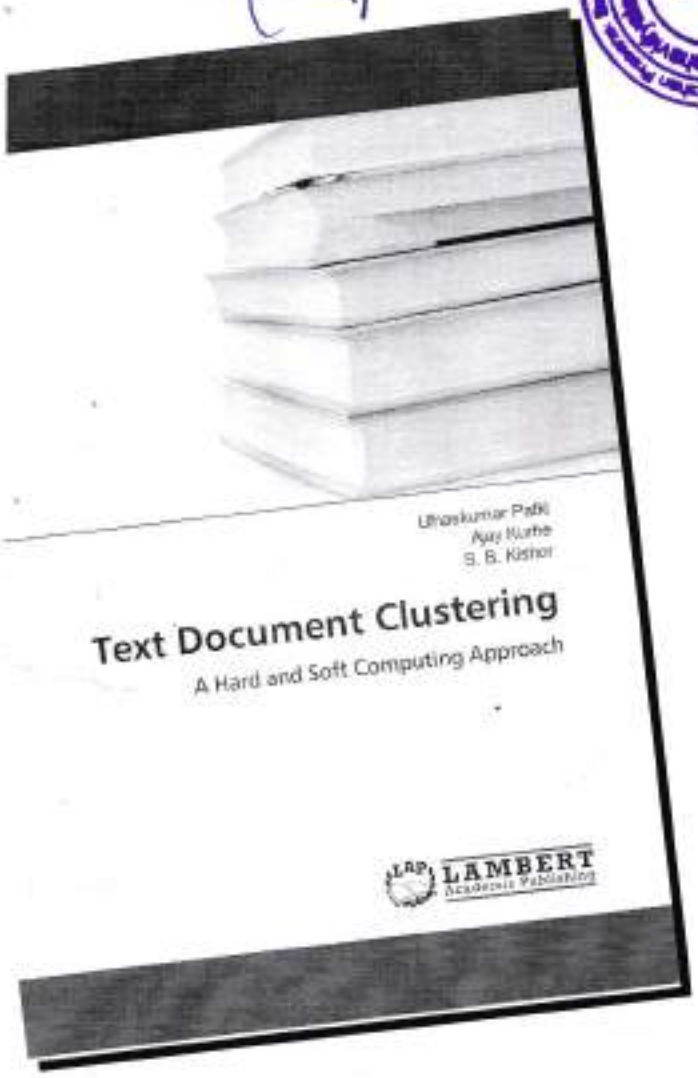


# Text Document Clustering

## A Hard and Soft Computing Approach

Ulhaskumar Patki

ISBN: 978-620-4-74538-1

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# Internet of Things and its Applications

*Ajay Kurhe*
*dept. of Computer Science*
*S.G.B. College*
*Purna, India.*
*ajay.kurhe@gmail.com*

*Alka S. Kausadikar*
*dept. of Mathematics*
*S.G.B. College,*
*Purna India.*
*akausadikar@gmail.com*

*Ulhas Patki*
*dept.of Computer Science*
*Science College,*
*Nanded, India*
*patkiulhas@gmail.com*

*Suhas S. Satonkar*
*dept.S.J.College,*
*Gangakhed, India*
*suhassatonkar.gmail.com*

*Abstract*— The high entrance rate of new innovations in every one of the exercise of regular day to day existence is encouraging the conviction that for any new societal challenge there is always an ICT solution that can deal with it successfully. The solution most recently proposed is the "Internet of Things " (IoT). This apparent panacea of the ICT world takes on different aspects and is actually identified with different technological solutions (often very different). As a result, many people believe that IoT is only RFIDs, others believe that it is sensor networks, and others believe that it is machine-to-machine. Meanwhile, industrial players take advantage of IoT 's popularity to use it as a very trendy brand for consumer-oriented technology solutions. Sometimes scientific literature doesn't help much to clarify, as it is rich in IoT definitions that are often discordant.

Objective of this paper is to clarify the concept of Internet of Things and it uses in society. Also we are present the applications of Internet of Things, these applications are arranged on ranking and in this ranking 3 main things are considered : people find on Google, people talk on twitter and what people write about on LinkedIn.

