



# Information Mining and Bibliometric Analysis of Academic Misconduct

Yuenan Wang<sup>1</sup>, Tianxiao Jiang<sup>2</sup>, Tong Zhai<sup>1</sup>, Hongbin Liu<sup>1\*</sup>

<sup>1</sup>Tianjin University Library, Tianjin University, Tianjin, China

<sup>2</sup>Tianjin Institute of Scientific & Technical Information, Tianjin, China

Email: \*280328951@qq.com

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## Abstract

Academic misconduct has always been a hot topic both internationally and domestically, and there have been many studies on it. The present bibliometric analysis was conducted on the basis of 1562 WOS database-derived papers to shed more light on publication performances as well as research features of Academic Misconduct. We used indicators for evaluating impacts of the most prolific journals, countries/territories, organizations and authors. Additionally, interactions across prolific countries/territories, organizations, authors and keywords were assessed and visualized through social network analysis by adopting VOSviewer software. Our findings shed more light on summarizing the research status in the field of academic misconduct-related fields.

## Subject Areas

Quantitative Information Science

## Keywords

Information Mining, Bibliometric Analysis, Academic Misconduct, Scholarly Misconduct, VOSviewer

## 1. Introduction

Scholarly misconduct causes significant impact on the academic community. To extremes, results of scholarly misconduct could endanger public welfare as well as national security [1]. The scientific misconduct subject is under extensive discussion in academic journals, but many papers on the specific topic are letters or editorials. Additionally, many papers focused on analyzing the scientific misconduct scope [2]. Scientific misconduct has aroused increasing interest in science

policy makers, researchers, and the whole society. The consequences may comprise efficient location of research funds because of forged clinical studies affecting clinical practice and overinflated curricula vitae [3]. Additionally, the scientific misconduct cases have an unfavorable influence on society if they are public [4] [5]. With the undermining of confidence, researchers and institutions will have reduced reputations. The definition of scientific misconduct is complicated since some readers suggest that it just involves data distortion and fabrication, whereas others suggest that it involves plagiarism by stealing ideas of others [6]. However, scientific misconduct has been increasingly suggested to involve more unethical behaviors such as including authors not contributing to studies, not declaring conflicts of interest, or publishing one article in diverse journals, also called self-plagiarism [4].

Bibliometrics has been the efficient approach used in the quantitative evaluation of the current scientific production status and development in a certain study field [7] [8]. It is used in different areas like solid waste [9], computer science [10], clinical medicine [11], proteomics [12], and river water quality [13] and so on. Traditional indicators are subject category, publication output, journal, author, contributing country and institution. There are five recent indicators developed for evaluating country and institution performances, namely, first-author, total, corresponding-author, as well as collaborative publications [14]-[16]. Keywords are analyzed for examining research trends and hotspots recently [17] [18].

In our study, we meticulously gather bibliographic information for all retrieved studies, and we then employ knowledge mapping techniques for analysis, utilizing VOSviewer, a tool renowned for its ability to transform bibliometric data into easily understandable visual formats [19]. Through VOSviewer, we conduct network analyses focusing on several aspects: author keyword co-occurrence, the journal and author co-citation, and the co-authorship networks that encompass the institutions and countries of the authors. This method includes generating link strengths to better understand the relationships within the data. This approach is instrumental in delineating and structuring the subject area's scope, enhancing our comprehension of the field. Additionally, we adopt the fractional counting approach for its effectiveness in offering field-normalized visual representations [20]. Visualizing networks such as the co-occurrence network of keywords, journal and author co-citation network, and co-authorship networks of institutions, countries, and authors, this method facilitates an exhaustive examination of the research status in this field [21].

