

Scholarly Mapping of Research Productivity of the Eastern University, Sri Lanka using Scopus Metrics

M N Ravikumar¹

ABSTRACT

Universities are augmenting knowledge via high-caliber research publications, encouraging innovative methodologies, and enacting substantial reforms to facilitate national progress. Research productivity is widely acknowledged as a significant indicator of advancements in the quality of a university. The Eastern University, Sri Lanka (EUSL), established in 1986, has expanded with multiple faculties and actively engages in various research activities. Despite its academic endeavors, no formal assessment of its research productivity has been conducted. This study attempts to map the research productivity of EUSL based on the articles indexed in the Scopus database. The study employed bibliometric methods and VOS viewer network maps to analyze the data extracted from the Scopus database. It was found that total of 639 documents and 169 authors affiliated with EUSL (Scopus ID 60071086) from 1989 to 2023. The majority of publications are journal articles (85.2%), followed by conference papers (8.8%), reviews (2.4 %), book chapters (2%), Erratum (1.3%), Letter (0.2%) and Retracted (0.2%).

¹Senior Assistant Librarian, Eastern University, Sri Lanka

Email: ravikumarmn@esn.ac.lk,  <https://orcid.org/0000-0002-2243-880X>



Received: 07 October 2024, Accepted revised version: 2 January 2025.

This work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License.

The growth rate of EUSL's publications was moderately progressive up to 2023, with a peak in 2021 and 2023 with 126 publications. Citations for the publications consistently increased from 1989 to 2023. The primary field of study for authors affiliated with EUSL is "Physics and Astronomy" with 312 articles, followed by "Chemistry" with 96 articles and 87 papers were published in "Materials Science". The preferred journal for authors from EUSL is "Journal of High Energy Physics" (88 articles), followed by "Acta Crystallographica Section E Structure Reports Online" (43 articles). EUSL primarily contributed to the field of Physics, with less attention given to other disciplines especially Arts and Humanities. At the time authors in Chemistry, Mathematics, and Computing were contributing significantly to the university's research output. The study suggests that the academics of the EUSL should be encouraged to publish their research in reputed journals and international conferences. Also introducing faculty wise rewarding system for research publications, providing access to renowned databases, and subscribing anti-plagiarism software will enhance the research productivity of the university. Moreover, the library should take necessary steps to boost research productivity by offering workshops and fostering a research-oriented environment for the academics. University academics should also create profiles on research networks like Google Scholar, Research Gate, and Scopus to upsurge their visibility and university's rank.

Keywords: Research productivity, Bibliometrics, Scopus, Eastern University, Sri Lanka, VOS viewer

Introduction

Research is a cognitive pursuit and plays a crucial part in society, as its objective is to find solutions to specific challenges. In addition, research is crucial in crafting a more promising future for humanity by employing creative methods and the state of research has advanced in every progressive nation. Universities contribute to the advancement of knowledge by producing high-quality research publications that have a positive impact on society. They also encourage the development of creative approaches and assist national progress by implementing significant reforms in various fields (Shahzad et al., 2021). In this scenario, the research productivity is widely regarded as a significant measure of the advancement in the caliber of universities. Examining scholarly works offers advantages to academics, universities, organizations, policymakers, investors, and partners by broadening scientific understanding and improving international collaboration (Powell et al., 2017).

The Eastern University, Sri Lanka (EUSL) was founded on October 1, 1986 followed by the establishment of Batticaloa University College on August 1, 1981. Initially, the college consisted of two faculties. Presently, the EUSL has a Campus at Trincomalee and an institute named Swami Vipulanatha Institute for Aesthetics Studies (SVIAS) at Batticaloa. The university has six faculties in the field of Arts & Culture, Agriculture, Commerce & Management, Science and Health Care Sciences. In addition to these faculties, a new faculty has established for graduate studies in 2023. The Trincomalee Campus has three faculties namely faculty of Applied Science, faculty of Business Communication and Studies and faculty of Siddha Medicine (University Profile, Eastern University Sri Lanka, n.d.). The university organizes annual research conferences, international conferences, and research

symposiums. Additionally, each faculty publishes its own faculty journals. However, throughout the history of the EUSL, no efforts so far have been undertaken to examine its research productivity.

Numerous research studies employed scientometric methods to assess and quantify the research output and productivity of academic institutions or individual researchers (Pradhan et al., 2021). Further bibliometric mapping is useful for visualizing outcomes and deriving conclusions after analysis (Van Eck & Waltman, 2010). Scopus is the one of the popular sources for identifying the research productivity of institutions which has been used as a bibliometric data source in large-scale by the researchers (Baas et al., 2020). Hence, this study aims to fill the gap and conduct a mapping on the research publications authored by academics of EUSL that are indexed in the Scopus database using scientometric approach. The study provides a thorough examination of the research patterns of EUSL by systematically analyzing academic publications. It will assist the university in revising research related policies and strengthening areas of weakness in order to improve its ranking at both the national and international levels. Additionally, the findings of the research will be highly beneficial for librarians in acquiring the appropriate information resources to meet the specific demands of university scholars.

