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OPEN SOURCE SOFTWARE

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From the Desk of Chairman, Publication Committee

Dear Fellow Members,



Greetings.

Of late a number of conferences/seminars are being organised under the auspices of CSI and other organisations highlighting the need to address Cyber Security. Today, people use the Internet for a number of transactions – financial and many more. Due to this, hackers and cyber criminals use the internet as a tool to spread malware and carry out cyber attacks. Cyber attacks such as the Golden Eye, Ransomware have crippled several organizations and forced many to shut down their operations. In the wake of these unprincipled cyber attacks and security breaches, cyber security has become extremely important and need to be addressed on a war footing.

Today's hackers are ahead of time. There are hundreds of hackers in China. Current practice of cyber security and defense in India need to be geared up. We need high class researchers who can counter the attackers' moves, create defense mechanisms etc.,

which the hackers cannot break. I feel it should be a topic of study in all educational institutions for an understanding of the gravity of the problem and to develop counter offensives..

The issues and problems needing attention of global community of researchers are many. These are highlighted in an excellent article by N. J. Rao, (CSIC, May 2015.) The need of the day is to create a cyber system which while meeting the basic parameters of utility, cost and ease with security must be a sustainable one. These are the challenges before us.

It is a happy augury that Mr. Sunder Pitchai - the CEO of Google has interacted with our Prime Minister - Sh. Narendra Modi, and has consented to invest more in India in IT.

With best compliments

Dr. D. D. Sarma

Chief Scientist (R), CSIR-NGRI, Hyderabad





CSI COMMUNICATIONS

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Editorial



Prof. (Dr.) S. S. Agrawal
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Dr. Ritika Wason
Editor

Dear Readers

"In real open source, you have the right to control your own destiny"

- Palmer Luckey

The above quote by *Linus Torvalds*, Developer of Linux Kernel depicts the power of open source software. As per Wikipedia, **Open Source Software (OSS)** is a computer software whose source code is available under a license where the copyright holder grants users the.

In today's world open source software has already penetrated into the computing systems in a big way. We are using many open source applications around us. We dedicate this issue to understanding and appreciating the role open source is playing in this smart computational world. Continuing with our invited series Titbits from the History of Computing -XIII by the legendary Prof. V. Rajaraman, this issue discloses, "CTSS-The first time-sharing operating system." This article traces the development of the first time sharing operating system. The first article, "Open Source: The Power of People" by Vrushank R. P. and Anand Panduranga details the nuances of open source software. The article, "Open Source Software: Freedom to Use" by A.R. Revathi, P.Rajalakshmi and M. Shweththa discusses how open source software expands the boundaries of software usage. The next article, "The Importance and Applications of Open Source Software" by Sharadhi A.M. and Snigdha Sen details how OSS can be shared under licensing.

The research front showcases, "Accelerating Innovation in Healthcare using Open Source Platform" by Archana Sasi and Satish Kumar Ravichandran delves into the innovations in Healthcare using Open Source Platform. The current trends highlights, "Post COVID-19 Education Scenario: Digital Transformation of Pedagogy" by N.K. Yadav and Subhash Chandra Yadav evaluates the challenges faced by academia during the pandemic times.

The technical trends commence from the article, "Global Survival and Success of OSS based on DFSG, neither proprietary nor closed source" by Jyotishmaan Ray traces the survival of Open Source Applications in the present world. The next article, "An Exploratory Study on Free and Open Source Artificial Intelligence Toolkits" by S Balakrishnan and J. Janet elaborates on the available Open Source Artificial Intelligence Toolkits. The article, "Understanding Open Source Software Licensing" by P. Ranjana and Thangakumar Jeyaprakash highlights the working of licensing in Open Source Software.

In the recent past, Computer Science has noticed many important losses. Prof. Dwijesh Kumar Dutta Majumder, a CSI Fellow and a pioneer in Indian Information Technology Education in India left for heavenly abode on 27th June, 2020 at the age of 88 years. S. Kundu fellow has paid homage to Sir. Mr. Kalyanasundaram Ganesan, Former Director of IT, Air India also left for heavenly abode on 01st August, 2020. He is survived by his wife, son and two daughters. Prof. Uttam Kumar Singh, Founder Director General of IIBM, and Dr. Zakir Husain Institute, Patna and fellow member, Life Time Achievement Awardee

of CSI left for heavenly abode on 25th July, 2020. May God rest their soul in peace. The issue also reports various webinars, student branch inaugurations and faculty development programmes conducted by various regions of CSI. A new trend in education / communication is very clearly visible that people have resorted to "online mode and the virtual mode for teaching and learning" at various levels. The experts in computer science and the CSI are assisting and showing the way for its effectiveness. It is very encouraging to see the reports from various chapters, specially the student chapters. We applaud all chapters and branches for conducting such activities even in these hard times. Varied student branch activities as well as workshops carried by different regional chapters of CSI like industrial visit and programming competitions have also been reported.

The call for papers for CSI 2021 has also been included for the information of readers and prospective authors. We would also like to congratulate the winners of CSI Fellowship Awards. We value the continued association of these distinguished experts with CSI. The authors are also introduced to the various CSI Committees for the year 2020-2021.

We are extremely thankful to all our contributors as well as readers. We are continuously receiving so many good quality articles each month that selection becomes a difficult task. May God bless you all with extreme strength and well-being to overcome these hard times safe and sound. Original, plagiarism-free, unpublished articles are solicited throughout the year from CSI members as well as non-members. Our sincere gratitude to the CSI publication committee members, editorial board members, authors and reviewers for their great contribution and support in realising this issue.

Our special thanks to Prof. A. K. Nayak, Immediate Past President, CSI for his constant encouragement, support and guidance in publication of August, 2020 issue.

We look forward to receive constructive feedback and suggestions from our esteemed members and readers at csic@csi-india.org

With kind regards,

Prof. (Dr.) S. S. Agrawal

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President's Desk



From : President, Computer Society of India

Date : 01 August, 2020

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Dear Members,

All of us are coming out of the difficult phase of pandemic Covid-19 in the country. Most of us have started working in physical mode after the new guidelines of safety issued by government. The guidelines will surely keep all of us safe and will allow us to work with safety.

Present issue of CSI communication is on the theme Open Source software (OSS). Open Source software are the software for which the source code is freely available, OSS can be modified as per user need and can be redistributed, unlike the proprietary software , which can be termed as closed source software. Open source software is developed by number of professionals and distributed under an OSD-compliant license which gives the rights to use, study, modify and share the software in modified and unmodified form. Open Source Software has given freedom to professionals to use the software for community development at low cost. Examples of popularly used open-source products are Apache HTTP Server, internet browsers Mozilla Firefox, office suite LibreOffice and many more. Generally all open source software is free software, but few exceptions are there and we also have misconception that free software is open source software but that is also not true always. Some open source software is restrictive, thus do not qualify as free licenses, however the facility is given to users to compile the source code and distribute free executables. The Open Source Software has really given professionals as edge to develop more and more software for the society in affordable budget.

Many researchers & professional had contributed their work on Open Source Software in current issue and explained judiciously the use of open source software in the development of environments for various IT applications in different areas.

The phased opening of facilities in Covid-19 pandemic and the Unlocking measures of government is allowing us to work in hybrid environment of physical and online mode in the country. Most of the organizations & education institutes have adapted themselves in current scenario for the growth, continuity of economic & industrial development. Our Chapters & Student Branches are quite dynamic & vibrant and utilized this period for organizing quality activities at local to International level through hybrid mode. The activity reports of chapters & student Branches published in this issue is giving excellent picture of CSI activities. I once again congratulate all the respective organizers & members of the chapters & student branches for their tireless efforts & significant contribution for their own professional growth & growth of CSI. In this issue we have asked for volunteers from chapters & student branches for the post of State & Regional Student Coordinators.

CSI is continuing 15% concession in the life membership to attract more & more professional & bring them together for the growth of IT, the details are available on our portal www.csi-india.org.

I once gain thank to all Past Presidents, Fellows & Senior Members of CSI for their continued guidance & support.

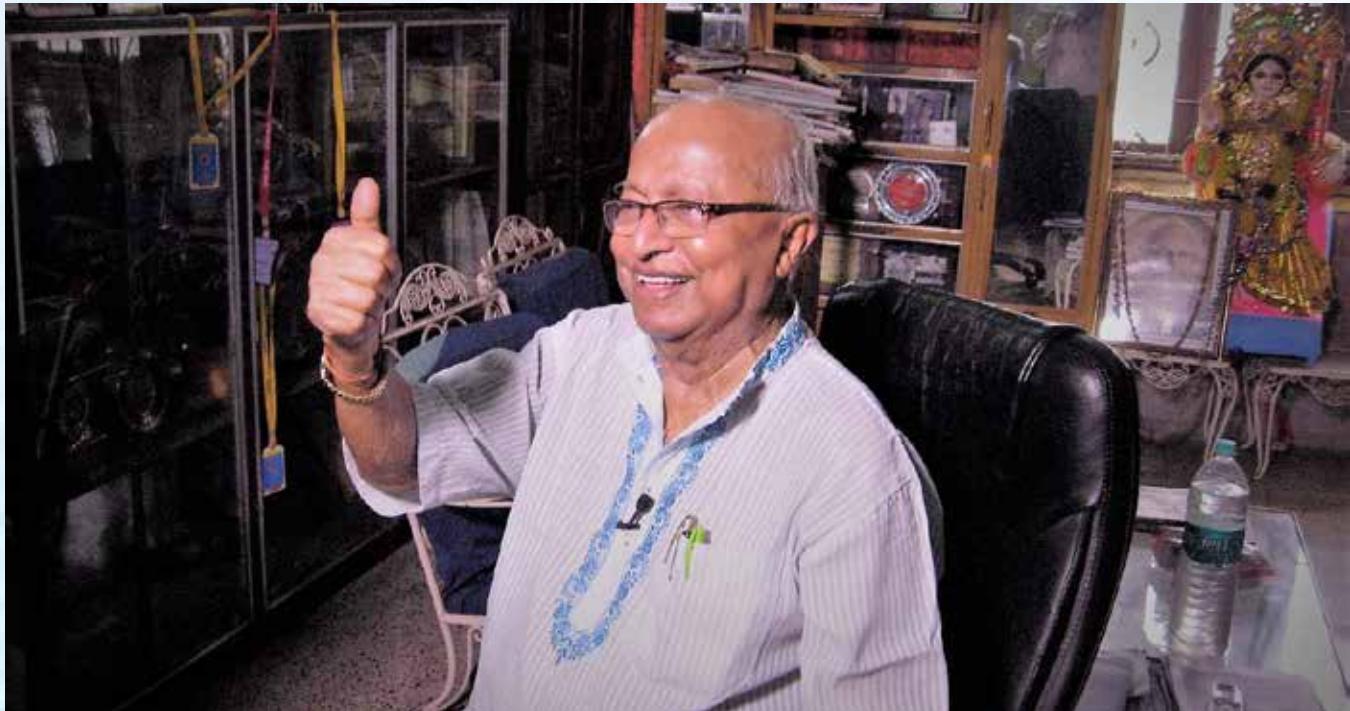
Stay Safe, Stay Connected.

With warm regards,

Mr. Ram Krishan Vyas
President, CSI

Homage to Prof. Dwijesh Kumar Dutta Majumder

By S. Kundu, Fellow CSI



Prof Dwijesh Kumar Dutta Majumder, CSI Fellow and a pioneer of Indian Information Technology education in India. He died on 27th June 2020 in a Kolkata hospital. He was 88 and left behind his one son, two daughters and thousands of students and followers. He was an Emeritus Professor of Indian Statistical Institute. His other achievements included:

- Professor Emeritus, ECSU, Computer and Communication Sciences Division, Indian Statistical Institute, (ISI).
- Honorary Director, Secretary & Chairman of Advisory Board, Institute of Cybernetics Systems and Information Technology, (ICSIT).
- Emeritus Scientist, Council of Scientific & Industrial Research (CSIR) Government of India.

He was one of the pillars of Indian IT industries and had contributed immensely for the development and spread of Computer knowledge in all the generations of Computer Science - First to Fifth.

He was declared Fellow in 1987 and Life Time Achievement Award in 2014 by Computer society of India during the Annual Conventions.

He was one of the founding members of Computer Society of India and used to take active interests in the propagation and enhancement of Computer education and computer culture in India.

He was an Emeritus Professor of the Indian Statistical Institute (ISI). Interestingly, his professional career started with ISI at a time when the founder of ISI, Prof. Mahalanobis, was introducing computers to young independent India. A need emerged to first operate and then maintain the computing systems imported to India. This need in no time transformed to an initiative to build infrastructure and train human resources to fabricate our own computing system. It was at this time Prof. Dutta Majumder took a pioneering role and devoted himself in building the foundations of the information technology era that India is proud of today. His prolific area of research at the beginning was

in the development of indigenous technology in fabricating drum based memory for digital computers. The beauty of his genius is in constant navigation in different cutting edge areas of digital computer technology. His next milestone is the first work in India in the field of statistical pattern recognition involving language technology especially for Indian languages. Since then he pioneered in the field of statistical pattern recognition and recognized cybernetics to be a key vehicle associated with the growth of information technology. Eventually he was one of the leaders in India spearheading national initiatives on knowledge based computing focusing areas like soft computing, machine learning, computer vision, speech technology, natural language processing and so on. He was the first to introduce and popularize fuzzy mathematics in application-driven computer science research in India. His numerous books, research papers and presentations motivated generations of researchers in these fields. Lately he steered his interest towards nano-technology and dreamt of exploring newer avenues of cybernetic systems research.

He was an institution builder in the true sense of the term. In ISI several research groups in diverse areas started under his leadership. His students are now leading several research groups in India and abroad. He was instrumental in opening different computer science curriculums at different state and centrally funded institutes. He was associated with national and international organizations related to pattern recognition, fuzzy mathematics, cybernetics and language technology.

He was a multifarious leader. He was a socialist to the core and always identified with the socialist idealism till his last days. He was an excellent public speaker on socialism and involved in a number of political movements both at state and national level.

He received a number of awards. To name a few, Norbert Wiener Award twice, P C Mahalanabis Award, Rathindra Puraskar, J C Ghosh Award etc.

Tribute to Prof. U. K. Singh



Prof. Uttam Kumar Singh, the Founder Director General of Indian Institute of Business Management, Patna & Dr. Zakir Hussain group of Institutions and the past Division Chair, Regional Vice President, Member, Nomination Committee, Fellow & Life Time Achievement Awardee of Computer Society of India has passed away on 25th July 2020 at 1 AM. Prof. Singh is regarded as father of Computer, IT & Vocational Education in Bihar and Jharkhand. Let us pray together for the peace of the departed Soul and to provide confidence to the family to overcome the sad time.

Born in 1955, Prof. U. K. Singh completed his higher education in Science & Management & then opted his career in Institution Building. He established the Indian Institute of Business Management, Patna in the year 1979 with the introduction of Post Graduate Programme in Management. In the year 1980, he introduced the full time academic programme in Computer Science for the first time in the state of undivided Bihar and 3 years Diploma in Hotel Management & Catering Technology for the first time in India under Private Sector. He remained pioneer in the state of Bihar to start Journalism & Mass Communication program in 1982, Environmental Education in 1985, BCA Course in 1996, IT Courses in 1999, BBA course in 2000, Para medical & Bio technology Programmes in 2002 & many more in Bihar along with the great visionary Prof. P. R. Trivedi & Prof. A. K. Nayak. With his dynamic association & leadership, two universities were established at Nagaland & Arunanchal Pradesh, the North East part of the country. He also served as the Chancellor of the Global Open University, Nagaland.

Prof. Singh played key role in establishment of CSI Patna Chapter in 1986 as it's Vice Chairman & latter he became Chairman of the Chapter for the year 1990-92. He served the National Executive Committee of CSI from 1993 to 1995 as Chairman Division V (data Communication) & 1996 to 2000 as Regional Vice President (East). He also served as a member in National Nomination Committee of CSI for two terms.

For his significant contribution for introduction & promotion of IT Education in India & significant contribution to the growth of Computer Society of India, CSI has honored him with most prestigious Fellowship Award in CSI-2011 at Ahmedabad & Life Time Achievement Award in 51st Annual Convention of CSI (CSI-2016) at Coimbatore.

CSI express it's heart felt homage to Prof. U. K. Singh on his sad demise and pray to the God for keeping his soul in peace.

Titbit from the History of Computing-13

CTSS – The first time-sharing operating system

► **V. Rajaraman**

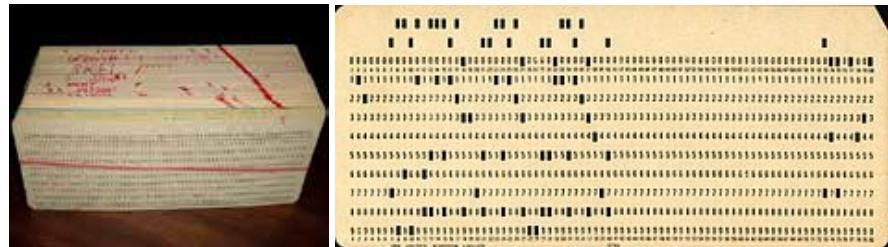
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“History is a peoples’ memory, and without memory, man is destined to the lower animals” – Malcolm X

The Cambridge dictionary meaning of titbit is “A small and particularly interesting item of gossip or information”.

Prologue

In 1957 Massachusetts Institute of Technology (MIT) installed a mainframe computer IBM 704, one of the fastest IBM mainframe computers at that time. It was programmed using SAP (Share Assembly Programming Language). FORTRAN was in the horizon but not yet in common use. The input to the system used 80 column cards on which users punched their programs and data. Each user program had a header card with user ID and computer resources needed. Users' program decks were collected together as a batch and fed to a card reader. The reader was connected to an IBM 1401 that read the cards and stored their contents on a magnetic tape. The programs in the tape were read by the IBM 704. A batch monitor scheduled the jobs, assembled and executed them on IBM 704 that had 32Kwords (36 bit words) main memory and the results were written on a tape. This tape was read by IBM 1401 and the results printed on sheets of paper using a line printer connected to it. These were put in output boxes to be picked up by users. IBM 704 was an expensive machine costing over a million dollars and use of its CPU was expensive. Using it to read programs and write the results using slow electro-mechanical devices was uneconomical. That was the reason the cheaper 1401 was used for I/O and tapes used as shared secondary store between IBM 704 and 1401. Reading a tape was relatively fast and did not waste 704 time. As the operation of 1401 and 704 was overlapped, the overall computation time was reduced. The entire effort in the early days of computers was to optimize the use of computer's resources and minimise its idle time. Users' time was not considered precious. The batch processing, from the



A program deck using 80 column punched cards and a single punched card

(Photo thanks to Wikipedia.org)

point of view of users, wasted their time as running their program took a few hours and at the end of it they would often find there was a silly syntax error in the program and it was aborted. Getting one successful result using the computer often took many days. This was frustrating and I remember a student asking me whether the computer was working for her or she was working for the computer! The situation improved with the advent of FORTRAN as it simplified programming. The availability of FORTRAN led to more users wanting to use computers and by 1959 the IBM 704 system at MIT was saturated and was replaced by IBM 709 that was twice as fast. Batch processing continued and users' frustration increased. John McCarthy joined the faculty of MIT in 1959 and was unhappy as the time required to get programs working was very long. He wrote a note to Professor Phillip Morse, the Director of the computer centre articulating the need to allow interactive debugging of programs by users of IBM 709. His idea was to allow several programmers to have concurrent access to the computer via remote tele-typewriters and let them share its resources and debug and execute their programs. This idea of “time-sharing” a computer was in the air in the late 1950s and was independently suggested by many including John Backus, Bob Bemer, W.F.

Bauer, and Christopher Strachey. McCarthy's articulation, however, persuasively argued the merits of time-sharing and led to its implementation at MIT.

Compatible Time-Sharing System

The Director of MIT computer centre requested his deputy Fernando Corbatò to explore the possibility of implementing time-sharing on the IBM 709. Corbatò started writing a program that he called a “Time-sharing Supervisor” in the spring of 1961. His idea was to give a set of users tele-typewriters using which they would write and debug programs. The time-sharing supervisor (occupying 5Kwords of memory) would run users' programs sequentially giving each user approximately 200 ms. This time was considered enough to do significant program development. At the beginning the system had three inter-active users each having a tele-typewriter. The users were serviced one after another in a round-robin fashion. IBM was asked to modify the 709 system's hardware to partition the main memory of 32Kwords into 2 parts - 5K words to store the time-sharing supervisor and 27Kwords to store a user's programs and to ensure that if a user's program attempted to write in the supervisor's partition it will be trapped. This memory protection feature was a novel idea. Another hardware modification was to provide an interrupt feature that would stop

a user's program after a specified period and swap it to secondary memory. The third was to trap a time-sharing user's program if it tried to perform I/O. At that time the IBM 709 had only magnetic tapes as secondary memory and disks were not yet available. Each time-sharing user was allocated two exclusive tapes; one in which their program files were stored and the other to dump the running program from main memory when their time was up. The time-sharing supervisor would read the program from a user's tape into the main memory when its turn came, execute it for 200 ms and write it and the result back on tape. Besides executing the programs of the three users time-sharing the computer, the supervisor also ran programs from the batch. At a time only one user's program was in the main memory. The system was called Compatible Time-Sharing System (CTSS). The word compatible was used to specify that it allowed both batch processing and time-sharing. This system was running by November 1961. Corbatò wrote most of the supervisor assisted by Daggett and Daley. The demonstration enormously improved the productivity of users as they could debug their programs interactively and execute them once they were convinced that the program was correct. Users realised the power of interaction with the computer and all users demanded time-shared access to the computer. IBM 709 was upgraded to IBM 7090 a transistorised version of 709 by summer of 1962. It was also upgraded with additional 32 K words memory in which the time-sharing supervisor was stored allowing 32Kwords for users' programs. An IBM 1301 disk drive replaced the tapes to swap



Fernando Corbatò (Corby) with IBM 709 in the background. (Photo thanks to galacticjourney.org)

users' program and data making the time-sharing system faster. Disk also allowed users to share their files. An IBM 7750 terminal controller was added that could support up to 32 tele-typewriters and some modems. A seminal paper titled "An Experimental Time-Sharing System" was presented at the Spring Joint Computer Conference by Corbatò, Daggett, and Daley in 1962 [1]. They wrote in this paper that once a user got used to interaction with a computer, a delay of even 30 seconds in computer's response time made them impatient. It was surprising that users who were waiting a day to get a result in a batch system complained when they had to wait for a minute to get a response in an interactive system! Use of tele-typewriter was not very convenient. The limited main memory size was another serious constraint.

In 1963 IBM 7090 was replaced with IBM 7094, a transistorised machine with all the upgrades necessary to run CTSS and also support for 32 time-sharing terminals. It was demonstrated in a summer workshop with over 25 well known computer scientists as participants. A second IBM 7094 was bought by project MAC supported by the Advanced Research Project Agency (ARPA) of the US government in which CTSS was implemented and many improvements were

made. CTSS continued to work till 1973 successfully with many improvements.

Epilogue

CTSS is a landmark in the development of operating systems for computers as for the first time users were allowed to interact with computers. It had many pioneering programs that included RUNOFF, the first text formatting utility (forerunner of word processing), QED, the first text editor for users' programs (forerunner of vi editor), RUNCOM that executed a list of commands in a file (forerunner of UNIX shell command), MAIL, the first messaging system among users of the system, and the first system to authenticate users with a password. CTSS was followed by Multics OS at MIT. CTSS influenced the development many Operating Systems for almost fifteen years. About UNIX Dennis Ritchie its developer remarked "It is in fact a modern implementation of MIT's CTSS" [2]. A comprehensive history of CTSS was edited by David Walden and Tom Van Vleck [3] and published by the IEEE Computer Society.

Acknowledgment

I thank Mr. R. Krishnamurthy for his suggestions that improved this article.

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Open Source: The Power of People

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Introduction to Software: Open Source

In a layman definition, open-source software is free to use software for business or personal use. Open-source developers freely share their knowledge and make source code available to the public. Distribution of open-source software happens through a specific kind of license that makes the source code legally available to end-users.

For software to be considered as open-source, users should have access to view the code and change it as per their needs, without any additional cost. Also, the source code should have the capability to be repurposed into their software, i.e., users can take the source code and distribute their program from it. Open-source software development can bring an entirely different perspective for an individual user/organization.

Rise of Open Source Software:

Majority of the people are dependent on open-source software, which creates a market for developers to invest a significant amount of time in software development. Indeed, a substantial percentage of the users and developers of open-source software today have never known a world that did not rely on open-source software. However, that would be a mistake; unconvincingly, it was a unique occurrence that could have started it all.

Evolution of open-source software goes back to the 1950s, 1960s and 1970s when the first computer had just come into existence. Universities went on to develop the software and share software improvements with other academicians. However, one constraint was that the operating systems limited the number of modifications on the software. The first known example of free, open-source software is the A-2 system, developed at the UNIVAC(Universal Automatic Computer) division of Remington Rand in 1953. History of evolution behind Open-source software is illustrated in Fig. 1.

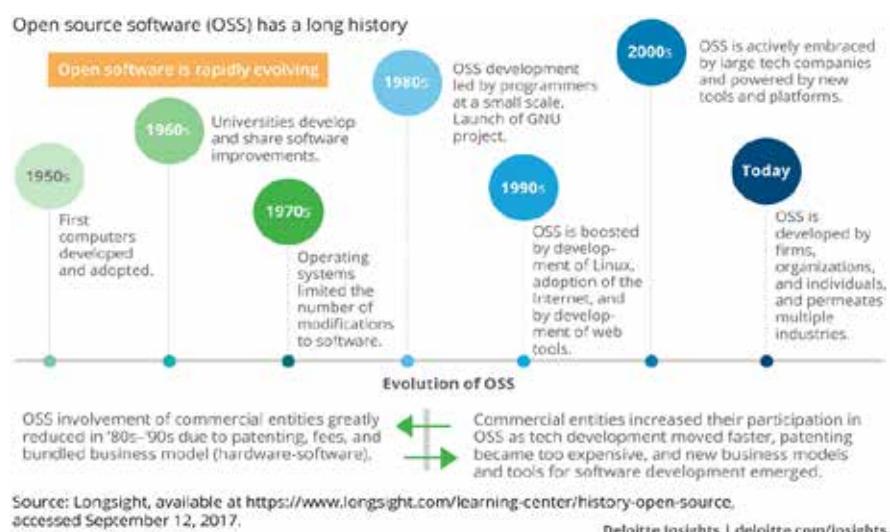


Fig. 1 : History of Open source software

The next notable developmental step of open-source software happened in the 1980s, through the launch of a small scale project titled as GNU (a reverse acronym for GNU's Not Unix). In the 1990s, Linux development gave a push for the adoption of open-source software on the internet. It also led to the development of web tools. In the 2000s, large tech companies supported open source software through the introduction of new tools. Talking about today, its no longer dependent on large tech companies for development but something which organizations of all sizes and individuals are contributing. In short, it is in everyone's pocket now.

How Open Source Software took over the world:

The authentic open source software projects were not businesses, but uprising against the unfair profits that closed-source software companies were gaining. Microsoft, Oracle, SAP and others were charging exorbitant rents for their software, which the top developers of the time did not

believe were world-class. With cybersecurity and cloud services gaining high demands, companies started giving an extra push to OSS(Operations Support System).

