



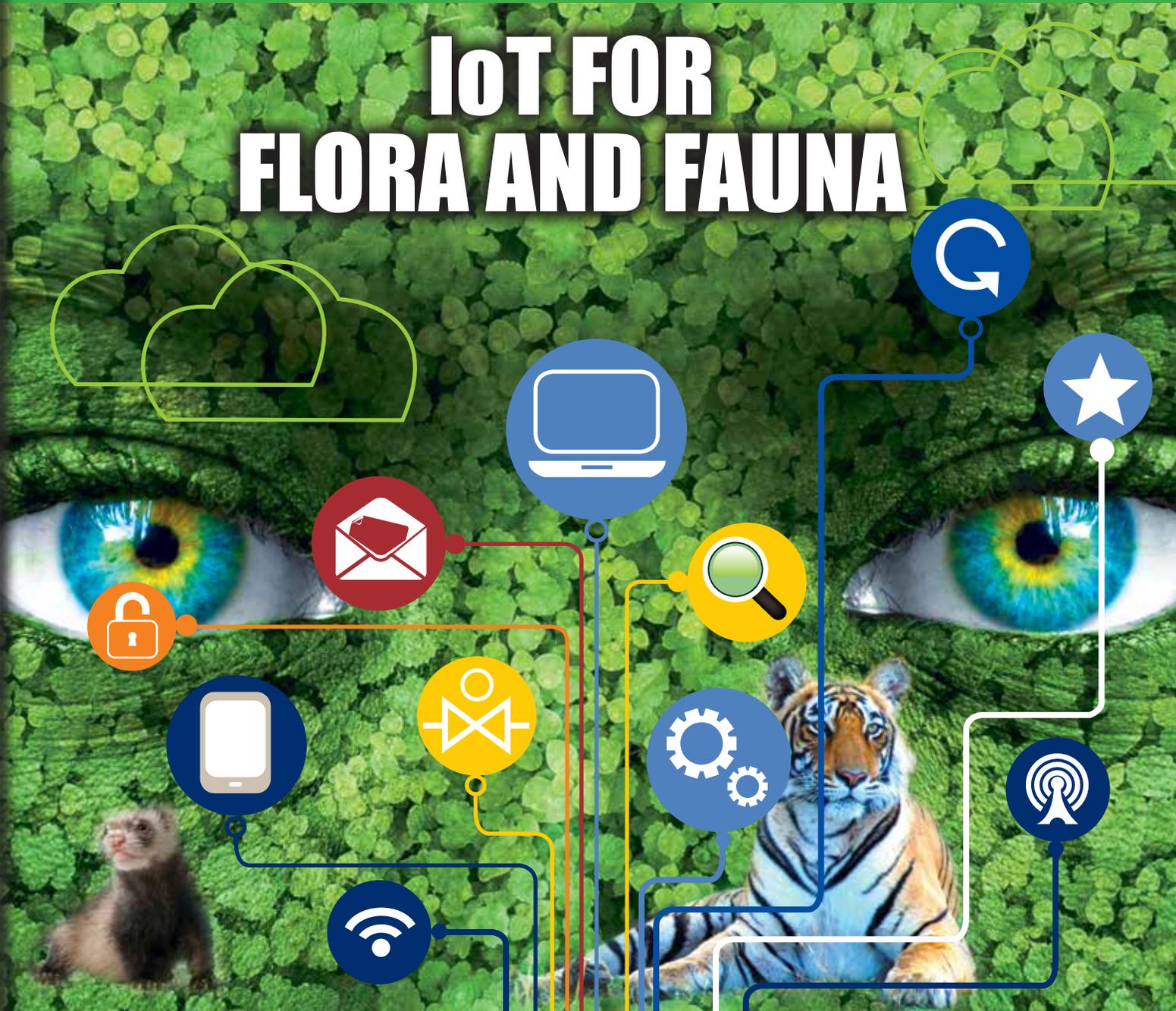
CSI Communications

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IoT FOR FLORA AND FAUNA



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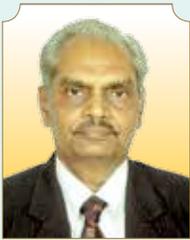
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Editor: Prashant R. Nair

Editorial



Prof. (Dr.) S. S. Agrawal
Chief Editor

Dear Fellow CSI Members,

"If you think that the internet has changed your life, think again. The Internet of Things is about to change it all over again!"

– Mr. Brendan O'Brien, Chief Architect & Co-founder of Aria Systems

"Internet of Things is changing and transforming everything from business to life. Imaginations are boundless and opportunities are infinite. Everything is being wired up or connected wirelessly — architecture, energy efficient sensing, secure networks, quality of service, new protocols, participatory sensing, data mining, GIS based visualization, cloud computing, and international activities. It simply means that powerful information will be at our fingertips."