Literature Review

Research productivity in universities is crucial for a high-quality education, driving transformative advancements and nurturing national development through innovative approaches. Numerous studies have been conducted to determine the research productivity of different types of institutions at both national and international levels based on widely recognized reorganized Scopus and Web of Science (WoS) data sources. This section discusses selected literature pertaining to studies conducted to quantify research productivity of universities both globally and nationally.

Pradhan et al., (2021) conducted a study to evaluate the research productivity of VSS University of Technology (VSSUT), Odisha, using scientometric parameters such as Annual Growth Rate (AGR), author productivity, institution-wide collaboration, and collaboration patterns. Data from Scopus covering 2015 to 2020 were analyzed, encompassing 1889 publications. The study finds that the research published by VSSUT in high-quality journals lacks citations and major contributions were made from the field of engineering. Mahala and Singh (2021) analyzed 26,173 documents obtained from the Science Citation Index of WoS database to investigate the research output of Indian universities in the field of sciences from 2015 to 2019. The findings of the study indicate that papers with multiple authors have a greater research impact in terms of citations received. Additionally, the study reveals that the United States, South Korea, and Germany are the countries with the highest level of collaboration.

Various studies have been conducted locally to examine the research productivity of state universities in Sri Lanka, and some are reviewed here. A

study has been conducted by Seneviratne and Navaneethakrishnan (2018) to measure the research output of University of Moratuwa during the period 1981- 2017 based on Scopus. This study analyzed 1712 publications authored by 5491 researchers using scientometric methods. Chandani and Wijayasundara (2019) have conducted a study to analyze the pattern of scholarly publication indexed in Scopus from University of Sri Jayewardenepura during 1998 to 2018. This study used quantitative methods mainly descriptive analysis to achieve the objectives. Janen (2022) has conducted a study with the aim to quantify research output of University of Jaffna based on WoS during 2000-2019. This study used scientometric techniques to obtain the findings. Gupta (2012) examined scientific and technological research output of Sri Lanka between 2001 and 2010 based on Scopus database and underlined the need to invest in research and development, deploy skilled labor, collaborate internationally, and improve research infrastructure in order to increase research output of the country.

Research productivity of five state universities of Sri Lanka during the period 2015-2018 was studied by Wijetunge et al. (2020) using SciVal which is a tool built on the Scopus database. The study analyzed 4723 publications authored by 3831 authors and found that University of Colombo and University of Peradeniya had the highest number of publications. The study emphasizes the potential for university libraries to improve their services in order to promote research productivity. It suggests that librarians should focus on research data management, measuring research impact, and digital curation to assist their universities in achieving the best in research productivity. In addition, several studies were undertaken in Sri Lanka to assess the research productivity of the state universities and various academic fields. The majority

of the research relied on the Scopus database and employed similar bibliometric techniques to analyse the data. Nevertheless, few research studies have used visualization approaches to map the intellectual output of state universities in Sri Lanka. Further literature concerning the research productivity of EUSL has not been identified.

In measuring research productivity, most studies focused on several key metrics, including document types, publication growth rates, and citation counts. Studies often spotlighted the most productive authors, track keyword occurrences, analyze funding sources, and examine collaboration patterns, both local and international, that are crucial element of scientometric analysis.

Objectives

The main objective of the study is to analyze and map the scholarly research productivity of the Eastern University, Sri Lanka (EUSL) based on publications indexed in Scopus database since its first indexed publication to 2023. Following are the specific objectives of the study;

- To trace the growth rate and citation trend of research publications of EUSL
- To reveal the major areas of research produced by the university
- To determine the most preferred journals of the academics of EUSL
- To identify the most prolific authors of EUSL with high research productivity
- To map the co-authorship and collaboration pattern of the academics of EUSL
- To map the country-wise research collaboration of the university

Research Design and Methods

The research study is based on the scientometric approach, which is a widely used methodology for quantitatively evaluating research activities. It is a specialized field within bibliometrics that focuses on measuring and analyzing literature to assess new ideas, track research trends, and inform policy decisions and future research directions (Mahala & Singh, 2021).

Data Source

Data for the study were extracted from the Scopus database. Scopus is an abstract and citation database, which was introduced by Elsevier in 2004 as a novel search and exploration instrument. One notable aspect of Scopus is that it indexes all authors, institutional addresses, and bibliographic references for each publication, regardless of the type of article (Kulkanjanapiban & Silwattananusarn, 2022). Also Scopus continues to be the leading source for citation data and the most essential multidisciplinary bibliographic databases (Wang & Waltman, 2016).

Data Extraction

To retrieve bibliographic data “Eastern University, Sri Lanka” was used as the search phrase, in the Scopus search interface. The records were extracted with greater specificity by using the Scopus ID for Eastern University, Sri Lanka (60071086). Since the data were retrieved in July 2024, the results were limited to the period from the first indexed publication of EUSL in Scopus to 2023. Accordingly following query was used to obtain the records from the Scopus database.

