# Bibliometric analysis of scientific production using VOS viewer: Analysis of Al Akhawayn University

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## Abstract

The purpose of this article is to promote researcher agency to use bibliometric analysis for professional development. To achieve this aim, this paper provides an overview of academic research, by conducting a bibliometric review on the Al Akhawayn University in Ifrane (AUI) between 1995 and 2024. With the aid of the VOSviewer software tool, this bibliometric review analysed **2306** Scopus-indexed documents related to AUI. Over 62% are articles, 20% conference papers, 13% book chapters… Benyoussef A. (Morocco), was the most productive researcher (460 articles). Hamedoun (Morocco), El Kenz (Morocco), Msrour (Morocco), Mounkachi (Morocco), Shoup J.A. (AUI, Morocco), Hlil E.K. (France), Bousmina M. (Morocco), Drissi (Morocco), and Bahmad L. (Morocco). Shoup J.A. is the unique permanent researcher among the ten visible in the list. The second permanent Professor Asmae Khaldoun is in the 14th position. Findings indicated that the collaboration is limited, since most papers published involve Moroccan researchers. France, the US, and Canada were the most considered. Saudi Arabia, the founder of Morocco, occupies the 7th rank. The information and data from a bibliometric review may help early-career researchers, postgraduate students, and experienced researchers exercise their agency in framing and strategizing their research trajectories.

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## 1. Introduction

"Bibliometrics" or "bibliometry" are interchangeable terms referring to the quantitative study of publications and publishing patterns. Both use statistical methods to analyze bibliographic data, often focusing on citation counts, publication output, and other metrics to assess research impact and trends (Pritchard, 1969; Ahmed, Biao Huang, 2019). While "bibliometrics" is more commonly used, "bibliometry" is also a valid term for the same field. In other words, bibliometrics helps to analyze publication data to assess research trends, impact, and collaboration networks between authors. It ranks universities, visualizes author collaborations, and understands research patterns. The VOSviewer can make visualizations, such as thematic and collaborative maps, using the obtained clusters to facilitate the interpretation of this data (Effendi *et al.,* 2021; Ech-Chihbi *et al.,* 2022; Bazzi *t al.*, 2023; Bukar *et al.*, 2023; Liu *et al.,* 2025; Hammouti *et al.,* 2025; Kachbou *et al.,* 2025). Search on Scopus of "Bibliometrics" or "bibliometry" indicated more than 36,250 articles, starting with one article in 1978, reaching 6320 in 2024. Key aspects of bibliometrics analysis led to a quantitative analysis of publications gathered from Scopus-indexed journals, such as articles, books, and other scholarly works. Focus on citation counts and patterns: A primary focus is on the number of times a publication is cited and patterns in who cites what, which can indicate the influence and impact of a work. Measuring research output and impact: Bibliometrics provides metrics to assess the productivity of researchers, institutions, and even entire fields of study (González Alcaide & Gorraiz, 2018; Öztürk *et al.,* 2024; Herawan *et al.,* 2024). Applications in various fields: Bibliometrics is used in academia, research institutions, and policy-making to evaluate research, make funding decisions, and assess the value of publications. Emerging role of alternative metrics: Besides traditional citation counts, bibliometrics also incorporates alternative metrics (altmetrics) such as page views, downloads, and social media mentions to gain a more comprehensive understanding of research impact (Singh, 2022).

The interesting bibliometric analysis papers conducted on USMBA, UMI, and UIZ, have incited us to extend our studies to the first private university in Morocco (Salim *et al.,* 2022; Hammouti *et al.,* 2025; Kachbou *et al.,* 2025). This project aims to collect data from Scopus from 1995 to 2024 to realize a bibliometric study on Al Akhawayn University, Ifrane. Data discussed the article number, authors, and their collaboration via VOSviewer mapping.

## 2. Historical Context of Al Akhawayn University in Ifrane (AUI)

### Founding and Vision

Al Akhawayn University in Ifrane (AUI) was officially established in 1995 by a royal decree from King Hassan Il of Morocco, following an agreement between Morocco and Saudi Arabia. The university's

creation was partly funded by a generous donation from King Fahd of Saudi Arabia, and its name, "Al Akhawayn" (Arabic for "The Two Brothers"), symbolizes the strong diplomatic and cultural ties between the two nations (Ennaji, 2005)..

The idea behind AUl was to create a modern, English-language institution modeled after the American liberal arts system, offering a high-quality education that would prepare Moroccan and international students for leadership roles in a globalized world. Unlike traditional Moroccan universities, AUl adopted an innovative, multidisciplinary approach, combining rigorous academics with a strong emphasis on critical thinking, research, and community engagement.

### Early Development and Growth

AUl opened its doors in January 1995 with a small cohort of students and faculty. The university was strategically located in Ifrane, a picturesque city in the Middle Atlas Mountains known for its cool climate and tranquil environment—an ideal setting for an academic institution.

### Academic Expansion and Modernization

By the early 2000s, AUl had expanded its academic offerings beyond its initial programs in Business Administration, Engineering, and Humanities. New schools and departments were introduced, including:

- o   School of Science & Engineering (offering Computer Science, Renewable Energy, and more).
- o   School of Business Administration (with AACSB accreditation).
- o   School of Humanities & Social Sciences (covering International Studies, Communications, and Political Science).

AUl also invested heavily in research centers, such as the Center for African Studies and the Moroccan-American Center for Policy & Economics, reinforcing its role as a hub for academic and policy research in North Africa.

