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Researches in IT and Computing—*An Overview*

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ABSTRACT

Information is the root and it is the key for development in today's context. To handle information properly many subjects have been developed and among these important is Information Technology. However apart from this few other subjects also important viz. Information and Communication Technology, Informatics, Information Science, Information Systems, etc. Due to importance and need, many subjects have been developed and their periphery and scope also rising gradually. Information Science is among these most interdisciplinary and as a result many other forms the Information Science has been developed viz. Health Information Science, Geo Information Science, etc. It is worthy to note that within Information Science IT and Computing gradients are increasing and this is creating a broader version of Information Technology. Naturally, various research areas have also been developed and these are rising gradually with support from other allied subjects. Virtually Information Science has become an important information centric technology focused field and therefore it is the need hour in almost all the sectors and areas. Information Science incorporates IT and Computing as well. Computing is also considered an important field of study and area dedicated to computer related activities and applications. Information Technology whereas worked with the Information and here different technologies played the leading role. The research and development areas therefore increasing in both Computing and Information Technology fields. This paper talks about the basics of Information Technology, Computing including its components and research areas. The paper also highlights the impact of IT and Computing in the research areas of Information Science briefly.

Keywords: Informatics, IT, Computing, Research, Information Systems, Higher Education, Interdisciplinary

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Information and its uses are rising rapidly in different sectors and areas and this is not an exception in the Computing sector. Computing, in general, is a field of study, practice in respect of Computation and is particularly useful in Computer related activities using Software and similar technologies. According to few experts Computing is doing activities using Computers and similar devices. Computing is the process of using computer technology to complete a given goal-oriented task[1],[5]. In other words, Computing normally involves the design and development of software and hardware systems including structuring, processing, managing different types of information; furthermore, this could be considered as a scientific study dedicated to making of intelligent systems, applications using different media required for the entertainment and communication. Information Technology is whereas a field of study and practice in the processing of information including collection, management, and dissemination uses proper technologies. Information Technology is close with ICT with a broader focus on different kinds of technologies viz.—

- Database Technology
- Web Technology
- Multimedia Technology
- Network Technology
- Software Technology
- Security Technology, and so on.

The field of Information Technology is rising rapidly in different sectors and areas therefore it is getting benefits of Information Sciences[6],[15],[18]. The Research areas of Computing, Information Technology, Information Science/ Informatics are changing and enhancing gradually.

Objective

The current paper entitled 'Researches in IT and Computing—*An Overview'* is a theoretical paper and mainly focused on finding areas of Computing and Information Technology in a different context such as

- To learn about the basics of Computing including its basic areas in a conceptual manner.
- To know about the fundamentals of Computing including its areas and rising fields in an international context.
- To know about the basic components of Computing and to find out computing as an area of study and research.
- To learn about the basics of Information Technology including its basic components and more advanced areas.
- To learn about the basic research areas of Computing, Information Technology in an internal context.
- To learn about the increasing role of Computing and IT in Information Science research.

Computing, IT, Information Science: Foundation

Computing is simply the use of computing. It is a kind of goal-oriented activity using computing in different forms and means. Computing is about designing, developing, building, structuring, managing

computer systems, and here software and hardware play a leading role of course[3],[10],[27]. Doing scientific research with computers; and making computer systems behave intelligently is also the task of Computing. Furthermore, as far as the creation and use of communications are concerned, it is particularly used in Computing. The term Computing may be classified into different senses for example as a field 'Computing' is basically less hardware and algorithm centric and focused on software designing and development, application process and development, basic operations of the network and databases. On other hand, 'Computing' is simply the use of computer in different sectors and areas.

Information Technology is about the information centric fields using technology. Information Technology is a broader field than Computing (which is software and application centric), and Computer Science (which is hardware and algorithm centric)[13],[14],[30]. And talks about many technologies as sub field viz.—

Network Technology—which is about the designing, developing, managing of network systems and network infrastructure. This technology is responsible for designing networks locally, in a city, or beyond a city or international basis. The aspects of network security, wireless network, converged network, cloud computing, internet of things fall under this Network Technology.

Database Technology—which is about designing, developing, and managing the database, database systems, storage units, etc. The aspects of multimedia database, intelligent database, big data management, etc. also fall under the areas of Database Technology.

