Computing Academics into New Age Programs and Fields: Big Data Analytics & Data Sciences in Indian Academics—*An Academic Investigation of Private Universities*

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ABSTRACT

India is moving towards a developed country and thus knowledge cultivation is very much required and in this context introducing new age programs and degrees are essential. This is required for the creation of next generation skills and knowledge as per industrial and organizational demands including Government etc. Data Science is about managing the large amount and complex data, moreover, it is also known as Big Data Technologies. Due to the wider requirement in different universities and organizations, many international universities have started academic programs on Data Sciences and Big Data. However, a large number of institutes are located in India but only a few offer programs on Data Science and Allied Technologies. Importantly most these are listed in Engineering Colleges and few Private Universities. Universities in this regard adopted both full-fledged degrees and specialization methods to offer the Data Sciences and Allied Technologies. This paper is theoretical and contextual in nature, but also purely interdisciplinary in nature combines with education, information technology, and managerial science to learn about the status and future of qualified and skilled manpower. However, the paper is specially focused on private universities only with a brief overview of the technologies in international universities.

Keywords: Big Data, Data Sciences, Data Analytics, Private Universities, HEI, Indian Universities, R&D, Research, Knowledge Economy.

Introduction

Data Science is an emerging academic field which purely deals with the Big Data Management and Analytics technologies. It is about managing large and numerous data and also complex data systems. Further it deals with the intelligent systems and information affairs. It is useful and required for almost all the purposes and settings viz. Government bodies, organizations, education systems, business and commercial places, healthcare and medicine and so on [1], [6]. Hence today companies and other establishments are also adopting analytics and big data systems for transformation of raw data into required information and easiness in decision making. Professional associated with this normally bears mixed of analytic, machine learning along with data mining skills. The reason behind the enhancement and popularity of the technologies include (but not limited to)—

- Helping and ensuring industrial knowledge viz. contextual understanding for a hidden solution to the business and organizations.
- Big Data Technologies and Management Systems today is in use of fields Organizational, Social, political, economic, legal, business, marketing for efficiency.
- Managing information explosion become easy with the adoption of Big Data Technologies and Management.

Initially, Data Science and Analytics were only available and started as a skill based program or area but gradually many international universities started educational programs in the field. Moreover, developing countries in recent past also moved into the field in their academia. As far as India is concerned, many educational institutes have started the program in the field particularly in Private Universities and Deemed Universities [1], [3], [7]. However, the growth of the program and field in Private Universities are catching.

Objective and Agenda

The core aim and agenda of this paper include (but not limited to) the following—

- To learn about the basics of Computing and Information Technology related subjects in brief with available programs.
- To know about the basics of emerging fields and areas of Computing or Information Sciences.
- To learn about the Data Science and Allied Technologies in brief with special reference to its characteristics.
- To know about the emerging educational programs in respect of Data Science and Allied Technologies in international universities, in brief.

- To find out the basics of Higher Education Systems in India emphasizing Private Universities in India with brief statistics.
- To learn about the Data Science and Allied Technologies as educational programs in Indian Private Universities.

Computing & Academics: An Overview of Super Specialty Age

Computing is a very vast field nowadays. It has increased in a rapid manner due to the information explosion and need of the information in the society at large. Due to this, several information centric domains and fields have been developed. Though initially, the first branch originated as *Computer Science* which has core focus of studying, designing and development of computer systems; thus it is hardware and mathematical in nature with a partial focus on Software Technologies/ Programming [2], [4], [6]. Though another limited branch called *Computing/ Computer Systems* is rather an application centric with a focus on Software Technologies [14]. However, it is important to note that another field called *Computer Application* has been developed in India with similarities in Computing/ Computer Systems. *Computer Engineering* though similar with the Computer Science but more focused on designing and development and programming languages. In Information space, among the domains important are *Information Technology*, which is concentrated with the information and combines with the components of Networking Technology, Database Technology, Multimedia Technology, Communication Technology apart from Software Technology which is the pillar of Computing/Computer Application and partially CS/CSE. *Information Systems* is another domain similar to the Information Technology but it has a focus on business and organizational uses and components of business into the program and domain. Information Science is another branch which is concentrated on information and IT application and integration in larger space include business houses, organizations, societal places etc [3], [5], [8]. However, apart from these few important areas, many merged domains also been developed viz.

- Informatics
- Knowledge Systems and Management
- Information Science and Technology or Information Science and Computing
- Computer and Information Science or Information and Computer Science
- Information Science and Systems etc.

