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A Brief Systematics Review and Visualization of Smart Cities based on Fog and Big Data Analysis Technology

Rubina Shaikh[1], Prashant Itankar[2]

[1]Rubina Shaikh, Department of Computer Engineering, ARMIET, Maharashtra, India
[2]Prashant Itankar, Department of Computer Engineering, University of Mumbai, Maharashtra, India

Abstract:
The fog computing is based on IoT, and same as clouds are on the edge of a network between a device and the cloud, which can provide very close service to the device in real time. cloud computing frameworks also extend support to emerging application paradigms such as IoT, Fog computing, Edge, and Big Data through service and infrastructure. the ubiquitous deployment of sensors in smart cities requires a high-performance computing paradigm to support big data analysis with smart technologies and communications in IoT, providing location-awareness and latency-sensitive computing near the data sources (i.e., at the edge of the network). Cloud Computing paradigms widely used in enterprises to address the emerging challenges of big data analysis because of its scalable and distributed data management scheme. However, data centers in the Cloud faces great challenges on the burden of exploding amount of big data and the additional requirements of location awareness and low latency at the edge of network necessary for smart cites. the widely distributed sensor networks generate massive volume of data, which leads to a "Big Data "analysis challenge. The machine-to-machine(M2M) communication among massive numbers of sensors will dominate future communication network traffic, namely Internet of Things, instead of traditional Internet of Contents (IoC) in human-to-human and human-to-machine communication. In this review system where we took the research article around 33 from the different database and also taken 1987 datasets form the PubMed database from 1959 to 2024 (02 June 2024). In addition, depending on the different requirement which is partially processed the data. Then the gathered data is stored at the ledger unit through the smart cities based on the fog computing and big data technology. The hashing identity-based data encryption is a public key encryption which uses a digital signature to encrypt the data to prevent the information from the third party.

Keywords: Fog Computing technology, Smart Cities, CNN, Distributed Learning.

1. INTRODUCTION:

The internet of things (IoT), in general, refers to many of objects and environments around us that connect to the internet through network communication (wired or wire- less)so that it can be controlled and managed by apps in smartphones, tablets, and PCs[11,12][1].Technological developments like edge computing, fog computing, Internet of Things (IoT), and Big Data have gained importance due to their robustness and ability to provide diverse response characteristics based on target application [2]. These emerging technologies provide storage, computation, and communication to edge devices, which

facilitate and enhance mobility, privacy, security, low latency, and network bandwidth so that fog computing can perfectly match latency-sensitive or real-time applications [13, 14, 15, 16, 17, 18, 19, 20, 21, 22][3].IoT-enabled devices use their sensing technology to generate big data and then transfer it via fog computing or cloud computing to destinations on which decision-making capabilities can be accurate by applying deep learning algorithms. However, fog computing, including cloud computing standards, has emerged as the backbone of a cutting-edge economy that uses the Internet to deliver services requested by users [23][4]. Fog computing, and Edge computing have grown important due to their nature aswarm-heartedness and ability to deliver response properties that depend on the tracked target applications [24][4].

