Voice of Academia
Academic Series of Universiti Teknologi MARA Kedah

Voice of Academia Vol.20, Issue (2) 2024

Voice of Academia

e-ISSN: 2682-7840

BIBLIOMETRIC ANALYSIS OF CONFIDENCE INTERVAL METHODS FOR MEAN ESTIMATION IN STATISTICAL RESEARCH

Siti Fairus Mokhtar[1]*, Zahayu Md Yusof[2], Hasimah Sapiri[3]

[123]School Quantitative Sciences,
Universiti Utara Malaysia, Kedah, Malaysia;

[1]College of Computing, Informatics, and Mathematics,
Universiti Teknologi MARA (UiTM) Kedah Branch;

[2]Centre for Testing, Measurement & Appraisal (CeTMA), Universiti Utara Malaysia, Kedah, Malaysia

ARTICLE INFO

Article history:

Received Feb 2024
Accepted April 2024
Published June 2024

Keywords:

Bibliometric, Scopus database, confidence interval, mean

Corresponding Author:
fairus706@uitm.edu.my

ABSTRACT

This study examines the development of confidence intervals for mean through a bibliometric approach through computational mapping analysis using VOSviewer. This paper aims to examine confidence interval and mean using bibliometric analysis. This paper also analyzes sources of publication, authorship, citations, distribution publications, and other bibliometric indicators. A bibliometric method was adopted. Literature published in academic journals indexed in the Scopus database was retrieved. The study period was set from 1950 to 2023. The study recalled 382 documents from 1950 to 2023 using keywords related to the research topic. It was analyzed using Microsoft Excel 2019, VOSviewer software, and Harzing's Publish or Perish software. The documents were retrieved to rank the most productive countries, institutions, authors, keywords, influential articles, and the topic model. The findings show that the top publication journals are Communications in Statistics Theory and Methods and Communications in Statistics Simulation and Computation. The top keywords in this research include confidence interval

and coverage probability. Countries such as the United States, Thailand, and Taiwan dominate the publication of this area of study. This investigation provides a recent review of this fast-growing field to highlight status and trends using network visualization and bibliometric indicators. The findings are hoped to aid researchers in identifying and exploring potential emerging areas in the related field.

©2024 UiTM Kedah. All rights reserved.

1. Introduction

In statistical inference, confidence intervals (CIs) are commonly used to estimate population parameters such as the mean based on a sample of data. The CI is an important statistical method used to estimate the population location and dispersion parameters. CIs are defined as a range of values that determines how precise the estimates of a parameter are. CIs are useful in a variety of fields of study, including education (Tyng *et al.,* 2011), clinicians (Hespanhol *et al.,* 2019), and engineering (He & Li, 2011). CIs are used in various fields, such as biology, business, finance, housing, manufacturing, market research, medicine, polling, population studies, and websites. Hence, CIs are a very useful tool for researchers in various fields to make inferences about population parameters based on sample data. CIs should always be used to describe the major findings of a research study (Patino & Ferreira, 2015).

Researchers can benefit from bibliometric analysis by examining the bibliographic content and citation analysis of each journal article and other scientific publications. Bibliographies that can be employed in bibliometric analysis include the publishing type, the study topic area, the researcher's place of origin, the journal in which the article was published, and the article's language (Hamidah *et al.,* 2020). Bibliometric analysis can alternatively be described as a quantitative technique for analysing the bibliographical information listed in an article. The bibliometric method is a statistical technique for quantifying the literature. Bibliometric analysis is considered an excellent tool for providing data sets that can be used to enhance the quality of research (Bonilla *et al.,* 2015). The goal of bibliometric analysis is to comprehend the development of research for the past 70 years. As a tool for analysis based on empirical principles and laws, bibliometrics has evolved through time into a broad and generic term for performing measurements in quantifying the data generated by technological and scientific production as published in articles as well as patents (Okubo, 1997; Madani, 2015).

Many studies on bibliometric analysis have been conducted, including bibliometric analysis in economics (Bonilla *et al.,* 2015; Castillo-Vergara *et al.,* 2018; Firmansyah & Faisal, 2019; Rusydiana, 2019; Nawi *et al.,* 2022; Nederhof & Van Raan; 1993), bibliometric analysis in chemistry research (Modak *et al.,* 2020; Grandjean *et al.,* 2011), and chemical engineering (Gaviria-Marin *et al.,* 2019). However, only a few research have been conducted on bibliometric analysis in the field of CI for mean research, specifically employing the VOSviewer software as a mapping analysis instrument. Hence, this study is necessary to identify gaps in the literature that must be filled to support the researcher's proposal.

Additionally, this research outlines the objectives as follows: i) to analyze the literature growth on CI in mean from the Scopus database; ii) to recognize the primary Scopus categories for which the

publications may be categorized and the primary terms may be found; iii) to identify the leading authors in the research field as well as their proximity according to publishing sources; iv) to find primary sources of publication; v) to assess collaboration and networking between both countries and authors; as well as vi) to determine keywords which are the most popular and relevant in this field.

This paper has been organized and aligned based on the following discussion. The first step is to conduct a bibliometric analysis with respect to research contributions that have been published in Scopus. Second, to provide a framework for the ensuing systematic literature search, the analysis's findings are utilized. The paper highlighted the need for more research to conclude the discussion. This specifically occurs while encouraging the use of literature and empirical data in CI of mean research for policymaking and regulatory requirements.

2. Methodology

A bibliometric analysis study uses academic literature database outputs as the foundation for a mechanistic approach to evaluating global research trends in a particular field. A review paper, which is fundamentally meant to examine the most recent advances, challenges, and future directions of a specific field, differs from a bibliometric analysis paper in this approach. Using the bibliometric analysis method, this paper seeks to evaluate current trends in the growth of academic literature on CI for mean. The results are presented in this paper using network visualization and bibliometric analysis.

2.1 Source of information

Elsevier launched Scopus in 2004 [43]. Moreover, with 22,800 titles obtained from more than 5000 international publishers, Scopus offers the most extensive global perspective on research in medicine, social sciences, science, technology, and the arts and humanities [43]. The Scopus database provides several operational features that make bibliometric analysis easier. Source, country or territory, author, document, affiliation, subject area, and type of document are all influenced by the year; the search results' central theme is then assessed. Bibliometric metrics, like total articles, CiteScore, total citations, and h-index, are employed for ranking purposes. The Scopus database, which contains about 394 titles, is among the most distinguished academic databases currently available. For this research, the Scopus database serves as the main data source.