### AUI Today: A Leading Institution in Morocco and Africa

Over the past three decades, AUl has solidified its reputation as one of Morocco's most prestigious universities and a key player in African higher education. Key milestones include:

- o   International Recognition: AUl is one of the few Moroccan universities ranked in global listings, attracting students from across Africa, Europe, and the U.S.
- o   Language Policy: While English is the primary language of instruction, AUl promotes multilingualism, requiring students to learn Arabic and French.

- o Entrepreneurship & Innovation: The university fosters startups through incubators and partnerships with tech companies.
- o Sustainability leadership: Reflecting Ifrane's eco-friendly setting, AUl emphasizes green campus initiatives and renewable energy research.

**Cultural and Architectural Legacy**

Beyond academics, AUl has become a cultural landmark in Morocco. The university's distinctive architecture, featuring green-roofed buildings and stone façades, harmonizes with Ifrane's Alpine-style surroundings, earning it the nickname "Little Switzerland of Morocco." The campus itself serves as an open-air museum, with:

- o The "Agora" Amphitheatre: Hosting international conferences and performances.
- o Islamic Art Installations: Showcasing Moroccan craftsmanship through zellige mosaics and carved cedarwood.
- o Sustainability Showcase: Solar-paneled walkways and wastewater recycling systems align with Morocco's 2030 Green Vision.

## 3. Materials and methods

VOSviewer is a software tool for visualizing bibliometric data, such as co-authorship networks, keyword co-occurrence, and citation networks. This visualization can help analyze research trends, impact, and collaborations, including collaborations between authors and institutions. While VOSviewer doesn't directly rank universities, the data it visualizes can support university ranking methodologies. On May 23rd, 2025, the Scopus database was used for bibliometric analysis using the search terms "Bibliometrics" or "bibliometry." Data were extracted from Scopus using VOSviewer to identify collaborations between authors, countries, organizations, and keywords (van Eck & Waltman, 2010).

## 4. Results and discussion

### 4.1. Evolution and scientific production type and area

The annual scientific production based on 2306 Scopus search results between 1995 and 2024 is depicted in **Figure 1**. It's clear that in the first dozen years of creation, the number of articles didn't exceed 50 per year. In 2024, the production is around 230. The annual percentage growth rate of productivity was calculated to be 14.3 articles/year. The distribution of "document type" of this study indicated that 61.8% are journal articles, while conference papers (19.9%), book chapters (13.0%). The publication of reviews
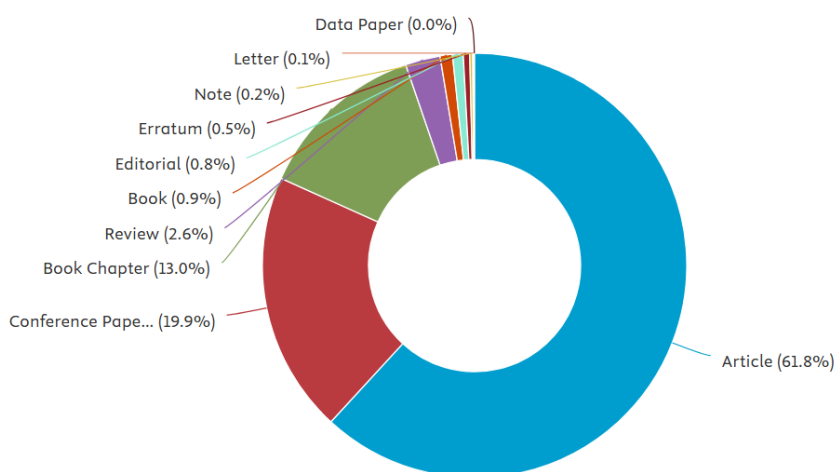
are considered as the most cited documents represented only (2.6%) and <1% are books (**Figure 2**). The journals targeted by researchers, presented in **Figure 3**, converge towards materials sciences, Physics and Engineering such as "Journal of Superconductivity and Novel Magnetism" (Sringer, Journal Impact Factor 1.7 (2023)) and "Journal of Magnetism and Magnetism materials" (Elsevier, Journal Impact Factor 2.5 (2023)). These findings reflected the percentages of documents per area in **Figure 4.** The three domains of Physics & Astronomy, Materials Science and Engineering cover around 40%, and explain the ranking of researchers as shown in **Figures 5 and 6**.
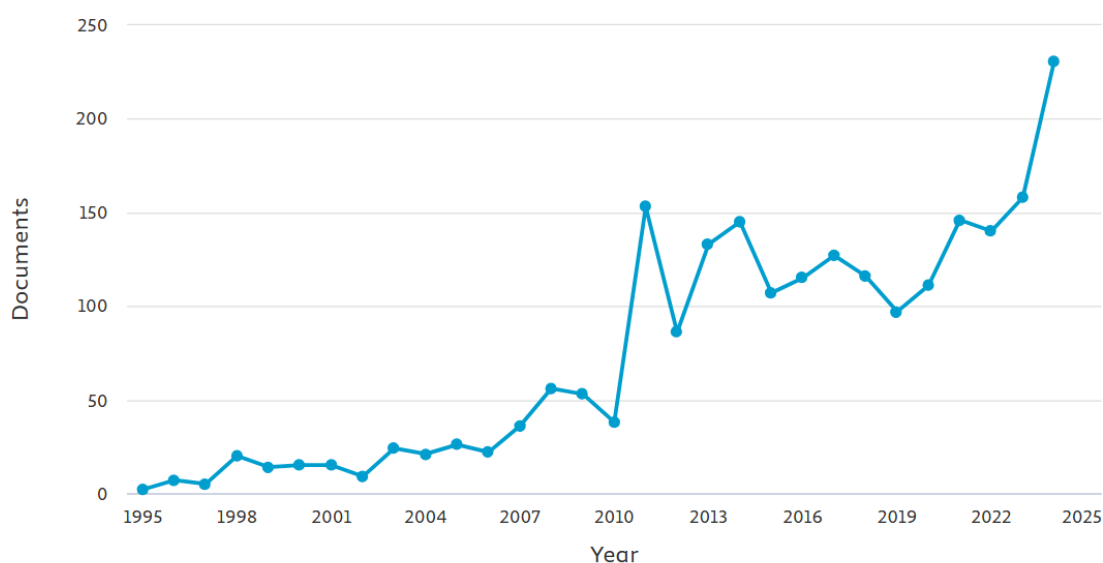