Large companies like Facebook and Google, which prioritize on the protection of our data, ensure that data is not open to the public. However, the very same companies allow anyone to download source code behind Facebook's user interface and Google's Android operating system.

A few years ago, there were doubtful thoughts among the investors concerning the attainability of open source as a business. The theory was that software of Red Hat was so renowned that no other company could gain significance in the open-source universe. However, curious technology-oriented people started developing their personal tools/software utilizing existing ones. Coming to date and talking about recent valuations, IBM acquired Red Hat for \$32 billion, MuleSoft got acquired for \$6.5 billion, MongoDB has evaluation north of \$4 billion. This highlights the value for quality open-source software in today's day and age.

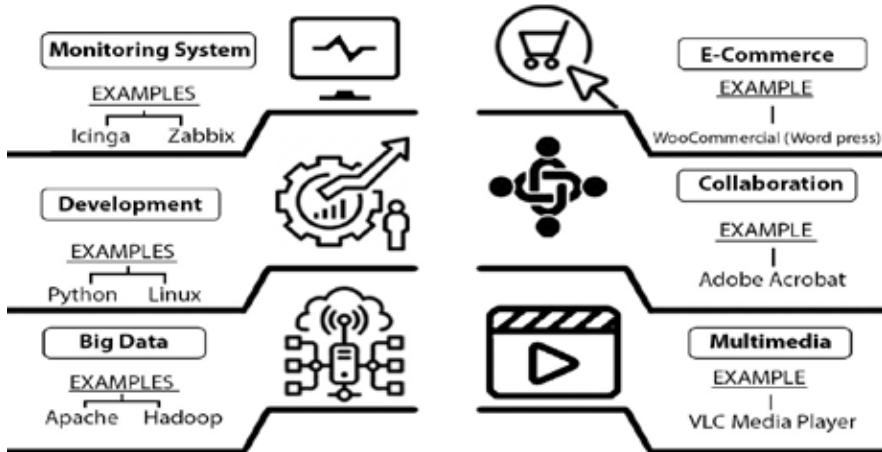


Fig. 2 : Applications of open-source software in the business world

Applications of Open Source Software:

Popular applications of open-source software in the business world, across various technology segments, are highlighted in Fig. 2.

Surface level view on the working of open source software:

Let us consider the example of a popular monitoring software in **Icinga**. Icinga, as a monitoring system, checks the availability of network resources, notifies users of interruptions, and generates performance data for reporting. Icinga has the scalability to monitor large, complex environments spread across multiple locations.

There are two ways to monitor using Icinga:

1. Monitoring via publicly available services.
2. Monitoring via an agent.

Companies take essential measures in the development of open-source software that they can manage.

Benefits of open source program:

Open-source software brings along with it a wide variety of benefits to organization and individuals, as illustrated in Fig. 3.



Fig. 3: Benefits associated with open-source software

Let us now look at some effective open-source alternatives for popular closed source ones. For Microsoft Office productivity suite, we have Apache OpenOffice offering a comprehensive office suite for Windows, Mac OS X and Linux, totally free. Similar to OpenOffice, we have the open-source program in Open document Foundations Libre Office, highlighting wide diversity in the open-source space.

The Future of Open Source Software:

The future of open-source software is getting brighter and brighter with more software companies acquiring the use of open source technology, and embracing it

as a business model. Open-source software brings greater transparency, innovation to companies and hence improves the work environment altogether.

Work philosophy of [opensource.com](http://www.opensource.com) that "Open source is not only a way to develop and license computer software, but also an attitude", highlights the underlying significance of the open-source universe.

Thus, open-source does not always mean developing and modifying existing code, but also that everyone has access to the design of the world. Source code should be shared so that many people can have their contribution in upgrading it for the betterment of society. Effective leadership is undoubtedly a must for the continued growth of the open-source universe.

We can then envision open source software as the key for the upcoming innovations with it acting as the default model for most software projects. The future promises the developers with a vast diversity of choices. I would summarize the article by saying that open-source tools would continue to play a vital role with the unique business logic layered on its top.

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Open Source Software: Freedom to use

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“Certainly there’s a phenomenon around open source. You know free software will be a vibrant area. There will be a lot of neat things that get done there.”

— Bill Gates, Founder of Microsoft

Introduction

In the world when software's were first developed not all had computers and knowledge of it. During that era, software's were developed for one specific purpose and were only used by a group of people or community. When people wanted to learn and use the software they were not permitted as it was expensive and not everyone was affordable as depicted in [1]. That's when Open Source Software (OSS) came into existence where the software was free for anyone to use under a licence agreement.

At the time of evolution, the OSS was very popular and everyone wanted to use it as it was completely free to learn, share and all had the freedom to modify the code as per their requirement. This had many advantages excluding the cost factor which made it even more popular and people started using this. To work with the open source software one needs to have additional skills apart from the normal computer knowledge. There are a certain criteria for OSS, only when all the criteria are satisfied it can be released. It is preferable for small and large business areas. There are three substitute for open source software namely freeware, shareware and free-software. There are also various classifications of OSS such as Operating System, Web design, CMS and others.

What is Open Source Software?

Open source software is the one in which software can run, alter, read and redistributed freely for any purpose. Since the software is open to the public, results are updated, improved and expanded constantly so that more user can run with its improvement. They are used in variety of big business and government organisation. A price of software is less than proprietary counterparts.

Open source software is safer from



Figure 1 : Freeware software

cyber security compared to other products. MySQL, OpenOffice and Apache are the some of the example of open source software. The key difference between open source software and proprietary software is its license. As copyright material, software is nearly always licensed. The license indicates how the software could also be used. OSS is exclusive therein it's always released under a license that has been certified to satisfy the standards of the Open Source Definition as said in [2].

Criteria for Open Source Software

There are some criteria for software to be OSS, only if all are satisfied. They are listed below

- Source code must be accessible for anyone using it.
- Redistribution of the software without limits.
- The licence must also be circulated.
- When a version is modified it should be shared.
- No discrimination against any community or groups for software sharing.

Alternatives of Open Source Software

As said above the OSS has three substitutes that are discussed below:

1. **Freeware** is the key of the software which can be utilized without inducing any costs as the word "free" in Freeware refers to a cost. In Freeware, Software available free of charges for an inexhaustible time and user faces the problem of copyright on the source code. They cannot be modified without an approval of author. Comparing open source software and Free Software, Freeware suggest the minimal freedom to the end user. Home user and enterprises are easy to use freeware and deploy it and has the capable of increasing the user base quickly. Without any pervade in expensive software freeware could able to solve the daily task assigned but they have limited functionality which is one of the major fault that occurs in freeware. Skype and Adobe Acrobat Reader play an important role in freeware which are free to use, but their source code are unavailable as expressed in [3]. Some freeware software's are represented in Figure 1. Usually developer market freeware as fermium to encourage the customer to buy it.

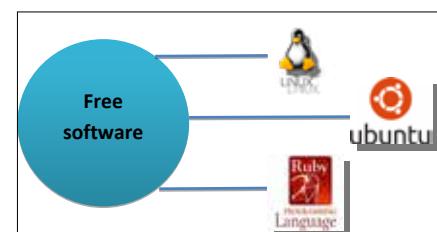


Figure 2 : Free Software applications

2. **Free Software** is the kind of computer software that is easy to use, alter and share without any limitation and cost. In Free Software, user will not face the problem of copyright. Generally people think that Free Software is free to use as named "Free Software" but actually that is not true. The word "free" in free software refers to the matter of liberty not money which indicates that user has the capable to run, alter, read, and distribute the software freely. Sometimes free software is called as "Libre software". Linux and Ubuntu are the best known free software as depicted in Figure 2. The four kind of Freedom that the user of the software should follow are listed below:
 - Freedom 1: user has the freedom to run the program as they wish for multiple purposes.
 - Freedom 2: user has the freedom to understand the working of the program and modify it as their convenient.
 - Freedom 3: user has the freedom to redistribute the copies to help others.
 - Freedom 4: user has the freedom to establish the copies of modified content to the public which helps the whole community.
3. **Shareware** is the commercial software. In shareware users get the chance to use the software freely just for a trial about 30 days. If the user wishes to continue their work or they need additional functionalities then they have to pay for it as said in [4]. As like freeware, shareware also face the problem of copyright.
Adware, Cripple ware, Trial ware, Donation ware, Nag ware and Freemium are the types of shareware. They have many powerful features and best to use for one-time task. WinRAR, CAMTASIA STUDIO and WINZIP are the some of the examples of shareware as shown in Figure 3.

Application of OSS in various fields

1. Cloud Computing

Open Source software is used to build cloud services that are called as open source cloud. It consists of all public, private and hybrid cloud models. It also provides Infrastructure as a Service, Platform as a Service, and Software as a Service that are completely accessible using open source technologies. They are highly customizable and can highly extend. Some point to be



Figure 3: Shareware Software

considered while selecting an open-source cloud are quality of services, meets the business requirements, scaling power and other such factors.

2. Machine Learning

Machine learning uses complex algorithms and tools for computing a dataset to arrive predictive outcomes. Open source software provides the tools and libraries that will make the ML process much easier. It assists developers and researchers to build and power the applications. The bugs and other problems can be easily handled while using an OSS. It requires special skills to work with these software's. Some of the popular ML open source software's are TensorFlow, Shogun, Pytorch and so on.

3. Multimedia:

As we know Multimedia is a combination of different media files. To pin them together and use them the open source software is the best. It is very useful for image editing purpose. Unlike the Machine Learning OSS, it does not require additional programming expertise and skills. It also enables easier creation of websites from small scale to large scale business. The commonly used OSS for multimedia applications are NVU, Bluefish, GIMPShop et cetera.

4. Education

Educational Organisation is focussing to place their resources and services online, which brings the world onto a typical platform and elevate the interest of lenders. Open source education is a principle through which users must produce, distribute and alter it based on knowledge. Calibre, Blender,

digiKam, Fedora, Atom and Audacity are some of the popular open source software for education purpose.

Some popular OSS

1. Open Office

It is one of the frequently used office suite. It can be used by individuals and even in organisations for business purposes as explained in [5]. Open Office includes the tools for office automation application such as word processing, spread sheet, calculator, graphics support, and presentation software et cetera.

2. Ubuntu

Ubuntu is the largest community for Linux OS. It assists users to draw upon a wide network for support. This falls under the application of Operating System (OS). Desktop server and code for IOT devices and robots are the three versions of Ubuntu.

3. PHP-Nuke

It is a free open source developed for web-based automated news publishing and content-management system. The entire software is based on PHP and MySQL. It is fully controlled by web-based user interface.

4. Bluefish

It was mainly developed for programmers and web designer for editing purpose. Bluefish supports various programming and mark-up languages. It is focussed on creating interactive website and editing dynamic pages.

Merits

- The source code is completely free for anyone to use. Developers can understand the code, learn, share and have the liberty to change the code.
- Flexibility is high as organizations can alter the code according to their need and use them at any time.
- It is fully independent from vendor-lock in as there is no vendor in this case.
- In open source software the quality factor is always high and also the customizability.
- There is no need to spend money to purchase the software as they are entirely free to the world.
- This is not proprietary software and hence there are no licence agreements, penalty, and negotiation et cetera.
- The external technical support will be there always for all versions of open source software.

Demerits

- Require additional skills and knowledge to handle such software.
- The security is less in these types of software thus high security is necessary which in turn a tedious task is again.
- The advanced features are in the enterprise edition which is not free.
- Moreover the software quality assurance procedure is hidden from the users always.
- The maintenance of open source software is high as there might be incompatibility issues with both software and hardware.

Conclusion

To summarize Open Source is software that follows a certain criteria such as free to use, free to distribute and free to modify. It is one of the common platforms for sharing the software and gathers them by authors or other users who wish to alter it. The reason behind the acceptance of Open Source Software is because of its wide range of advantages, mainly considering the cost aspect even while there are some demerits. According to researchers point of view the OSS will rule the future.

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**Themes for CSI Communications**

Month & Year	Theme	Month & Year	Theme
September, 2020	Digital Twins	November, 2020	Deep Learning
October, 2020	Robotics	December, 2020	Industry 4.0



The Importance and Applications of Open Source Software

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Introduction

Computer software's source code that is available to all public users and can access it with or without any modifications in the source code is known as **Open-Source Software**. This open-source software will not undergo any kind of license fee. This software is better at appealing to open standard requirements for the software than the other patented software. In the **1970s**, the users were not allowed to redistribute, modify, or access the source code of the software. So, the evolution of **Open-Source Software** became a reaction to the proprietary software by other developers. In contradiction to open-source software, we have this proprietary software which can also be known as patented software that includes the complete solution of the functions that are bound inside the software that users may require. In this software, the source code cannot be accessed, modified, or re-deploy the software by users. Also, it is not freely available for users. This becomes the main reason to overcome the problem of proprietary software with open-source software, because of the high availability and accessibility of the open-source code to all the programmers.

The following listed licenses provide an understanding of the software licenses.

• Software Licenses:

The license is one which allows the developers to make modifications to the software with their own ability. There are five most well-known licenses:-

1. MIT (Massachusetts Institute of Technology) License which is OSI certified.
2. GNU General Public License (GPL) 2.0 which is most widely used.
3. Apache License 2.0
4. GNU General Public License (GPL) 3.0
5. Berkeley Software Distribution (BSD) with very least restrictions for usage.

The open-source movement was started in the year **1980s** with **Richard**

Stallman who is the developer of the **GNU**

be altered or make a move to a different

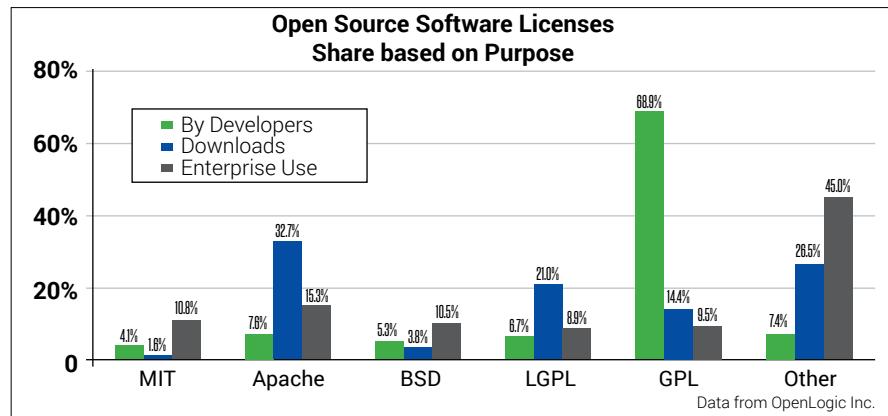


Fig. 1 : [1]

general public license model (GPL), holds the software which can be modified freely, so that any changes made in the software should be updated in the open-source community too. According to open-source guidelines, in this software, the source code is available at free of cost or with a minimal cost so that the software can be installed and used. This model was introduced to show that users can also help in designing new software products.

OSS will be always released under a license that has been certified to encounter the motives of Open-Source Definition. The Open Source Definition was also primitively acquired from Debian Free Software Guidelines (DFSG). This basis includes right:

- To redeploy the software without any kind of restriction
- To access the source code;
- To revise the existing source code;
- To again deploy the revised version of the software.
- To be against discrimination.

To know that, the source code is a dedicated language that grants the software developers to design and revise the computer programs. If there is no legal access to the source code, then the program cannot

computer.



Fig. 2 : [2]

• Benefits

- **Cost-effectiveness/Lower Cost:** Open source does not receive any kind of license fee in general or may cost less price for the software than proprietary software. This becomes one of the main reasons to adopt open-source software in business firms. This becomes for enterprises to explore software solutions.
- **Flexibility:** A developer/ user can have the standard software and get access to it, also he can make any kind of modifications and redeploy it in the business needs. The programmer can add any

particular functions to it. This is the reason why open-source is more flexible. Since it's flexible, it is also more secure because the errors can be identified and fixed for reuse.

- **Agility:**

The action of every technology, business firms, and their needs keep on changing rapidly, it is also expected that the software also changes. But the proprietary software delivers the updates slowly and asks the customers to use it based on their rules. In open-source, all these changes are made very quickly and are made available for the users. This is all done through the agile process criteria that are mentioned which make changes quickly and are natural.

- **Reliability and Quality:**

After looking into the enhanced quality of the software, it can be trusted that for the better use of the software. This works on more consistency and also has good quality. This is independent of the company that is holding the software. Since the errors can be fixed by many numbers of developers it is more reliable.

- **Disadvantages:**

- This software's interface is not so user-friendly.
- Users in business sectors need to be trained to use this particular open-source.
- Due to the availability of the source code, the hackers can find the vulnerabilities and leave those loopholes for software exploitation.

Major Applications-

1. Business sectors:

FOS is having a vast application in business sectors. Due to its low cost and free availability, the business can acquire huge amounts of profits and use them. In the case of proprietary software, they expect to invest the capital and afford money for software.

Businesses can make use of this customizable feature of the software by making modifications to themselves and use in their business homes. There will be no

need to wait for original vendors for further improvements in the software.

2. E-Commerce:

Open-source provides more flexibility and digital commerce solutions to run the business online. E-commerce sites can use the open-source and customize their selling platform and take care of the sales by giving good and user-friendly platforms. Some examples of E-commerce applications are Magento Community Edition, osCommerce, OpenCart, PrestaShop, etc.

3. Bigdata:

SUSE Linux Enterprise Server 11 SP2 is open-source which provides a flexible and ideal platform in deploying Bigdata Solutions. It is used to analyze the data of huge volumes at high velocity. This particular software is designed to process the huge amount of data sets of all varied data effectively and this provides the maximum value.

- **How do education sectors get benefited by this?**

- Open-source software has become a large application in the research and education sectors. It has a great impact on learning.
- The open-source E-learning platform is now evolved as a most important and feasible solution in educational institutes.
- It helps future programmers to learn about how the software works by showing the flexibility of the open-source.
- It is an advantage for the institutes that, due to the absence of license fees, the education sectors can adopt the FOS in their institutions to avoid the large sums of capital on patented software.
- It allows programmers from different institutions and universities, organizations to contribute freely to projects.

The main drawback of open-source impact in education is that it becomes noticeable during the implementation of the software. This source code may become unrelated to the end-users if the software is not useful for them.

- **How effectively can a New open-source software aim to reduce Cybersickness in VR use?**

- Cybersickness also called motion sickness is the tenderness that

is caused due to Virtual Reality. When this VR includes a lot of applications, one among those applications is in video games. During these VR games, due to the many activities, the body may undergo cybersickness and there might be a need to balance our body. This cybersickness can become the major barrier to the evolution of virtual reality and augmented reality technology.



Fig: 3 [3]

According to new research at UTSA (The University of Texas At San Antonio) have introduced GingerVR, the first Open-Source Unity software tool kit which is used by developers to use the evaluated techniques and new solutions to reduce Cybersickness in the future of extended reality environment. This GingerVR can be implemented on any applications like VR gaming technology, enterprise applications, etc. XR (extended reality) will be for the higher-level digital content that can be introduced inside the smartphones by companies like Microsoft, Samsung, Google, etc. this XR is seen as the optimized one for entertainment.

- It is very hard to check on a person suffering from the symptoms of Cybersickness, with a huge range of sensitivity it is noticed according to the technology that there are more than half of users who suffer these symptoms.
- This GingerVR was named as it became an antidote for nausea- that is the most common symptom of cybersickness. This can also include fatigue and disorientation.
- According to John Quarles, GingerVR can meet the Cybersickness gap in VR, where OpenXR cannot address that

- gap.
- This particular tool kit fulfills eight reductions in Cybersickness approaches. They are packed inside the repository of open-source to make the integration easier. Now, all these techniques are very simple and independent which is a default in Unity projects.
 - Researchers are also trying to add new reduction approaches that can be easily built-in to GingerVR. Also, Quarles who is the professor and a student Ang both are recently working on automated real-time detecting and predicting software to reduce the Cybersickness framework in the GingerVR toolkit.
 - This package can help the researchers who are working on a better understanding of being affected by cybersickness and can reduce it. Based on the user's feedback Unity package can come up with much more cybersickness reduction techniques. This work was supported by Intel and was funded by the National Science Foundation.

• **Best open source software so far? Comparative study.**

Most Widely Used OpenSource Software.	Details
1. Mozilla Firefox	<ul style="list-style-type: none"> ▪ This is one of the free and open-source software which was evolved by Mozilla foundation. ▪ This involves the great interaction platform with a mouse click. ▪ This particular platform clutches about 4.39% wide usage of the browser market share and it is also reachable for other Operating Systems like Android, iOS, Windows, and Linux. ▪ Licensed by: - Mozilla Public License, GPL. ▪ This is written in C, C++, JavaScript, Rust, CSS, HTML languages.
2. LibreOffice	<ul style="list-style-type: none"> ▪ It is also a free and open-source office suite, which was introduced by The Document Foundation. ▪ This is used for making the PowerPoint presentation, Excel sheets, and documents. ▪ Compared with Microsoft Office, which is not available to all the users due to its pricing criteria, LibreOffice is completely free for all the users, and this includes a large number in the community of contributors. ▪ This is also available for many other Operating Systems like macOS, Linux, and Windows. ▪ Licensed by: - MPLv2.0 (secondary license GPL, LGPLv3+ os Apache License 2.0). ▪ This is written in C++, XML, and Java languages.
3. GIMP (GNU Image Manipulation Program)	<ul style="list-style-type: none"> ▪ It is a free and open-source product that is known as a raster graphics editor that allows users to use it for editing the image, converting it from one image format to another. ▪ This was introduced by The GIMP Development Team. ▪ This is written in C language. ▪ Licensed by: - GPLv3+ ▪ And it is also available for Operating Systems like Linux, macOS, and Microsoft Windows.
4. VLC Media Player	<ul style="list-style-type: none"> ▪ This media player software is well known open-source software or the free software. ▪ VLC player is used to playing video, audio, or any media files. It can also access the discs, webcams, and many more. ▪ This also allows us to improve the media files for any of the hardware configuration and give access to customize the designs. ▪ It can also run on many Operating System platforms like Linux, iOS, Windows, and so on. ▪ This was brought by VideoLAN developers that were written in C, for GUI: C++, Objective-C, Swift, Java Bundled Extensions. ▪ Licensed by:- GPLv2.0 under LGPL-2.1
5. Linux (operating system)	<ul style="list-style-type: none"> ▪ This software was developed by Community Linus Torvalds. ▪ This is the most popular and commonly used open-source system that is freely available for all users. It is often packaged in a Linux distribution. It is mainly based on the command-line interface. ▪ It is likely written in C and Assembly language. This software is also called GNU/Linux by Free Software Foundation. ▪ Its default user interface is Unix shell. The platforms are Alpha, ARC, ARM, Unicore32, Itanium, and many more. This can also run on embedded systems. ▪ Licensed by: - GPLv2.
6. Python	<ul style="list-style-type: none"> ▪ Python is one of the most commonly used programming or scripting languages. This is more readable. ▪ This was developed under OSI-agreed open-source license so that it's freely available for everyone to use. It is authorized and licensed by the Python Software Foundation. ▪ This is available on many Operating Systems like Linux, macOS, Windows, etc. ▪ This platform is also used to create many web applications and provides easy access to users.

Other examples of open-source software:

1. MySQL:

It is one of the most popular open-source database software, it holds about 100 million copies of software downloads till today. This helps us to store the data with high speed, great reliability and also easy to use. It is a highly preferred choice in today's world for Websites, In telecom companies etc. Most of the world's best-known companies use MySQL instead of other patented software.

2. Apache:

It is a highly used HTTP server, which is also called an Apache web server. It was the first web server that was introduced to undergo the 100 million websites. It is kept and maintained under the Apache Software Foundation. It is widely available for all varieties of Operating Systems namely Linux, GNU, macOS etc.

3. BIND:

It is the most widely used DNS software over the internet. It also provides the most stable platform of all the organizations that can build the distributed computing system. This software is an open-source that can implement DNS protocols over the internet.

Conclusion:

Open-Source can become a good investment in the future. The upcoming software architectures are likely to be resting on open-source models. In the future, all web, cloud, and mobile technologies are likely to

	 Free software	 Open-source software	 Freeware	 Public-domain software
Definition	"FREE" is a matter of liberty, not price	"OPEN" doesn't just mean access to the source code	"FREE" refers to price, while freedom of the use is restricted by creator	"PUBLIC DOMAIN" belongs to the public as a whole
Ground philosophy	Social movement	Development methodology	Marketing goals	Copyright disclaimation
Ground rules	Four Freedoms https://www.gnu.org/philosophy/free-sw.html	Open Software initiative https://opensource.org/bsd		Creative Common Organization https://creativecommons.org
Free of charge	Not necessary	Not necessary	✓ YES	✓ YES
Covered by copyright law	✓ YES	✓ YES	✓ YES	X NO
Examples	   	 		

Fig. 4 : [4]

be predominantly rising on open-source architecture. We can conclude that OSS is one of the freely available, customizable, low costs and flexible software that is used in a wide range to make users less dependent on the patented software and to introduce newly modified software to people.

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Accelerating Innovation in Healthcare using Open Source Platform

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Open Source Software – An Introduction

Open Source Software (OSS) is a computer software whose source code and layout is freely accessible to anyone without any licensing price. Here the copyright holder grants users the right to study, vary, amend, enhance and transmit the software to anyone for any purpose. The word “open source” was introduced by the founders of the non-profit group “Open Source Initiative (OSI)” in 1998 with an aim of promoting and offering information regarding the benefits of open source software products. This organization continues to this day, with a large number of participants and growing a wide portfolio of associates, who are there mainly to support the current open source software products. Fig 1 shows various contributors of Open Source Initiative of the world.



Fig 1 : OSI Contributors of the world

Benefits of Open Source Software

In the present IT industry the term “Open Source” is commonly used with a high rate of acceptance to address important business requirements. It is an innovation engine, and can be seen as a framework of today’s enterprise. It is a collaborative software development approach that involves the integration of peer review

and process transparency to create freely accessible code.

Open Source relies on a network of thousands of developers and clients around the world to accelerate innovation. The free accessibility of the source code helps developers to create a fresh machine code to suit their needs or enhance the technology that enables many applications to be built and developed using the same model. Fig 2 shows various advantages of using Open Source Software.



Fig. 2 : Open Source Software (OSS) Benefits

Open source software for different applications

Open source revolution began off as a philosophy for software development in the late 1990s, the world has changed. Effective open source projects draw on the hard work of eventually thousands of volunteers who committed to give up their effort to design something amazing. An accessible system of development such as this has some significant benefits. OSS is perhaps more secure because new releases are scrutinized by people from around the world, and bugs are reported and quickly addressed. Fig 3 depicts some of the important OSS applications.



Fig 3. OSS Applications Platform Development Tools and Infrastructure

Role of open source software in healthcare

Healthcare is dynamically growing through interaction, record-keeping mechanism as a source of decision-making support, thereby playing a significant role in medical service. Open source software provides versatility and scalability to healthcare organizations in their health IT systems, thus allowing them to engage in the latest IT innovations in health sector. Health IT infrastructure is the basis for all that happens in a healthcare firm, from quality assurance and patient protection to financial efficiency and economic

intelligence. Although many different health IT approaches will promote success, ensuring that an enterprise has versatile, scalable, and future-proof resources at its disposal can minimize the risk of being stuck with obsolete capabilities.

