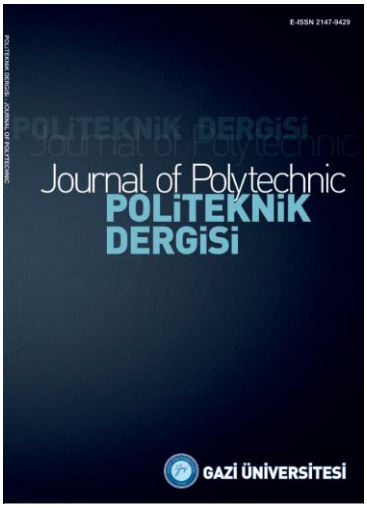

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Automatic detection of disinformation: a systematic mapping study

Dezenformasyonun otomatik tespiti: sistematik bir haritalama çalışması

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Automatic Detection of Disinformation: A Systematic Mapping Study

Highlights

- *A map of the research area of automatic detection of disinformation has been put forward.*
- *Resources were analyzed within the determined criteria and mapping questions.*
- *Supported approaches, obtained accuracy rates and used data sets have been revealed.*
- *Features such as journal and publisher name, journal class, publishing year, author's country of origin, used keywords, most prolific authors and institutions are presented.*

Graphical Abstract

The need for a detailed study of the trends in the research area due to the increase in the number and variety of studies conducted for automatic detection of disinformation in recent years is the main motivation of this study. In this direction, a systematic mapping study was conducted that reveals the map of the research area by offering an overview of the literature.

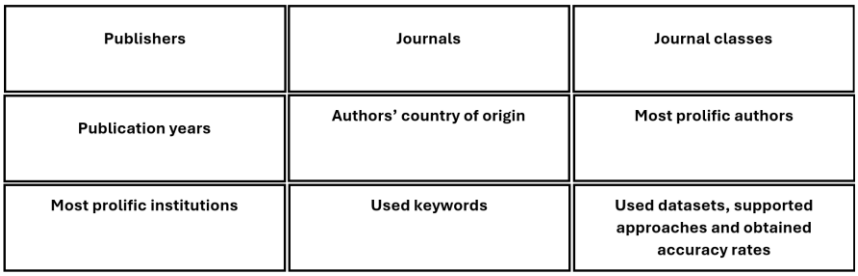

Figure. Presented features

Aim

This study's aim is to present a map of the current status of the research area by performing a meta-analysis of existing studies on the automatic detection of disinformation. With this study, it is aimed at providing new researchers with an insight into the current status of the research area and motivating them to address the challenges in this field. At the same time, it is another expected contribution of the study to give guidance for future research by identifying current and potential trends and methodological gaps.

Design & Methodology

61 primary sources published in Scopus and Web of Science electronic databases about automatic detection of disinformation between 2018-2022 were analyzed within the framework of the determined criteria and referenced systematic mapping protocol.

Originality

The originality of this study is that it presents the techniques that are commonly used in studies for automatic detection of disinformation and obtained accuracy rates, and reveals performance improvements in detection studies. At the same time, the relationship between the used data set and the obtained accuracy rate was examined by showing the approach supported in studies using more than one data set and the accuracy rates obtained from each data set. Another unique aspect of the study is that it reveals the most productive institutions as well as the most productive authors contributing to the research field.

Findings

In addition to the supported approaches, obtained accuracy rates and data sets used in the studies carried out for the automatic detection of disinformation in the literature, features such as publication year, published journal, journal class and publisher, countries of origin of the authors, used keywords, most prolific authors and institutions in the relevant literature were revealed.

Conclusion

It is expected that this study will serve as a guide for future research and contribute to the literature, which offers an overview of the literature on the automatic detection of disinformation and presents a map of the research area.

Declaration of Ethical Standards

The authors of this article declare that the materials and methods used in this study do not require ethical committee permission and/or legal-special permission.

Automatic Detection of Disinformation: A Systematic Mapping Study

Review Article / Derleme Makale

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ABSTRACT

In recent years, the spread of disinformation, which is one kind of information pollution, has accelerated on online social media platforms, and detecting disinformation early has become significant to be able to remove the negative impact it has on individuals and societies. In this direction, an increased number of studies focusing on the automatic detection of disinformation and the variety of approaches developed have been observed in recent years, and the need to study the trends in the studies carried out in detail has emerged. This research seeks to present a map of the research area for the automatic detection of disinformation. In this context, 61 primary sources published in the electronic databases Web of Science and Scopus between 2018-2022 included in the research scope have been examined and analyzed within the framework of the determined criteria. The conducted systematic mapping study aims to provide useful insights about automatic detection of disinformation including publication year, journal, journal class and publisher name, country of origin of the authors, most prolific authors and institutions, keywords used, supported approaches, obtained accuracy rates and datasets used. It is expected that this research will guide/direct researchers about the approaches developed for the detection of disinformation and contribute to future studies.

Keywords: Disinformation, fake news, systematic mapping.

Dezenformasyonun Otomatik Tespiti: Sistematik Bir Haritalama Çalışması

ÖZ

Son yıllarda çevrimiçi sosyal medya platformlarında bilgi kirliliği türlerinden olan dezenformasyonun yayılımı hızlanmış olup birey ve toplumlar üzerinde yarattığı olumsuz etkiyi kaldırabilmek amacıyla dezenformasyonun erken tespiti önem kazanmıştır. Bu doğrultuda son yıllarda dezenformasyonun otomatik tespitine odaklanan çalışmaların sayısında ve geliştirilen yaklaşımların çeşitliliğinde artış gözlemlenmiş, gerçekleştirilen çalışmalardaki eğilimlerin detaylı bir şekilde incelenmesi ihtiyacı ortaya çıkmıştır. Bu çalışma, dezenformasyonun otomatik olarak tespitine yönelik araştırma alanının bir haritasını ortaya koymayı amaçlamaktadır. Bu doğrultuda araştırma kapsamına alınan Scopus ve Web of Science elektronik veri tabanlarında 2018-2022 yılları arasında yayınlanmış 61 birincil kaynak incelenmiş ve belirlenen kriterler çerçevesinde analiz edilmiştir. Yürütülen sistematik haritalama çalışması yayın yılı, dergi, dergi sınıfı ve yayıncı adı, yazarların menşe ülkesi, en üretken yazarlar ve kurumlar, kullanılan anahtar kelimeler, desteklenen yaklaşımlar, elde edilen doğruluk oranları ve kullanılan veri kümeleri dahil olmak üzere dezenformasyonun otomatik tespiti hakkında yararlı bilgiler sağlamayı amaçlamaktadır. Bu araştırmanın, dezenformasyonun tespiti için geliştirilen yaklaşımlar konusunda araştırmacılara yol göstermesi/yönlendirmesi ve bundan sonraki çalışmalara katkı sağlaması beklenmektedir.

Anahtar Kelimeler: Dezenformasyon, sahte haber, sistematik haritalama.

1. INTRODUCTION

Technology advancement has resulted in the emergence of many new generation digital media and communication platforms today. Social media has become an integral component of daily life since billions of users worldwide including social media researchers, companies, politicians, and even government agencies come together in a virtual environment every day on these global platforms [1, 2]. Today, most people use social media for interaction, entertainment, socialization, information seeking and sharing, self-expression, education and surveillance [3]. In social media, which has a significantly different structure from traditional media, users can exchange information more easily and unfiltered than in traditional media without third-party filtering or editorial control [4]. This has made it easier to spread disinformation, which is one kind of information pollution, or fake news with its more widespread use, and has also opened the door for doubting the reliability of the information posted on social media platforms. [5].

With the increase in its spread, automatic detection of disinformation has gained popularity as a research topic today in order to remove the negative impact of disinformation on individuals and societies. The number of studies on this subject has increased significantly.

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Particularly over the past five years, studies on disinformation have gained a more interdisciplinary and dynamic dimension. In recent years, many researchers have been studying methods for rumor classification on the automatic detection of disinformation, which poses a great risk to societies. Conducting a large number of studies on the subject has led to an expansion of the scope of the literature, and this situation has raised the need for a detailed examination of the trends in studies on the subject.

The main motivation of this research is to map the current state of the research area by analyzing and synthesizing proposed existing solutions for automatic detection of disinformation. Research questions created in this direction have been developed in order to provide the current state of knowledge in the field by emphasizing the basic aspects of primary studies. By means of this systematic mapping study, the techniques commonly used in the automatic detection of disinformation and the most up-to-date suggested solutions were explained, the accuracy rates obtained with the different techniques used were determined and the success performance progress was revealed, and in addition, the existing datasets that were studied were determined. This study also presents a quantitative analysis that provides an overview of a number of features, such as the journal in which current studies are published, journal class, publisher name, publication year, authors' country of origin, and keywords used in the relevant literature. Identifying the most prolific authors and institutions in the research field is another intended outcome of this study. The purpose of this study is to provide new researchers with an insight into the current state of the research field and to motivate them to address the challenges in this field. At the same time, it is another expected contribution of the study to give direction for future research by identifying current and potential trends and methodological gaps. Systematic mapping is suitable for this knowledge area due to increased number of studies conducted on the research topic in recent years, the diversity of proposed approaches, the absence of systematic reviews for automatic detection of disinformation, and the difficulty of collecting existing studies. It is anticipated that this research will fill the gap in the literature since systematic mapping studies that offer a meta-analysis similar to this study on the research subject are very limited. This article distinguishes itself from existing mapping studies in the literature by adopting a broader perspective, conducting a more recent and extensive analysis of existing research, and considering inclusive/exclusive criteria. Instead of narrowing down to a single tool or technology, this work aims to encompass the entire field, opening up space for hybrid solutions and a more holistic understanding. In addition to its comprehensive review, the article takes a proactive approach, not only examining and analyzing existing articles but also identifying emerging trends, such as the growing significance of deep learning and the increasing demand for diverse datasets sourced from various social media platforms. These forward-looking insights provide valuable guidance for researchers in the field. Furthermore, this article addresses a significant research gap by shedding light on the absence of studies related to widely used social media platforms, such as WhatsApp, YouTube, Telegram, and Instagram. This unique combination of a comprehensive review, timely recognition of emerging trends, and the highlighting of research gaps positions this article as an up-to-date and indispensable guide for advancing the field of disinformation detection, making it an invaluable resource for both researchers and practitioners.

In this study, terms like fake news, false news, misleading information and black propaganda in the literature will be expressed with the term “disinformation”.

The study is divided into the following sections: “Conceptual Framework and Literature”, gives an overview of the concept of disinformation and in this section, information about the current systematic mapping studies in the literature on the subject is given. In the “Systematic Mapping” section, information is given about the systematic mapping study carried out. After that, this study's systematic mapping protocol is described and the systematic mapping process is included. Under the “Findings and Discussion” section, the findings obtained from the systematic mapping study are presented and discussed. Finally, under “Conclusion and Evaluation”, the conclusions drawn from the findings, general evaluations of these results, and the factors affecting the validity of the research and its limitations are discussed.