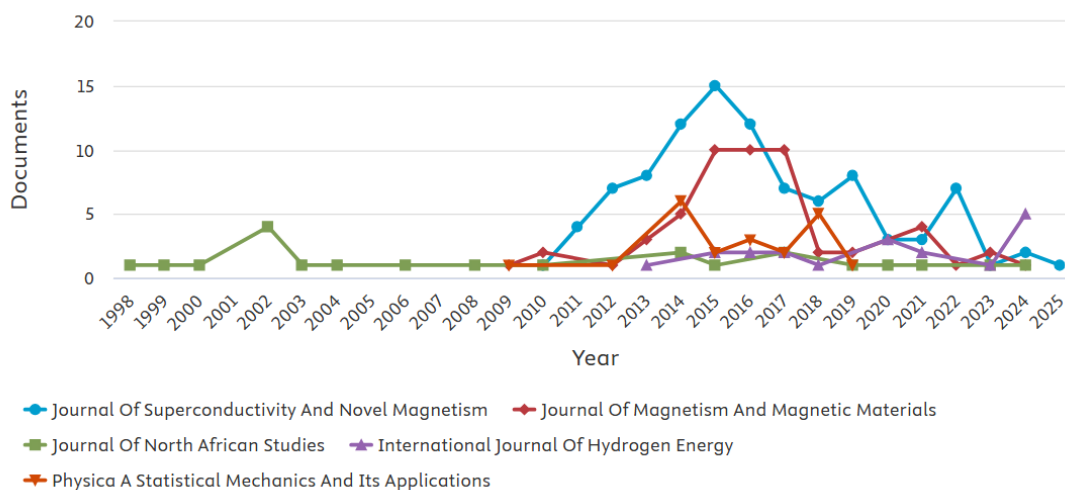**Figure 1.** Evolution of the articles from 1995 to 2024.



**Figure 2.** Type of documents from 1995 to 2024.

## Documents per year by source

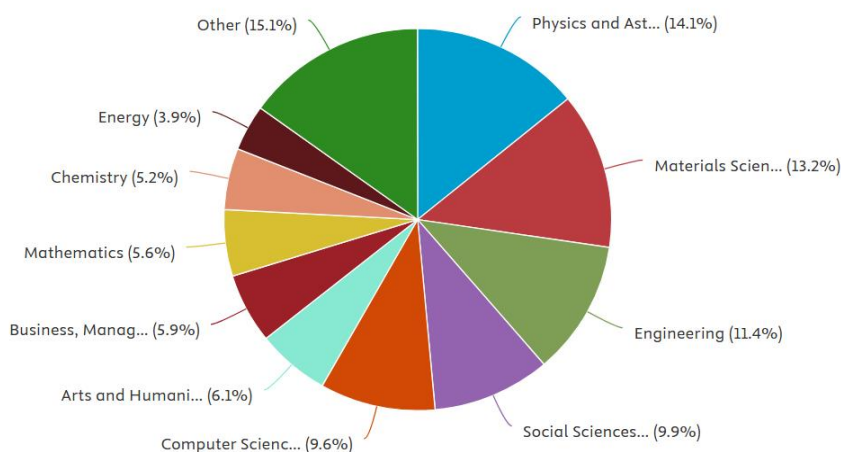Compare the document counts for up to 10 sources.     Compare sources and view CiteScore, SJR, and SNIP data



- Journal Of Superconductivity And Novel Magnetism
- Journal Of Magnetism And Magnetic Materials
- Journal Of North African Studies
- International Journal Of Hydrogen Energy
- Physica A Statistical Mechanics And Its Applications

