

Fake News: Mapping the Fakeness through Scholarly Output Lenses

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ABSTRACT

The study attempts to map the trends across the scholarly publications published in the field of “Fake News.” Data were collected from one of the extensive indexing/abstracting services, Web of Science, the top indexing/abstracting service and a proprietary of Clarivate Analytics. The study reveals that the research on “Fake News” is mainly published as “articles” in English. Research on “Fake News” in terms of publication count and citation score shows a steady increase. “Lecture Notes in Computer Science,” “Professional De La Informacion,” and “New Media Society” stay as the prioritised platforms for researchers to publish their research. “Computer Science,” “Communication,” “Engineering,” “Information Science and Library Science,” and “Government Law” are the prioritised research domains in which research on “Fake News” stays a high priority. The highest number of articles are published from the U.S.A. The U.S.A., England, and Germany have the highest collaboration (links) with other countries, and the USA-China collaboration ranks first. Arizona State University is the top-ranked institute with the highest number of articles published on “Fake News,” and “Pennycook G” stays the most productive author. Six hundred ninety funding agencies support the funded research papers with The National Science Foundation N.S.F., U.S.A. as the top sponsor.

Keywords: Fake news; Fake news in scholarly communication; Research output; Bibliometrics; Misinformation

1. INTRODUCTION

Fake news dates back to the origin of human civilisation¹. According to Merriam Webster - 2019, fake news seems to have been used generally at the end of the 19th century; it gained popularity since the 2016 U.S. presidential elections². There are many explanations for fake news. Fake news is comprehended as a piece of fabricated and usually sensational information spread under the garb of news. Propaganda, news updates not liked by people, hidden advertising, or biased journalism also fall under fake news³. Fake news is synonymously used for terms like disinformation (intentionally providing false information) and misinformation (unintentionally providing false information)⁴⁻⁶. Himma-Kadakas defines fake news as misinformation either on social media or in conventional media. The author also refers to it as junk news and further defines it as a deliberate and deceptive spread of any information or news through any form of media, i.e., print, online, or any other media⁷. In his message for World Communications Day on January 24, 2018, Pope Francis also explains the meaning of fake news. He refers to the spreading of disinformation while saying that false information is meant to deceive and manipulate the readers/listeners in serving the advanced specific goals, influence political decisions and

serve economic interests⁸. According to Allcott and Gentzkow, there is no reality or authenticity in fake news but presented as facts⁹ while Benkler, Faris, Roberts, and Zuckerman; Mourao and Robertson give a new perspective on fake news in their studies. According to them, utterly fabricated news is not often seen. Instead, there is a blend of primarily correct information with various elements of fake news like clickbait, partisan bias, unintentional misleading information, or sensationalism^{10, 11}. Various authorities characterise fake news through different elemental frameworks. Lim characterises fake news through six elements: falsity, intention to mislead, omitted information, clickbait (or misleading headlines), partisan bias, and distorted context². Another study classifies fake news under six types: news satire, native advertising, photo manipulation, propaganda, fabrication, and news parody¹².

With the emergence of social media and various online platforms, enormous information is generated daily. It becomes very challenging for people to understand the authenticity of such colossal information. People can be easily led into the trap of fake news since various digital platforms, and social media make them easily vulnerable to false information¹³. There could be various reasons for creating and encouraging fake news, e.g., causing fear, anxiety, panic, promoting discrimination, or even political reasons¹⁴. This could cause tribal and religious intolerance, capitalist behavior, or xenophobic behavior, causing an imbalanced and unintegrated society¹⁵. Fake news

poses a severe threat to the well-being of the world and people's perspective since it is used to spread hate, racism, crime, disease outbreaks, pandemics, war, etc.¹⁶. For instance, during the outbreak of COVID-19, much fake news came up now and then through social media or mainstream media. Some fake news claimed that COVID-19 was developed as a biological weapon by China¹⁷, which was later discredited as there was no evidence to support such a claim¹⁸. Some news reported providing various health advices as a remedy to COVID-19 like salt or vinegar usage, drinking warm water, taking a saline solution of warm water¹⁹, or even using cow dung and cow urine to cure the virus²⁰.

Social media is the most straightforward approach to spreading fake news to larger masses at no or low cost. It has been called the lifeblood of fake news²¹. Fake news spreads like wildfire, leading to serious negative consequences on society in general and on an individual in particular. First and foremost, the news environment's authenticity comes under the radar, and second, readers start accepting the false claims²². Consequently, it becomes imperative to develop such technology to identify and sensor fake news independently²³. Various academicians, organisations, professionals, even librarians have come forward to overcome this nuisance and raise this concern time and again in many conferences, empirical studies, and fact-checking².