## 2. Methodology and Source Data

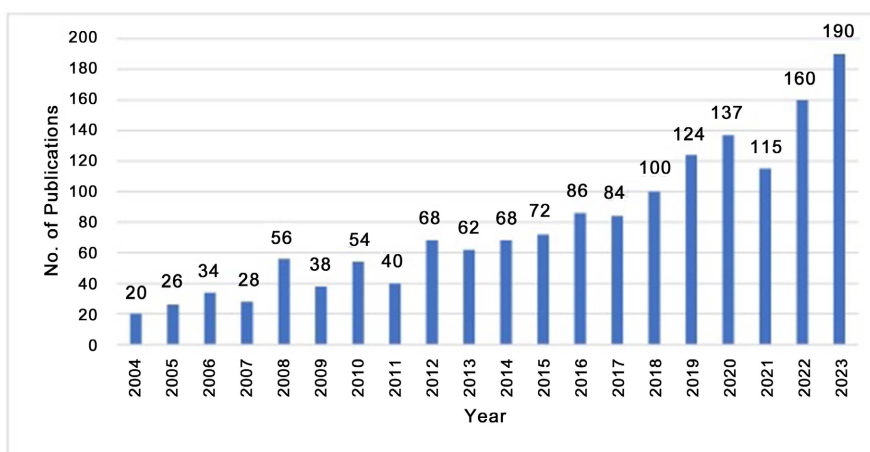
We retrieved publication data in the present work using Science Citation Index Expanded (SCIE) and Social Sciences Citation Index (SSCI) from online Web of Science Core Collection database. It represents the frequently utilized data source to retrieve bibliometric documents. All papers on academic misconduct were searched according to topic (title, abstract, keywords plus, and author keywords).

Data were cleaned using duplicate, whereas unrelated data were eliminated by initial title, abstract and keyword screening. Only “Article” and “Review” were searched. As mentioned earlier, there were 1562 papers on academic misconduct from 2004 to 2023 in SCIE and SSCI. Data from a total of 1562 papers were obtained based on Web of Science Core Collection. The software used to construct and visualize bibliometric networks was employed for data analysis [22]-[27].

### 3. Results and Discussion

#### 3.1. Research Output Trend

**Figure 1** displays annual number of publications. In 2004, 20 papers were on academic misconduct. During the twenty years, the published papers showed a steady increasing trend, but in 2021, the number decreased slightly and decreased to 115. In 2023, it reached the highest value of 190. The continuous increase in the number of papers indicates the growing global interest and development in academic misconduct research.



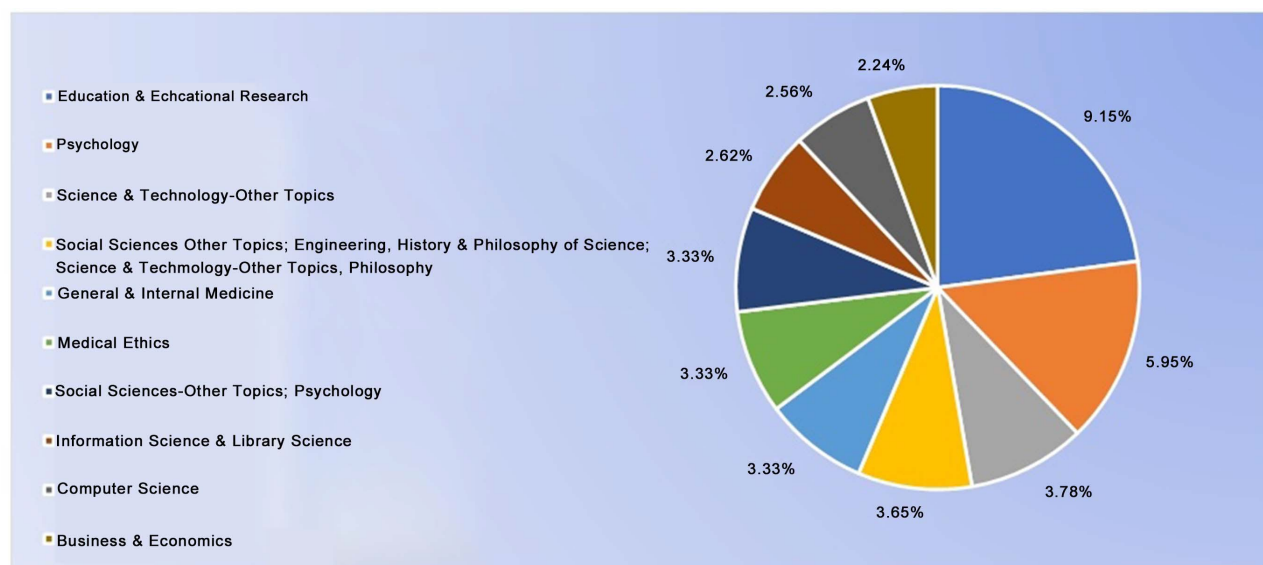
**Figure 1.** Publication trends of papers published each year.