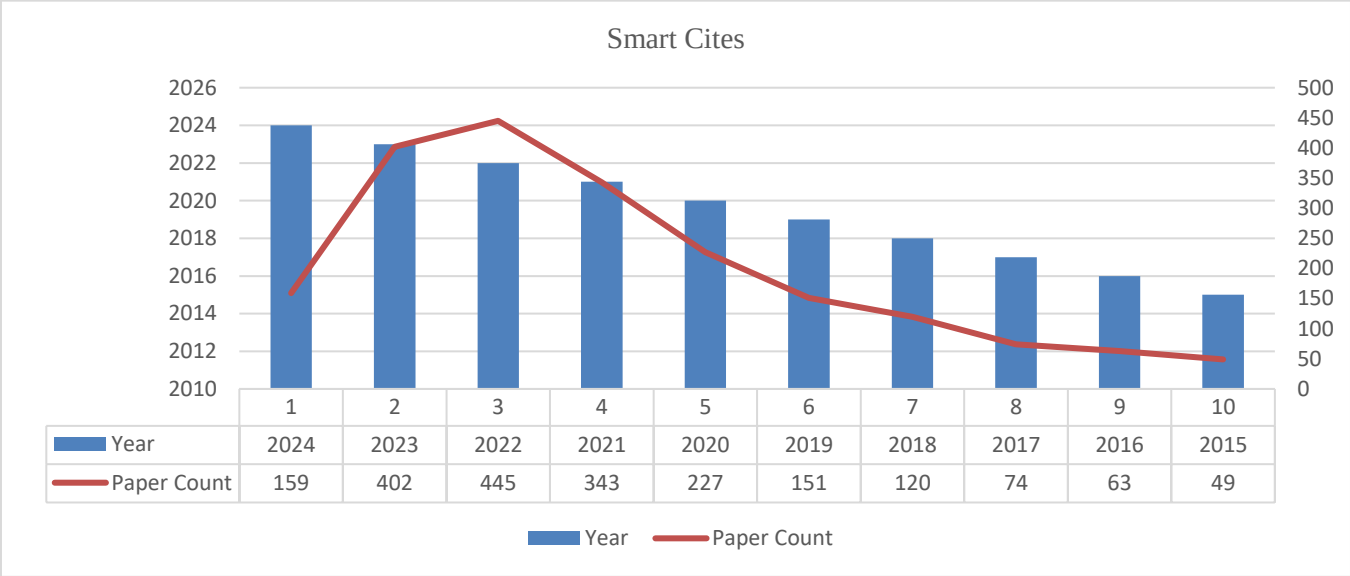

Fig 1: Survey of Publication: keywords- Smart Cities.

2. LITERATURE REVIEW:

Chaomin Li et. al (2020) In the field of healthcare, IoT sensors enable WSN to generate large amounts of high-speed and high-volume data that need an efficient approach for analyzing such a big volume of data with secure, confidential and accurate infection severity prediction mechanisms. With this aim we propose FoG assisted smart and real time healthcare information processing (SRHIP) systems that process and analyze data using Hadoop and Apache Spark systems. The collected data information from the data preprocessing step is further processed and analyzed at real-time using Hadoop and Apache Spark ecosystem. For infection severity prediction we use naïve bayes classifiers and compare their performance with existing benchmark classifiers including KNN, ANN, and SVM. Based on the comparative analysis of different classifiers, proposed NB based SRHIP outperforms other classifiers in terms of accuracy, specificity, sensitivity and F- measure. We also evaluate our proposed system in term data storage, transmission cost and transmission ratio. Proposed SRHIP system outperforms other existing benchmark schemes including SPPDA and GCEDA aggregation method and TMT approach. Simulation Results prove the dominance of our proposed EHDA scheme as compared to TMT, GCEDA and SPPDA schemes. The proposed SRHIP system needs less transmission cost of 40.10% in comparison to SPPDA, 100% fewer bytes are compromised in comparison to GCEDA. Our proposed system data size reduction of 60% reduction due to proposed compression scheme in comparison to

other benchmark strategies that offer 40% of reduction. In future, this work can be extended to the deployment of sensing devices to different mobility situations where Fog servers will be shifting based on the mobility in different areas [10].

Javad Rezazadeh et. al (2018) In Internet of Things (IoT) technologies, iBeacom motes, as a promising infrastructure of indoor localization, requires more research and evaluation. In this paper, impact of iBeacon placement for localization accuracy was considered. We experimentally evaluated the problem of RF-based positioning with iBeacon signal quality. Then, we introduced Crystal based iBeacon Placement (CiP) for iBeacons employed in indoor positioning. The placement method has been analyzed vertically and horizontally. It experimentally was tested and evaluated to validate its efficiency and yielded 21.16% improvement in terms of accuracy. Moreover, a customized android application was developed to collect and measure the signal from iBeacons, timely and efficiently. As future direction, we are planning to evaluate an Indoor Navigation System based on CiP idea and a machine learning method [12].