2. CONCEPTUAL FRAMEWORK AND LITERATURE

The Internet is defined as an “information highway” where information spreads rapidly [6]. Today, online platforms, especially social media, have become widespread in the internet environment and the main news source for an increasing number of individuals with their features such as easy access, cheaper and faster dissemination [7]. Thus, the ordinary masses have evolved into both news-producing and news-consuming communities [8]. Although social media platforms have many advantages and widespread usage areas and can be a tool for fundamental social changes, they can also serve as a platform for the widespread dissemination of misleading or false information. Today, these platforms have created a new environment for the spread of information pollution, and this has led to some undesirable results [9].

The types of information pollution prevalent on social media fall into three different categories: misinformation, disinformation, and malinformation. Disinformation is the intentional creation and spreading of false information with the intention of harm; misinformation is the unintentional dissemination of false information; malinformation, on the other hand, is defined as the

deliberate spread of accurate information with the goal of harming a person or organization [10].

Disinformation, which is one of the types of information pollution, is also expressed as "information distortion" [11] and "intentionally disseminated misleading information" [12]. It is the dissemination of false, incomplete or in other words, unconvincing information produced through fiction or deliberate manipulation in order to mislead a certain audience about the facts and to wear down the individual, society and the state [12, 13]. Disinformation can also be expressed as "frugal misinformation", as it is the intentionally disseminating of false and misleading information. Allcott and Gentzkow [4] define disinformation, which is widely used as "fake news" in the literature, as "news articles that are deliberately and verifiably false and may mislead readers". Here, misinformation refers to misleading statements [14].

Disinformation, more often known as fake news, is not new [15] and the first use of the term dates back to the 1950s [16]. Allcott and Gentzkow [4] consider that there are two main reasons for creating fake news. The first is about materiality. With fake news's quick spread on social media and subsequent redirection of users to the site where it is published by clicking on the news, the site owner can earn a significant amount of advertising income. The second main motivation is ideological. The producers of fake news are making this effort to benefit the people, institutions or political parties they ideologically support. The concept of disinformation, the basis of which is a lie, contains great dangers. Because the news in the fields of culture, politics, medicine and economics that contains misleading and incorrect information can lead to serious financial, emotional and even physical damage to individuals and societies. At the same time, the politicization and armament of information raise larger issues, such as the traditional media crisis and technical limitations in preventing the spread of misinformation [17].

The concept of disinformation, also called "black propaganda", is an important propaganda tool today, and its usage area is quite wide. By producing content in this type of information pollution, distortions can be made on every conceivable subject. The damage caused by disinformation, on the other hand, can be directed at individuals, communities, organizations and even countries. For this reason, the concept of disinformation has become a growing concern in today's social media age, and its early detection is of great importance. At the same time, in order to promote confidence, which is an important element in the interaction between individuals on social media, it is important to confirm the accuracy of the news as well as the information about whom, where and when the news was spread [18]. The purpose of early detection of disinformation is to prevent further spread on social media by providing early warning [19]. At the same time, it permits limiting the number of people affected and the harm caused. Today, the fact-checking platforms that carry out news verification activities within the scope of the detection of disinformation are available, such as Snopes.com, FactCheck.org, CheckYourFact.com, YalanSavar.org, Teyit.org, DogrulukPayi.com and Dogrula.org [20]. On all these mentioned platforms, the verification stages of the news are carried out by experts using traditional methods. Since verification activities carried out by traditional methods cannot cope with the large amount of information produced online today [21], and in an environment where disinformation exists, as the first step, it is important to detect the content that causes disinformation in order to spread the right information quickly, automatic detection of spreading disinformation has become a popular research topic today.

There are studies in the literature that have been conducted to detect disinformation using machine learning and deep learning techniques. The number of these studies has increased especially in recent years. This situation has revealed the need for a detailed examination of trends in research on the detection of disinformation. Systematic mapping studies on the detection of disinformation in the literature are quite limited, and some of the studies conducted are as follows. Lahby et al. [22] analyzed 76 scientific papers between January 1, 2010 and June 30, 2021 by systematic mapping. These papers were categorized and analyzed based on eight criteria: publication channel and publication year, research type, field of study, study platform, study context, study category, feature, and machine learning techniques used. Caio et al. [23] conducted a mapping study to identify and analyze the smart computing techniques used to detect fake news in the context of big data and examined a total of 35 articles. They searched for answers to the questions of what are the most commonly used algorithms in current studies, which empirical evaluations are used, from which country are the most published researchers on the subject, in which years more works have been published in this field. Similarly, in another study, systematic mapping results for the studies carried out on detecting fake news were presented, and the machine learning approaches suggested in the studies and the data sets used were included [24]. In the study conducted by Souza et al. [25], 87 identified primary sources were included in the analysis and research on fake news on social media covering the period between December 2012-2020 was conducted. The primary techniques employed in the literature, text and user features, and datasets are presented in the systematic mapping study. The features presented in the existing systematic mapping studies in the literature for the detection of disinformation summarized above are shown in Table 1 below. The primary sources identified in related studies refer to sources that contribute to the research topic, which can also be expressed as original sources [26] and included in the final analysis stage within the scope of systematic mapping.

Table 1. Presented features of existing systematic mapping studies

Name of Study	Presented Features
Lahby et al. [22]	Distribution of primary studies by channel and year of publication, research type, study domain, study platform, study context, study category, feature and machine learning techniques used to handle categorical data.
Caio et al. [23]	Distribution of primary studies by base, used algorithms, empirical evaluations, country, publication vehicle, using big data and per year.
Choraś et al. [24]	Distribution of primary studies by year, proposed machine learning approaches and datasets used.
Souza et al. [25]	Distribution of primary studies by year, most active authors, main publication venues, domains where studies are being applied, primary methods used, text and user characteristics, and datasets.

The difference between this study and the existing mapping studies related to the research subject is that it presents the commonly used techniques and the obtained accuracy rates together in the studies conducted for the automatic detection of disinformation, thus revealing the performance progress in the detection studies and the techniques that provide the highest accuracy. At the same time, in studies where more than one data set is used, the accuracy rates obtained for each data set are also given separately, revealing the relationship between the accuracy rate obtained and the data set used. Within the scope of the study, a quantitative analysis was also presented that provides an overview of a number of features, such as the journal in which the current studies are published, the journal class, publisher name, publication year, country of origin of the authors and keywords used in the relevant literature. Another gap that the study fills in the literature is that it reveals the most productive institutions as well as the most productive authors who contribute to the research field. The original evaluations presented in the study are expected to contribute to the literature on detecting disinformation. The unique contributions of the study to the literature are as follows: Firstly, the broader perspective and comprehensive analysis encompassing a wider array of primary sources and research trends allow for a more holistic understanding of the field, enabling the identification of gaps and emerging directions that might have otherwise been overlooked. This original contribution paves the way for hybrid solutions that draw from various methodologies and technologies, potentially yielding more robust and adaptable disinformation detection systems. Moreover, the proactive approach, coupled with the recognition of emerging trends like deep learning and the demand for diverse datasets, positions the field to stay ahead of disinformation tactics and to continuously evolve its detection capabilities. The identification of research gaps, particularly regarding widely used social media platforms, opens up new avenues for exploration, prompting future studies to focus on these platforms and adapt their methodologies to address evolving disinformation challenges. In essence, the original contributions of this work provide valuable direction for future studies, guiding researchers to explore emerging technologies, adapt to evolving disinformation tactics, and expand the scope of their research to encompass the broader landscape of social media platforms, ultimately advancing the field of disinformation detection.

3. SYSTEMATIC MAPPING

Studies called systematic mapping or scoping are secondary empirical studies that provide an overview of the latest technology in a field and identify the places and themes of the relevant events discussed in the literature [27]. According to a more detailed definition, systematic mapping is a comprehensive search of all the studies published in that field in order to provide an answer to a specific question or a solution to a problem, determining which studies will be included in the compilation depending on various selection criteria and the quality of the research, and synthesizing the findings. This method is a systematic approach to providing an overview of a research area and understanding the map of the research area, focusing on connections rather than results through classification [28]. The search and inclusion processes of studies in systematic mapping are carried out comprehensively with a full review, but the process of mapping does not include critical evaluation and data synthesis. Data extraction is carried out from the selected studies to identify key aspects of the studies using a standard template and identified keywords. In the systematic mapping study, it is not intended to test a target hypothesis or find a qualitative or quantitative answer to questions about the effects of the study. Systematic mapping deals with where and how studies are done. This approach is designed to collect a range of descriptive information, such as descriptors of studies such as the country and year of the study, the methodologies used, and citation information such as publisher name and journal name [29]. Systematic mapping studies, which provide an overview of the scope of the field and allow researchers to explore research gaps and trends [30], are a method generally used in medical research but have also been used in different research fields recently.

3.1. Systematic Mapping Protocol

In this study, which aims to identify the current approaches to detecting disinformation spread on social media platforms and to contribute to determining the direction for future research by revealing the current situation of the literature related to the research field, the systematic mapping protocol presented by Neiva et al. [31] was used. All the steps of the applied systematic mapping protocol are listed below:

- Step 1: Defining systematic mapping questions
- Step 2: Defining search terms
- Step 3: Defining the electronic databases and query strings to be used in the search
- Step 4: In order to reach the studies on the subject, conducting searches in the determined electronic databases and identifying the studies to be examined
- Step 5: Defining the selection criteria
- Step 6: Selection of studies according to the determined criteria
- Step 7: By scanning the contents of the studies, determining the findings in a way that responds to the determined mapping questions

The first step of the systematic mapping protocol is to define the systematic mapping questions. The mapping questions aimed to be answered within the scope of the research are defined as indicated in Table 2 below.

Table 2. Defined mapping questions

Number	Mapping Questions
MQ1	What is the distribution of the studies according to the years they were published?
MQ2	What is the distribution of the studies according to the publishers?
MQ3	What is the distribution of the studies according to the journals in which they are published?
MQ4	What is the distribution of the studies according to the journal classes in which they are published?
MQ5	What is the distribution of the studies according to the authors' country of origin?
MQ6	Which are the most prolific authors?
MQ7	Which are the most prolific institutions?
MQ8	What is the distribution of the keywords used in the studies?
MQ9	What are the datasets used in the studies, supported approaches and obtained accuracy rates?

In the second step of the systematic mapping protocol, based on research objectives, search terms were defined using the PICOC method (Population, Intervention, Comparison, Outcomes and Context) to find relevant studies [32]. In Figure 1, the PICOC items specific to this research are explained and the search terms defined for each PICOC item are included.

In the selection of electronic databases to be used in the search, the requirements determined by Costa and Murta [33] were used. These selection criteria are:

- It should be possible to search databases using logical expressions or similar mechanisms.
- It should be possible to search to cover the entire text or only certain areas, such as the title, abstract and keywords.
- Researchers should have open access to the database.