**Figure 3.** The most journals preferred by researchers

## Documents by subject area



**Figure 4.** Percentages of documents per area

VOS viewer mapping indicated a dominance of Benyoussef as the most prolific in AUI, with two nodes, the purple node of large size, where the majority of articles (370), and the brown one for 91, as shown in **Figure 5abc**. Three different visualizations are used in this research for mapped bibliometric analysis, such as visualization of data network, overlay, and density. The node's size indicates the number of documents by the author, and the thickness of the link between any two authors suggests the strength of the collaboration between the two scholars (Kay *et al.,* 2017; Oyewola *et al.,* 2022; Vaishya *et al.,* 2025). Moreover, **Figure 5c** portrays the density visualization, illustrating the depth of research. The color density in the figure corresponds to the frequency of occurrence of keywords, providing insight
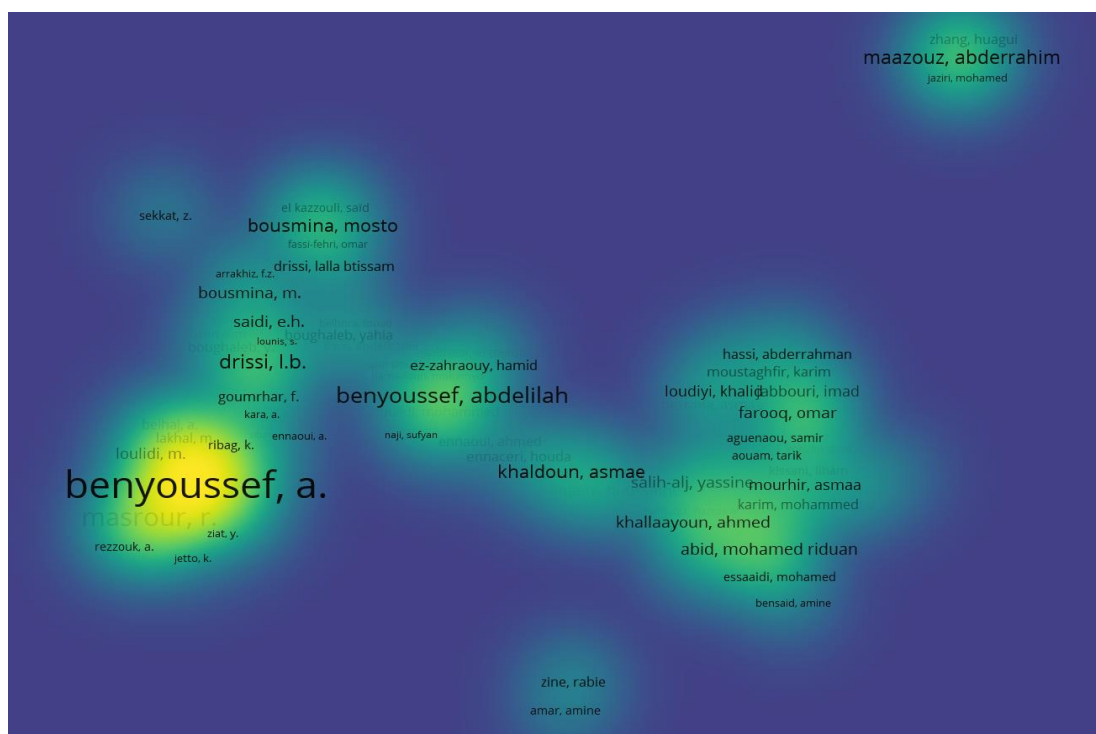
into the intensity of research focus in different areas. The density of the colors shows the high growth of research. **Figure 5c** shows keywords that have less frequent occurrence and less color density.
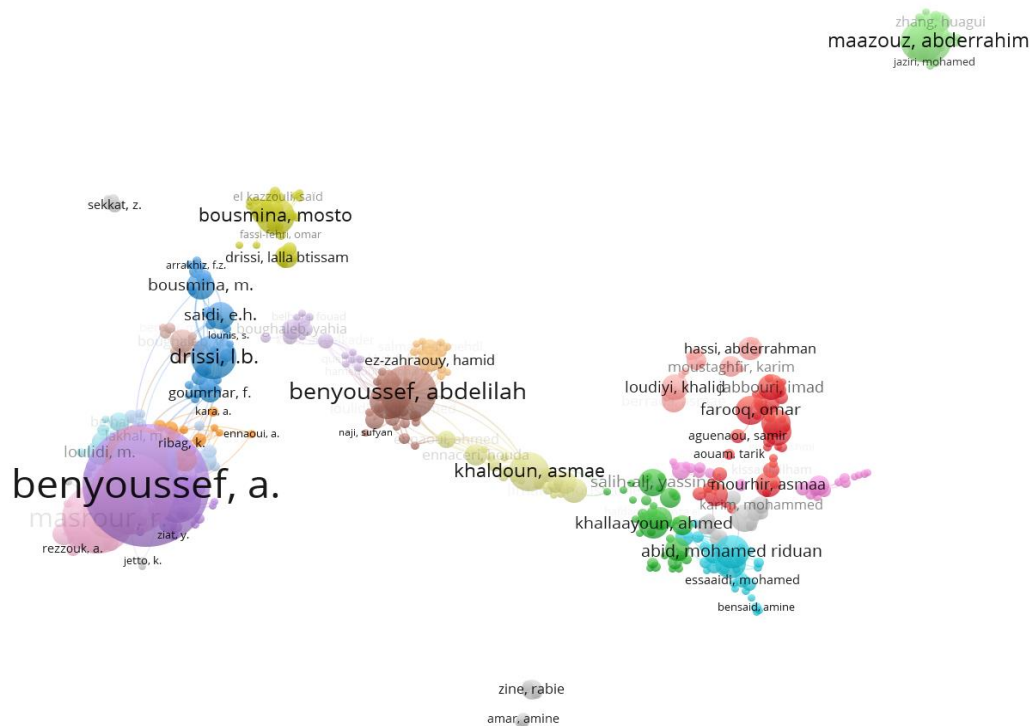