Keywords— IoT (Internet of Things), Web of Things, microelectronics, smart home, RFID (Radio Frequency Identification), Intelligent.

## I. INTRODUCTION

The Internet of Things is a vision in which the Internet expands into the real world. Everyday objects embrace the world. Physical components are no longer separated from However, the virtual world can be remotely controlled and act as physical access points to services of the Internet. An Internet of Things really makes computing omnipresent. Concept initially presented in the early 1990s[1] by Mark Weiser

The "Internet of Things" terminology was used in 1999 by UK innovation pioneer Kevin Ashton to depict a framework. At that time, questions raised, how to physical world connected to internet by sensors [2]? Ashton makes up the term to exemplify the influence of connecting (RFID) Radio-Frequency Identification tags [3]. This tags used in commercial supply chains to the Internet. So as to tally and track products without the requirement for human mediation. Now days, the Internet of Things has come to be popular term for depicting situations in which Internet network and computing ability extend to a lot of different of things or devices, objects, sensors and regular items.

The vision of the Internet of Things is based on the belief that steady progress is being made. We have seen microelectronics, communication and information technology Over recent years, the foreseeable future will continue. In fact – due to their decrease Sheet price decrease constantly and energy consumption decrease processors, Module communications and other electronic components are increasingly combined into regular things nowadays.

The term "internet of things" has spread rapidly in recent years–it could spread in 2005. You can already find it in book titles [4, 5] and the first scientific conference was held in 2008, held in this area of research [6]. Initially, European politicians only used the term in RFID technology context, but the RFID Conference titles "From RFID to The Internet Things (2006) and " RFID: Towards the Internet of Things" (2007) held by the EU Commission already allude to a broader interpretation. Finally, in 2009, a dedicated EU Commission action plan ultimately saw the Internet of Things as a general evolution of the Internet "from a network of interconnected computers to a network of interconnected objects" [7].

The Internet of Things (IoT), also known as or referred as the Internet of Objects, will change all of us. The Internet affects science, government, enterprise, education, communication and humanity [8]. The Internet is clearly one of the most important and a powerful creation in human history and now, with the Internet of Things concept, the Internet is growing and has smart life in every aspect [9].

## II. CONCEPT

The Internet of Things is a new Internet access technology. Objects recognize themselves and obtain intelligence through the Internet of Things by taking or enabling related decisions to communicate information about them [10]. These objects can access information that has been added to other services or can be added to them [10]. Figure 1 review that anything can communicate with the Internet at any time from any place to provide any services to anyone via any network. This concept will create new types of applications such as smart vehicles and smart homes for the provision of numerous services such as automation, communication, entertainment, notifications, security, computers and energy saving [11, 12].From a technical point of view, the Internet of Things is not the result of a single novel technology; instead, several technical developments combined provide the capabilities to bridge the gap between the virtual and physical worlds. These features include: Communication and cooperation, Addressability, Identification, Sensing, Actuation, Embedded information processing, Localization, User interfaces [13].

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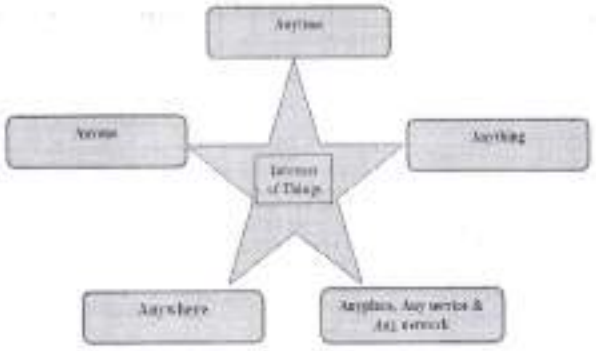


Figure 1. Internet of things Concept

In the past, combining these digital devices has been difficult or impossible. In addition, it is essential to collect information for the day-to-day management of activities and for long - term development planning in the city. For example, some information on public transport, such as real - time location and use, parking space occupancy, traffic jams and other data such as weather, air and noise pollution, water pollution, energy consumption, etc. Continuously should be collected. To this end, various technologies have been used to address each application's specific features.