Web Technology—is about the planning, designing, developing, managing websites, web portals, and similar systems. It lies on various web programming, content management systems, multimedia systems, etc.

Software Technology—is about designing, developing, and managing the software, software systems, etc. It is about various high level programming languages that deals with applications and software development using proper guidelines and principles.

Multimedia Technology—is about the various media like text, audio, video, images, etc in better information packaging and representation. Offline and online multimedia products are important and growing internationally due to their role and importance.

Therefore, Information Technology is a broad field incorporating various types of technologies and systems that helps in information related activities by computers, network systems, database systems, infrastructure systems, etc.[7],[22]. The commercial use of IT encompasses both computer technology and telecommunications; therefore, IT also includes Management and Business principles. However here it is worthy to note on Harvard Business Review definition of Information Technology. The *Harvard Business Review* coined the term *information technology* to make a distinction between purpose-built machines designed to perform a limited scope of functions, and general-purpose computing machines that could be programmed for various tasks. As the IT industry evolved from the mid-20th century, computing capability increased, while device cost and energy consumption decreased, a cycle that continues today when new technologies emerge[8],[31].

Research Areas & Diversity in Computing, IT in respect of Information Sciences

The areas, components, and gradients are similar in Computing, Information Technology, and Informatics (Information Science) in many contexts since all are being used as information related activities. However, as far as research areas are concerned few emerging areas include—

Computing and Potential Research Areas

As far as potential areas of Computing are concerned the list is increasing and impacting not only the concerned field itself but also in other areas. The field of Computing is close with Software Technology. Some of the emerging areas include—

Computing and Software Systems is for making Digital Society/ World: This is one of the major and important area of study and research in the areas of computing. The world is become changing and almost all the organizations and institutions currently using Computing in order make digitalization. In this connection this area is considered as prime importance in different countries within 'Computing' research. In the research by Accelerated Strategies Group, Inc., find out that 63.3% of the organizations are moving towards the transformation of their company with digital tools and technologies[9],[12],[17].

Remote Work/ Work from Home using Digital Mechanism: Accelerated Strategies Group, Inc., study shows that digital transformation and adaptation lead the remote work culture and as per a study it is noted that organizations are moving contactless services (60.1%), cloud migration (52.25%), DevOps activities (51.75%) for the digitalization. The remote work management brings new corporate and works culture, team management, productivity. Even many organizations have shown better results in healthy activities, services and productivity using remote work culture or digital mechanisms. As far as 'computing' field is concerned this is also an important and emerging job area.

Cloud Computing based Services: Cloud Computing is rising and changing traditional systems of Information Technology and thus almost all the sectors, services are integrating with Cloud Computing. Cloud Computing services are rising and according to Gartner due to remote organizational activities the business operations may be double in the next five years. According to Statista, 74% of the business houses expressed to enhance their Cloud computing adoption in organizations. Therefore, in the Computing field this area of Computing adaptation may be considered an important job area in a technological and managerial context. The growth and expected Cloud Computing market share is depicted in Fig. 1 (*Source*: sam soulutions)[4],[19].