AF-ID (“Eastern University Sri Lanka” 60071086) AND (EXCLUDE (PUBYEAR, 2024)).

Data Analysis

Various bibliometric tools were employed in this study to assess the records extracted from the Scopus database. The software programmes MS Excel and SPSS were utilized to analyze the trend of publication and citation. Moreover, three-term polynomial model was used to forecast the growth of publications in the forthcoming years. This is a regression model utilized to assess the relationship between a dependent variables and independent variables, particularly in non-linear contexts, and it has been frequently employed in trend analysis (Serrano et al., 2019). Additionally, the collaboration networks for co-authorship, co-occurrence, and geographical locations were visualized using VOSviewer which is a widely utilized knowledge mapping application that visualizes and generates networks composed of several nodes (Van Eck & Waltman, 2010).

Results and Discussion

General Information

The study found that total of 639 documents and 169 authors were affiliated with Scopus ID 60071086 for Eastern University, Sri Lanka up to 2023. In addition, this ID was associated with other name formats such as “Eastern University” and “Eastern University Sri Lanka”.

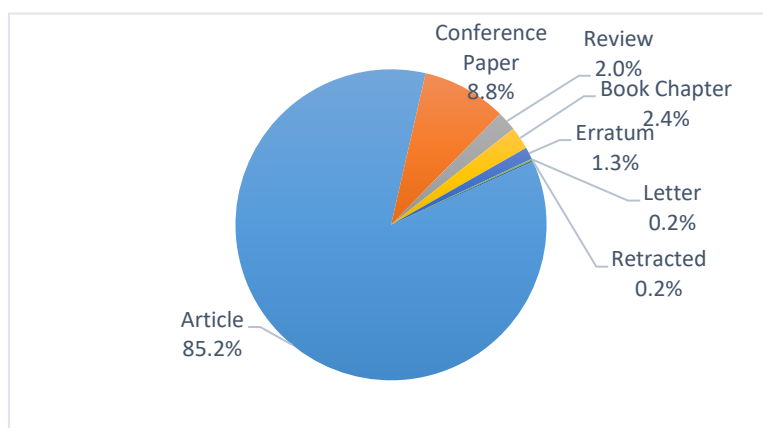
Types of Publications

Out of 639 documents, the majority are categorized as "Articles," making up 545 of the publications (85.2%). This is followed by "Conference papers", which account for 56 publications (8.8%). Additionally, the publications include 15 Book chapters (2.4%), 13 Reviews (2.0%), 8 Erratum

(1.3%), and 1 each for both Letters and Retracted papers (0.2%). The following figure 1 shows the various types of publications in the Scopus database.

Figure 1

Various types of research publications

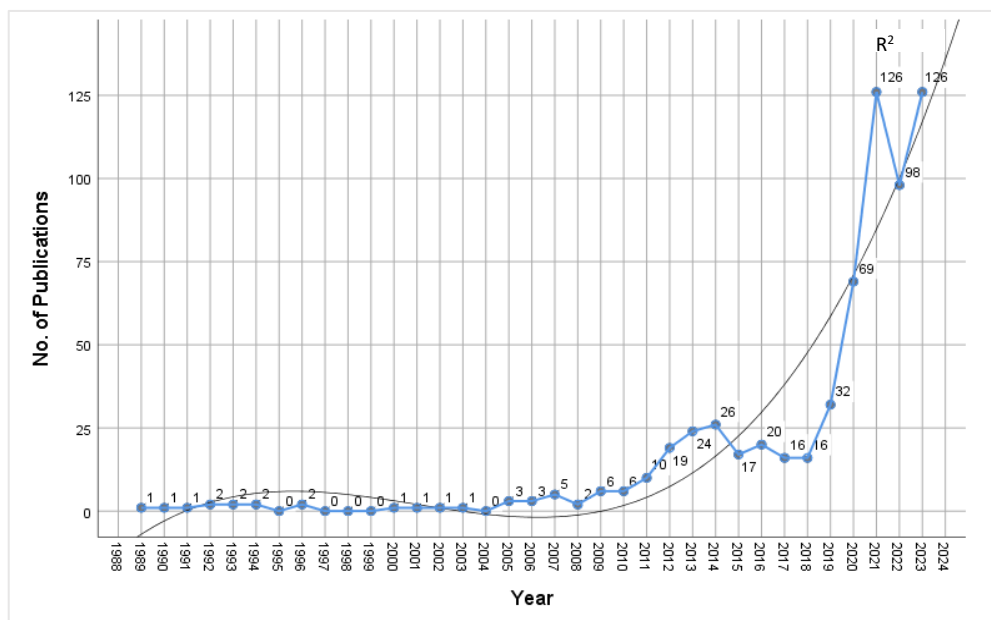


Publication Trend

The first publication indexed from EUSL in the Scopus database dates back to 1989. The publication growth did not show significant progress until 2010. From 2011 to 2018, there was an increase in publications, but the growth rate remained inconsistent. A persistent increasing trend of publications has been observed since 2018, with number of publications doubled each year and peaking in 2021 with 126 publications. However, there was a significant decline after 2021, but it picked up again in 2023 with 126 articles. Figure 2 depicts the growth of publications of EUSL from 1989 to 2023.

