

BIG DATA ANALYTICS THROUGH CROWDSOURCING

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Abstract: Big Data Analytics (BDA) is one of the most envisage fields in the present era after cloud computing. Big business houses and internet giants are busy to explore the benefits of BDA and have implemented the concept terrifically in the last decade to bring a great revolution in the field of data search, online retailing, digital marketing, web mining, social networking, community site growth and much more. With the advent of Crowdsourcing concept, the researchers of BDA field have started searching further new aspects in the form of Crowdsourcing to know how it can be helpful to boost up the concept of BDA in efficient, economical and scalable manner. To answer this, we have explored the concept of Big Data and their analytics, their myriad applications, the concept of Crowdsourcing, the manner in which Crowdsourcing can benefit BDA and the applications related to Crowdsourcing Big Data (CBD) through this article.

Keywords: Big Data, Big Data Analytics (BDA), Crowdsourcing, Crowdsourcing Big Data (CBD) and Data Science

I. INTRODUCTION

With the mushrooming of social media sites and rapid development of digital computing devices and the mighty Internet access, a huge amount of data belonging to the public domain is generally generated and processed on daily basis today. This massive amount of data, rightly termed as “Big Data” is analyzed through efficient techniques and algorithms under the field of “Big Data Analytics” to provide comprehensive real-time information pertaining to rising trends so that early measures can be developed to meet the challenges and demands of today. Moreover, the careful mining of “Big Data” and their analytics have worked wonderfully so far to reveal myriad helpful indicators belonging to public and socioeconomic events, which can contribute to the establishment of productive public policies [1].

Big Data Analytics (BDA) field has experienced a lot of striking developments that have enabled one to process, store, and analyze Big Data effectively. Besides the Big Data computing capability (in terms of processing and storing Big Data in a distributed fashion on a cluster of computers [2]), the rapid advancement made through intelligent data analytics techniques—drawn from the emerging areas of artificial intelligence (AI) and machine learning (ML)—provide data scientists an ability to process massive amounts of diverse unstructured data. As it is a

known fact that whatever data the Internet generates today are generally in an unstructured form which is difficult to exploit so as for obtaining any meaningful information. BDA has made it possible to work on unstructured data to extract valuable actionable knowledge. This provides a great opportunity to researchers for using this data for developing useful knowledge and insights [3].

BDA examines huge size data to unearth hidden patterns, finding out correlations and other details. It is possible with today’s technology to analyze one’s data and obtain answers from them quickly. However, such effort with traditional business intelligence techniques might be slower and so less efficient. Henceforth, the emerging concept of Crowdsourcing is the best alternative to such data analytics techniques as Crowd-sourcing play a crucial role in boosting the motivation to involve many minds to contribute to the development, analysis and exploring the insights of the Big Data. This article is an effort to put light on the concept of Crowd-sourcing – a new and the most promising methodology to explore Big Data in recent times, and how it can be worked upon to make it beneficial to contribute to BDA at the most.

Section 2 of this article discusses a short review on the concept of Big Data and its analytics while section 3 covers the applications of Big Data Analytics. Section 4.unfolds the emerging concept of crowdsourcing while section 5

discusses how crowdsourcing can be related to Big Data Analytics. Section 6 of this article puts light on the applications of Crowdsourcing Big Data. Finally, we conclude the article with Section 7.

II. BIG DATA AND ITS ANALYTICS

The concept of Big Data is not new and it has been under constant usage and research for many years, but its need and importance are understood by most of the organizations in recent years. They try to collect all kinds of data that are streamed into the world of their businesses so that such data can be put under analytics so that they can derive significant information from them through myriad algorithms of data science. This can be considered quite crucial to boosting their businesses if the right analytics could be made available on right time. And this could be considered as the real motivation behind the development of so-called "Big Data Analytics". Amazingly, the craze for Big data go past to 1950s [4] where the efforts had already begun to work upon the exploration of Big Data but the success of BDA have been experienced by business houses in the recent years only.

Big data can be defined as the huge data sets that can be considered as so large or complex which can't be dealt with traditional data processing mechanism or any such application software. The big challenges that come in the path of dealing with big data involve the issues related to their acquisition, storage & analysis, followed by their curation, search, transfer, sharing, visualization, update, querying and most importantly the privacy of information related to them. The "Big Data" can be most often referred to the usage of user behavior analytics, along with predictive analytics, followed by many advanced methods of data analytics that could be helpful to find value from data, rather than looking up and worrying about a specific size of data set.

