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Big Data Management, Data Science and Data Analytics: What is it and Where— An Educational in Indian Perspective

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Abstract*—Large object normally treated as 'Big'. It is a fact that Data is the raw information and content. Technology is rapidly changing emerging and today social media is very much popular and broken all the geographical boundaries. Big data is a concept and procedure which is deals with the data sets which are so large and in which traditional data processing become tough and eventually applications are inadequate. Analysis, capture, sharing, storage, visualization, querying, information etc in general data management principles become important challenge. Hence data sets having complexity and huge sizes suffer in adequacy. Business Intelligence is a related branch and accountable for the descriptive statistics with soaring information compactness to measure things, identify trends and so on. Data science approaches is deals with the quantitative analysis of data by using methods of statistical learning. It is an approach and combines classical statistical methods including progress in computational systems along with machine learning. This is a theoretical paper depicted current trends and issues of data science and big data. Moreover paper is also describes the potential and available programs in the field. Paper is also proposed and possible programs in the field.

***Keywords*— Data Science, Big Data Analytics, Degree Programs, Emerging Courses, Programs, Universities, ICT Education, Higher Education**

I. INTRODUCTION

Data Science and Big Data Management is care about the analytical methods with hands-on applications using example datasets. Data Science is useful in gaining of experience with confidence of using the methods etc. Data preparation, processing with structured databases, key-value formatted data. Moreover it is also deals with unstructured textual data valuable in Data Science practicum [01], [06]. Big Data Management educated normally considered with sound understanding data science as well as the skills of analyze and interpreting data. Use and utilization of a number of methods and solid foundation are necessary for higher or more specialized study.

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In recent past few universities around the world are offering program on the field.

In the global IT market UK is important nation that offers various Data Science programs which include—

- Data Science and Technology.
- Big Data and Intelligence.
- Big Data Management.
- DBMS with Analytics.
- Data Management and Analytics.
- Business Data Analytics and so on.

II. OBJECTIVES WITH AGENDAS

With the following core aim and agendas this research was proposed and undertaken (but not limited to)—

- To learn the Data Science including basic principles and features of Big Data Management, Data Science.
- To dig out the core advantages and function of the Data Science along with similar systems in contemporary context.
- To learn about the emerging utilization of Data Science in different settings viz. corporate houses, industrial and sectors.
- To draw a picture on Indian higher education systems along with research function in the academia in recent time.
- To learn the changing scenario of Data Science programs (including education and training) with possible and potential academic initiatives in the universities in the U.K.
- To find out the core challenges as well as issues related to Data Science programs especially in India.

III. METHODOLOGIES

This is a paper and responsible to learn about the latest on Data Science perspective. Theoretical research methodologies have been adopted in writing of this paper. Secondary data play a vital role for analyzing basics data science. Simple search strategies have been used to find out the latest on Data Science. Here the keywords of MSc- Data Science have been used and analyzed 10 pages to learn the latest programs on Big Data Management or Data Science. Current research journals in the field of Health Informatics, Health Data Science, Big Data, and Computing etc have been consulted to get latest knowledge.

IV. BIG DATA MANAGEMENT

Data Management and Data Science is deals with the collection, selection, processing and Management of data and content. It is a fact that complex data processing are the key issues and challenges of the current time. Analysis, data-curation, sharing, storage, transfer etc are purely depends on analytical tools. Thus Data Science is also known as Big Data Management. Business Intelligence is another domain which is for the descriptive statistics with high information density to measure things etc [02], [03], [06]. According to the McKinsey Global Institute, 'Big Data' predicted giant monetary importance and that may reach up to EUR250bn per year; sector wise. In the ambit of Cross-research council among the initiatives few important are 'Digital Economy' or 'Connected Digital Economy Catapult', etc are few programs and agenda that have solid interaction with Data Science. Sustainable Development and growth outcomes are deemed as major for development of every kind and in this regard Data Science plays a vital role. McKinsey Global Institute also expressed that '*Data Science is suffering with big data tools and technology*'. Data Science is applicable in almost all kind of industries, organizations, and universities [03], [15].

V. DATA SCIENCE AND ANALYTICS

'Big' is the Data or the raw information. In the last decade technology has been changed rapidly specially the social media. We just need to click for numerous information*and* Data Science has a great role. With Data Science applications, data sets which are large enough or complex and sought after for the traditional data processing. Data Science is also considered as Business Analytics and it is required in almost all the organizations and sectors which deals the information or depends on Information. The huge created data on Healthcare, Banking and Finance, Information Foundations, Corporate sectors play an important role in this regard. Data Science professionals have huge demand in recent past and many universities around the World offering programs related with Big Data and Data Sciences. However, in this regard European Universities have valuable and imperative role [04], [07], [08]. It is an important fact among the areas of Computing and Information Technology Big Data or Data Science fall under the emerging areas (refer Fig: 1 for more details).