Figure 2

Growth of publications (1989 to 2023)



Furthermore, a three-term polynomial model was used to evaluate the relationship between the number of publications and the year. The model demonstrated a strong fit with the annual publication growth trend, as indicated by a high coefficient of determination ($R^2 = 0.837$). This fitting curve guarantees that growth of annual publications will increase in the future.

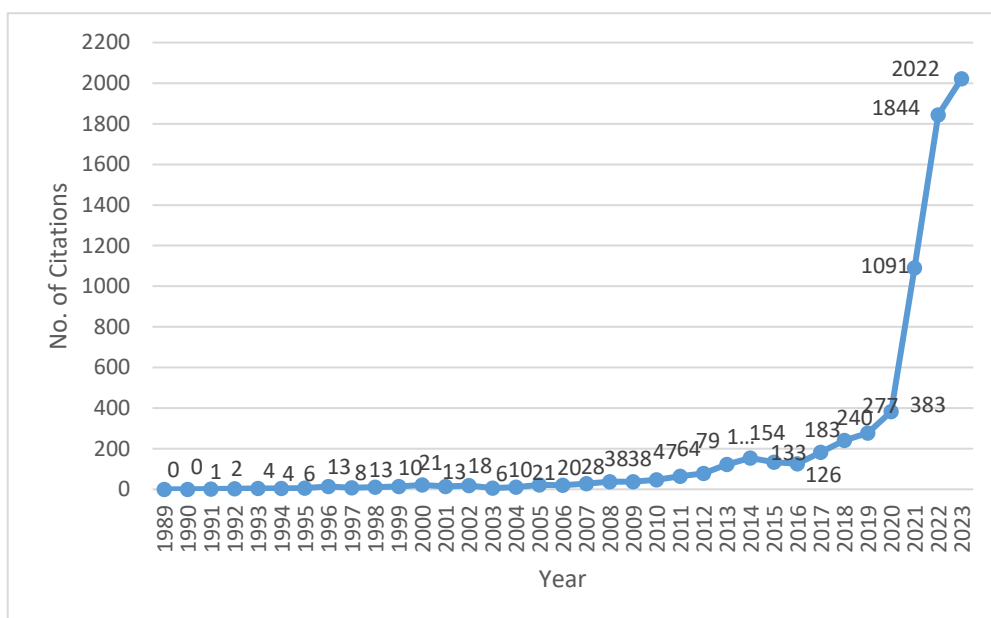
Citation Trend

Figure 3 clearly illustrates the research output of EUSL in terms of the total number of citations received for research publications each year. EUSL received its first citation in 1991. From 1991 to 2007, the citation counts were inconsistent. However, from 2008 to 2016, the number of citations gradually increased, although a slight decline was observed in the last two years of this period (2015 and 2016). After 2016, the citation count increased consistently,

culminating in a dramatic rise in the years 2021, 2022, and 2023, with 1091, 1844, and 2022 citations respectively. The analysis further reveals that average of 11.02 citations received per publication, which underscores the significance and quality of the research produced by EUSL scholars. These results suggest that EUSL has made substantial progress in establishing itself as a notable contributor to academic research, particularly in recent years.

Figure 3

Citation trend of research publications



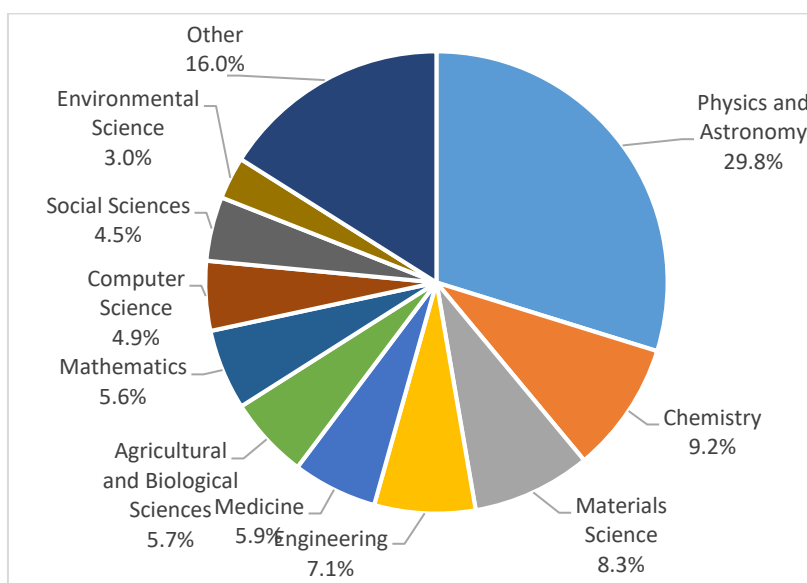
Major Areas of Research

According to Scopus, the research papers of EUSL are classified into 26 primary subject areas, with some publications falling into multiple subject categories simultaneously. The primary field of study for authors affiliated with EUSL is "Physics and Astronomy", with a total of 312 (29.8%) articles. This is followed by the field of "Chemistry", which has 96 (9.2%) publications.

