begins by examining the disciplinary breadth of these journals through a cross-correlation map of Scopus subject areas assigned at the journal level, highlighting the distribution and overlap of thematic fields. Fundamental performance indicators—such as publication volume and citation impact—are assessed for authors, institutions, countries, and journals to identify leading contributors. Furthermore, author keywords are analyzed to explore thematic patterns and terminological consistency. A correlation map based on shared author keywords studies the interrelation among journals, where stronger connections imply higher thematic similarity. In addition, a citation network reveals the direct referencing structure among journals, while co-citation and bibliographic coupling analyses uncover indirect intellectual linkages. Finally, a co-occurrence network of author keywords is used to identify dominant research themes and conceptual clusters within the engineering literature. Together, these analyses provide a multidimensional view of the structure, dynamics, and thematic orientation of engineering research in Latin America, offering valuable insights into regional integration, collaboration, and visibility in the global scientific landscape.

The rest of this paper is organized as follows: Section 2 discusses the methodology used. Section 3 presents the results. Section 4 discusses the findings. Finally, Section 5 presents the conclusions.

# Materials and Methods

This section outlines and examines the standard workflow commonly employed in literature analysis and tech-mining studies, which also serves as the methodological foundation of this paper. This process has been widely discussed in the research literature, including by Aria and Cuccurullo (2017), Donthu et al. (2021), and Page et al. (2021). The adopted methodology comprises four key stages:

1. Design of the study.

2. Collection and preparation of data.

3. Analysis of the data.

4. Interpretation of the findings.

## Design of the Study

The study's parameters are presented below, following the literature review criteria established by Kitchenham (2004). Scopus was used as the bibliographic database to retrieve information on engineering journals indexed in SciELO, aligning with the study's objective of analyzing SciELO-indexed engineering journals. The search strategy consisted of listing the ISSNs of the relevant journals from SciELO and using them to perform targeted searches within Scopus. The study parameters are:

* Database: Scopus.
* Years of analysis: From Jan 2015 to Dec 2024.
* Data retrieval: Feb 3, 2025.
* Search string: The search operator ISSN() was used to retrieve the information of each engineering journal indexed in SciELO from Scopus.
* Inclusion criteria: None.
* Exclusion criteria: Documents whose abstracts are not written in English.

The exclusion criterion was established based on two primary considerations. First, most abstracts in the dataset are written in English, making it the dominant language of scholarly communication in the selected journals. Second, the text processing tools employed in this study are configured to analyze English-language content, ensuring consistency and accuracy in the analysis. As a result, documents with abstracts written in other languages were excluded from the dataset.

**Fig. 1** presents the PRISMA flow chart. During the identification phase, the search string returned 29,499 documents. A time restriction was applied in the screening phase, excluding 12,849 papers published before 2015 or in 2025. The eligibility phase involved reviewing the titles and abstracts of the remaining 16,603 documents published between 2015 and 2024, excluding 1,307 papers. Consequently, the final dataset consists of 15,286 documents.

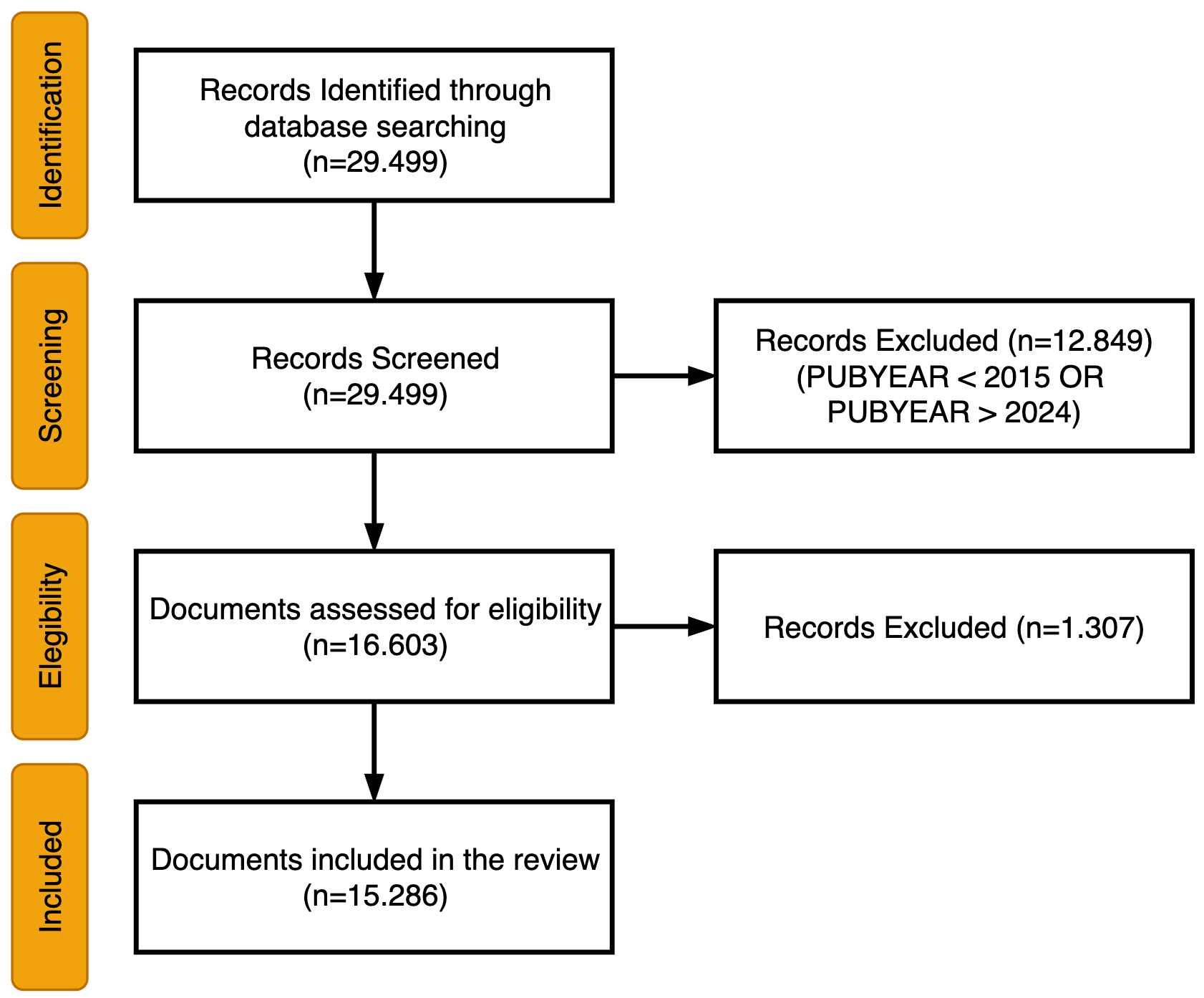


Figure 1. The PRISMA flow chart

Source: The authors.