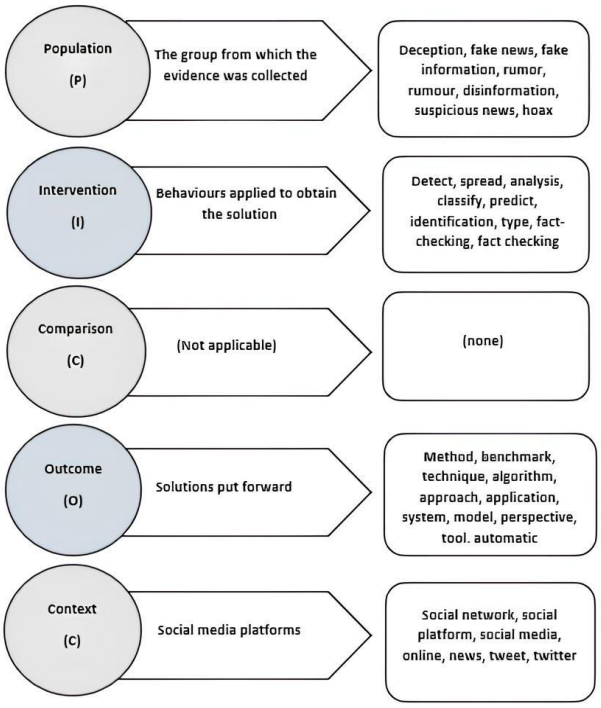

Figure 1. Definition of PICOC and defined search terms for PICOC items

In accordance with these requirements, electronic databases called Scopus and Web of Science (WoS) were determined to be scanned in this study.

The query strings were created by using the search terms defined for each PICOC item to perform the search in the selected electronic databases and using the boolean operators (AND OR) to separate the search terms from each other are given in Figure 2 below.

(deception OR "fake new*" OR "fake information" OR rumor OR rumour OR disinformation OR "suspicious new*" OR hoax) AND (detect* OR spread OR analysis OR classif* OR predict* OR identification OR type OR fact-checking OR "fact checking") AND (method OR benchmark OR technique OR algorithm OR approach OR application OR system OR model OR perspective OR tool OR automatic) AND ("social network*" OR "social platform*" OR "social media" OR online OR news OR tweet OR twitter)

Figure 2. Generated query strings

The search was carried out by considering the query strings and selection criteria determined through electronic databases, and the studies that meet the determined selection criteria were included in the research for analysis. Studies that are not related to the purpose of the research or that complicate the evaluation process were excluded from the scope of the research. The determined selection criteria are given in Table 3. As a result of the application of the first selection criterion in Table 3, only research articles are the subject of this study. This is because research articles published in

journals are considered "certified knowledge". Certified knowledge is a widely used concept to describe information that has been critically reviewed by other researchers and received their approval [34]. As the second selection criterion, the reason why only studies published between 2018 and 2022 were included in the research is that when similar systematic mapping studies on the subject were examined, it was seen that a period unity was not achieved in the determined publication year ranges, and it was determined that there were only two systematic mapping studies [22, 24] covering the period after 2018. For this reason, in order to ensure continuity in the literature, published studies aimed at detecting disinformation during the 4-year period covering 2018 and the year in which the research was conducted have been the subject in this research.

Table 3. Determined selection criteria

Criterion	Selection Criteria
1	Studies other than editorial materials, book chapters, book reviews, review articles, meeting summaries, news articles and proceedings
2	Studies published between the years 2018-2022
3	Studies in English language
4	Studies whose contents are provided with open access
5	Studies that propose and implement a solution approach for automatic detection of disinformation spreading on social media platforms

3.2. Systematic Mapping Process

This study was conducted on 03.06.2022 by scanning the scientific electronic databases called Scopus and WoS with query strings based on the studies' title, abstract, and keywords. As a result of the scan, 5,791 resources were collected from the Scopus database and 3,593 resources were collected from the WoS database. The total number of sources obtained from the two databases was 9,384. In the second stage, the filtering process was carried out taking into account the selection criteria and the sources unrelated to this mapping study were extracted. As a result of the filtering process performed over the resource type, the total number of resources decreased to 4,807, the filtering result performed in the year range decreased to 4,086, the filtering result performed of the language type decreased to 3,785, and the filtering result performed of the access type decreased to 2,064. A total of 2,064 resources obtained as a result of applying the selection criteria were downloaded and stored in BibTex format. Then, repetitive studies were identified by using the citation and reference management software JabRef to remove duplicate studies. As a result of the removal of duplicate studies, the number of sources to be examined decreased to 1,271.

In the next step, the title, keywords and abstracts of the studies were read. As a result of this process, the studies that were determined not to focus on the automatic detection of disinformation, which is the subject of the research, were excluded, and the remaining 348 studies were analyzed according to the mapping questions by reading full texts. Studies that were found not to answer the mapping questions were also excluded from the resource pool, and the remaining 61 studies constituted the final primary sources of this research.

The filtering stages of 61 final primary sources selected in accordance with the criteria determined in the systematic mapping protocol are presented in Figure 3.

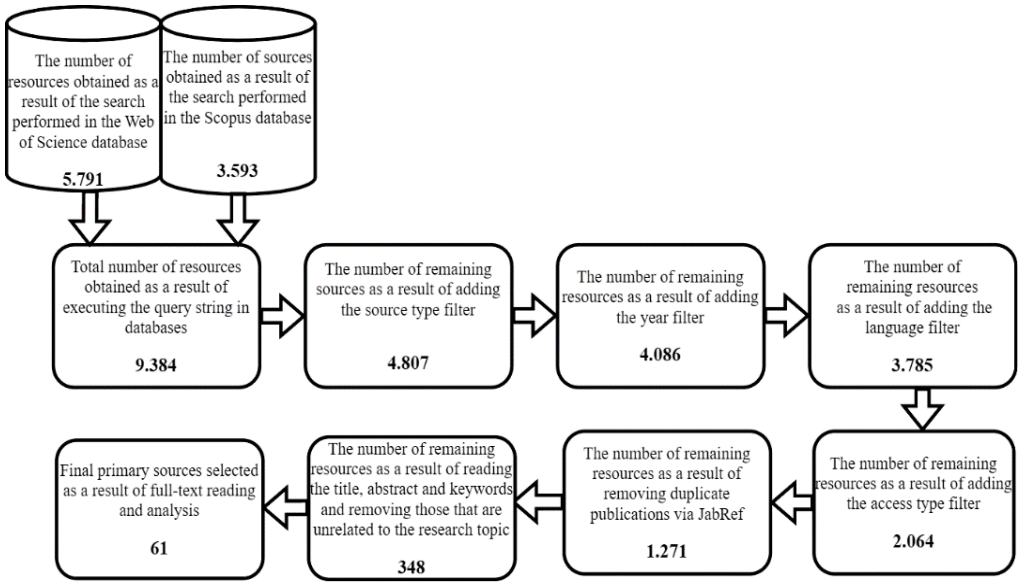

Figure 3. Overview of systematic mapping protocol steps

4. FINDINGS AND DISCUSSION

In this section, the findings obtained as a result of the analysis of the 61 final primary sources determined within the scope of the research regarding the mapping questions and the evaluations regarding these findings are included.

4.1. Distribution of the Studies by Years

The distribution of the studies based on the years they were published, obtained by performing the filtering process covering the years 2018-2022, is given in Figure 4.

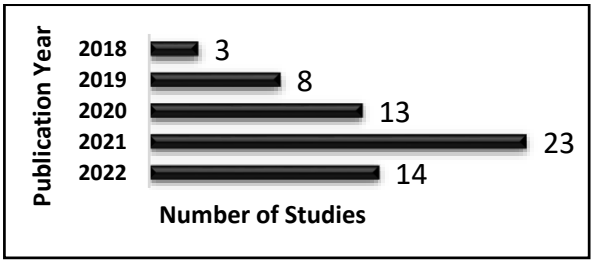

Figure 4. Distribution of the studies by years

Most of the studies were carried out in 2021. Since the study covers the first six months of 2022, a total of 14 studies on the subject were published in the first six months of 2022. The fact that the quantity of studies has increased throughout time shows that the research field is growing in prominence as a result of the researchers' keen interest. Among the reasons for the increase in the number of studies on the subject over the years is the popularization of the term as a result of a huge wave of fake news spreading on the internet during the 2016 US presidential election. As a result, the use of the term "fake news" has increased by 36% in the same year, making it the word of the year 2017 by the traditional English dictionary Collins [35]. At the same time, the announcement of a stricter set of rules by Twitter in 2018 to prevent the spread of fake news and political manipulation on the social networks [36], and similarly the implementation of an application by Facebook to label an item in the news feed as fake [37] may have drawn attention to the necessity of tackling disinformation and increased initiatives in this regard. Finally, due to the increasing disinformation content during the Coronavirus (COVID-19) epidemic that emerged in 2019, the World Health Organization called this phenomenon an "infodemic" [38]. It is stated that all these facts may have caught the attention of researchers and institutions collaborating to seek ways to combat disinformation [39]. The increase in the number of studies on the detection of disinformation over the years is also an expected result of today's developing technology.

4.2. Distribution of the Studies by Publishers

The distribution of primary researches analyzed within the scope of the research according to the publishers is shown in Figure 5. When the distribution of the studies according to the publishers is examined, it appears that most of the studies have been published by the publisher Elsevier Ltd. The second place is followed by the Institute of Electrical and Electronics Engineers Inc., and the third place is by the Science and Information Organization. 42.6% of a total of 61 primary studies examined within the scope of the research were published by these three publishers.

4.3. Distribution of the Studies by the Journals Published

The distribution of primary research studies analyzed within the scope of the research according to the journals in which they are published is given in Table 4.

