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Big Data Analytics on Social Media: A review of open issues and future bearings

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Abstract. Interpersonal interaction services alias Social Media interface individuals around the world, where they convey through sharing items, photographs, and recordings, posting their direct assessments, and remarks, and following their companions. Consequently, big social media is developed where big data methods are used to decode social interactions. With the always-expanding development of informal interaction organizations, the examination of social information, to portray and find correspondence designs among company's clients and grasp their ways of behaving, has drawn much consideration. The ongoing review plays out a methodical writing survey (SLR) to blend earlier exploration of big social data analysis by examining 47 quality studies published between 2019 and Sept, 2022. The discoveries of this paper are presented in form of yearly appropriations, and the conveyance of studies among distributors. This study explores plots where BDA can be applied and where BDA can convey benefits to residing creatures and nature and furthermore show forthcoming scientists' way by giving a structure**.**

Keywords: Social Media, Big Data Analytics, Social Governance, Social Sensors.

1 Introduction

With the Web improvement, virtual entertainment has become piece of individuals' life. Social Media provides us with online stages for Interpersonal interaction (or informal communication) appropriated across different PCs over significant distances. A large number of individuals from one side of the planet to the other use social media to transfer photographs, and recordings, update their ongoing status and post everyday remarks. Besides the fact that these stages are utilized by people to associate with others these are also used by organizations to contact their crowds [1]. The fast development of online informal organization relationship destinations has urged specialists to research the distributed items and dissect clients' ways of behaving. Social media marketers explore social media to understand what customers like and share and plan their social media campaigns accordingly.

Big data Analytics (BDA) has a great impact on social media marketers as a fuel that powers their digital campaigns toward success. Through big data analysis, online communities can be understood in a better way by advertisers and behaviors can be predicted using this making them convey customized administrations as well as fast resolution of any issue [2]. Various researchers have tested the potential utilization of BDA in social media analysis. For example, Forecasts of the election result, Disaster Alerts, and many more different regions get benefitted from BDA applications. Nonetheless, researchers have contended that the compromise between gathering productive information-driven social network examination and the related data security in the process is yet to accomplish a balance [3-4].

We value the significant information about the utilization of BDA in web-based entertainment presented by previous examinations. Notwithstanding, none of old investigations have assessed the nature of the records in the sample under survey. Subsequently, the discoveries of these investigations are dependent upon a basic limit of their example plan. Consequently, the inaccessibility of an extensive synopsis of key focus points from quality articles is a significant hole in the writings on the utilization of BDA in social media [5]. Besides, there is a scarcity of exploration pointed toward distinguishing the areas inside social media where BDA is regularly applied [6]. The current review plans to address the examination holes in the writing on the utilization of BDA in social media by directing a methodical writing survey (SLR). SLRs have been perceived for their capacity, to

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sum up, significant information about a subject of significance and to direct future exploration on the subject. This SLR intends to address four exploration questions (RQs) as follows: RQ1. What is the ongoing status of research on the use of BDA in social media? RQ2. In which areas inside social media are the uses of BDA being examined? RQ3. What are the important points from earlier examinations on BDA in social media? Significant future examination plans are the question of RQ4.

2 Related Literature

Big data analytics and social media review papers have all been covered in this section. In earlier research, review articles focusing on either a particular ailment or the evolution of the healthcare system as a whole were attempted. Researchers like [7] concentrated on particular healthcare fields. [8] evaluated research on using big data analytics and social media to address the issue of drug abuse. [9] presented a review paper on tracking mental health using social media data and big data approaches. [10] used social big data and COVID-19 to generate a review paper on mental health issues. While [11, 12] focused their reviews on healthcare as a whole. [11] did not employ any paper selection techniques when developing a review study on the advantages that the healthcare system can obtain from the examination of social media data. Also produced by [12] was a review paper with the goal of enhancing healthcare services through the examination of large-scale social health data. [13] used qualitative approach to write the paper, but did not provide the necessary justification for the qualitative methodologies they employed. All of these studies have provided the research community with insightful information, but the current study, which is focused on the growth of big data analytics as a whole, offers insights based on five selection criteria and in-depth information on the qualitative techniques utilized, as shown in Table 1. In addition to being the most recent study, this one also directs future researchers.