OSS is one advanced way that IT infrastructure costs can be minimized by healthcare providers while remaining flexible enough to implement new IT technologies that will enable for future progressions and potential changes in patient care and business activities. Open source promotes collaboration among suppliers, developers and providers through sharing of source code to create ever-changing and upgrading infrastructure technologies.

This collaborative approach has the potential to introduce technical advances far faster into the health-care space than independent development. Open source allows software to be created or modified by the organizations to make it usable and interoperable. It will help healthcare providers resolve many of the data interoperability issues that have complicated the sharing of health information between electronic medical records and other healthcare IT platforms. Interoperability meets the needs while at the same time increasing the level of care provided, enhancing the effectiveness of healthcare and even economic opportunities. Fig 4 shows the gains of interoperability in healthcare sector.



Fig 4. Interoperability in Healthcare Sector

Need of open source in healthcare

Open source is the best approach to rapid health IT innovation that will aid healthcare to overcome some of its major technological obstacles, such as compatibility and security. It also offers opportunity for organizations to develop new technology while still using legacy applications. Doctors consult alongside other doctors and experts, because having more professionals working on an issue increases

the likelihood of discovering a solution faster. Entities cannot invest the time or resources required to tear out and rebuild their entire infrastructure. Some of the benefits of using OSS in healthcare services is shown in fig 5.



Fig 5. Benefits of OSS in healthcare

Open Source Software - Is secured or not

Open source justifiably raises security risks in healthcare. Healthcare firms do not build on community-based open source since it is not generally secured and supported by businesses or organizations. Open source code must be "enterprise grade," until it is used in a commercial setting by healthcare organizations. Enterprise grade can be used effectively in a healthcare environment, since a vendor takes the open source code and makes it safe for business. Many people working on the source code means that after a cyber-attack developers can easily change the code and enhance security, enabling organizations to be more vigilant in their network protection.

Open source lets organizations to discover various technology possibilities without having to replace everything, while investing only in the open source license and the developers that they need. Open source allows healthcare organizations to use proprietary solutions where necessary and add flexible open source software to that technology.

Proprietary and open source solutions work together as the developer can change the open source solution to be consistent with a proprietary solution by getting access to the source code. Providers need to implement open source in a manner that enables the organization to build on it and gain the benefits of technological advances as well as preserve legacy solutions that need not be replaced urgently.

OSS encourages the advancement of community in the medical field. Fig 6 shows some of the top Open Source Softwares

available in healthcare sector. In his article we are going to discuss about role of Open Source Electronic Health Record Agent in the health care sector.

- 1 • OpenEMR
- 2 • Open Clinic GA
- 3 • OpenMRS
- 4 • One Touch EMR
- 5 • HospitalRun
- 6 • Bahmni
- 7 • Advanced Hospital Management System
- 8 • MedKey
- 9 • VistA
- 10 • Open Hospital

Fig. 6 : OSS in Healthcare Sector

OSEHRA – The Open Source Community in Healthcare

Open Source Electronic Health Record Agent (OSEHRA) is a non-profit organization committed to accelerating revolution in software and associated technology for the Electronic Health Records (EHR). It promotes an open, collaborative group of developers, users and businesses involved in the advancement of EHR software and health information management. The Veterans Health Information Systems Technology Architecture (VistA) of OSEHRA is one of the major open source software systems available for healthcare. It is the widest available EHR implementations and provides support for imaging, inpatient and outpatient care. Fig. 7 depicts the OSEHRA VistA platform.

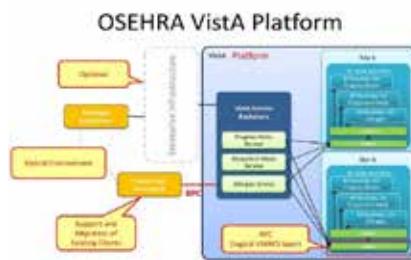


Fig. 7 : OSEHRA VistA platform

OSEHRA community organizations offer developers an official place to collect resources, and participate with other developers to ask queries and discuss current developments in source code. According to OSEHRA, most present [VistA] distributions pre-date the development of OSEHRA VistA, which was developed to satisfy the need for a popular reference version of VistA to run the entire community.

OSEHRA adopts the fundamental objective of the OSS development in the healthcare sector by absorbing valuable distributions into the main source code of VistA. OSEHRA continues to incorporate advancements submitted by the VistA developer team. Key VistA distributions comprise OpenVista, FOIA VistA, RPMS and vxVistA. These distributions, along with others, offer numerous open-source solutions for health-care organizations looking for specific features. Fig 8 shows the relationship among the VistA contributors.

Conclusion

Open source provides healthcare organizations with full control of their IT infrastructure. Healthcare organizations benefit immensely from having greater flexibility over their IT technology strategies, because they can create a scalable IT

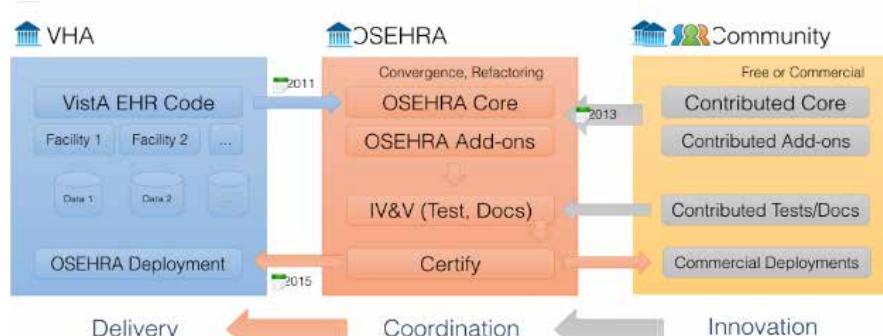


Fig. 8 : Relationship among VistA contributors

network around what they already have in their technology and what they plan to incorporate in the future. Open source remains to be a cornerstone of health IT services, which plays a significant role in IT management technology creation and growth. It also encourages companies to adopt emerging technologies in a way that is forward-thinking yet remaining compliant with existing solutions.

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An Exploratory Study on Free and Open Source Artificial Intelligence Toolkits

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The term “open source is primarily related to software, whose source code is freely accessible to users other than the developer for examination, use and expansion”. In some ways, the churchly part for internet’s boom is the free sourcing movement, concentrating much of the hardware, software and protocols that backbones global communications infrastructure and promote free sourcing, transparency and the power of conglomeration. Artificial Intelligence is a “territory of computer science that goes behind the formation of intelligent machines which can work and react like a human”. In the technology industry, AI is viewed as a key part. The center aspect of AI is Machine learning. This article is essentially centering about a diagram of a portion of our preferred “free and open source artificial intelligence software”.

1. Introduction

The propelled procedure of a machine to settle on choices based on rationale includes the Artificial Intelligence innovation. The production of “conversational chatbots, self-driving vehicles and recommendation systems unmistakably features the worldwide effect of AI”. It overruns in numerous pieces of our lives and is viewed as probably the sultiest region of innovation research. Frameworks that have fused AI advances go about as a coded automated framework as well as begin suspecting like people. They are too “fueled to the level that they can execute undertakings like; arranging, planning and deciding”.

1.1 Drivers for Open Source

Openness has been the “most noted reason for the IoT revolution, leading to experiments and analysing the technological futuristics” [1] [2]. It helped “creating many interesting applications, ranging from automated kettles to data analyzers”.

The other elements behind open-source establishment:

2. Artificial Intelligence Key aspects

The “key parts of artificial Intelligence solutions are as per the following” [3] – [9]:

- (i) Automation
- (ii) Natural Language Understanding (NLU) and Natural Language Processing (NLP)

(iii) Machine Learning

2.1 Automation:

Artificial Intelligence (AI) is in some cases mistook for computerization (Automation), and the terms are regularly utilized reciprocally. At the point when robotic process automation is joined with components of AI, for example, AI, the outcome is known as intelligent process automation (IPA). An IPA device is amazing in light of the fact that it permits us to receive both the rewards of robotization – sped up, productivity, time-reserve funds, and capacity to scale – with the experiences, adaptability, and preparing intensity of AI.

2.2 NLU and NLP.

The two ideas manage the connection between natural language (as in, what we as people talk, not what PCs comprehend) and artificial intelligence. They share a shared objective of comprehending ideas spoke to in unstructured information, similar to language, rather than organized information like insights, activities, and so forth. Keeping that in mind, NLP and NLU are contrary energies of a great deal of other data mining methods.

2.3 Machine Learning:

Machine Learning [10] – [11] is the state of art technology where it can analyze and model the data. Machine Learning

algorithms are examined in two ways: Learning and Inference. The prime aim of the learning step is to describe the data which is called as feature vector and aggregate it in a model. The learning algorithm selects a model and actively searches for the model's parameters. The Learning stage is more time consuming and the inference step uses the model created by the learning step to mold it and project an intelligent model.

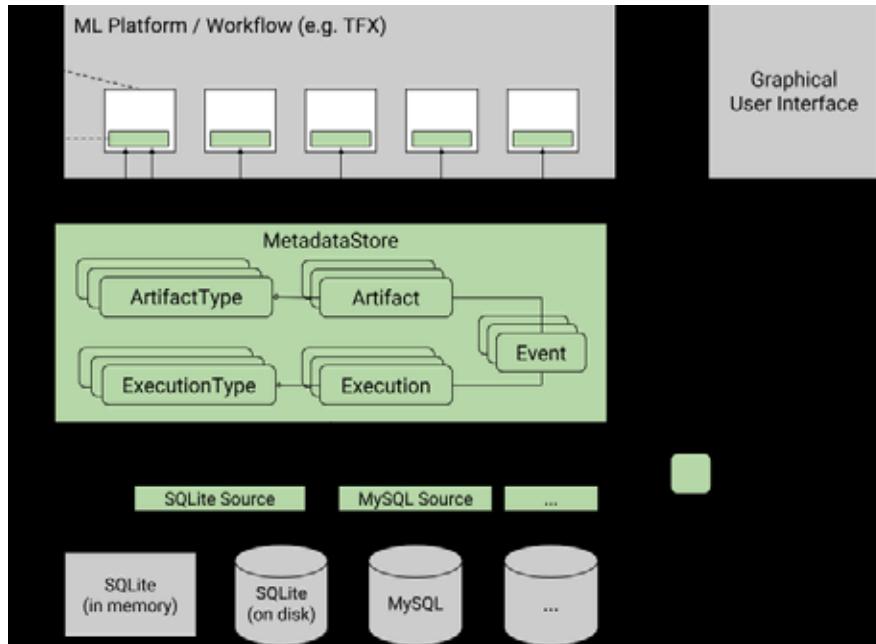
3. Top 5 Free and Open-Source Artificial Intelligence Software

In this segment, you ought to have the option to accumulate the information and comprehension of “free, open-source artificial intelligence software”.

- i. “Tensorflow
- ii. IBM Watson
- iii. Apache Mahout
- iv. OpenNN
- v. Scikit-learn”

3.1 Tensorflow

The second machine learning framework created by Google is Tensorflow. This is used to “design, build and train machine learning models”. Tensorflow uses various libraries to do a numerical computation, but these computations are executed with data flow graph. The graph contains nodes and edges, where nodes represent “mathematical operations and edges represent the data,



which are generally a multidimensional arrays or tensors, which are communicated between the edges". Tensorflow enables to develop and deploy the models with ease and use them in the field of machine learning. Automatic differentiation is one of the important properties of Tensorflow since it makes it easier to implement the neural network concept of back-propagation.

3.2 IBM Watson

IBM Watson is a "free, open-source AI programming that gives power to the organizations to accelerate the exploration and disclosure, compute interruptions, and improve co operations". A few organizations are exploiting this product to consider their information, accumulate protected innovation, bits of knowledge, and foresee their future execution without any problem. By utilizing cloud-based IBM stage, associations can settle on progressively educated choices.

3.3 Apache Mahout

Apache Mahout is a "distributed system that proficiently handles the preparing of the information". You can capably utilize this free AI instrument for information mining related to "Hadoop. Facebook, Foursquare, Twitter, LinkedIn, and Yahoo" are generally enormous enterprises that utilize this product for information mining.

3.4 OpenNN

OpenNN is the "free, open-source artificial intelligence software that is written in C++ programming language". It gives a

3.5 Scikit-learn

Scikit-learn is the "free artificial intelligence tool that gives an assortment of regulated and solo learning calculations through a steady interface". It is viewed as a straightforward and productive device for information mining and information examination.

4. THE ROAD AHEAD

Artificial Intelligence impacts some certifiable applications like "facial recognition, language interpreters, and associates like Siri, Alexa and Netflix". AI is working for buyer applications as well as offers huge advantages for organizations and economies by adding to profitability development and economies. Over different businesses, Artificial Intelligence is displaying the breadth of innovation applications. You will discover its capacity in "Robotics, human services, money, travel and transportation, Google: brilliant applications, internet based life, online business, and promoting". In everyday administrations, Artificial Intelligence assumes a significant job. We expect significantly more utilization

higher preparing speed. For cutting edge examination, "this application fills in as a free neural system library. In vitality, wellbeing, and promoting, this application gets to the base of numerous applications".



of this innovation later on because of fast development in innovation and advancement. The previously mentioned free and open-source man-made reasoning programming arrangements are fit for performing successive and mechanized undertaking dependably.

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Post COVID-19 Education Scenario: Digital Transformation of Pedagogy

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During the tenure of COVID-19, while the academia is fighting with a gigantic educational crisis; global education scenario is facing potentially one of the paramount threats in human existence. Every private, public and government educational institutes has been impacted by the COVID-19 crisis. Schools, colleges and universities have been closed and-or are delivering all education online. Education during the lockdown period has automatically shifted to the default online mode. For the time being, other academic activities like conferences, seminars, workshops and symposiums have been cancelled or are turned into a series of webinars. The certain shift towards online was being observed within a very short span of time. As a result, it has accelerated new forms of pedagogy and remarkable initiatives from individual academics and institutions have emerged. This paper is intended to explore the obstacles behind digital higher education, the effectiveness / new normals of this blended learning, offering elements of online learning. The paper also comprises of the facts, lying behind the sustainable and long term triumph of this tectonic move in pedagogy.

1. Introduction

Since March 2020, the COVID19 pandemic has kept worldwide, 1.7 billion enrolled students out of their schools; which is all about 80 % student's from 162 countries. During the months of February to April while most of the students observe a flurry of assessment and curricular activities; are constrained to their homes. Circumstances have mounted a tremendous pressure on students and on academic institution, how to recoup the loss of academic time?. What is the possible way to reinvent their teaching and learning? There was no way, except to espouse online teaching and learning mode. And then, there is a paradigm shift in pedagogy from traditional to online mode has been observed. The entirely new, fully technology driven education scenario emerged as an online education, where in the education is taking place over the Internet for both learning and teaching processes. Online education is superset of distance education, where learning takes place not in a traditional classroom but across the distance. This distance education is an umbrella term for any mode of learning, whether it can be distance learning, online learning, e-learning,

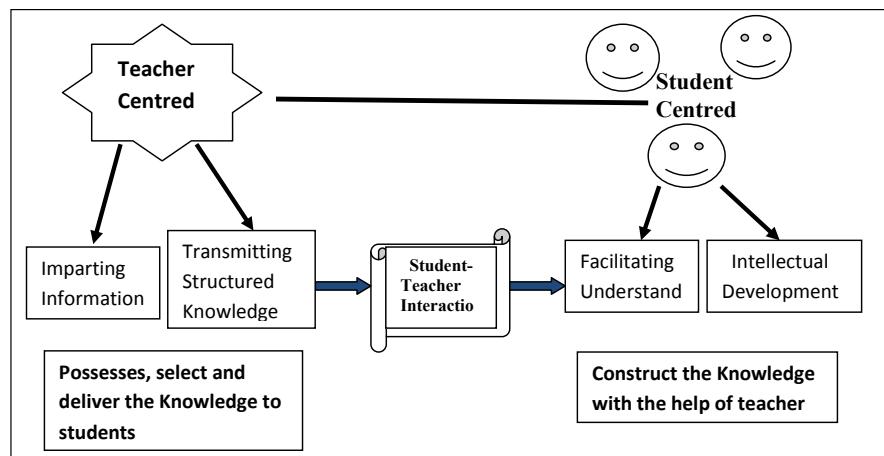


Fig. 1 : Continuum of Academics' Thinking about Teaching

m-learning, or virtual classroom etc. Prior to evolution of this e-learning in education system, over 2000 years of human civilization there were three waves of pedagogy;

- **First:** Gurukula System with a concept of one master being involved in teaching process with few pupils.
- **Second:** University System where our traditional teaching process is being evolve and get modified one teacher

and many learners at a time.

- **Third:** Distance learning across the globe where one or many learners are passively involved with one master. Fig. 1, illustrates conceptual continuum for the potential shifts in relationships that exist among the teachers, students and consequential learning perspective i.e. teaching, content and knowledge. This continuum is categorized with two extreme

polar entities teacher centred versus student centred.

Where, the continuum of teacher's side entity actively selects course content and delivers directly to their submissive students. Students discover the course content by actively engaging themselves at the reverse side of the continuum. Teachers act here as facilitators or change agents to the students who vigorously engaged themselves in content discovery and construction of knowledge. Phenomenon of teaching is known to be happening between these two extreme ends. In this educational experience learner/ student presumes an active role where as the teacher acts as both tutor and presenter.

Due to technological inventions, the development of traditional ceremonial education seems to be restricted to early development stage and traditional classroom panorama is fading drastically. Now, the concept has shifted to a student centred education paradigm, distance education has emerged with greater flexibility in relation, the learning process can occur anywhere any time.

Educators and information technology developer's has started playing pivotal role in the paradigm shift of pedagogy. All the initiatives taken for online education get embedded in institutions' policies and the portfolio of high quality online or blended learning offerings. If we will talk about Indian higher education scenario, at present online enrolment ration is 26.3 %, which is expected to be increased up to 40% by the year 2023.

2. Elements of Online Teaching & Learning

Tectonic shift of the pedagogy from tradition to online will depend massively on several online teaching and learning elements for its sustainable and long term triumph. Among them seven major elements are shown in figure 2.

▪ Interesting & Engaging Learning

Online teaching and learning is neither just library of e-contents like e-lectures, e-books, e-journals, e-periodical, video nor digital files get converted from the class notes. But, it involves the contextualization and byte sizing of the content into high quality learning materials to make online learning more interesting and more engaging; Success of this digital pivot will require rare skill sets; for that educational institutions need to establish collaboration

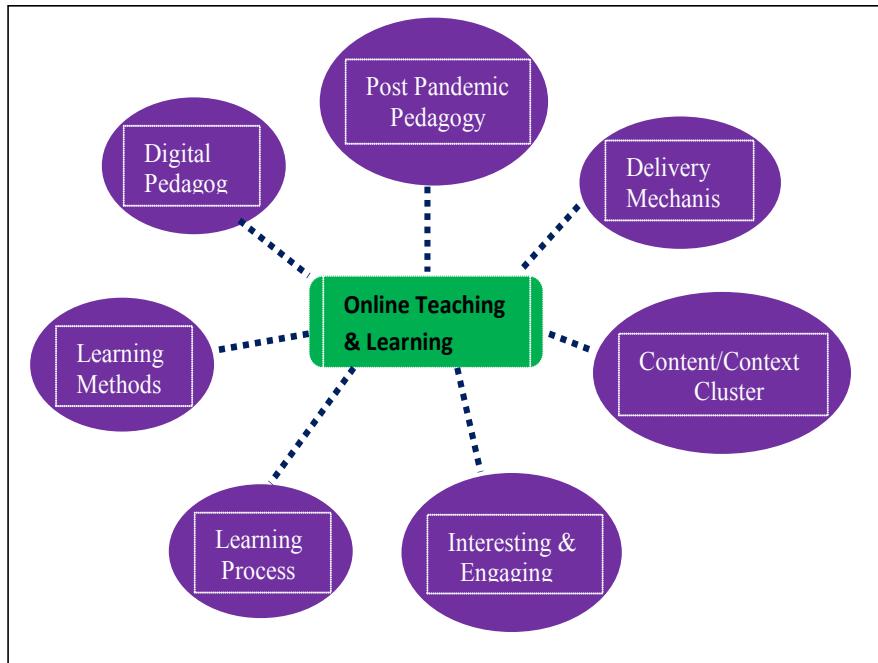


Fig. 2 : Basic Elements of Online Teaching & Learning

with information technology experts of the fields.

Digital Pedagogy

Information and communication technology plays an intermediary role for online delivery of subject matter covered in class room. Faculty should be equipped with required technical skills or supported by collaboration with information technology experts in the way forward. Digital pedagogy requires immense understanding of learning science and its applications; unsighted replication in any way is not a good idea.

• Content Context Cluster

The classical pedagogy of our traditional teaching and learning comprises of classrooms with diverse groups of typical learners. Where the content / context cluster as a mean of the class' is being derived by subject experts and teacher's best with his prior knowledge and collective ability. Then the crafting of teaching and learning transactions takes place in constructed mean. This pedagogy cannot be practically implemented to work for online learning; where the learner's profile is of diverse nature. Then context and content of the teaching needs to be weaved into particular program design by spending much more times by the academic institutions.

• Learning Methods

Emerging computer technologies like

artificial intelligence, deep learning and machine learning can provide the better scientific models to create improved learning methods and plans in a customized way. Quick adoption of these by educational institutions may conquer the trouble of contemporary digital education.

• Delivery Mechanism

Pedagogy of online teaching and learning is not all about only one model but it comprises of aggregation of various existing models. It is indeed an art of science and technology that combines content delivery, analytics of individual behavioural, learning psychology to cater with specialized teaching and learning. That will able to assess the weight of learner's journey and progress as well. The success of online learning, while working with specialist and subject experts, widely depends on the delivery mechanism of the pedagogy.

• Learning Process

Learning is a process of inducing gradual changes in the behaviour and action of the learners. Through this process learner observes incremental changes in this mental models and in his thinking that was being induced gradually step by step through conceptual strengthening and deep understanding. In each episode of learning, learner's acquired knowledge will get refined; As a result, gained knowledge can be utilised

or applied by learner in any situation of his personal and professional life at any time anywhere.

Earlier our traditional teaching and learning process was teacher centric, where as the online is focused towards learner. Online learning process is technology drive science of learning that includes various models, technical tool and methods and panacea associated with online delivery. Teachers actively involved in online mode of teaching and learning needs to be retrained and familiarize massively; so that they can become good classroom teacher or experts with content and context delivery; also they can deliver equal importance to the art of teaching and learning in digital periphery.

Post Pandemic Pedagogy

It is widely accepted truth that education during the lockdown period or during pandemic has automatically shifted to the default online mode. All educational ecosystems will get altered and a drastic shift in pedagogy can only be assumed.

(i) Dramatic Increase in Blended Learning:

The efforts being made by our teaching fraternity towards the remote or distance teaching and learning; do not bear resemblance with traditional education. To develop high quality online teaching and learning programs, it requires standard input operations along with time and the momentous investments to execute these programs. Many of the educationists are anxious about this rapid shift in remote teaching and learning as it may cause the failure to online education. The real scenario of virtual classroom and future benefits of COVID 19 necessitated distance teaching and learning education. Its will actually get tested when teachers and students will return to their physical classrooms and when face to face instruction of traditional teaching methods will be layered into virtual instruction methods.

(ii) Institutional Priority for Online

Education: There are only few academic institutions left behind in utilising the online education before COVID 19 pandemic. And many of them have never kept online education in their institutions' strategic planning. But this opinion will get changed after COVID19. In near future, people from academia like trustee, principal,

provost and **deans** will understand the importance of online education that it is not only a prospective source to generate new kind of revenues. Instead, **online** or distance education will also acknowledge regarding academic stability and institutional resilience as core to every school's plan.

(iii) Online Program Management

Partnerships: COVID 19 pandemic has taught a big lesson to the academic institution that willingly or unwillingly have started outsourcing the core capabilities of academia. Every educational institution is known by its core capability of teaching and learning. Most of the institutions are efficiently able to manage COVID 19 requirement of remote teaching and learning by investing in learning design resources. Institutions have hired instructional designers and also reorganised their campus learning organizations into integrated units. It is tough time for those Institutions that are fully dependent on OPM providers to execute online teaching and learning. Partnership of educational institutes with OPMs will get increased due to expertise of OPMs in digital marketing and market research for online programs and the partnerships of institution with company will remain sustained. Such a partnership of OPMs with academic institution for developing and running online programs will result remarkable deficit in the revenue share of academic institutions.

3. Post COVID-19: Change in Education Scenario

A gigantic educational crisis will definitely alter our academic world and as well as our global perspective. It will be interesting to analyse post crisis, what remains of all the initiatives taken from online education, and to blended learning offerings that come out of this period. Some remarkable lessons will surely be emerged when the world is free from the pandemic.

An interconnected world to educate

citizens: Our issues and actions no longer remains isolated thing in this globally interconnected world and COVID 19 disaster has illustrated it very well. It is the demand of forth coming decades; academicians need to understand the gravity of interrelatedness and well

skilled to navigate their work and their differences in collaborative way across global boundaries. Academicians need to continuously enhance and ready to upgrade their technical skill with emerging new technological changes.

- Redefined the role of educators:

In our traditional mode of teaching, a perception prevails for long time about the educator as a resource of knowledge, imparting the wisdom to their students; this model no longer is persistent for online education. It then becomes highly essential that educator's roles need to be redefined in classroom or in the lecture theatre, so that knowledge imparted by him will be easily accessible by learners with capability to learn technical skills, through electronic gadget massively used for online teaching and learning.

Futuristic life skills needs: COVID 19

pandemic is increasingly changing our global environment, so it became essential, how effectively our teachers are able to navigate the skills like resilience and adaptability, imagination, communication and teamwork, besides understanding and emotional intelligence. And being competent to work across demographic lines of differences to harness the power of the collective through effective collaboration.

▪ Freezing the technology for

deliverance of education : Educational institutions across the world has one of the visible observation during the COVID 19 pandemic, they are bound to use the suite of available technological tools to create content for distance learning for students of each age groups. Academia across the globe is continuously experiencing recent possibilities to execute the things differently; as a result education is accessible for all the students with potential benefits and greater flexibility.

No doubt the entire education scenario has been changed drastically, if we talk about the aspects related with complex and waste higher education system, it has miles to go to achieve the remarkable position. In the digital scenario of higher education, there has not been such a wave of online education, yet, several hindrances are lying specially;

- Non availability of ICT infrastructure to the remote learner,
- Lack of digitally equipped trainer/ subject expert,
- Problem associated with transposing of classroom to digital medium by some of the practitioners',
- Lack of efficiency or effectiveness with online or live classes
- Staggered rate of completion associated with digitalization of higher education,
- Nonexistent rigidity of evaluation,
- Knowledge improvement and competency in learners is not established.
- Lack of contextual delivery
- Same mechanism of delivery fit for all.

In a nut cell, we can say that online educational models can be successfully established depending on two sacrifices made both at teachers and educational institutions end

- Faculty to avoid the practicing switching from classroom to online mode without applying proper digital learning science.
- Educational institutions need to provide proper technical training to their teacher and make an effort to redesign the educational needs for the newest online trends of the time.