Amir M. Rahmani et. al (2018) In this paper, the concept of fog computing and Smart e-Health Gateways in the context of Internet-of-Things based healthcare systems was presented. Smart gateways at the close proximity of sensor nodes in smart home or hospital premises can exploit their unique strategic position to tackle many challenges in IoT-based health systems such as mobility, energy efficiency, scalability, interoperability, and reliability issues. We investigated in detail a range of high-level services which can be offered by smart gateways to sensors and end-users in a Geo-distributed fashion at the edge of the network (e.g., local processing, storage, notification, standardization, firewall, web services, compression, etc.). We presented a proof-of-concept implementation of an IoT-based remote health monitoring system which includes our demonstration of a Smart e-Health Gateway called UT-GATE. By exploiting a number of UT GATEs, we formed an intermediary processing layer to demonstrate the fog computing concept for IoT-based healthcare systems. Our fog-assisted system was applied to a medical case study called Early Warning Scores, targeted to monitoring patients with acute illnesses. Our full system demonstration includes all the data flow processes from data acquisition at sensor nodes to the cloud and end-users [13].

Shreshth Tuli et. al We proposed a novel fog-cloud based deep learning approach for object detection. Our system provides a deployable framework for deep learning applications and provides different modes (high-accuracy and low-latency) for different target applications or user requirements. We used Aneka platform service to deploy and test the effectiveness of the proposed model. We compared different characteristics like detection accuracy, response time, jitter, network and power consumption for different fog scenarios and used the results to suggest different modes of operation for different use cases [14].

Ammar Awad Mutlag et. al [2019] Fog computing is considered as one of the important research directions for many purposes in healthcare IoT systems. Research endeavors in this direction are still in progress. However, pertinent portrayals and limits continue to be considered ambiguous. In this study, acquiring understanding and insights into this domain is considered to be significant. By serious perusing and investigation of different review articles, a high-volume of indispensable data was acquired, for example, the issues, difficulties and challenges, motivation, and advantages, and suggestions identified for future work in fog computing in the healthcare applications. In this study, we have identified issues, difficulties, and challenges, and provided different suggestions to determine current and potential difficulties and issues of resource management in healthcare IoT systems that can

be overcome by adopting the main three factors Computation offloading, Load balancing and Interoperability. Hence, research studies motivate to propose (or develop) and use fog computing framework in Healthcare IoT systems. Moreover, we have provided a methodical review that depicts methods that apply fog computing in the healthcare IoT systems. Furthermore, we have examined the weaknesses of the current methods, systems, and frameworks and determined the scope of improvements that can be used for future research studies [18].

3. RESEARCH GAP AND CHALLENGES:

- The hidden Markov method with sequential learning model use sensor for sensing the data, which is related to the smart cities but such data are not be able to collect easily and should be frequently maintain the battery of a sensor [5].
- The machine learning method have some difficulties for data management, scalability, interoperability, device-network-human interfaces, security, and privacy [7].
- The artificial intelligence based deep learning method leads to more power usage, it is inactive, and this approach does not provide the accurate result [4].

4 RESULT AND DISCUSSION

4.1 Network Analysis

Network Analysis between Co-authorship and Authors:

In this network analysis, to use full counting method. Where maximum number of authors per documents consider as 25. The minimum number of documents of an author is 1 of the 42 authors, 42 meet the threshold. The each of the 42 authors, the total strength of the co-authorship link with other authors will be calculate. The authors with the greatest total link strength will be selected. The number of authors to be selected as 42. The some of the 42 items in your network are not connected to each other's. the largest set of connected items consists of items.