Big Data and Data Sciences: An Overview

Big Data is an emerging branch today and mainly deals with processes to extract knowledge of *structured or unstructured* nature. Moreover, these are offered with few data analysis and tools as well such as statistics, data mining, and predictive. Probability models, pattern recognition are also important in Big Data Systems and it is also involved also with the areas of learning, visualization, machine learning, signal processing, statistical learning, database and mining, predictive analytics and databases, and so on [5], [7], [9]. The large amount of data affairs is called Big Data and organizations and institutions at large currently adopted Data Management benefits in different spaces [12], [13]. And it has become developed as a branch of study as well. Today many international universities have started programs and degrees on Big Data and allied subjects and among the subjects few important are—

- *MSc-Data Science offered by Sheffield University, UK*
- *MSc-Data Science offered by University of Southampton, England*
- *MSc-Business Analytics offered by Imperial College, London*
- *MSc-Data Engineering offered by University of Dundee, UK*
- *MSc-Data Science offered by Edinburg Napier University, UK*
- *MSc-Data Science offered by Kings College, London*
- *MSc-Data Science offered by Goldsmith University of London, UK*
- *MSc-Big Data offered by University of Stirling, Scotland*

The ample job opportunities created the awareness about the area of Big Data and in many developed countries, various nomenclatures have been developed viz. *Data Science, Big Data and Analytics Studies* etc. Moreover UK has a well number of institutions/ programs in this regard [6], [10], [11].

Data Science and Allied Technologies in Academics: A Study in Private Universities

India is a leading higher education hub in the world with more than 40000 HEIs (Higher Educational Institutes). The body of HEIs consists of the universities, colleges, research centers, institutes of national importance etc. The Universities in India basically consist with the state universities, central universities, private universities, and deemed to be universities. Table: 1 depicted in Details on Private Universities in India.

Table: 1-Private Universities in India with distribution of Super Specialty Program in Data Sciences

Serial No.	States	No. of Universities	No. universities having Data Science & Allied programs	No. universities having Data Science & Allied programs
1	Arunachal Pradesh	7	Absent	Absent
2	Assam	5	1	2
3	Bihar	2	Absent	Absent
4	Chhattisgarh	9	Absent	Absent
5	Gujarat	30	4	5
6	Haryana	20	7	10
7	Himachal Pradesh	17	Absent	Absent
8	Jharkhand	7	Absent	Absent
9	Karnataka	14	8	15
10	Meghalaya	8	Absent	Absent
11	Mizoram	1	Absent	Absent
12	Madhya Pradesh	24	4	5
13	Maharashtra	9	4	4
14	Manipur	1	Absent	Absent
15	Nagaland	3	Absent	Absent
16	Odisha	4	1	3
17	Punjab	15	5	10
18	Rajasthan	46	4	5
19	Sikkim	5	Absent	Absent
20	Tripura	1	Absent	Absent
21	Uttar Pradesh	29	7	15
22	Uttrakhand	13	5	7
23	West Bengal	9	2	2
	Grand Total	**279**	**52**	**83**

India holds 279 Private Universities (as on October, 2017) and in almost all the states having universities in this category except few states viz. Goa, Tamilnadu, Jammu & Kashmir. Among the Indian states, Rajasthan holds first position with 46 (forty six) universities while Gujarat and Uttar Pradesh hold second and third positions with the number of universities 30 and 29 respectively. Importantly private universities are known for the specialty in various affairs viz. (but not limited to the)—

- *New educational methodologies in teaching*
- *Designing and development of new programs*
- *Interdisciplinary Programs*
- *Joint Degrees with Companies*
- *Joint Degrees with other institutions*
- *Joint and Integrated Degrees*
- *Collaboration with leading universities etc.*

Importantly in respect of new age programs also private universities are well known and getting popularity. It is a fact that Information and Computing is a large field and it has two track 'Computing' and 'Information'. As far as new age programs within Information Science and Technology few important are include—

- Cloud Computing
- Virtualization
- Information Security
- Big Data Management
- Data Analytics
- Data Science
- Cyber Security and Forensic
- IT Infrastructure Management

In the field of Big Data, there are many related and allied subjects have been started as educational programs and among these few important are Data Analytics, Business Analytics, Big Data, Big Data Management, Data Science, Data Science and Engineering etc. It is worthy to mention that among the private universities offered or started the programs the degrees are with three main categories viz. Full-fledged Degrees, Major, Specializations, Minors in the concerned or allied fields viz.

- Data Analytics
- Business Analytics
- Big Data Big Data Management
- Data Science
- Data Science and Engineering

Table: 2 depict complete details on Data Science programs offered by the private universities in India according to the study conducted.