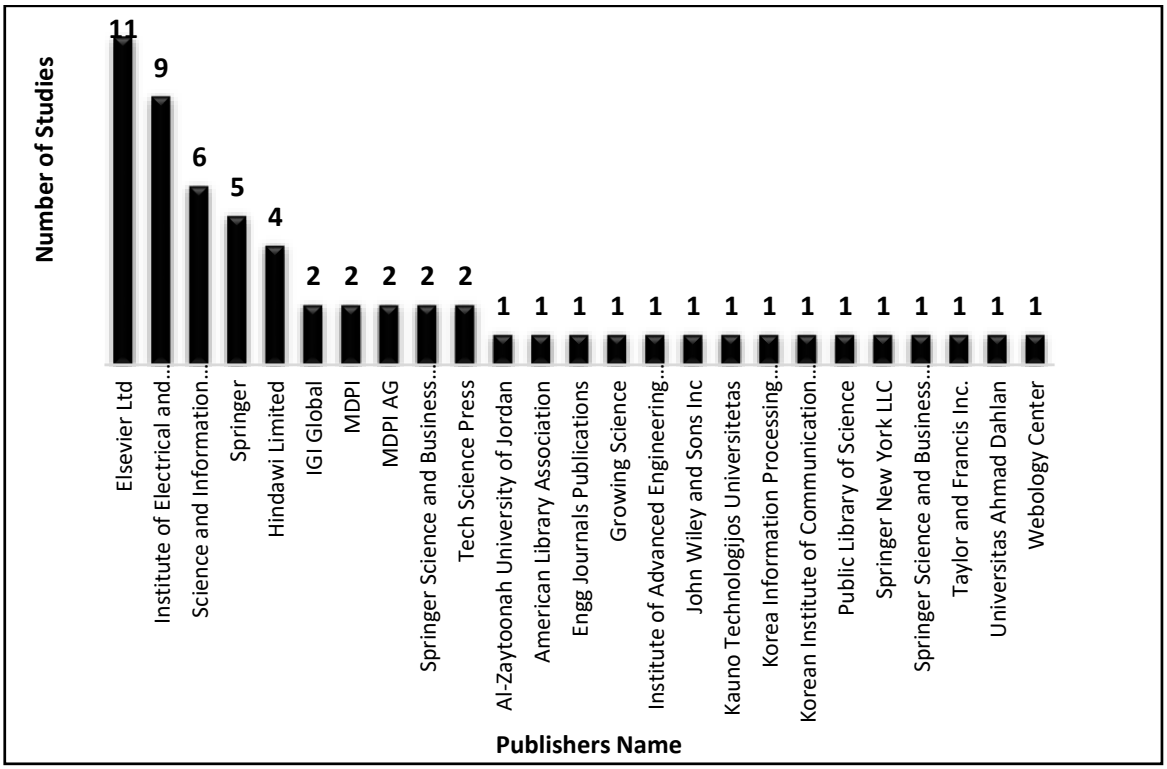

Figure 5. Distribution of the studies by publishers

Table 4. Distribution of the studies by the journals published

Journal Name	Number of Studies
IEEE Access	**7**
International Journal of Advanced Computer Science and Applications	**5**
Expert Systems with Applications	**5**
Applied Sciences (Switzerland)	**3**
Complexity	**2**
Computers, Materials and Continua	**2**
Information Processing and Management	**2**
Information Sciences	**2**
Multimedia Tools and Applications	**2**
Applied Artificial Intelligence	**1**
Arabian Journal for Science and Engineering	**1**
Cognitive Systems Research	**1**
Computational and Mathematical Organization Theory	**1**
Discrete Dynamics in Nature and Society	**1**
Elektronika ir Elektrotechnika	**1**
Future Internet	**1**
IAES International Journal of Artificial Intelligence	**1**
ICT Express	**1**
IEEE Transactions on Computational Social Systems	**1**
IEEE Transactions on Multimedia	**1**
IET Information Security	**1**
Indian Journal of Computer Science and Engineering	**1**
Information Technology and Libraries	**1**
International Journal of Advanced Computer Science and Applications	**1**
International Journal of Advances in Soft Computing and its Applications	**1**
International Journal of Data and Network Science	**1**
International Journal of Information Management Data Insights	**1**
International Journal of Information Technology (Singapore)	**1**
International Journal of Web-Based Learning and Teaching Technologies	**1**
International Journal on Semantic Web and Information Systems	**1**

Table 4 (continue) Distribution of the studies by the journals published

Journal Name	Number of Studies
Journal of Ambient Intelligence and Humanized Computing	**1**
Journal of Information Processing Systems	**1**
Journal of Supercomputing	**1**
Mathematical Problems in Engineering	**1**
PLoS ONE	**1**
SN Computer Science	**1**
Soft Computing	**1**
Sustainable Cities and Society	**1**
Telkomnika (Telecommunication Computing Electronics and Control)	**1**
Webology	**1**

In terms of the quantity of studies published and productivity, IEEE Access ranked first, the International Journal of Advanced Computer Science and Applications ranked second, and Expert Systems with Applications ranked third. The scope of the journal IEEE Access includes application-oriented interdisciplinary publications in all scientific fields. The International Journal of Advanced Computer Science and Applications is a journal that publishes research, reviews and survey articles that contribute to the computer science literature and covers all major branches of computer science and related applications. On the other hand, Expert Systems with Applications is a journal that aims to publish research on the design, development, testing, implementation, and management of expert and intelligent systems and provides practical guidance on developing and managing these systems. 27.8% of a total of 61 primary studies examined within the scope of the research were published in these three journals.

4.4. Distribution of the Studies by Journal Classes

The distribution of analyzed primary studies by journal class in which they were published is given in Figure 6.

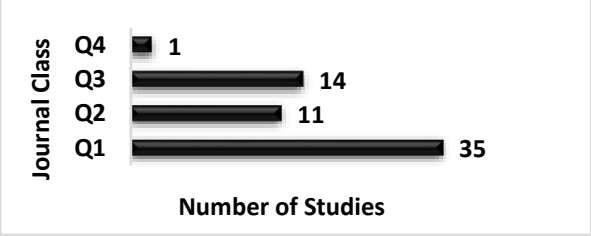

Figure 6. Distribution of the studies by journal classes

Of the studies, 35 were published in journals placed in the first quartile (Q1), 11 in the journals in the second quartile (Q2), 14 in the journals in the third quartile (Q3) and 1 in the journals in the fourth quartile (Q4). The fact that more than half of the published studies were published in the journals in the first quartile is a remarkable finding in terms of the quality of the studies.

4.5. Distribution of the Studies by Authors' Country of Origin

The distribution of the studies analyzed within the scope of the research according to the authors' country of origin is given in Figure 7.

In some studies with more than one author, a study may be counted more than once in Figure 7 because the authors belong to different countries of origin. When the distribution of the researches is evaluated in relation to the country of origin of the authors, it is seen that the majority of them are concentrated in India, China and Saudi Arabia. Accordingly, it can be said that these three countries are the most productive in the field of research. The fact that the 61 primary studies examined are distributed among 24 different countries shows that there is great interest in the subject worldwide. However, it can be said that researchers are also open to international interaction.

4.6. The Most Prolific Authors

When the distribution of the studies according to the authors is examined, it is determined that only one of the 61 primary sources included in the analysis stage of the research is a study with a single author, while the others are studies with more than one author.

The total number of authors of the 61 primary sources analyzed is 211, and eight of these authors submitted multiple studies for automatic detection of disinformation. It was observed that other authors contributed to only one study in the research area. In this context, it can be said that the eight authors identified as contributing to more than one publication are the most prolific authors. The names of these authors, the organization they are affiliated with, their country, their number of publications, the ratio of the number of publications they contributed to the total number of publications analyzed (%), and their productivity rank are given in Table 5.

Analysis to identify the most prolific authors shows that most authors do not produce large numbers of articles in the research field. Among the authors, Narang and Kaliyar came to the forefront due to their contributions to three different studies and shared the first rank in terms of productivity. Another remarkable finding is that the institution where five of the eight most productive authors are located is in India.

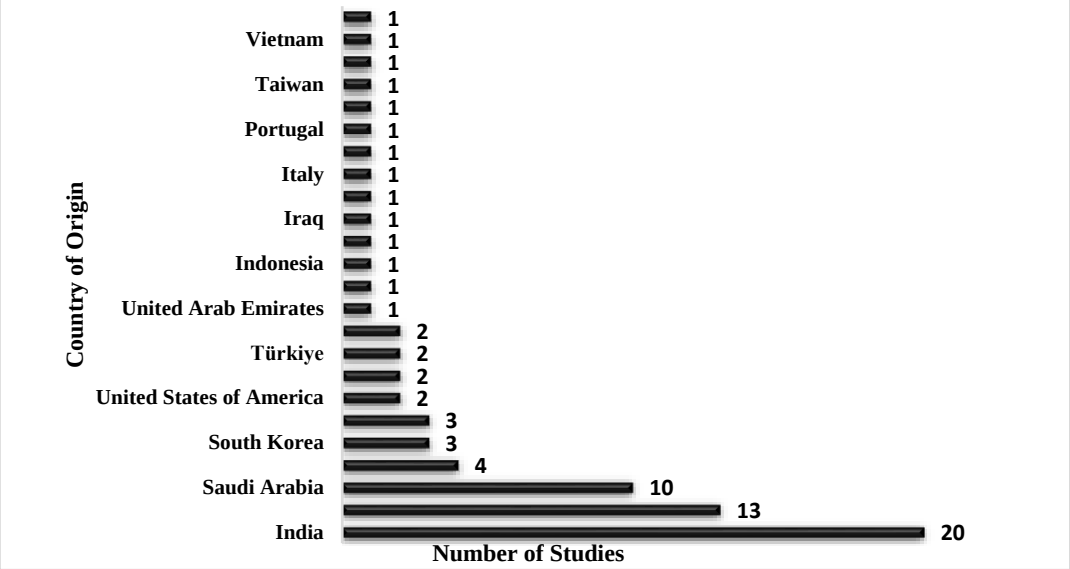

Figure 7. Distribution of the studies by authors' country of origin

Table 5. The most prolific authors

Author	Institution	Country	Number of Publications	Ratio of the Number of Publications	Productivity Rank
Narang, P.	BITS Pilani	India	3	4.9%	1
Kaliyar, R. K.	Bennett University	India	3	4.9%	1
Devi, M. S.	Periyar University	India	2	3.2%	2
Qian, S.	University of Chinese Academy of Sciences	China	2	3.2%	2
Goswami, A.	Bennett University	India	2	3.2%	2
Albahar, M.	Umm Al Qura University	Saudi Arabia	2	3.2%	2
Al-Sarem, M.	Taibah University	Saudi Arabia	2	3.2%	2
Sandrilla, R.	Periyar University	India	2	3.2%	2

4.7. The Most Prolific Institutions

Authors from 106 different institutions contributed to the 61 primary sources included in the analysis phase of the research. Multiple studies of automatic detection of disinformation have been conducted by authors from nine of these institutions. Only one study in the research field was conducted by the authors in the other 97 institutions. In this context, it can be said that nine institutions, whose name, type, country, number of publications, ratio of publications to total analyzed publications and productivity rank are given in Table 6, are the most prolific institutions.

Table 6. The most prolific institutions

Institution Name	Institution Type	Country	Number of Publications	Ratio of the Number of Publications	Productivity Rank
Taibah University	Academic	Saudi Arabia	4	6.5%	1
Bennett University	Academic	India	3	4.9%	2
Birla Institute of Technology and Science	Academic	India	3	4.9%	2
Chinese Academy of Sciences	Academic	China	2	3.2%	3
Delhi Technological University	Academic	India	2	3.2%	3
Periyar University	Academic	India	2	3.2%	3
Saba'a Region University	Academic	Yemen	2	3.2%	3
Sichuan University	Academic	China	2	3.2%	3
Umm Al Qura University	Academic	Saudi Arabia	2	3.2%	3

The analysis carried out to identify the most prolific institutions shows that most institutions do not produce a large number of articles on the research subject. Among the institutions, Taibah University ranks first among the most productive institutions, as the authors of Taibah University have contributed to four different studies on the research topic. Another remarkable finding is that four of the nine most productive institutions are located in India.