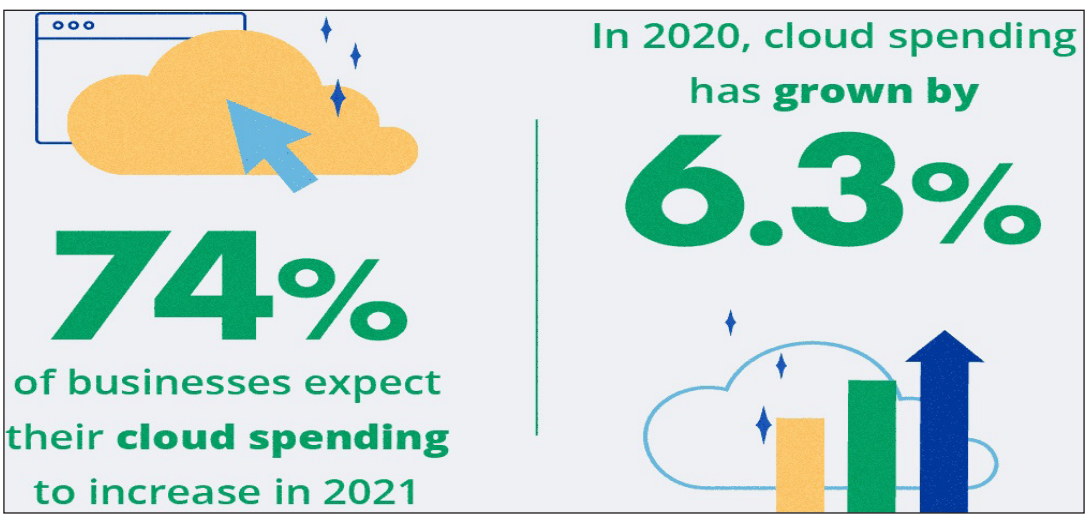

Fig. 1: The growth of Cloud Computing and also expected in 2021

Java and Python Coding for Software Development & Engineering— Research in the areas of enhancing Java and Python Programming can be considered an important research area. Furthermore, in the context of business and management also the research may be carried. It is noted according to a study that, in the year 2020 about 68% of the software engineers used Java whereas 44% of the software engineer expressed about the uses of Python in their Software Development.

Containers and Microservices are increasing— An important trend of increasing Kubernetes is also considered as important in the software development segment. According to Statista, 54% of businesses used the container technology system Kubernetes in some way in 2020. Kubernetes is an important and emerging tool in managing containers, and building microservices architecture. Internationally, microservices market size was in $744 million in 2020and is also expected to grow $1.5 billion by 2026 (Refer Fig. 2/ source sam solutions). Therefore, Kubernetes related technologies and managerial issues could be considered an important research area in Software Development and Computing field[26],[28].

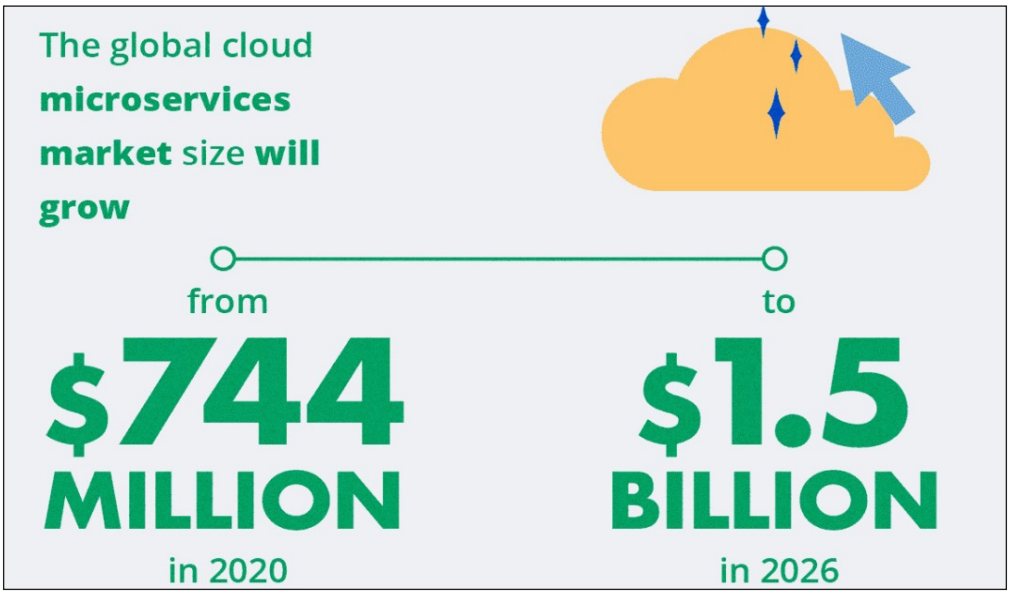

Fig. 2: Growth and expectations in the microservices market

Low Coding Systems— Internationally many organizations and engineers are moving towards less or low coding systems. In this, instead of the traditional platform here graphical user interfaces and configuration are being used. Such programming allows people to implement the software or application with limited or no specific development skills. Therefore, Low coding systems or programming can be considered an important area of research in the 'Computing' field.

Continuous Integrations, Delivery, Deployment— Today organizations and institutions are opting for the practice of continuous integration, delivery and deployment (CI/CD) in software development. This is giving the opportunity in testing more effective and simplifies bug fixing as well. The market size for continuous deployment tools is also growing with CAGR of18.7% and moreover, it is expected to reach $1.14 billion by 2023.