Following the study of chemistry, a total of 87 (8.3%) papers were published in the topic category of “Materials Science”. Figure 4 illustrates the ten subject categories that have the highest number of publications authored by the scholars of EUSL.

Figure 4

Major subject categories of research publications



The aforementioned statistics indicate that the top ten research areas exclusively comprised of science disciplines and comparatively less publications from the fields of Social Sciences, Arts, and Humanities. One probable explanation could be the limited number of Scopus indexed journals in these fields and the faculties in these streams at EUSL use the local language (Tamil) as their medium of instructions.

Most Preferred Journals

Table 1 lists the ten most prominent academic journals where the highest number of articles published by researchers affiliated with EUSL. At the top is the "Journal of High Energy Physics", with 88 articles, followed by "Acta Crystallographica Section E Structure Reports Online" with 43 articles. The "European Physical Journal C" ranks third with 34 papers. Additionally, Table 1 provides comprehensive information about these journals, including their Impact Factor (for 2023), Scopus coverage, publisher, Cite Score (CS), SCImago Journal Rank (SJR), and Source-Normalized Impact per Paper (SNIP). This detailed data highlights the prominent sources of publications associated with EUSL, showcasing their impact and reach within the academic community.

Table 1

Top 10 preferred journals for the authors affiliated with EUSL

Source	No. of Articles	IF (2023)	Scopus Coverage	Publisher	CS	SJR	SNIP
Journal of High Energy Physics	88	5.0	1997-2023	Springer Nature	10.0	0.832	1.132
Acta Crystallographica Section E Structure Reports Online	43	0.5	2003 -2015	International Union of Crystallography	0.8	0.136	0.210
European Physical Journal C	34	4.2	1991-1995, 1998 -2023	Springer Nature	8.1	1.451	1.218
Physical Review D	31	4.6	1989, 2001 - 2003, 2008, 2015 - 2023	American Physical Society	9.2	1.639	1.185
Physical Review Letters	24	8.1	1958 - 2023	American Physical Society	16.5	3.040	2.162
Physics Letters Section B Nuclear Elementary Particle and High Energy Physics	15	4.3	1967 to Present	Elsevier	9.1	1.593	1.175
Journal of Instrumentation	9	1.3	2006 - 2023	Institute of Physics Publishing	2.4	0.580	0.917

Acta Crystallographica Section E Crystallographic Communications	7	0.5	2015 - 2023	International Union of Crystallography	1.9	0.233	0.439
Polyhedron	7	2.4	1982 to Present	Elsevier	4.9	0.379	0.579
Pramana Journal of Physics	6	1.9	1973 - 2023	Springer Nature	3.6	0.382	0.640

**CS- CiteScore; SJR- SCImago Journal Rank; SNIP- Source-Normalized Impact per Paper*

(Note. www.scopus.com/sources and Journals website as at July, 2024)

Most Prolific Authors

The most prolific authors are determined by the quantity of articles in journals indexed in Scopus throughout the specified study period. Table 2 delineates the top ten most productive authors, including citation counts for their publications, and average citations per publication.

Table 2

Top 10 productive authors based on number of publications

Rank	Author	No. Articles	H-Index as per the Scopus	Total Citation	Avg. citation per publication
1	Sithambaresan, M.	77	16	615	7.99
2	Johnpillai, A.G.	41	14	554	13.51
3	Thirukkanesh, S.	39	18	859	22.03
4	Rifky, M.	26	8	134	5.15
5	Thavareesan, S.	23	14	812	35.30
6	Ragel, F.C.	21	11	408	19.43
7	Ranathunge, T.	15	7	176	11.73
8	Thadchanamoorthy, V.	14	4	35	2.50
9	Sotheeswaran, S.	13	5	46	3.54
10	Koneswaran, M.	11	7	690	62.73
10	Prasannath, K.	11	6	185	16.82
10	Sakuntharaj, R.	11	6	260	23.64
10	Seran, T.H.	11	5	60	5.45

The results reveal that academics from the Faculty of Science at EUSL are the most prolific in terms of research output, dominating the top 10 list of authors. Sithambaresan, M. from the Department of Chemistry leads with 77 publications, demonstrating a significant contribution to the university's research productivity. Johnpillai, A.G. and Thirukkanesh, S. from the Department of Mathematics follow with 41 and 39 publications, respectively, further highlighting the active research culture within the Faculty of Science.