## Collection and preparation of data

Following widely accepted practices in the literature, all bibliographic data were downloaded from Scopus in CSV format for analysis (Donthu et al., 2021; Page et al., 2021). The downloaded dataset includes document titles, abstracts, author keywords, index keywords, authors, affiliations, source titles, and bibliographic references.

Data processing combined automated procedures with manual refinements to ensure consistency and quality. The cleaning process applied to the raw author keywords included:

* Converting all text to uppercase.
* Translating British spelling to American variants.
* Removing multiple consecutive spaces within strings.
* Standardizing the formatting of hyphenated words.

This preprocessing step was essential to ensure accurate grouping and analysis of keywords in the subsequent stages. Author keywords were used directly for thematic exploration, reflecting the terminology and concepts prioritized by the authors themselves. Identifying dominant themes based on cleaned author keywords supports a multifaceted analysis of the engineering papers published in SciELO, as detailed in the following section.

## Analysis of the data

Various analyses were conducted to understand better the papers published in engineering journals indexed in SciELO. The following sections detail each analysis's specific procedures and findings.

## Interpretation of the findings

The interpretation phase focused on reviewing and synthesizing the results obtained from the various analyses. Patterns, trends, and thematic clusters identified during the data analysis phase were examined to derive meaningful conclusions aligned with the study's objectives. This step involved contextualizing the findings within the broader research landscape and ensuring consistency between the results and the study’s research questions.

# Results and Discussion

This section presents the fundamental bibliometric indicators of the analyzed dataset.

## General Metrics

The dataset includes scientific publications from January 2015 to December 2024, totaling 15,286 documents and reflecting an annual growth rate of 28.05%. The average document age is 5.77 years, with each work receiving approximately 4.11 citations overall, or 0.41 citations per year. Publications originate from 37 different sources, averaging 413.14 documents per source. The dataset comprises 14,822 journal articles, 35 conference papers, 21 editorials, two errata, one letter to the editor, and 402 review papers. A total of 40,773 authors (1,609 unique) contributed to the publications, with a strong tendency toward collaboration—averaging 3.61 authors and 3.92 co-authors per document. International collaborations account for 18.84% of the dataset. The contributing authors are affiliated with 10,687 organizations across 127 countries.

## Leading Scopus Subject Areas

This section analyzes the subject areas assigned by Scopus, which are attributed at the journal level rather than to individual articles. These classifications help identify the disciplinary focus of the research published in SciELO-indexed engineering journals. The dataset used in this study comprises 15,286 documents, which are distributed across 18 of Scopus's 27 subject areas. Notably, eight subject areas are associated with 1,000 or more documents. The most prominent areas are:

* Engineering: 7,257 documents (as anticipated).
* Materials Science: 2,664 documents.
* Computer Science: 1,884 papers.
* Chemical Engineering: 1,629 documents.
* General: 1,609 documents.
* Agricultural and Biological Sciences: 1,401 papers.
* Environmental Science: 1,263 documents.
* Business, Management, and Accounting: 1,017 papers.

**Fig. 2** displays a cross-correlation map between Scopus subject areas and SciELO journals. This visualization provides insight into the interconnections between journals based on their associated subject areas. The numbers alongside each subject area indicate the corresponding documents and citations. Links between nodes reflect the degree of similarity, while node size is proportional to the number of documents associated with each subject area.

The correlation map reveals a strong central cluster of subject areas closely related to Engineering and its subfields (including “Material Science,” “Computer Science,” and “Energy”). In addition, several other groups of nodes emerge that exhibit strong internal correlations but relatively weak connections to the engineering core. These include:

* “Social Sciences,” which appears as an isolated node.
* “Physics and Astronomy” and “Mathematics” form a distinct cluster.
* A group consisting of “Medicine,” “Immunology and Microbiology,” “Biochemistry, Genetics and Molecular Biology,” and “Environmental Science,” which are closely interrelated but show limited overlap with engineering disciplines.

## Basic Performance Metrics

### Authors

**Table 1** presents the 20 most frequent authors publishing in engineering journals indexed in SciELO between 2015 and 2024, including the number of papers, citations received within SciELO, total publications indexed in Scopus, and the ratio of SciELO to Scopus publications. This ratio provides insight into each author's publication preferences and engagement with the SciELO platform relative to the broader Scopus-indexed literature.