***Outsourcing*—**The outsourcing market also increasing day by day and this is can be considered as important in the Computing field. According to Statista, international market for outsourced services emerged $45.6 billion in 2000 to $92.5 billion in 2019; and this could be considered an important research area so that more research is carried in order to optimize more benefits[20],[21].

***Human Augmentation*—** Human Augmentation is one of the important technologies in Computing. The applications of the technologies in the human brain, physical and cognitive are the main goal in human augmentation. As far as the Computing field is concerned, Human Augmentation can be considered an important research area in both technological and managerial contexts.

***Augmented Reality*—** Augmented Reality is one of the important areas of research in the field of Computing since it is applicable in different areas such as retail, navigation, manufacturing, and so on. Different social media like Facebook and Instagram, marketers, virtual makeup bringing it to a whole new dimension and emerging as a real example in augmented reality[33].

***Virtual Reality and Mixed Reality*—** Not only in the gaming and video industry Virtual reality is emerging in the entertainment, manufacturing industries, and so on. Various emerging software is playing an important role in connection with proper virtual reality development. Similar to the Virtual Reality Mixed reality can also be a good area of research in the Computing field. AR smart glasses with VR headsets may be considered as important examples. And therefore, the technological and managerial areas could be best research areas as far as 'Computing' is concerned[23],[32].

***DevSecOps*—** DevSecOps is the abbreviation of *development, security,* and *operations (refer to fig: 3)*. This is specifically dedicated in automating and integration of security at different and particularly in every phase of the software development life-cycle.

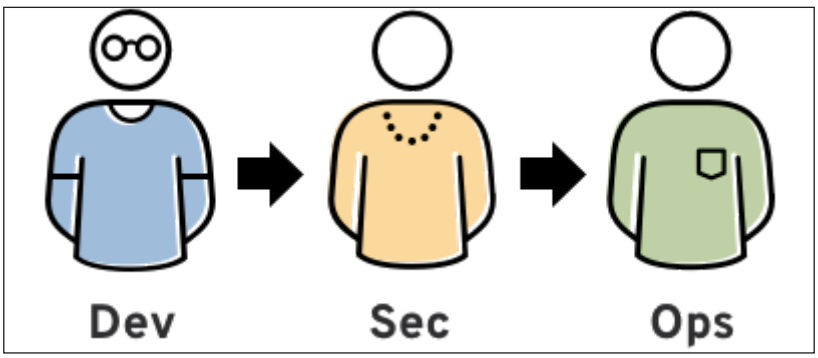

Fig. 3: The basics components of DevSecOps

Furthermore, from the initial design to integration, testing, deployment, and software delivery; everywhere this technology is rising and as far as Computing is concerned, this could be considered as important.

***Native Mobile-Development Languages*—** Programming languages focused on improving product speed, memory, safety, and parallelism can be considered as important in Native Mobile Development Languages. And, this could be considered a valuable area of research in Computing.

***Balanced Development Automation*—** Balanced Development Automation in short called BDA which is also emerging rapidly worldwide and this is enabling organizations and institutions regarding secure and advanced digital products. Balanced Development Automation helps in key parts of proactive

manual security including compliance processes which are slow, inconsistent, as well as expensive in some contexts. Therefore, Balanced Development Automation may be considered an important area of research in the field 'Computing'.

Mobile-Responsive Design— Mobile Responsive Design is another important area of the Computing field. Today websites are changing and become responsive with features of automatic changes to fit the device[16],[29].

Serverless Computing— Serverless is another important potential and emerging research area of Computing. Serverless computing is helpful in infrastructure management including capacity provisioning and patching become effective. As far as Computing is concerned, Severless Computing is important with rich impact.

Information Technology Potential Research Areas and Sectors

The field of Information Technology is about the sub technologies such as Networking Technologies, Web Technologies, Database Technologies, Software Technologies, Multimedia Technologies, Security Technologies, etc. and within these technologies few important and most emerging are given bellow with research potentialities. Internationally the market of Information Technology is rising (also refer Fig. 4/source Sam solutions).