– Tech.co



Prof. Prashant R. Nair
Editor

The theme for the Computer Society of India (CSI) Communications [The Knowledge Digest for IT Community] June 2018 issue is 'IoT for Flora and Fauna'. After our thematic series on ICT in education, healthcare, agriculture and e-governance, we continuing with the thematic series on IoE and IoT with this issue. Earlier themes focused on sensors and applications of IoE and IoT. This theme focuses on IoT applications in agriculture & forestry which included flora and fauna.

There are 2 research front articles which highlights original research results in medical image processing, deep learning and pattern recognition. These are "I3: Intelligent Image Interpolation for Super-Resolution of Retinal Images in Automatic Eye Disorder Diagnosis System" by J. Dinesh Peter and Jebaveerasingh Jebadurai "A comparative study of Open source Deep Learning Libraries for Beginners" by Sachin Shetty, Kavya Sri A. and Sitarama Brahmam Gunturi of Tata Consultancy Services (TCS)

The technical trends featured are:

"Robotic Process Automation: A Death knell to dead-end jobs" by KVN Rajesh, KVN Ramesh and Mr.Hanumantha Rao N. 2 of these authors are from Tech Mahindra and throw light on this disruptive industry trend.

"Cloud based ICT infrastructure for Endangered Language Protection and Preservation" by Alokeparna Choudhury and Sourav Samanta

We have 3 articles providing us our theme, applications of IoE and IoT in agriculture & forestry which included flora and fauna. The articles are:

"IoT Based Sensors for Agriculture Applications" by Vivekanandhan.R, Sandheep Kumar, Arunarumugam. D, Nandhini Vigneshwar Manokar and Vigneshwar Manokar

Sensors for Internet of Animal Health Things" by Ankitha K and Manjaiah D H

"Social Ramification of Fire on Forest using IoT" by Ganta Rama Mohan Reddy and S. Murugan

In Practitioners Workbench, we have 2 contributions:

"Implementation of Software Defined Network on Mininet Emulator" by Sangeeta Mittal

"A Speculation: Prevalent Virtualization Software in Demand" by Madhulika, Sarthak Singhal and Dipesh Jain

CSI history series is reappearing with CSI Nashik Chapter: A glorious journey of 30 years by Dr. Shirish S. Sane, Regional Vice President, CSI Region VI. We call upon all chapters to share their journey with us for the CSI History Series.

This issue also contains reports of CSI activity reports from divisions, chapters & student branches.

In our Tech Leader interview series in this issue, we are very proud to present an interview of Dr. S.S. Mantha, Former Chairman, All India Council for Technical Education (AICTE). His suggestions include involving subject experts from the CSI Membership base for helping academic institutions in institutionalizing best practices, accreditation and audit activities like NAAC or NBA and providing contemporary curriculum inputs. He also exhorts CSI to work closely with the industry bodies like CII, FICCI or ASSOCHAM and creating an effective Labour Management Information System (LMIS).

We seek the support of all CSI members for suggestions and support for this next exciting section of CSI Communications.

We are thankful to entire ExecCom for their continuous support in bringing this issue successfully.

We wish to express our sincere gratitude to the CSI publications committee, editorial board, authors and reviewers for their contributions and support to this 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
Chief Editor

Prof. Prashant R. Nair
Editor



Tech Leader Interview with **Dr. S. S. Mantha**, Former Chairman, All India Council for Technical Education (AICTE)



Dr. S S Mantha, an eminent academician and an able administrator, was the Chairman, of All India Council for Technical Education (AICTE), starting 05th January 2012 till 4th January 2015. Having joined AICTE in March 2009 as its Vice Chairman, he has been at the forefront of bringing in some radical changes for transparency and accountability in its administration. On completion of the tenure at AICTE he worked as Professor of Robotics, CAD/CAM and AI in the Department of Mechanical Engineering at VJTI, Mumbai and superannuated on 31st May 2016. Dr. Mantha has also contributed to India's entry to Washington Accord having participated and proposed several Accreditation initiatives of National Board of Accreditation having been its executive President for three years and as Chairman of the Board for three years. Dr. S S Mantha has developed the National Vocational Education Qualification frame work (NVEQF), now called National skills qualification framework (NSQF), which would help in promoting skill based competency modules to be integrated into seven certification levels where a student can undergo skill based learning that enhances employability and employment opportunities and also allowing him/her the flexibility to pursue formal education or take up an appropriate job at the end of any level of certification. A complete Credit framework for NSQF has also been developed by him and adopted by MHRD, GOI. He has been an Adjunct Professor in the National Institute for Advanced Studies (NIAS), Bangalore and advisor to Governments of Andhra Pradesh and Maharashtra.

Prof. Prashant R.Nair, Editor, CSI Communications and Vice-Chairman, Department of Computer Science & Engineering, Amrita Vishwa Vidyapeetham, Coimbatore caught up with Dr. S.S. Mantha on the sidelines of the CSI Mumbai TechNext India 2018 conference at IIT Bombay.