## III. Applications:

### *1) Smart home*

Smart Home stands out clearly as the highest application of the Internet of Things on all measured channels. More than 60,000 people are currently searching every month for the term "intelligent home." It's not surprising. The Smart Home IoT Analytics company database consists of 256 companies and start - ups. More companies are active in smart house applications than any other IoT application. The total funding for start - ups in Smart Home is currently over $ 2.5 billion. This list contains leading startup names such as Nest or AlertMe and a number of multinational companies such as Philips, Haier or Belkin.

### *2) Wearables*

Wearable's is also a hot topic. As consumers await the release of Apple's new smart watch in April 2015, wearable innovations like the Sony Smart B Trainer, the Myo gesture control or the Looksee bracelet are plenty more exciting. Of all IoT start - ups, Jawbone is probably the wearable manufacturer with the largest funding to date. It's over half a billion dollars.

### *3) Smart City*

Smart city covers a wide range of applications, ranging from traffic management to water distribution, waste management, urban security and monitoring. Its popularity is driven by the fact that many intelligent city solutions promise to alleviate real pain in the cities today. Smart City IoT solutions solve traffic congestion, reduce noise and pollution and help make cities safer.

### *4) Smart grids*

It's a special smart grid. A future smart grid promises to automated use information on the behavior of electricity suppliers and consumers to improve electricity efficiency,

reliability and economy. 41,000 monthly Google searches highlight the popularity of the concept. The lack of tweets (only 100 per month) shows, however, that people do not have much to say.

### *5) Industrial internet*

The industrial Internet is also one of the special applications of the Internet of Things. While many market researchers such as Gartner or Cisco consider the industrial Internet to be the IoT concept with the highest overall potential, its popularity does not currently reach masses such as smart homes or wearable's. However, the industrial internet has a lot to do with it. The industrial Internet receives the biggest push on Twitter (~1,700 tweets per month) compared to other IoT concepts that are not consumer-oriented.

### *6) Connected car*

The connected car slowly arrives. Due to the fact that the development cycles typically take 2 - 4 years in the automotive industry, we have not seen much buzz around the connected car yet. But we seem to get there. Most major car manufacturers and some brave startups work on connected automotive solutions. And if this world's BMWs and Fords do not soon present the next generation of Internet connected cars, other well-known giants will: Google, Microsoft and Apple all have connected car platforms announced.

### *7) Connected Health (Digital health/Telehealth/Telemedicine)*

Connected health is still the sleeping giant of applications in the Internet of Things. The concept of a connected health care system and intelligent medical devices has enormous potential (see our market segment analysis), not only for companies, but also for people's well - being in general. Connected health, however, has not yet reached the masses. Prominent cases of use and major start - up successes remain to be seen.

### *8) Smart retail*

Proximity-based advertising begins to take off as a subset of intelligent retail. But the ranking of popularity shows that it's still a niche. One LinkedIn post a month is nothing like 430 for an intelligent home.

### *9) Smart supply chain*

Supply chains have already become more intelligent for some years. Solutions to track goods while on the road or to exchange inventory information with suppliers have been on the market for years. So while it is perfectly logical that the subject gets a new push with the Internet of Things, its popularity seems to be limited.

### *10) Smart farming*

Intelligent agriculture is a frequently overlooked business case Things Internet because it does not really fit into the categories of health, mobility or industry. However, the Internet of Things could revolutionize the way farmers work because of the remote monitoring operations

and the large number of livestock that could be monitored. This idea has not yet reached wide - ranging attention. However, one of the applications for the Internet of Things should not be underestimated. Intelligent farming will become an important field of application in exporting countries with predominantly agricultural products.