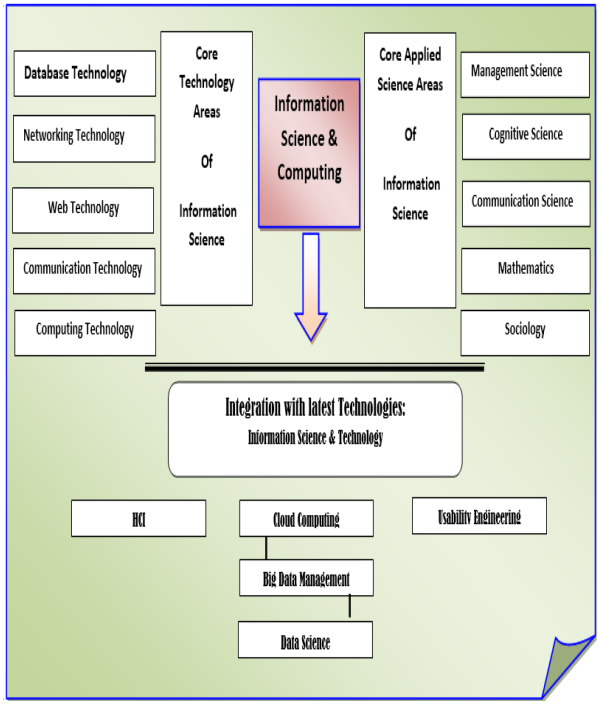

Fig: 1- The emergence of Cloud Computing and Big Data in the field of Computing and Informatics

VI. EDUCATIONAL ATTENTION IN BDM: A STUDY

The world changing and in many universities and higher educational institutes several interdisciplinary programs are being listed. The UK and US based universities are offering several Data Science and Big Data Management related programs. The search strategy adopted in this study depicted that European Universities are the pioneer in this field [05], [06], [11]. As Big Data Management and Data Science program is interdisciplinary in nature thus combines with the Information Management, Management Science, and Statistical and Data Science program. Hence most of the universities adopted different criteria to get into its admission. Here Table: 1 is depicted few important aspects in this regard.

Table: 1 Some programs in Data Science as per the research and search strategy adopted

Programs	University	Duration	Incoming Branches
MSc-Data Science	Sheffield University	1 Year to 2 Year	Any Bachelor Degree
MSc-Data Science	City University, London	1 Year to 28 Months	Bachelor with Computing/Pure Science/ Health/ Psychology/ Engineering/Economics/ Business etc
MSc-Data Science	Goldsmith University of London	1 Year to 2 Year	Bachelor with Computing/Pure Science/ Finance / Engineering/Economics/ Business etc

MSc-Data Science	Lancaster University, UK	1 Year to 2 Year	Bachelor with Computing/ Statistics/ Mathematics/Environment
MSc-Data Science	University of Glasgow	1 Year to 2 Year	Bachelor with Computing or related subjects.
MSc-Data Science	Kings College, London	1 Year to 2 Year	Bachelor with Computing/Pure Science/ Mathematical Science/ GIS/ Engineering/Economics/ Business etc
MSc-Data Science	University of Southampton	1 Year	Bachelor with Computing/Pure Science/ Mathematical Science/ Engineering
MSc-Business Analytics	Imperical College, London	1 Year to 2 Year	Bachelor with Computing/Pure Science/ Mathematical Science/ Engineering/Economics/ Business etc
MSc-Data Science	University College, London	1 Year to 2 Year	Bachelor with Computing/Pure Science/ Mathematical Science/ Engineering/Statistics/ Quantitative Science etc
MSc-Data Science & Analytics	Brunel University, London	1 Year to 2 Year or 1.5 Year with Internship	Bachelor with Computing/Pure Science/ Mathematical Science/ Engineering/Statistics/ Quantitative Science etc
MSc-Data Science	University of Essex, UK	1 Year	Bachelor with Computing/Pure Science/ Mathematical Science/ Engineering/Statistics/ Quantitative Science etc
MSc-Data Science	University of Dundee, UK	1 Year to 2 Year	Bachelor with Computing
MSc-Data Science	Edinburg Napier University, UK	1 Year to 3 Year	Bachelor with Informatics, artificial intelligence, cognitive science, computer science, electrical engineering, linguistics, mathematics, philosophy, physics or psychology
MSc-Data Science	Queen Marry University of London, UK	1 Year to 2 Year	Bachelor with Electronic Engineering, Computer Science, Mathematics or a related discipline
MSc-Data Science	Royal Holloway University of London, UK	1 Year to 2 Year	Bachelor with Computer Science, Economics, Mathematics, Physics, or other subjects that include a strong element of both mathematics and computing
MSc-Data Science	University of Warwick, UK	1 Year to 2 Year	Bachelor with Mathematical Sciences
MSc-Data Science	University of Brikbeck	2 Year	Bachelor with Computer or Strong Foundation/Experience in the Field
MSc-Data Science	University of Sussex	1 Year to 2 Year	Bachelor with Computer Science, Mathematics, Physics, Bio Sciences or other subjects that include a strong element of both mathematics and computing
MSc-Data Science	Heriot Watt University	1 Year to 2 Year	Bachelor with Computer related Subjects with Database and Programming Subject
MSc-Health Data Science	Swansea University, UK	1 Year to 3 Year	Bachelor Degree but preferences will be for the relevant subjects.