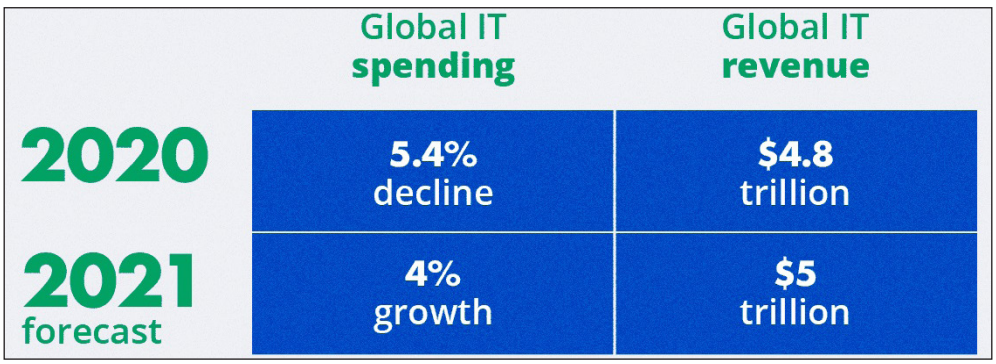

Fig. 4: The growing market of IT sector

Big Data and Analytics— Big Data is managing a large amount of data, complex data with different kinds of tools, techniques and procedure. Big Data is focused on data management with proper methods for better information access and infrastructure building. Furthermore, this is also an important subfield of Information Technology. Scientific, technological, and managerial research are in demand in the areas of Big Data, Analytics including another very close area called Data Science[24],[33].

Cloud Computing & Virtualization— Cloud Computing is another important area in Information Technology and this is rising gradually for managing virtual infrastructure; and therefore, organizations are putting efforts in this regard. As far as the Information Technology field is concerned, Network Technology is considered as an important one and within Network Technology Cloud Computing and Virtualization are rising rapidly and become a promising research area in many contexts.

Internet of Things— The applications of internet services in almost all the sectors, areas, and disciplines bring a new technology called 'Internet of Things' or IoT in short. In almost all the sectors the growing

uses of the internet lead this technology to serve. Therefore, this is considering one of the important and emerging technologies in IT for conducting technological and managerial research.

Usability Engineering & UXD— As far as Usability Engineering is concerned the areas such as User Experience Designing, Interaction Designing, Information Designing are rising rapidly. Regarding the potential areas of Usability Engineering, it is worthy and rising rapidly due to its importance. Therefore, within Information Technology this could be treated as an important area of research in technological, managerial, and design contexts.

Visual Effects and VFX— Within Multimedia Technology Visual Effects and VFS are rising as the latest areas due to their importance in different sectors and areas. Due to its importance and applicability, this trend is rising and has become a potential area of research.

Converged & Intelligent Network— Converged Network is one of the innovative and intelligent network services which is lying on combined audio, video, different other contents format in the same network; and this media of network is emerging rapidly internationally. The organizations become virtual, global and world become global village using Converged and Intelligent Network. As far as Information Technology is concerned the technical and managerial research is booming and has become potential internationally[2],[11].

Cyber Security & Information Assurance— Worldwide the applications of IT and Computing products, tools, systems not only bring healthy technological infrastructure and information infrastructure but also results in various threats to all of us. Cyber Security is therefore an important area of practice and research in the Information Technology domain. Similarly, Information Privacy, Data Protection, Information Assurance become also rising rapidly internationally.

Robotics and AI— Partially Robotics and Artificial Intelligence may be considered as one of the important areas of Information Technology. However, Robotics and AI may be considered as core areas of Computer Science/ Engineering. The core areas of IT are many ways connected with the Computer Science areas especially Robotics and AI as far as the current trend is concerned.

Domain Centric Information Science Research Areas powered by IT/ Informatics

The applications of IT and Computing (also similar technologies) into different sectors, areas and divisions leads the development of another interdisciplinary field called Information Science. The emerging applications leads many new areas and domain in this segment and growing internationally as a research area as bellow (also refer Fig. 5).

Health Informatics— This is the merger of Health Science and Information Science and also known as Health Information Science. Since this is the application of Computing and Technology in different areas like Healthcare affairs, Medical Systems, Hospital Management, etc. therefore, research areas are booming in this Information Science[7],[25].

Bio Informatics— BioInformatics is the combination of Biological Science and Informatics and purely interdisciplinary in nature areas of biological science, Computing applications. Due to its uses in homology and similarity tools, protein function analysis, personalized medicine, gene therapy, drug development, etc. it becomes an important research area in Information Science.