4.8. Distribution of the Keywords

The distribution of the most used keywords in primary researches analyzed within the scope of the research is shown in the word cloud in Figure 8. The font size decreases from the most frequently used keywords to the least used keywords in the word cloud. When the related

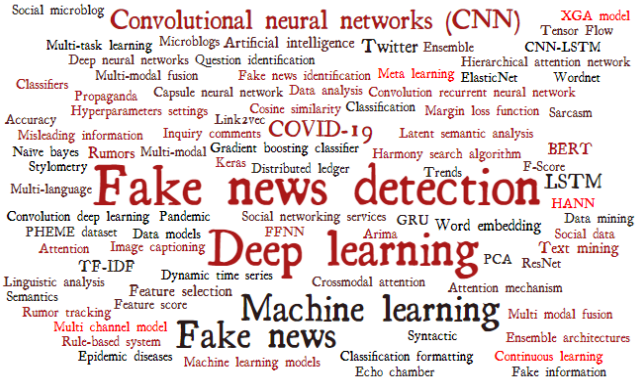

Figure 8. Distribution of the keywords

word cloud is examined, it is seen that the most frequently used keywords in the studies analyzed within the scope of the research are fake news detection, deep learning, fake news, machine learning, convolutional neural networks (CNN) and COVID-19. The usage rates of the most frequently used keywords among a total of 253 keywords included in the 61 primary sources examined; 7.9% (N=20) for fake news detection, 6.7% (N=17) for deep learning, 4.7% (N=12) for fake news, 4.7% (N=12) for machine learning, 2.7% (N=7) for convolutional neural networks (CNN) and 1.9% (N=5) for COVID-19 are determined. All these frequently used keywords also show the most studied subtopics.

4.9. Distribution According to Datasets Used, Approaches Supported and Accuracy Rates Obtained

The disinformation detection approaches supported in the final primary studies analyzed within the scope of the research, the accuracy rates obtained with the supported approach and the datasets used are presented in Appendix A. The supported approach corresponds to the one that gives the highest accuracy rate among one or more techniques/methods or algorithms applied for the detection of disinformation. It should be taken into account that the datasets used may also be determinative in the accuracy rates obtained in the related studies due to the fact that analyses are not performed on a common dataset. When the supported approaches in the studies in Appendix A are examined, it is noted that hybrid approaches containing more than one learning method have been revealed in most of them. In addition, there are studies that do not reveal a hybrid approach but only focus on determining disinformation detection through the use of various machine learning or deep learning algorithms. Machine learning and deep learning algorithms are two of the most common methods used to identify disinformation nowadays. Machine learning algorithms, which can be classified as either supervised learning or unsupervised learning, are effectively used in the detection of disinformation. Although supervised learning algorithms are highly effective in detecting disinformation, supervised learning depends on important information in labeled data and data labeling often takes a lot of time. Similar to this, supervised learning faces significant difficulties due to a lack of sufficient labeled data. On the other hand, deep learning gives successful results in disinformation detection studies due to its effectiveness in complex natural language processing processes. Deep learning algorithms are more effective at getting categorization results, but they have some drawbacks, such as huge dataset training requirements, difficulty in determining the best hyperparameters for each dataset, and a lack of interpretability [40].

The accuracy rates obtained in the studies vary between 0.60 and 0.100, and it can be seen that the studies with the highest accuracy rate mostly benefit from hybrid approaches. The use of hybrid approaches that combine machine learning and deep learning techniques contributes positively to the accuracy rate obtained. When the datasets used in the studies are examined, it is observed that the datasets available in the literature are generally used. Within the scope of the presented study, the number of studies using a newly created dataset is quite low. Among the platforms from which the datasets available in the literature and used in the studies are obtained are news sites; social media platforms such as Twitter and Facebook; data repositories offering free ready-made datasets such as Kaggle; microblogs like Weibo and BuzzFeed; and news verification websites such as PolitiFact and GossipCop are placed and most of which are free open access. Although data obtained from various platforms is used in studies, it has been observed

that the number of studies using Twitter data is high. The openness characteristic of this social media platform may be the cause of this, and there may not be as many research using Facebook data because it is challenging to gather data from this social media platform due to privacy concerns. At the same time, microblogs such as Twitter and Weibo are places where news is shared instantly compared to other social media platforms [41].

5. CONCLUSION AND EVALUATION

This study aims to shed light on the current state of the studies in the literature for the automatic detection of disinformation and to map the research field. With this aim, a systematic mapping study was conducted in accordance with the guidelines presented by Neiva et al. [31]. The studies published between 2018-2022 that provide approaches to detecting disinformation are retrieved using search terms and query strings defined during the mapping phase from two different electronic databases, Scopus and WoS. 61 primary studies have been identified in accordance with the defined selection criteria. The identified primary studies were analyzed according to the year they were published, their publishers, the journals and journal classes they took part in, their author's country of origin, their keywords, their supported approaches, their obtained accuracy rates, and their used datasets. In addition, determining the productivity of the authors and the institutions they are affiliated with in the research field is another aim of the analysis phase.

The research findings demonstrate an increase in the number of studies over time and the area is gaining popularity. It is predicted that this increasing trend may continue in the upcoming years. The reason for this increase can be attributed to the spread of disinformation, or more widely used fake news and content, through social media platforms causing political, social and financial instability in society [42]. Social networking environments are virtual environments that bring with them many dangers and have positive as well as negative aspects [43]. The top three publishers of the selected work are Elsevier Ltd., Institute of Electrical and Electronics Engineers Inc., and Science and Information Organization. IEEE Access, International Journal of Advanced Computer Science and Applications and Expert Systems with Applications are among the top journals in terms of productivity among the articles included. When the quality of the journals is examined, more than half of the published studies were published in the journals that take part in the first quartile. This shows that the studies examined are qualified research. When the country of origin of the authors is examined, it is determined that the majority of them are from India, China and Saudi Arabia, and it can be said that the researchers in these countries are the most productive. In support of this finding, when the most prolific authors and institutions are examined, it is seen that most of them are located in India. In addition, the fact that the studies carried out belong to authors from many different countries shows that there is a worldwide interest in the research field and that it has great potential. Also, it is stated in the literature that with the increasing number of developing technologies, imaging techniques and open access data sets, methods such as artificial intelligence, machine learning and deep learning have become popular and are widely used in many fields [44]. It was observed that the most frequently used keywords by the authors of the studies were: fake news detection, machine learning, deep learning, fake news, convolutional neural networks (CNN) and COVID-19. This shows that the technique of that study is frequently included among the keywords in the studies carried out for the automatic detection of disinformation in the literature. The COVID-19 disease appeared in December 2019 [45], and it is among the frequently used keywords. The increasing interest in social media during the home closure period [46] has also led to an increase in disinformation. Studies focusing on the COVID-19 pandemic, which poses a serious health crisis for humans on a global scale, have occupied a large place in recent fake news research [47]. When supported approaches for the detection of disinformation in the study are evaluated, the increasing use of neural network approaches indicates that deep learning is a promising topic in disinformation detection. At the same time, it has been revealed that because of the complexity and ambiguity of the problem, new hybrid approaches involving more than one learning method are included in most studies. Although the use of hybrid approaches is in the majority, it has been found that there are also studies that use only machine learning or deep learning techniques. When the data sets used in the detection of disinformation are examined, it is revealed that the use of data sets created with content obtained from microblogs such as Twitter and Weibo is widespread. There is a lack of research on data obtained from social media platforms that are frequently used, including WhatsApp, YouTube, Telegram and Instagram.

In the study carried out, many different factors and limitations such as researcher bias, searched electronic databases, generated keywords and query strings, time interval and publication type included in the search can affect the results and validity of the systematic mapping study. In order to ensure internal validity in the study, it was tried to create a primary resource pool as complete as possible, and by using the PICOC method, different keywords, a query string consisting of a combination of these, and selection criteria were determined and the studies to be included in the study were determined. In order to minimize the effects of the researchers' personal evaluations, selection and extraction analyzes of the relevant studies were carried out by four researchers who worked independently and made joint reviews over the reviews on certain days, using a final voting mechanism.

The evaluations in this study are valid within the scope of limitations. In future studies, carrying out the research in a wider scope by reducing the limitations of the research may reveal the current situation more

comprehensively. The studies examined within the scope of the research were obtained from electronic databases called Scopus and WoS. In future research, the scope of the number of resources obtained can be expanded by including other electronic databases such as Google Scholar, Microsoft Scholar, Academia and ResearchGate. As a second limitation, only open access studies were taken into account. This situation may not reveal an evaluation that will cover all studies on the subject. Another limitation is that certain types of resources, such as proceedings, books and book chapters are not included in the research. In future studies, including other types of resources in the scope of research may produce more effective results. Thus, it will be possible to access more comprehensive findings on the subject. At the same time, an in-depth systematic literature review (SLR) study can be carried out by developing this study for future research.

As a result of this study, the map of the research area for automatic detection of disinformation is revealed. With this study, a contribution to the literature is anticipated in terms of being a guide for future research by providing useful information such as published journals and their qualifications, publishers, year of publication, the authors' country of origin, the included keywords, the most prolific authors and institutions, supported approaches, obtained accuracy rates during the detection phase and used datasets.

DECLARATION OF ETHICAL STANDARDS

The authors of this article declare that the materials and methods used in this study do not require ethical committee permission and/or legal-special permission.

AUTHORS' CONTRIBUTIONS

Merve Ertürk: Conducted a literature review and data collection processes, analyzed the obtained data, and completed the writing of the manuscript.

Tuana İrkey: Conducted a literature review and data collection processes, analyzed the obtained data, and completed the writing of the manuscript.

Başak Gök: Ensured the proper execution of the research and effective monitoring of the processes, contributing to the writing of the manuscript and the necessary revisions.

Hadi Gökçen: Ensured the proper execution of the research and effective monitoring of the processes, contributing to the writing of the manuscript and the necessary revisions.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

REFERENCES

[1] Daouadi, K. E., Rebaï, R. Z. & Amous, I., "Real-Time Bot Detection from Twitter Using the Twitterbot+ Framework", ***Journal of Universal Computer Science***, 26(4):496-507, (2020).

[2] Krause, H.-V., Baum, K., Baumann, A. & Krasnova, H., "Unifying the detrimental and beneficial effects of social network site use on self-esteem: A systematic literature review", ***Media Psychology,*** 24(1): 10–4, (2021).

[3] Whiting, A. & Williams, D., "Why people use social media: a uses and gratifications approach", **Qualitative Market Research**, 16(4): 362–369, (2013).

[4] Allcott, H. & Gentzkow, M., "Social media and fake news in the 2016 election", ***Journal of Economic Perspectives***, 31(2): 211–236, (2017).

[5] Michael, R. B. & Breaux, B. O., "The relationship between political affiliation and beliefs about sources of 'fake news'", ***Cognitive Research: Principles and Implications***, 6(6): 1-15, (2021).

[6] De Maeyer, D., "Internet's information highway potential", ***Internet Research,*** (1997).