## CONCLUSION:

The Internet of things is another innovation that offers a variety of applications to interface things and people with things online. Each object on Earth is distinguished, related to each other autonomously through internet selection. All correspondence systems and advances are used to build the online concept of things such advances are versatile computing, RFID, remote sensor arrangements and plant frameworks, but varying calculations and procedures to induce managers' firms, swinging off information and security problems. IoT needs institutionalized style methodology, conventions, ID plans and frequencies can occur in parallels, each of which is intended for specific and express use. Several shrewd applications seem to be real in our life online.

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# A Study Of Role Of FOG Computing In IoTs

Mr. Patki U.S.
Department of Computer Science
Science College
Nanded (MS) India

Dr. Kurhe A.B.
Department of Computer Science
SGBS College
Purna(Jn) Dist Parbhani

Dr. Satonkar S.S.
Department of Computer Science
ACS College
Gangakhed Dist Parbhani

*Abstract*— IOTs in an emerging branch of Information technology that includes transfer of data over a network through the different objects without requiring human to human or human to computer interaction. It was evolved from the concept of Machine to machine communication which is commonly known as M2M. This M2M communication uses clouds for transferring data. But due to the rapid data transfer in the cloud for IOT devices, the density of cloud will be increased that leads to increase in bandwidth and decrease in the processing speed. This problem was solved by a new concept known as "fog computing" or "fogging". Fog computing acts as a intermediate layer between the cloud and the hardware. This paper studies the role of Fog computing in IOTs.

Keywords— IOTs, M2M, fog computing, cloud, fogging.

## I. INTRODUCTION

Internet of Things is a concept based on the capability of various devices connected in the network to sense and collect the data from the surroundings and distribute them across the internet. This data might be further utilized for further purposes as per the user's interest. The basic concept of IoTs is to generate and share the information among machine to machine through

cloud computing without intervention of human beings. [2] The main intention of IoTs was to minimize the human interaction for data collection and data entry. It was achieved by using different types of sensors in the machines that has capability to collect the data from surrounding environment and transmit it over the network. Hence this is also referred as M2M communication. The basic idea of IoT is shown in the figure bellow.

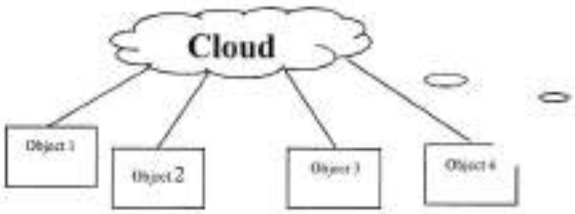


**Fig1. Internet of Things(IoTs)**

When IoTs and Cloud computing is combined together, it is also known as Cloud of things.

It is very clear that the IoT applications generate massive amounts of data from sensors and other devices. There for to distribution this huge amount of data over a cloud causes many problems such as bandwidth speed of computation etc. Hence there was a need intermediately computations of the data generated by different devices in IoTs, pre-process it and then distribute it over a network. Here comes the role of Fog computing.

Fog computing which is also referred as "fogging", is a distributed infrastructure in which different preprocessing and computation are performed at the edge of the network by smart devices. These devices have capability of data processing, data analysis, data storage capability before distributing the data over a cloud. Thus the purpose of fog computing in the IoT is to improve efficiency, performance and decrease the amount of data transferred to the cloud for processing, analysis and storage. The fig bellow shows an idea of fog computing.

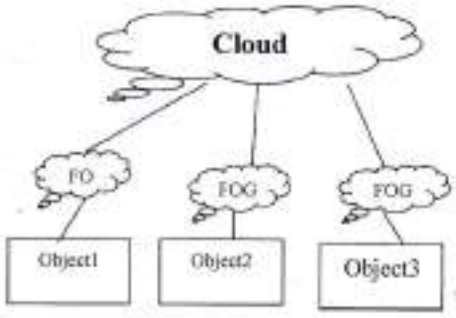


**Fig.2 Fog Computing**

## II. IoTS AND FOG COMPUTING

[3] The general architecture of IoT system consists of five different layers. These layers are