#### 3.2. Distribution of Subject Categories

**Figure 2** shows the distribution of 1562 papers in the top 10 research fields. Many documents were in “Education & Educational Research” field, occupying 9.15% of the whole number. The other four research fields were Psychology (5.95%), Science & Technology—Other Topics (3.78%), Social Sciences—Other Topics, Engineering; History & Philosophy of Science, Science & Technology—Other Topics; Philosophy (3.65%) and General & Internal Medicine (3.33%).

#### 3.3. Important Journals

The papers on academic misconduct were published in 449 journals. According to article and citation numbers in each journal, we have determined in our study which 10 journals have contributed most significantly to the field of academic misconduct (**Table 1**). The 273 papers published by these prestigious journals



**Figure 2.** Distribution of 1562 papers in the top 10 research fields.

together account for 60.8% of all publications in this discipline. *Science and Engineering Ethics* stands out as the leading journal with more articles totaling 57. With 52 and 51 publications, *Academy of Management Discoveries* and *Ethics Behavior* comes second and third among the 10 most prolific journals separately. Among those 10 most prolific journals, papers published in *PLOS One* had highest total citations which have been cited 1371 times, with the greatest mean citation frequency reaching 72.16 times. The number of total citations of *Science and Engineering Ethics* and *Ethics and Behavior* was second and third, respectively, but both papers have fewer citations per article. Notably, journals with fewer publications, such as *Studies in Higher Education*, *Assessment and Evaluation in Higher Education*, *Frontiers in Psychology* and *Higher Education* have amassed a considerable amount of citations per article. This emphasizes how highly significant the articles published in these journals are from an academic standpoint.

**Table 1.** Features of those 10 most prolific journals for research regarding academic misconduct.

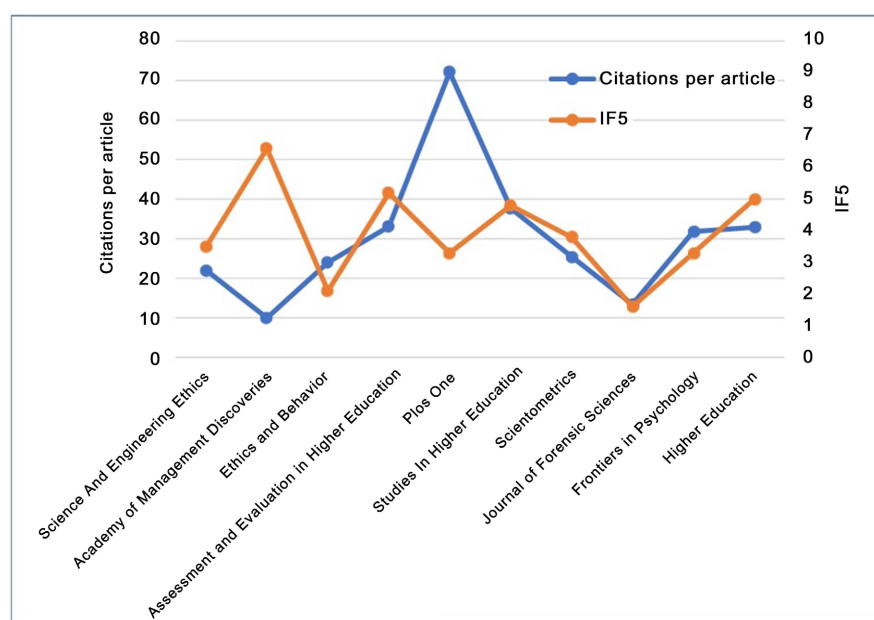
Journals	Articles	Citations	Citations per article	IF5
Science and Engineering Ethics	57	1254	22	3.5
Academy of Management Discoveries	52	520	10	6.6
Ethics and Behavior	51	1224	24	2.1
Assessment and Evaluation in Higher Education	22	728	33.09	5.2
PLOS One	19	1371	72.16	3.3
Studies in Higher Education	17	642	37.76	4.8

**Continued**

Scientometrics	17	433	25.47	3.8
Journal of Forensic Sciences	14	188	13.43	1.6
Frontiers in Psychology	12	382	31.83	3.3
Higher Education	12	395	32.92	5.0

IF5: 5-year impact factor.