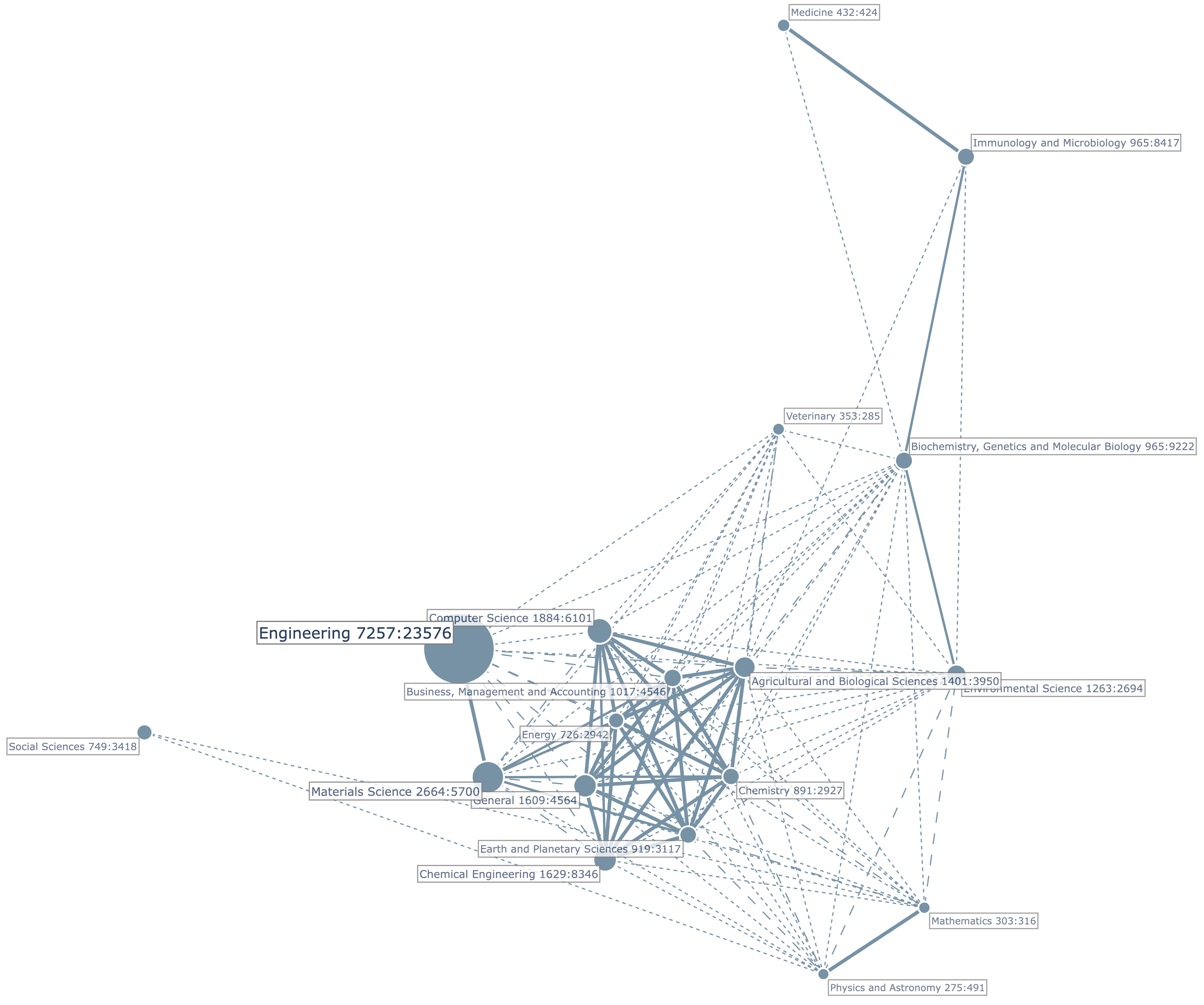


Figure 2. Correlation map of Scopus Subject Areas crossed with engineering SciELO journals.

Source: The authors.

Among the authors, Ganga-Contreras F.A. leads with 39 publications in SciELO, accounting for 25.4% of their total output in Scopus, followed closely by Pedraja-Rejas, L.M. and Campos-Aranda D.F., both with 37 papers. Notably, Campos-Aranda D.F. shows a very high SciELO/Scopus ratio of 86.0%, suggesting a strong focus on SciELO as their primary publication venue. Similarly, Severino-González P. and Acevedo-Correa D. also exhibit high ratios (59.0% and 57.9%, respectively), indicating a substantial portion of their research is disseminated through SciELO journals.

In contrast, authors such as Gelbukh A. and Valencia-Arias A. have a much lower ratio (11.5% and 11.8%, respectively), suggesting a broader or more international publication strategy favoring Scopus journals outside SciELO. Despite this, they maintain a notable presence in SciELO and receive many citations.

Authors like Bustamante-Ubilla M.A. (52.4%) and Castrillón O.D. (60.6%) also strongly engage with SciELO relative to their total output. In contrast, others such as Preciado-Rangel, P. and Escobar D.A. have lower ratios but remain among the most frequent contributors.

### Organizations

**Table 2** lists the ten most frequent institutions contributing to engineering journals indexed in SciELO between 2015 and 2024. These institutions are ranked based on their total number of publications in the dataset. Two citation metrics are included: Global citations, which refer to the total number of citations recorded in Scopus, and Local citations, which count citations made between documents within the analyzed database.

Out of 10,687 unique organizations represented in the dataset (and 4,956 as first-author affiliations), these top 10 institutions account for a significant proportion of the overall scientific output. The Universidad Nacional de Colombia (COL) leads with 829 papers, followed by Instituto Politécnico Nacional (MEX) with 602, and Universidad de Antioquia (COL) with 353 publications. These three institutions alone contribute over 11% of all documents analyzed, highlighting their central role in SciELO’s engineering research landscape.

Regarding global impact, measured by Scopus citations, the Universidad Nacional de Colombia again stands out with 3,754 citations, the highest among all institutions, suggesting strong visibility and influence beyond the local database. Instituto Politécnico Nacional also shows a high global citation count (2,342), while other institutions, such as Universidad Nacional Autónoma de México and Universidad del Valle, maintain solid performance with over 900 citations each.

Table 1.

Most Frequent Authors.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Author Name | Papers  SciELO | Citations  Scielo | Papers  Scopus | Ratio |
| Ganga-Contreras F.A. | 39 | 182 | 153 | 25.4 % |
| Pedraja-Rejas, L.M. | 37 | 240 | 108 | 34.3 % |
| Campos-Aranda D.F. | 37 | 64 | 43 | 86.0 % |
| Severino-González P. | 36 | 221 | 61 | 59.0 % |
| Gelbukh A. | 33 | 219 | 287 | 11.5 % |
| Acevedo-Correa D. | 33 | 164 | 57 | 57.9 % |
| López-Lezama J.M. | 30 | 177 | 131 | 22.9 % |
| Vidal-Silva C.L. | 29 | 152 | 88 | 33.0 % |
| Valencia-Arias A. | 28 | 178 | 237 | 11.8 % |
| Muñoz-Galeano, N. | 27 | 148 | 85 | 31.8 % |
| Rodríguez-Ponce E.R. | 26 | 185 | 87 | 29.9 % |
| Ortega-Toro R. | 26 | 157 | 96 | 27.1 % |
| Dávila-Morán, R.C. | 25 | 21 | 84 | 29.8 % |
| Preciado-Rangel, P. | 24 | 63 | 118 | 20.3 % |
| Escobar D.A. | 23 | 86 | 88 | 26.1 % |
| Paz-Pellat F. | 23 | 58 | 44 | 52.3 % |
| Bustamante-Ubilla M.A. | 22 | 117 | 42 | 52.4 % |
| Fontalvo-Herrera, T. | 21 | 167 | 46 | 45.7 % |
| Castrillón O.D. | 20 | 110 | 33 | 60.6 % |
| Zapata J.E. | 20 | 109 | 48 | 41.7 % |

Source: The authors.

Table 2.

Most Frequent Institutions.

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Papers | Global  Citations | Local  Citations |
| Univ Nac de Colombia (COL) | 829 | 3754 | 28 |
| Inst Politec Nac (MEX) | 602 | 2342 | 39 |
| Univ de Antioquia (COL) | 353 | 1406 | 6 |
| Univ Nac Autonoma de Mexico (MEX) | 254 | 1171 | 13 |
| Univ Autonoma Metropolitana (MEX) | 248 | 910 | 18 |
| Univ de Tarapaca (CHL) | 237 | 761 | 4 |
| Tecnol Nac de Mexico (MEX) | 234 | 695 | 7 |
| Univ del Valle (COL) | 232 | 983 | 9 |
| CONICET (ARG) | 192 | 528 | 13 |
| Univ Ind de Santander (COL) | 179 | 656 | 4 |

Source: The authors.