Table: 2-Private Universities in India emphasizing Super Specialty Program in Data Sciences

Sl. No.	Private Universities with Data Science & Allied Technologies (UG & Above)	
	Universities	**Programs**
Arunachal Pradesh		
1	Absent	
Assam		
2	Assam Royal Global University	BTech-CSE(Data Analytics & Engineering) MTech-CSE (Data Analytics & Engineering)
Bihar		
Absent		
Chhattisgarh		
Absent		
Gujarat		

3	Ahmadabad University	MTech CSE (Data Science & Analytics)
4	Ganpat University	BTech- CSE (Big Data) MTech-CSE (Big Data)
5	G.L.S. University	MSc-IT (Data Analytics)
	Navrachana University	MSc-IT (Database Administration)
Haryana		
6	Amity University	BTech-(Data Science) MTech-(Data Science)
7	Ansal University	MTech-CSE (Data Analytics)
8	O.P. Jindal University	MBA (Business Analytics with IBM)
9	Jagan Nath University	BTech-CSE (Business Analytics)-IBM MBA (Business Analytics) with IBM
10	PDM University	BTech-CSE (Big Data Analytics)-IBM
11	Shree Guru Gobind Singh Tricentenary University	BTech-CSE (Data Analytic) MTech-CSE (Data Analytics)
12	The Northcap University	MTech-CSE (Data Science)
Himachal Pradesh		
Absent		
Jharkhand		
Absent		
Karnataka		
13	CMR University	BBA (Business Analytics)
14	Dayanand Sagar University	MTech- CSE (Big Data)
15	Garden City University	BBA (Business Analytics)
16	Institute of Trans-Disciplinary Health Sciences and Technology University	MSc-CS CS (Data Analytics) Integrated MSc-CS (Data Analytics)
17	JSS Science & Technology University	MTech-Data Science
18	PES University	MTech-CSE (Big Data)
19	Reva University	BS-CS (Cloud Computing & Big Data) MTech- Data Engineering & Cloud Computing
20	Srinivas University	BCA (Data Analytics & Cloud Computing) Integrated MCA (4 Year) & Trimester Based (10+2 Any)- (*With Specialization in Big Data*) 2 Year MCA (Related Degree)- *With Specialization in Big Data* MPhil (Data Analytics & Cloud Computing MPhil Business Analytics & Cloud Computing

		MPhil (Big Data & Business Analytics) MBA (Business Analytics)
Meghalaya		
Absent		
Mizoram		
Absent		
Madhya Pradesh		
21	Avantika University	BTech-CSE (Data Analytics)
22	Jagran Lakecity University	MBA (Business Analytics)
23	People's University	BTech-CSE (Business Analytics) BTech-IT (Business Analytics)
24	Shri Vaishnav Vidyapeeth Vishwavidyalaya	BTech-CSE (Data Analytics)-IBM
Maharashtra		
25	Ajeenkya D.Y. Patil University	BTech-IT (Data Science)
26	MIT Art Design & Technology University	BTech-IT (Data Analytics)
27	Sandip University	BTech-CSE (Business Analytics)
28	Vishwarkarma University	MBA (Data Analytics)
Manipur		
Absent		
Nagaland		
Absent		
Odisha		
29	Centurion University of Technology and Management	BTech-CS (Data Science)-Silicon Labs MTech-Data Science (Silicon Lab) MBA (Data Analytics)
Punjab		
30	Chandigarh University	BE (Hons) CSE (Big Data)-IBM ME (Hons) CSE (Big Data)-IBM MBA-Business Analytics-IBM
31	CT University	MBA (Business Analytics)
32	GNA University	BTech-Big Data Analytics
33	Lovely Professional University	MBA (Business Analytics)
34	Rayat Bahra University	BCA Specialization- DBMS MCA Specialization- DBMS BTech (CSE)- Database & Analytics (Oracle) MBA (Business Analytics)-Google/
Rajasthan		
35	J.K. Lakshmipat University	BTech-CSE (Big Data Analytics)
36	Manipal University	MTech-Advance Computing & Data Science-with CDAC
37	Mody University of Science and Technology	BTech-CSE (Big Data) MBA (Business Analytics)
38	NIIT University	MBA (Business Analytics (with WnS)
Sikkim		
Absent		
Tripura		