**Figure 3** shows the values of citations per article and 5-year impact factor (IF5) for those 10 most prolific journals. Obviously, the variation trend average citation values were inconsistent with journal IF5, especially for *PLOS One* whose IF5 took the 7th place among 10 most prolific journals, but the average citation value was the highest. In addition, IF5 of *Academy of Management Discoveries* ranks first among those 10 most prolific journals, but the average citation value was lowest.



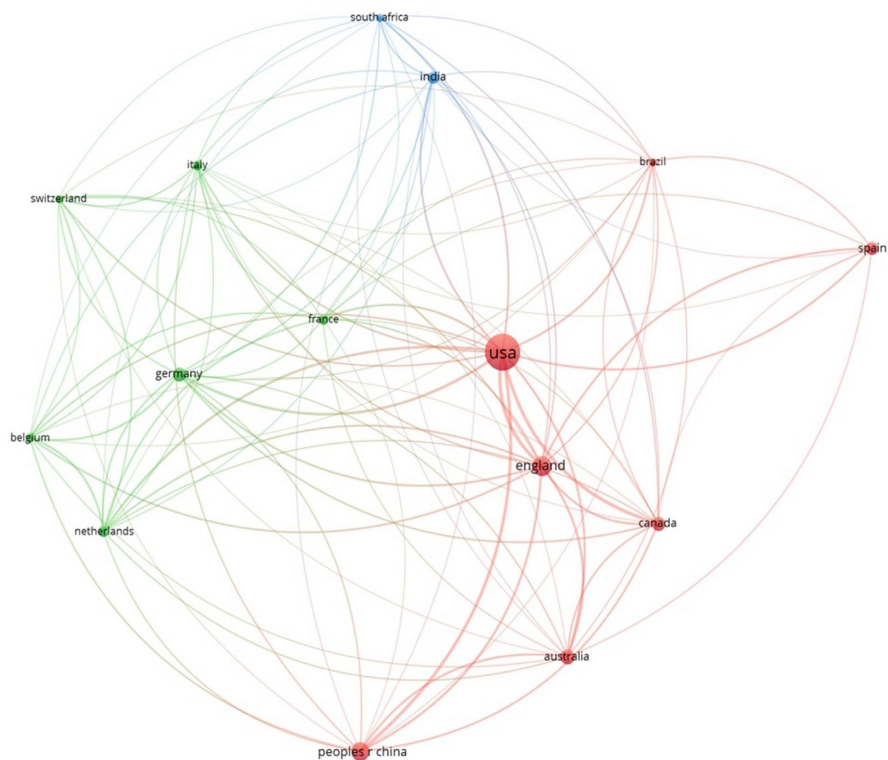
**Figure 3.** Paper average citations values and 5-year impact factor for those 10 most prolific journals.

### 3.4. Contribution of Countries and Organizations

Those 15 most prolific countries/territories were investigated for their international collaborations (**Table 2**). During 2004-2023, the USA, England, China, Australia and Germany emerged as the leading countries regarding the overall number of publications within the field of academic misconduct. The USA tops the list with 530 documents, which have been cited 15205 times. England and China follow with 150 publications and 4115 citations, and 147 publications and 2341 citations respectively. Canada has the highest Average Citations (AC = 50.26). Australia is second (AC = 30.88). The presence of countries from different continents, Asia (China), Europe (England, Germany, Italy, Belgium, France, The Netherlands),

Australia and America (USA, Canada), among the top 10 contributors, underscores the global significance of this research topic.

Link represents the indicator (VOSviewer) that indicates the connection number of a factor (like one country/territory) with others (like additional 14 countries/territories). For those 15 most prolific countries/territories, their links were 14, indicating the close collaborations among them. Total Link Strength (TLS) also stands for an indicator (VOSviewer) adopted for representing collaboration strength of selected factors (countries/territories). The collaborative state among these countries, as illustrated in **Table 2**, indicates that the USA, with the highest link strength of 139, maintains extensive connections with numerous countries, particularly England, Germany, Canada and China. These four countries alone account for 50% of USA's total link strength, emphasizing strong international collaborations. **Figure 4** shows visualization of international collaborations among the 15 most prolific countries/territories. When visualizing the network, the circle size for one item could be analyzed through the item weight, with a greater item weight indicating a larger circle. Additionally, the link strength was the highest between USA and England. Of those 10 most significant link strength combinations, there were 6 combinations related to USA. USA had a pivotal role in such collaborations, suggesting the research potential in academic misconduct. Colors in **Figure 4** can differentiate diverse clusters (with one cluster indicating one set of tightly associated nodes).