When considering citation counts, Thirukkanesh, S. stands out with 859 citations, indicating the high impact and recognition of their research work. Thavareesan, S. from the Department of Computing follows closely with 812 citations, reflecting strong research engagement in the field of computing. Koneswaran, M. from the Department of Chemistry, with 690 citations, also demonstrates substantial research influence. Notably, Koneswaran, M. holds the highest average citation per publication at 62.73, underscoring the quality and significance of his research contributions. Overall, these results highlight that the Faculty of Science, particularly in the fields of Chemistry, Mathematics, and Computing, plays a crucial role in driving EUSL's research output and impact.

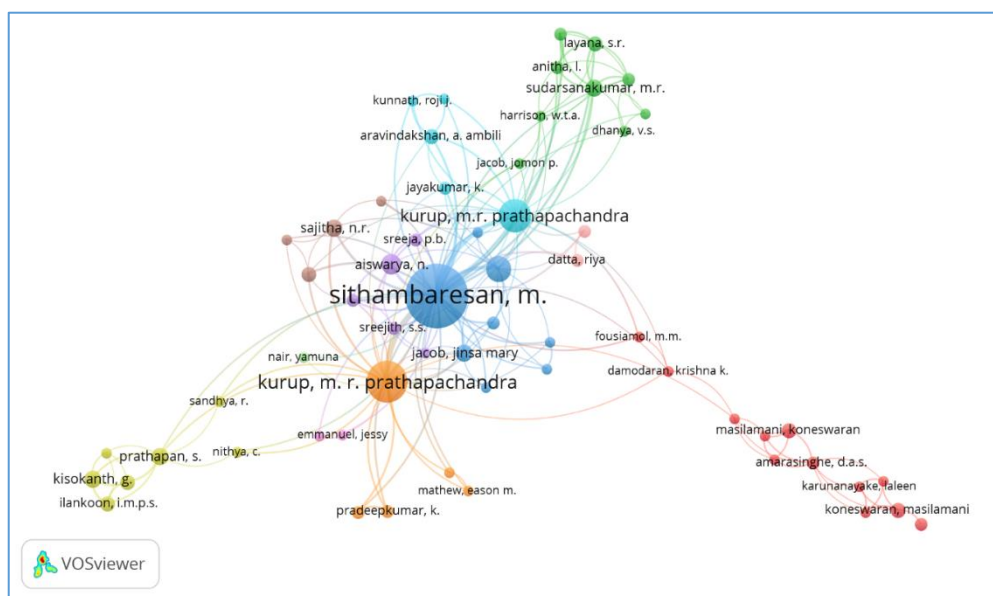
Co-authorship Mapping

Co-authorship map was developed through the analysis of data from academics who contributed a minimum of two publications and received at least one citation in the Scopus database, using VOSviewer. Among the authors in the data set, 252 met the threshold, with the largest set of connected items comprising 60 authors organized into 11 clusters. Figure 5 illustrates the results. The large number of citations and link strength demonstrated by

Sithambaresan, M. is noteworthy. Further, it was noted that connections among EUSL academics are not well established.