2.2 Search Strategy

This review's topical scope was delimited to 'confidence interval and mean.' PRISMA (Preferred Reporting Items for Systematic Environ Sci Pollut Res Reviews and Meta-Analyses) standards for the document search were followed by the authors in operational terms, as shown in Figure 1 (Moher, Liberati, Tetzlaff & Altman, 2009). The following keyword string was entered into several different searches: (TITLE- KEY ("confidence interval") AND (mean). This Scopus search was done on March 15, 2023, and it retrieved a total of 394 papers (see Figure 1). The list of 394 papers was then further filtered to eliminate those that were not produced in English. After eliminating 12 documents, a total of 382 documents were generated and thoroughly evaluated. For additional analysis of publications relying on the citation counts, impact per publication, and citation per publication applications, including Microsoft Excel, Harzing Publish or Perish, as well as VOSviewer, have been utilized.

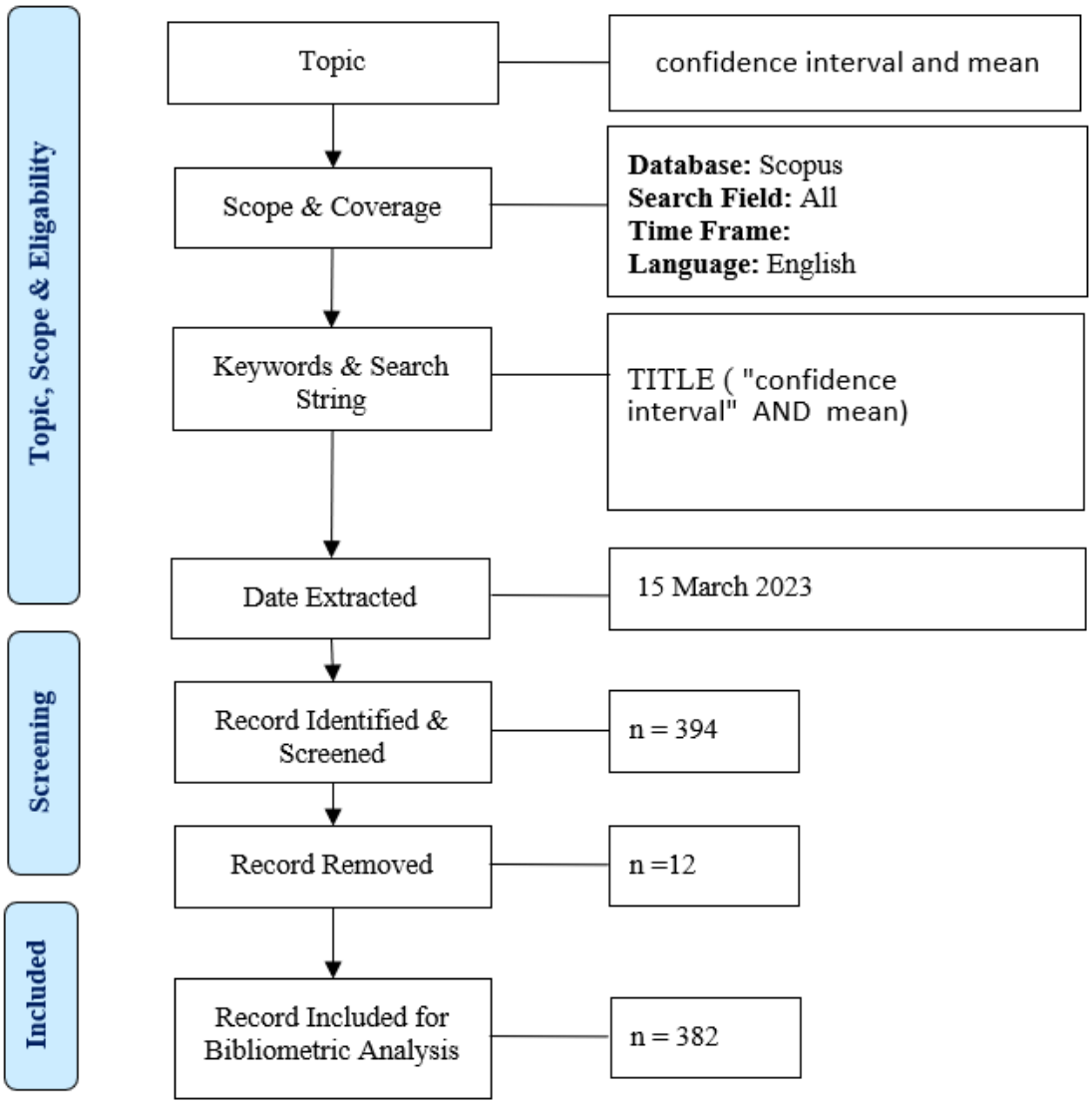


Figure 1. The Flow Diagram of PRISMA.

3. Results

Document types, source type, year of publications, most active source titles, keywords, subject area, citation productivity, source type, keywords, distribution of publication by countries, year of publications, subject area, most productive authors, abstract analysis, title, as well as citation analysis have been used to analyze the academic material that has been extracted

during the search process. The findings also included annual growth data through 2023, along with their percentage and frequency.

3.1 Document and Source Types

Table 1 presents the distribution of publications by document type in a particular field, with a total of 382 publications analyzed. Most publications are articles, comprising 87.70% of the total. Conference papers represent 6.81% of the publications, while book chapters account for 2.62%. Erratum, reviews, letters, and notes each make up a smaller percentage at 1.31%, 0.79%, 0.52%, and 0.26%, accordingly.

Table 1
Document Type.

Document Type	Total Publications (TP)	Percentage (%)
Article	335	87.70%
Conference Paper	26	6.81%
Book Chapter	10	2.62%
Erratum	5	1.31%
Review	3	0.79%
Letter	2	0.52%
Note	1	0.26%
Total	**382**	**100.00**

Table 2 presents the distribution of publications by source type in a particular field. Journal articles make up most publications, accounting for 90.58% of the total publications analyzed. Conference proceedings and book series represent 4.71% and 3.93% of the total publications, respectively. Books and trade journals each account for less than 1% of the publications.