2. STATEMENT OF THE PROBLEM

Since fake news is creating lot of problems in the present world, the current study tries to identifies the trends and patterns of the scholarly literature published in the said field. The study showcases the type of documents and language used for communicating fake news research. The publication growth, citation rate, journals used, and focussed research areas have also been studied. Research output in fake news across nations, country collaboration, institutional distribution of publications, author productivity, and research funding have also been focused on.

3. LITERATURE REVIEW

Vosoughi, Roy and Aral studied a data set of tweets from 2006-2017 and find that fake news reaches more people than the facts. Further, while talking about the categorical influence, the study reveals that false political news was more viral than any other fake news category. The authors further report that fake news on Twitter is retweeted more rapidly and broadly by large masses than facts, particularly political topics²⁴. Similarly, Silverman reveals that the fake news which is more prevalent is extensively shared on Facebook than those of mainstream popular news stories²⁵.

In a study on evaluating how high school students (new generation) evaluate social media content like Twitter and Facebook, it is found that students do not entirely trust every social media news. Instead, they show more faith in television news. However, the study also shows that students could differentiate between a legit news source and someone's opinion.

However, they usually fail to understand the difference between bias concerning political or organisational affiliation and fail to understand that images and videos can be fabricated²⁶. Marchi reveals that the youth mainly prefer opinionated stories that seem more authentic than some objective news²⁷. Marwick reports that false news stories with people's pre-existing beliefs are shared more often than those that do not support their views²⁸.

Metzger reveals that users' ability to evaluate information plays a vital role. Less the ability, more dependence on fake news, and vice versa²⁹. A study evaluating the vulnerability of fake news on 26576 respondents across 28 European countries reveals that users' attitude towards fake news varies among different European countries. According to the study, tech-savvy and younger users are more likely to spot fake news and assess digital information sources without relying on outside help³⁰.

Few studies based on the evaluation of the authenticity of images on a photo-sharing site by school students in the United States, it is revealed that most of the students believe that the post has a strong base as it presents pictorial proof while students are not concerned about the source of the image itself³¹⁻³². Users emphasise the presentation and user-friendliness of the website rather than giving importance to its authenticity or who develops it or how it is developed³³.

A study based on fake news through the content analysis of 103 peer-reviewed publications published between 2000 and 2018 reveals that the highest number of publications is observed for 2017 and 2018. It is also revealed that most articles are theoretical, and surveys, qualitative research methods, or content analysis are most often used as a methodology. Furthermore, most of the papers focus on the United States. Simultaneously, the studies are equally distributed among various media genres, i.e., traditional, digital, and social media, whereby television and Twitter receive more scholarly attention³⁴. In another similar study based on 387 articles on fake news selected from the journals listed in Science Citation Index Expanded and Social Sciences Citation Index published

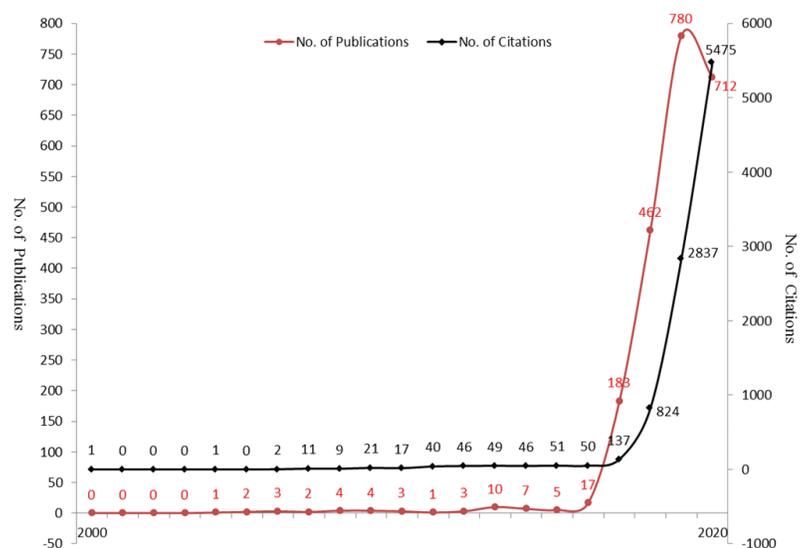


Figure 1. Publication growth and citation rate.