Geo Informatics— Geo Information Science is also rising in domain centric Information Science due to its role. This is the application of Information Technology in Geo Sciences, Earth Science, Geology

etc. Remote Sensing, Geo Information Systems, Disaster Management, etc. are very important and in all these, Geo Informatics can be considered as important role. And therefore, it is an important area in Information Science in a technological and managerial context.

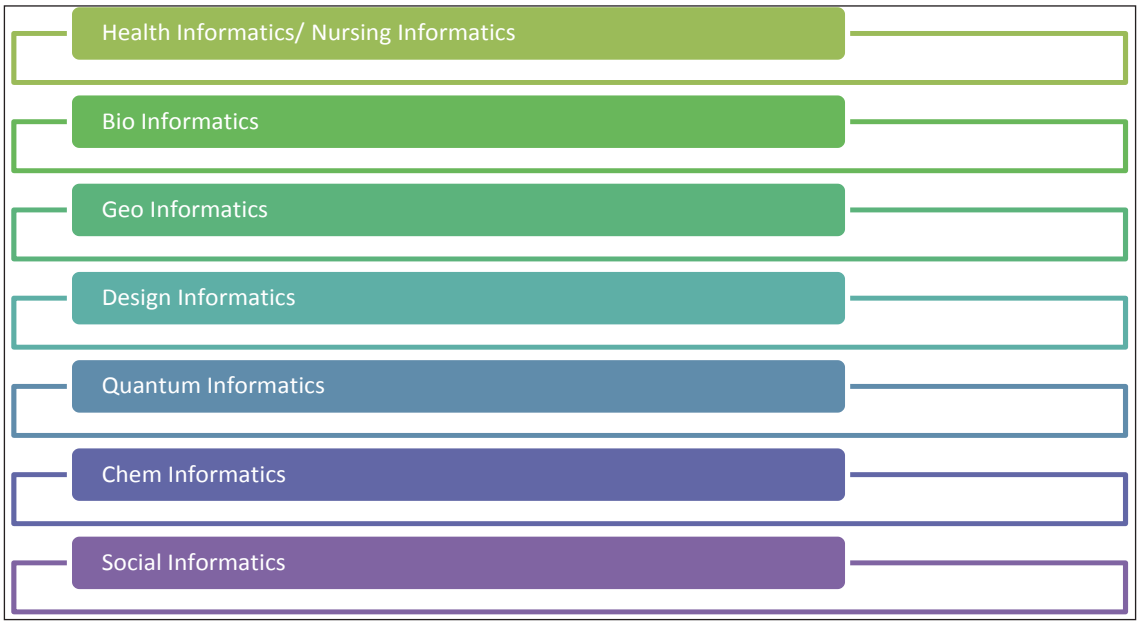

Fig. 5: The growing domain centric Information Sciences

Design Informatics— The central premise of design informatics is the application of IT and Computing in Designing, Architecture, and allied areas. As designing is applicable in different areas and sectors therefore, this is considered as an important and potential area in research as far as Information Science is concerned[6],[29].

Quantum Informatics— Information Science is applicable in different subjects and sectors and as a result different field specific information science has been developed. The application and merger of IT and Informatics in physics and quantum science result in Quantum Information Science as a potential research area.

Chem Informatics— Information Science in the Chemistry including Chemical Sciences results in Chemo Informatics. It is strongly applicable in the areas of Pharmacy and Allied Sciences; therefore, research and innovation are going on in this subject.

The areas of Information Science are rising and there are many emerging domains specific to information science also having the research potentialities such as Social Informatics, Community Informatics, Business Informatics, Education Informatics, etc.

CONCLUSION

Internationally the market of technologies is rising and countries are putting efforts into healthy development of the Information Technology Sector. As far as Information Technology is concerned, it

is applicable in all the sectors today and common people are also directly and indirectly associated with Information Technology. Furthermore, as far as Computing is concerned this is rising and growing as a branch of study, practice, and research emphasizing software technology. This branch is very common with the subject/ branch 'Computer Application' available in India. The rising applications of IT in different sectors lead to various domain centric Information Science which helps in sector specific growth and development. Within Information Science E-Business, Digital Marketing, E-Governance, Digital Society, Digital Healthcare also emerging and in such subjects IT and Computing also play a leading role.

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