However, the term of Big Data is considered to be coined by John Mashey in around 1990s [5]. The actual model to understand and analyze Big Data came later when in the research report of Douglas Laney, published in 2001 [6] by META Group (most famously known as Gartner in recent times) defined the concept of big data as three-dimensional - increasing volume (that describes big data as "amount of data"), velocity (that describes big data as "speed of data in and out"), and variety (that describes big data as "range of data types and sources"). Since then, besides Gartner, the entire data science industry uses this "3Vs" model for describing and understanding the concept of Big Data [7].

III. APPLICATIONS OF BIG DATA ANALYTICS

BDA is a most promising field of research that has lots of applications and benefits to its credit. Some of the most distinguished applications of BDA include the following [14]:

A. Internet Surfing

Internet surfing or if we say internet search, only one thing comes to mind – Google, even though there are a large number of search engines on the Internet to be looking out for – some of them include Baidu, Ask, Yahoo, AOL etc. All these search engines exploit myriad algorithms related to Big Data under data science field to provide efficient searching of data content present on the Internet. For instance, it has been learnt that Google do the processing of around 21 petabytes of data each day that is clear application of BDA.

B. Digital Based Advertisements

In the recent years, the people around the world who use the Internet have experienced a great boom in the field of digital marketing that made online. This marketing strategy involves tracking of all links from a given website that are most frequently visited by the users to derive the "likeness" for such sites by them so that competitive business houses can do the marketing after considering the "likeness" of the users online. We can understand why these ads obtain higher and higher CTR these days as compared to the advertisements made through traditional methods.

C. Image Processing

You can search for an image on Google just by loading a related image on Google's search by image. The web giants like Google and Facebook have conceptualized the image recognition technique of BDA fabulously. Facebook provides suggestions to tag one's friend once one has uploaded one's image on Facebook. In recent times, WhatsApp has provided the feature of the barcode scanner in mobile phones.

D. System Recommenders

One can experience the suggestions obtained for similar products on online retailing sites like Flipkart, Ali Baba, Amazon, Snapdeal etc. that help one to buy products as per one's choice. These online retailing giants use system recommender to help themselves to get their product promoted as per buyer's interest and the related information obtained by buyers search online. Moreover, this concept is also used by other internet giants including Google, LinkedIn, Netflix, Twitter and much more. One can understand how such technique contributes to BDA.

E. Speech Recognition

Speech recognition feature on search engines encourages BDA in an innovative way by providing users an option to search for their requested data online through speech recognition feature added to a search engine as an alternative to writing text to search for data. Some of the famous examples of speech recognition systems are Google Voice, Cortana, Siri, etc.

F. Fraud and Risk Detection

Before the arrival of BDA concept, the financial institution like bank used to suffer from bad debts due and losses due to the mismanaged data resulted from huge paperwork involved during sanctioning of loans. But, with BDA, such institutions make use of DCC (Divide, Conquer, Combine) approach over Big Data maintained online through customer profiling, previous expenditures, and many other essential data to obtain the information that helps to predict the chances of fraud, risk or default happening.

G. Development of logistics

BDA also finds application in the development of logistics. This can be attributed to the companies involved in the development of logistics such as FedEx, DHL, UPS who exploited the algorithms of BDA to discover best routes for doing shipping delivery in an efficient manner.

H. Gaming Applications

BDA find an important application in the development of interactive gaming platforms including EA Sports, Sony, Zynga, Activation Blizzard and Nintendo. These gaming platforms make use of BDA algorithms to analyze the performance of a player in a game in interactive mode, determining the player's online moves and tracking the locations in the game to find out the best possible way to score well by the player.

I. Benefitting Aviation Industry

BDA plays a crucial role in reviving aviation industry from great losses in the recent past. Earlier the industry was facing heavy losses due to the inability of aviation companies to resist their operating profits and occupancy ratio. One of the main reasons for this peculiar issue is ever rising fuel prices across the globe. All this has led the aviation industry to find out the best possible solutions through BDA to deal with this situation. BDA help the companies to make decisions to buy best class of planes that could earn profits for the companies, predicting flight delay, carrying out customer loyalty programmes through the knowledge of users' mood by analyzing data obtained through surveys and questionnaires conducted online as well as offline.