Table 2
Source Type

Source Type	Total Publications (TP)	Percentage (%)
Journal	346	90.58%
Conference Proceeding	18	4.71%
Book Series	15	3.93%
Book	2	0.52%
Trade Journal	1	0.26%
Total	**382**	**100.00**

3.2 Year of Publications

Table 3 provides a summary of the bibliometric analysis for the publications related to the CI of mean over a period of 74 years from 1950 to 2023. Figure 2 displays the growth in publishing activity in the subject's area. An increasing number of papers on CI of mean has emerged in the last twenty years. In this sense, CI is very important in real-world applications. Additionally, the table shows a trend of increasing publications utilizing this type of analysis in recent years, with the highest percentage of publications occurring in 2022 at 25 publications (6.54%), while the lowest number

was in 1950, 1952, 1959, 1965, 1966, 1977, and 1986 with only one publication in each of these years. The information in this table can be used to spot trends in research on the mean of CI changes over time.

Table 3
Year of Publications (TP)

Year	TP	%	Year	TP	%
2023	3	0.79%	1997	7	1.83%
2022	25	6.54%	1996	5	1.31%
2021	14	3.66%	1995	5	1.31%
2020	11	2.88%	1994	5	1.31%
2019	9	2.36%	1993	4	1.05%
2018	12	3.14%	1992	7	1.83%
2017	13	3.40%	1991	7	1.83%
2016	16	4.19%	1990	2	0.52%
2015	15	3.93%	1986	2	0.52%
2014	13	3.40%	1985	3	0.79%
2013	18	4.71%	1984	3	0.79%
2012	7	1.83%	1983	1	0.26%
2011	9	2.36%	1982	2	0.52%
2010	15	3.93%	1981	3	0.79%
2009	21	5.50%	1980	3	0.79%
2008	12	3.14%	1979	2	0.52%
2007	13	3.40%	1978	2	0.52%
2006	11	2.88%	1977	1	0.26%
2005	8	2.09%	1974	2	0.52%
2004	7	1.83%	1972	3	0.79%
2003	11	2.88%	1970	2	0.52%
2002	10	2.62%	1966	1	0.26%
2001	6	1.57%	1965	1	0.26%
2000	5	1.31%	1959	1	0.26%
1999	6	1.57%	1952	1	0.26%
1998	6	1.57%	1950	1	0.26%

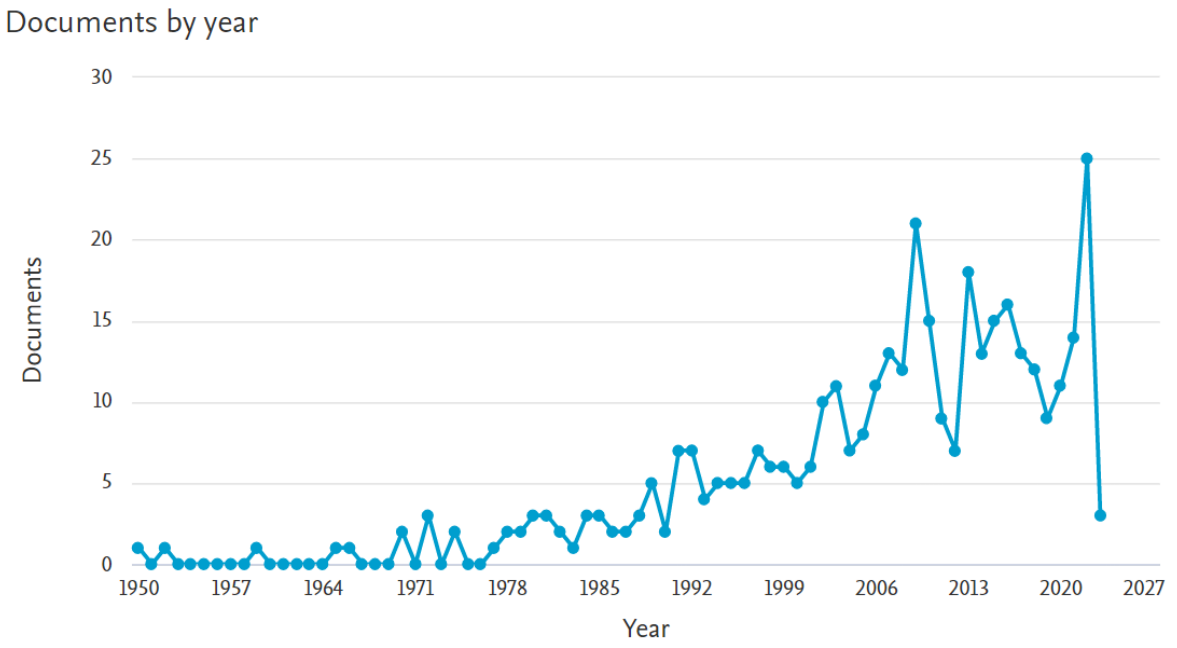


Figure 2. Document by Year.

3.3. Subject Area

According to the total number of publications as well as the corresponding percentage of the total, Table 4 illustrates the distribution of scientific publications across multiple subject areas. With a total of 276 publications, mathematics had the most publications, accounting for 72.25% of the total publications. Decision Sciences followed, with 120 publications representing 31.41% of the total. Computer Science had 48 publications, accounting for 12.57% of the total, while Medicine had 38 publications, representing 9.95%. Engineering and Agricultural and Biological Sciences both had 22 publications each, accounting for 5.76% of the total. The subject areas with the lowest number of publications are Nursing, with only one publication, accounting for 0.26% of the total publications, and Economics, Econometrics, and Finance, with only two publications, accounting for 0.52% of the total publications.

Table 4
Subject Area.