Table 1. Sample of papers under consideration

Author	Year	QE1	QE2	QE3	QE4	QE5	Sum
Xia, Q. et al. [1]	2022	1.5	2	2	1	1	7.5
Takane, Y. et al. [2]	2022	2	2	2	1	1	8
Badshah, A. et al. [3]	2022	1.5	2	2	1	1	7.5
Rahman, M.S. et al. [4]	2022	2	1.5	0	0	1	4.5
Sahoh, B. et al. [5]	2022	1.5	2	2	0	1	6.5
Zhang, M. et al. [6]	2022	2	2	2	1	1	8
Wang, X. et al. [7]	2022	2	2	2	1	1	8
Zhang, H. et al. [8]	2022	2	1.5	2	1	1	7.5
Chen, W et al. [9]	2021	1.5	0	0	0	1	2.5
Zhang, J. Z et al. [10]	2021	2	0	0	0	1	3
Kushwaha, A.K. et al. [11]	2021	1.5	2	2	1	1	7.5
Su, Z. et al. [12]	2021	1.5	1.5	2	1	1	7
Nilashi, M. et al. [13]	2021	1.5	2	2	1	1	7.5
Kar, A.K. [14]	2021	2	2	2	1	1.5	8.5
El Barachi, M. et al. [15]	2021	2	2	2	1	1	8
Song, T. M. et al. [16]	2021	1.5	2	2	1	1	7.5
Xu, J. et al. [17]	2021	2	2	2	1	1	8

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Jha, M. et al. [18]	2021	2	1.5	0	0	1	4.5
Shah, S. A. et al. [19]	2021	2	2	2	1	1	8
Yang, J.S. et al. [20]	2021	2	2	2	1	0	7
Muhamad Adnan, M. H. et al. [21]	2020	2	0	0	0	1	3
Abu-Salih, B. et al. [22]	2020	2	2	2	1	1	8
Bathla, G. et al. [23]	2020	2	2	2	1	1	8
Sahoh, B. et al. [24]	2020	2	2	2	1	1	8
Shuang, H. [25]	2020	2	2	2	1	0	7
Bathla, G. et al. [26]	2020	2	2	2	1	1	8
Del Vecchio, P. et al. [27]	2020	2	1.5	2	1	1.5	8
Feng, J. et al. [28]	2020	2	1.5	1.5	1	1	7
Ren, R. et al. [29]	2020	2	1.5	2	1	1.5	8
Zhou, X. [30]	2019	1.5	1.5	2	1	0	6
Li, S. et al. [31]	2019	2	2	2	1	1	8
Yang, J. S. et al. [32]	2019	2	2	2	1	1	8
Ahani, A. et al. [33]	2019	2	2	2	1	2	9

Note: Quality Evaluation criteria are taken from [18] and [19]. The studies that received a sum<4.5 (threshold value) are highlighted in grey.
QE 1: Examination of gains and losses of the point being talked about – 'yes (+2)', somewhat '(+1.5)', and 'negative (+0)'; the score for fractional examination is appointed when the conversation needs profundity.
QE 2: Proof of information examined in the review – 'quantitative (+2)', 'subjective (+1.5)', and 'no proof (+0)'.
QE 3: Defense of the review result as per the philosophy utilized in the review – 'yes (+2)', 'somewhat (+1.5)', and 'negative (+0)'; the score for fractional support is doled out when handful of procedures are told or definite clarification of a method utilized is inaccessible.
QE 4: Are methods used powerful? – 'yes (+1)' and 'no (+0)'
QE 5: Conspicuousness and consistency of the source - (+2) when the H index and number of references exceed 100; (+1.5) when they fall between 50 and 99; (+1.0) when they fall between 1 and 49; and (+0) when they are both zero.