[7] Shu, K., Wang, S. & Liu, H., "Understanding user profiles on social media for fake news", ***Det. 2018 IEEE Conference on Multimedia Information Processing and Retrieval***, (2018).

[8] Karakaş, O., & Doğru, Y. B., "Analysis Of Produced New Media Contents For Covid-19 Vaccines In The Context Of The Post-Truth Concept", ***Asya Studies-Academic Social Studies,*** 5(16): 163-182, (2021).

[9] Tandoc, E.C., Lim, Z.W. & Ling, R., "Defining "fake news" a typology of scholarly definitions", ***Digital Journalism***, (2017).

[10] Wardle, C. & Derakhshan, H., "Information Disorder: Toward an interdisciplinary framework for research and policymaking", ***Strasbourg: Council of Europe***, (2017).

[11] TDK., "Manipülasyon", ***Türk Dil Kurumu Büyük Türkçe Sözlük***. http://www.tdk.org.tr/index.php?option=com_bts&arama=kelime&guid=TDK.GTS.5c2f51b8ede4c1.63593221. (2018).

[12] Karlova, N. A. & Fisher, K. E., "Plz RT: A Social Diffusion Model of 75 Misinformation and Disinformation for Understanding Human Information Behaviour", ***Information Research***, 18, 1-17, (2013).

[13] İnceoğlu, Y. & Akıner, N., "Continuity In Disinformation: Some Examples From The War On Iraq", ***2nd International Symposium of Communication in The New Millennium,*** Istanbul, (2004).

[14] Swire-Thompson B. & Lazer D., "Public health and online misinformation: challenges and recommendations", ***Annu Rev Public Health***, 41: 433–51, (2020).

[15] Taylor, A., "Before 'fake news' there was soviet 'disinformation'", ***The Washington Post,*** https://www.washingtonpost.com/news/worldviews/wp/2016/11/26/before-fake-news-there-was-soviet-disinformation/ (2016).

[16] Manning, M. J., Manning, M. & Romerstein, H., "Historical dictionary of American propaganda", ***West Port, CT: Greenwood Publishing Group***, (2004).

[17] Zimdars, M. & McLeod, K. (Eds.), "Fake News: Understanding Media and Misinformation in the Digital Age", ***MIT Press,*** (2020).

[18] Sari, R. F., Ilmananda, A. S. & Romano, D. M., "Social Trust-based Blockchain-enabled Social Media News Verification System", ***Journal of Universal Computer Science***, 27(9): 979-998, (2021).

[19] Shu, K. & Liu, H., "Detecting fake news on social media", ***Synthesis Lectures on Data Mining and Knowledge Discovery,*** 11(3): 1–129, (2019).

[20] Ünver, H. A., "Türkıye'de doğruluk kontrolü ve doğrulama kuruluşları", ***Siber Politikalar Dijital Demokrasi.*** https://edam.org.tr/wpcontent/uploads/2020/06/TürkiyedeDoğruluk-Kontrolü-ve-Doğrulama-Kuruluşları-Akın Ünver.pdf (2020).

[21] Ciampaglia G. L., Shiralkar P., Rocha L. M., Bollen J., Menczer F. & Flammini A., "Computational fact checking from knowledge networks", ***PloS One***, 10(6), (2015).

[22] Lahby, M., Aqil, S., Yafooz, W.M.S. & Abakarim, Y., "Online Fake News Detection Using Machine Learning Techniques: A Systematic Mapping Study". In: Lahby, M., Pathan, AS.K., Maleh, Y., Yafooz, W.M.S. (eds) Combating Fake News with Computational Intelligence Techniques. Studies in Computational Intelligence, 1001. ***Springer, Cham.***, (2022).

[23] Caio V., Meneses Silva, Raphael Silva Fontes & Methanias Colaço Júnior, "Intelligent Fake News Detection: A Systematic Mapping", ***Journal of Applied Security Research***, 16(2): 168-189, (2021).

[24] Choraś, M., Demestichas, K., Giełczyk, A., Herrero, Á., Ksieniewicz, P., Remoundou, K., Urda, D. & Woźniak, M., "Advanced Machine Learning techniques for fake news (online disinformation) detection: A systematic mapping study", ***Applied Soft Computing,*** 101: 1568-4946, (2021).

[25] Souza, J., Gomes J.J., Marques, F., Julio, A. & Souza, J., "A systematic mapping on automatic classification of fake news in social media", ***Social Network Analysis and Mining,*** 10, (2020).

[26] Morgan, D. & Rasinski, T., "The power and potential of primary sources", ***The Reading Teacher***, 65(8): 584-594, (2012).

[27] Fernandez-Sotos P., Torio I., Fernandez-Caballero A., Navarro E., Gonzalez P., Dompablo M. & Rodriguez-Jimenez R., "Social cognition remediation interventions: a systematic mapping review*",* ***PloS One***, 14(6): (2019).

[28] Cooper ID, "What is a 'mapping study?'". ***J Med Libr Assoc,*** 104(1), (2016).

[29] Haddaway N. R., Bernes C., Jonsson B.-G. & Hedlund K., "The benefits of systematic mapping to evidence based environmental management", ***Ambio***, 45(5): 613-620, (2016).

[30] Petersen, K., Feldt, R., Mujtaba, S. & Mattsson, M., "Systematic mapping studies in software engineering", ***12th International Conference on Evaluation and Assessment in Software Engineering,*** 17, (2008).

[31] Neiva F. W., David J. M. N., Braga R. & Campos F., "Towards pragmatic interoperability to support collaboration: a systematic review and mapping of the literature", ***Inf. Softw. Technol***, 72: 137–150, (2016).

[32] Petticrew, M. & Roberts, H., "Systematic Reviews in the Social Sciences: A Practical Guide", (2006).

[33] Costa C. & Murta L., "Version control in distributed software development: a systematic mapping study", ***In: 8th international conference on global software engineering (ICGSE), IEEE,*** 90–99, (2013).

[34] Ramos-Rodríguez, A.-R. & Ruíz-Navarro, J., "Changes in the Intellectual Structure of Strategic Management Research: A Bibliometric Study of the Strategic Management Journal", ***Strategic Management Journal***, 25(10): 981–1004, (2004).

[35] Collins, "Collins 2017 word of the year shortlist",(2017). https://www.collinsdictionary.com/ word-lovers-blog/new/collins-2017-word-of-the-year-shortlist,396,HCB.html

[36] Twitter, "Twitter muda regras para combater fake news e manipulac¸~ao polıtica", (2018). https://help.twitter.com/pt/rules-and-policies/twitter-report-violation

[37] Rochlin, N., "Fake news: Belief in post-truth", ***Library Hi Tech***, 35(3): 386–392, (2017).

[38] Zubiaga, A., Aker, A., Bontcheva, K., Liakata, M., Procter, R., "Detection and resolution of rumours in social media: A survey", ***ACM Computing Surveys (CSUR),*** 51: 1–36, (2018).

[39] Tandoc, E. C., Jr, Lim, Z. W., & Ling, R., "Defining 'fake news' a typology of scholarly definitions", ***Digital Journalism***, 6(2): 137–153, (2018).

[40] Silva, A., Han, Y., Luo, L., Karunasekera, S., Leckie, C., "Propagation2Vec: embedding partial propagation networks for explainable fake news early detection", ***Inf Process Manag.,*** (2021).

[41] Zubiaga, A., Ji, H., "Tweet, but verify: epistemic study of information verifcation on twitter", ***Soc. Netw. Anal. Min.***, 4(1), (2014).

[42] Korkmaz Ş., Alkan M., "Derin öğrenme algoritmalarını kullanarak deepfake video tespiti", ***Journal of Polytechnic,*** 26(2): 855-862, (2023).

[43] Yavanoğlu U., Sağıroğlu Ş., Çolak, İ., "Sosyal Ağlarda Bilgi Güvenliği Tehditleri ve Alınması Gereken Önlemler", ***Journal of Polytechnic,*** 15(1) : 15-27, (2012).

[44] Darıcı M. B., "Performance analysis of combination of cnn-based models with adaboost algorithm to diagnose covid-19 disease", ***Journal of Polytechnic,*** 26(1): 179-190, (2023).

[45] World Health Organizaton (WHO), "*Coronavirus disease (COVID-19)",* https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid- 19 (2021, May, 13).

[46] Dixon, S., "*Social media use during COVID-19 worldwide - statistics & facts.*" Statista. https://www.statista.com/topics/7863/social-media-use-during coronavirus-covid-19-worldwide/#topicHeader__wrapper. (2022, February 8).

[47] Melchior, C. & Oliveira, M., "Health-related fake news on social media platforms: A systematic literature review", ***New Media and Society***, (2021).

[48] Sicilia, R., Lo Giudice, S., Pei, Y., Pechenizkiy, M. & Soda, P., "Twitter rumour detection in the health domain", ***Expert Systems with Applications***, 110: 33-40, (2018).

[49] Xiaoning, G., De Zhern, T., King, S. W., Fei, T. Y. & Shuan, L. H., "News reliability evaluation using latent semantic analysis", ***Telkomnika (Telecommunication Computing Electronics and Control)***, 16(4): 1704-1711, (2018).

[50] Moin, R., Zahoor-ur-Rehman, Mahmood, K., Alzahrani, M. E. & Saleem, M. Q., "Framework for rumors detection in social media", ***International Journal of Advanced Computer Science and Applications,*** 9(5): 439-444, (2018).

[51] Ozbay, F. A. & Alatas, B., "A novel approach for detection of fake news on social media using metaheuristic optimization algorithms", ***Elektronika Ir Elektrotechnika***, 25(4): 62-67, (2019).

[52] Gravanis, G., Vakali, A., Diamantaras, K., & Karadais, P., "Behind the cues: A benchmarking study for fake news detection", ***Expert Systems with Applications,*** 128: 201-213, (2019).

[53] Lee, D., Kim, Y., Kim, H., Park, S. & Yang, Y., "Fake news detection using deep learning", ***Journal of Information Processing Systems***, 15(5): 1119-1130, (2019).

[54] Jadhav, S. S., & Thepade, S. D., "Fake news identification and classification using DSSM and improved recurrent neural network classifier", ***Applied Artificial Intelligence***, 33(12): 1058-1068, (2019).

[55] Shu, K., Mahudeswaran, D. & Liu, H., "FakeNewsTracker: A tool for fake news collection, detection, and visualization", ***Computational and Mathematical Organization Theory***, 25(1): 60-71, (2019).

[56] Wang, Z., Guo, Y., Wang, J., Li, Z. & Tang, M., "Rumor events detection from chinese microblogs via sentiments enhancement", ***IEEE Access***, 7: 103000- 103018, (2019).

[57] Son, L. H., Kumar, A., Sangwan, S. R., Arora, A., Nayyar, A. & Abdel-Basset, M., "Sarcasm detection using soft attention-based bidirectional long short-term memory model with convolution network", ***IEEE Access***, 7: 23319-23328, (2019).