As expected in a diverse and broad dataset, local citations (a proxy for intra-database scholarly exchange) are generally lower. However, Instituto Politécnico Nacional shows a relatively high local citation count (39), suggesting a strong internal connection within the SciELO engineering network. Other institutions, such as Universidad Nacional Autónoma de México (13) and CONICET (ARG) (13), also reflect moderate levels of local scholarly interaction.

The top institutions are geographically concentrated in Colombia and Mexico, with seven out of ten based in these two countries, underscoring their prominent role in regional engineering research. Notably, institutions like Universidad de Tarapacá (CHL) and CONICET (ARG) also contribute significantly, reflecting the broader participation of Latin American countries in SciELO’s engineering publications.

### Countries

**Table 3** highlights the top ten countries contributing to engineering publications in SciELO between 2015 and 2024. Colombia and Mexico lead with 3,524 and 3,452 papers, respectively, accounting for nearly 46% of the total 15,286 documents. While Colombia has the highest output, Mexico shows more vigorous intra-database citation activity, indicating greater local engagement. China ranks third in productivity (2,148 papers) and demonstrates high global visibility through citations but limited local interaction. Other Latin American countries (Chile, Brazil, Ecuador, Peru, Argentina, and Cuba) further emphasize SciELO’s strong regional identity, with Latin America and the Caribbean contributing 11,094 documents, 39,040 global citations, and 506 local citations. Spain also stands out for its citation impact despite fewer publications. Regionally, the Americas dominate with 11,235 documents and 40,220 global citations, followed by Asia (3,237 papers) and Europe (1,922). Subregional analysis confirms that Latin America and the Caribbean are the core of SciELO’s engineering output, while Eastern and Southern Asia show notable participation. Southern Asia, in particular, demonstrates high local citation rates, suggesting active engagement with the SciELO research network. Overall, SciELO serves as a key platform for engineering scholarship, particularly within Latin America, with growing international participation.

Table 3.

Most Frequent Countries.

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Papers | Global  Citations | Local  Citations |
| Colombia | 3,524 | 13,447 | 102 |
| Mexico | 3,452 | 12,408 | 154 |
| China | 2,148 | 6,326 | 59 |
| Chile | 1,265 | 6,100 | 85 |
| Spain | 1,226 | 5,341 | 42 |
| Brazil | 951 | 4,351 | 133 |
| Ecuador | 859 | 1,697 | 8 |
| Peru | 661 | 1,474 | 25 |
| Argentina | 543 | 1,162 | 15 |
| Cuba | 415 | 889 | 8 |

Source: The authors.

### Sources

Table 4 presents the ten most frequent journals in the dataset, drawn from 37 sources, with an average of 413 documents per journal. BOLETIN TECNICO leads with 1,820 papers but shows relatively low citation counts (2,810 global and 12 local), suggesting high productivity but limited impact. In contrast, DYNA, with 1,341 papers, has a much higher global citation count (5,321), indicating greater visibility. COMPT SIST and REV MEX ING QUIMICA also show strong performance, with over 1,000 and 900 papers, respectively, and significant local citations—particularly the latter, which leads in local citations (197), suggesting strong engagement within the SciELO community.

ELECTRON J BIOTECH stands out with the highest global citation count (11,229) despite ranking lower in document volume (593 papers), reflecting a high citation impact per paper. Similarly, J APP RES TECH shows strong citation metrics relative to its output. These results indicate that while some journals focus on volume, others achieve more significant influence through citation impact. Overall, the data reflect a diverse set of publication strategies across journals in SciELO’s engineering collection, with varying balances between productivity and scholarly impact.

Table 4.

Most Frequent Journals.

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Papers | Global  Citations | Local  Citations |
| Boletin Tecnico | 1,820 | 2,810 | 12 |
| DYNA | 1,341 | 5,321 | 45 |
| Comput. Sist. | 1,037 | 3,310 | 100 |
| Rev. Mex. Ing. Quimica | 903 | 5,404 | 197 |
| Inf. Tecnol. | 882 | 3,698 | 7 |
| Interciencia | 871 | 2,342 | 8 |
| Form.Univ. | 701 | 4,205 | 7 |
| Tecnologia Ciencias Agua | 625 | 1,552 | 2 |
| Electron. J. Biotechnol. | 593 | 11,229 | 85 |
| J App Res Tech | 580 | 5,889 | 65 |

Source: The authors.

## Author Keywords Analysis

The analyzed dataset contains 42,141 unique text strings representing the author-assigned keywords. As described in Section 3.2, these raw keywords were subjected to a cleaning procedure to unify different text strings representing the same concept or idea. As a result of this process, 39,450 cleaned author keywords were obtained.

**Fig. 3** presents the six most frequent author keywords per year from 2015 to 2024, based on their occurrence and citation impact, and serves as the basis for analyzing temporal keyword dominance. Early years (2015–2016) featured specialized terms like *social networking*, *bi-level programming*, and *asphaltenes*, reflecting narrower research focuses. From 2017 onward, broader and high-impact terms such as *big data*, *data mining*, and *genetic algorithm* emerged, marking a shift toward digital technologies and computational methods. Keywords like *simulations*, *artificial neural network*, and *optimization* gained prominence with sustained relevance and high global citations. Education-related terms, such as *teaching*, *learning*, and *higher education*, also became more visible, peaking around 2018-2020. More recently, terms like *machine learning*, *deep learning*, and *natural language processing* reflect current AI-driven trends. Post-2020 entries such as *covid19*, *circular economy*, and *digital transformation* indicate responses to global disruptions. In 2023-2024, emerging technologies like the *large language model*, *blockchain*, and *cybersecurity* suggest a forward-looking research agenda. The diversity and evolution of keywords underscore the dynamic nature of engineering research indexed in SciELO, spanning traditional disciplines, applied technologies, and societal challenges.