Alaska airlines and southwest airlines are the ones that have used Big Data Analytics to strategize profit earning operations through the information that are harnessed through BDA.

J. Online Data Comparison

There are websites on the Internet that are fully devoted to doing comparison of data in the form of product prices of the various companies, a performance comparison of the various service sector, IT sector, hospitality sector, retail sector etc. These websites collect a huge amount of data in the form of Big Data and do their analytics for making reliable data comparisons. Some of the examples of

websites involved in the activity of data comparison include Jungle, MagicBricks, PriceGrabber, DealTime, PriceRunner, etc.

K. Development of Self-Driving Cars and Robots

These are considered as the mega projects of Internet giants like Google and Facebook that have made huge investments for their development. Both the projects totally rely on BDA to work in an intelligent manner, somewhat similar to human intelligence. Since human has learning capability that is a dynamic process, self-driving cars, and robots, thus, have their stake in the BDA to develop, not exactly, but similar learning capability in the form of machine learning to get the best results out of them.

IV. EMERGING CONCEPT OF CROWDSOURCING



Fig 4.1: Crowdsourcing: “Many minds are always better than a single one to solve a big problem”

Crowdsourcing is an emerging concept in the field of data mining process where some sort of sourcing model is designed so as to obtain the contributions from individuals and organizations over the Internet to gather new ideas and data revolving around that model in the form of Big Data. This technique of Big Data development helps to achieve data analytics in much promising manner. This is in accordance of a very famous proverb – “many minds are always better than a single one to solve a big problem”. However, this process may involve ambiguous and contradictory ideas from the participants. It is the task of the researchers and data scientists to develop best possible tools or strategies to deal with such ambiguity or vagueness that arise during the process of crowdsourcing.



Fig 4.2: Concept of crowdsourcing

The coining of the term crowdsourcing dates back to 2005 when it was introduced to the world as a “portmanteau of crowd” or “outsourcing” [7]. The idea behind crowdsourcing is to distribute work among participants to obtain a cumulative result. One can easily distinguish

crowdsourcing from outsourcing in the way that whatever tasks performed here are all obtained from a public domain of unspecified size rather than worked upon by a specific, named group. Crowdsourcing works either in top-down or bottom-up manner or the mixture of the two [8]. Crowdsourcing has a lot of benefits to offer as such that it is an economical and quick way to gather data in qualitative, scalable, flexible and diverse manner [9].

V. HOW CAN CROWDSOURCING BE RELATED WITH BDA

This is a huge complementary for a crowdsourcing concept that has quite promising potential to leverage the needs for Big Data Analytics. This can be understood from the fact that the fundamental activities of BDA including the tasks of Tagging and further the organization of all myriad kinds of Big Data - be it structured, unstructured or semi-structured, they demand huge effort that can be achievable in an efficient manner only if the power of crowd is utilized with respect to BDA [11].



Fig 4.3: Big Data vs. Crowdsourcing

Big Data can be worked upon in three simple steps covering all three aspects of utilizing Big Data as a whole value chain. These are [15]:

A. Moderation of Big Data which implies organization of unstructured data or the process of tagging necessary contents related to semi-structured or structured data.

B. Development of infrastructure in the form of powerful data centers to hold data while ensuring high data security

C. Deriving meaning value or information from Big Data that makes some sense by using powerful data science algorithms.

Out of these three aspects, the first aspect poses a major limitation due to ever increasing unstructured data at quite unprecedented speed. And for this reason, crowdsourcing is required to leverage BDA. Through crowdsourcing, Big Data can be disintegrated into mini chunks that could be organized later by exploiting the power of the crowd. This way of utilizing crowdsourcing to boost up the process of BDA places BDA related companies at that level where they can easily focus on the key aspects of infrastructure and data related security while making sense of the collected data rather than investing hugely in just data organization.

Benefits of Big Data Analytics through Crowd-sourcing

A. *A lots of time is saved through crowdsourcing Big Data:* Crowd-sourcing has its greatest power lies in its being distributed in nature which allows the processing of data at unprecedented speeds where a large crowd is

responsible for handling one’s projects so as to deliver fine results in efficient manner that could never be achieved in any other way at present.