Q1: Sir, you were at the helm of affairs of AICTE for 3 years from 2012 to 2015. During this period, we saw a lot of

reforms especially in e-governance and thrust towards transparency and accountability. Can you please briefly describe the highlights of your tenure?

A : I joined AICTE in 2009 as its Vice Chairman and was quickly elevated to be the Acting Chairman. Two months of joining to be precise. The time I joined, was very challenging with the Organisation in a real mess. There were insinuations, innuendo and what not. The credibility of the Organisation was at its nadir. No proper procedures were in place and all processes were in a way adhoc and executed with no transparency. My challenge was to streamline the procedures and restore credibility. An advantage I had, was that I implemented several e-governance and workflow applications for the Government of Maharashtra earlier and I could possibly do this as well. I had to anchor the project and develop from a scratch. Of course L&T provided the support. In a sense, the turnaround of AICTE happened during this time.

The e-Governance implementation at AICTE is a complete web enabled application, where the entire process of receiving the applications to processing the same until an approval is given is on-line. This greatly improved the transparency and accountability. The Portal also provides complete information along with video of more than 11500 institutions in the public domain. The Business intelligence reports generated provides for comprehensive statistics on technical education in the country. The development using Oracle-Siebel CRM is extremely robust and scalable providing for several features that aid the student and the teacher community. The effort was given SKOCH order of merit for 2014. A single most achievement was that the effort restored credibility of the Organisation.

There were several other initiatives that I implemented to improve quality, was instrumental in getting the Washington accord, could implement a revised industry oriented curriculum with internships, more QIP centres, scholarships for women, disabled, DBT etc. National Skills Framework started with my initiatives and am happy to note, has progressed. NEEM a unique proposal to promote skills with Industry was also started in my time.

A magnificent Office, green building on a 5 acre land, a 950 seater state of art auditorium, guest rooms were built in addition to own office buildings, in Thiruvananthapuram, Bhopal, and Assam.

Q2: Any unfinished agenda from your time that you feel that AICTE should now focus on?

A: Hindsight is the best gift that one can have. As an administrator, you will always feel that there is a lot of unfinished agenda when you have to go. Activities that will add value to the Organisation. But then everyone has a shelf life, determined more by the exigencies of the system. I too had one. Looking back, I could restore the credibility of a system that was sorely lacking in values. The new dispensation is equally competent, capable and passionate and believe that AICTE would soar to even greater heights.

Q3: Professional bodies such as CSI, IETE, SAE and IET are very much part of the Indian engineering landscape in terms of most premier engineering colleges and technical universities promoting student chapters and branches of these bodies. In your opinion, can you please give some suggestions on how these professional bodies can contribute more extensively to furthering engineering education in India?

A: All these bodies have certainly added value to Indian education system. I would like to see the best practices they can bring, institutionalised in our system. The technical experts that these bodies can bring to the Institutions can add further value. I would also like to see these bodies working closely with the Industry bodies like CII, FICCI or ASSOCHAM and creating an effective Labour Management Information System (LMIS), that would aid in a more equitable expansion. Contemporary curriculum inputs can be another add-on. Accreditation methodologies as practiced in other countries can also be a good input.

Q4: I am aware that you are also a CSI member and have been actively participating in various CSI events. We have been seeing that majority of CSI student members do not upgrade their membership to corporate membership once they graduate and take up placement in companies. Any suggestions to professional bodies such as CSI on how to effect this conversion?

A: CSI must actively engage the Alumni of an Institute. An MOU with an Institute to use alumni data base can help. An intelligent data capture and a Mobile application can go a long way. The benefits that accrue on upgradation of a membership status must be available on the CSI website. A CSI magazine or a newsletter posted to all members can further help.

Q5: You have always been a votary of e-Governance. CSI is proud to be hosting the CSI Nihilent e-Governance awards for government departments for the last 15 years or so. In the light of Digital India and the like, how is e-Governance such a force-multiplier?

A: The biggest takeaway from an e-governance project is the democratic processes that it established and the utility that it brought to the people. Transparency and accountability are the other benefits. A common citizen is truly empowered if the implementation sticks to common goals. I would say, not just a force multiplier but a perpetual force multiplier.

Q6: AICTE has not brought out a new model curriculum for both UG and PG in engineering incorporating global

practices and hands-on training. But this is not binding on engineering colleges or technical universities to follow. I personally feel that it should be made mandatory except for maybe the top institutions. What are your views on this?

A: AICTE has very recently, brought out a model curriculum for all technical programs. This has features of internship, global practices, and hands on training etc. Technically Universities are autonomous and have academic bodies within themselves that create curriculum. In that sense the guidelines are not binding. But AICTE can certainly speak to the Vice Chancellors and prevail upon them to adopt the guidelines. Academic freedom is the cornerstone on which a University functions. Making it mandatory may kill the innovation that is possible within the Universities.