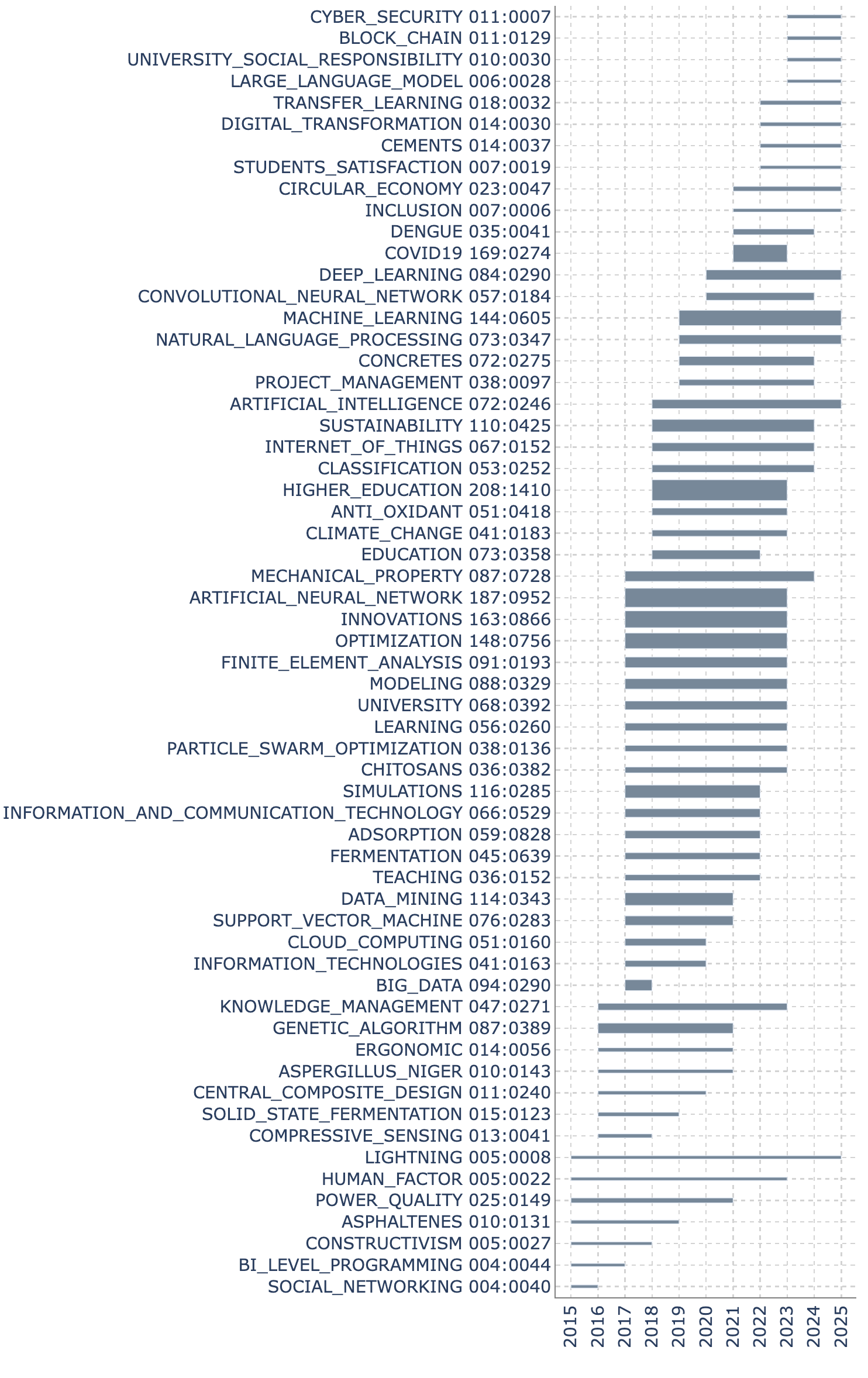


Figure 3. Dominant author keywords per year

Source: The authors.

## Correlation Analysis

**Fig. 4** presents a correlation map of SciELO engineering journals based on the cleaned author keywords used as the cross-variable. The size of each node is proportional to the number of documents published by the corresponding journal. At the same time, the width and intensity of the connecting lines reflect the strength of the cross-correlations between journals. The map reveals a well-defined core of closely interrelated journals actively published in engineering fields. This core includes prominent journals such as DYNA, BOLETIN TECNICO, and COMPUT SIST. In contrast, journals like TERRA LATINOAM and PAP PHYS appear on the periphery of the correlation map, indicating that their thematic focus diverges from the central topics shared by the core journals. The map highlights a strong correlation between ANAL INVEST ARQUIT and ESTOA, suggesting a shared thematic scope or overlapping research interests within a specific subfield.