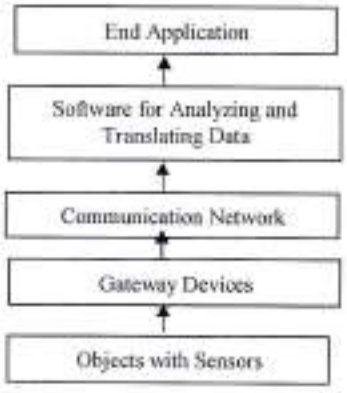


**Fig3. Layered Architecture of IoT**

i) **Sensors or controllers:** Sensors or controllers are the intelligent devices that are built-in the different objects that are connected to IoTs. These objects are termed as "Things". Sensors are the devices that

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capture the data from the objects. The captured information is given to the upper layer called Gatway Devices.

ii) **Gateway devices:** An IoT device passes the data generated by sensors to an IoT gateway or other edge device where data is either sent to the cloud for analysis.

iii) **Communication Network:** It consists of Communication channel used for data transmission.

iv) **Data analyzing and translation software:** This is cloud computing layer where different computations on data are performed. It includes data analysis, data abstraction etc. Many times this is also termed as "Edge Computing".

v) **End application service:** Finally this analyzed data is handover to the end application for further usage.

In the era of Information technology, millions of devices are becoming intelligent and have capability of transmitting information over a network. Thus in IoTs millions of Objects are connected over a network and transmitting information. This leads to information Flooding.

It will cause number of problems such as bandwidth, speed of transmission, data computations etc. Hence the data should be analyzed and summarized before it is transmitted over a network. It leads to perform computations at the edge of a network. This concept is referred as Fog Computing or fogging. Fog computing increase the flow of the data and processing speed. It also results into low-cost installation and integration for complex data processing and deployment.

The fig bellow elaborates the position of Fog in IoTs architecture.

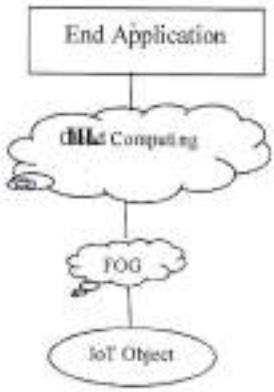


**Fig. 4 Position of Fog in IoT**

[4] The concept of fog computing is to bring networking resources near the objects that are generating the data. Fog computing term is many times used for an alternative to cloud computing that puts some kinds of transactions and resources at the edge of a network, instead of establishing channels for cloud storage and utilization. In fog computing data is stored temporary basic for intermediate computations. It is permanently stored in cloud storage. Hence once the data is transmitted to cloud storage it is removed from fog storage. As shown in the fig above Fog resources are placed between the information generating objects and the cloud layer. Fog computing can be implemented in three different steps. First by adding process and memory resources to Edge devices. Then Pre-processing collected data at the Edge and finally sending aggregated results to the cloud.

### III Role of Fog Computing in IoTs

Fog computing provides an efficient way to overcome shortcomings found in cloud computing and IoTs. Fog computing acts as a middle layer between "Things" and "cloud".

Fog computing filters the data by prior computations before it is send to the cloud. Hence it will improve the performance of IoTs. Fog computing uses much less bandwidth as less that transmission is carried out. It implements real time computations as the data analysis is performed as soon as it is generated by IoTs. As Fog computing sends only summary data to the cloud, data becomes more secure. Fog computing helps create low-latency network connections between devices and their analytics endpoints.

The different examples of fog computing is healthcare systems, vehicle automation, smart cities services such as public safety, sanitation, traffic congestion, high-energy utilization and municipal services.

In smart home there are different devices that use IoTs and sensors. These devices work on different platforms and hence produce heterogeneous data. It is very difficult to integrate this data together for processing. Fog computing efficiently resolves this issue. Fog computing provides a combined interface to integrate all different independent devices that improves the performance of the IoT system.

### IV Conclusion

An integration of Fog computing with cloud computing and IoTs make a revolution in human life. The goal of fog computing is to improve efficiency and reduce the amount of data transported to the cloud for processing, analysis and storage. It acts as a middle layer between IoT devices and cloud computing environment. It has capability of computing heterogeneous data analyze it and send it to cloud network.

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