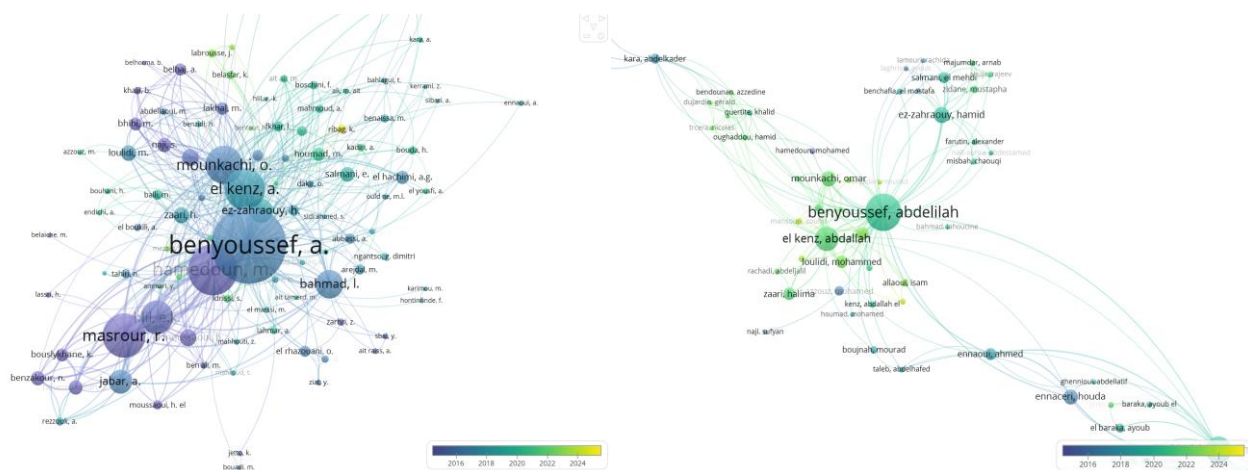**Figure 5a.** Authors' collaboration network of the most productive authors in AUI
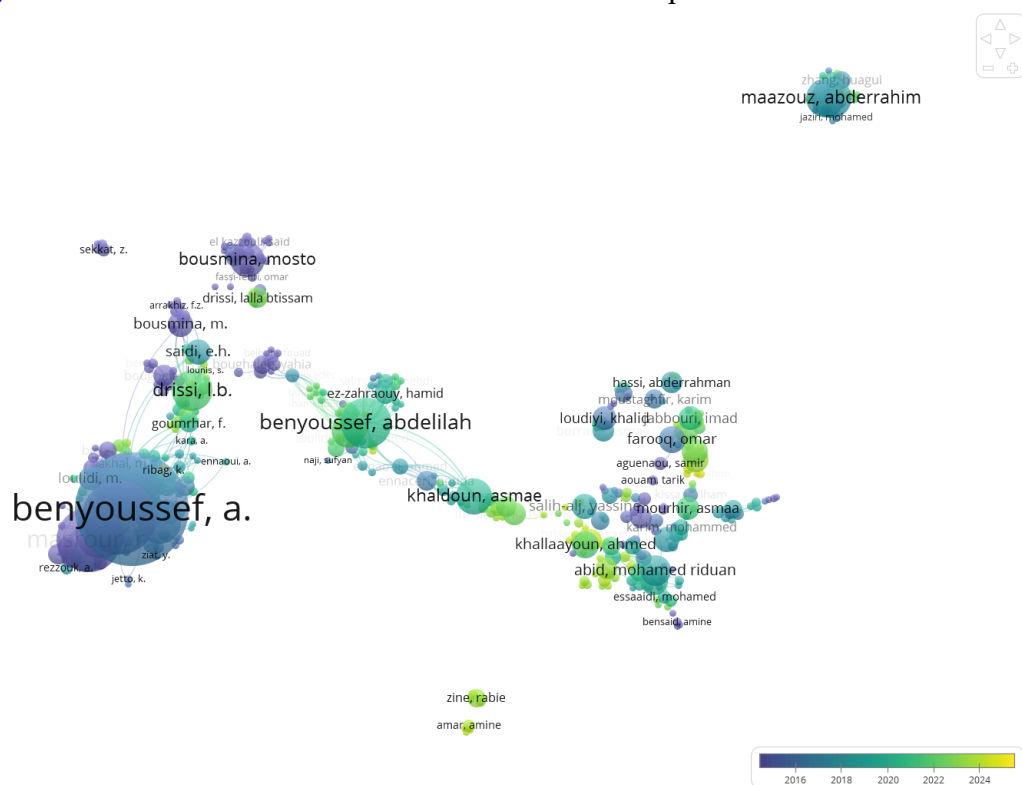


**Figure 5b.** Overlay visualization of the Authors' collaboration network

**Figure 5c.** Overlay visualization of the Authors' collaboration network

**Figure 5d** visualizes Benyoussef's two clusters and the collaborations in specific domains. It is important to note that the Scopus database can merge the different profiles for a given author into a single one upon their request or that of their organization.



**Figure 5d.** Authors' collaboration network of the most productive authors in AUI

The Scopus analysis provides a quantitative ranking of the best researchers through a histogram presentation. Then, the top 32 most contributing authors over the past 30 years (**Table 1**). Benyoussef has reached more than 450 articles with various affiliations and is known as an Eminent Scientist in Morocco who has contributed to the formation of numerous researchers. His Scopus profile indicates

828 articles H-index of 48, and 12253 citations by 7387 documents. The most cited paper (948 citations) on "Ancient human genomes" in "Nature" by Berrada F. (8 papers, H=7, 1190 citations by 1189 documents) (Lazaridis *et al.*, 2014).