	Absent	
Uttar Pradesh		
39	Amity University	MTech-Data Science PGD in Big Data
40	Galgotias University	MBA (Business Analytics) BTech (H)-CSE (Data Analytics) BTech (H)-CSE (Business Analytics BTech (H)-CSE (Big Data)
41	Maharishi University of Information Technology	BTech-CSE (Data Analytics) BSc-IT (Analytics & Big Data) with related paper MSc-Analytics & Big Data (Related & Relevant Degree including Economics)
42	Sharda University	BTech-CSE (Business Analytics)-IBM
43	Shiv Nadar University	MSc-Data Analytics PGD in Data & Business Analytics
44	Teerthanker Mahaveer University	MBA-Business Analytics-IBM
45	The Glocal University	MBA (Business Analytics)
Uttarkhand		
46	DIT University	BTech-CSE (Big Data Analytics-IBM)
47	University of Petroleum and Energy Studies	BTech-CSE (Business Analytics-IBM) BTech-CSE (Big Data with Xebia)
48	Graphic Era Parvatiya Vishwavidyalaya	BTech-CSE (Big Data Analytics)
49	Himalayan Garhwal University	MBA-Analytics Management
50	Uttaranchal University	BBA (Business Analytics-IBM) MBA (Business Analytics-IBM)
West Bengal		
51	JIS University	MBA (Business Analytics)
52	The Neotia University	BTech-CSE (Data Analytics)-IBM

It has been studied that among 279 private universities a significant growth has been carried in respect of offering programs in the field of Data Sciences. It is observed during this knowledge mapping that 52 universities offering programs in the field leading to Bachelors and Masters Degrees. However, as far as the numbers of programs are concerned in the field it is higher than that of the number of universities.

The study reveals that Karnataka and Uttar Pradesh hold first position regarding the offer of programs in Data and Allied Sciences with 15 (fifteen) UG/PG level of study. Whereas the second position holds Punjab and Haryana states with 10 (ten) programs each.
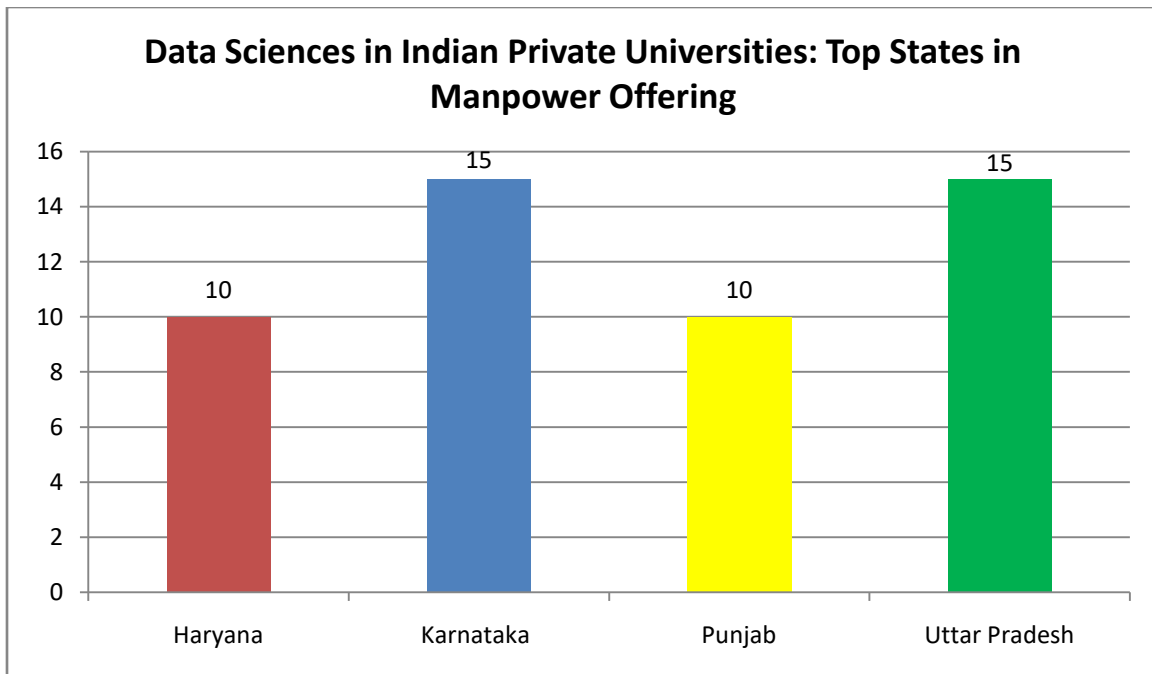
Fig:1- Top States having Private Universities in India on Super Specialty Programs in Data Sciences

It is worthy to note that among the programs on Data Science and Allied Technologies, these are offered in different track or flavor as well viz. within a program of Engineering, Science, and even in Management.