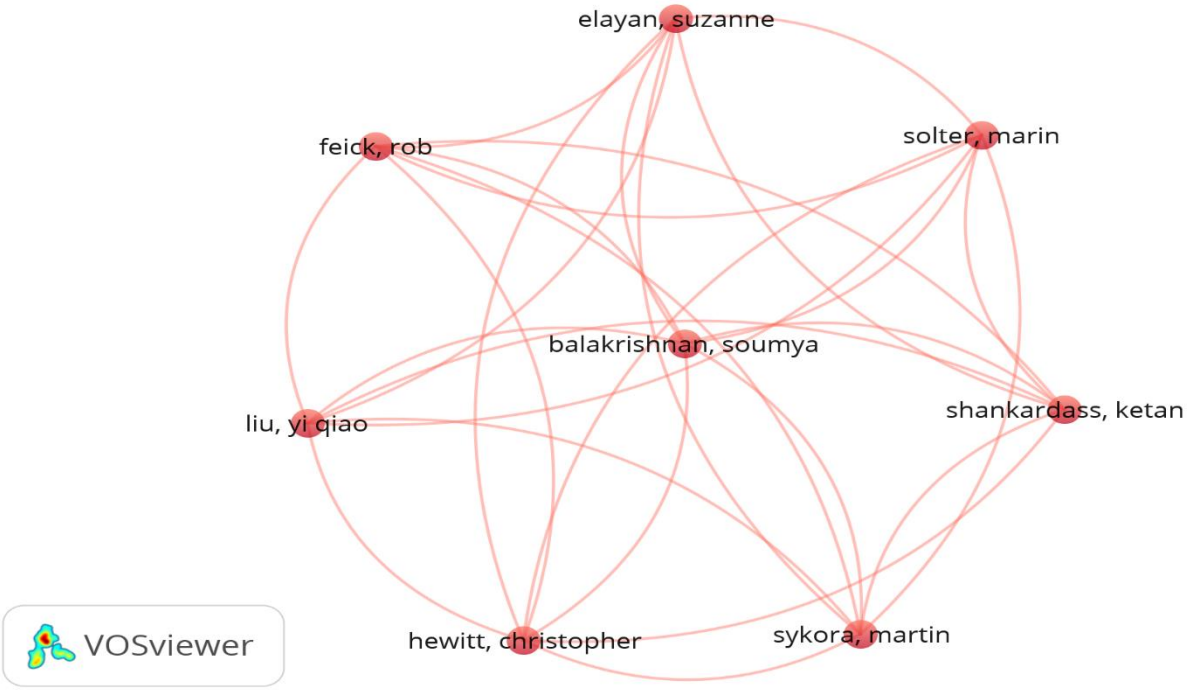

Fig 2: Co-authorship and authors.

Analysis between Co-authorship and Organization:

The analysis between co-authorship and organization where maximum number of organizations per documents is 25 and minimum number of documents of an organization is 1, of the 25 organizations, 25 meet the threshold. Now for each of the 25 organizations, the strength of the co-authorship links with other organizations will be calculated. The organizations with the greatest total link strength will be selected. The number of organizations to be selected as 25. As per observation some of the 25 items in your network are not connected to each other where largest set of connected items consist of 4 items.