**Figure 4.** International collaborations among 15 most prolific countries/territories.

**Table 2.** The 15 most prolific countries and relevant indicators.

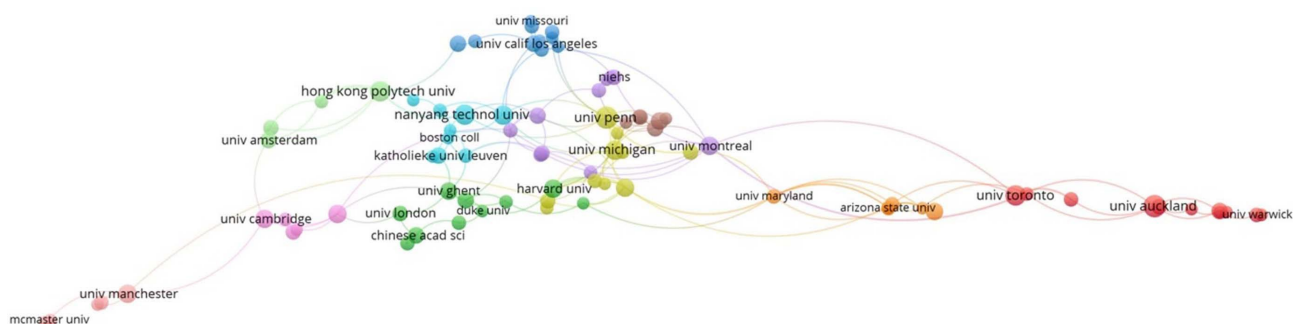
Country/Territory	TP	TC	AC	TLS	Links
USA	530	15,205	28.69	139	14
England	150	4115	27.43	92	14
China	147	2341	15.93	57	13
Australia	91	2810	30.88	47	14
Germany	77	1068	13.87	59	13
Canada	76	3820	50.26	58	14
Spain	64	1101	17.20	24	8
India	54	465	8.61	32	14
Netherlands	48	1417	29.52	52	13
France	43	1287	29.93	41	14
Italy	39	610	15.64	35	14
Belgium	37	733	19.81	45	13
Brazil	29	515	17.76	30	14
Switzerland	27	713	26.41	28	13
South Africa	25	537	21.48	29	13

TP, the number of publications; TC, Total Citations; AC, Average Citations; TLS, Total Link Strength.

**Table 3** displays primary performance for 15 most prolific organizations. Of them, eight organizations were in USA, three in China, two in Netherlands and one each in Canada and England. University of Pennsylvania takes the leading position in Total Publications (TP = 16). With regard to institutions, the University of Montreal, University of Pennsylvania, University of Michigan, Leiden University and University of Illinois are identified as the top five in research based on citation numbers. However, University of Montreal was dominant in total citations (TC = 660) and Average Citations (AC = 60). The second is the Leiden University (AC = 41.25) and the third is University of Michigan (AC=40.25). The links of University of Pennsylvania are 12, which indicates the collaboration of the university with an additional 12 organizations. From **Figure 5**, collaborations could be visualized between the top 15 organizations, with different colors indicating diverse clusters.

### 3.5. Influential Authors

We investigated the global distribution of 1562 papers. From **Table 4**, USA is the first prolific country/territory according to first author and CA. USA is advantageous relative to other countries/territories. Hu, Guangwei published the most papers, followed by Resnik, David B. and Casadevall, Arturo. Fanelli, Daniele has the highest average citation count, followed by Fang, Ferric C. and Casadevall, Arturo.