B. *A lot of internal resources is saved through crowdsourcing big data:* Any Big Data project demands huge and costly workforce at the site. Moreover, the channelization of the work of such staff is really a cumbersome task. In contrast to this, crowdsourcing allows the companies to involve crowd in one’s project to come with new and innovative ideas, sometimes even the involvement of unwelcomed strategist and skilled individuals from crowd is observed in the project that helps the companies to get their Big Data related project to be done in effective and fantabulous manner.

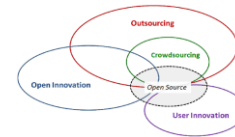


Fig 4.4: Understanding the effectiveness of crowdsourcing in BDA

C. *Crowdsourcing Big Data is helpful to meet demands of the data industry at an equal pace with your growth in the industry:* Data always grows as one’s business grows and the major challenge that posed by growing data is their organization and usage in a meaningful manner. It demands a skilled and efficient workforce that work with growing data to achieve their better organization so as to improve their search functionality, their content moderation, catalog cleansing and personalizing marketing campaigns. So, crowdsourcing lets one’s big data related projects to come across such crowdworkers who may be best at their work that help to deal with Big Data in an effective manner no matter at what speed data grows with the business.

D. *Achieving real-time analytics through Crowdsourcing Big Data:* It is easy to understand that a customer served by any business always wants the things to happen on time. It demands a complete understanding and right motivation between a company and its workforce which sometimes become a complex task to be handled and managed. Through crowdsourcing, the techniques of sentiment analysis, categorization, content moderation and other data science techniques along with qualitative analysis make the task of everything happen in real time. That is the beauty of crowdsourcing concept.



Fig 4.5: Real-time analytics through Crowdsourcing Big Data

Further, the online conduct of business always poses great challenges like doing marketing of the business, convincing customers for the products, efficient delivery of the products etc. All this require hefty spending and a good investment. Crowdsourcing do the philosophy of smart investment of crowd’s ideas and effort that help to gather important information related to customer likeness or their pleasures that can be suitably targeted through right suggestion offered by the company including product’s dos and don’ts on the behalf of customers and suitable price comparison to achieve wonders in the business.

E. Active involvement of crowd to achieve wonders through Crowd-sourcing Big Data: The involvement of many minds in a task can do wonders if they are capitalized in a suitable manner. Crowdsourcing help to do the same which lets crowd explore deep insights into the problem to search for valid information and suggestion. In this regard, the social media platforms and community sites play an appreciable role that involves helpful suggestions, useful feedbacks and suitable comments and reviews. All these help to obtain accurate, insightful and real-time results that can be expected from a machine.

VI. APPLICATIONS OF CROWDSOURCING BIG DATA

Crowdsourcing Big Data (CBD) has myriad applications and benefits that can be analyzed in a wider scope to understand the need of Crowdsourcing to boost BDA. These applications include [16]:

A. In determining election trends

In the recent times, a lot of craze have aroused for elections trends among masses across the globe due to arrival of opinion poll and exit poll where psephologists throw their entire analytical ability and their ground work experience to predict which party would do wonders or which wouldn’t in an election held at any geopolitical area of the world. They use the technique of CBD to analyze the situation and political parties’ ground work through feedback, comments, reviews, suggestions posted by people online from their constituencies. This not only helps psephologists to predict party’s fate in the election but this help political parties too to build their election manifestos to catch the attention of the people to draw their valuable votes to them to win the election. The latest examples include Donald Trump’s win in the US Elections and rise of Narendra Modi and BJP in the Indian democracy.

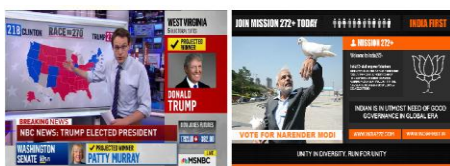


Fig 5.1: Crowdsourcing played a crucial role in the election wins of Donald Trump and Narendra Modi

B. In solving public issues

In recent times, many parts of the world experienced a situation where the demography belonging to such parts had reported about the water, food and other civic related issues prevailing in their areas through public portal to draw the attention of the government and other civic authorities in the wake of solving their problems. The government and civic bodies, under massive public pressure, had to come forward to sort out their problems. For instance, the water related problem faced by the people of Hyderabad was raised through a crowdsourcing site where innumerable suggestions and crowd support poured into the portal. As a result, the government of Hyderabad had come into a proactive mode to sort out the issue of the Hyderabadis.