Q7: There is a huge mismatch between demand and supply in terms of engineering seats in India. In Tamil Nadu alone more than 1 lakh seats are vacant annually. Of course we know that many colleges are being allowed to close down. But don't you think more drastic steps need to be taken?

A: A robust LMIS is needed to estimate demand. There is none available today. The Industry bodies must create it. Perspective plans must also be created by various States. If for example in Tamil Nadu, if a scientific report is created based on analysis as to how many Arts, Science, commerce or technology or other disciplines based institutions exist, how many more are required, whether woman only institutions are required, if minority institutions are required, how many job opportunities exist, how many seats currently are in Mechanical, electrical etc., how many more are required, statistics of X and XII enrolments and their migration to various courses, data on demographics etc are all available, then the supply side can be easily estimated and planned. In the absence of such data, which currently is the case, only knee jerk reactions are possible and perceptions will rule.

As an aside, with the demographics skewing in favour of younger population, why is it that the enrolments in X and XII have only marginally risen or are even static for the last few years?

Q8: Your concerted efforts had resulted in India being part of the Washington Accord through NBA. To be very honest, is there any tangible benefit apart from the fact that our institutions are embarking on accreditation and the bragging rights? I mean even without NBA or Washington Accord, our graduates are securing admissions in top universities like Stanford, Berkeley etc.

A: India is officially a member of the Washington accord from 13th June 2014 with the permanent signatory status of the National Board of Accreditation (NBA). This is considered as a significant step of progress for the higher-education sector in India. One principle advantage that accrues is that a student in India graduating from an institute accredited by NBA is eligible to practice as an engineer in his/her relevant domain in any of the

countries that have signed the Washington Accord.

There are several other measures that various countries use to gauge the quality of a student and the Institute that he graduates from. Rankings and ratings help in this process. Many countries rely on these processes. They also have individual metrics designed to measure the scholastic aptitude that one has. Indian education is fundamentally on sound footing and hence students do well when adapting to systems in other countries.

Q9: One of the biggest problems faced by engineering institutions is employability. There are alarming statistics brought out by some reports such as National Association of Service and Software Companies (NASSCOM), which estimates that, of the 3 million joining the IT workforce, only 25% of engineering graduates are employable. What are the steps that can be taken by engineering institutions for improve employability?

There is a job deficit that some bodies will not acknowledge and shift the blame on lack of skills. It is anybody's guess, sometimes scary, to imagine the plight of graduates of other disciplines and their employability. India's Job Markets need to take a leap in geometric progression in coming years if we were to contain the aspirations of 65% of the population below the age of 30 years. This would mean creating at least 15 Million jobs this year that grows at a rate of a minimum of 3.5% to 4% each year, a tall order indeed.

A recent report of Crisil pegs 13 million job aspirants each year and five million jobs created annually in both organised and unorganised sectors against it and leaving a gap of 8 million year on year. Share of jobs for engineers in this is anybody's guess in the absence of credible data. Seen cumulatively, are we staring at something more expansive? With GDP not stably growing, this gap would only increase. No wonder, the supply side suffers in this "educated vs job availability" equation getting skewed. Lack of adequate skills makes the problem even more critical.

I would like to see a credible LMIS being created and efforts made to create new markets and new job opportunities. Methods to improve quality is an ongoing process and everyone concerned with it are making the best efforts.

Q10: How should engineering institutions leverage the National Skill Qualification Framework (NSQF) to improve employability?

I was instrumental in developing the National Vocational Education Qualification frame work (NVEQF), now called National skills qualification framework (NSQF), which helps in promoting skill based competency modules to be integrated into seven certification levels where a student can undergo skill based learning that enhances employability and employment opportunities and also allowing him/her the flexibility to pursue formal education or take up an appropriate job at the end of any level of certification. A complete Credit framework for NSQF has also been developed and adopted by MHRD, GOI. The course curriculum for more than 15 sectors

and 80 specializations was also developed. The skill program developed for Cyber Security is one of its kind. Further, this has immense potential to create new job opportunities and aid the "Make in India Program of GOI". All students whether of technical or other education must make use of it.

Q11: Can professional bodies such as CSI or IET contribute towards improving skilling or employability?

There is a great potential for bodies like CSI and IET to contribute towards Skills which in turn improves employability. Skill are required by two groups of people. Those who are in college and graduating in a certain discipline and those who have never gone to school or college. Value added courses and hands on training can take care of both the groups. NSQF must be used for imparting skills at various levels. Since skills are sector specific, it must be understood that Skills at higher levels are higher order skills in the same sector.

Q12: I am aware that you have been working extensively on robotics before donning the mantle of AICTE chairman. What is the general scenario for robotics in India as of now, in terms of education, research and innovation?

Three levels of automation is found in Indian industries as is the case all over the world. Low level – low cost that has pneumatics, Mid-level that includes, hydraulics, Pneumo-hydraulics, electro hydraulics etc and at the high end robotics. Usually an Industry has all three depending on the assembly lines that they have. Indian automobile industry has high end automation to be able to manufacture quality products that are globally competitive. Research in robotics is wide ranging, in that it includes, Robotics for manufacture, medicine, pharmaceuticals, space research, games, toys and what have you. Several innovations have happened in the robotics supply chain in the last decade which has completely transformed and disrupted the manufacturing Industry. AI has further changed the landscape.