Conclusion

COVID-19, a gigantic educational crisis

will definitely teach us regarding how online education desires to alter to be proficient to better plan our students and educators. It will definitely well revolutionize our academic scenario and our universal viewpoint. Certainly, after the post COVID-19 pandemic era, traditional / conventional or the offline education models and pedagogy will not be vanished nor become outmoded. Certainly, they will stay alive. However, emerging online modes will get combined with classroom teaching i.e. blended learning; will be the new normal. Teachers and Institutions will experience judicially the blending of two according to the content and the context. In order to well establish online education models sacrifices are needed at the end of teachers as well as by the institutions.

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Global survival and success of OSS based on DFSG, neither proprietary nor closed source

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OSS is an acronym of Open Source Software. Any type of software whose source code is available publicly for studying/ changing/ modifying/ improving, with an unique license agreement given to programmers, can be classified as open source software. FS is an acronym of Free Software. Richard Matthew Stallman (a American free software movement leader and programmer) defined the free software at the context of liberty and not on the price of it, which is an upholder of four necessary freedoms of free software (as defined by the FSF). DFSG is an acronym of Debian Free Software Guidelines, formed mainly by Bruce Perens with inputs fetched from Eric S. Raymond and others.

The article on OSS, discusses the beginning point of the story and how it evolved over the last many/few decades. It emphasizes on the step by step evolutionary process of OSS, the definitions/ terms of Open source, FS (Free Software), FSF (Free Software Foundation), OSD (Open Software Definition), DFSG (Debian Free Software Guidelines), OSI (Open Source Initiative), OSS (Open Source Software), FOSS/FLOSS (Free and Open Source Software/Free Libre and Open Source Software) etc. are studied with insights on the concept of license. It then throws lights on the proprietary softwares ideology, features of OSS and the comparison is studied as defined by the software taxonomy and a linear flow chart showing the evolution. The contributions of the software movement leaders who had given their precious time and put lot of hard work in the developmental process, to further upgrade OSS is beyond envision of the minds of normal beings in the real time. The methodology of the OSS is then focused with different working open source software development models accepted by the OSS developing companies globally. Lastly, it covers the pros and cons of OSS as compared to other software developing methods. Finally the factors responsible for the grand success of OSS, application of

open source cloud are seen in brief, with the future scope and hence the conclusion.

The ideology of free software began much before 1983, when officially Richard Stallman (founder of the software movement) led the free software movement (in 1983), and he has been credited with the concept of FS. The free movement was an organized movement at large by many computer people/ordinary people/ organizations or both to attain a specific goal they had set called the four important freedoms of FS user (human rights basically as set by FSF). They were to run the FS (freedom 0), to study and modify (freedom 1), to redistribute it to others in order to help (freedom 2), and distribute the modified free software to others (freedom 3). FSF, a non-profit organization was founded by Richard Stallman on 4 October 1985, for supporting the software movement and promoting the four freedoms of FS. FSF is not any profit making organization created to further promote the four freedoms of the users of the FS and all members of FSF adhered to it. This organization had a working principle based on copyleft rather than on copyright license type. Copyleft license type software means, the users are offered the rights to distribute the software (both source code/ binaries or related documents etc.) and even change it and preserve the same rights for the future usage in further derivation from the given software. Copyright license of software type implies that the users/ developers of such softwares (the source codes or the binaries or any other products related to the given softwares) have been deprived of any rights to distribute or modify it in any case. Free softwares do have free/open license type implying that, the users/developers do have the rights to redistribute and modify the source code or the related documents of the softwares etc. The term open source came into existence on February 3 1998 strategically in a free software movement session held at Palo Alto in California. Later on April 7, 1998 the

term was adopted by Bruce Perens, publisher Tim O'Reilly, Linus Torvalds and others. This action was taken actually with the release of source code of Navigator in January 1998 as the business companies never wanted to install the free releases. The open source movement was initiated by the MIT computation center with the manufacturing of a system called CTTS (Compatible Time-Sharing System). This triggered further more systems production (initially a system meant both the hardware and software, and there was not any difference between these two terms). This way open source movement (based on developmental method) achieved the momentum which finally segregated out from the free software movement (also called social movement) with the launch of GNU project by Richard Stallman in the late 1980s. [1][2][3][5]

Almost all open source software is free software but there have/had been exceptions at the context of open source license types which are at times made too restrictive in nature. It implies that though it is open source type license still it may not qualify to modify the source codes etc and use it privately. One example to quote is Open Watcom, which is not free for being restrictive in case of making any changes/ modification in its version further. Difference between the terms free software and open source lies completely in the freedom of the users/developers in software source codes exchange and modification in furthering the developmental process of the software. So both shared the exchanging of source codes but not modification in all cases. As they have this commonality of exchanging/ sharing of the source codes, both the terms are considered under an umbrella term called FOSS/FLOSS. FSF have taken this view that FS is basically a subset of OSS. [4][9]

Open source definition (OSD) was based on the DFSG formally adopted and composed by Bruce Perens. OSI came into existence on February 1998 by two founders- Eric S. Raymond and Bruce Perens. OSI is

considered as the marshall of the open source definition which functions as such to review and approve the licenses complying to OSD. To determine exactly whether the software is OSS or not from a given license, OSI has defined ten criteria basis which are as : (i) Free to redistribute (ii) Source code (iii) Derived Works (iv) Integrity of the author's source code (v) No discrimination against persons/ groups (vi) No discrimination against fields of endeavor (vii) Distribution of license (viii) License should not be specific to a product (ix) License should not restrict other software and (x) License must be technology-neutral. [11] Examples of open source/free software license is GNU General Public License (GPL) BSD License, Apache License, Mozilla Public License etc. A software license agree to give the rights to the users while in case of copyright law option, rights will be reserved. It is to be noted that the license type is actually based on a model which comply with the type of software being made like open source or free software or say proprietary. Global leaders of OSS includes: Open Source Software projects and contributors-Debian, Drupal Association, FreeBSD Foundation, Linux Foundation, OpenSuse Foundation, Mozilla Foundation, Wikimedia Foundation, Wordpress Foundation etc. They had held the OSI's mission and OSD 's definition by agreeing with the OSI affiliation. [4][6]

Proprietary software also called as closed source software is not a free software. [11] It implies that the owner who can be a single individual/organization has the copyrights, meaning that others cannot use it to copy/modify/ it. The source code is normally not available to others to change/ modify it. Such an example of a company, providing globally softwares is none other than the big gaint in IT, Microsoft and its various products from the days of single user operating system i.e. MS DOS (1981) to Windows 8.1 (2013) operating system etc.

Free Open Source Software (FOSS) implies that a software which is both free and open source at the same time which further implies the users of FOSS are free to use, copy, study and modify the given software in any way. The source code is made freely available to anyone to change/ modify it, if need be according to their need (Examples- Linux kernel, GNOME Desktop, Free Berkeley Software Distribution (FreeBSD) etc.) FLOSS (Free-Libre /Open Source Software) in brief

can be defined as software whose license grant its users the freedom to run the program, to study, and to redistribute either the actual or modified software program without paying any royalty to the earlier developer /s).

The features of OSS are those ten points basis on which, it has been classified as OSS, as mentioned earlier. If OSS is compared in the taxonomy of softwares, it can be put under the open source which is neither proprietary nor closed source. [11] OSS can be further divided into groups based on whether it is made by a corporation or a group, i.e. collaboration and sharing. The evolution of OSS is shown below as a linear flow chart: [1][2][4][5][6]

FS → FSF → FSD → DFSG → OSD → OSI → FOSS/FLOSS

Methodology of OSS:

Eric S. Raymond have distinctly suggested two models for closed source and open source softwares in his book/essay titled as "The Cathedral and the Bazaar" (in 1997). In the first case he took the software development process like that of building a cathedral with central planning, closed type organization, and a single process from beginning to end. The second case dealt with the step wise development of open source software analogous to a decentralized way, to build a coherent and stable system amid the babbling bazzar of many different sorts of things. Difference in the two style lies (according to Bar and Fogel) in that of managing the defects/bugs, and any request for new add ons, and the limitations of software development working conditions etc. In closed source it has been observed that the programmers spend much more time in just dealing and planning of these issues rather than on the mere development of the source codes. The development team is held under a tight time schedule constraint (such as deadlines to deliver and project budgets etc.) interfering with the technical matters of the software project. [4] [7]

In the open source software development, all these constraints are resolved either by process of integration of the users of the software in the development process or allowing them to build the whole software system themselves (in collaboration mode). Such an open source software project can start in many ways as: (i) from a individual effort (ii) from a group of individuals (iii) releasing the source codes of

a mature project and (iv) from forking of a well established project by a third side party/ body etc. to public domain. It all begins with the point of investigating a successful project normally and then the next step follows as an option with either existing project or the adoption of altogether a new project. In case if it's already in existence, the process leads to the execution stage straight way else to the intial stage (being a new project).

Different types of OSS projects:

- (i) Standalone pieces of source codes and libraries
- (ii) Dependable pieces of source codes
- (iii) Distributions (collection of softwares, examples are operating system like Linux distributions, such as Debian, Fedora Core, Mandriva, Slackware, Ubuntu etc). Other distributions are ActivePerl, the Perl, Python (with libraries) programming language meant for different operating systems and Cygwin distributions of open source programs made for Microsoft Windows.
- (iv) Other OSS projects are like BSD derivatives which maintain the source codes of an entire operating system, the kernel and all other core parts in an integrated system (version control and source control etc.) developing in one system as a single team
- (v) Book or standalone document project (example is Linux documentation project, which is a host of many other projects that provides the document aspects of the GNU/Linux operating system).

The development of OSS begins with the requirements collection. This is however not done before the project initiation always but they are based on the early release of the projects which we saw, when we studied the different types of OSS as mentioned above (pointed out by Robbins). Early prototypes (to enhance further discussion with the customers to gain more favourable attention and also changes in requirements etc.) are released in order to gain more number of customers for the OSS to survive else it will be the end of OSS project life (as pointed out by Abrahamsson et al.). In other words, OSS does not support to work on conventional software model like waterfall model, since traversing backwards is not permitted at any given point in such a model. Rapid prototyping, incremental and evolutionary development, spiral lifecycle,

rapid application development, extreme programming and the agile software process are used in both OSS and also in proprietary softwares. Basically OSS projects permits all agile programming methods as they are iterative and incremental in nature and supports traversal in the backward direction too. In other words, say already the OSS project is in design stage, but with a new pop up requirement change from the customer, will not hinder to incorporate that new feature though the project has already completed that phase of development. Other agile methods used in OSS are Internet-Speed Development (came into being in late 1990s) which works based on the distribution of development across the globe combining both spiral and waterfall model to provide builds on daily basis finally to develop the software at a high speed. Agile methodology supported collaboration, cross-sectional team work, early delivery to customers and a continuous improvement of the software (in 2001, 17 developers, Kent Beck, Ward Cunningham et al. altogether published the Manifesto for Agile Software Development, after they discussed on the lightweight development methods at a resort in Snowbird, in Utah). [7][8]

Tools of Glue used in OSS:

(I) Email is used as a means to communicate by the OSS developers and the users across the varying time zones globally (ii) OSS uses CVS (Concurrent Version system), SVN (Subversion revision control system) and distributed revision control system such as Git (used in Linux Kernel) and Mercurial in Python programming language (iii) Bug tracker tools to keep track of the defects raised in OSS (like Bugzilla, SourceForge etc.) (iv) Testing and Debugging tools: Preferably automated testing tools of integration are preferred, example-Tinderbox and debugger like GNU Debugger. Memory debugger tools (for memory leaks and buffer overflows) like XPCOM used in Mozilla and Validation tools like Splint are used in order to validate the piece of codes syntactically. (v) Package Manager/ Management System like RPM (Red Hat Package Manager) for .rpm file APT (Advanced Packaging Tool) for .deb file formats are used in distributed Linux OSS.

Preference of using OSS:

(i) Control of source codes on changes according to the need by the developers and users (ii) Publicly accessible on sharing basis inviting comments and criticisms to

further improve (iii) Security of source codes from the view point of correction of errors etc. (iv) Stability of source codes (v) Community of users and developers (vi) Low cost of marketing (vii) Better quality (viii) No vendor business (ix) Production of highly reliable source codes quickly (x) Interoperability with other businesses, computers and users and not limited by proprietary data formats etc. (xi) Anyone can spot and fix the bugs that might have been missed, by the authors of the source codes (xii) Difficult to hack

Pros of OSS:

(i) Easy to obtain OSS than proprietary softwares (ii) More users of OSS (iii) Lower cost of marketing and logistical services (iv) Production of reliable and quality software quickly and in inexpensive way (v) Distributable (vi) Easy to modify (vii) Durability (viii) Security (ix) Attracts more skilled programmers/users (support) (x) OSS is not dependent on original creator or the organization as such (xi) OSS has thousands (or more than it) of independent developers for testing and fixing the bugs (xii) OSS is flexible in the sense that it has modular system and can have customized interfaces (xiii) Supports innovation amid the large number of developers working in collaboration (scaling and consolidating) (ivx) Mix of diversity, corporate objectives and personal goals speeds up the innovation (xv) No commercial pressures on the developers to degrade the quality (xvi) Do not have to bother about complex issues of licensing and does not need anti-piracy issues too like product activation and serial number (xvii) Integrated management (xviii) Simple license management (xix) Makes money by providing online/onsite training and support to their open source programs [11][12][13][14][15]

Cons of OSS:

(i) Not easy to use, needs efforts or training, which will incur certain cost (example Linux) (ii) Compatibility issues of OSS with other softwares (iii) Non clarity of available functionalities of released versions of OSS (iv) The steps of methodology in OSS at times may not be well defined in some cases, such as system testing and documentation may be ignored (true in cases of small OSS projects, example SourceXchange and Eazel) (v) Late defect discovery (vi) Difficult to design commercially sound design model with OSS paradigm (vii) Technical requirements are met but not of the market (viii) At the level of security,

hackers find it easy to find the weaknesses or the loop holes of the OSS [4]

Factors responsible for the success of OSS:

(i) Project popularity and developer activity (ii) A comprehensive model of OSS success based on extrinsic (product related but not parts of product) and intrinsic (like physical properties of the product) attributes [13] (iii) Highlighting of the errors and flaws of design issues (iv) Understanding of the early major/minor releases of OSS (v) Impact of complexity on technical success (Feller and Fitzgerald 2012) (vi) Impact of license type on market success (Stewart et al. 2005) (vii) Time variant and Time-invariant variables (Subramaniam et al. 2009) (viii) Number of releases and downloads (ix) Extrinsic (product related) and intrinsic (physical properties of the product) attributes [13] (x) Structural complexity of a program (Gorla and Ramakrishnan, 1997) (xi) Algorithmic complexity of a program (Darcy et al. 2005) (xii) Modularity (Torvalds, 1999) (xiii) Size of user and developer base (xiv) Use of CVS, SVN or Git (for version control, storage of source codes and managing of development process) [12] (xv) Communication among the user and developer base by using email [14][15] (xvi) OSS tools used for IT (Information technology) and Service Management process administration [16] (xvii) Usability and sustainability of OSS (to adopt) [10]

Application of open source cloud:

OSS and technologies are used to build open source cloud. It basically constructs data centers which could be public, private or hybrid in nature with computing power, storage capacity to be shared across many applications to provide SaaS (Software as a service), IaaS (Infrastructure as a service) or XaaS services (to deliver anything, built entirely on OSS technologies). Examples are: (i) OpenStack started in 2010 jointly by Rackspace and NASA (ii) Linux containers (behaves as virtual machines) used for creating applications for the cloud relying on the functionality built into the Linux kernel and runs faster as compared to virtual machines (iii) Big Data and Internet of things are two users of cloud computing with tools being made using OSS technologies etc.

Some companies using/providing OSS:

Facebook, eBay, Google, Amazon.com, Ticketmaster.com, IBM, Internet Movie

Database etc.

Conclusion:

The users and developers in OSS projects works with a motivation, sharing their experiences and skill sets and hence it has not only survived mostly, but also continually racing the development process seamlessly with the time and variation in technologies. [13][14]

Future scope:

The future of OSS lies in seamless growth which has high potential globally across the varying time zones. With the quantum computers under the process of research and growth, it is unprecedented about the usage of OSS in the future time to come. It is also expected to watch the growth of cloud based OSS with advancement in technologies soon globally.

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About the Author



Jyotishmaan Ray

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Obituary



Mr. Kalyanasundaram Ganesan

Former Director of IT, Air India Mumbai, passed away on August 1, 2020, at Austin USA, while on a visit to his son Madhu Iyer. He is survived by his wife Mrs. Saraswathi, son Madhu, two daughters Sugandhi and Jayanti.

Mr. Kalyanasundaram was an alumnus of Indian Statistical Institute and a valuable and active member of the Computer Society of India. He had served as Director, Information Technology, in Air India, Bombay. It was always a pleasure to see the Air India IT team work as a happy family.

Mr. Kalyanasundaram served Air India at a great time, inducting the mammoth reservation system, and integrating it into the world's reservation network. He is remembered by hundreds of friends for his cheerful and friendly disposition.

Shyam Sharma and Srinivasan Ramani

August 6, 2020

Understanding Open Source Software Licensing

► P. Ranjana and Thangakumar Jeyaprakash

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Open Source Software can be modified and redistribute by anyone since its design can be easily accessible by the public. This term is originated in the context of software development to develop a software to address a specific need. In 1998, the term Free Software has been started mentioning as Open Source Software to avoid confusion with the word free which doesn't mean the software has been developed for free. It means that it can be used with more freedoms such as exploring the functionality of source code, redistribution, modification, etc. Such open source software has the usage privileges depends upon the licensing under open source definition (OSD). In this article, such various software licensing of open source softwares under the Open Source Initiatives (OSI), compatibility and different types of legal risks in using the Open Source Softwares has been discussed.

Keywords: Open Source Software, Software Licensing, Open Source Initiatives

Introduction

The Open Source Software covers the aspects of software licencing under the free software foundation and open source software initiatives [1]. The open source projects or products follow the principle of open exchange through modification and redistribution of the Open source software.

Software licensing

Software licensing is the use of a computer program that are granted rights of use. The rights to the program are granted in different way they are the

1. **Single right of use:** where all users have the same privileges, so that the license is with the single person who lawfully use with a right.
2. **Perpetually granting:** The license may be granted worldwide or territory wise. This license is also provided with time restriction.
3. **Varying type uses:** The type of licenses is granted for various types of use like reproduction of the entire software, or a part of the software, translation, modification and redistribution of this computer program and make the software publicly available [1]. This licence must be purchased based on the development company price.

Open Source Software licensing

The free software has the user privileges



Fig. 1: The Open Source Definition [8]

with 4 freedoms such as the user can explore the source code such us the functionality of the program, user can able to modify the code, can take copies and redistribute the code, and again the user can able to redistribute the modified code as a different version to others. The four freedoms are as follows.

Freedom 0: Freedom to study and execute the source code of the software

Freedom 1: Freedom to modify the source code as they wish

Freedom 2: Freedom to take copies and redistribute it for working on the code.

Freedom 3: The freedom to redistribute the copy of the modified source code as a different version to others

According to the usage privileges of Open Source Software initiatives, any covered software with source code form can have 10 distribution terms [8] mentioned in Fig. 1.

Difference between Proprietary Software license and Open Source

Software

Proprietary Software license is not free of charge for the right to use the software, they come with the specific restriction with special requirements like use or distribution of software. The payment for the software also varies accordingly. Open Source Software licenses is free of charge, but they require the provision of license texts of other information to make use of the software.

Some popular Open Source Software Licenses [8]

Some of the popular open source software licenses listed in the popular licenses category of Open Source Initiatives[8] are Apache license, Berkeley Software Distribution(BSD) license[Clause 2 and 3], GNU General public license and GNU Lesser General Public license by GNU Project, MIT License, Creative Common Licenses, Mozilla Public License and Eclipse Public License.

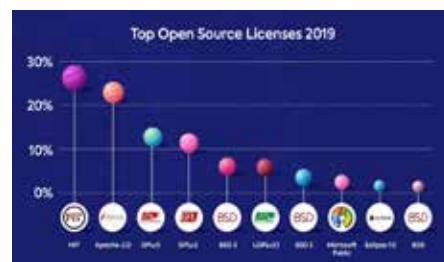


Figure 2: Popular Software Licenses

According to the research conducted by white source data [4] base more than 4 million open source packages and 130 million open source files with 200 programming languages were found as most popular open source licenses in 2019. It is also predicted that the use of permissive open source license will continue to increase in the coming years.

Figure 2 shows the Open Source Software licence usage in 2019 and the comparison with previous years.[4]. From the figure, it is observed that use of permissive licenses continues increase and copyright licence continue to decrease.[4]

Open Source Software Licensing Compatibility

If the user wants to merge two or more open source Software programs for his need, they should know the compatibility of the two programs to check if they have the same licence, to avoid compatibility issues [3].

The Licensing compatibility are classified int 3 types they are

1. **Permissive** - Permits the code into the proprietary software derivative works.
2. **Intermediate** – provides conditions on modifying code into the proprietary code.
3. **Copy left** – All programs must be redistributed under same licences [7]



Figure 3. Open Source Software Licensing Compatibility [4]

Open Source Software Licensing and Legal Risk

To use the Open Source Software license [7], the legal risk of using the open source software must be determined. This is a difficult task for the software developers since they are not legal experts. The software developers need to know the type of licensing risk. The licensing risk are classified into 3 broad categories.

Low Risk: This is otherwise known as Permissive licenses; they generally do not have a real limiting condition. It needs a copyright note if the software is distributed. The open source can be changed if the copyright is available. Some Examples are Apache and MIT Licences

Medium Risk: This is semi-permissive licenses. This licence is required only if the source code needs to be modified and modification are carried out under some terms and conditions. To comply with this licence condition, the developer must release the source code. Examples of this category include Mozilla and Eclipse

High Risk: This is known as Restrictive Licenses; the risk factor depends on the integration of open source software with the proprietary software. In some worst case, the proprietary software has to be released under the same licence. Some examples are GPL 3.0 and APGL



Figure 4: Types of Legal Risk [5]

Conclusion

In this article, popular open source software licensing under the Open Source Initiatives has been discussed. And also, it is clearly explained, how the Open Source Software differs from Software licensing, compatibility of merging two open source softwares and the different types of legal risks in using the Open Source Software which helps the software developers for the better understanding about Open Source Definition. Since Open Source Software is an essential instrument for the developers, knowledge on licencing is essential to use the Open Source Software efficiently by the developers and users.

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About the Authors



Dr. P. Ranjana (CSI life membership No. 2010000854) has been working as a Professor in Department of Computer Science and Engineering in Hindustan Institute of Technology and science, Completed Ph.D. in Computer Science and Engineering from Hindustan Institute of Technology and science. Her current research is focused on Graph theory, optimization techniques and machine learning algorithms. She has published nearly 50 research papers in refereed International Journals and conferences.



Dr. Thangakumar Jeyaprakash, (CSI life membership No. 2010000856) has been working as an Associate Professor at Hindustan Institute of Technology and Science, Padur, Chennai in the Department of Computer Science for over twelve years. He has finished his Ph.D. in Computer Science and Engineering from Hindustan University and his research area is "Mobile Adhoc Networks and Network Security". He is professionally very competent and ability to motivate the students in various academic and co-curricular activities. He has published 22 Scopus/SCI indexed journals.

अन्वेष
गण्डीय भवन कला २०२१



Computer Society of India™

Call For Paper

Digital Transformation eReadiness for Self Reliance

Digital Transformation: eReadiness for Self-Reliance

Dates: 11th, 12th, 13th & 14th February, 2021 at Lucknow

The Annual Convention of Computer Society of India (CSI) is proposed to be held on 11, 12, 13 and 14 February 2021 at Lucknow, the capital city of the largest state of India - Uttar Pradesh. The Convention with the theme Digital Transformation: eReadiness for Self-Reliance, includes several activities like the International Conference, Pre-convention Tutorials, Student-level Poster/Paper Presentation Sessions and Competitions apart from Statutory Meetings of CSI and Award Ceremonies etc.

Tracks of the Convention: There will be following significant tracks of the conference-

Track 1: Self Reliance through ICT & IT: Services and Infrastructure

Track 2: Changing ways in Governance for Self Reliance: Policies and Frameworks

Track 3: Use of ICT in Making Agriculture and Defence Self Reliant

Track 4: Use of ICT in Making Education and Research Self Reliant

Track 5: Interdisciplinary approaches and applications for Self Reliant

Track 6: Entrepreneurship Challenges: From Jobseeker to Job provider

Call for Papers:

Searching for opportunities, between the battle of saving human lives and stagnating economies in this challenging time of the pandemic, the emphasis of the Government of India is to regain the lost status of the Nation known as 'Sone ki Chiriyा'. To spur economic growth in India and to overcome the current crisis, the Government has announced "Atmanirbhar Bharat Abhiyan" (Self-Reliant India Scheme) with a quote "Economy, Infrastructure, Technology-driven System, Vibrant Demography and Demand will be the five pillars on which India's self-reliance will be based". A technology-driven "Atmanirbhar Bharat" relies heavily on digitising India,

with an emphasis on health, education, governance, agriculture, defence, engineering/technology and other sectors. The aim is to create and sustain the ability to produce quality products in a cost-competitive manner in order to compete with any country in the world and to priorities cottage and home industries, small and medium enterprises (SMEs) and other ancillary industries. The effects of this reorientation towards domestic manufacturing are already visible in India's International Trade Policy, where it seems determined to protect its domestic policy space. It not only deals with manufacturing the products and services but also ensures that the deliverables reach even to the citizen standing at the last step of the economy. The theme of the Convention Digital Transformation: eReadiness for Self-Reliance, is inclined towards having a broader look and to explore the possibilities for futuristic India.

We wish to bring together innovative academia and industrial experts to a common forum to deliberate on this issue. We seek active participation from End users, Academicians, Researchers and other faculty members from various esteemed institutions/research organizations. It will be a matter of delight to have a personal presence at the Convention and hear what the technology experts and researchers have to share about the technology advancements and their impact on our daily lives and the steps to be taken towards making India self-reliant.