[58] Fang, Y., Gao, J., Huang, C., Peng, H., & Wu, R., "Self multi-head attention-based convolutional neural networks for fake news detection", ***PLoS ONE***, 14(9), (2019).

[59] Umer, M., Imtiaz, Z., Ullah, S., Mehmood, A., Choi, G. S. & On, B., "Fake news stance detection using deep learning architecture (CNN-LSTM)", ***IEEE Access***, 8: 156695-156706, (2020).

[60] Huang, Y. & Chen, P., "Fake news detection using an ensemble learning model based on self-adaptive harmony search algorithms", ***Expert Systems with Applications***, 159, (2020).

[61] Kumar, G. V. D., Jadhav, M. V., Tadisetti, A. & Kiran, K., "A deep model on hoax detection using feed forward neural network and LSTM", ***Webology,*** 17(2): 652-662, (2020).

[62] Chen, X., Ke, L., Lu, Z., Su, H., & Wang, H., "A novel hybrid model for cantonese rumor detection on twitter", ***Applied Sciences (Switzerland),*** 10(20): 1-12, (2020).

[63] Guo, M., Xu, Z., Liu, L., Guo, M., Zhang, Y., & Kotsiantis, S. B., "An adaptive deep transfer learning model for rumor detection without sufficient identified rumors", ***Mathematical Problems in Engineering***, (2020).

[64] Albahr, A., & Albahar, M., "An empirical comparison of fake news detection using different machine learning algorithms", ***International Journal of Advanced Computer Science and Applications***, 11(9): 146-152, (2020).

[65] Mertoğlu, U. & Genç, B., "Automated fake news detection in the age of digital libraries", ***Information Technology and Libraries***, 39(4), (2020).

[66] Kaur, S., Kumar, P., & Kumaraguru, P., "Automating fake news detection system using multi-level voting model", ***Soft Computing***, 24(12): 9049-9069(2020).

[67] Saeed, F., Al-Sarem, M., Hezzam, E. A. & Yafooz, W. M. S., "Detecting health-related rumors on twitter using machine learning methods", ***International Journal of Advanced Computer Science and Applications***, 11(8): 324-332, (2020).

[68] Alsaeedi, A., & Al-Sarem, M., "Detecting rumors on social media based on a CNN deep learning technique", ***Arabian Journal for Science and Engineering***, 45(12): 10813-10844, (2020).

[69] Agarwal, A., Mittal, M., Pathak, A., & Goyal, L. M., "Fake news detection using a blend of neural networks: An application of deep learning", ***SN Computer Science***, 1(3), (2020).

[70] Kaliyar, R. K., Goswami, A., Narang, P., & Sinha, S., "FNDNet–A deep convolutional neural network for fake news detection", ***Cognitive Systems Research***, 61: 32-44, (2020).

[71] Abonizio, H. Q., de Morais, J. I., Tavares, G. M., & Junior, S. B., "Language-independent fake news detection: English, Portuguese, and Spanish mutual features", ***Future Internet***, 12(5), (2020).

[72] Albahar, M., "A hybrid model for fake news detection: Leveraging news content and user comments in fake news", ***IET Information Security***, 15(2): 169-177, (2021).

[73] Shim, J., Lee, Y. & Ahn, H., "A link2vec-based fake news detection model using web search results", ***Expert Systems with Applications***, 184, (2021).

[74] Song, C., Ning, N., Zhang, Y. & Wu, B., "A multimodal fake news detection model based on crossmodal attention residual and multichannel convolutional neural networks", ***Information Processing and Management***, 58(1), (2021).

[75] Chen, X., Wang, C., Li, D., & Sun, X., "A new early rumor detection model based on BiGRU neural network", ***Discrete Dynamics in Nature and Society***, (2021).

[76] Sandrilla, R. & Devi, M. S., "A Robust Technique Of Fake News Identification Using Ensemble Feature Selection", ***Indian Journal of Computer Science and Engineering***,12(6): 1886-1898, (2021).

[77] Qasem, S. N., Al-Sarem, M. & Saeed, F., "An ensemble learning based approach for detecting and tracking COVID19 rumors", ***Computers, Materials and Continua***, 70(1): 1721-1747, (2021).

[78] Abdelminaam, D. S., Ismail, F. H., Taha, M., Taha, A., Houssein, E. H., & Nabil, A., "CoAID-DEEP: An optimized intelligent framework for automated detecting COVID-19 misleading information on twitter", ***IEEE Access***, 9: 27840-27867, (2021).

[79] Goldani, M. H., Safabakhsh, R., & Momtazi, S., "Convolutional neural network with margin loss for fake news detection", ***Information Processing and Management***, 58(1), (2021).

[80] Kaliyar, R. K., Goswami, A., & Narang, P., "DeepFakE: Improving fake news detection using tensor decomposition-based deep neural network", ***Journal of Supercomputing,*** 77(2): 1015-1037. (2021).

[81] Divya, T. V., & Banik, B. G., "Detecting fake news over job posts via bi-directional long short-term memory (BIDLSTM)", ***International Journal of Web-Based Learning and Teaching Technologies,*** 16(6): 1-18. (2021).

[82] Sastrawan, I. K., Bayupati, I. P. A. & Arsa, D. M. S., "Detection of fake news using deep learning CNN–RNN based methods", ***ICT Express***, (2021).

[83] Asghar, M. Z., Habib, A., Habib, A., Khan, A., Ali, R., & Khattak, A., "Exploring deep neural networks for rumor detection", ***Journal of Ambient Intelligence and Humanized Computing,*** 12(4): 4315-4333, (2021).

[84] Aslam, N., Ullah Khan, I., Alotaibi, F. S., Aldaej, L. A., & Aldubaikil, A. K., "Fake detect: A deep learning ensemble model for fake news detection", ***Complexity***, (2021).

[85] Zeng, J., Zhang, Y. & Ma, X., "Fake news detection for epidemic emergencies via deep correlations between text and images", ***Sustainable Cities and Society***, (66), (2021).

[86] Ying, L., Yu, H., Wang, J., Ji, Y. & Qian, S., "Fake news detection via multi-modal topic memory network", ***IEEE Access***, 9:132818-132829, (2021).

[87] Kaliyar, R. K., Goswami, A., & Narang, P., "FakeBERT: Fake news detection in social media with a BERT-based deep learning approach". ***Multimedia Tools and Applications***, 80(8): 11765-11788, (2021).

[88] Meel, P. & Vishwakarma, D. K., "HAN, image captioning, and forensics ensemble multimodal fake news detection", ***Information Sciences***, 567: 23-41, (2021).

[89] [89] Khanday, A. M. U. D., Khan, Q. R., & Rabani, S. T., "Identifying propaganda from online social networks during COVID-19 using machine learning techniques", ***International Journal of Information Technology (Singapore),*** 13(1): 115-122, (2021).

[90] Choudhary, A., & Arora, A., "Linguistic feature based learning model for fake news detection and classification", ***Expert Systems with Applications***, 169, (2021).

[91] Chauhan, T., & Palivela, H., "Optimization and improvement of fake news detection using deep learning approaches for societal benefit", ***International Journal of Information Management Data Insights***, 1(2), (2021).

[92] Tu, K., Chen, C., Hou, C., Yuan, J., Li, J. & Yuan, X., "Rumor2vec: A rumor detection framework with joint text and propagation structure representation learning", ***Information Sciences***, 560: 137-151, (2021).

[93] Bhattacharya, P., Patel, S. B., Gupta, R., Tanwar, S., & Rodrigues, J. J. P. C., "SaTYa: Trusted bi-LSTM-based fake news classification scheme for smart community", ***IEEE Transactions on Computational Social Systems***, (2021).

[94] Islam, N., Shaikh, A., Qaiser, A., Asiri, Y., Almakdi, S., Sulaiman, A., Moazzam, V. & Babar, S. A., "Ternion: An autonomous model for fake news detection", ***Applied Sciences(Switzerland)***,11(19), (2021).

[95] Senhadji, S. & Ahmed, R. A. S., "Fake news detection using naïve bayes and long short term memory algorithms", ***IAES International Journal of Artificial Intelligence***, 11(2): 746-752, (2022).

[96] Gonwirat, S., Choompol, A., & Wichapa, N., "A combined deep learning model based on the ideal distance weighting method for fake news detection", ***International Journal of Data and Network Science***, 6(2): 347-354, (2022).

[97] Palani, B., Elango, S. & Vignesh Viswanathan, K., "CB-fake: A multimodal deep learning framework for automatic fake news detection using capsule neural network and BERT", ***Multimedia Tools and Applications,*** 81(4): 5587-5620, (2022).

[98] Alsaidi, H., & Etaiwi, W., "Empirical evaluation of machine learning classification algorithms for detecting COVID-19 fake news", ***International Journal of Advances in Soft Computing and its Applications,*** 14(1): 49-59, (2022).

[99] Dixit, D. K., Bhagat, A., & Dangi, D., "Fake news classification using a fuzzy convolutional recurrent neural network", ***Computers, Materials and Continua***, 71(2): 5733-5750, (2022).

[100] Wang, J., Mao, H. & Li, H., "FMFN: Fine-grained multimodal fusion networks for fake news detection", ***Applied Sciences (Switzerland),*** 12(3): (2022).

[101] Sandrilla, R. & Devi, M. S., "FNU-BiCNN: Fake news and fake URL detection using bi-CNN", ***International Journal of Advanced Computer Science and Applications***, 13(2): 477-488, (2022).

[102] Almars, A. M., Almaliki, M., Noor, T. H., Alwateer, M. M., & Atlam, E., "HANN: Hybrid attention neural network for detecting covid-19 related rumors", ***IEEE Access***, 10:12334-12344, (2022).

[103] Yu, D., Zhou, Y., Zhang, S. & Liu, C., "Heterogeneous graph convolutional network-based dynamic rumor detection on social media", ***Complexity***, (2022).

[104] Tembhurne, J. V., Moin Almin, M. & Diwan, T., "Mc-DNN: Fake news detection using MultiChannel deep neural networks", ***International Journal on Semantic Web and Information Systems***, 18(1), (2022).

[105] Zhang, H., Qian, S., Fang, Q. & Xu, C., "Multi-modal meta multi-task learning for social media rumor detection", ***IEEE Transactions on Multimedia***, 24: 1449-1459, (2022).

[106] He, X., Tuerhong, G., Wushouer, M., & Xin, D., "Rumors detection based on lifelong machine learning", ***IEEE Access***, 10: 25605-25620, (2022).

[107] Hirlekar, V. V. & Kumar, A., "Tweet credibility detection for COVID-19 tweets using text and user content features", ***International Journal of Advanced Computer Science and Applications***,13(4): 430-439, (2022).

[108] Alotaibi, F. L., & Alhammad, M. M., "Using a rule-based model to detect arabic fake news propagation during covid-19", ***International Journal of Advanced Computer Science and Applications***, 13(1): 112-119, (2022).