Q13: There have been some innovative initiatives from AICTE such as Smart India Hackathon. Your views on these initiatives and how can we expand them.

Smart India Hackathon is a great idea and am happy for AICTE for having started it. It should now move to the next level of making the start-up India campaign succeed. As a melting pot of creativity, ideas, and skills, hackathons have helped in building some of the coolest apps of our times. Hackathons offer the opportunity to meet like-minded people, mentors, and potential investors. This makes it easy for participants to test and validate their product. The hackathon environment can lead to the invention of many successful business ideas. Hackathons have helped solve pressing issues and business challenges, worldwide.

Q14: Most of our 1000+ CSI student branches and institutional branches are in normal engineering and arts & science colleges. A few top institutions are there, but most of them are 'Aam Aadmi' colleges, who are primarily teaching institutions. Can you please give some pointers on how to promote research in these institutions?





CSI Guwahati Chapter Meeting

Date: 29 April, 2018

Venue: Cotton University Conference Hall, Guwahati 781 001



Prof. Shikhar Kr. Sarma, Convener of the meeting welcomed the National Secretary Prof. A. K. Nayak & RVP-II Devaprasanna Sinha, alongwith all the members and attendee. He also briefed about the agenda of the meeting highlighting that CSI Guwahati Chapter was a vibrant Chapter in the nineties but somehow it has been not in the function since last several years. And for this, as per discussions held with Secretary & RVP-II of CSI, this meeting has been convened. E-mail invitation has been sent to the e-mail ids of the members as well as few other interested professionals.

Prof. A. K. Nayak has addressed the gathering and he has elaborated

on the intension of CSI for expanding its activities in the North Eastern India region. He emphasized on the regular activities of the CSI to be implemented in this region, for which the Guwahati Chapter could act as the nodal chapter. He described various types of activities of CSI including the facilities that members & chapters, branches could avail. He also briefed the members on the structure of the Society. He informed that an Adhoc Committee of the Society-Guwahati Chapter needs to be formed for one year & within one year the regular committee through election will be formed. CSI National Execom will facilitate the initial requirement including the seed money for opening the chapter account.

D P Sinha, the Regional Vice President also addressed the gathering, He included in his lecture about the

initial formation of CSI & also the evolution how CSI has evolved to such a large organization. He pointed out about different activities like academic & research activities. He emphasized on expanding the reach of CSI to every sphere of the society. The organizational pattern also needs to include people from different sections including research organization, business, industries & Government offices.

Provisions of organizing Conferences, Seminars & outreach programmes have also been pointed out by both of them. Many of the attendee participated in the interactive session followed by the lectures. They also suggested that a tentative calendar of events for the year to be framed. The meeting also formed the Adhoc Managing Committee for CSI Guwahati Chapter.

The meeting ended with vote of thanks to the CSI National Office bearers, as well as to all attendees. ■



Research is like practicing religion. Fanatics and mavericks who are passionate about innovation, research and problem solving must be identified and a very conducive environment must be created for them. A lot of funding is required to do this. Industry must come forward to tie up on sharing problems and money. IPR and Patent cells must be created. Can all this be done in any institute? The answer is a no. We need to decide on Institutions that teach and do some research or Institutions that do research and do some teaching. Though the answer could lie somewhere in the middle, the expansion and scaling that is required may not be feasible.

Q15:As an engineering college faculty as part of a deemed-to-be-university for the last 18 years, to be honest, I feel that we are being over-regulated by statutory bodies and their regulatory mechanisms. There are a multitude of bodies such as UGC, AICTE, NAAC, NBA, NIRF etc. I agree there is a need for regulation, but can't of these happen in one shot or under one umbrella?

I agree. Having said that, Self-regulation is obviously the best form of regulation. However, every human being and every system that supports quality of life is regulated in some form or the other. Homeostasis is an internal human body mechanism that maintains balance, harmony, equilibrium, and steady-state, all of them fundamental attributes of life and health. Externally, there is no system be it, finance, be it education, be it business or any other,

that is devoid of some form of regulation. The overlapping that happens, between regulators must be removed.

Q16:Today, there is a rat race especially among top institutions for rankings both national and international. Is this a healthy trend?

To be compared among the peers is a healthy trend, in that it allows scope for improvement. Some Global Ranking agencies, like QS, Times foundation have made some mark with the procedures that they follow. In fact there are at least 30 odd ranking agencies worldwide in different disciplines, sub disciplines and niche areas. Yes there are also any number of local ranking agencies which should not be there in the first place.

Q17:Sir, on a lighter note, I follow you on Facebook and have been seeing you giving your opinions almost on a daily basis? Social media is no doubt a powerful medium?