**Table 1.** The top 32 most contributing authors.

| Author | Documents | Author | Documents |
|--------|-----------|--------|-----------|
| Benyoussef, A | 461 | Sekkat, Z | 42 |
| Hamedoun, M | 186 | Zaari, H | 39 |
| El Kenz, A | 170 | Boughaleb, Y | 38 |
| Masrour, R | 142 | Loulidi, M | 38 |
| Mounkachi, O | 129 | Rachidi, T | 38 |
| Shoup, J.A | 114 | Saidi, E.H | 36 |
| Hlil, E.K | 93 | Benhaddou, D | 33 |
| Bousmina, M | 85 | Khallaayoun, A | 33 |
| Drissi, L.B | 82 | Farooq, O | 32 |
| Bahmad, L | 70 | Harroud, H | 32 |
| Ez-Zahraouy, H | 69 | Kawata, S | 31 |
| Maazouz, A | 67 | Chetioui, Y | 30 |
| Lamnawar, K | 62 | Labrim, H | 30 |
| Khaldoun, A | 52 | Legrouri, A | 30 |
| Jabar, A | 49 | Loudiyi, K | 30 |
| Abid, M.R | 43 | Driouchi, A | 29 |

Among the 32-listed authors in **Table 1,** only Shoup J.A. is a unique permanent researcher. Prof Shoup (114 articles among the list) published 216, reaching an H-index of 3 and 73 citations. Shoup's biography on the AUI webpage can be added without modification:

John A. Shoup is a Full Professor of Anthropology and has his BA and MA in Middle Eastern Studies/Arabic from the University of Utah and his PhD in Cultural Anthropology from Washington University in St. Louis. He has conducted field work in Lesotho, Jordan, Syria, Egypt, Tunisia, Morocco, and most recently in Mauritania on topics related to pastoralism, impact of tourism on local communities, traditional land use systems, and popular culture. He has authored and co-authored several articles and book chapters and published Culture and Customs of Jordan (2007), Culture and Customs of Syria (2008), and co-authored Saudi Arabia and Gulf Arab States Today: An Encyclopedia of Life in the Arab States (2009), and Ethnicities in the Middle East and Africa (2012). He was part of a research team for the Baseline Survey conducted in the Middle Atlas region of Ifrane (2000) and on the impact of tourism in the Atlantic port city of Essaouira (2001- 2002), published as Assessing Tourism in Essaouira by Al Akhawayn University (2002). John Shoup taught at the American University in Cairo from 1990 to 1996 and at Al Akhawayn University in Ifrane, Morocco from 1996 to the present.

https://aui.ma/teacher-bio/john-austin-shoup-iii

The second permanent Professor Asmae Khaldoun, at the 14th position, published 68 articles, with an H-index of 18 and 956 citations by 743 documents. Her research concerned various topics as Engineering, Energy, Materials Science, Physics and Astronomy, Environmental Science… **Figure 7** indicates the mapping of collaboration with Manssouri, Limami, and Ennaceri from regional universities, such as the University Moulay Ismail, Meknes.

Asmae Khaldoun was born in July 1970 and brought up in Morocco. She graduated in Physics from Abdel Malek Essaadi University in 1993 and acquired in 1996 her M. Sc. degree in Renewable Energy from the University Mohamed V in Rabat. She earned a PhD in Physical Chemistry at the University of Abdel Malek Essaadi in Morocco in 2002. She earned a second PhD in Physics "Soft condensed Matter" 2013 at the University of Amsterdam. She worked as Post Doc at University of Amsterdam then worked as Project Leader at Avantim Technologies in Amsterdam. She has worked at Al Akhawayn University since 2009, where she has taught undergraduate and graduate classes. On the other hand, she is actively involved in research and was awarded several research funds and supervised several PhD theses. https://aui.ma/teacher-bio/asmae-khaldoun
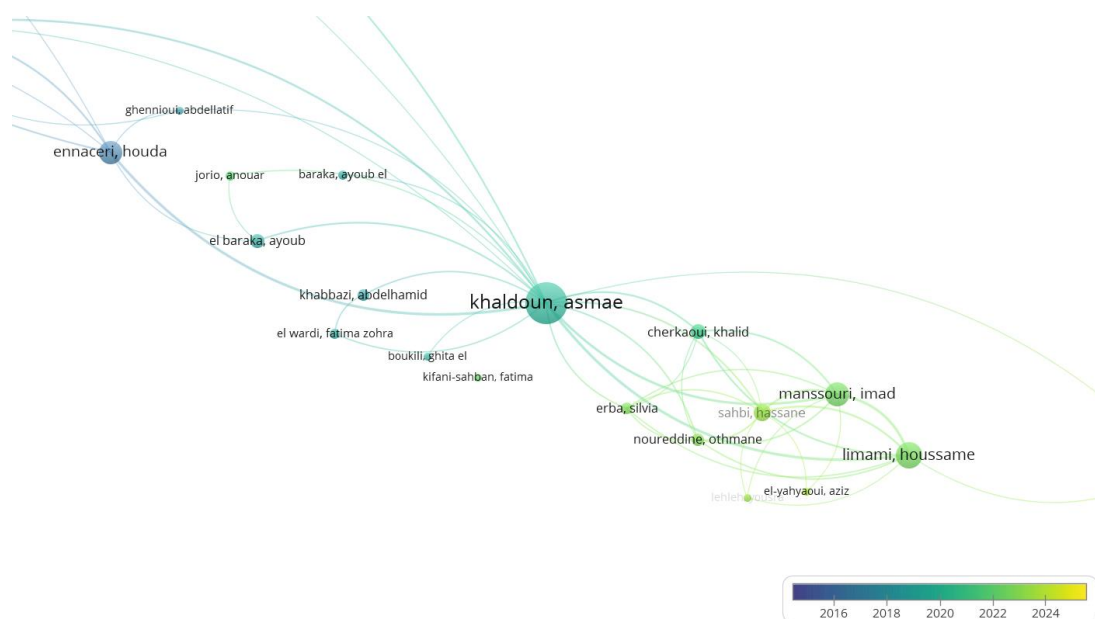


**Figure 7.** The cluster of Khaldoun Asmae

Bibliometric data **(Figure 8)** reveals a remarkable publication output from Akhawayn University, with a collaboration network primarily rooted in Morocco and France. The figures highlight strong partnerships with Moroccan institutions such as Mohammed V University of Rabat (480), Cadi Ayyad University (189), and Sidi Mohamed Ben Abdellah University (170 publications), underscoring Akhawayn's central role in the national academic landscape.