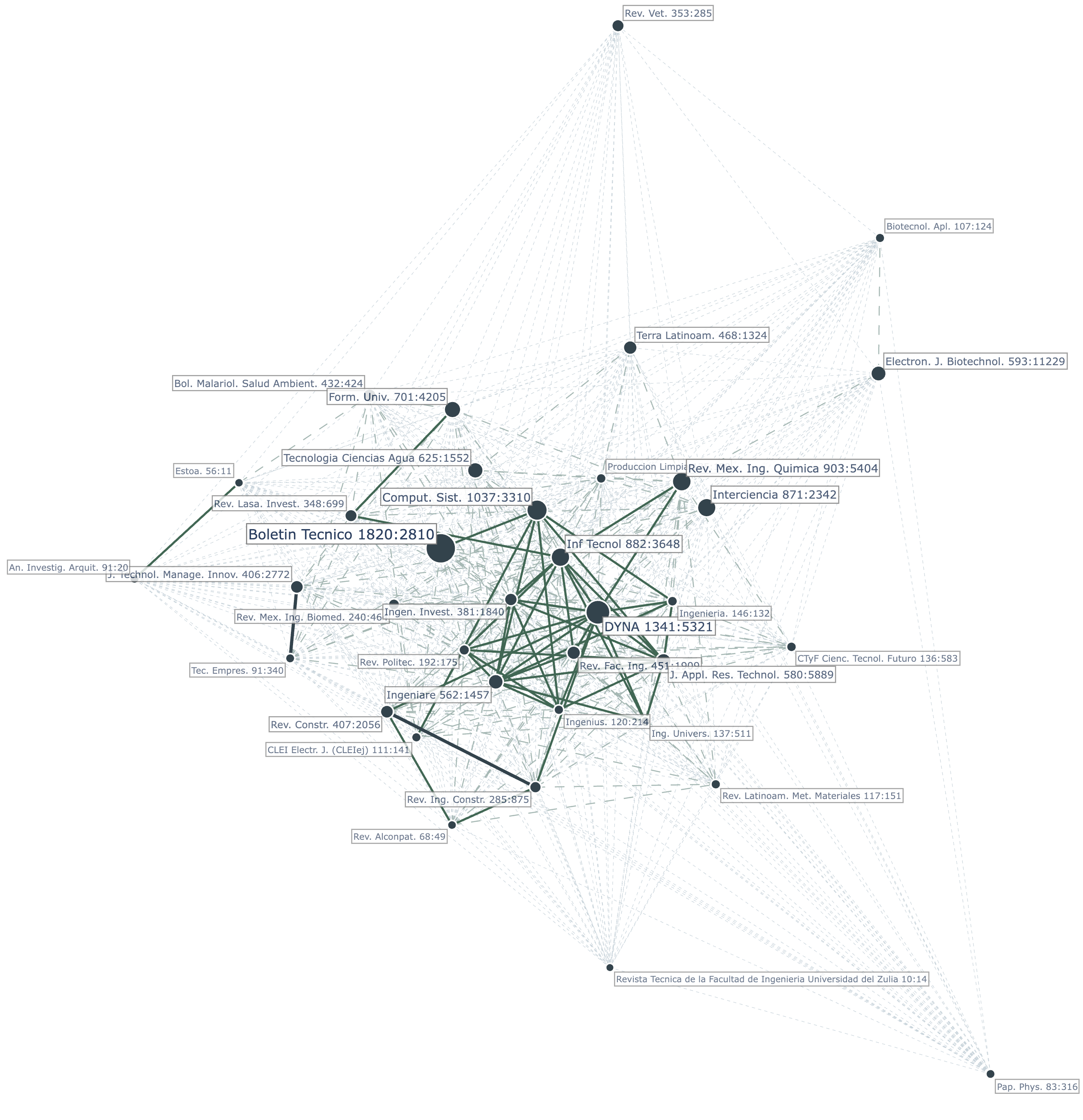


Figure 4. Correlation map of the engineering SciELO journals based on the author keywords.

Source: The authors.

## Network Analysis

### Citation Network

**Fig. 5** presents the citation network of engineering journals indexed in SciELO, clustered using the Louvain algorithm. In bibliometric analysis, a citation network is a graphical representation where nodes correspond to documents (e.g., journals or articles) and edges represent citation links between them. These networks help identify thematic clusters, influential sources, and patterns of knowledge dissemination across disciplines. The Louvain clustering revealed 14 distinct clusters, each grouping journals with stronger internal citation ties. The cluster, most densely populated by grouping 13 sources, includes highly cited journals, such as DYNA, INF TECNOL, and INTERCIENCIA, suggesting this cluster forms the core of SciELO’s engineering literature. These journals exhibit high publication volume and citation impact, indicating centrality in the network. The journals BOL MALARIOL SALUD AMBIENT contain the second central cluster, J TECHNOL MANAGE IINOV, and REV LASA INVEST. REV ING CONSTR, INGENIERIA, and REV ALCONPAT conform to the third most crucial cluster. There are no more essential relationships to highlight among the journals.

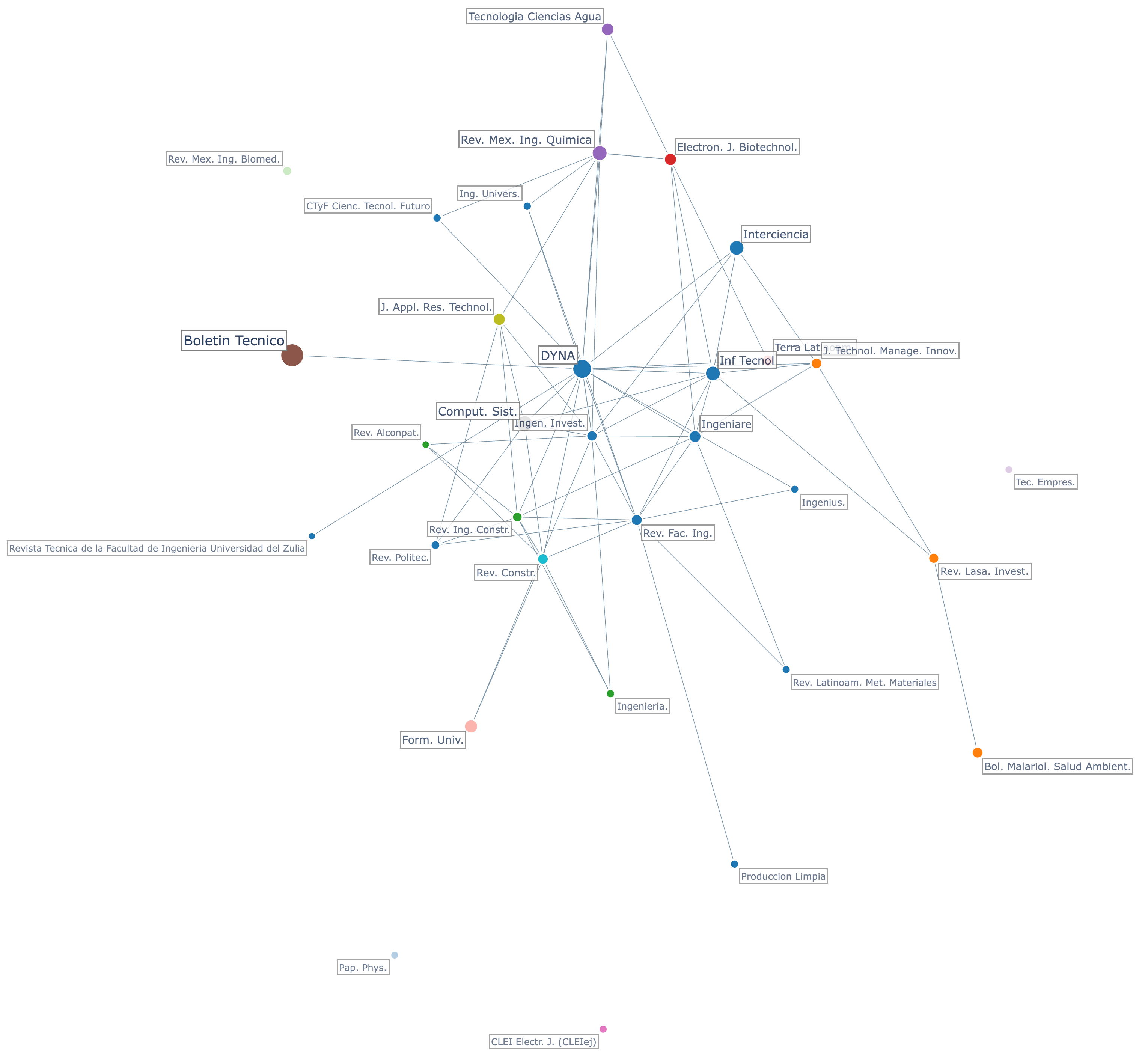


Figure 5. Citation network.