Table 1. Most productive journals in fake news research

Rank	Journal Name	No. of WoS Documents	% of total Documents
1	Lecture Notes in Computer Science	34	1.55
2	Professional De La Informacion	30	1.36
3	New Media Society	18	0.82
3	Social Media Society	18	0.82
4	Digital Journalism	17	0.77
4	Journal of American Folklore	17	0.77
5	International Journal of Communication	16	0.73
6	IEEE Access	15	0.68
6	IEEE International Conference on Big Data	15	0.68
6	Journalism Practice	15	0.68
7	Journal of Product and Brand Management	13	0.59
7	Media and Communication	13	0.59
8	INTED Proceedings	12	0.55
8	Journalism Studies	12	0.55
9	American Behavioral Scientist	11	0.5
9	Cadernos De Letras Da Uff	11	0.5
9	Information Communication Society	11	0.5
9	Journalism Mass Communication Quarterly	11	0.5
9	New Scientist	11	0.5
9	PLoS O.N.E.	11	0.5
9	Revista Latina De Comunicacion Social	11	0.5
10	Brazilian Journalism Research	10	0.45
10	Historia Y Comunicacion Social	10	0.45
10	Journalism	10	0.45
10	Political Communication	10	0.45
10	Proceedings of the 2019 IEEE ACM International Conference on Advances in Social Networks Analysis and Mining ASONAM 2019	10	0.45
10	Revista Espanola De Comunicacion En Salud	10	0.45

before 2019, it is found that the number of research articles on fake news dramatically increased since 2017. The study also reveals that most of the research and news articles come from the United States compared to other countries. The study also finds that even if fake news is a new subject for researchers, certain articles receive a good number of citations in the range of 59 and 556³⁵.

4. METHODOLOGY

The study is based on publications produced on “Fake News.” The data were downloaded from the Web of Science (WoS), the most extensive citations and abstract databases. The records were retrieved by entering a search query [TS=(Fake News), Timespan= 2000-2020, Database= Web of Science

Core Collection, Indexes= SCI-EXPANDED, SSCI, A&HCI]. No variations of the term were used to capture only the use of the specific phrase, “Fake News.” Data were downloaded in tab-delimited format for more in-depth analysis and treatment and imported in VOSviewer to establish a country collaboration network.

5. DATA ANALYSIS

5.1 Document Type and Language of Publications

The document type is based on the WoS database classification, categorizing fake news publications into 12 types. The primary document type includes articles comprising 1380 (62.75 %) publications. The other types include proceedings papers (477), editorial material (208), early access articles

Table 2. Fake news in the top research areas

Rank	Research area	No. of WoS documents	% of total documents
1	Computer Science	553	25.148
2	Communication	456	20.737
3	Engineering	171	7.776
4	Information Science and Library Science	167	7.594
5	Government Law	143	6.503
6	Educational Research	121	5.503
7	Social Sciences other topics	105	4.775
8	Business Economics	104	4.729
9	Psychology	102	4.638
10	Science Technology other topics	80	3.638

(109), reviews (55), book reviews (40), book chapters (27), letters (19), news items (19), meeting abstracts (11), corrections (5), and books (2).

Two thousand one hundred ninety-nine documents on fake news are published in 16 languages, with 1950 (88.68 %) documents published in English, followed by Spanish (111), Portuguese (34), German (24), Russian (22), Italian (19), French (14), Turkish (8), Dutch (6), Slovak (3) and Hungarian (2). Other languages include Afrikaans, Catalan, Chinese, Czech, Lithuanian, and Slovenian, with one article each, respectively.

5.2 Publication Growth and Citation rate

The annual distribution of journal article publications and their citation rate for 20 years is shown in Fig. 1. During the study, it is observed that the first paper was published in 1998, which received its first citation in 2000. It can be observed that the studied period involved the first publications in 2004, and since then, the publication rate has varied from 1 to 10 till 2015. Moreover, the publication rate has increased steadily from 17 in 2016 to 780 in 2019, with a sharp increase in 2018-2019 and a slight decline in 2020.

The citation rate is an indicator of the research impact. The citation rate of fake news publications from 2000 to 2016 fluctuates between 0 and 50 citations and sharply increases from 137 in 2017 to 5,475 in 2020. The highest number of citations is observed in 2019 and 2020. Further, it is observed that there is a single sharp peak in both the publication curve and citation curve. The study indicates the fake news research received attention over the last few years.