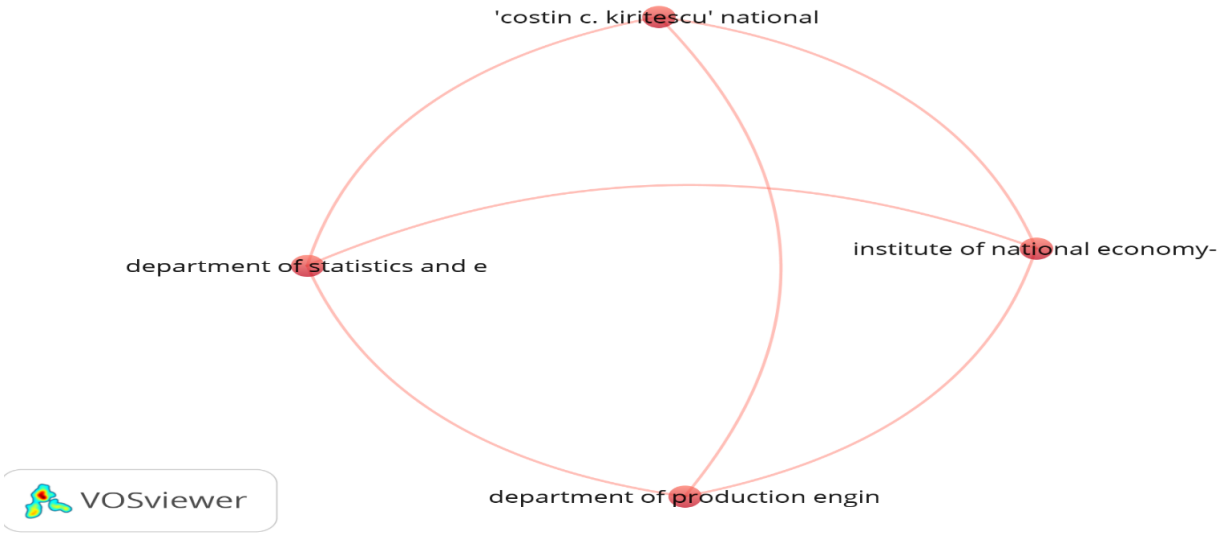

Fig 3: ***Analysis between Co-authorship and Organization***

Network Analysis between Co-occurrence and All Keywords:

In this type of analysis between Co-occurrence and all keywords where we use full counting methods by using the VOS Viewer software tools. To select the minimum number of occurrences of a keyword is 5, of the 75 keywords, 3 meet the threshold. Now each of the 3 keywords, the total strength of the cooccurrence links with others keywords will be calculated. The keywords with the greatest total link strength will be selected. The number of keywords to be selected 3, the name of the highly linked keywords are cities, human and smart city.

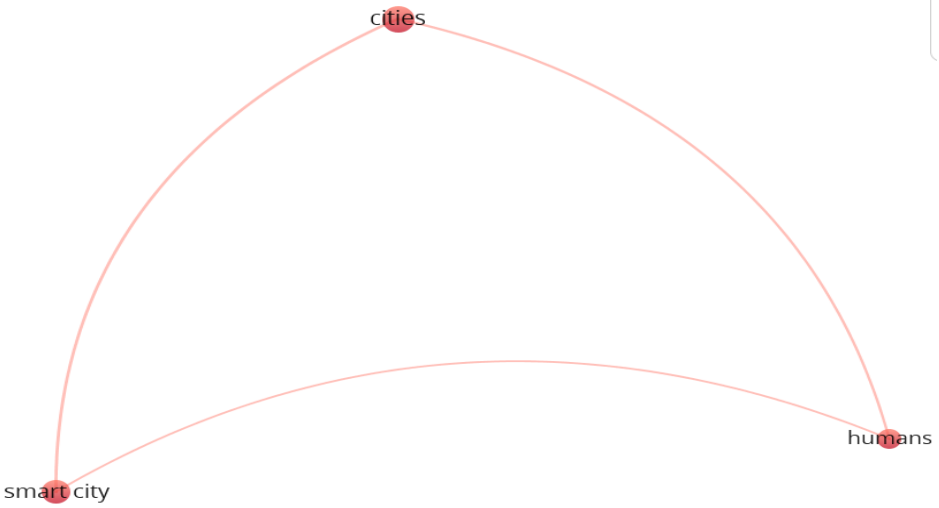

Fig 4: Analysis between Co-occurrences and all keywords

Network analysis between Co-occurrences and Authors keywords:

In this type of analysis between Co-occurrence and Authors keywords where we use full counting methods by using the VOS Viewer software tools. The minimum number of occurrences of a keyword is selected 2, of the 46 keywords, 6 meet the threshold. For each of the 6 keywords, the total strength of the cooccurrence links with other keywords will be calculated. The keywords with the greatest total link strength will be selected and number of keywords to be selected as 6 where smart city keywords having highest occurrences that is 7.