Source: The authors.

### Co-citation Network

The co-citation network (**Fig. 6**), constructed by analyzing only references corresponding to journals in SciELO that are also indexed in Scopus, reveals the intellectual structure underpinning Latin American engineering research. The analysis shows that the network is organized into three distinct clusters, each representing a group of journals frequently cited together, suggesting thematic or disciplinary affinities. The first cluster includes journals such as REV CONSTR, COMPUT SIST, and J APPL RES TECHNOL, focusing on applied engineering, construction, and computing technologies. This cluster reflects interdisciplinary connections within practical and technological domains. The second cluster is centered around REV MEX ING QUIMICA and ELECTRON J BIOTECHNOL, suggesting a strong emphasis on chemical engineering and biotechnology, with CTyF CIENC TECNOL FUTURO contributing additional coverage of scientific and technological development themes. The third comprises DYNA, INGEN INVEST, and ING UNIVERS, three general engineering journals that are among the most prolific in the region. Their co-citation is central to supporting foundational engineering knowledge and cross-cutting topics. The presence of distinct, well-formed clusters reflects the specialization of Latin American engineering journals. At the same time, their internal cohesion suggests the development of stable and recognizable thematic communities within the regional research ecosystem.

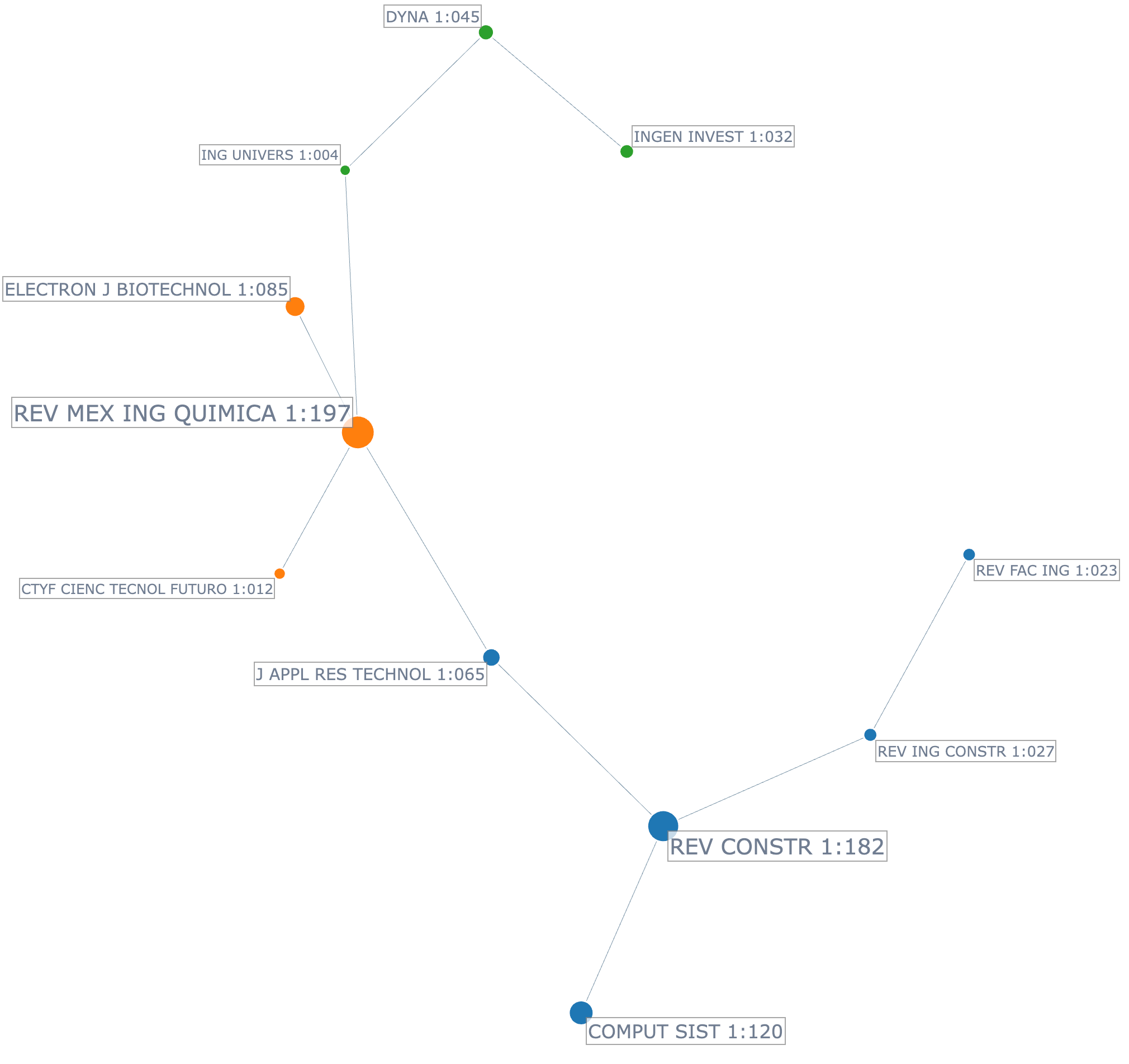


Figure 6. Co-citation network

Source: The authors.

### Coupling

A journal coupling network is a bibliometric structure in which links between journals are established based on the number of shared references they cite. The more two journals cite the same sources, the stronger their coupling relationship. This method reveals similarities in the intellectual base and thematic orientation of journals, regardless of whether they directly cite each other. This study constructed the coupling network using journals indexed in both SciELO and Scopus. The Louvain algorithm identified four clusters, each representing a distinct thematic community based on shared citations.

**Fig. 7** presents the obtained coupling network, which contains four clusters. The first cluster, the largest, includes general and applied engineering journals such as FORM UNIV, J APPL RES TECHNOL, COMPUT SIST, and INGEN INVEST, reflecting a core of publications grounded in multidisciplinary engineering education, technology, and construction. The second cluster features journals like INF TECHNOL, INTERCIENCIA, and REV FAC ING, suggesting a group focused on innovation, institutional research, and technology management. The third cluster brings together journals such as REV MEX ING QUIMICA, ELECTRON J BIOTECHNOL, and TERRA LATINOAM, indicating a strong thematic alignment with chemical engineering, biotechnology, and environmental sciences. The fourth cluster group, comprised of CTYF CIENC TECNOL FUTURO and DYNA, forms a tightly coupled pair, possibly representing a more interdisciplinary or policy-oriented focus. The coupling network reveals clear thematic divisions and shared intellectual foundations among Latin American engineering journals.