Subject Area	**Total Publications**	**Percentage (%)**
Mathematics	276	72.25%
Decision Sciences	120	31.41%
Computer Science	48	12.57%
Medicine	38	9.95%
Engineering	22	5.76%

Agricultural and Biological Sciences	22	5.76%
Psychology	19	4.97%
Biochemistry, Genetics and Molecular Biology	18	4.71%
Physics and Astronomy	14	3.66%
Business, Management and Accounting	13	3.40%
Multidisciplinary	12	3.14%
Social Sciences	12	3.14%
Immunology and Microbiology	9	2.36%
Pharmacology, Toxicology and Pharmaceutics	8	2.09%
Arts and Humanities	7	1.83%
Chemistry	6	1.57%
Earth and Planetary Sciences	6	1.57%
Environmental Science	6	1.57%
Chemical Engineering	4	1.05%
Health Professions	4	1.05%
Neuroscience	3	0.79%
Economics, Econometrics and Finance	2	0.52%
Nursing	1	0.26%

3.4 Most Active Source Titles

Table 5 illustrates the most active source titles in terms of number of publications and percentage contribution. The data presented in this table provides insights into the academic journals that have published the most articles in the field of statistics. Communications In Statistics Theory and Methods has the highest number of publications at 18 (4.71%), followed by Communications In Statistics Simulation And Computation with 16 publications (4.19%) as well as Journal Of Statistical Computation And Simulation with 14 publications (3.66%). The remaining publications are spread across other academic journals like Computational Statistics and Data Analysis, American Statistician, Statistics In Medicine, Biometrics, and others. The table provides useful information for researchers, academics, and practitioners who are interested in statistics, as it indicates which sources are most active in terms of publishing new research in this field.

Table 5
Most Active Source Title.

Source Title	**TP**	**%**
Communications In Statistics Theory And Methods	18	4.71%
Communications In Statistics Simulation And Computation	16	4.19%
Journal Of Statistical Computation And Simulation	14	3.66%
Journal Of Statistical Planning And Inference	13	3.40%
Computational Statistics And Data Analysis	12	3.14%

American Statistician	10	2.62%
Statistics And Probability Letters	10	2.62%
Statistics In Medicine	10	2.62%
Biometrics	9	2.36%
Journal Of The American Statistical Association	9	2.36%
Sequential Analysis	8	2.09%
Studies In Computational Intelligence	8	2.09%
Annals Of The Institute Of Statistical Mathematics	7	1.83%
American Journal Of Mathematical And Management Sciences	6	1.57%
Biometrika	6	1.57%
Journal Of Applied Statistics	6	1.57%
Journal Of Modern Applied Statistical Methods	6	1.57%
Psychological Methods	6	1.57%
Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics	5	1.31%
Statistical Papers	5	1.31%

A VOSviewer was used to conduct all keyword analysis. Figure 3 displays the network visualization of all terms. The relationship between each keyword and the other keywords is indicated by the font color, node, connection line size, and weight. Figure 3 shows the keywords that frequently appeared in the keywords of the CI of mean papers. Furthermore, the terms are significant since they identify the focus areas of the research.

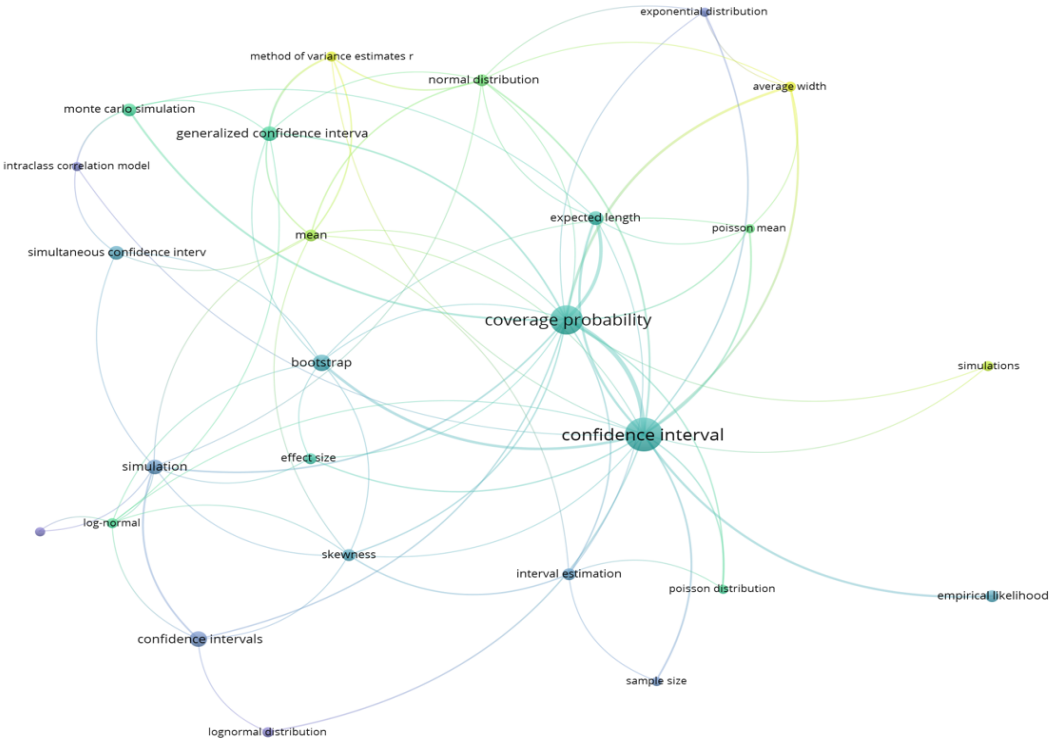


Figure 3. Network visualization map with respect to the author's keywords.

3.5 Keywords Analysis

A VOSviewer was used to conduct all keyword analysis. Figure 4 displays the network visualization of all terms. The relationship between each keyword and the other keywords is indicated by the font color, node, connection line size, and weight. Figure 3 shows the keywords frequently appearing in the keywords search for the CI of mean papers. Furthermore, the terms are significant since they identify the focus areas of the research. The key concepts associated with CIs are coverage probability and interval length (Minkah & de Wet, 2017).