3 Methodology

3.1 Planning the review

To start, appropriate catchphrases were identified to search for significant papers in databases. Databases like Scopus, IEEE, and Springer were the focus of this SLR. These databases serve as the primary hubs for articles in computer science. The qualification of the full texts of the papers that seemed significant was assessed. Studies that met the criteria were then evaluated for quality and value (paying particular attention to the consideration and prohibition guidelines).

3.2 Performing the review

To decide the proper search words, an inquiry was performed on Google Scholar with the expression 'big data analytics' meets social media. The most ordinarily related terms were recognized from the initial 100 query items. Only studies from 2019 to Sept, 2022 providing some framework or model were considered, leaving us with 33 studies. 3 studies which received sum of less than 4.5 (threshold value of Quality assessment) got failed in quality assessment (shown in grey color in Table 1) giving us final sample of 30.

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3.3 Presenting the review

The topic under discussion is relatively new in the literature as the oldest study taken into account is from 2019. These papers receive a sizable number of papers and an average of citations every year. For instance, the research taken into consideration for this SLR earned an average of 30.8(2019), 11(2020), and 11.22(2021) citations per year. As a result, we can find astounding statistics that relate to our issue and attest to its popularity among scholars.

Key Contributors. [23] and [24] contributed the most to our SLR by giving us 2-2 research papers, out of all the researchers who made significant contributions to the papers being examined in this SLR. Although our scholars are connected to institutions in 13, we only listed the nations where we received at least two contributions in Fig. 1. As seen in Fig. 1, China (10 articles) and India produced the majority of these studies. (4 papers). Italy, Japan, Jordan, Malaysia, Pakistan, the United Arab Emirates, and the United States were unable to secure a spot in Fig. 1.

Key Publishers. Studies Fig. 2 which shows the distribution of studies over the time period considered shows that the maximum number of papers was published by Elsevier, IEEE and Springer. MDPI, IGI Global and Emerald have presented the low number of publications. Fig. 3 shows the high numbers of publications were received in 2021. In 2022 we have got 8 publications under our belt till Sept, 2022, and many more are expected to come by end of the year. Fig. 4 states that IEEE, Springer and Elsevier have given contributions of 30% each. On the other hand, MDPI, and IGI Global have given least number but valuable contributions of 3% each.

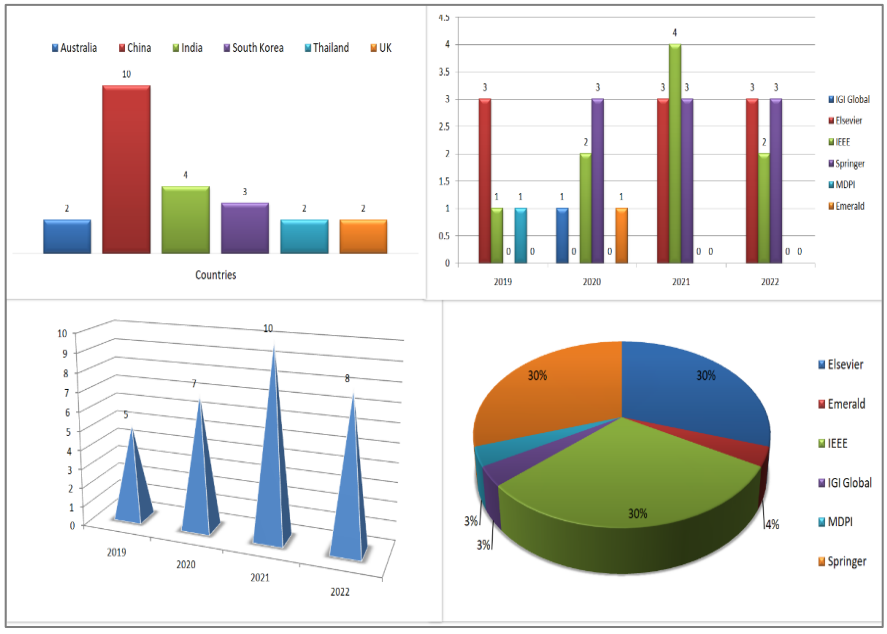

Fig.1-4 (Top Left, Top Right, Bottom Left, Bottom Right respectively). Affiliation of our Researchers (Top Left), Publisher wise publications per year (Top Right), Publications per year (Bottom Left), Categorization of Publications (in terms of %) based on Publishers (Bottom Right)