### Co-occurrence

Table 5 presents the eight main dominant themes identified in engineering journals indexed in SciELO. These themes were obtained by applying the Louvain algorithm to the co-occurrence network of author keywords. A co-occurrence network is a type of graph in which nodes represent keywords and links are established between keywords that appear together in the same document. The strength of the link increases with the number of co-occurrences, revealing relationships between concepts and helping to uncover thematic structures. For this analysis, only cleaned author keywords with a frequency of five or more occurrences were included, ensuring the focus remained on the most relevant and recurring terms across the dataset. The Louvain algorithm, a widely used community detection method in network analysis, groups densely connected nodes into clusters, allowing for the identification of coherent topics or research areas. Each resulting cluster represents a dominant theme within the SciELO engineering literature. This method offers a data-driven approach to thematic mapping, highlighting the conceptual organization of the field and providing insights into how topics are interlinked across publications.

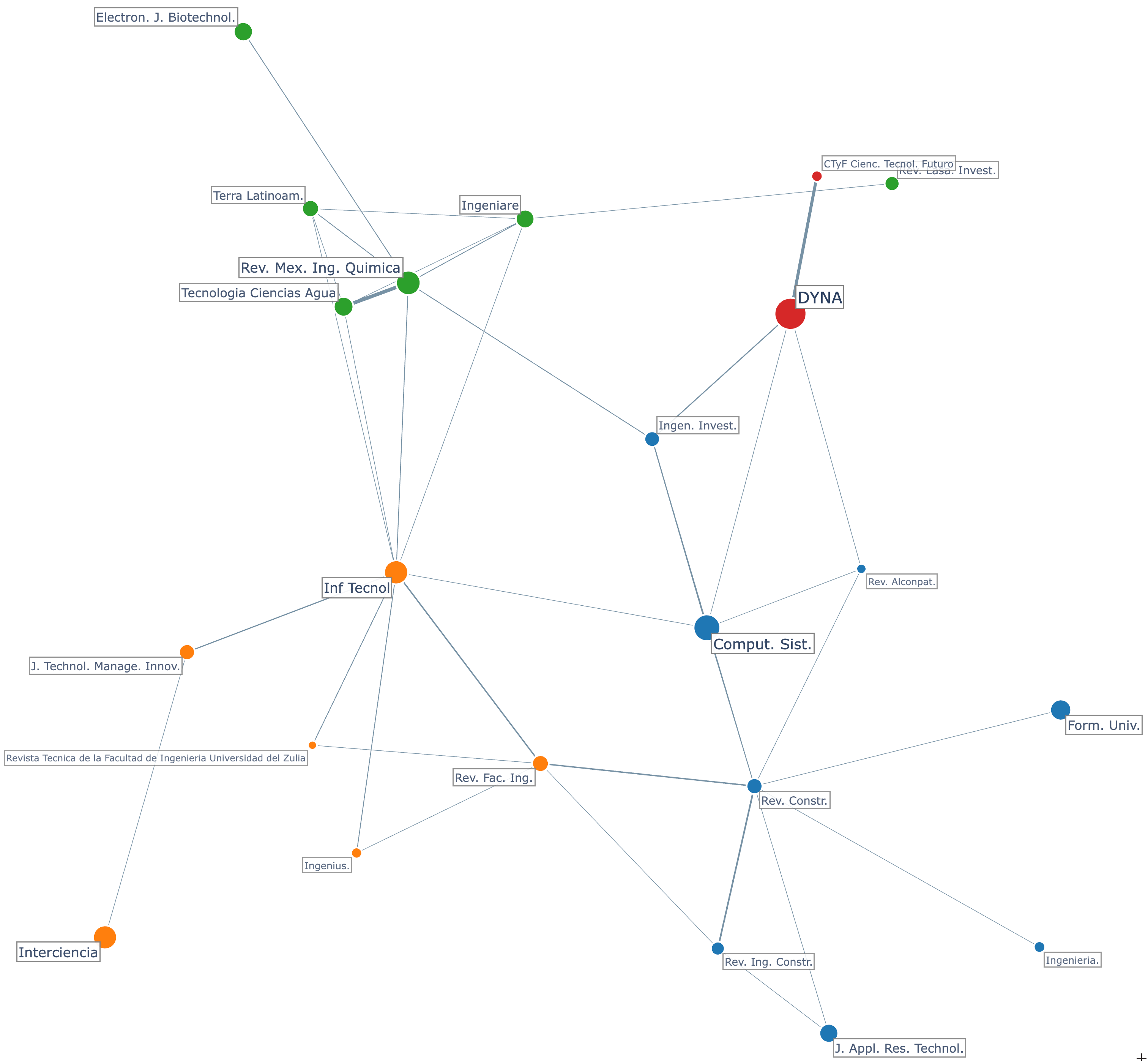


Figure 7. Coupling network.

Source: The authors.

Table 5.

Dominant themes.

|  |  |  |  |
| --- | --- | --- | --- |
| Theme Name | Num Terms | Percentage | Main Terms |
| Bioremediation and bioenergy for environmental sustainability | 478 | 24.8 % | Adsorption; biomass; antioxidant; heavy metals; fermentation; antioxidant activities; wastewater; pollution; biofuel; bio diesel |
| Innovation, ICT, and knowledge management in higher education | 413 | 21.4 % | Higher education; innovations; education; university; information and communication technology; learning; small and medium enterprises; management; university students; knowledge management |
| AI and data-driven technologies | 339 | 17.6 % | Artificial neural network; machine learning; data mining; big data; deep learning; support vector machine; natural language processing; artificial intelligence; internet of things; convolutional neural network |
| Engineering materials and structural analysis | 290 | 15.0 % | Finite element analysis; mechanical property; concretes; computational fluid dynamics; nano particle; compressive strength; numerical simulations; corrosion; chitosan; rheology |
| Climate modeling and risk assessment | 130 | 6.7 % | Simulations; modeling; temperatures; climate change; remote sensing; precipitation; mathematical modeling; risks; accessibility; risks assessment |
| Optimization and intelligent engineering systems | 111 | 5.8 % | Optimization; genetic algorithm; response surface methodology; reliability; micro grid; wireless sensor network; multi objective optimization; power quality; heuristics; production |
| Epidemiology and public health | 103 | 5.3 % | Covid19; dengue; pandemic; risk factors; dogs; prevalence; cattle; epidemiology; stresses; prevention |
| Sustainability, circular economy, and environmental management | 64 | 5.3 % | Sustainability; sustainable development; recycling; circular economy; solar energies; environmental impacts; agriculture; environmental education; solid wastes; costs |

Source: The authors.

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# Conclusions

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