At the international level, collaborations are mostly concentrated with French institutions, including

CNRS (164), Université Grenoble Alpes (80), and INSA Lyon (68). While these connections reflect an openness toward Europe, they remain largely confined to a limited group of laboratories and do not significantly extend to major scientific hubs in North America, Asia, or other parts of Europe.

This configuration raises important questions about the global impact and visibility of the university's research. Although Akhawayn excels in publication volume, the geographical concentration of its collaborations may limit the broader reach of its research output. A strategic diversification towards partnerships with top-tier universities and cutting-edge research centers worldwide could significantly enhance its positioning on the global scientific stage.
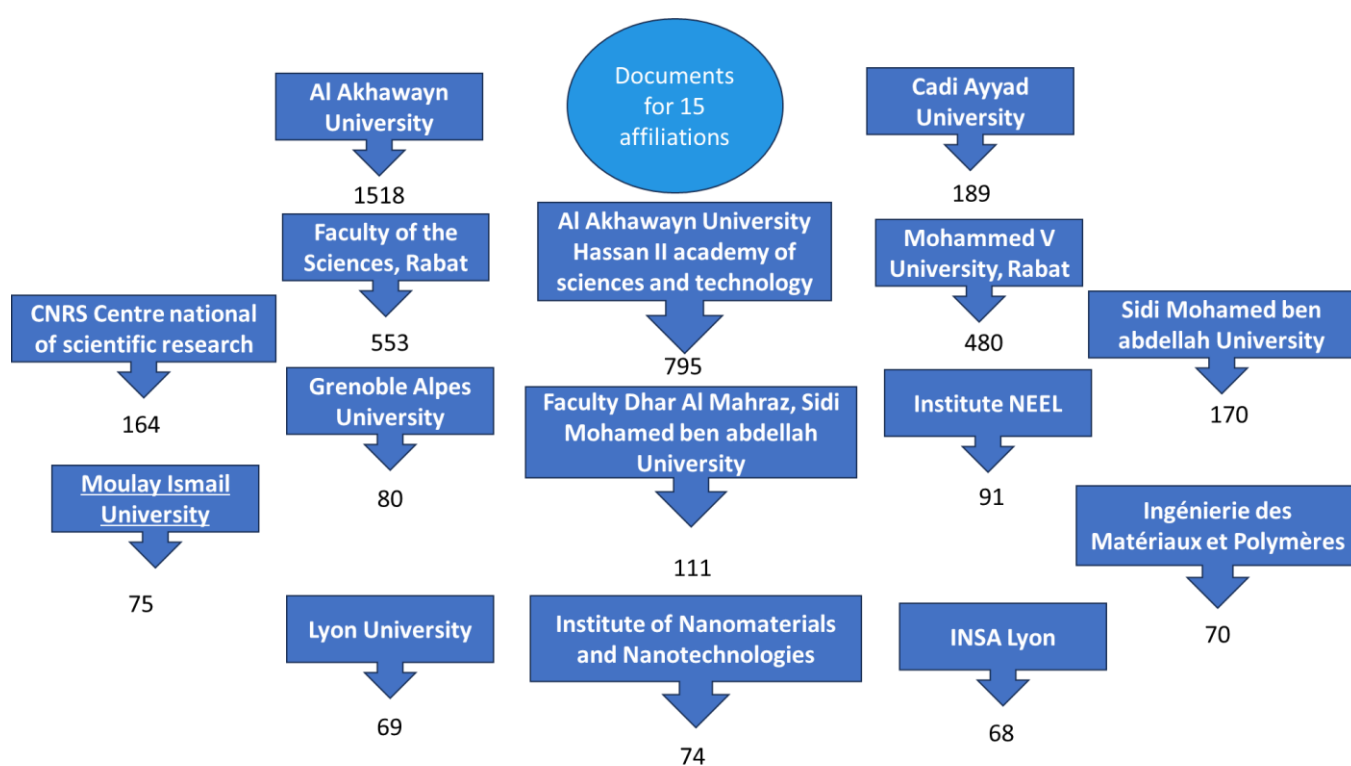


**Figure 8.** Document for 15 affiliations.

**Table 2** reveals that the majority of scientific publications from Akhawayn University originate from Morocco (2,306 documents), while international collaborations are predominantly with France (332 documents) and the United States (224), followed by Canada (138), and a few European countries such as Germany (70) and Italy (56).

Although partnerships exist with countries like Japan (52), the United Arab Emirates (51), and Saudi Arabia (59), their volume remains modest, reflecting an international outreach that is still limited to a few key partners. This distribution indicates a strong local foundation, coupled with solid ties to France and the United States **(Figure 10a; Figure 10b)**, but also highlights opportunities for diversification

toward other major scientific hubs. Expanding collaborations beyond these established networks could enhance the university's global research impact and visibility.