Figure 5

Co-authorship network map of authors

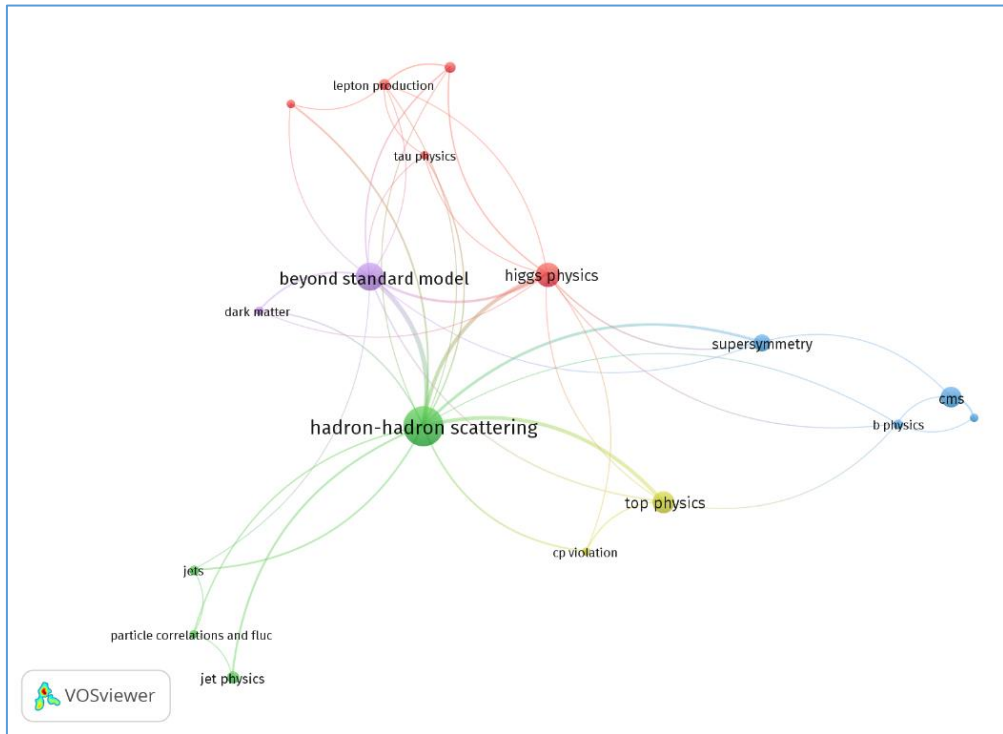


Keywords Cluster Mapping

The keywords, typically specific, are employed to enhance the visibility of research paper and ensure the content is adequately searchable. The data extracted from the Scopus database was analyzed to find out the co-occurrence of author keywords at least with three times. It was found that out of 1413 keywords 73 met the threshold. Largest set of connected items comprising 17 keywords categorized into 5 clusters. Following figure 6 shows the visualization obtained from VOSviewer.

Figure 6

Co-occurrence of author keywords network



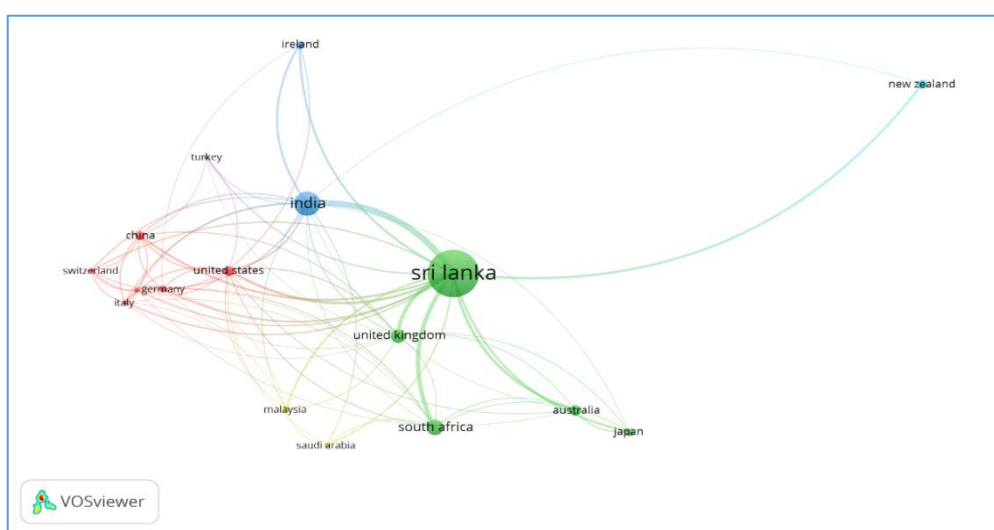
The diameter of the circle signifies the frequency of keywords used in research articles, while the thickness of the connecting lines denotes the strength of the intra-association among terms. The most frequently occurring keyword was "hadron-hadron scattering" with 58 occurrences, followed by "beyond standard model" (27), "higgs physics" (22), "top physics" (18) and "single-crystal X-ray study" (16).

Country Level Collaboration Mapping

The co authorship analysis was performed in VOSviewer using countries as unit of analysis and minimum number of documents of a country set to 5. It was observed that 17 items in 6 clusters met the threshold. Figure 7 depicts country level collaboration network visualization.

Figure 7

Country level collaboration network map



As expected, most collaboration take place within Sri Lanka with 440 documents. This strong local collaboration suggests that EUSL actively engages with other Sri Lankan universities and research institutions, nurturing a strong national research network. India emerges as the leading international collaborator, with 117 joint publications, highlighting a strong academic relationship between EUSL and Indian institutions. This could be attributed to geographical proximity, cultural ties, and shared academic interests. Beyond India, EUSL has also established notable collaborations with South Africa (50

documents), the United Kingdom (39 documents), Australia (22 documents), and the United States (21 documents). These collaborations, though fewer in number, reflect growing presence of EUSL in the global academic community and its efforts to engage with diverse research partners. The involvement of countries from different continents suggests that EUSL is gradually expanding its international research footprint, enhancing the quality and visibility of its research through global partnerships.

Conclusions and Discussion

The bibliometric analysis revealed that journal articles constituted the major publications affiliated with EUSL that are indexed in the Scopus database from 1989 to 2023. Growth of publications were progressive until 2021, after which there was a modest decline in 2022. However, it has risen in 2023, and the analysis confirms the potential for future increases. In addition, the significant surge from 2018 to 2021 clearly witnesses that EUSL scholars have shown enthusiasm in publishing articles in indexed journals. Similar to the publication trend, the number of citations has also been continuously increasing from 2016 to 2023. In the last three years, there has been a significant increase in the number of citations, with the growth of documents associated with EUSL and it will be expected to continue in future as per the statistical analysis.