MSc- Big Data	University of Stirling, Scotland	1 Year	Bachelor Degree in relevant subjects.
MSc-Data Engineering	University of Dundee, UK	1 Year to 2 Year	Bachelor with Computer related Subjects
MSc-Big Data Science & Technology	University of Bradford, UK	1 Year	Bachelor Degree with Computer science, computer engineering, informatics or other computer-related subjects

However the development of Data Science and Big Data Management has created many other areas and specialization and among these few important are include Heath Data Science, Business Data Science, Environmental Data Science. Table 2 depicted information in this regard.

Table: 2 Some programs in Health Data Science according to the knowledge Survey

Universities	Running Programs
Swansea University	MSc Health-Data Science
The University of Manchester, London	MSc Health-Data Science
University College London, London	MSc-Data Science for Research in Health and Biomedicine
Saint Louis University, Spain	MS- Health Data Science
Harvard University, US	MSc- Health Data Science
Lancaster University, UK	MSc-Data Science (Health)

Computing and India: Emerging Programs in India: Towards more Data Science for Complete Development—

India has over 40000+ Higher Educational Institutes (HEIs) and that is treated as largest in the world. It is comprises with the colleges, universities, polytechnics research centers, etc. Engineering Colleges, Management Colleges, Architecture Colleges are also fall-under this. The controlling bodies of these institutes are UGC AICTE which are run under the MHRD etc. India is also hold ranked one in terms of producing Engineers. India has around 17 Lakhs of seats of Engineering. Computer Science and Information Technology are most available subjects and around the 4000+ Engineering Colleges offered the same. Interestingly 30000+ General Colleges offers IT and Computing related programs ranging from Computer Science, Computer Applications, Information Technology, Information Science with the degrees of BSc, MSc, BCA, MCA etc. In the Polytechnic Colleges so many other Computing related programs are also offered. MCA is another popular program under the jurisdiction of AICTE. Among the areas of Information Technology and Computing few important areas are Database, Networking, Multimedia, Communication and so on. Big Data and Data Science is also have huge potentialities in Indian academics [07], [10], [13].

It is expected that around 175 million broadband connections will be in 2017 in India and moreover that may touch about 600 million in 2020. Regarding the download speed about 2 MBPS may be increased and may touches about 100 MBPS. UK has very strong digital markets and it is at this moment is very much important in almost all the areas [06], [08], [12]. Digital content world value is about £100bn. UK's digital economy is predicted to be biggest than any European country. *McKinsey Global Institute* expressed that healthy financial input may bring in the Big Data System and this may tune of EUR250bn per. United States is also growing rapidly in Data Science implementation [07], [09], [14]. The symptom is become common in many Asian and USA countries too. There are many programs available in Data Science and Big Data Management. The program of MSc/MS- Data Science is most common. Availability of BSc/BS- Data Science or Big Data Management is too tough in this stage. Thus there are tremendous opportunities for offering programs in different segment.

In Basic Science and Applied Science Data Science may positively possible to start in Indian context. The Table: 3 herewith depicted few possible programs in this regard.

Table: 3 Possible Data Science programs in the context of Science domain/s.

Possible Bachelor Degrees	Possible Masters Degrees
BS/BSc- Data Science & Informatics Engineering BS/BSc- Informatics with Big Data Management BSc- Information Technology (Data Analytics) BSc-Computer Science (Analytics) BSc-Computer Application (Big Data Management)	MS/MSc- IT & Science MS/MSc - Information Sciences & Big data MSc- Information Technology (Big Data) MSc-Computer Science (Data Analytics & Management) MSc-Information Science (Data Analytics) MSc-Computer Application (Data Analytics)

In the Engineering and Technological stream i.e. BTech (Bachelor of Technology), BE (Bachelor of Engineering), ME/MTech degrees Data Science or Big Data Management specializations have an important role. Here Table: 4 depicted the core and emerging possible programs in this regard.