**Figure 5.** Co-occurrence network of those top 15 prolific organizations.

**Table 3.** The 15 most prolific organizations and relevant indicators.

Organizations/Institutions	Country	TP	TC	AC	TLS	Links
University of Pennsylvania	USA	16	510	31.87	13	12
Hong Kong Polytech University	China	13	108	8.31	13	6
University of Michigan	USA	12	483	40.25	11	10
Northwestern University	USA	11	231	21	11	9
University of Montreal	Canada	11	660	60	10	9
University of Manchester	England	11	284	25.82	9	5
University of Amsterdam	Netherlands	9	185	20.56	8	4
Chinese Academy of Sciences	China	9	186	20.67	7	3
University of Illinois	USA	8	308	38.5	7	7
Leidin University	Netherlands	8	330	41.25	7	6
University of Maryland	USA	7	161	23	9	8
Indiana University	USA	7	185	26.43	7	7
Johns Hopkins Bloomberg School of Public Health	USA	7	238	34	8	6
Huanggang Normal University	China	6	37	6.17	8	3
Yale University	USA	5	90	18	8	8

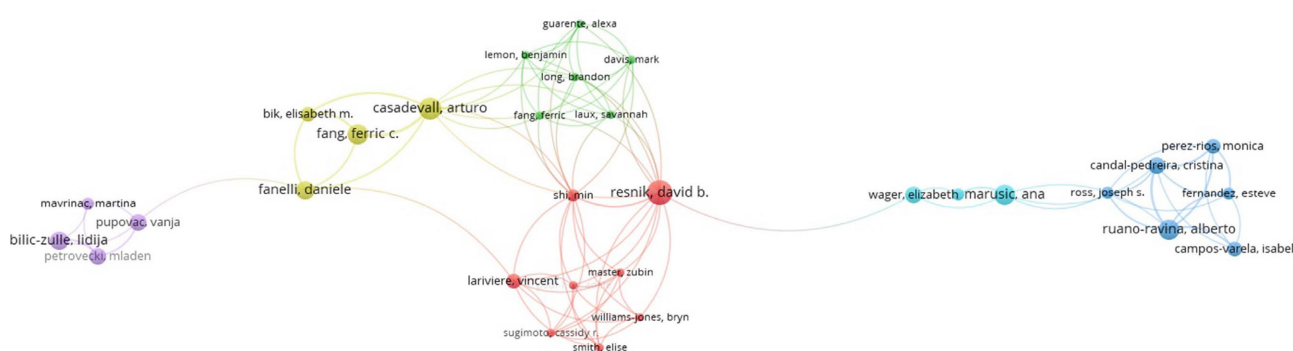
**Table 4.** The 15 most prolific authors.

Author	Country/Territory	Organizations/Institutions	TP	TC	AC
Hu, Guangwei	China	Huanggang Normal University; Hong Kong Polytechnic University	17	299	17.59
Resnik, David B.	USA	National Institutes of Health (NIH)	9	228	25.33
Casadevall, Arturo	USA	University of Washington	7	949	135.57
Fang, Ferric C.	USA	University of Washington	6	949	158.17
Marusic, Ana	Croatia	University of Split	6	178	29.67
Ruano-Ravina, Alberto	Spain	Universidad de Santiago de Compostela	6	130	21.67
Yang, Shu Ching	China	National Sun Yat Sen University	6	92	15.33

## Continued

Fanelli, Daniele	USA	University of Montreal	5	988	197.6
Van Houtte, Mieke	Netherlands	Ghent University	5	272	54.4
Lei, Jun	Singapore	Nanyang Technological University; National Institute of Education (NIE) Singapore	5	184	36.8
Tang, Bor Luen	Singapore	National University of Singapore	5	105	21
Hofmann, Bjorn	Norway	University of Oslo; Norwegian University of Science & Technology (NTNU)	5	80	16
Holm, Soren	USA	University of Manchester	5	80	16
Mahadi, Zurina	Malaysia	Universiti Kebangsaan Malaysia	5	38	7.6
Amin, Latifah	Malaysia	Universiti Kebangsaan Malaysia	5	38	7.6

From **Figure 6**, the author's co-citation network map plays a crucial role in understanding the interconnections among authors in the field of academic misconduct. From a total of 4510 authors, 1000 were selected for this map according to the minimum citation threshold of 20. This map organizes these authors in six distinct clusters, each representing a group of authors frequently cited in the literature. The largest cluster is represented in red, encompassing 8 authors, with Resnik, David B. standing out as the leading figure. The second cluster, shown in yellow, includes 6 authors. Notably, Arturo Casadevall is prominent within this cluster. The third cluster, shown in deep blue, includes 6 authors, and Ruano-Ravina, Alberto is prominent within this cluster. Each cluster within this map features key authors who act as focal points, around whom other authors are positioned. These individuals are significant contributors to the field, as indicated by their positioning and link strengths in the co-citation network, highlighting their influence and importance in the field of academic misconduct.