C. In Journalism

CBD helps journalists to crowdsource information to make the task of journalism quite efficient and effective. It helps the journalists to prepare quick and quality articles covering necessary details covered from crowds from different genres. A lot of instances had been experienced in recent past where the relation between crowdsourcing and journalism became quite apparent and clear. For example, the Guardian, a British newspaper was involved in the crowdsourcing activity to motivate people to examine millions of documents in related to it 2009[10] to derive considerable information from them to prepare content for its newspaper.

D. In matrimonial

A large number of matrimonial sites are mushrooming these days that clearly use the concept of CBS to make the match of a bride with a groom online. Such websites add on an average 10,000 subscribers on a daily basis which is a clear indicator of how crowdsourcing has become favorites in doing perfect matching of life-partners. Matrimony.com is such a famous website.

E. In Business

We discussed earlier how the concept of crowdsourcing is used by online retailers to purchase their products online after drawing the attention of masses to their websites [12]. Through publicity by mouth about the product do wonders for the companies and thus add the significance of crowdsourcing in today’s scenario.

F. In Education

Crowdsourcing has helped to build community sites related to education where notes, queries, suggestions, comments related to a particular concept is shared online that helps to carry out education and research task in a wonderful manner [13]. The famous example of one such website is GeeksforGeek that contributes significantly in the field of computer science education, especially the students of higher education to get frequent notes, questions, answers, comments, suggestions, etc. online.

G. Miscellaneous Applications



Fig 5.2: Crowdsourcing made the song “Why this Kolaveri Di” a household song in 2011.

Crowdsourcing also finds applications in the field of ornithology to do the census of birds of particular species. For instance, National Audubon Society had organized a crowd-sourcing project to do a census of “Christmas day bird” on 25 December 1990 which later got success to find 90 species of the bird with the help of just 27 different contributors online. In linguistics, crowdsourcing helps to add new and trending words to human vocabulary. For instance, the word Kolaveri found a place in Oxford Dictionary in 2012 [17] after a huge popularity for the song “Why this Kolaveri Di”. In genealogy research, crowdsourcing is not new and the techniques related to it were used long before the arrival of personal computers. For instance, the Church of Jesus Christ used the concept of crowdsourcing in 1942 to encourage its members to submit details about their ancestors so as to obtain a single collection.

VII. CONCLUSION

Big Data Analytics (BDA) is one of the phenomenal in the field of data science that is basically concerned with the examination of huge and varied data sets in order to derive useful information like hidden patterns and unknown correlations that can be utilized to carry out myriad tasks related to business and research in any particular field. The concept of BDA is quite prominent among big organizations and business houses today. The task of Big Data exploration and their analytics is quite challenging due to the huge size and unstructured pattern of Big Data. We have various tools and techniques to harness Big Data today that usually exploit one or other algorithm of data science. Some algorithms are quite complex and difficult to be implemented. So, the need of the hour is to search for some efficient and effective techniques to do Big Data analytics. Crowdsourcing is one of the most promising approaches in this regard.

Crowdsourcing use the idea of bringing the power of crowd on an online portal to gather their help, ideas, views, comments, suggestions, feedback for some cause which can be later organized to obtain useful results from Big Data. The major benefit of crowdsourcing is that it is quite efficient, economical and scalable approach to derive a hidden pattern, uncover correlations and other useful information from Big Data.

In this article, we have tried to explain the concept of Big Data and its analytics, application of Big Data Analytics (BDA), crowdsourcing and its significance with relation to BDA and finally we analyzed myriad applications of crowdsourcing Big Data. So, we can say that crowdsourcing is a quite beneficial concept and the matter of further research that can contribute a huge to BDA. Moreover, the readers of this article can make further reading and research in the associated field of crowdsourcing like crowdvoting, crowdsolving, crowdsearching, crowdfunding, mobile crowdsourcing, healthcare crowdsourcing, crowdsourcers and much more.

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