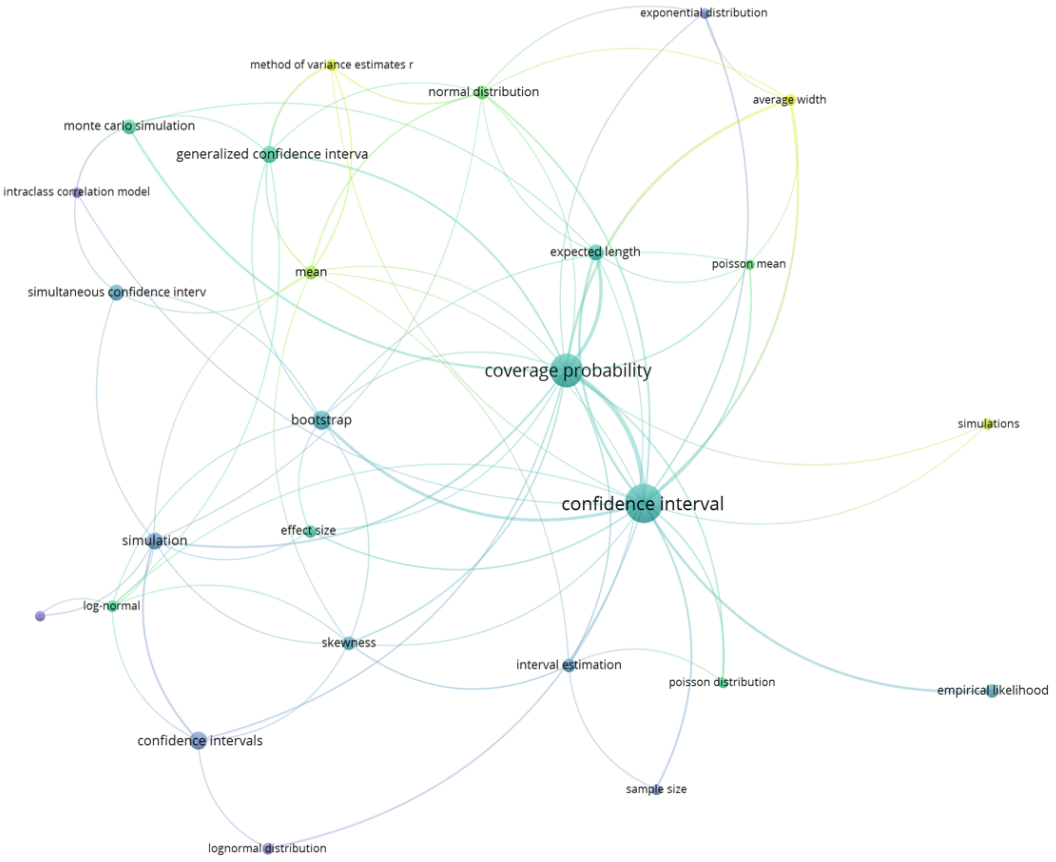


Figure 4. Network visualization map of the author keywords.

The top searched terms determined by bibliometric analysis are shown in Table 6. The CI was among the predominant keywords that is transpired, followed by coverage probability and human. The table includes a list of keywords along with the total number of publications in which each keyword appears. The most frequent keyword searched by authors is "Confidence Interval," with 209 publications, followed by "Coverage Probability," with 73 publications, and "Human" with 72 publications. Other keywords that appeared frequently include "Simulation" (71 publications), "Article" (52 publications), "Statistical Methods" (42 publications), "Probability" (38 publications), "Monte Carlo Method" (35 publications), and "Statistics" (34 publications). There are fewer than 30 publications related to the other keyword.

Table 6
Top Keywords

Author Keywords	Total Publications
Confidence Interval	209
Coverage Probability	73
Human	72
Simulation	71
Article	52
Statistical Methods	42
Probability	38
Monte Carlo Method	35
Statistics	34

Using WordSift to create the word cloud, this research then analyzes the author's keywords further (WordSwift.org 2021). Figure 5 displays the word cloud's outcome with a limit of about 100 words and a scale setting. The best 100 keywords (or parts of keywords) from the article on CI of mean were displayed in the figure. The size of each phrase reflects the overall frequency of the keywords. Although keywords were used to search the document's title, other emerging keywords such as statistics, distribution, estimate, confidence, and data are also included in the word cloud. Additionally, small-sized words made a significant contribution to the research on immigration as well as environmental degradation. It is crucial to note that every word generated in Figure 5 is a trending or popular word that is also used in confidence interval and mean research. Therefore, it is possible to predict that future research will focus on these keywords.



Figure 5. Word cloud of the keywords

3.6 Geographical Distribution of Publications - Most Influential Countries

Table 7 portrays the contribution of various countries to the publications in this field. The data indicates that the United States is the leading contributor, with 189 publications accounting for 49.48% of the total publications. Thailand follows the United States with 46 publications, contributing 12.04% of the total. Taiwan and Canada contributed 23 (6.02%) and 22 (5.76%) publications, respectively. Japan, China, and Germany contributed 18 (4.71%), 15 (3.93%), and 13 (3.40%) publications, respectively. Australia and the United Kingdom contributed 12 (3.14%) and 11 (2.88%) publications, respectively. Other countries, such as India, Jordan, Iran, New Zealand, Bangladesh, Israel, and Sweden, contributed less than 2% of the total publications.

Table 7
Most Countries contributed to the publications.

Country	Total Publications	Percentage (%)
United States	189	49.48%
Thailand	46	12.04%
Taiwan	23	6.02%
Canada	22	5.76%
Japan	18	4.71%
China	15	3.93%
Germany	13	3.40%
Australia	12	3.14%
United Kingdom	11	2.88%
India	8	2.09%
Jordan	7	1.83%
Iran	6	1.57%
New Zealand	6	1.57%
Bangladesh	4	1.05%
Israel	4	1.05%
Sweden	4	1.05%

3.7 Authorship

Table 8 displays the top productive authors relying on the number of documents that have been published by them in the selected field. The table presents the author's name, the total number of documents that have been published, and the percentage of their contribution to the field. Niwitpong, S.A., and Niwitpong, S. are the two most productive authors, with 29 and 24 publications, respectively, accounting for 7.59% and 6.28% of the publications in the field. The table also shows other highly productive authors such as Mukhopadhyay, N., Chen, H.J., and Krishnamoorthy, K., with 12, 9, and 8 publications, respectively, representing a considerable percentage of publications in the field.