5.3 Research Output Across Journals and Research Areas

Two thousand one hundred ninety-nine publications are published across 1362 journals. Among these, 1335

Table 3. Most productive countries in fake news research

Rank	Countries/Regions	No. of WoS Documents	% of Total Documents
1	USA	669	30.423
2	Spain	183	8.322
3	England	171	7.776
4	Italy	112	5.093
5	Germany	105	4.775
6	Australia	103	4.684
7	Canada	94	4.275
8	China	93	4.229
9	Brazil	84	3.82
10	India	64	2.91

(98.02 %) journals publish less than ten publications. Moreover, 973 (71.44 %) journals publish only one article; 204 (14.98 %) two articles; 76 (5.58 %) three articles; 27 (1.98 %) four articles; and 22 (1.61 %) five articles respectively. The top 10 journals account for 382 (17.37 %) articles (Table 1).

Lecture Notes in Computer Science publishes the highest number of articles on fake news with 34 (1.55 %) publications, followed by *Profesional De La Informacion* (30, 1.36 %). The third most productive journal includes *New Media Society* and *Social Media Society*, with 18 (0.82 %) articles each. The top journals include journals about journalism and media and cover conference proceedings of computer science and communications.

The fake news research spans over 118 research areas. About 95 research areas cover less than 1 percent of the total article count, and 23 areas cover about one or more than 1 percent of fake news articles. The highest leading research area includes *Computer Science* with 553 (25.15 %) publications, followed by *Communication* (456, 20.74 %), *Engineering* (171, 7.78 %), *Information Science Library Science* (167, 7.59 %), and *Government Law* (143, 6.50 %) (Table 2). The *Computer Science* area's dominance indicates the technological coverage of fake news research, which otherwise is considered an area of journalism and communication.

5.4 Research Output Across Nations and Country Collaboration

Two thousand one hundred ninety-nine articles are published from 92 countries. 35 (38.04 %) countries publish 1-5 articles; 15 (16.30 %) publish 6-10 articles; 8 (8.69 %) publish 11-15 articles; 8 (8.69 %) publish 16-20 articles; 5 (5.43 %) publish 21-25 articles; 3 (3.26 %) publish 26-30 articles; and 18 (19.56 %) countries publish more than 30 articles. Only 26 countries contribute over 1 percent of the total publications. The top 10 most productive countries produce 76.31 percent of the publications (Table 3).

The U.S.A. is the most productive country with 669 (30 %) articles, followed by Spain (183, 8 %), England (171, 7.78 %), Italy (112, 5.09 %), and Germany (105,

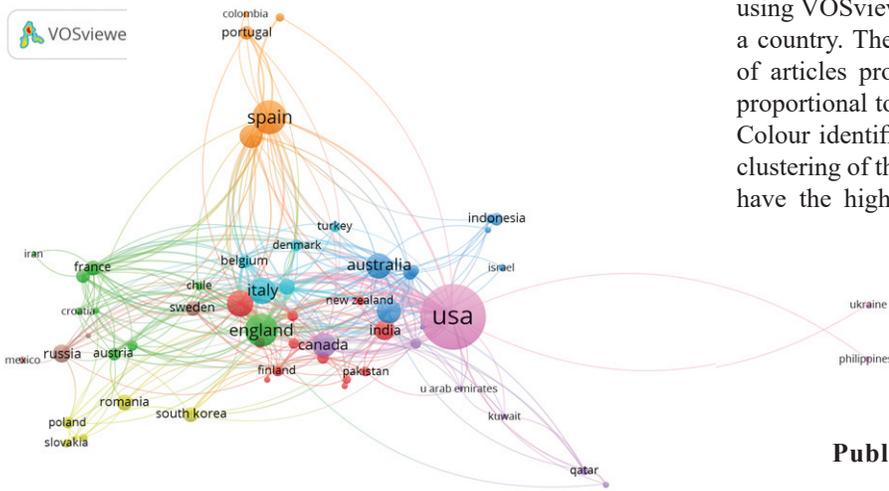


Figure 2. Country collaboration network between countries with a minimum of 5 articles.

Table 4. Most productive institutions conducting fake news research

Rank	Institute	No. of WoS documents	% of total documents
1	Arizona State University	25	1.137
2	Harvard University	20	0.91
2	University of Oxford	20	0.91
3	Complutense University of Madrid	19	0.864
4	Nanyang Technological University	18	0.819
4	University of Texas Austin	18	0.819
5	Boston University	17	0.773
6	Massachusetts Institute of Technology	16	0.728
6	New York University	16	0.728
6	Penn State University	16	0.728
7	Simon Fraser University	15	0.682
8	University of Southern California	14	0.637
9	University of Cambridge	13	0.591
9	University of Carlos III Madrid	13	0.591
9	University of Michigan	13	0.591
9	University of Sydney	13	0.591
10	Queensland University of Technology	12	0.546

4.77%). India holds 10th rank with 64 (2.91 %) publications. To visualise the collaboration between countries, 59 countries with a minimum of five documents were selected and mapped

using VOSviewer (Fig. 2). In the figure, each circle represents a country. The circle size is proportional to the total number of articles produced by the country, and the line weight is proportional to the strength of cooperation between countries. Colour identifies a group, which is assigned according to the clustering of the countries. The U.S.A., England, and Germany have the highest collaboration (links) with other countries.