Paper Invite: End-users, technocrats and academicians, researchers including research scholars and students are invited to this Annual Convention to deliberate and discuss the issues and showcase their original research work related to the theme of the convention, which pertains to the need of the hour i.e. development in the infrastructure, bringing the existing

human resources at par with the needs of any organization, the utilization of Information Communication Technologies and Information Technology infrastructure for making India self-reliant, which has been made in reference to the following themes (but not limited to these themes) :

Paper Themes:

Digital Transformation and Innovation

- Internet of Things & Applications
- Block Chain Technologies
- Digital Infrastructure for Every Citizen
- Governance & Services on Demand
- ICT in Health Care
- Social Media Networks
- ICT in Human, Social and Ecological Compatibility
- E-Learning & MOOCs
- Data Visualization

Artificial Intelligence & Virtual World

Artificial Intelligence

- | | |
|--|---|
| <ul style="list-style-type: none"> ▪ Computational Intelligence ▪ Knowledge Acquisition ▪ Automated Software Generation ▪ Swarm Intelligence | <ul style="list-style-type: none"> ▪ Computer Simulation ▪ Human Computer Interaction ▪ Genetic Algorithms |
|--|---|

Machine Learning

- Artificial Neural Networks (ANN)
- Reinforcement Learning
- Deep Learning
- Adversarial Machine Learning

E-learning

- Word Embedding
- Digital Repositories
- Photo Sharing
- Social Networking
- Subscribed Content Delivery

Expert Systems

- Expert Systems for Industry
- Expert Systems for Medicine and Health

Natural Language Processing

- Signal and Speech Processing
- Geo Informatics & Remote Sensing
- Game playing

Machine Vision

- Computer Vision
- Brain-Machine Interface
- Medical Diagnosis
- Robotics and automation
- Biomedical Engineering

Virtual World

- Virtual Reality
- Virtual Entertainment
- Virtual Society
- Digital Library

Data Analytics and Big Data

- Data Science
- Data Mining

- Data Analytics
- Secured Computing
- Pattern Recognition
- Performance Evaluation
- Big Data Analytics
- Predictive Analytics
- Human Computer Interaction
- Intelligent Database Systems

E-Governance and Business Intelligence

E-Governance

- Digital Democracy
- ICT for Sustainable Economic Development
- ICT for Pandemic & Disaster Management
- ICT Challenges for Self Reliant India
- Digital Empowerment of Citizen
- Digital and Green Economy
- ICT for Social Development
- ICT in Creation of Wealth
- ICT in Job creation & Poverty Alleviation
- Digital Infrastructure as a Utility to Every Citizen
- Governance & Services on Demand

E- Commerce

- ICT in On-line Marketing & purchasing
- ICT in Retail Chain Management
- ICT in On-line Auction Systems
- ICT in On-line Booking (ticket, Seat Etc.)
- ICT in Online publishing & advertisements
- ICT in Financial Management
- ICT in M-Commerce

Business Intelligence

- | | |
|---|---|
| <ul style="list-style-type: none"> ▪ Dashboards ▪ Reporting | <ul style="list-style-type: none"> ▪ Visualisation ▪ ETL & OLAP |
|---|---|

Data Communication, Computing & Innovation

Computing

- Algorithms
- Evolutionary Algorithms
- High Performance Computing
- Cognitive Computing
- Cloud Computing
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- Human-Centred Computing
- Digital Twins
- Quantum Computing
- Distributed And Parallel Systems
- Grid Computing
- Scalable Computing
- Mobile Computing

Internet and Web Applications

- Networking
- Open Spectrum Solutions
- Cognitive Radio
- Wireless/ Mobile Communication
- Mobile Ad-Hoc Networks
- Networks With Memory
- 5g Wireless Technologies
- Next-Generation Wireless Communication
- Signal Processing
- Communication Protocols
- Satellite Communication Systems
- 4g/5g Network Evolutions
- Software Defined Networking
- Wireless Sensor Networks

Network Security and Data Protection Security

- Cyber Security
- Computing Ethics
- Data Compression
- Ethical Hacking
- Digital Forensics
- Facial Expression and Emotion Detection
- Security & Cryptography
- Data Encryption
- Data Fusion and Security

Important dates:

Regular Track Paper Submission Last date : 10th December 2020

Author Notification

15th January 2021

Registration Deadline

20th January 2021

Conference Dates

11th, 12th, 13th & 14th February, 2021

Convention Website:

Please visit the conference website for more details: <http://csi-india2021.org/>



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Webinar Reports, BVICAM, New Delhi

Organized by: **Bharati Vidyapeeth's Inst. of Computer Applications and Management, New Delhi with a technical collaboration of CSI Delhi Chapter and IEEE Delhi Section**

Reported by **Ritika Wason**, Associate Professor, BVICAM

Webinar on "Internet of Things (IoT) – Industrial Perspective"

11th July, 2020



AICTE's Industry Institute Partnership Cell (IIPC) of Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi, in collaboration with Computer Society of India (CSI), IEEE Delhi Section, IEEE Computer Society, Consultants Network Affinity Group, Inter Society Relations, Institution of Electronics and Telecommunication Engineers (IETE), Delhi Centre and Indian Society for Technical Education (ISTE), Delhi Section organized an online webinar on "Internet of Things (IoT)-Industrial Perspective" on 11th July 2020.

The Webinar was held on 11th July, 2020 in the benign presence of Prof. Subrata Mukhopadhyay, Chairperson, CNA Group and Former Chairperson, IEEE Delhi Section, Prof. Ajay P. Thakare, Chairman, TPPC, IETE, Mr. R. K. Vyas, President, CSI and Mr. Ajay Goel, Vice President, Altran. The webinar began with the welcome address by Mr. R. K. Vyas, welcoming all the participants and acknowledging the importance of IoT in digital era, followed by the welcome address by Prof. M. N. Hoda, Director, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi. He discussed the background note of conducting Webinars through virtual platforms and the success of such webinars which can be observed by huge participation from attendees across the world. These webinars act as networking tools to connect people across the world and help them to adapt to a New Normal life, a new ecosystem caused by Covid-19. He also discussed the five phases of Covid-19 i.e. Denial, Anger, Bargain, Depression and Acceptance and motivated the participants to directly move to Acceptance phase from Bargain phase without going into Depression phase, which is also the primary objective of this webinar.

The session concluded with Question & Answer session moderated by Mr. Ajay Goel, where participants willingly asked their queries. Prof. Ajay P. Thakare extended his appreciation towards speakers for their valuable and knowledgeable session. Prof. M. N. Hoda thanked all the participants and panelist for giving their precious time in attending this webinar and making all webinars hosted by BVICAM, a huge success. The webinar attracted around 1500 participants from across the world.

Webinar on "Simplifying IPR and Patent Filing"

24th July, 2020



AICTE's Industry Institute Partnership Cell (IIPC) of Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi, in collaboration with Computer Society of India (CSI), IEEE Delhi Section, IEEE Computer Society, Consultants Network Affinity Group, Inter Society Relations, Institution of Electronics and Telecommunication Engineers (IETE), Delhi Centre and Indian Society for Technical Education (ISTE), Delhi Section organized an online webinar on "Simplifying IPR and Patent Filing" on 24th June 2020.

The Webinar was held on 24th July, 2020 in the benign presence of Prof. Subrata Mukhopadhyay, Chairperson, CNA Group and Former Chairperson, IEEE Delhi Section, Prof. A. K. Saini, Vice President-cum-President Elect, CSI, Prof. Prerna Gaur, Chairperson, IEEE Delhi Section and Mr. R. K. Vyas, President, CSI. The webinar began with the welcome address by Prof. Subrata Mukhopadhyay welcoming all the guests and participants, followed by the welcome address of Prof. A. K. Saini outlining the significance of IPR and Patents. He acknowledged the need that nation along with premier Universities and educational Institutes must collectively contribute to sensitize young professionals & researchers of how to get patent and protect their research work and novel ideas. Prof. M. N. Hoda, Director, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi also acknowledged the session and discussed the importance of first getting patent on novel research work and then publishing it. He also outlined the background note of conducting such Webinars through virtual platforms. He emphasized that these webinars act as networking tools to connect people from across the world and help them to adapt to a New Normal life, a new ecosystem caused by COVID-19. He also discussed the five phases of COVID-19 i.e. Denial, Anger, Bargain, Depression and Acceptance and motivated the participants to directly move to Acceptance phase from Bargain phase without going into Depression phase, which is also one of the objectives of these weekly webinar series.

The session concluded with Question & Answer session where participants willingly asked their queries. Prof. M. N. Hoda gave his heartfelt appreciation to Mr. Awab Habib Fakih for his valuable and knowledgeable session. He also thanked all the participants and panelist for giving their precious time in attending this webinar and making all the webinars hosted by

5 days Computer Awareness Program (CAP) for Rural Children

Organised by : **Department of Computer Science and Technology, Central University of Jharkhand, Ranchi**

Reported by **Prof. S C Yadav**, Chairman, Division-V, Research and Academic

तकनीकी विभाग के शिक्षक बच्चों को देंगे मुफ्त शिक्षा

- प्राप्त होने वाले नोटर्स
पेटी, बर्केट, डेक्स,
स्क्रीन और स्क्रॉलर, जो
विद्या का विविध
- बच्चों को सिर्फ़ खाती,
विद्या न ठाउंडा

संस्कृत विभाग

गढ़ी, २० जून - लैटेक्स
शूलियों की ओर से
प्रतिक्रिया, बच्चों को अधिकारी
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बच्चों की ओर से अधिकारी
विभाग के लिए आवेदन
करने के लिए इनका
दृष्टिकोण बदल गया।



मुख्य शूलियों ने लैटेक्स
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विभाग के लिए आवेदन
करने की ओर से इनका
दृष्टिकोण बदल गया। इन
बच्चों की ओर से अधिकारी
विभाग के लिए आवेदन
करने के लिए इनका
दृष्टिकोण बदल गया।

प्राप्त होने वाले नोटर्स
पेटी, बर्केट, डेक्स,
स्क्रीन और स्क्रॉलर, जो
विद्या का विविध

बच्चों को सिर्फ़ खाती,
विद्या न ठाउंडा

संस्कृत विभाग

During the tenure of COVID-19, while the academia is fighting with a gigantic educational crisis; global education scenario is facing potentially one of the paramount threats in human existence. Every private, public and government educational institutes has been impacted by the COVID-19 crisis. Schools, colleges and universities have been closed and/or are delivering all education online. Education during the lockdown period has automatically shifted to the default online mode. The certain shift towards online was being observed within a very short span of time. Under such scenario where all the academia was facing pedagogical changing; the program Computer Awareness Program (CAP) for Rural Children was

formulated as one of the dream project of Prof. A K Naayak, under the dynamic leadership of Prof. NK Yadav "Indu" the Vice chancellor of Central University of Jharkhand; the programm was executed by the Prof SC Yadav, Chairman, Division-V (Research and Academic), as special lectures for the rural children/ students from class 1 to 12 with special slots allotted for each class. CAP is a progressive computing initiative, with results driven drive to inculcate the tenancies of individual growth; that leads to better problem solving with credits for labour exercised. Putting a single child at the forefront of information simulation within their capacities to turn the wheel of the society up and running, to cycle without friction through the speeding wheels of the digital enchantment. Village children are facing gigantic crisis of their live due to the situation created by COVID 19 in the country. Tribal state Jharkhand with 4.1 crore population its 68 % peoples lives in villages. 17% of the total population there are children residing in the villages. In the first phase of CAP Five villages of city Ranchi has been identified namely Cheri, Manatu, Tendar, Sundeeel and Sukurhoot . On July 19,2020 the CAP program was inaugurated online by IPP and National Chair Academic Committee of CSI Prof. A. K. Nayak and Vice Chancellor of Central University of Jharkhand, Prof. N. K. Yadav "Indu" in the presence of Panchayat Mukhiya Mr. Thano Munda.

The program was very much appreciated by print media of Jharkhand , this was the new in 5 major new papers.



Session was inaugurated online by IPP and National Chair Academic Committe of CSI Prof. A K Nayak and Vice Chancellor of Central University of Jharkhand , Prof. N K Yadav "Indu", Prof. S C Yadav, Chairman, Div.-V, (Education and Research)



Girl Children attending the practical session



Prof. S C Yadav, taking the CAP class

Allahabad Webinar Series

Reported by **Prof. Ratnesh Mishra**, CSI Allahabad Chapter Chairman, UP India

CSI Allahabad Chapter organised a Webinar Series 14, hosted by Prof. Ratnesh Mishra, CSI Allahabad Chapter Chairman and Prof. Narendra Gupta CSI Allahabad Chapter Secretary welcome to all participants and speaker by Prof. Ratnesh Mishra. The topic of this program was "**Impact of COVID-19 on Higher Education: Teachers' and Students' perspectives**" by Dr. Nupur Gupta, Asst. Professor-NMIMS University, Navi Mumbai. She has discussed about the Covid-19 pandemic has significantly disordered the higher education sector, which is critical in shaping a country's economic future. The pandemic is swiftly transforming the traditional lecturing model of teaching to a technology driven method of delivery. There has been a rapid increase of mobile internet users in India, which is expected to reach 35% by 2023. Technology is empowering pervasive access and personalization of education even in the remotest parts of the country. The recent pandemic has been working as a catalyst for the educational institutions to grow and opt for platforms and techniques, they have not used before. The "new normal" has brought the world reachable within a click of a keyboard from the convenience of homes. Online Teaching should not be confused with distance education. Online teaching has two components-synchronous and asynchronous. The benefits of online synchronous learning allow the instructor to interact with the participants in real time, which is helpful for group activities, live discussions, student presentations and case studies. The asynchronous component uses; discussion board activities, email, reading articles and submitting assignments as well as many other modes of delivering information are asynchronous. MOOCs are asynchronous, open-access, web-based courses geared toward enrolling hundreds or thousands of students at a time. MOOCs offer learning content with the help of recorded video lectures, online readings, online assessments, discussion forums and peer-based evaluation system. Guided projects offered through MOOCs provide various degrees of student-instructor interaction. This form of learning has gained immense popularity in the past months of the pandemic. Online teaching and learning have their own sets of advantages and disadvantages. Class engagement is the biggest fear for the teaching fraternity. Then start the question session, in this session participated by Mr. Vijay Pandey, Dr. Durga Palavi, Ms. Akansha. Dr. Dushyant Kumar singh and Mr. Conclude the program by Dr. A. K. Nayak and Votes of thanks by Mr. D. K. Dwivedi (Patron, CSI Allahabad Chapter).

Report on Webinar Series-12

Prof. A. K. Nayak, CSI Immd. Past President has given good wishes and said CSI Allahabad Chapter is energetic chapter for this webinar series. In this webinar series, topic was "**IOT-Perspective-Concept, State of Art with Applications**", which was delivered by Dr. Shirshu Varma, Prof., Department of Information Technology, IIIT, Prayagraj, U.P. He said the Internet of Things provides a new eon to the smart generation of present scenario, where the daily utilizing objects are mannered by sensing the environment, processing capabilities of the objects and connect them on a network that allows the objects to communicate with each other. IoT is state of the art technology providing many smart applications, for example, smart city, smart appliances, smart gadgets, and so on. IoT is gaining so much popularity on day to day basis, because there is dominance of internet users everywhere and IoT has the capability to access any of

the connected devices from anywhere to everywhere type. The 'I' in IoT is stands for Internet, which is more significantly defines the protocols used on internet to enable the connected devices to communicate with each other, whereas the 'T' stands for the Things or Objects that are connected to internet and provide various facilities to the users of IoT technology. These things are associated to internet via Radio Frequency Identification, Wireless Sensor Networks, Bluetooth, Long Term Evolution, Near Field Communication, and various smart communication technologies. IoT is considered a dynamic and a global network of infrastructure designed to manage self-configuring things in an intelligent way. The IoT concept was first proposed by Sir Kevin Ashton, who was the promoter of auto-identification centre in MIT, in 1999. Ashton said, "The IoTs has the potential to change the world, just as the Internet did. Maybe even more so". Then, the IoT was presented authoritatively by ITU (International Telecommunication Union) in 2005 and stated: "a global infrastructure for the information society, Guillemin and Friess stated, "The Internet of Things allows people and things to be connected Anytime, Anyplace, with anything and anyone, ideally using any path/network and any service". There were more objects or things connected to the Internet than people from 2008. Predictions says that, the number of devices connected to Internet will exceed to 50 billion, by 2020. However, the IoT become a massive device market which made the companies to save billion dollars. IoT generated \$1.7 trillion dollar value of the global economy in the year 2019. Then start the question session, in this session participated by Mr. Vijay Pandey, Dr. Durga Palavi, Ms. Akansha. Dr. Dushyant Kumar singh and Mr. Conclude the program by Dr. A. K. Nayak and Votes of thanks by Mr. D. K. Dwivedi (Patron, CSI Allahabad Chapter).

Report on Webinar Series-11

The Chapter organised a Webinar Series 11, hosted by Prof. Ratnesh Mishra and Prof. Narendra Gupta welcome to all participants and speaker by Prof. Ratnesh Mishra. The topic of this program was "**Machine Learning For Computer Vision**", which was delivered by Dr. Dushyant Kumar Singh, Asst. Professor, Dept. of CS and Engg. MNNIT, Prayagraj, U.P. He said the Machine Learning is of big role in every sector of the technology and hence is of equal importance in developing Computer Vision based solutions for many societal problems/applications. Machine learning is a faster tool towards ICT based automations. Computer Vision is now getting used in various domains like public safety & security through computer vision based surveillance. Driver assistance, driverless vehicles and autonomous vehicle navigation; assistive technology for elderly through camera monitoring; space exploration, medical imaging and activity monitoring in sports are some other examples. Machine learning helps such systems work own their own. Machines having learning capability posse autonomous behaviour to work independently in any environment i.e. without human interventions. Humanoid and robots are typically good examples of these autonomous machines. Vision is key component of senses in these autonomous machines which lets them see around them and react accordingly. Then start the question session, in this session participated by Mr. Vijay Pandey, Dr. G. P. Sahu. Dr. Avinash Dwivedi and Mr. Suraj, Conclude the program by Dr. G. P. Sahu Past CSI Allahabad Chapter Chairman. Votes of thanks by Mr. D. K. Dwivedi (Patron, CSI Allahabad Chapter). Programme attended by Prof. Sheel Shalini, Mr. K. K. Pandey Dr. Rajesh Prasad, Mr. Suraj, Mr. Manish. Ms. Nancy, Ms. Akansha,

International Virtual Conference on Future Trends of Research and Innovation in Computer Science & Information Technology

Reported by Dr. Pankaj Goswami & Sri Vinay Kumar Johri



Computer Society of India, Lucknow Chapter organized an International Conference on Future Trends of Research and Innovation in Computer Science & Information Technology which was held on 11th July 2020 (Saturday) from 11.00 AM onwards. Prof. R.K. Vyas, President Computer Society of India presided over the event. Sri Vinay Kumar Johri, Hon. Secretary on behalf of CSI Lucknow Chapter welcomed the esteemed speakers, Prof. R.K. Vyas, Prof. A.K. Nayak, Sri Arvind Sharma and all the participants present in the Conference.

The programme started with the welcome address by Dr. Pankaj Goswami, Chairman CSI Lucknow Chapter who welcomed all dignitaries and participants connected on the virtual platform and he advised that CSI Lucknow Chapter has a vision to bridge the gap between the resources and recipients, to bridge the gap between Industry and Academia, to bridge the gap between researcher and facilitator. He told that this Conference on Virtual platform has been envisioned with the guidance of Prof. A.K. Nayak, Immediate Past President and Chairman Academic Committee, Computer Society of India. He welcomed esteemed speakers of the Conference Prof. Nayak, Dr. Bimal Kumar Roy, Chairman National Statistical Commission & Ex. Director Indian Statistical Institute Kolkata, Prof. (Dr.) Alok Kumar Rai, Vice Chancellor University of Lucknow, Prof. R.K. Vyas, President Computer Society of India, Mr. Aninda Bose, Senior Editor Springer

Nature, Prof. (Dr.) M. N. Hoda Director Bharti Vidyapeeth Institute of Computer Application & Management, Prof. (Dr.) Dharm Singh, Namibia University of Science and Technology, Prof. (Dr.) Durgesh Mishra, Hon. Treasurer Computer Society of India, Sri Arvind Sharma, Regional Vice President Region-1 Computer Society of India.

Theme presentation and event briefing was done by Prof. A.K. Nayak followed by Inaugural address by Dr. Bimal Kumar Roy, Guest of Honour Address by Prof. (Dr.) Alok Kumar Rai. Prof. R.K. Vyas delivered the Presidential Address.

Keynote sessions were delivered by Mr. Aninda Bose from Springer Nature & Prof. (Dr.) M.N. Hoda from Bharti Vidyapeeth's Institute of Computer Applications and Management. The Invited Sessions were taken by Prof. (Dr.) Dharm Singh from Namibia University of Science and Technology (NUST) and Prof. (Dr.) Durgesh Mishra, Hon. Treasurer from Computer Society of India.

Question-Answer session was handled by Dr. Puneet Misra. The conference was concluded by Sri Arvind Sharma., Regional Vice President (Region-1) Computer Society of India, thanked all the esteemed guests and the participants present in the International Conference. He appreciated all the speakers for their excellent presentation and valuable experiences during the Conference.

Webinar Reports, Delhi Chapter

Organized by: Bharati Vidyapeeth's Inst. of Computer Applications and Management,
 New Delhi with a technical collaboration of CSI Delhi Chapter and IEEE Delhi Section

Reported by Ritika Wason, Associate Professor, BVICAM

Two Weeks Online Faculty Development Programme (FDP) on "Emerging Technologies for Education and Research in CS & IT"

Date : 13th – 25th July, 2020



AICTE's Industry Institute Partnership Cell (IIPC) of Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi, in collaboration with Computer Society of India (CSI), IEEE Delhi Section, IEEE Computer Society, Consultants Network Affinity Group, Inter Society Relations, Institution of Electronics and Telecommunication Engineers (IETE), Delhi Centre and Indian Society for Technical Education (ISTE), Delhi Section organized a two weeks online FDP on "Emerging Technologies for Education and Research in CS & IT" from 13th to 25th July 2020.

The FDP began with the Inaugural Session on 13th July, 2020. Prof. M. N. Hoda, Director, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi, welcomed all the guests & attendees, and discussed the need of Education 4.0 under the backdrop of Industry 4.0. He also motivated all the participants to proactively adapt to the new ecosystem New Normal and make the entire teaching-learning process flexible enough to meet the expectations of students in the digital era. Prof. Prema Gaur, Chairperson, IEEE Delhi Section, was the Guest of Honour and highlighted the activities of the IEEE Delhi Section. She also talked about various student chapters introduced under IEEE DS to promote the relationship between Academia and Industry. Chief Guest of the inaugural session, Dr. Dinesh Kumar, Vice Chancellor, J. C. Bose University of Science & Technology, YMCA, Faridabad, addressed the session and discussed the urgent need of focusing on continuous assessment of students & promoting online education in all parts of the country. The presidential address was delivered by Prof. M. N. Doja, Director, IIIT, Sonipat highlighting the need to develop interest among students in online education in order to meet challenges posed by COVID-19 Pandemic. The session was also addressed by Prof. A. K. Saini, Vice President-cum-President-Elect, CSI and Prof. J. W. Bakal, President, IETE, New Delhi.

There were 21 interesting and knowledge imparting Webinar sessions covered during two weeks of FDP. Changing Instructional Paradigm by Prof. M. N. Hoda, BVICAM, New Delhi, Citations and Reference Management using Mendeley by Dr. Ritika Wason, BVICAM, New Delhi, Google Classroom by Mrs. Tanya Pathak Garg, BVICAM, New Delhi, Robotics and Automation Process by Dr. George Tsaramirisis, King Abdulaziz University, K.S.A, 21st Century Computing Technologies and Innovations: Challenges and Opportunities by Dr. Nasib Singh Gill, MDU, Rohtak, Docker and Kubernetes by Dr. Vipin Gupta, U-Net Solutions, Punjab, Research Methodology by Prof. D. K.

Lobiyal, JNU, New Delhi, MOODLE - Open Source LMS by Mr. Uttam Singh Bist & Mrs. Tanya Garg, BVICAM, New Delhi, Applications of Design Thinking by Mr. Shailesh Gupta, 3SRC Technologies, Noida, Software Defined Networking (SDN) by Mr. Manish Aggarwal, Altran Technologies, Gurugram, MOOC -The Next Generation Learning Platform by Dr. Durgesh Tripathi, GGSIPU, New Delhi, Introduction to Data Science and Analytics by Ms. Ekta Gupta, Brain Mentors Pvt. Ltd., N. Delhi, The Art of Writing Quality Papers by Dr. Gagandeep Singh, CRC, Taylor & Francis Group, Basics of Machine Learning using Python, Text & Image Analytics using Machine Learning, Object Detection using Machine Learning & Deep Learning with Python – all four sessions by Mr. Ravikant Tyagi, Brain Mentors Pvt. Ltd., N. Delhi, Simplifying IPR and Patent Filing by Mr. Awab Habib Fakih, AIKTC, Mumbai, Industry 4.0 by Mr. Vijay Anand, Altran Technologies, Gurugram, Role of Academia in Industry 4.0 by Dr. Mani Madhukar, IBM, Noida and BlockChain by Dr. Mayank Aggrawal, G. K. V., Haridwar.

The FDP was aimed to provide all participants with a better understanding of emerging technologies for education and areas of research in CS & IT. During the FDP, the participants were given Assignments based on the sessions and they also underwent a quiz based on MCQ Tests. On the basis of their performance in these assignments and MCQ Tests, they were ranked at A+, A and B categories. The FDP observed active participation from 55 participants as research scholars and faculties from different states of the nation, including participants from College of Engg. & Mgmt., Kolaghat, Banasthali Vidyapith, Tonk, Gujarat Vidyapith, Ahmedabad, Guru Nanak Dev University, Amritsar, Graphics Era University, Dehradun, BIT Sindri, Dhanbad, Delhi School of Business, Jorhat Engg. College, Assam, JJTU, Rajasthan, Annamalai University, ICFAI University, Tripura, Himachal Pradesh University, Shimla, ASBM University, Bhuvneshwar, Rajiv Gandhi Govt. Polytechnic, Itanagar, Maulana Azad National Urdu University, Hyderabad, to name a few.

Last day of the FDP witnessed Valedictory Session. Dr. Vishal Jain, Associate Professor, BVICAM, presented a brief report on all the sessions covered during two weeks of FDP. Prof. M. N. Hoda welcomed all the guests and thanked all the speakers & participants to make this FDP a successful program with positive outcomes. He also motivated participants to always get involved in the continuous improvements to upgrade their technical skills. Guest of Honour, Prof. A. K. Saini, Vice President-cum-President Elect, CSI, congratulated the organizing team for successfully conducting FDP on a wide area of topics turning into a value addition to the attendees. Chief Guest of the event, Prof. J. P. Saini, Vice Chancellor, Netaji Subhash University of Technology (NSUT), New Delhi, congratulated all the participants and motivated them to adapt & learn new technologies for research & innovation for sustainability. The session was presided over by Prof. K. K. Aggarwal, Noted Academician, Chairman, NBA, New Delhi and Former Founder Vice Chancellor, GGSIP University, New Delhi. He discussed the need and significance of emerging technologies in our lives and acknowledged that the inadequacies and shortcomings in these technologies must be recovered to make better solutions for meeting the challenges. He also appreciated the efforts made by BVICAM in organizing continuous FDPs and webinars on wide area of topics serving multiple disciplines.

Webinar on Open Source Software

Organised by : **Indian Institute of Business Management with the Technical Collaboration of Computer Society of India**

Reported by **Prof. Ganesh Pandey**, Dy. Director, IIBM, Patna



An one day National webinar was organised by Indian Institute of Business Management with the technical collaboration of Computer Society of India on 4th July 2020 on the theme Open Source Software. The webinar was inaugurated by Prof. U. K Singh, the chancellor of TGU, Nagaland. In his opening address, Prof. A. K. Nayak, IIBM Director and National Chairman of Academic Committee of Computer Society of India highlighted the various advantages of open source software particularly for the students and teachers due it's legal accessibility without any cost involvement. He discussed about the different popular platforms which can be used by the user community for the development & applications of wide veracity of software. Prof. Nayak has also stressed on the optimal utilisation of these softwares in the post Covid era particularly in Education 4.0 and Industry 4.0.