Table 8
Most Productive Authors

Author's Name	No. of Documents	Percentage (%)
Niwitpong, S.A.	29	7.59%
Niwitpong, S.	24	6.28%
Mukhopadhyay, N.	12	3.14%
Chen, H.J.	9	2.36%
Krishnamoorthy, K.	8	2.09%
Burdick, R.K.	7	1.83%
Seo, T.	7	1.83%
Thangjai, W.	7	1.83%
Kibria, B.M.G.	6	1.57%
Abu-Shawiesh, M.O.A.	5	1.31%
Bonett, D.G.	5	1.31%
Chen, S.Y.	5	1.31%
Graybill, F.A.	5	1.31%
Maneerat, P.	5	1.31%
Panichkitkosolkul, W.	5	1.31%
Kabaila, P.	4	1.05%
Koizumi, K.	4	1.05%
Liu, X.S.	4	1.05%
Sinsomboonthong, J.	4	1.05%
Zhou, X.H.	4	1.05%

3.8 Most Influential Institutions

Table 9 shows a list of institutions that have published at least five articles on the topic being studied, along with their total number of publications and the percentage of publications they represent in the total sample. King Mongkut's University of Technology North Bangkok is considered the most influential institution in the study, with 34 publications representing 8.90% of the total sample. The University of Florida, Florida International University, University of Connecticut, and University of Louisiana at Lafayette are also among the top institutions with 11, 10, 10, and 9 publications, respectively. Other institutions from various countries like Taiwan, Australia, Japan, as well as the United States are also represented on the list with at least five publications.

Table 9
Institutions that are most influential have a minimum of five publications

Institution	Total Publications	Percentage (%)
King Mongkut's University of Technology North Bangkok	34	8.90%
University of Florida	11	2.88%
Florida International University	10	2.62%
University of Connecticut	10	2.62%
University of Louisiana at Lafayette	9	2.36%
Tamkang University	8	2.09%
Tokyo University of Science	8	2.09%
University of Minnesota Twin Cities	8	2.09%
Hashemite University	7	1.83%
Iowa State University	6	1.57%
Colorado State University	6	1.57%
Thammasat University	6	1.57%
University of Georgia	6	1.57%
Arizona State University	5	1.31%
La Trobe University	5	1.31%
National Chiao Tung University	5	1.31%
National Cheng Kung University	5	1.31%
University of South Carolina	5	1.31%
University of California, Berkeley	5	1.31%
Callaghan Innovation	5	1.31%

4. Discussion and Conclusion

Analysis of the number of publications conducted on the subject during the time under investigation revealed an upward trend in the number of articles that have been published, demonstrating the importance and relevance of the increasing CI for mean research. A total of 382 articles from the Scopus database that were written between 1950 and 2023 were examined.

The major authors of the area (Niwitpong, S.A., Niwitpong, S., and Mukhopadhyay, N.) and their proximity to one another in terms of the sources of publication were also identified owing to the bibliometric analysis. The top five publications on the confidence interval for the mean topic are found in Communications in Statistics Theory and Methods, Communications in Statistics Simulation and Computation, Journal of Statistical Computation and Simulation, Journal of Statistical Planning and Inference, and Computational Statistics and Data Analysis. The research studies journals with the highest h-index and impact factor.

Table 10 provides information on the citation metrics of the publications in the analyzed dataset. The data retrieved from the SCOPUS database is used to determine the citation index employing Harzing's Publish or Perish software. Moreover, the publication years range from 1950 to 2023, with a total of 382 papers published. The citation years span 73 years, from 1950 to 2023, with a total of 6,241 citations. The average number of citations per year is 85.49, and the average number of citations per paper is 16.34. The average number of papers per author is 230.07, the average number of authors per paper is 2, and the average number of citations per author is 3,585.74. The h-index of the dataset is 36, while the g-index is 69.

Table 10

Citations Metrics

Metrics	Data
Publication years	1950 - 2023
Citation years	73 (1950 – 2023)
Paper	382
Papers	382
Citations	6241
Years	73
Citations/year	85.49
Citation/paper	16.34
Citation/author	3585.74
Papers/author	230.07
Authors/paper	2.05
h_index	36
g_index	69

Table 11 presents a list of highly cited articles along with their authors, titles, year of publication, total citations as well as citations per year. The table lists a total of 20 articles, which are arranged according to their overall number of citations. With a total of 697 citations and an average of 34.85 citations a year, the most cited article is "Overlapping confidence intervals or standard error intervals: What do they mean in terms of statistical significance?" by Payton, Greenstone, and Schenker. Additionally, the table also includes other highly cited articles related to confidence intervals, means, and statistical significance, published between 1972 and 2013, with a range of 71 to 697 total citations and an average of 1.65 to 34.85 citations per year. The list provides insight into some of the most influential research studies in the field of statistics and their impact on the discipline.

Table 11

Articles that are highly cited.

No.	Authors	Title	Year	Cites	Cites per Year
1	M.E. Payton, M.H. Greenstone, N. Schenker	Overlapping confidence intervals or standard error intervals: What do they mean in terms of statistical significance?	2003	697	34.85
2	J.M. Bland, D.G. Altman	Statistics notes: Transformations, means, and confidence intervals	1996	345	12.78
3	E. Diletti, D. Hauschke, V.W. Steinijans	Sample size determination for bioequivalence assessment by means of confidence intervals	1991	283	8.84
4	R. Pfister, M. Janczyk	Confidence intervals for two sample means: Calculation, interpretation, and a few simple rules	2013	173	17.3
5	S.A. Julious	Using confidence intervals around individual means to assess statistical significance between two means	2004	161	8.47
6	K. Krishnamoorthy, T. Mathew	Inferences on the means of log-normal distributions using generalized p-values and generalized confidence intervals	2003	154	7.7
7	X.-H. Zhou, S. Gao	Confidence intervals for the log-normal mean	1997	154	5.92
8	J. Algina, H.J. Keselman, R.D. Penfield	An alternative to Cohen's standardized mean difference effect size: A robust parameter and confidence interval in the two independent groups' case	2005	141	7.83
9	K. Kelley	The effects of nonnormal distributions on confidence intervals around the standardized mean difference: Bootstrap and parametric confidence intervals	2005	118	6.56
10	H. Sahai, A. Khurshid	Confidence Intervals for the Mean of a Poisson Distribution: A Review	1993	110	3.67
11	U. Olsson	Confidence intervals for the mean of a log-normal distribution	2005	100	5.56
12	C.E. Land	An evaluation of approximate confidence interval estimation methods for log-normal means	1972	90	1.76
13	A. Donner, G.Y. Zou	Closed-form confidence intervals for functions of the normal mean and standard deviation	2012	89	8.09