**Table 2.** The number of documents by county.

| Country | Documents | Country | Documents |
|---|---|---|---|
| Morocco | 2306 | Italy | 56 |
| France | 332 | Japan | 52 |
| U.S. | 224 | U.A.E | 51 |
| Canada | 138 | United kingdom | 48 |
| Germany | 70 | Belgium | 34 |
| Saudi Arabia | 59 | Spain | 34 |
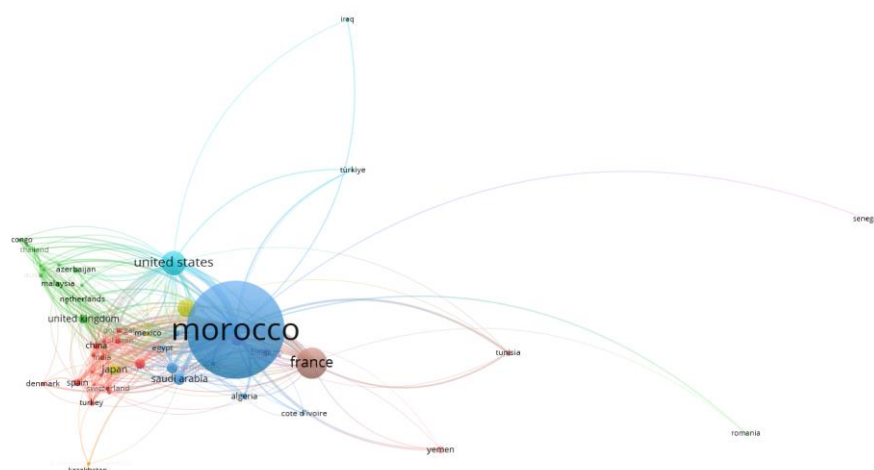


**Figure 10a.** Network visualization of Al Akhawayn University's collaborations.
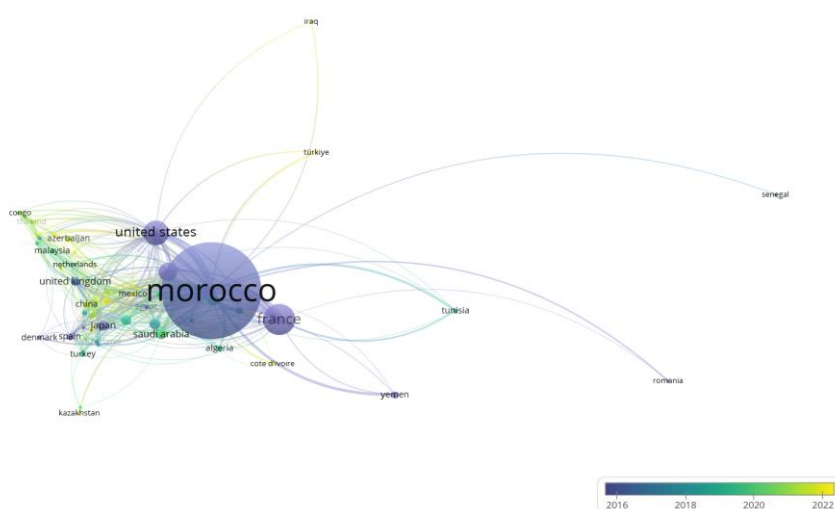


**Figure 10b.** Overlay visualization of Al Akhawayn University's collaborations.

The graph visualization illustrates the network **(Figure 10a)** of international scientific collaborations led by Al Akhawayn University in Morocco between 2016 and 2022 **(Figure 10b)**, highlighting its central role in the regional and global academic landscape. Morocco, represented by the largest node in the graph, reflects the university's sustained activity in establishing strategic partnerships. The lines connecting the countries indicate the intensity of collaborations, their thickness representing the volume of joint work, while their color, shifting from violet (2016) to yellow (2022), traces the temporal evolution of these connections. It's also important to note that Saudi Arabia becomes last years the third country in the Organization Islamic Countries (OIC), (**Table 3**). Saudi's rank raised from the 5th rank to the 3rd. the Saudi effort can be a key to promote a visible scientific production for the AUI decision Makers.

**Table 3.** Scientific Production of some Organization Islamic Countries (OIC).

| Country | Documents | Country | Documents |
|---|---|---|---|
| Turkey | 77,977 | Nigeria | 20,690 |
| Iran | 77,242 | Morocco | 18,437 |
| Saudi Arabia | 73,511 | Bangladesh | 17,084 |
| Indonesia | 67,613 | Jordan | 14,795 |
| Malaysia | 52,209 | Algeria | 13,389 |
| Iraq | 29,558 | Tunisia | 11,627 |
| Emirates | 23,676 | | |

**Scopus Data: May 24, 2025**

**Conclusion**

Al Akhawayn University in Ifrane, established in 1995 as a pioneering English-language institution inspired by the American liberal arts model and founded through a Moroccan-Saudi partnership, has become a central actor in Morocco's academic and research landscape. Utilizing bibliometric analysis and visualization tools like VOSviewer, this study highlights the university's expanding international scientific collaborations from 1995 to 2024. The quantitative data reveal the volume and impact of publications and the dynamic evolution of research partnerships with key countries such as France, the United States, and others. These collaborations underscore Al Akhawayn's commitment to fostering interdisciplinary research, innovation, and global academic exchange. Bibliometrics provides a valuable framework to understand and map research trends, impact, and networks of Al Akhawayn University.

**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial  relationships that could be construed as a potential conflict of interest.

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