In his key note address, Dr. R. R. Deshmukh, professor & former Dean of Baba Saheb Ambedkar Marathawada University ,Aurangabad, Maharashtra described about various scope and opportunities of Open Source Software which should be effectively used by the software professional. His deliberation was based on examples, Case Studies through PPT presentation. He has also pointed about the future trends of these softwares with respect to the Industry needs.

Dr. M. Sundaresan, Professor & Head of Dept. of Information Technology, of Bharatiar University, Coimbatore, Tamil Nadu, the key note speaker of the webinar talked about the Computer Human Interaction and how open Source softwares are being utilised & helpful for this application. He advised the students to widely use the open source software and restrict themselves not to use the pirated software.

Participating as an Invited speaker, Mr. Abhishek Kumar Singh, the Global Director of Boston Consulting Group delivered his talk describing the relevancy of open source softwares from business and industry prospect & their state of art in respective application. Mr Ashok Kumar Singh, System Analysts of Central University of South Bihar, Gaya spoke on various practical applications of open Source Software.

In his presidential address Prof. (Dr.) A. K. Saini, Vice President of Computer Society of India and Professor & Director Industry cell of Guru Govind Singh Indraprastha University, New Delhi described about the future scenario of COVID 19 & how the open source Software shall be helpful in different applications including on line education. The vote of thanks was proposed by Md. Shams Raza, the regional Vice President of CSI. The webinar was coordinated by Prof. Ganesh Panday, Deputy Director of IIBM & hosted by prof Rohit Kumar, Asst. Professor, IIBM, Prof. Gopal Krishna, Bihar State Student Coordinator, CSI & Prof. Niles Ranjan, Chairman CSI Patna Chapter.

Instructions for submission of Chapter & Student Branch Reports

Viewing the huge number of online activities conducted by our Chapters and Student Branches through out the country, the Editorial board requests to the Chapter Office Bearers and Student Branch Coordinators to restrict the size of the report upto half page for a Chapter event and quarter page for a Student Branch event along with one photograph.

Student branches are requested to send their report to sb-activities@csi-india.org with CC to admn.officer@csi-india.org

Chapters are requested to send their activity report to chapter-activities@csi-india.org with CC to admn.officer@csi-india.org

Kindly send **High Resolution Photograph** with the report.



Prof. A. K. Nayak
Publisher



Computer Society of India™ Fellowship Award

Prof. Anil K. Saini is currently a Professor in the area of Information Technology in the School of Management Studies, Director -Industry Interaction Cell and Director-Development at GGSIP University, New Delhi. Prof. Saini is a Post-Graduate in Physics, Computers and Management. He obtained his doctorate (Ph.D.) from FMS Delhi University in the area of Information Systems. Prior to joining academics, he served in the IT Industry for about six years.

He has taught at Slovak University of Agriculture, Slovakia under Faculty Exchange Programme and has widely travelled abroad for academic assignments. He has published more than 100+ research papers in International and National Journals of repute in the field of Information Technology and Management and authored/edited fifteen books. He has guided more than 15 Ph.D. thesis. He is member of the Board of Studies/Advisory/Editorial Board of several Universities and Institutions and reputed Journals. He is a trained NAAC Assessor. He is Fellow and senior member of several other professional societies such as IETE, AIMA, ORSI, etc.

Prof. Saini has been active member of CSI since last more than three decades and has held several positions such as Chairman CSI Delhi Chapter, Regional Student Coordinator, Member and Chairman of National Nomination Committee and Publication Committee, etc. He was instrumental in acquisition of permanent premise for CSI Delhi Chapter and Best Chapter award under his Chairmanship for the first time. He has organised several CSI events and was key team member of CSI 2015.

In grateful recognition of Prof. Saini's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra

Chairman, Awards Committee, CSI

Prof. A. K. Nayak

President , CSI

Bhubaneswar, 17th January 2020



Computer Society of India™ Fellowship Award

Prof. (Dr.) M. N. Hoda is working as a Professor of Computer Science & Director of Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi, since 2002. He has over twenty-five years of experience in academics in different capacities. Prior to joining the academics, he has initially worked with corporate as a Software Engineer. He is an expert member of many board level committees of Govt. of India like DST, CSIR, MHRD, etc. He is a member of Academic Council of GGSIP University, New Delhi, for 2019-2020 and has also served it for past for 11 terms from 2006 and served three terms as the Member of Board of Management and one term as the member of the Court of GGSIP University, New Delhi.

He has started International Journal of Information Technology, in the year 2009, which is being published quarterly by Springer Nature, since 2017, to which he is the Editor-in-Chief. He has edited more than 25 volumes of Conference Proceedings published by IEEE and Springer Nature. He has co-authored many books. He is a prolific writer and has published over 100 Papers at both National and International levels, in the journals and conferences of repute. He is a profound speaker and has delivered over 200 Invited Talks and Keynote Addresses at different academic forums, in India and abroad. He has organized and conducted over 110 MDPs and QIPs for working executives in the industry and academia. As member of different Committees and Task Forces, he has facilitated more than a dozen of Universities in overall restructuring of IT and Computer Science programmes as well as innovating and re-aligning their teaching learning practices in line with the requirements of the IT industry.

He has been elected as the President (ICT & CS Section) of the Indian Science Congress Association (ISCA) for 2019-2020. He was elected as the member of the National Governing Council, IETE, for 2016-2019 and has served it as the Chairman of Technical Programme & Publicity Committee. He has significantly contributed to Computer Society of India (CSI) for more than two decades, in different capacities, like Member of National ExecCom as Chairman of Division-I, Chapter Chairman, Vice Chairman, Hon. Secretary, Regional Students Co-ordinator, etc. He has been the Organizing Secretary of 50th Golden Jubilee Annual Convention (CSI-2015), which had significant contributions including publication of its Proceedings by Springer Nature in 10 volumes, for the first time in the history of CSI. He has served to Indian Society for Technical Education (ISTE), Delhi Section, in different capacities like Chairman, Secretary, etc. He is serving to the Execom of IEEE Delhi Section since last 11 years. He holds MCA degree from Aligarh Muslim University (AMU), Aligarh and Doctorate in Information System Audit in Computer Science. His current areas of research are Information System Audit, Software Engineering, Computer Networks, Artificial Intelligence, Industry 4.0, ICT and Innovative Learning Pedagogies.

He is a Senior Member of IEEE (USA), Member of ACM (USA), Fellow of IETE, Life Member of CSI, Life Member of ISTE, Life Member of IE(I) , Life Member of Indian Science Congress Association and Life Member of National HRD Networks. He was awarded Outstanding Achievement Award – 2000 by Management Studies and Promotion Institute, New Delhi for his outstanding achievement and contribution to the field of Management and Computer Education in the year 2001 and the Best IT Teacher of the Year Award during 18th All India Management Congress in 2016 for his outstanding achievement and contribution to the field of Teaching, Research and Institution Building.

In grateful recognition of Prof. Hoda's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra

Chairman, Awards Committee, CSI

Prof. A K Nayak

President , CSI

Bhubaneswar, 17th January 2020



Computer Society of India™ Fellowship Award

Prof. Ajay Kumar Singh is Vice Chancellor of Sri Sri University, Cuttack, Odisha, w.e.f. May 10, 2019. He is on EOL from the post of Professor at Faculty of Commerce & Business, Delhi School of Economics, University of Delhi. He has served as Dean (Works), DU, OSD, University Press, DU, Head, Graphic Arts Centre, University of Delhi.

Dr. Singh has filed two patents having 33+ years of teaching experience in all with 211 Publications including 10 books, 1 International Monograph, 106 research papers, 12 articles, 16 case studies, 54 editorial reviews, 2 abstracts, and 8 book reviews published in leading journals (Emerald's TLO & Social Responsibility Journal, Inderscience- IJBIS, Springer's Current Psychology, Scientific Journal ACTA OPERATIVO OECONOMICA, Slovak Republic, ACTA OECONOMICA PRAGENSIA, Agricultural Economics – Czech, IJ of Bus. & Mgt. Studies, Turkey, etc. (including two GOLD MEDALS for best paper awards, two best paper awards, two silver medal winning papers, and two 2nd best papers).

Dr. Singh was conferred by Indian Commerce Association (ICA), Best Business Academic of the Year (BBAY) Award-2011 Gold Medal & MMSM Research Award 2011& 2012 Gold Medal.

Dr. Singh (school topper, SRCC Alumnus, Editor-in-Chief: Delhi Business Review) has earned best teacher award for two consecutive years in 1998 and 1999 at IAMT. 12 International Awards and Distinctions have been conferred including 2 Gold Medals, 1 Silver Medal, and Other Distinctions.

35 Scholars have been awarded Ph. D. degree under his supervision.

Dr. Singh served as Vice Chancellor of University of Jazeera, Dubai, UAE and has travelled to 23 countries and addressed in more than 200 conferences/seminars/ workshops/training programs.

Dr. Singh is Fellow and Managing Trustee of Indian Commerce Association (ICA), Immediate Past President of Indian Commerce Association Delhi NCR Chapter, Past President of Indian Association for Management Development (IAMD), Hon. President of Governing Body of Divine Group of Institutions, DSPSR, and many NGOs.

In grateful recognition of Prof. A. K. Singh's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra
Chairman, Awards Committee, CSI

Prof. A. K. Nayak
President , CSI

Bhubaneswar, 17th January 2020



Computer Society of India™ Fellowship Award

Dr. Gulshan Rai holds a master's degree in technology and doctorate and has over 30 years of experience in different areas of Information Technology which include different aspects of e-Governance, Cyber Security, Cyber Laws and several related fields.

He recently retired from government service as the National Cyber Security Coordinator, Government of India in the office of Prime Minister. Prior to that he was in the Ministry of Electronics & Information Technology. He held the prestigious post of Director General, CERT-In (Indian Computer Emergency Response Team) and headed E – Security & Cyber Law Division, STQC and other Divisions.

He has led the team to put in 2nd Technological Legislation the Information Technology Act, 2000. Such a legislation feed to other legislations. He was a member of Data Protection Committee. He has also led the team to set up National Watch and Alert System in the country as a part of Cyber Security initiative and Computer Emergency Team. Several international cooperation agreements have been entered under his leadership. He led a team from time to time to draft and bring out National Policies in the area of Cyber Security and Cyber Laws.

He was Executive Director, ERNET India for over seven years and was instrumental in selling up of the first large scale education and research network in close collaboration with the leading educational and research institutions in the country. During his tenure, the project of National Knowledge Network was evolved and designed. He has been leading designing and implementing IT solutions in the areas of Finance, Taxes and Law & Order. He is distinguished fellow of prestigious think tank like ORF, East West and Carnegie."

In grateful recognition of Dr. Gulshan Rai's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra
Chairman, Awards Committee, CSI

Prof. A K Nayak
President , CSI

Bhubaneswar, 17th January 2020



Computer Society of India™ Fellowship Award

Prof. Subir Lahiri, graduated in Science (B Sc) with major in Physics from the University of Calcutta, and got his First Degree equivalent Higher National Diploma in Electrical and Electronic Engineering from the Central Lancashire University. He then obtained the coveted MIET (London) qualification. He acquired four-year Post-qualification professional experience in computer programming before returning to India. Since then he has contributed to the field of Information Technology for over 25 years. Prof. Lahiri possesses an M Sc Degree, a Diploma in Management and has done Post Graduation in Sc. Journalism as well.

He developed the first Airline-Travel Agency Software Package in Calcutta as the Group EDP Manager of Marshall Corporation in 1987. He was also instrumental in opening the first CAD Training Center in the city in 1989.

Prof. Lahiri also showed his far-sighted managerial capability at Braithwaite & Co. Ltd when he was its Assistant General Manager. He convinced Braithwaite's Board to sanction a budget of ₹ 3 Crores, and implemented the BAAN ERP System (2005), instead of revamping the existing system. In addition, he steered the Y2K remediation program for the totally COBOL based systems at Braithwaite.

He joined ICFAI National College (Kolkata) as Training Manager. He later became Principal of ICFAI National College, Asansol Campus. Currently, he is the Head of the Department, Department of Business Management, Techno India College of Technology, New Town, Kolkata.

Prof. Subir Lahiri has made considerable contributions to the growth and development of the CSI Kolkata chapter. After being a member of both the Managing Committee and Nomination Committee for several years, he served as Treasurer (2004-2005), got elected as the Chapter Secretary (2014-2016), Vice-Chairman cum Chairman-Elect (2016-17), Chairman (2017-18) and Immediate Past Chairman (2018-19). Further, he served as Chairman of the Organizing Committee of the International Conference, EAIT-2017 as well as the Co-Chairman of the Organizing Committee of CSI's 52nd Annual Convention held in Kolkata (2017). Prof. Lahiri jointly arranged the 'Outreach' programme, a novel project as part of the social responsibility of CSI-KC.

In 2019, on the National Science Day, Prof. Lahiri received Sir J. C. Bose Memorial Award from the Science Association of Bengal, for his outstanding contribution in the field of Science and Technology to the Society. Prof. Lahiri is a Life member of Indian Society for Training and Development. A regular of school and college Cricket teams (both here and in England). He now spends his spare time enjoying Indian Classical Music and Rabindra Sangeet.

In grateful recognition of Prof. Subir Lahiri's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra

Chairman, Awards Committee, CSI

Prof. A. K. Nayak

President, CSI

Bhubaneswar, 17th January 2020



Computer Society of India™ Fellowship Award

Dr. Rabindra Narayan Behera, served as Scientist in National Informatics Centre for last 31 years and taken VRS from Government as Sr. Technical Director for greater social service. He has done his Ph. D in Artificial Intelligence from Utkal University, Bhubaneswar in the year 2005. Dr. Behera is an eminent Technocrat in the field of IT & e-Governance in Odisha and India. He is pioneer in framing e-Governance activities in Government domain in Odisha and associated with various State and National projects.

The first web site of the State, Lord Jagannath Temple was developed, designed and hosted by him in the year 1998. Conceptualized, Designed, Developed and Hosted Odisha Government Portal www.odisha.gov.in in 2004 and Project coordinator for "Standardisation of District Portal" a National Level project under National Portal of India (India.gov.in).

As web site coordinator of Odisha, engineered to host around 300 websites of Odisha including Raj Bhavan, Orissa High Court, Odisha Police, CID (CB). He was Project coordinator for online Chief Minister Grievance Cell- e-Abhijoga, CMRF, Digital Employment Exchanges, Skill Development Project Odisha, Labour Commission e-Shramik, e-Pothi and e-Archives Project. Archival documents and palm leaf manuscripts are digitised and catalogued online so that people across the Globe can access rare manuscripts.

The first Accessibility website of Odisha for persons with disabilities and Grievance Redressal system for women through Women Commission was developed by him. e-University of Ramademi Women's University and Utkal University, Bhubaneswar were developed and implemented by him.

He has contributed a lot for CSI activities in Odisha and the present National Conference at Bhubaneswar. Took a leading role in CSI National Conference 1992(Akshaya92) held at Bhubaneswar and re-establishment of CSI Bhubaneswar Chapter in 2012 and become Vice-Chairman and Chairman. He got various awards of National and International repute i.e. e-World, e-India, Manthan, ECEG2009 etc and got Biswa Gourav Award at Indonesia, Digital Knowledge Exchange Award 2015, Web Ratna Award.

In grateful recognition of Dr. Rabindra Narayan Behera's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra

Chairman, Awards Committee, CSI

Prof. A K Nayak

President, CSI

Bhubaneswar, 17th January 2020



Computer Society of India™ Fellowship Award

Dr. Aliseri Govardhan is a Professor of Computer Science & Engineering and at present Pro Vice-Chancellor of Jawaharlal Nehru Technological University Hyderabad (JNTU Hyderabad), Telangana. He is also a member of Executive Council and Finance Committee, JNTU Hyderabad. He served and held several Academic and Administrative positions including Principal (JNTUH College of Engineering Hyderabad), Director (School of Information Technology, JNTUH), Director of Evaluation (JNTUH). He is also a member on Boards of Governors and Academic Councils for number of institutions and R & D Organizations. He is the recipient of 33 International and National Awards including Best Senior Scientist Award (2018), Dewang Mehta Academic Leadership Award (2017), Dr. Sarvepalli Radhakrishnan National Award, Andhra Pradesh State Government Best Teacher Award (2012), CSI Chapter Patron Award and Mother Teresa Award for Outstanding Services, Achievements, Contributions, Meritorious Services, Outstanding Performance and Remarkable Role in the field of Education and Service to the Nation. He is a Chairman and Member on several Boards of Studies of various Universities. He is a Member on the Editorial Boards for Twelve International Journals. He is reviewer of number of International Reputed Journals/ Conferences like IEEE, ACM, Springer, Elsevier and InderScience. He is a Member on Advisory Boards & Academic Boards and Technical Program Committee Member for more than 85 International and National Conferences. He is an Editor for 4 Springer Proceedings. He has 3 Monographs and 10 Book Chapters in Springer. He has guided 38 Ph.D. Scholars, 1 M.Phil. and 135 M. Tech. projects. He has published 225 research papers at International/National Journals/Conferences including IEEE, ACM, Springer, Elsevier and InderScience. He has organized 4 International Conferences, 20 Workshops and 1 Refresher Course. He has delivered more than 100 Keynote speeches and invited lectures. He has Chaired 22 Sessions at the International/ National Conferences in India and Abroad. He has the Research Projects (Completed/ Ongoing) worth of Rs. 1.159 Crores. He has 25 years of Teaching and Research experience. He served as a Convener for number of Entrance Tests like TS ECET-2019, TS ECET-2018, TS ECET-2017, Co-Convenor for TS EAMCET-III-2016, EAMCET-2009 and Chief Regional Coordinator for TS EAMCET-2016, EAMCET-2010 and EAMCET-2011. He is a member on several Professional and Service Oriented Bodies. His areas of research include Databases, Data Science, Security and Information Retrieval Systems.

He has served CSI at various levels as Chairman & Vice-Chairman, CSI Hyderabad Chapter. He has been instrumental in increasing the CSI Institutional, professional and student memberships at CSI Hyderabad Chapter. He was the Chairman, Program Committee of CSI annual convention 2014 held at Hyderabad. He has widely travelled to USA, Sweden, Netherlands and Thailand on academic and professional assignments.

In grateful recognition of Dr. Aliseri Govardhan's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra
Chairman, Awards Committee, CSI

Bhubaneswar, 17th January 2020

Prof. A. K. Nayak
President , CSI



Computer Society of India™ Fellowship Award

Shanker Ramasamy is in the field of Information Technology for the last 3 decades. He is a Post- Graduate in Computer Applications from a Premier Institute and belong to the First Batch of MCAs in India. Ramasamy had a professional training for six months in Main frame computers in Japan on the invitation from CICC, Japan. He is a Certified ISO 27001 implementer in Software, also a Certified Information System Manager (CISM), Certified Sig Sigma Green Belt. He is also a qualified Legal professional.

Ramasamy has a great passion on student's activities and he started his CSI carrier as a CSI Student member in 1985. He was the first CSI State Student Coordinator in 2010 for Tamil Nadu State, National Student Coordinator for CSI during the year 2017-18.

Leadership is a quality which Ramasamy cherishes. During his tenure as Chairman of the CSI Chennai Chapter, more than 8 batches of PMP courses conducted and enrolled about 120 as Life members of CSI. During his Chairmanship, the seminar hall at Education Directorate at Chennai was made fully functional with all required AV equipment, Air conditioners etc.

He was elected unopposed as Regional Vice President for the National ExecCom for the term 2011-2013. Spearhead CSI convention in 2008 at Chennai, SEARCC software contest for the school students at the international level during 2008 and 2010. An international conference "Networking 2010", an International Federation of Information Processing (IFIP) Technical Committee (TC6) supported was conducted during May 2010 at IIT, Chennai. Started two new CSI chapters, activated 5 defunct chapters, did base work 3 new chapters. Conducted a job fair for the students at Salem. Rolled out National Quiz competition, National Programming contest for the students. One of his pet projects is Special education program for special children workshop conducted at Chennai, Coimbatore, Pune. He is equally interested in helping the chapter during the Plus 2 Model Computer Science examination for the last 15 years.

Apart from these professional bodies, Ramasamy was a Member, Academic Council, Anna University. Chennai, he is an Expert panel member for recruitment / promotion / career advancement of Management dept. faculty members in Abdul Rahman University and a Board of Studies Member for School of Computer Science & Engineering at Bharathidasan University, Trichy

On the professional arena, Shanker Ramasamy has worked in various industries right from Automobiles Electronics to Yellow pages. Has got experience of working with people of different cultures. Invited to Australia by Southern Queensland university to review their software of ECG records in handheld mobiles, PDA and tablet during 2008. Offered suggestions to improve and been rolled out in 2008/2009. Presently working as GM-Technology at Great Lakes Institute of Management, Chennai, one of the top 10 B-Schools of India.

In grateful recognition of Mr. Shanker Ramasamy's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a **FELLOW** of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra
Chairman, Awards Committee, CSI

Bhubaneswar, 17th January 2020

Prof. A K Nayak
President , CSI



Computer Society of India™ Fellowship Award

Dr. Subbanagounder Arumugam obtained his B.E. Degree in Electrical and Electronics Engineering and M.Sc. (Engg) Degree in Applied Electronics from the University of Madras in 1971 and 1973 and Ph.D. in Computer Science and Engineering from Anna University in 1990.

In the year 1974, he joined the Technical Education Service of Government of Tamil Nadu as Associate Lecturer in College of Engineering, Guindy. Going up the rungs of the ladder, he was elevated as Principal in 1998 and served at Government College of Engineering, Bargur and Government College of Technology, Coimbatore. In 2005, he assumed charge as Additional Director of Technical Education and Chairman, Board of Examinations, Chennai. Presently he is working as Chief Executive Officer in Nandha Educational Institutions, Erode. He also served as Faculty in Malaysia for a period of three years.

He guided 48 Research Scholars for their PhD. and currently he is guiding 2 Research Scholars. He has published more than 200 papers in International Conferences and Journals. He delivered Graduation Day, Annual Day, and keynote addresses in various Colleges and Conferences. He handled funding projects from AICTE, Ministry of Information Technology, Government of India and TEQIP I fund from World Bank.

He has been Chairman or expert member in various Committees by the Government, AICTE, Anna University and other Universities for Curriculum development, examination reforms, fee structure, admissions, purchase of computers and Staff Selection. He served as Performance Auditor for TEQIP funded by World Bank and operated by Government of India.

He is a Senior member of Computer Society of India. He served as Chairman and Treasurer in Computer Society of India, Coimbatore Chapter and RVP VII. He is a Fellow of Institution of Engineers (India) and in Institution of Electronics and Telecommunication Engineers he served as Chairman and Secretary in Erode chapter. He is a Life Member in Indian Society for Technical Education. He is a Senior member in IEEE and served as Vice Chairman, Executive Committee and Editor in IEEE Madras section.

In grateful recognition of Dr. Subbanagounder Arumugam's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a FELLOW of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra

Chairman, Awards Committee, CSI

Prof. A. K. Nayak

President, CSI

Bhubaneswar, 17th January 2020



Computer Society of India™ Fellowship Award

Dr. Gopinath Ganapathy is currently Registrar of Bharathidasan University, Tamil Nadu and Life Member of Computer Society of India for 23 years since 1996.

He has 32 years of experience in academia, industry, research & consultancy services, including 8 years of International experience in the U.S and U.K. He served as a consultant for a few fortune500 companies including IBM, Lucent-Bell Labs, Merrill Lynch, Toyota etc. He is a specialist in designing and architecting Multi-tier and EAI technologies. He received the "Young Scientist Fellow Award" for the year of 1994 from the Govt. of Tamil Nadu. His areas of research include Semantic Web, AI, Auto Programming, Ontology, Computational Linguistics, Deep Learning, etc. To his credit, 18 of his scholars were awarded Ph.D. with 8 more pursuing. He had launched Research Consortium of Computer Science in Bharathidasan University, Tamil Nadu. Earlier he acted as Chair, School of Computer Science, Engineering and Applications, Director, Bharathidasan University Technology Park (BUTP), Director, Institute for Entrepreneurship and Career Development (IECD), Director, DDE KAUSHAL Kendra, Coordinator, University Business Collaboration Center (UBCC) and many other positions.

He has published two books and more than 120 research articles in International journals and conferences besides many book chapters in reputed International Publishers in the field of computing. He acts as a member in several academia and technology councils in various Universities in India. He has convened/hosted/chaired many International conferences/workshops/seminars. He was a referee and editorial member in a few international journals. He is the professional member in IEEE, ACM, Indian Science Congress and Indian Society for Technical Education. His hobbies include Pilot Trainee, Golfing, Kick Boxing, Boating and scuba diving etc. He traveled widely more than 25 countries.

He served as secretary, vice-chairman, and chairman in CSI Trichy Chapter. During his tenure he was instrumental to receive awards such as best student branch, special chapter award, etc. He conducted more than 50 CSI events in his tenure right from Symposia, workshops, technical lectures, job Fair, Road shows and Membership Drive.

In grateful recognition of Dr. Gopinath Ganapathy's significant contributions to the area of Computer Science and Engineering at National and International levels, the Computer Society of India is proud to name him a FELLOW of the Society. The Society is pleased to present him with this citation on this occasion of its 53rd Annual Convention at Bhubaneswar on this Seventeenth day of January 2020.

Mr. Sanjay Mohapatra

Chairman, Awards Committee, CSI

Prof. A K Nayak

President, CSI

Bhubaneswar, 17th January 2020

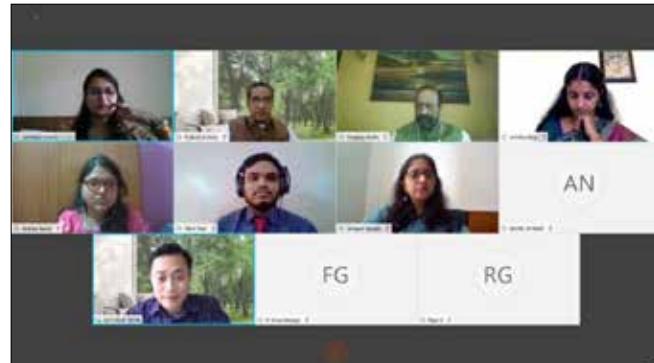
International Symposium on “Current Trends in Research and Innovation”

Reported by Mr. Pradeep Rathi, Regional Vice-President – Region-VI



International Symposium on Current Trends in Research and Innovation (ISCTRI'20) was organized by the Department of Computer Science, Christ (Deemed to be University), Pune Lavasa campus on technical association with Computer Society of India (CSI) on 25th July 2020. Mr. Pradeep Rathi, RVP-6 of CSI was the Chief Guest for the event. The symposium focused on topics related to recent trends in research as well as innovation related to data and analytics. Guest speakers included Mr. Pradeep Rathi, RVP-6 of CSI and Dr.Fr. Arun Anthony and Dr. Guydeuk Yeon, of Christ University, along with 3 resource speakers Mr. Kothandaraman Sridharan, Dr. Iven Jose and Mr. Ajith Suresh. The event officially commenced by Dr. Samiksha Shukla and the concluding remarks were delivered by Fr. Jossy P George.