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4 Findings

4.1 Applications of BDA on Social Media

The studies under review synthesize the following themes (see Table 2), as discussed below:

Public Health. This theme involves papers related to health issues that can be resolved using an application of big data in Social Media Analysis, like studies discussing issues like air pollution, and diabetes. [21] discussed the bad effects of air pollution on public health and on health facilities provided by the government to the public. The researcher also found the impact of the bad health of people on the GDP of a nation. [22] discussed adverse drug reactions to diabetes medicine using social media analytics and interactive visualizations.

CPS. This theme relates to papers dealing with Cyber-Physical Social World. [22] discussed the evolving situation of the Cyber-Physical Social World. [23] discussed QTT-DLSTM through which they described the usage of CPS for the personalization of offers given by businesses to customers. [24] discussed Optimization Model based on Tensor for big data computations in CPS world.

Other User Opinions. This theme is also related to opinion mining but these researchers mined opinions not for benefit of businesses but for purposes like estimating Digital Harassment [25], for constructing sentences from Emoticons and for purposes like improving social trust and social recommendation.

Emergency. This theme provides papers like automatic semantic understanding from social media at times of emergency, analyzing Twitter data for emergency alerts [26], and giving automatic responses to reaction teams in an emergency.

Table 2. Contexts of reviewed studies

Theme	Details
Public Health	Polluted Air [28], unfriendly responses of diabetes medication [30]
CPS	QTT-DLSTM [22], Optimization Model based on Tensor for Big Data Calculations in CPS world [23]
Other User Opinions	Digital Harassment [25], Sentiment based sentences [26], Social Influence [27], Social trust [28], Travel Choice [29]
Emergency	Use of Social sensors in Crisis Management [28], Disaster alerts [29], and Semantic-based emergency management [30]

4.2 Value Delivered by BDA on Social Media

The studies under review synthesize the following values (see Table 3), as discussed below:

Strategy Formulation. This covers aspects like Division of market and travel decision forecast based on the web surveys [21], giving Personal Credit Based on Social Big Data Analysis by considering factors like the worth of friend circle, behavioral properties, and other tangible qualities of human being that makes one reliable for trusting, usage of Social Big Data to validate E-commerce Credit details, and making a plan of action for business navigation using social big data.

Data Governance. This covers studies like Allocation of resources being mindful of security concerns [24], and investigation of mobile payments to find out user satisfaction. In papers like [18] there is a discussion about how people choose operators and mostly those operators are chosen by people who value their data and their privacy. [18] proposed a resource allocation scheme to safeguard versatile social mobile big data during conveyance.

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Social Governance. [17] advised extraction and examination of public opinion are imperative so that state-run administrations are able to devise and execute the important remedial measures, forestall savagery, and guarantee the rule of law. Whereas [16] suggested analyzing changes in the behavior of humans can help in developing environmental protection strategies.

Technology Development. [31] discusses the Use of regional computing to minimize the social big data effects in which he proposes a way out to handle large loads of social media data to be handled appropriately by not sending data all time to the main server rather he proposes data handling at regional level servers citing facts and figures showing that most social users interact regionally most of the times. Same way [32] advocates a Multi-Modal learning approach. Similarly, [33] created a miniature network by thinking about minority opinions utilizing reluctant fuzzy semantic Data.