14	M.A. Seaman, R.C. Serlin	Equivalence Confidence Intervals for Two-Group Comparisons of Means	1998	89	3.56
15	K. Kelley, J.R. Rausch	Sample size planning for the standardized mean difference: Accuracy in parameter estimation via narrow confidence intervals	2006	88	5.18
16	C.S. Locke	An exact confidence interval from untransformed data for the ratio of two formulations means	1984	88	2.26
17	K. Kelley, K. Lai	Accuracy in parameter estimation for the root mean square error of approximation: Sample size planning for narrow confidence intervals	2011	86	7.17
18	G. Cumming, R. Maillardet	Confidence intervals and replication: Where will the next mean fall?	2006	79	4.65
19	N. Mukhopadhyay	A consistent and asymptotically efficient two-stage procedure to construct fixed-width confidence intervals for the mean	1980	71	1.65
20	T. Britton, B. Oxelman, A. Vinnersten, K. Bremer	Phylogenetic dating with confidence intervals using mean path lengths	2002	70	3.33

The major sources of English-language publications are identified in this paper's archives, along with the publication growth in the different areas of mean CI research. Additionally, it examines key terms, the nations with the greatest number of publications on the subject, and global cooperation networks between top countries and authors. To find future trends and current research for author CI of mean, a bibliometric analysis of the literature is crucial.

Acknowledgments
The authors would like to thank the editor and anonymous reviewers for the detailed reading that resulted in an improved version of this paper.

Funding Details
This work has received no funding.

Authors Contributions
All authors were responsible for the whole structure of manuscripts and analysis of the data as well as the writing of the journal article.

Conflict of Interest
There is no conflict of interest associated with this publication.

References

Ahmi, A., Elbardan, H., & Raja Mohd Ali, R. H. (2019). Bibliometric Analysis of Published Literature on Industry 4.0. In *2019 International Conference on Electronics, Information, and Communication (ICEIC)* (pp. 1–6). IEEE. https://doi.org/10.23919/ELINFOCOM.2019.8706445

Ahmi, A., & Mohd Nasir, M. H. (2019). Examining the Trend of the Research on eXtensible Business Reporting Language (XBRL): A Bibliometric Review. *International Journal of Innovation, Creativity and Change, 5*(2), 1145–1167

Bahri, S., Adnyana, I.K., Hasan, M.F., Ray, H.R.D., & Paramitha, S.T. (2022). Science mapping for nutrition education in sports recovery research: A bibliometric analysis. *International Journal of Education in Mathematics, Science, and Technology (IJEMST), 10*(4), 795-811. https://doi.org/10.46328/ijemst.2620

Bonilla, C.A.; Merigó, J.M.; and Torres-Abad, C. (2015). Economics in Latin America: a bibliometric analysis. *Scientometrics, 105*(2), 1239-1252.

Burnham, J. F. (2006). Scopus database: A review. *Biomedical digital libraries, 3*(1), 1. https://doi.org/10. 1186/1742-5581-3-1.

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, web of science, and Google scholar: Strengths and weaknesses. *The FASEB Journal, 22*(2), 338–342.

Firmansyah, E.A.; and Faisal, Y.A. (2019). Bibliometric analysis of Islamic economics and finance journals in Indonesia. *Al-muzara'ah, 7*(2), 17-26.

Castillo-Vergara, M.; Alvarez-Marin, A.; and Placencio-Hidalgo, D. (2018). A bibliometric analysis of creativity in the field of business economics. *Journal of Business Research, 85*, 1-9.

Gaviria-Marin, M.; Merigó, J.M.; and Baier-Fuentes, H. (2019). Knowledge management: A global examination based on bibliometric analysis. *Technological Forecasting and Social Change, 140*, 194-220.

Grandjean, P.; Eriksen, M.L.; Ellegaard, O.; and Wallin, J.A. (2011). The Matthew effect in environmental science publication: a bibliometric analysis of chemical substances in journal articles. *Environmental Health, 10*(1), 1-8.

González-Albo, B., & Bordons, M. (2011). Articles vs. proceedings papers: Do they differ in research relevance and impact? A case study in the Library and Information Science field. *Journal of Informetrics, 5*(3), 369-381. https://doi.org/10.1016/j.joi.2011.01.011

Hamidah, I., Sriyono, S., & Hudha, M. N. (2020). A Bibliometric analysis of Covid-19 research using VOSviewer. *Indonesian Journal of Science and Technology*, 34-41.

He, S., & Li, J. (2011). Confidence intervals for neural networks and applications to modeling engineering materials. *Artificial Neural Networks-Application*.

Hespanhol, L., Vallio, C. S., Costa, L. M., & Saragiotto, B. T. (2019). Understanding and interpreting confidence and credible intervals around effect estimates. *Brazilian journal of physical therapy*, *23*(4), 290-301.

Madani, F. (2015). 'Technology Mining' bibliometrics analysis: applying network analysis and cluster analysis. Scientometrics, 105(1), 323-335. http://dx.doi.org/10.1007/ s11192-015-1685-4.

Minkah, R., & de Wet, T. (2017). Comparison of confidence interval estimators: An index approach. *arXiv preprint arXiv:1702.08572*.

Modak, N.M.; Lobos, V.; Merigó, J.M.; Gabrys, B.; and Lee, J.H. (2020). Forty years of computers and chemical engineering: A bibliometric analysis. *Computers and Chemical Engineering, 141*, 106978.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group*, T. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine*, *151*(4), 264-269.