USA-China collaboration ranks first with 28 collaborated articles, followed by USA-Canada (26), USA-England (24), USA-Germany (17), USA-Italy (14), and England-Australia (14).

5.5 Institutional Distribution of Publications

One thousand nine hundred twenty-six institutes are involved in the publication of 2199 articles. Most of the institutions (1898; 98.55 %) produce less than 10 articles, with 1352 (70.20 %) institutes contributing only 1 article; 268 (13.91 %) contributing 2 articles; and 127 (6.59 %) contributing 3 articles respectively. Table 4 presents the top 10 institutions that produce the highest number of publications from 2000 to 2020. Arizona State University is the top-ranked institute with the highest number of articles (25, 1.14 %). It is the only institute that holds more than 1 percent of the total articles. Harvard University and the University of Oxford are the second most productive institutes with 20 (0.91 %) articles each, followed by Complutense University of Madrid (19, 0.86 %), Nanyang Technological University (18, 0.82 %), and University of Texas Austin (18, 0.82 %) correspondingly.

5.6 Author Productivity

A total of 4634 authors are credited with 2199 publications. Most of the authors in fake news research publish under the anonymous name (17, 0.77 %). Moreover, 4630 (99.91 %) authors contribute less than ten publications, with 4103 (88.54 %) contributing only one article; 386 contributing two, and 96 contributing three articles, respectively. However, the most productive author is Pennycook G with 12 (0.55 %) articles, followed by Liu H (11, 0.5 %); Shu K (11, 0.5 %); Rand DG (9, 0.41 %); and Wang SH (9, 0.41 %) respectively. The other authors that contribute less than 10 publications include Roozenbeek J (7, 0.32 %); Tandoc EC (7, 0.32 %); Van Der Linden S (7, 0.32 %); Jeong CS (6, 0.27 %); and Jin ZW (6, 0.27 %) among others. This indicates that only a small number of authors attribute a significant share of fake news research publications.

5.7 Research Funding

In fake news research, a total of 582 publications are funded, indicating a funding ratio of 26.47 percent. Six hundred ninety agencies support funded research publications.

The National Science Foundation N.S.F., U.S.A. is the top funding sponsor with 65 (2.96 %) publications, followed by the National Natural Science Foundation of China NSFC (34, 1.55 %), European Union E.U. (30, 1.36 %), and

Table 5. Top funding agencies sponsoring fake news research

Funding Agency	No. of funded publications	% of total funded documents
National Science Foundation N.S.F.	65	2.956
National Natural Science Foundation of China NSFC	34	1.546
European Union E.U.	30	1.364
United States Department of Defense	22	1
Office of Naval Research	20	0.91
Coordination for the Improvement of Higher Education Personnel CAPES	17	0.773
Defense Advanced Research Projects Agency DARPA	17	0.773
National Council for Scientific and Technological Development CNPQ	15	0.682
Australian Research Council	12	0.546
European Research Council ERC	12	0.546
Social Sciences and Humanities Research Council of Canada SSHRC	12	0.546
Fundacao De Amparo A Pesquisa Do Estado De Sao Paulo FAPESP	10	0.455
National Institutes of Health NIH USA	10	0.455
United States Department of Health Human Services	10	0.455
German Research Foundation D.F.G.	9	0.409

United States Department of Defense (22, 1 %) (Table 5). A total of 686 funding agencies support less than 1 percent of the total publications, with 571 supporting just one (0.04 %), 56 sponsoring 2 (0.09 %), and 24 supporting 3 (0.14 %) publications, respectively.

6. CONCLUSION

The research on fake news has assumed importance over the past few years, which, to a large extent, can be grounded in the emergence of social media. The highest citation rate over the last few years, more significantly in 2020, underlines the attention towards fake news in recent years. The lead of “*Lecture Notes in Computer Science*” among research carriers and Computer Science under research area points out that the research on fake news is more oriented towards technological context. The U.S.A. leads in producing research on fake news and establishes extensive collaborative links with other countries, with most of its institutions figuring out in top rank. Various funding agencies have also made financial interventions towards the research in fake news, which needs to be enhanced to bring out more truth.

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