APPENDIX A THE SUPPORTED APPROACHES, USED DATASETS AND OBTAINED ACCURACY RATES

Study	Supported Approach	Dataset Used	Obtained Accuracy Rate
Sicilia et al. [48]	Random Forest (RF)	Newly created dataset	0.861
Xiaoning et al. [49]	An automated news credibility assessment system that uses a variety of Natural Language Processing (NLP) techniques such as Term Frequency-Inverse Document Frequency (TF-IDF), Sentence Detection, and Cosine Similarity, along with Latent Semantic Analysis (LSA)	Newly created dataset	0.733
Moin et al. [50]	Inquiry Comments Detection Model (ICDM)	Newly created dataset	0.70
Ozbay and Alatas [51]	Model based on Gray Wolf Optimization (GWO) metaheuristic algorithm and Salp Swarm Optimization (SSO) algorithm	BuzzFeed dataset Random Political News dataset Liar Benchmark dataset	Buzzfeed dataset: 0.875 Random Political News dataset: 0.926 Liar Benchmark dataset: 0.965
Gravanis et al. [52]	A model created using AdaBoost, SVM and Bagging machine learning techniques	Kaggle-EXT dataset BuzzFeed dataset McIntire dataset Politifact dataset UnBiased (UnB) dataset	Accuracy rate of up to 0.95 on all datasets
Lee et al. [53]	Deep learning model called BCNN (Bi-CNN), which is a combination of "Fasttext" and "Shallow-and-wide CNN"	Dataset of 100,000 articles scanned from businesses Joongang Ilbo, Dong-A Ilbo, Chosun Ilbo, Hankyoreh and Maeil	0.726
Jadhav and Thepade [54]	A hybrid model (DSSM-LSTM model) developed using enhanced recurrent neural networks and a deep structured semantic model	LIAR dataset	0.990
Shu et al. [55]	Fake news collection, detection and visualization framework called FakeNewsTracker	PolitiFact dataset BuzzFeed dataset	0.684
Wang et al. [56]	SD-DTS-GRU: (A new two-layer GRU model for the detection of rumor events based on the Sensitivity Dictionary (SD) and Dynamic Time Series (DTS) algorithm)	Large amount of original Chinese microblogging dataset	0.952
Son et al. [57]	A hybrid deep learning model called sAtt-BLSTM convNet (A hybrid Bi-LSTM and CNN based neural architecture)	SemEval 2015 task 11 dataset Random Tweet dataset	SemEval 2015 task 11 dataset: 0.978 Random Tweet dataset: 0.937
Fang et al. [58]	SMHACNN: (A hierarchical neural network model that combines the advantages of a multi-headed attention mechanism and a Convolutional Neural Network (CNN))	Fake News dataset	0.959
Umer et al. [59]	Hybrid deep learning model (based on CNN, PCA and LSTM)	Fake News Challenges (FNC) dataset	0.978
Huang and Chen [60]	An ensemble learning model that combines four different deep learning models: embedded LSTM, depth LSTM, LIWC CNN, and N-gram CNN	Fake or Real News dataset (FOR) Snopes_Fake_Legit_news (SFL) dataset Fake News Detection (FND) dataset	0.994
Kumar et al. [61]	RNN (LSTM)	Kaggle dataset	0.9485
Chen et al. [62]	A new hybrid model called XGA that takes advantage of XLNet, BiGRU and the attention mechanism	Cantonal rumor dataset	XLNet: 0.9200 XGA: 0.9281
Guo et al. [63]	Deep transfer model based on CNN (TL-CNN)	Yelp Polarity dataset (YELP-2) Five Breaking News dataset (FBN)	0.8728
Albahr and Albahar [64]	Naïve Bayes	LIAR dataset	0.99
Mertoğlu and Genç [65]	Extra Trees Classifier (ETC)	TRFN dataset (Newly created dataset)	0.9681
Kaur et al. [66]	Multi-level voting model based on different machine learning algorithms	News Trends dataset Kaggle dataset Reuters dataset	Voting classifier (TF-IDF): 0.938
Saeed et al. [67]	Random Forest (RF)	Health-related rumors dataset	0.8350
Alsaeedi and Al-Sarem [68]	A deep learning model based on the convolutional DL-CNN architecture.	PHEME dataset	0.86

Agarwal et al. [69]	A hybrid model based on a mix of Convolutional Neural Network (CNN) and Recurrent Neural Networks (RNN) architecture	Kaggle fake news dataset	0.9471
Kaliyar et al. [70]	A deep convolutional neural network (FNDNet)	Fake news dataset	0.983
Abonizio et al. [71]	Random Forest	Horne and Adali's dataset for EN news Fake.Br corpus dataset for PT news FakeNewsCorpusSpanish corpus dataset for ES news	0.853
Albahar [72]	A hybrid model based on a Recurrent Neural Network (RNN) and Ssupport Vector Machine (SVM).	FakeNewsNet dataset	PolitiFact dataset: 0.912 GossipCop dataset: 0.802
Shim et al. [73]	Deep learning based fake news detection model based on Link2vec	Balanced dataset for fake news analysis Korean fake news dataset	Balanced dataset for fake news analysis: 0.931 Korean fake news dataset: 0.819
Song et al. [74]	CARMN (A multimodal fake news detection model based on Crossmodal Attention Rediual (CARN) and Multichannel Convolutional Neural Networks (MCN))	Twitter dataset Weibo A dataset Weibo B dataset Weibo C dataset	0.922
Chen et al. [75]	DDR model	Twitter dataset	DDR:0.863
Sandrilla and Devi [76]	Random Forest (RF)	Newly created dataset	0.8749
Qasem et al. [77]	A model that combines GA-SVM and stacking classifier Logistic Regression (LR)	ARCOV-19 dataset	0.9263
Abdelminaam et al. [78]	Deep neural network model based on Modified-LSTM and Modified-GRU deep learning techniques	CoAID dataset Disasters dataset PolitiFact dataset Gossipcop dataset	CoAID dataset: 0.986 Disasters dataset: 0.8674 PolitiFact dataset: 0.8393 Gossipcop dataset: 0.8382
Goldani et al. [79]	Convolutional Neural Networks (CNN) with loss of margin	LIAR dataset ISOT dataset	0.99
Kaliyar et al. [80]	DeepFakE: A multi-layer deep neural network based on the community machine learning classifier (XGBoost).	FakeNewsNet dataset	BuzzFeed dataset: 0.8586 Politifact dataset: 0.8864
Divya and Banik [81]	Bi-LSTM	Fake Job Postings dataset	0.9377
Sastrawan et al. [82]	Bidirectional LSTM	ISOT fake news dataset Fake news dataset Fake or real news dataset Fake news detection dataset	ISOT fake news dataset: 0.9995 Fake news dataset: 0.9865 Fake or real news dataset: 0.946 Fake news detection dataset: 0.9924
Asghar et al. [83]	Deep learning model based on Bidirectional Long Short Term Memory with Convolutional Neural Network (BiLSTM-CNN model)	Pheme dataset	0.8612
Aslam et al. [84]	A community-based deep learning model (Bi-LSTM-GRU intensive deep learning model)	LIAR dataset	0.898
Zeng et al. [85]	FND-SCTI model (based on VGG deep learning model and hierarchical attention mechanism)	Twitter dataset Weibo dataset	Twitter dataset: 0.772 Weibo dataset: 0.839
Ying et al. [86]	End-to-End Multimodal Thread Memory Network (MTMN)	Weibo dataset Pheme dataset	Weibo dataset: 0.884 Pheme dataset: 0.885
Kaliyar et al. [87]	FakeBERT model (a deep learning approach based on BERT)	Real world fake news dataset	0.989
Meel and Vishwakarma [88]	Hierarchical Attention Network (HAN) hybrid multimodal deep learning model	Fake News Detection dataset All Data dataset Fake News Sample dataset	0.959
Khanday et al. [89]	Decision Tree	Newly created dataset	0.985
Choudhary and Arora [90]	Neural-based sequential learning model	Buzzfeed political news dataset Random political news dataset	0.86
Chauhan and Palivela [91]	LSTM neural network model	Fake and real news dataset Glove Twitter dataset	0.998

Tu et al. [92]	Rumor2vec rumor detection model (A multi-modal CNN-based deep fusion model combining node features and text features)	Weibo dataset Twitter15 dataset Twitter 16 dataset	Weibo dataset: 0.951 Twitter15 dataset: 0.796 Twitter16 dataset: 0.852
Bhattacharya et al. [93]	A model integrating Bi-LSTM and BC network	Newly created dataset	0.995
Islam et al. [94]	Support vector machine (SVM)	Fake news dataset	0.931
Senhadji and Ahmed [95]	Long short-term memory (LSTM)	Newly created dataset	0.92
Gonwirat et al. [96]	A unified deep learning model based on the ideal distance weighting method (based on CNN-LSTM)	ISOT fake news dataset COVID-19 fake news dataset	ISOT fake news dataset: 0.9956 COVID-19 fake news dataset: 0.7372
Palani et al. [97]	CB-Fake model (based on capsule neural network)	FakeNewsNet dataset	Politifact dataset: 0.93 Gossipcop dataset: 0.92
Alsaidi and Etaiwi [98]	Naïve Bayes	True-fake Covid 19 news dataset	0.946
Dixit et al. [99]	Fuzzy CRNN	LIAR dataset LIAR-PLUS dataset ISOT dataset	LIAR dataset: 0.65 LIAR-PLUS dataset: 0.70 ISOT dataset: 0.99,99
Wang et al. [100]	Fine-Grained Multimodal Fusion Networks (FMFN)	Weibo dataset	0.885
Sandrilla and Devi [101]	FNU-BiCNN model (Combination of ARIMA, CNN and Bi-LSTM)	Kaggle dataset	1.000
Almars et al. [102]	Hybrid attention neural network model (HANN) (Based on Convolutional Neural Network (CNN) and Bidirectional Long Short Term Memory (Bi-LSTM) deep neural networks)	ArCOV dataset	0.915
Yu et al. [103]	Graph convolutional network based dynamic rumor detection method (HDGCN)	Twitter15 dataset Twitter16 dataset	Twitter15 dataset: 0.834 Twitter16 dataset: 0.865
Tembhurne et al. [104]	A multi-channel deep learning model (Mc-DNN) with a combination of CNN and BiLSTM	Fake News Data (FND) ISOT fake news dataset	ISOT dataset: 0.992 FND dataset: 0.946
Zhang et al. [105]	A multimodal meta-multitasking learning model (MM-MTL)	RumourEval dataset Pheme dataset	RumourEval dataset: 0.819 Pheme dataset: 0.822
He et al. [106]	GA-SA-ELLA model (Based on Genetic Algorithm (GA), Simulated Annealing (SA) and Efficient Lifelong Learning Algorithm (ELLA))	Weibo rumor events dataset	0.961
Hirlekar and Kumar [107]	Hybrid model named CRED_Tweet (based on CNN-BİLSTM algorithm)	Newly created dataset	0.976
Alotaibi and Alhammad [108]	Text classification method based on a rule-based system	A dataset of Arabic tweets about Covid-19	0.781