In good old days, we use to maintain a personal diary and write on our family, our friends, our affairs, our poetry and possibly anything under the sun. We used to even get angry when someone, even close in the family were to read the same. The times have changed. Today we write profusely on Facebook, Instagram or twitter and get angry if no one reads it. There are tools to even spike the readership. Social media is a powerful tool for the mature and the initiated. It can be a disaster in the hands of a dimwit or the uninitiated. I wish someone would develop do's and don'ts for social media, though I know no one would take it seriously. ■

Robotic Process Automation: A Death knell to dead-end jobs?

▶ K V N Rajesh

HOD and Sr. Asst. Professor, Dept. of Electronics and Computer Engg. (ECM), Vignan's Inst. of IT, Visakhapatnam

▶ K V N Ramesh

Technical Architect, Tech Mahindra, Visakhapatnam

▶ Hanumantha Rao N

Delivery head, Data and Analytics, Tech Mahindra, Hyderabad.

Automation is a term which is being heard frequently from the past two-three years and is causing a major scare to people working in the technology sector and knowledge based industry. Now-a-days, hardly a day goes by without news headlines similar to given below:

- Americans Love Automation, Until It Comes for Their Jobs (News Article in Wired dated 17-Oct-2017)
- Automation will affect one in five jobs across the UK, says study (News Article in The Guardian dated 17-Oct-2017)
- Going, Going, Gone: Automation can lead to unprecedented job cuts in India (News article in Business Today dated 18-Jun-2017)
- Tech Mahindra reskilling employees amid automation (News article in Economic Times dated 15-Jun-2017)
- Indian IT needs to reinvent itself for the age of automation and AI (News article in Times of India dated 11-Jun-2017)
- Automation could mean a 14% decline in India's IT workforce by 2021 (Article dated 31-May-2017 on Times Now News)

Automation, Job Losses and Reskilling are the common keywords in these articles. Many a time, news articles are prone to sensationalism and may exaggerate or write from one specific point of view. This has led to a general tendency of clubbing Automation with Layoffs and Job losses. It reminds us of the days in 1980s when there were protests against introduction of computers into various government organizations due to perception that computers would rob people of their jobs. Now we know how much unfounded

those fears were and how Computers and Information Technology industry has become one of top Job providers in India. If we see human history, the endeavor has always been to make things easier, faster and better and free humans from drudgery and monotony of repetitive tasks. If not for this nature of human beings, there would have been none of the industrial and technological revolutions. Automation and related technologies are just a natural step in this journey. As Victor Hugo said, nothing is more powerful than an idea whose time has come. Automation is one such idea whose time has come. Automation has been around for many decades. Automation consists of various technology solutions to minimize and reduce human labor and intervention in various processes. Automation has already been implemented in a big way in manufacturing sector. In modern factories, large shop floors with just a few workers are not an uncommon sight. Production Assembly lines with robots doing most of the work is a reality. In our view, the whole process of computerization going on from the past 4-5 decades is nothing but automation. The day-to-days task which we do like drawing cash from ATM and paying bill online is nothing but Automation of financial process.

So now the question arises about why there is this big hype about Automation as if it is something that has newly come up on the scene. The difference is the development and great advances in technologies like Artificial Intelligence, Natural Language processing, Big Data and IoT. The availability of these technologies has made Automation a whole new ball game. Automation is a vast subject with application in many areas. The focus of this article is a specific area called

Robotic Process Automation (RPA in short). RPA is one among many of the other key areas which are considered when organizations go in for digital transformation from legacy systems to the latest available digital technologies.

Introduction to RPA

One question which would definitely strike anybody's mind who is new to RPA is about how is RPA different compared to usual automation of Business processes using programming languages. Process automation using computerization has been going on for decades. There are many large companies around the world which have been around for decades and for even more than a century. These companies had been founded even before computers were invented. Ever since computerization started, these companies have deployed various information systems for automation of various business processes that are required for carrying out the day-to-day operations in the respective companies. These information systems have been progressively added over a period of many decades and have been developed using the technologies available at the time of their development. These systems have been developed using legacy programming languages to latest digital technologies. For various business operations and processes, there is a need for these systems to talk to or interface with each other. Operations like retrieving of data from one system and entering it into another system need to be done. Also, there is a need for receipt, manual processing and entry of data received from other systems like e-mail. The slang term for this kind of work which involves transfer of data between disparate systems by Human Staff is known as swivel chair interface. It can be visualized as

a human operator sitting a revolving swivel chair with three four computer systems around him/her and taking data from one system and entering data into another system. Swivel Chair is just an analogy for this kind of manual human intervention between disparate computer systems. Till now, it was very difficult, time taking, costly or even not possible to automate these kinds of processes involving interfacing between manual, legacy and latest digital technology based information systems. Till recently, all these kind of operations and tasks were handled by Human Business Process executives. Eventually, this may not be needed once the companies go in for complete digital transformation. The mentioned non-automated repetitive manual processes involving humans have the usual issues related to quality, cost, mistakes, monotony, longer average handling time since humans are not programmed robots. Robotic Processes Automation (RPA) is the solution developed to address this specific kind of problem. RPA can mimic human actions and do the same actions which humans perform between user interfaces of various information systems and thus remove Human Swivel Chair Integration. RPA is also thus known as Swivel Chair Automation. RPA can achieve this by not touching the underlying code of any of these information systems. RPA tools can record the sequence of steps (required to complete a business process) performed on various user interfaces. RPA tools are mostly graphical in nature and do not require much programming knowledge. The learning curve is quick and the usage of these tools to automate processes can be learnt by even non-technical business process executives.