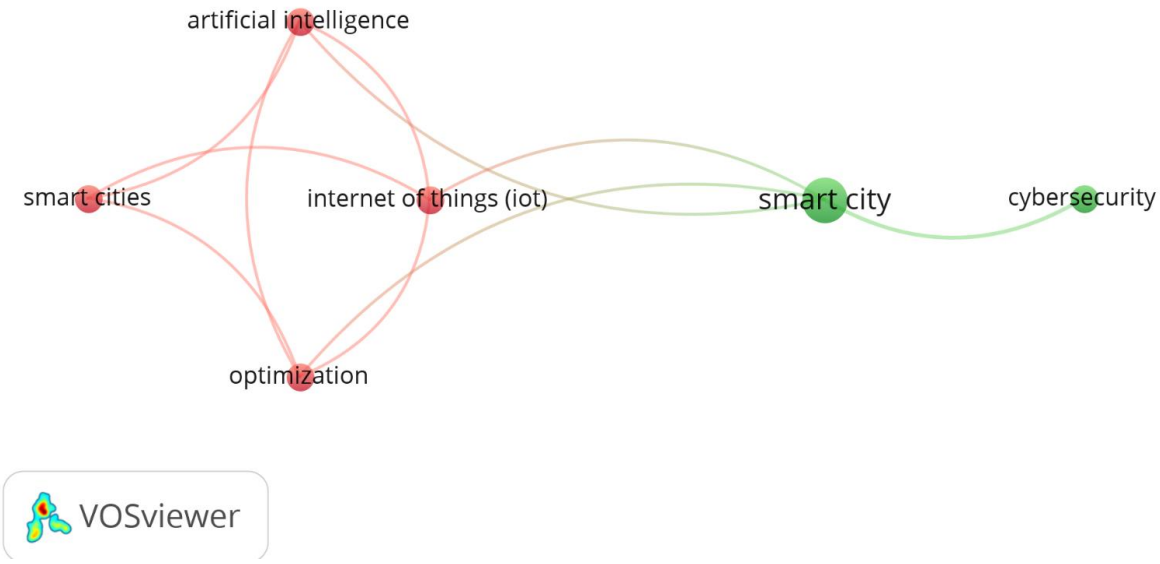

Fig 5: Analysis between Co-occurrences and authors keywords

4.2 Statistical Analysis

Statistical analysis between Co-occurrences and MeSH keywords:

In this type of analysis between Co-occurrence and MeSH keywords where we use full counting methods by using the VOS Viewer software tools. To select the minimum number of the occurrences of a keyword is 3, of the 36 keywords, 3 meet the threshold. For each of the greatest total link strength will be selected and number of keywords to be selected as 3 that are a

Id	Keyword	Occurrences	Total Link Strength
1	Cities	10	8
2	Covid-19	3	6
3	Humans	5	8

Statistical analysis between Co-occurrences and Authors keywords:

In the statistical analysis where 6 keywords are their but where smart city is having highest occurrences and high link strength.

Id	Keyword	Occurrences	Total Link Strength
1	Artificial intelligence	2	4
2	Cybersecurity	2	2

3	Internet of things (IoT)	2	4
4	Optimization	2	4
5	Smart cities	2	3
6	Smart city	7	5

CONCLUSION

In this research artcle smart cities based IoT and fog Computing method is proposed in this research using a novel deep learning methodology. Here, IoT sensors are used to collect the data and stored the collected data for expert analysis. This systematic review-based research article we taken article or data from the Scopus journal and PubMed these are one of the types of research based largest databases in the world, are used for systematic literature review, bibliometrics analysis and visualization of work done so far in the field of smart city using machine learning and deep learning. We have taken in account of Scopus and PubMed documents released between 1959 to 2024. By using the keywords search the database searching done. In this analysis a total count of 1987 document from smart city obtained from the Scopus database from PubMed and 33 research paper from the different Scopus journal. In assessing the aforementioned database, specific factors are duly taken into account. It is important to note that practically the whole essay is written in standard English. According to PubMed database statistics, 2023 is the year with the most published articles, followed by 2022. Almost all document categories are published through conferences, and a higher percentage of papers are published in research journals.

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