Table: 4 Health Data Science domains Vis-à-Vis possible Engineering Degrees

Possible Bachelor Degrees	Possible Masters Degrees
BTech/BE- Big Data Management and Technologies BTech/BE- Informatics & Analytics BTech/BE - Information Sciences with Big Data BTech/BE - Information Technology (Big Data) BTech/BE - Computer Engineering (Big Data)	MTech/ME- Big Data Management and Technologies MTech/ME- IT & Data Sciences MTech/ME– Data Science MTech/ME- Information Technology(Analytics & Cloud) MTech/ME-Computer Science (Data Management)

In the context of Commerce, Economics and Management there is also potentiality to offer Big Data Management or Data Science programs and few important and possible programs in this regard are (table: 5)—

Table: 5 Possible Management and allied Degrees in Data Science flavor

Possible Bachelor Degrees	Possible Masters Degrees
BBA (Analytics) BBA (Informatics with Big Data) BBM (Data Analytics and BI) B.Com (Analytics & Management)	MBA (Data Analytics & Informatics) MBA (Data Science) MBM (Informatics with Big Data) M.Com (Analytics & Management)

The MCA program is a 3 year program and mostly offered in semester approach. Bachelor Degree holders such as BCA/BSc/BCom/BA degree (*with Mathematics/ Computer Science as one of the subjects at 10+2 level or graduation*) are eligible for the program. However one can enter into the MCA Program with Lateral Entry scheme. It is treated as equivalent of the BE/BTech-Information Technology/ Computer Science and Engineering programme. Some of the proposed programs are listed in Table: 6.

Table: 6 Possible Health Data Science in Computer Application flavor

Possible Bachelor Degrees	Possible Masters Degrees
BCA (Analytics) BCA (Informatics and Big Data) BCA (Data Science)	MCA (Information Systems and Analytics) MCA (Big Data Management) MCA (Data Science & Technology) MCA (Big Data Intelligence)

There is also a potentiality to offer Big Data Management and Data Science and that include but not limited to as depicted in Table: 7.

Table: 7-Proposed Data Science, BI, Big Data program in the context of Social Science and Humanities

Possible Programs in Social Science Domain
BA/MA (Economics with Analytics Practice) BA/MA (SMAC & Analytics) BA/MA-Economics (Internet Economy) BA/MA (Internet Marketing with Big Data)

This way Data Science and Big Data Management may be implemented for higher and more specific degree programs. It is essential to start the programs based on need and demand and obviously in this regard nature of Indian academics needs to be considered.

VII. FINDINGS AND FURTHER RECOMMENDATION& RESULTS

Data Science including all other nomenclatures such as Big Data Management, Data Analytics, Business Intelligence have huge impact in wide spectrum and for its inclusive development educational input needs to be enhance [05], [16]. The following points are suggested for solid and sustainable development in this regard—

- Big Data is today not only treated as a tool these days but also a valuable domain these days in the academia and research.
- Applications of Big Data and Allied domain are increasing rapidly in almost all kinds of settings. In this regard core areas are include Government and Private industries, organizations, institutions.
- Cloud Computing, Data Science and Big Data etc are become important gradients these days in Degree and PG level in the subjects of *Computing, IT, IT Management* etc.
- In many US and European countries Big Data Programs are offered in the European Countries.
- Big Data and Data Science related programs are available in the universities as BSc, MSc program and mainly available in the UK. However few Indian Universities are offering specialization in this subject as well.
- Data Science programs are available with as a paper, module or electives in many universities in Computing and some Quantitative Subjects such as Management Science, Statistics, Mathematics, Physical Sciences, Operation Research etc.
- In India few universities are offering Big Data and Data Science program viz. UPES, Hindustan University, UST offered BTech-CSE with Specialization in Data Science & Analytics.
- Universities and research centers of many Developing countries desires proper planning, initiation and implementation for starting papers, modules etc on Big Data Science, Data Analytics.
- Proper collaboration is essential establish for healthy implementation of the Cloud and Data Science in the academia and industries.

- Organizations, Institutions, need to establish understanding with the universities for real life and complete development of the projects.

VIII. CONCLUSION

Organizations are changing rapidly and thus proper and ready manpower is required. Universities normally offers general programs however there is a potentially to offer Corporate Universities and collaborative research centers for enhancing training, academics and R&D in the areas of data science, big data and cloud computing. Developing countries such as India, Pakistan, Bangladesh, Indonesia, Brazil, South Africa etc are moving for implementing new age education systems and it is also time to gear up new age programs as well. In this regard apart from the Data Science, Big Data Management some allied programs are also essential to start for better and sustainable information infrastructure building.

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