Mr. Rathi spoke on creating an Innovative Mind Set and its



importance. He highlighted the three personal traits required in an innovator are that he should be willing to “Take Chances”, “Attempt the Impossible” and “Collaborate with Others”. He laid emphasis on that while innovating one has to approach the subject with “Beginners Mindset” and with lot of empathy. He concluded by saying that innovation is all about demonetization, dematerialization and democratization of products, services and industries. His final advise was that when it comes to innovation, “think out of the box”.

The symposium was organized in association with CSI was an enriching experience that brought academic fraternity as well as researchers together to share their thoughts and ideas on the topic of innovation and research in the field of data science among a variety of audiences from diverse domains.

Call for Paper for CSI Journal of Computing

(e-ISSN: 2277-7091)

Original Research Papers are invited for the **CSI Journal of Computing**, published online quarterly (e-ISSN: 2277-7091) by the Computer Society of India (CSI). The Journal of Computing, offers good visibility of online research content on computer science theory, Languages & Systems, Databases, Internet Computing, Software Engineering and Applications. The journal also covers all aspects of Computational intelligence, Communications and Analytics in computer science and engineering. Journal of Computing intended for publication of truly original papers of interest to a wide audience in Computer Science, Information Technology and boundary areas between these and other fields.

The articles must be written using APA style in two columns format. The article should be typed, double-spaced on standard-sized (8.5" x 11") with 1" margins on all sides using 12 pt. Times New Roman font and 8-12 pages in length. The standard international policy regarding similarity with existing articles will be followed prior to publication of articles. The paper is to be sent to Dr. R. R. Deshmukh, Editor-in-Chief in the email id: rrdeshmukh.csit@bamu.ac.in with a copy to Prof. A. K. Nayak, Publisher, CSI Journal of Computing in the email id : aknayak@iibm.in

Prof. A K Nayak
Publisher

Emerging Trends of IT in India and Role of CSI

Reported by Mr. Diwakar Tripathi, President at CSI BBDITM Student Council, Lucknow



CSI BBDITM Student Council of Dept. of CSE and IT organized a national webinar in collaboration with the Computer Society of India Region 1. The theme of the webinar was "Emerging Trends of IT in India and Role of CSI". It was conducted online on the Zoom app on 17/07/2020 from 11:00 am-1:00 pm. The webinar was marked by the presence of Prof. A. K Nayak (Immediate Past President, Chairman Academics and Award Committee Computer Society of India), Mr. R.K Vyas (President Computer Society of India), Dr S.C. Yadav (Professor and Head Dept of Computer Science and Technology, Central University of Jharkhand, Ranchi), Mr. Arvind Sharma (Vice-President Region 1 Computer Society of India), Prof. (Dr) Bhavesh Kumar Chauhan (Chief Patron, Director-BBDITM, Lucknow), Prof. (Dr.) Manuj Darbari (Chair Patron, HOD-IT), Prof. (Dr.) Diwakar Yagyasen (CSI Branch Co-ordinator, HOD-CSE) and Prof. Shadab Siddiqui and Prof. Zulfikar Ali Ansar (CSI Branch Counsellor). The webinar was witnessed with 200+ attendees including the students, faculties, and professionals across INDIA. The session was inaugurated by welcoming the guests and all the attendees.

Mr. R. K. Vyas gave the presidential address and began the session by stating the historical background of CSI and also how CSI works with various organizations and won various prestigious awards. CSI has published various journals.

Prof. A. K. Nayak gave the chief guest address and spoke about CSI and its role. He explained the advancement in Information Technologies and its impact and the challenges for forthcoming IT Human Resource. He emphasized how technologies helped us during the COVID-19 pandemic and also explained the various computing technologies like Cloud Computing and Big Data. Prof. Nayak explained the relation of science to VED, Puran, Shastra etc. Prof. Nayak sir told "In this generation technology is like" as means in this generation technology available for all, not for any specific person. In the last Prof Nayak also told about the benefits & advantage of CSI for the students, institute and professionals.

Prof. S.C. Yadav gave keynote address and continued the session and explained IOT, Artificial Intelligence, Quantum computing, Data Science etc. Prof S.C. Yadav told about use of these technology etc.

The entire session was very informative and interactive. All the queries were solved and the session was concluded with the Vote of Thanks. Vote of Thanks was given by the Prof. (Dr.) Diwakar Yagyasen (HOD CSE, BBDITM Lucknow). According to the feedback form, attendees strongly appreciated the webinar and also interested to conduct this type of webinar again.

Call for Contributions in CSI Adhyayan

(A National Publication dedicated to IT Education, Research and Student Community)

CSI Adhyayan is being positioned as a national publication dedicated for IT education, research and student community. This quarterly electronic publication performs the functions of a newsletter, a magazine and journal.

We take this opportunity to invite the contributions in this venture. Your invaluable contributions, suggestions and wholehearted support will be highly appreciated. We appeal to all our Chapters, Student Branches and member academic institutions for encouraging and motivating the students in terms of contributing innovative ideas, exploring new vistas of knowledge and new

findings through CSI Adhyayan. We especially invite news and updates from our member institutions and student branches.

Please send your article to the Chief Editor **Dr. Vipin Tyagi** via email dr.vipin.tyagi@gmail.com with a copy to the publisher Prof. A. K. Nayak in the email : aknayak@iibm.in

On behalf of CSI Publication Committee

Prof. A. K. Nayak, Publisher



Call for Regional & State CSI Student Coordinator/s - 2020-2021

Computer Society of India, with 500+ Student Branches across India with close to one lakh members invites applications from Life Members of CSI interested in serving as Regional and State Student coordinators. The Student Coordinators should be able to contribute to the growth of CSI Student Branches and to increasing activity towards spreading of IT Education in different academic institutions.

The National Student Coordinator (NSC) / Regional Student Coordinator/s (RSCs) will work closely with the ExecCom, Regional Vice Presidents and CSI Education Directorate for leading, coordinating and managing student activities in the seven regions in the country. RSCs will be supported by the State Student Coordinators (SSCs) in each of the states which constitute the Regions. Details of the Regions and constituent states are given below in this advertisement.

The applicants must be dynamic with experience of serving the student community and with ability to organize Student Conventions. CSI has ambitious plans of growth and intends to conduct programs in line with the national IT policy of the Government of India so as to prepare the student community to contribute towards nation building.

The student coordinators at the Regional and State level must be Life Members of CSI with experience of serving CSI at the Chapter level and should be ready to devote time to carry out the tasks for the benefit of CSI Student Branches. Preference will be given to applicants who have organized Institutional / State level / Regional / National events and are working in an academic institution.

Interested candidates are requested to send their detailed CV (including Qualification, Experience, Position held at CSI & Membership Number) by email to admin.officer@csi-india.org with copy to Hon. Secretary at csi.hon.sec@gmail.com mentioning details of the position applied for on or before 25th August 2020.

The following is the list of Regions and States for which Student Coordinators are invited:

Regions	States
Region-1	<ul style="list-style-type: none"> ▪ Delhi ▪ Haryana ▪ Himachal Pradesh ▪ Jammu & Kashmir ▪ Punjab & Chandigarh ▪ Uttar Pradesh ▪ Uttarakhand
Region-2	<ul style="list-style-type: none"> ▪ Assam ▪ Bihar ▪ West Bengal
Region-3	<ul style="list-style-type: none"> ▪ Gujarat ▪ Madhya Pradesh ▪ Rajasthan
Region-4	<ul style="list-style-type: none"> ▪ Chhattisgarh ▪ Jharkhand ▪ Odisha
Region-5	<ul style="list-style-type: none"> ▪ Andhra Pradesh ▪ Telangana ▪ Karnataka
Region-6	<ul style="list-style-type: none"> ▪ Goa ▪ Maharashtra
Region-7	<ul style="list-style-type: none"> ▪ Kerala ▪ Tamil Nadu 1 & Puducherry ▪ Tamil Nadu 2

KIND ATTENTION !

Prospective Contributors of CSI Communications (SPECIAL ISSUE)

Forthcoming Special Issue : Online Education in the Post COVID-19 World & Beyond

Please note that keeping in mind the altering scenario of education due to the COVID-19 pandemic, CSI has decided to bring forth a special issue on "Online Education in the Post COVID-19 World & Beyond". We plan to publish this issue in September, 2020 for which kindly send your contributions on or before 5th September, 2020.

The articles should be authored as original text. Plagiarism is strictly prohibited.

Please note that CSI Communications is a magazine for members at large and not a research journal for publishing full-fledged research papers. Therefore, we expect articles written at the level of general audience of varied member categories. Equations and mathematical expressions within articles are not recommended and, if absolutely necessary, should be minimum. Include a brief biography of four to six lines, indicating CSI Membership no., for each author with high resolution author photograph.

Please send your article in MS-Word format to Chief Editor, **Prof. (Dr.) S. S. Agrawal** in the email id csic@csi-india.org with copies to the Publisher **Prof. A. K. Nayak**, in the email id : aknayak@iibm.in and Editor **Ritika Wason**, Associate Professor Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM) in the email id : rit_2282@yahoo.co.in

Issued on the behalf of the Editorial Board, CSI Communications.

Prof. A. K. Nayak

Publisher

Dr. D. D. Sarma

Chair, Publications Committee

Prof. (Dr.) S S Agrawal

Chief Editor

Dr. Ritika Wason

Editor

CHAPTERS REPORT

AMRAVATI CHAPTER

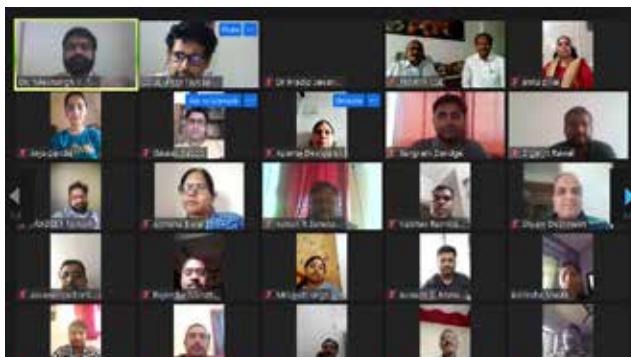
Reported by Dr. S S Agrawal, MC Member, CSI Amravati Chapter



College of Engineering and Technology, Akola in association with CSI Amravati Chapter and Indian Society for Technical Education, New Delhi organized an online one Week Short Term Training Program (STTP) on E-Learning Tools, Methodologies and Content Management from 13th to 18th June 2020. Around 180+ participants from all over India participated in the STTP.

Dr. Gajendra R Bamnote, Past Chairman, CSI Amravati Chapter inaugurated the STTP program and also conducted the session on Flipped Classrooms for Distance Learning During Covid-19. Dr. Mohammad Atique, Dr. Aarti M Karande, Dr. N M Tarbani, Dr. N M Thakare, Dr. Pravin Satav, Dr. Shrikant Sonekar, Dr. S A Bhura, Dr. S S Agrawal and Dr. R S Jaiswal were also the resource persons. Dr. Pradip M Jawandhiya, Chairman, CSI Amravati Chapter conducted session on Swayam on the last day of the session. Dr. S L Satarkar, Head and Associate Professor, Department of CSE was the Convener for the STTP and the event was coordinated by Dr. S S Agrawal and Dr. R S Jaiswal.

Reported by Dr. Sunil R Gupta, Coordinator of STTP and SBC – CSI, PRMITR, Bandra



Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati has organised a one week online AICTE-ISTE approved Short-Term Training Program on Research and Publication Ethics in association with CSI Amravati Chapter during 29th June 2020 to 3rd July 2020. The Course Content of STTP covers Philosophy and Ethics, Scientific Conduct, Publication Ethics & Misconduct, Open Access Publishing, Database & Research Metrics. Around 250

participants successfully completed this Short-term program from all over India. Dr. P M Jawandhiya, Chairman CSI Amravati Chapter inaugurated the STTP. Dr. Gajendra R Bamnote, Past Chairman, CSI Amravati Chapter was the Convener and Dr. Sunil R. Gupta, the SBC, P.R.M.I.T & R, CSI Student Branch and Prof. Sangram S Dandge CSI members were the coordinators.

CHENNAI CHAPTER

Reported by Dr. A Prema Kirubakaran, Hon. Secretary, CSI Chennai Chapter

The CSI Chennai Chapter organised the following webinars jointly with ACM Chennai and IEEE CS Madras during June – July 2020.

1. In collaboration with ETU team of CDAC Mumbai, conducted a 90 minutes webinar in two batches on "Introduction to eLearning Content Creation" from 3:30 PM to 5 PM on 15th June & 22nd June 2020. The webinar consisted of two sessions of about 40 minutes each followed by Q&A for 10 minutes. Presentation of both sessions was delivered by Dr. M Sasikumar, Executive Director, CDAC Mumbai and the tools demonstrations were done by Ms Archana of ETU team.

Session-1 included: Presentation on the big picture of Online Teaching Learning; Content - the Key to Online Learning; Basic Content - Text, Images, Diagrams, Audio, Video with examples; and Guidelines for effective basic content creation. Tools Demonstrations included: Record Narration in power point; Draw.io; Audacity; and Handbrake.

Session-2 included: Presentation on Advanced Content - Screen Casts, Interactive Videos, Time Lines, Story Maps, Animation, Simulation, AR/VR with examples; OER, Curating already available content, etc.; Content Copyright; Content Delivery; and Guidelines for effective advanced content creation. Tools Demonstrations included: VUE – mindmap; and OBS Studio. Link to the presentation: <https://bit.ly/3Fhzkh>. Link to video (two hours and 16 minutes) recording: <https://bit.ly/2ZnBu0p>

2. Webinar on "**Machine Learning an Exploratory Tool: Key Concepts and Programming**" by Dr. Amlan Chakrabarti, Prof. & Director, A.K. Choudhury School of IT, University of Calcutta, Distinguished Speaker at IEEE CS on 17th June 2020 from 6 PM to 7 PM. This program was re-presented due to the cyclone problems, we had experienced during the first webinar held on 25th May 2020. Link to video (one hour and 35 minutes) recording: <https://bit.ly/31mTISj>

3. Webinar on "**Power Up your Presentation & Public Speaking Skills**" by Mr Senthil Raj Jagadeesh, Managing Partner for Seasons (A Kovai Pazhamudhir Nilayam Initiative) & Founder & CEO of "The Foundation" on 20th June 2020 from 6 PM to 7 PM. Topics covered include: Posture and Body Language; Vocal Dynamics; Gestures and Movement; Effective Storytelling, Understand and Connect with your audience; and Effective handling of Q&A sessions. Link to presentation: <https://bit.ly/37MxQky>. Link to presenter's handout <https://bit.ly/3148o92>. Link to video (one hour and 25 minutes) recording: <https://bit.ly/2YWdm4l>

4. A session on Yoga Practice cum Demonstration on International

CHAPTERS REPORT

Day of Yoga was conducted on 21st June 2020 by Ms Pushpa Krishnaswamy, a yoga teacher, certified at Sri Sri School of Yoga & the founder of the online yoga studio Yoga Abhyaasaa by following the Common Yoga Protocol. Link to the invitation: <https://bit.ly/3gXVLBM>

5. Webinar on "Autonomous Systems: Advances, Applications, and Opportunities" by Dr. San Murugesan, Director, BRITE Professional Services, Adjunct Professor, Western Sydney University, Australia on 25th June 2020 from 3 PM to 4 PM. The participants learnt the following by attending this webinar: What an autonomous system is, and why it matters, Principles and architecture of an autonomous system, Levels of autonomy – human-in-the-loop, and human-values-in-the-loop, Advances in this domain and supporting developments, Current and future applications of autonomous systems, Concerns on autonomous systems such as trust and ethics, and how we can address them, Impact of autonomous systems and Opportunities for further research and application development. Link to video (one hour and 53 minutes) recording: <https://bit.ly/2CMlmgf>. Link to presentation: <https://bit.ly/2BlnNav>

6. Webinar on "IoT & AI for Healthcare and Manufacturing" by Dr. Arpan Pal, Chief Scientist and Research Area Head (Embedded Systems and Robotics), TCS Research and Innovation, Tata Consultancy Services on 30th June 2020 at 6 PM. Dr. Arpan Pal covered the Generic COVID related applications, Specific applications in Healthcare and Manufacturing (short term) and Longer-term requirements, impacts and challenges. Link to video (one hour and 24 minutes) recording: <https://bit.ly/31NcTF0>

7. Webinar on "Mastering Digital Writing and Entrepreneurship" by Ms Nandini Alagar, Business Owner, Talent Canvas on 4th July 2020 at 6 PM. The session covered the journey of Digital Entrepreneur starting from the first few steps of creating their own website to writing blogs and performing SEO and then proceeding towards Digital Marketing, Advertising and Automation Techniques. The speaker emphasized "When done systematically, within a short time span of 30-90 days maximum, one can become a full stack digital entrepreneur with several products and services to sell online and earn income out of. Literally anybody today can master the art of DIGITAL and have their own online start-up". Link to video (1 hour 18 minutes of size 595 MB) recording: <https://bit.ly/2YZlh1p>

8. Webinar on "Social Media Governance in the connected world" by Dr. K Rama Subramaniam, Director & CEO, Valiant Technologies Group on 11th July 2020 at 6 PM. The presentation covered the current state of digital wildfires supported by case studies and examined the features of current social media governance structure. The speaker emphasized that various social media stakeholders having different positions in relation to digital wildfires need to evolve controls over digital wildfires. Link to video (1 hour 32 minutes of size 765 MB) recording: <https://bit.ly/3fqENLa>

Link to presentation: <https://bit.ly/3fm8Wep>

While Mr P V Subramanian, Chairman, CSI Chennai Chapter welcomed the participants and introduced the speakers in the above events, Mr HR Mohan, Past President, CSI and Chair ACM Chennai moderated the Q&A and presented concluding remarks. These

webinars were well attended, and the participants felt the events were timely, interactive, and found the content relevant, interesting, useful.

KANCHEEPURAM CHAPTER

Reported by Dr. M Senthil Kumar, Hon Secretary, CSI Kancheepuram Chapter



St. Joseph's College of Engineering
St. Joseph's Group of Institutions
OMR, Chennai - 119
nirf 2020 RANK - 160
26
NBA
A+ RANK

Department of Information Technology

Organize STTP In Association with CSI - KANCHEEPURAM CHAPTER

Cyber Security - Threats and Vulnerabilities in Real Time Applications

PATRONS

Dr. B. Babu Manoharan M.A., M.B.A., Ph.D.,
Chairman, St.Joseph's Group of Institutions

Mrs. S. Jessie Priya M.Com.,
Managing Director, St.Joseph's Group of Institutions

Mr. B. Shashi Sekar M.Sc.,
Director, St.Joseph's Group of Institutions

Dr. Vaddi Seshagiri Rao M.E., M.B.A., Ph.D.,
Principal, St.Joseph's College of Engineering

Dr. B. Parvathavarthini M.E., Ph.D.,
Dean, St.Joseph's College of Engineering

Mr. S. Ram Sundar
Director
Hebesec Security Labs



CSI Kancheepuram chapter in association with CSI Student Branch of St Joseph's College of Engineering organized an online six days STTP on the topic "Cyber Security –Threats and Vulnerabilities in Real Time Applications" from July 6th to July 11th with the support of respected Dr. B Babu Manoharan, Chairman, St Joseph's Group of Institutions, Mrs S Jessie Priya, Managing Director, Mr B Shashi Sekar, Director, Dr. Vaddi Seshagiri Rao, Principal, St Joseph's College of Engineering and Dr. B Parvatha Varthini, Dean.

The Coordinator Dr. Lilly Raamesh, HOD-IT Student Affairs delivered the welcome address by inviting the esteemed chief guest Dr. Rajeswari Mukesh, Chairman, CSI Kancheepuram Chapter for the inaugural address. The Chief Guest delivered the inaugural address. She stressed the importance of cyber security and appreciated the choice of the topic cyber security during the lockdown period. She also welcomed all the registered participants by thanking them for showing their interest in attending the STTP. She also invited the resource person Mr S Ram Sundar Director, Hebesec Security Labs .200 faculties of various colleges were registered for the event. The STTP focused on the introduction of cyber security, web applications cyber security, footprinting and reconnaissance, sql injection vulnerability, Cross site vulnerability, Brute force attack and misconfiguration attacks and file upload vulnerability. On the Last day, the Convener Mrs G Lathaselvi, HOD-IT Staff Affairs welcomed Dr. M Senthil Kumar, Hon Secretary, CSI Kancheepuram Chapter who joined the valedictory. The STTP ended with vote of thanks. Dr. D Logeshwari, Dr. M Anbu, S Thresa Jenifer and S Anitha were also involved in conducting this STTP. The event was organized under the guidance of Dr. Rajeswari Mukesh, Chairman CSI Kancheepuram Chapter

CHAPTERS REPORT



A National Level Webinar on Bright Side of Covid-19 : Opportunities organized by the CSI Kancheepuram Chapter on 23rd of July 2020. The theme of the webinar was to discuss the bright side of covid-19 pandemic and the opportunities for the human being. Dr. Rajeswari Mukesh, Chairman, CSI Kancheepuram Chapter welcomed the Guest speaker Dr. B Chidhambararajan, Chairperson Division-IV (Communication), CSI. She also welcomed the Guest of Honor Dr. A K Nayak, Immediate Past President, CSI and the participants from various Institutions. The guest speaker began his presentation with the dark side of covid-19 pandemic how it affected the people in all aspects. He primarily emphasized on various aspects of positive side like stay at home which gave opportunity to rejuvenate individual by doing passionate things, spending more time with the family which gave the chance to take care of elders, play with children. He also clearly explained the various Positive side of online teaching like

increased flexibility of time, flexibility of locations, easy information sharing and increased interaction and engagement. He also gave suggestions to self-motivate yourself which is an essential requirement for online teaching. The participants got the opportunity to know how to take the positive side of covid-19 pandemic period and everyone enjoyed the session, as it was interactive and interesting. More than 260 Professors from various institutions in all parts of India were registered for the webinar and got benefited. Finally, the session was ended with vote of thanks proposed by Dr. M Senthil Kumar, Hon Secretary CSI Kancheepuram Chapter.

With the support and guidance of Dr. Rajeswari Mukesh (Chairman, CSI KPM) Dr. M Murugan (Vice Chairman, CSI KPM), Dr. M Senthil Kumar (Hon Secretary, CSI KPM) and Dr. J Frank Vijay (Hon Treasurer, CSI KPM) gave the platform for the participants and brought the webinar to the maximum success.

TIRUCHIRAPPALLI CHAPTER

Reported by **D Senthil Kumar**, Hon. Secretary, CSI Tiruchirappalli Chapter

CSI Tiruchirappalli Chapter jointly with IEI organized a Webinar Thru Zoom on Topic "ICTs for Sustainable Development Goals". Dr. Narasimha Sarma N V S, Director, Indian Institute of Information Technology (IIIT) Tiruchirappalli was the speaker. Dr. N Kumaresan, NIT Trichy welcomed the speaker. Er R Selvaraj, Chairman CSI Trichy Chapter delivered the vote of thanks.

KIND ATTENTION !

Prospective Contributors of CSI Communications

Forthcoming Issues : September 2020 : **Digital Twins**

Please note that Cover Theme for the September 2020 issue is **Digital Twins**. Articles may be submitted in the categories such as: Cover Story, Research Front, Technical Trends, Security Corner and Article. Please send your contributions by 25th August, 2019.

The articles should be authored as original text. Plagiarism is strictly prohibited.

Please note that CSI Communications is a magazine for members at large and not a research journal for publishing fullfledged research papers. Therefore, we expect articles written at the level of general audience of varied member categories. Equations and mathematical expressions within articles are not recommended and, if absolutely necessary, should be minimum. Include a brief biography of four to six lines, indicating CSI Membership no., for each author with high resolution author photograph.

Please send your article in MS-Word format to Chief Editor, **Prof. (Dr.) S. S. Agrawal** in the email ids **csic@csi-india.org** with copies to the Publisher **Prof. A. K. Nayak**, in the email id : **aknayak@iibm.in** and Editor **Ritika Wason**, Associate Professor Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM) in the email id : **rit_2282@yahoo.co.in**

Issued on the behalf of the Editorial Board, CSI Communications.

Prof. (Dr.) S S Agrawal
Chief Editor

JAI PARKASH MUKAND LAL INNOVATIVE ENGINEERING AND TECHNOLOGY INSTITUTE, RADAUR (REGION-I)

Reported by Mr. Vishal Garg, SBC, Jai Parkash Mukand Lal Innovative Engineering and Technology Institute



Seth Jai Parkash Mukand Lal Institute of Engineering & Technology (JMIT), Radaur and Jai Parkash Mukand Lal Innovative Engg. & Technology Institute, JMIETI, Radaur have organized a one-day online conference on Sharing of Best Practices- Efficient Engagement of Students through Virtual Classes in collaboration with CSI on 18 July 2020. The main speakers of the conference were Dr Ramesh Kumar, General Secretary, Mukand Institutions; Ms S Dharini, Joint Secretary & Head-COE, CBSE, Noida; Ms Shashi Bathla, Principal, Mukand Lal Public School, Yamuna Nagar; Ms Suman Singh, Principal, Army Public School, Panchkula; Mr B Murali, Principal, DPS, Jagadhri; Dr S K Garg, Director- JMIT, Radaur; Dr Puja Walia Mann, Principal, Pratap Public School, Karnal; Mr Mohan Singh, Principal, JPS Academy, Assandhi; Ms Suneeta Sharma, Principal, PKR Jain Girls Sr Sec School, Ambala; Dr R S Chauhan, Director- JMIETI, Radaur, who have together shared best practices which they are currently following in their institutions to teach students. They have brainstormed the solutions to the problems, All the speakers' have emphasized the need of transforming traditional teaching learning process. At the end of the conference, the institute's director, Dr S K Garg JMIT congratulated all the organizers on the successful event and Dr R S Chauhan director, JMIETI thanked all the participants of the conference whole heartedly.

SUPREME KNOWLEDGE FOUNDATION GROUP OF INSTITUTIONS, HOOGHLY (REGION-II)

Reported by Aritra Bandyopadhyay, SBC, Supreme Knowledge Foundation Group of Institutions



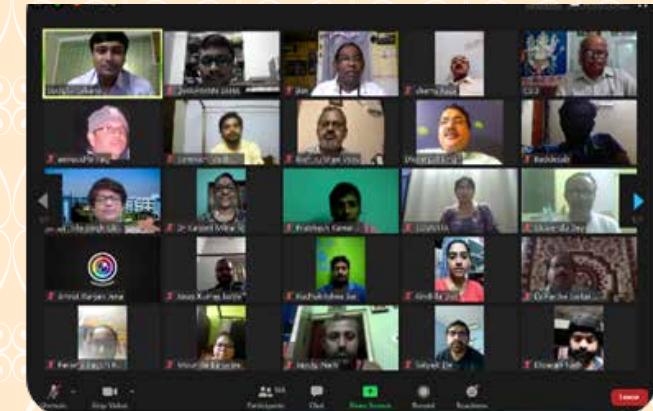
The Department of Computer Science and Engineering, Supreme Knowledge Foundation Group of Institutions has successfully organized a webinar on Full Stack Development: Idea, Scope and Prospect on 13th July 2020 in association with CSI Student branch of SKFGI. The workshop was focused on motivating students about scope and prospect of Full Stack Development. It was an interactive session where the students got to interact with distinguished speaker Mr Sumit Saha on various aspects.