**Figure 6.** Co-citation network analysis of the top 15 most productive authors.

### 3.6. Research Themes

Author keywords represent the literature essence and core, which demonstrate the most interesting areas for researchers. In our research on academic misconduct, we employed co-occurrence network analysis on author keywords for dis-

cerning primary research priorities and interests globally. This analysis reveals the most frequently used keywords and their interconnections, providing insights into the dominant themes in this research area. **Table 5** displays author keywords (occurrences  $\geq 10$ ) and corresponding total link strengths. Of them, “plagiarism” associated words had the highest occurrence, occurring 266 times. In particular, “plagiarism” also has the highest total link strength, illustrating “plagiarism” as a keyword tightly related to others. “Academic dishonesty” is the second-most common word that appears (129 occurrences). Other significant keywords include “scientific misconduct” (85 occurrences), “research misconduct” (80), “academic integrity” (75), “cheating” (73), “ethics” (67), “academic misconduct” (46), “research integrity” (43), and “misconduct” (40). The co-occurrence network demonstrates strong connections between academic misconduct and key areas like plagiarism, academic dishonesty and scientific misconduct.

**Table 5.** List of author keywords (occurrences  $\geq 10$ ) and corresponding total link strengths.

Author keywords	Occurrences	TLS	Author keywords	Occurrences	TLS
Plagiarism	266	372	Retraction	29	25
Academic dishonesty	129	138	Education	18	25
Cheating	73	131	Academic honesty	14	24
Scientific misconduct	85	127	Turnitin	11	23
Research misconduct	80	113	Authorship	12	22
Academic integrity	75	110	Scientific integrity	15	21
Ethics	67	101	Attitudes	12	21
Research integrity	43	77	Research	10	21
Misconduct	40	66	Meta-analysis	17	20
Academic misconduct	46	59	Integrity	10	20
Research ethics	32	53	University students	12	17
Fabrication	17	53	Knowledge	12	17
Falsification	37	52	Methodology	11	16
Higher education	33	50	Iran	12	15
Fraud	24	41	Gender	11	15
Dishonesty	19	34	Trust	20	14
Self-plagiarism	20	31	Systematic review	13	14
Students	14	31	Plagiarism detection	19	9
Retractions	19	28	Distrust	12	9
Academic writing	16	26	Covid-19	10	5
Publication ethics	16	26			

**Figure 7** exhibits co-occurrence network of author keywords with highest occurrence frequency. The 41 authors’ keyword network (occurrences  $\geq 10$ ) was dis-



The interactions among productive countries/territories, organizations, authors and keywords were analyzed. With regard to countries/territories, USA published the most papers and had the greatest total citations; Canada had the greatest average citations. At an institutional level, University of Pennsylvania was the most prolific organization with the greatest total number of articles. University of Montreal had the greatest total citations and average citations. USA played a key role in international collaborations, suggesting the research potential in academic misconduct. For organizations, University of Pennsylvania has the highest collaboration intensity. For authors, Hu, Guangwei (Huanggang Normal University; Hong Kong Polytechnic University) was the most prolific author and Fanelli, Daniele (University of Montreal) has the highest total citations and average citations. Resnik, David B. has the most collaborators. “plagiarism”, “academic dishonesty”, “scientific misconduct”, “research misconduct” and “academic integrity” were the most frequent author keywords. VOSviewer was adopted for visualizing relation networks of prolific countries/territories, organizations, authors and keywords. Our research findings serve as a valuable resource for researchers, such as complete knowledge regarding leading journals, countries/territories, and institutions in this relevant research area, so as to instruct paper submission, academic exchange and collaboration and offering them essential insights into the topic to shape future research directions. Based on such high-quality papers, readers can obtain efficient knowledge, like theory, methods, and tools, and acquire research frontiers and hotspots for finding the key issues for scholars. Overall, conducting a bibliometric study on academic misconduct field offers a systematic approach to understanding the state of the field, identifying research trends and guiding future research efforts.

### Author Contributions

Yuenan Wang: Writing—original draft; Tianxiao Jiang: Methodology; Tong Zhai: Formal analysis; Hongbin Liu: Project administration, Writing—review & editing; All authors read and approved the final manuscript.

### Data Availability Statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

### Conflicts of Interest

The authors have declared that no competing interests exist.

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