Table 3. Values delivered by reviewed studies

Value	Details
Strategy Formulation	Market Strategy [18], Customer Trust [19], Travelers' Segmentation [20], Factors affecting Mobile Payments [21], Enhancing SME business [22], Purchase Decisions [16], Knowing Customers [17], Loan System [18]
Data Governance	Protecting mobile social big data [20], Privacy and Data [20]
Social Governance	Handling crises using Social Sensors [23], Micro Grid development [24], Public Health [23], Forestall savagery [24], Environment Shielding [25]
Technology Development	Regional Computing [19], Multi-Modal Learning Approach [22], Reluctant fuzzy semantic technique [23]

4.3 Future Research agendas

Here, we will discuss the potential scopes and restrictions of the investigations under consideration. However, before discussing the potential scopes mentioned in these studies, let's first examine their limits. (The list of limitations and future scopes are covered in Table 4 and Table 5 respectively).
Limitations as in our sample of papers:

Data Collection. [27] said of limited data being available, [34] faced challenges in getting quality worth data and access to data, sampling issues were faced by [29].

Methodological Constraints. Like the paucity of available methods [35], analysis of non-English information [36], and simulation-based results were also faced by our researchers [37] fell short while explaining the methodology adopted to categorize positive and negative words into low, medium, and high whereas research done by [38] faces the limitation of manual labeling. On the other hand, [39] has just taken single context and gender into considerationlimiting the scope of research.

Table 4. Limitations as in reviewed studies

Limitations	Details
Data Collection	Limited Data [30], Quality of data and access to data [31], Sampling Issues [32], Single Informant Limitation [33]
Methodological Constraints	The paucity of methods [34], analysis of non-English information [35], and simulation-based results [36]

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Future scopes of studies considered are discussed as following:

Conceptual Advancement. Like model optimization, and model extension was told by these researchers [32].

Methodological Rigor. Like usage of Advanced methods [33], alternate sources of data [34], analyzing noise [40] were suggested by fellow researchers.

Study Extension. [33] suggested of researching on all pollutants, [31] have future plans of scaling up of their proposed model, and [41] are encouraging fellow researchers to do work like them in other scopes or in other fields also.

Technological Advancement. Connecting social media with mobile cloud computing is a future endeavor of [32], investigating the cloud security resource in the mobile social network is the future plan of [42]. Using Incremental learning ability and picture examination abilities in their model are upcoming plans of [43] and [44] respectively.

Research Design. Various writers considered in this review have thrown light on the following points that affect the way research needs to be designed. [45] showed the path of considering regional cyber rules and maintaining the privacy and security of information in local servers. [46] want to change the basic design of their writing by taking into consideration non-English papers.

Table 5. Future paths guided by studies considered

Future Scope	Details
Conceptual Advancement	Model Optimization, Model extension [47]
Methodological Rigor	Advanced method [33], alternate sources of data [34], analyzing noise [48]
Study Extension	Research on all pollutants [33], scales [31], and scopes [32]
Technological Advancement	Social mobile cloud computing [32], deep learning technique [33], cloud security resources in mobile social networks [32], ensemble learning techniques, incremental learning ability [28], Picture and facial feeling examination [29]
Research Design	Security Issues [28], heterogeneous data usage [29], analyzing non-English information [30], cyber rules [31]

5 Conclusion and Future scopes

The present study expected to resolve four questions connected with the use of BDA in Social Media Analysis. These inquiries have been responded to by observing standard guidelines for inspecting writings from key information bases. The earlier writing on the utilization of BDA in Social Media Analysis gave us different subjects and values connected with the use of big data in Social Media Analysis. The review has recognized the holes in the current writing and given a significant exploration plan for future examination of the use of big data in the Social Media Analysis. Despite the important deliverables of this study's flow, there are several drawbacks, such as the failure to consider non-English publications that may contain important pieces of knowledge and additional research information written in Book chapters, short reviews, and letters have not been thought of. We welcome future researchers to deal with these limitations. Also, we recommend scholars to explore the application of BDA in other avenues like the Agriculture, Education sector, Energy sector,

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and many other vast areas rich in data and hidden knowledge.

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