The Department of CSE, Supreme Knowledge Foundation Group of Institutions has successfully organized the webinar on "Motivation post Covid-19: Job Prospect and Entrepreneurship" on 4th July 2020 in association with CSI Student branch of SKFGI. The workshop was primarily focused on motivating students about job prospects and entrepreneurship post COVID-19. It was an interactive session where the students got to interact with our distinguished speaker Mr. Dave on various aspects.

JIS COLLEGE OF ENGINEERING, KALYANI (REGION-II)

Reported by Prof. Sudipta Sahana, SBC, JIS College of Engineering



One week FDP on Image Authentication, WSN & IoT from 22-6-2020 to 26-6-2020 was organized by Department of Computer Science & Engineering, JIS College of Engineering in Association with Computer Society of India, Kolkata Chapter. The program commenced on 22nd June 2020 with a beaming inaugural session. We had with us all the distinguished dignitaries from Computer Society of India, as well as from JIS College of Engineering.

ASSAM UNIVERSITY, SILCHAR (REGION-II)

Reported by Dr. Somnath Mukhopadhyay, Assam University

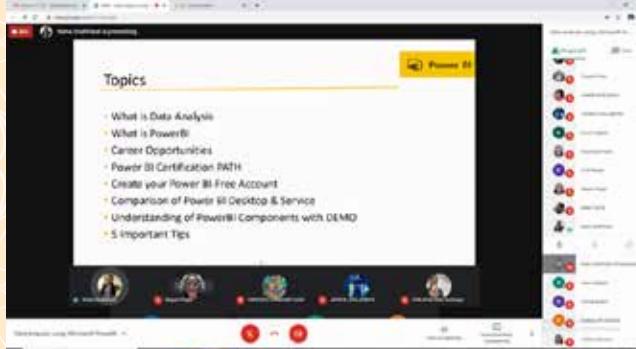


CSI Student Branch of Assam University in association with Department of Computer Science & Engineering, Assam University, Silchar organized two International webinars attended exclusively by an online audience of registered participants on the internet, on 28th June 2020 and 4th July 2020.

Prof. Dilip Chandra Nath, Vice Chancellor, Assam University as Chief Patron administratively encouraged both the events and addressed the inaugural ceremonies. Distinguished speakers, also at the inaugurations, were Mr. Ram Krishna Vyas, President, CSI, Prof. A. K. Nayak, Immediate Past President, CSI and Prof. Atal Chaudhuri, Vice Chancellor, Veer Surendra Sai University of Technology, Odisha, India. The General Chairs for the events were Prof. Md. Shams Raza, Regional Vice President, Region-II, CSI and Dr. Aniruddha Nag, Chairman, CSI, Kolkata Chapter. Organizing Chair for the webinars was Prof. Sudipta Roy, Dean, Triguna Sen School of Technology, Assam University, Silchar. The events were coordinated by Dr. Somnath Mukhopadhyay, and Dr. Sunita Sarkar, of the Department of Computer Science & Engineering, Assam University, Silchar. The webinars covered a wide range of topics.

CHANDUBHAI S PATEL INSTITUTE OF TECHNOLOGY, ANAND (REGION-III)

Reported by Aniruddh G. Fataniya, Chandubhai S Patel Institute of Technology

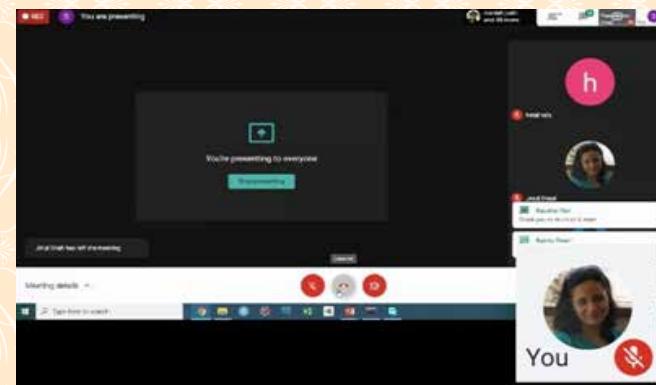


CSI Student Branch of Chandubhai S Patel Institute of Technology has organized an online event on Data Analysis using Microsoft PowerBI on 4th July 2020. The aim is to make the students attentive of the

cutting-edge technologies to make them accomplished of having an improved stand in society. The main objective behind this workshop was to make the students familiar with present data visualization tools for better career opportunities.

DEVANG PATEL INSTITUTE OF ADVANCE TECH AND RESEARCH, ANAND (REGION-III)

Reported by Prof. Drashti Garadharia, Devang Patel Institute of Advance Tech and Research



Devang Patel Institute of Advance Technology and Research (DEPSTAR) organized National Level Workshop on Covid19 Data Analysis, Prediction and Visualization. The Workshop was conducted from 11th May 2020 to 13th May 2020. The mode of workshop was remote training. A total of 104 participants participated in the Workshop. The Workshop was conducted at the National level where faculty members, research scholars and students from all over the Nation were invited to attend the Workshop. The objective of the workshop was to introduce Python libraries used for Data Analysis, how to do Web Scraping for collecting data from various resources and then analyze the data and predict the future outbreak. Three Days workshop will cover a complete understanding of AI for Corona Virus Data Analysis with theory & hands-on sessions. Live demonstration of Topics and practical's are included to ensure that the candidate can get hands-on exposure.

SANGAM UNIVERSITY, BHILWARA (REGION-III)

Reported by Prof. Kuntal Barua, SBC, Sangam University



An International webinar on "Post Covid-19 Superpowers - Computer Science, Healthcare, Information Technology & Personal Branding" held on 27 June 26, 2020. This webinar was organized by Mr Kuntal

Barua, Assistant Professor of Department of Computer Science on the subject "Post Covid-19 Superpowers - Computer Science, Healthcare, Information Technology & Personal Branding".

JAYPEE UNIVERSITY OF ENGINEERING & TECHNOLOGY, GUNA (REGION-III)

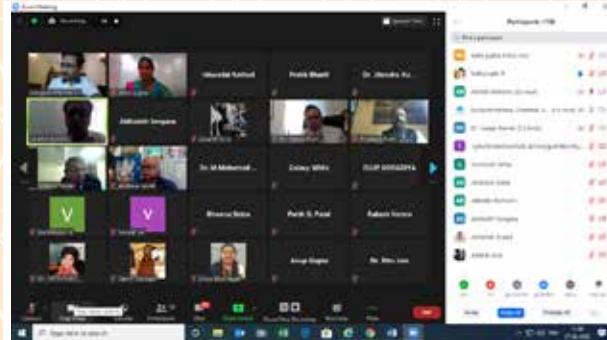
Reported by Mr. Nilesh Patel, Jaypee University of Engineering & Technology



Jaypee University of Engineering and Technology, Guna organized a competitive coding contest: Kodeathon A12 - Death Note on May 20, 2020. Students were tasked to solve 5 problems in 2:00 hours. The contest was hosted online at HackerEarth competitive coding platform. Total 202 students participated in the event and 164 submissions were made. After applying plagiarism filter, top 5 performers were: 1) Mrityunjaya Gupta 2) Sourav 3) Kartikeya Srivastava 4) Sohit Kumar Shihhare and 5) Eshita. Student coordinators of the event were Prakhar Pandey and Sachinam Srivastava. This event was coordinated by Dr Nileshkumar Patel (Assistant Professor), CSE Department, JUET, Guna. Faculty advisors for the event were Prof Shishir Kumar (HOD, Dean-A&R, JUET, Guna) and Prof. Vipin Tyagi, (Professor, JUET, Guna, Hon Secretary of CSI). This event was technically supported by Mr Abhinav Kumar Pandey, Developer Associate, SAP Lab, India.

SYMBIOSIS UNIVERSITY OF APPLIED SCIENCES, INDORE (REGION-III)

Reported by Prof. Neha Gupta, SBC, Symbiosis University of Applied Sciences, Indore



A National Webinar on Incubation and Entrepreneurship was organized by School of Computer Science and Information Technology on 27th and 28th June 2020 under CSI Student Branch of Symbiosis University of Applied Sciences, Indore. The Theme of webinar was to discuss ecosystem and services required to support entrepreneurship ecosystem to help young entrepreneurs fulfil their dreams and

become 'job givers' rather than 'job seekers'. This webinar was of 2 days duration and was inaugurated by Vice Chancellor, Symbiosis University of Applied Sciences, Indore Dr Sanjay Kumar and Prof A K Nayak, Immediate Past President, CSI in presence of Dr Ashish Bansal, Professor and Director, SCSIT and Dr Durkesh K Mishra, Treasurer, CSI and Mr Jayant Bhide, Regional Vice President Region-III. The webinar ended with a Valedictory note by Dr Neha Gupta.

CMR TECHNICAL CAMPUS, HYDERABAD (REGION-V)

Reported by Prof. N. Bhaskar, SBC, CMR Technical Campus

Online Faculty Development Programme & Two Weeks Certificate Program on Machine Learning & Computer Vision were organised by the Student Branch of CMR Technical Campus, Hyderabad from 29-6-2020 to 8-7-2020. The Speakers are Prof. P.K. Biswas, IIT Kharagpur, Dr ParthaPratim Roy, IIT Roorkee, Dr Santosh Viparthi, MNIT Jaipur, Prof AparajitaOjha, IIITDM Jabalpur & Dr Subrahmanyam Murala, IIT Ropar. Many topics concepts are covered.

Online Faculty Development Programme & Two Weeks Certificate Program on Machine Learning & Computer Vision
June 29 to July 8 , 2020

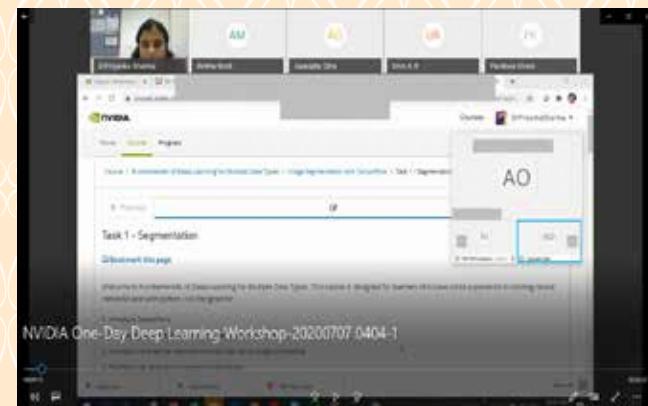
Jointly Organized by:
IIT Guwahati
MNIT Jaipur
PDPM IIITDM Jabalpur
NIT Patna

Resource Persons

- Prof. P.K. Biswas, IIT Kharagpur
- Dr. Partha Pratim Roy, IIT Roorkee
- Dr. Santosh Viparthi, MNIT Jaipur
- Prof. Aparajita Ojha, IIITDM Jabalpur
- Dr. Subrahmanyam Murala, IIT Ropar

One day session by
NVIDIA

CSI Student Branch of CMR Technical Campus, Hyderabad organized a One Day NVIDIA Online Certification Workshop on "Fundamentals of Deep Learning for Multiple Data Types on 7th July 2020. Speakers of the event Dr Priyanka Sharma. In this event many concepts are covered.



CHALAPATHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, GUNTUR (REGION-V)

Reported by Dr. K Kiran Kumar, SBC, Chalapathi Institute of Engineering and Technology

**CHALAPATHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS**

CHALAPATHI NAGAR, LAM, GUNTUR, ANDHRA PRADESH - 522034

ACCREDITED BY NAAC WITH "A" GRADE, NBA ACCREDITED, ISO 9001:2015 CERTIFIED, UGC 2(f)

ORGANIZED BY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
IN ASSOCIATION WITH CIET CSI STUDENT CHAPTER (REGION V)

5 Day Workshop on Data Science using Python



Dates: 22-06-2020 to 26-06-2020
Time : 4 PM to 6 PM daily
Registration Link : <https://forms.gle/PXVLaL5C3H4Yx94VA>
Resource Person :
Vidyasagar Nesanuru
Sr. Manager - AI & ML
Salesforce India Pvt Ltd

Registration Fee : Rs.100/-
Google pay/PhonePe: 9052176699

For details contact: S.Seshagiri(9032777050)/Mr.P.Venkata Siva(9052176699)

A 5 day workshop on Data Science using Python was organized by the department of CSE from 22nd – 26th June 2020 in Association with CIET CSI Student Branch. The workshop was started by the inaugural speech of the Principal, Dr M Chandrasekhar. The invite talk was given by Prof M S Prasad Babu, RVP, CSI Region V. The host is Mr N Vidyasagar, Sr Manager, Salesforce India Pvt. Ltd, Hyderabad. Various aspects were covered and discussed during the events. The workshop was concluded with vote of thanks by Professor & HOD of CSE, Dr K Kiran Kumar. 646 students and faculty members have participated and acquired good amount of knowledge. Entire programme was coordinated by Dr K Kiran Kumar, HOD-CSE, CIET.

NEW HORIZON COLLEGE OF ENGINEERING, BANGALORE (REGION-V)

Reported by Dr. B. Rajalakshmi, SBC, New Horizon College of Engineering

The department of CSE in association with CSI Student Branch organized an “International Online Alumni Meet” on 26th June 2020. Around 8 alumni were invited from different batches to address the IV, VI and VIII semester students on the topic “Understanding Industry Needs - Challenges Faced Moving from Campus to Corporate”. One of the alumni invited, has completed her masters from Carnegie Mellon University, USA. The session was very interactive as the students posed lot of questions about their placements and higher studies.



DAYANANDA SAGAR ACADEMY OF TECHNOLOGY AND MANAGEMENT, BANGALORE (REGION-V)

Reported by Dr. C Nandini, Vice Principal & Head, Dayananda Sagar Academy of Technology and Management



CSI-student branch in association with Department of CSE, Dayananda Sagar Academy of Technology and Management organized a Webinar Series on Research Focus in Computer Science from 8-6-2020 to 12-6-2020 for sharing best practices and digital opportunities for development, exchanging knowledge and ideas. Inauguration Session of the Webinar done in the presence of Dr B R Lakshmikantha, Principal, Dr C Nandini, Vice Principal, Prof. & CSE Head, Prof. Dr Sandhya N, Prof. Manjunath D R, Prof. Manasa Sandeep and Prof. Jahnavi S from Dept. of CSE , DSATM with the Resource Persons Prof Raghavendra Prasad, SAC-IEEE, Dept. of ISE RVCE. Various topics were covered during the sessions.

SAI VIDYA INSTITUTE OF TECHNOLOGY, BANGALORE (REGION-V)

Reported by Dr. Sangeetha, Sai Vidya Institute of Technology

Sai Vidya Institute of Technology
Department of Computer Science & Information Science Engineering
In Association with CSI Student Branch ORGANIZES



RESOURCE PERSON
Binod Adhikari
Full Stack Developer
Infidata Technologies

WEBINAR ON
Laravel Web Framework

Register now at webinarsvit.herokuapp.com

Date : 30th June 2020
Timings : 11.30 to 12.30 pm
E-CERTIFICATE WILL BE ISSUED TO ALL THE PARTICIPANTS

Dr. K Ananthapadmanabha HOD, CSE
Dr. Vrinda Shetty HOD , ISE
Dr. H S Ramesh Babu Principal

CSI Student Branch of Sai Vidya Institute of Technology, Bengaluru organized a Webinar on Laravel Web Framework on 30th June 2020. Webinar focused on providing knowledge about Laravel PHP Framework in Web Development, Object-arranged in libraries that are not found in some other PHP framework which is found in Laravel, MVC architectural pattern, How Laravel can make modular, responsive and simple web applications. The reason for such a huge utilization of this framework is that it reduces the struggle of programming and web application can be developed in less time and with less effort. It is a clean, perfect and classy PHP framework that has stunned the PHP community. This has made the process of PHP development increasingly productive and secure, as it accelerates the development procedure by giving exceptionally secure validation tools and empowering effective utilization all around.



CSI Student Branch of Sai Vidya Institute of Technology, Bengaluru organized a Webinar on Introduction to Cyber Security on 7th July 2020. Practical demonstration of various cyber-attacks were demonstrated and measures to prevent them were highlighted in the webinar.

DR AMBEDKAR INSTITUTE OF TECHNOLOGY, BANGALORE (REGION-V)

Reported by Prof. Asha K N, Dr. Ambedkar Institute of Technology



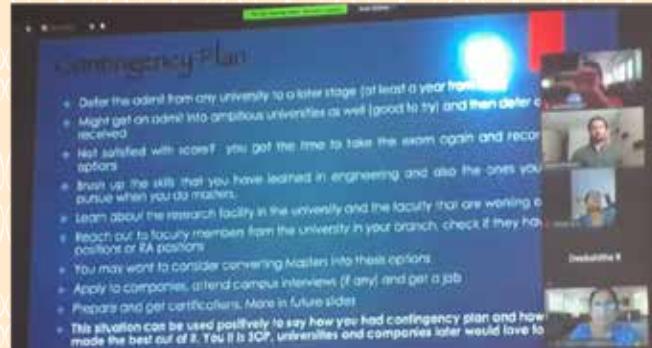
The CSI Student Branch of Dr Ambedkar Institute of Technology, Bangalore organized Hands-on workshop on Advanced Embedded Design and IoT Applications from 10-3-2020 to 13-3-2020. The first session started with an introduction to Texas Instruments, their products and its uses. It was followed by an introduction to the TM4C123GXL module where the students learnt about the Architecture, pins and its purposes. Before the modules were given to students, they were introduced to the use of Energia, an IDE developed by Texas Instruments based on Arduino IDE. It is mainly used to upload the code to the module.



The CSI Student Branch of Dr Ambedkar Institute of Technology, Bangalore organized the Webinar on Future of Digitalization and AI in Industry on 19-6-2020. The participants included Dean of Academics and HoD of CSE, Dr Siddaraju, faculty coordinators Dr K R Shylaja, Mrs Veena Potdar, Mrs Asha K N, Mrs. Asha Rani K P, several other faculty members and students from our college and also different colleges. We had close to 250 participants attending the webinar.

K.S. INSTITUTE OF TECHNOLOGY, BANGALORE (REGION-V)

Reported by Prof. Deepa S R, K.S. Institute of Technology, Bangalore



K.S. Institute of Technology, Bangalore organised a Webinar on "Career Guidance", on 6th July 2020, Webinar on "Career Guidance", The Speaker(s) at the Event was Mr Shashvath Bhaskar, Technical Project Manager & Security Champion, Intel Corporation, San Jose, California. Highlights of the event :

1. Doing masters - How, Pros, Cons
2. Online Studying and available resources
3. Job Opportunities and Certifications
4. Queries raised by the students

The webinar gave a platform for students in which students can choose their career path and opportunities provided.

SIPNA COLLEGE OF ENGINEERING AND TECHNOLOGY, AMRAVATI (REGION-VI)

Reported by Prof. S Z Khan, Sipna College of Engineering and Technology

A three days Faculty Development Program on "Video Recording, Editing and Uploading Tools" was organized by Department of Information Technology, Sipna College of Engineering & Technology, from 1st June 2020 to 3rd June 2020 in association with CSI Amravati Chapter. There were 375 participants who participated in the FDP. Objectives of FDP:



This program was planned with objective of introducing several free tools for video recording, editing and uploading for efficient and effective online teaching.

FROM CSI STUDENT BRANCHES

SRM VALLIAMMAI ENGINEERING COLLEGE, KATTANKULATHUR (REGION-VII)

Reported by **Dr. M Senthil Kumar**, SBC, SRM Valliammai Engineering College



SRM Valliammai Engineering College, CSI Student Branch has conducted a one week online course on Basic Programming Skills for Engineering Beginners from 1st June 2020 to 7th June 2020. More than 100 school students registered and got benefited. It was an interactive class on MS Teams platform



SRM Valliammai Engineering College, CSI Student Branch conducted a Poster designing contest. It was a good way to make use of the time in the quarantine period. The poster designs were based on Sustainable Future Digital India, Cyber Crime and Security, Digital India, E-school & E-governance and OS World.

PRINCE SHRI VENKATESHWARA PADMAVARTHY ENGINEERING COLLEGE, CHENNAI (REGION-VII)

Reported by **Dr. P. Veeralakshmi**, SBC, Prince Shri Venkateshwara Padmavathy Engineering College



CSI Student Branch of Prince Shri Venkateshwara Padmavathy Engineering College has organized a National Level Coding Competition-Geek-O-Code on 22nd June 2020. This competition has been organized to increase the coding ability of the students. A total of 868 students from across the Nation participated for the event.

B S ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE & TECHNOLOGY, CHENNAI (REGION-VII)

Reported by **Dr. N. Ayyanathan**, B S Abdur Rahman Crescent Institute of Science & Technology



The three days FDP on Insights of Software Development, Testing and Quality Process in its Industry was held from 30-5-2020 to 1-6-2020. The session started with the introduction of the chief guest by Dr Gufran Ahmed Ansari. The details of the 3 days session were given by Dr Shakila Anjum. After this the program started with different sessions on three topics. At the end the vote of thanks was given by Ms S Srisakthi. The participants gained knowledge about the process that is happening in the IT industry. All the sessions had an interactive questions session. As the real time case studies were shared by the resource persons, the participants could gain a good and quick insight into the working of the IT industry.



A Three-day Online Faculty Development Programme on Trending Technologies (through GoToMeeting), was conducted during 14th-16th May 2020. It was organized by the Department of Computer Applications, School of Computer, Information and Mathematical Sciences, in association with Computer Society of India. Dr T Russo, Associate Consultant, Wipro Ltd., handled the Day 1 Session on Spring Boot. Day 1 Afternoon Hands-on Session on Spring Boot was handled by Dr T Russo and Dr A K Reshma, AP/CA, BSACIST. Dr D Senthilkumar, AP, Department of CSE, University College of Engineering, Anna University, Tiruchirapalli, handled the sessions on Day 2 & Day 3, on Machine Learning Using R and Deep Learning using R respectively.

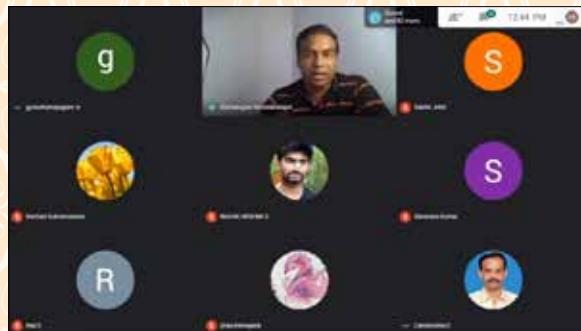
SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNAI (REGION-VII)

Reported by **Prof. Jabez J.**, SBC, Sathyabama Institute of Science and Technology

The CSI Student Branch of Sathyabama Institute of Science and Technology jointly with IT Dept organized a webinar The Introduction to Virtual Reality on 24th July 2020. The Speaker Mr Prem Sella Kumar CS, Senior Specialist -AR/VR highlighted the importance of Virtual Reality and Augmented Reality in the current scenario and its various applications in an efficient manner. The session started with the welcome address of CSI Student Branch Coordinator Dr J Jabez and around 95 students participated from various institutions. The final year IT department students Mr Jithin Abhishek and Mr Akash P (CSI Members) organized the event more interactively with the guidance and support of staff coordinators Dr S Gowri and Ms Vimali J S. The event was successfully conducted with the moral support of Dr R Subhashini, HOD-IT. Finally, the vote of Thanks was delivered by the CSI member Mr P Akash (Final Year - IT).

RAMCO INST. OF TECHNOLOGY, RAJAPALAYAM (REGION-VII)

Reported by **Prof. M. Swarna Sudha**, SBC, Ramco Institute of Technology



The Department of Computer Science and Engineering in association with CSI Students' chapter, Ramco Institute of Technology (RIT), organized five days webinar series on FUTURE IT-4.0. The webinars were conducted through google meet and YouTube live chat. More than 150 participants from various engineering colleges, arts and science colleges, universities.

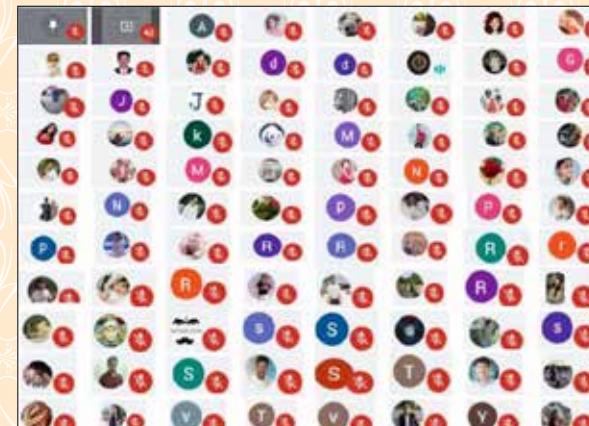
The department of Computer Science and Engineering, Ramco Institute of Technology in association with CSI organized Virtual Technical Lecture on A beginner's guide to blogging and digital marketing on 11th July 2020. The Virtual Technical session began with the introduction of the resource person. The resource person discussed about various topics and advised them to choose the platform of their own preference. She also explained about hosting and monetizing the blog. She presented the best practices in blogging and shared free keyword research tools for SEO and moved on to the next topic of the session, digital marketing. She categorized the digital marketing as online and offline digital marketing and highlighted the skills needed for digital marketing as Search Engine Optimization (SEO), Content Marketing, Social Media Marketing. She also gave remote freelancing career alternatives and concluded with a quote, "Stop selling. Start helping. The best marketing doesn't feel like marketing."



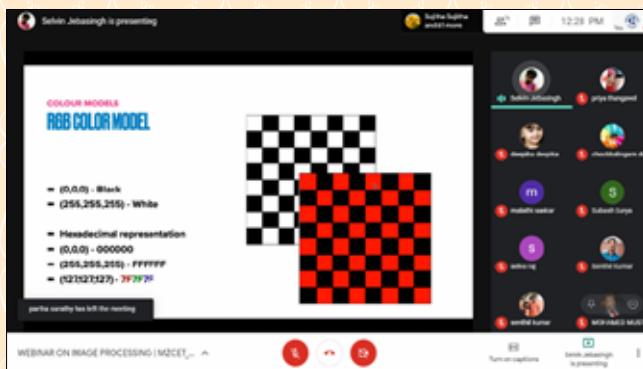
MOUNT ZION COLLEGE OF ENGG. & TECHNOLOGY, PUDUKKOTTAI

Reported by **Prof. M. Swarna Sudha**, SBC, Ramco Institute of Technology

Mount Zion College of Engineering and Technology in association with CSI, Tiruchirappalli Chapter organized Webinar Thru Zoom on 1st June 2020 on the Topic Block Chain Application and its Uses. Dr S Hemalatha, CSI State Student Coordinator, Tamil Nadu and Pudicherry/ Professor, CSE, Panimalar Institute of Technology, Chennai was the Speaker



Mount Zion College of Engineering and Technology in association with CSI, Tiruchirappalli Chapter organized 2 Days Workshop via Webinar Thru Zoom on 17th June 2020 between 12:00 PM – 01:30 PM on the Topic Image Processing Mr J Selvin, CEO, Smartawe, Chennai was the Speaker.



अन्वेष
गान्धीजी यासोन्हज २०२१



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