Software tools for Automated Regression Testing and Automated Performance monitoring using Virtual users from different locations, have been around for past 10-15 years. These tools had the ability to mimic human workers and carry out repeatable tasks like regression testing and monitoring of various front end desktop and online applications. In opinion of the Authors, RPA is a natural progression of these functionalities.

The core to RPA are the Software Robots (known in short as BOTs) which are the Virtual equivalents of the Human workforce. Many of the tasks of Human workers in call centers, front offices, data centers are repetitive and involve doing the same tasks again and again based on certain rules. These are nothing but dead-end jobs with very less scope for growth for the respective process executives. As already explained, many of these cases may involve multiple information systems including legacy applications. Such applications may be too rigid or too costly or too risky to integrate. Therefore, to carry out Business Processes spanning across such multiple application, Human involvement is required. RPA is perfect solution for such scenarios. Some examples where RPA can be used are as follows:

1. A process executive in the loan processing division of a bank receives the soft copy of the approved loan application in designated format by e-mail and the data from the same needs to be uploaded into a software application.
2. A support executive for an application receives user requests in form of tickets and does various tasks like password reset or new user creation or giving a specific access to an existing user.
3. A customer service executive of a telecom company receives a call from a customer enquiring about his bill details and various discounts plans and upgrade plans applicable to him. The executive needs to login into multiple applications and then fetch the details corresponding to the customer. While the executive is fetching the details from multiple applications, the customer call is kept on hold.

It can be seen that for completion of each of the mentioned process, the sequence of steps to be followed always remain the same. These are good cases for automation using the right RPA tools.

Data Scraping techniques like Screen Scraping, Web Scraping and Report Mining have been around for long time. These techniques allow for

extraction of data from human readable outputs coming from user interfaces of various computer applications. These techniques are used when the legacy applications do not provide means like application programming interfaces to communicate or transfer data to other applications. Also, many of us would be aware of Macro Recording features in various word processing and text processing applications. They allow for recording user actions so that the same can be played back as many times as needed to perform repetitive tasks. Optical Character Recognition programs provide the ability to recognize and read the handwritten and printed text data and convert them into machine readable format. RPA tools use all these mentioned technologies along with many other latest technologies to come up with ability to record user actions.

Another point to note is that RPA is non-invasive and do not affect the code of the existing applications on which they carry out the operations. They are just like Humans who work on top of existing applications. Hence there are no new specific security concerns due to usage of RPA.

Abilities of RPA

To put it in simple terms, RPA tools would have the ability to record the various steps or operations which a normal human user of computer would perform to accomplish various tasks. These RPA programs as Software Robots (or simply as BOTs), can be played back as many times as required and on as many computers as required. They can be run as assistants to human operators on physical systems for performing certain tasks or they can run in virtual mode to perform certain processes end-to-end without any human intervention.

The below is simple common minimum list of operations which most of the RPA tools should be able to record and mimic.

- Windows Operations like maximize, minimize, activate and close various windows
- Folder Operations
- File Operations
- Operations on variables of various data types like strings and numbers

► TECHNICAL TRENDS ►►►

- Programing logics like Loops and If/Else
- Operations on web browser based URLs like login, entering data, grabbing/extracting data and logout
- Operations on local clients in which objects can be recognized by the RPA tool
- Operations on clients where the RPA tool can only be able to recognize objects by way of image recognition and coordinates
- Citrix Automation
- Various Operations on Excel, csv, text and PDF files
- Basic database operations like connect, run queries (like insert, update, delete) run procedures and disconnect
- E-mail Integration and Automation
- Error Handling

RPA Market

As per MarketsandMarkets Research Private limited, the RPA market is poised to reach USD 2,467 million by the year 2022. As per a research report dated 21-Aug-2017 by Global Market Insights, the RPA market size is set to exceed USD 5 billion by year 2024. As per Hfs Research dated 10-Jun-2017, RPA market as in the current year 2017 is USD 443 million and is expected to grow to \$1224 million by year 2021. As per Forrester, the RPA market size was USD 250 million in year 2016 and is expected to grow to USD 2.9 billion in 2021. As per a Grand View Research report dated October 2016, the RPA market is expected to reach USD 8.75 billion by year 2024. As per Arcluster, the RPA market is set to reach USD 5.01 billion by year 2022. As per Transparency market research press release dated 14-Sep-2017, the IT robotic automation market is predicted to reach a value of USD 16,884 by end of year 2024.