The major research contributions of EUSL are in the field of Physics, while other fields have relatively less publications. However, the determination of the most productive authors highlights significant contributions in the field of Chemistry, Mathematics, and Computing, which play a crucial role in driving the university's research output and impact. Furthermore, the main

research areas were dominated by science disciplines, with fewer publications in Social Sciences, Arts, and Humanities, likely due to the limited number of Scopus-indexed journals in these fields and the use of local language Tamil as the medium of instruction at in these fields of studies at EUSL. The collaboration between authors from EUSL and other nations is remarkable. Nevertheless, collaboration among university scholars is not significant.

According to the findings of this study, it is recommended that the authorities of EUSL should make efforts to encourage the staff to publish their research work in reputed indexed journals and international conferences. Furthermore, introducing faculty-wise awards or honorariums for academics based on their publications, will enhance the research output. Providing access to reputed databases in the field of major research area and subscribing to anti plagiarism software will significantly improve the publication output of EUSL. The library should play a vital role in enhancing the research productivity of the EUSL by conducting workshops pertaining to publishing research papers and offering assistance towards fostering a research-oriented environment among young scholars. All university academics need to create a profile on the research networks, such as Google Scholar, Research Gate, Scopus, etc., in order to increase the visibility of their work and improve the university's rank.

References

- Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quantitative Science Studies*, 1(1), 377–386. https://doi.org/10.1162/qss_a_00019
- Chandani, J. G., & Wijayasundara, N. (2019, June 19). *Visibility of University of Sri Jayewardenepura in Scopus* [Paper presentation]. National Conference on Library and Information Science (NACLIS), Colombo, Sri Lanka. 108–209.
<http://dr.lib.sjp.ac.lk/handle/123456789/8449>
- Gupta, B. M. (2012). Sri Lanka S&T output during 2001-2010: A scientometric assessment. *Malaysian Journal of Library and Information Science*, 17(3), 49–65.
- Janen, T. (2022). Research output of University of Jaffna, Sri Lanka during 2000-2019. *DESIDOC Journal of Library and Information Technology*, 42(1), 3–10. <https://doi.org/10.14429/DJLIT.42.1.17000>
- Kulkanjanapiban, P., & Silwattananusarn, T. (2022). Comparative analysis of dimensions and Scopus bibliographic data sources: An approach to university research productivity. *International Journal of Electrical and Computer Engineering*, 12(1), 706–720.
<https://doi.org/10.11591/ijece.v12i1.pp706-720>
- Mahala, A., & Singh, R. (2021). Research output of Indian universities in sciences (2015–2019): a scientometric analysis. *Library Hi Tech*, 39(4), 984–1000. <https://doi.org/10.1108/LHT-09-2020-0224>

- Powell, J. J. W., Fernandez, F., Crist, J. T., Dusdal, J., Zhang, L., & Baker, D. P. (2017). Introduction: The worldwide triumph of the research university and globalizing science. In *International Perspectives on Education and Society* (Vol. 33). <https://doi.org/10.1108/S1479-367920170000033003>
- Pradhan, B., Sahoo, S., & Padhan, A. (2021). A scientometrics study of research productivity of VSS University of Technology(VSSUT) as reflected in scopus database during 2015-2020. *Library Philosophy and Practice*, 2021, 1–14.
- Seneviratne, T., & Navaneethakrishnan, S. (2018). Research productivity of University of Moratuwa: A study based on scopus database. *LibSym* 2018, 134–145. <http://www.digital.lib.esn.ac.lk/1234/14481>
- Serrano, L., Sianes, A., & Ariza-Montes, A. (2019). Using bibliometric methods to shed light on the concept of sustainable tourism. *Sustainability (Switzerland)*, 11(24). <https://doi.org/10.3390/SU11246964>
- Shahzad, K., Iqbal, A., Khan, D. S. A., Ali, I., Naeem, M., Javed, Y., & Lateef, S. (2021). Research output of government college University Lahore, Pakistan: A bibliometric Study Based on Scopus Database from 1908 to 2020. *Library Philosophy and Practice*, 2021, 1–29.
- University profile, Eastern University Sri Lanka. (n.d.). Retrieved December 8, 2023, from <https://www.esn.ac.lk/University-Profile>
- Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>

- Wang, Q., & Waltman, L. (2016). Large-scale analysis of the accuracy of the journal classification systems of web of science and scopus. *Journal of Informetrics*, 10(2), 347–364. <https://doi.org/10.1016/j.joi.2016.02.003>
- Wijetunge, P., Silva, A., & Manatunga, P. K. S. (2020). Research productivity of the state universities of Sri Lanka, a case based on SciVal and the contribution of the libraries towards excellence. *Journal of the University Librarians Association of Sri Lanka*, 23(1), 91–118. <https://doi.org/10.4038/jula.v23i1.7968>