Mukhopadhyay, N. (1980). A consistent and asymptotically efficient two-stage procedure to construct fixed width confidence intervals for the mean. *Metrika, 27*(1), 281-284. doi:10.1007/BF01893607

Mukhopadhyay, N. (2020). Asymptotic normality of sequential stopping times with applications: Confidence intervals for an exponential mean. *Calcutta Statistical Association Bulletin, 72*(1), 17-34. doi:10.1177/0008068320923895

Mukhopadhyay, N. (1981). Convergence rates of sequential confidence intervals and tests for the mean of A U-statistic. *Communications in Statistics - Theory and Methods, 10*(21), 2231-2244. doi:10.1080/03610928108828184

Mukhopadhyay, N., & Bishnoi, S. K. (2020). On general asymptotically second-order efficient purely sequential fixed-width confidence interval (FWCI) and minimum risk point estimation (MRPE) strategies for a normal mean and optimality. *Metron, 78*(3), 383-409. doi:10.1007/s40300-020-00187-1

Mukhopadhyay, N., & Datta, S. (1996). On sequential fixed-width confidence intervals for the mean and second-order expansions of the associated coverage probabilities. *Annals of the Institute of Statistical Mathematics, 48*(3), 497-507. doi:10.1007/BF00050850

Mukhopadhyay, N., de Silva, B. M., & Waikar, V. B. (2010). On two-stage confidence interval procedures and their comparisons for estimating the difference of normal means. *Sequential Analysis, 29*(1), 44-68. doi:10.1080/07474940903479482

Mukhopadhyay, N., & Hu, J. (2017). Confidence intervals and point estimators for a normal mean under purely sequential strategies involving Gini's mean difference and mean absolute deviation. *Sequential Analysis, 36*(2), 210-239. doi:10.1080/07474946.2017.1319684

Mukhopadhyay, N., & Poruthotage, S. M. (2013). Sequential fixed-width confidence interval procedures for the mean under multiple boundary crossings. *Sequential Analysis, 32*(1), 83-109. doi:10.1080/07474946.2013.751851

Mukhopadhyay, N., & Venkatesan, S. (2022). A new formulation of minimum risk fixed-width confidence interval (MRFWCI) estimation problems for a normal mean with illustrations and simulations: Applications to air quality data. *Sequential Analysis, 41*(2), 241-274. doi:10.1080/07474946.2022.2070214

Nawi, N. F., Anuar, A., Manshor, N. M., & Latif, R. A. (2022). Policy, Legal and Regulation Research in the Sharing Economy: A Bibliometric Analysis and Systematic Literature Review. *IIUMLJ*, *30*, 1.

Nederhof, A.J.; and Van Raan, A.F. (1993). A bibliometric analysis of six economics research groups: A comparison with peer review. *Research Policy, 22*(4), 353-368

Niwitpong, S. (2013). Confidence intervals for the mean of lognormal distribution with restricted parameter space. *Applied Mathematical Sciences, 7*(1-4), 161-166. doi:10.12988/ams.2013.13014

Niwitpong, S. (2015). Confidence intervals for the normal mean with known coefficient of variation. *Far East Journal of Mathematical Sciences, 97*(6), 711-727. doi:10.17654/FJMSJul2015_711_727

Niwitpong, S. (2011). Coverage probability of confidence intervals for the normal mean and variance with restricted parameter space. *World Academy of Science, Engineering and Technology, 80*, 540-545. Retrieved from www.scopus.com

Niwitpong, S., Koonprasert, S., & Niwitpong, S. (2012). Confidence interval for the difference between normal population means with known coefficients of variation. *Applied Mathematical Sciences,* 6(1-4), 47-54. Retrieved from www.scopus.com

Niwitpong, S., & Niwitpong, S. -. (2010). Confidence interval for the difference of two normal population means with a known ratio of variances. *Applied Mathematical Sciences, 4*(5-8), 347-359. Retrieved from www.scopus.com

Niwitpong, S., & Niwitpong, S. -. (2015). Confidence intervals for the difference between normal means with known coefficients. Paper presented at the *Lecture Notes in Artificial Intelligence (Subseries of Lecture Notes in Computer Science), , 9376* 171-182. doi:10.1007/978-3-319-25135-6_17 Retrieved from www.scopus.com

Niwitpong, S., & Niwitpong, S. -. (2017). Confidence intervals for the difference between normal means with known coefficients of variation. *Annals of Operations Research, 256*(2), 237-251. doi:10.1007/s10479-016-2388-9

Niwitpong, S., & Wongkhao, A. (2015). Confidence interval for the inverse of normal mean. *Far East Journal of Mathematical Sciences, 98*(6), 689-698. doi:10.17654/FJMSNov2015_689_698

Niwitpong, S. A. (2013). Confidence intervals for the ratio of means of lognormal distribution with restricted parameter space. *Applied Mathematical Sciences, 7*(101-104), 5175-5184. doi:10.12988/ams.2013.37395

Niwitpong, S. -. (2015). Confidence intervals for the difference and the ratio of lognormal means with bounded parameters. *Songklanakarin Journal of Science and Technology, 37*(2), 231-240. Retrieved from www.scopus.com

Patino, C. M., & Ferreira, J. C. (2015). Confidence intervals: a useful statistical tool to estimate effect sizes in the real world. *Jornal Brasileiro de Pneumologia*, *41*, 565-566.

Rusydiana, A.S. (2019). Bibliometric Analysis of Scopus-Indexed Waqf Studies. *Ekonomi Islam Indonesia, 1*(1), 1-17.

Okubo, Y. (1997). Bibliometric indicators and analysis of research systems: methods and examples. Paris: Organisation for Economic Co-operation and Development.

Suseelan, M., Chew, C.M., & Chin, H. (2022). Research on mathematics problem solving in elementary education conducted from 1969 to 2021: A bibliometric review. *International Journal of Education in Mathematics, Science, and Technology (IJEMST), 10*(4), 1003- 1029. https://doi.org/10.46328/ijemst.2198

Tyng, T. Y., Othman, A. R., & Heng, L. C. (2011). The Effects of Data Distribution on the Confidence Interval of the Number of Projected Items. *Pertanika Journal of Science & Technology*, *19*(2).

Zhang, L., & Glänzel, W. (2012). Proceeding papers in journals versus the "regular" journal publications. *Journal of Informetrics,* 6(1), 88-96. https://doi.org/10.1016/j.joi.2011.06.007