Findings

- Data related areas become subject and area nowadays and different nomenclatures are offered in different universities viz. Data Analytics, Business Analytics, Big Data, Big Data Management, Data Science, Data Science and Engineering.
- Data Science is a part of Technology and most specifically within Computing related Technology and it is also studied that in Computing related field 'Computer Application' subject is the important one. In the degrees on BCA and MCA also suitably Data Science Major may be incorporated and two universities among the private category have started this specialization (Refer Table: 3)
- As a whole, the Data related subjects and areas called as Data Sciences and the private universities as per the concerned study offering the programs within Engineering and Technology track under the specializations of Computer Science and Engineering rather. While few universities have started Management track within MBA degree (refer Table: 4).
- Among the universities, it has noticed that Srinivas University, Maharishi University of Information Technology, Rayat Bahra University, Galgotias University etc offers a large number of programs in the field.

Table: 3-Private Universities started Data Science in Computer Application Track

Sl. No.	Private Universities in India offering Data Science and Allied Technologies Programs (Computer Application Track)	
	Universities	**Programs**
1	Srinivas University	BCA (Data Analytics & Cloud Computing) Integrated MCA (4 Year) & Trimester Based (10+2 Any)- (*With Specialization in Big Data*)

		2 Year MCA (Related Degree)- *With Specialization in Big Data*
2	Rayat Bahra University	BCA Specialization- DBMS MCA Specialization- DBMS

Table: 4-Private Universities started Data Science in Management Track

Sl. No.	Private Universities in India offering Data Science and Allied Technologies Programs (Management Track)	
	Universities	**Programs**
1	Jagan Nath University	MBA (Business Analytics) with IBM
2	Garden City University	BBA (Business Analytics)
3	Srinivas University	MBA (Business Analytics)
4	Jagran Lakecity University	MBA (Business Analytics)
5	Vishwarkarma University	MBA (Data Analytics)
6	Centurion University of Technology and Management	MBA (Data Analytics)
7	Chandigarh University	MBA-Business Analytics-IBM
8	CT University	MBA (Business Analytics)
9	Lovely Professional University	MBA (Business Analytics)
10	Rayat Bahra University	MBA (Business Analytics)-Google
11	Mody University of Science and Technology	MBA (Business Analytics)
12	NIIT University	MBA (Business Analytics (with WnS)
13	Galgotias University	MBA (Business Analytics)
14	Teerthanker Mahaveer University	MBA-Business Analytics-IBM
15	The Glocal University	MBA (Business Analytics)
16	Himalayan Garhwal University	MBA-Analytics Management
17	Uttaranchal University	BBA (Business Analytics-IBM) MBA (Business Analytics-IBM)
18	JIS University	MBA (Business Analytics)

- Srinivas University, Karnataka holds first position with the highest number of programs in the field of Data Sciences and Allied Technologies. The university offers programs with BCA, MCA, Integrated MCA, and Three (3) MPhil program in the emerging field of study (Refer Table: 3).

Suggestion and Further Possibilities

- Data Science and Allied Technologies in future may be started with the degrees as the Full-fledged way such as BSc/MSc-Data Science or Big Data or Allied Areas.
- The branch may be offered in collaboration with the industries for better job opportunities.
- The branch may be offered with Technology track for the degrees of BTech/BE and MTech/ME directly and as a Major.
- It is maybe also offered with the Degrees of MTech (Research) in Data Science and Technologies for the interested persons in research in the field.
- It has observed that Full-fledged MTech in Data Sciences (Coursework based) is still limited and the program may be offered with huge coursework for the concentration of industry and scientific bodies/ organization.
- Though two universities have started program of BCA in the field but it may be offered in the MCA program for better and more opportunities.
- Similar to private universities such subjects may be offered in other universities mainly central universities, state universities; as a good number of deemed universities already taken the initiative of the programs.

Conclusion

The world is changing rapidly and higher educational systems have been changed significantly in different occasion. There are tremendous changes and developments have been undertaken in the field of Computing and Informatics. It is worthy to note that the field has increased its scope and periphery significantly. In Information space, the development noticed in the creation of newer subjects viz. Informatics, Information Systems, Information Science, Information and Communication Technology. It is moreover gained reputation in recent past by the development of more new areas and super specialty areas like Cloud Computing, Virtualization, Information Security, Big Data Management, Data Analytics, Data Science, Cyber Security and Forensic, IT Infrastructure Management, User Experience Designing, Human Computer Interaction etc. Even due to their requirement in different settings most of these are offered as full-fledged subjects. As far as educational programs are concerned private universities in India also did a wonderful job by introducing new age, job ready and skill enhanced programs in the field. In future in different level also such programs may be started due to importance as a part of academic innovations.

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