The above mentioned forecasts by various research and consulting firms, about the growth of global RPA market, may vary as per the respective research methodologies adopted. But one point which is clear is that RPA is one among the latest technologies with great year-on-year growth opportunities. Applications areas of RPA are Finance and Accounting, Human Resources,

Supply chain management, Healthcare, Customer Service, IT support and any other operational areas with repeatable rule based tasks and processes. Hence Indian IT services and product companies are embracing RPA with open arms and coming up with innovative RPA solutions in various verticals for their respective customers and helping them in optimizing their operations and achieving cost savings.

RPA Tools

UiPath, Blue Prism and Automation Anywhere are mentioned in the list of top RPA tool vendors in the market studies carried out by Gartner, Forrester and Everest Group.

UiPath is a company headquartered in New York which sells Robotic Process Automation Platform. UiPath's RPA Enterprise Platform consists of UiPath Studio, UiPath Robot and UiPath Orchestrator. UiPath Studio is a designer tool used to model and design workflows, sequences, flowcharts and business processes. It is used to capture and record actions done by business users for executing business processes on their computers. Once the Business Process is captured and modeled using the UiPath Studio, the UiPath Robots can execute those processes any number of times with or without human supervision. UiPath Orchestrator is a web application used to administer and manage these Robots and Processes. A Community Edition of UiPath is available on UiPath website for the benefit of individual developers and for training and educational purposes. There are a number of free RPA online courses available in the UiPath website (<https://academy.uipath.com/>) and certificates are also given free of cost on completion of the courses.

Blue Prism is a Pioneer in RPA and invented the term Robotic Process Automation. Blue Prism is a UK based company. Their flagship RPA product is the Digital Workforce Platform. It is a graphical user interface and is code free. All the capture and modelling of Business Process is done as Objects and Processes in the Studio tab of this product using two submodules known as object studio and process studio. The control room is accessed from the Control tab of this Product.

In the control room, the Processes are assigned to Resources. Resources are the computers on which Blue Prism BOTs run to perform the Automation operations. From the control room, the processes can be started and stopped and can also be scheduled.

Automation Anywhere is another top RPA product company headquartered in San Jose, California, USA. This tool consists of web control room and Automation Anywhere client. The client can be a creator or runner. The web control room is used for administration and management of the automation infrastructure and BOTs. The creator client is the place where the developers create the automation task and upload them to web control room. The runner clients are the places where the automation tasks run as BOTs to perform automation operations.

There are a number of other RPA tools like Pega Robotics, Kofax Kapow, NICE, WorkFusion, Redwood Robotics and Thoughtonomy available in the market

RPA – Indian IT industry perspective

All the top Indian IT services companies either have their own in-house developed RPA products or partner with top RPA product companies to provide Automation development and support services.

UNO is Tech Mahindra's solution set for Robotic Process Automation with two variants known as UNO-R and UNO-P. UNO is TechM acronym for Unified NexGen Operations. UNO-R is a RPA solution completely built in-house by Tech Mahindra for unified Desktop and front office automation. UNO-P are the RPA solutions by Tech Mahindra for back office automations. UNO-P is powered by Tech Mahindra partner solutions like UiPath, Blueprism and Automation Anywhere. On a whole, these solutions help in reducing the average handling time of various requests by customer service executives by automating and optimizing various possible steps in back office and front office operations.

Infosys BPO lists RPA as one of its service offerings. It mentions Data Extraction and Enrichment, Smart User Environment, Reporting & Insights and Auto Query Resolutions as its

RPA components. It lists automation of various processes related to procurement, insurance, human resources, order management and IT operational support services in corresponding industry verticals as its success stories in RPA. Another subsidiary of Infosys named EdgeVerve Systems has a technology platform named AssistEdge for RPA.

Other top Indian IT services companies like TCS, Wipro, HCL and Genpact also have strong RPA competencies and practices and are delivering RPA solutions in various industry verticals to their respective customers.

Benefits of RPA

There are a large number of benefits of RPA. Some of them are listed below.

1. By usage of Virtual Workforce – Software Robots, humans can be freed to carry out tasks which require various human qualities like leadership, critical thinking, adaptability, managing emotions, conflict resolutions. Repeatable monotonous tasks can be best left to BOTs.
2. Process Automation using RPA can be carried out by Business People also instead of software professionals since RPA is mostly code free and does not require much programming background to carry out automation.
3. Accuracy and Consistency in tasks carried out
4. Task are always carried out First Time Right
5. BOTs are available 24X7
6. Instantly Scalable whenever there is increased workload
7. Six Sigma quality since BOTs are not prone to monotony and boredom associated with repetitive tasks. Costly errors which can lead to loss can be eliminated.
8. Lower costs of operations and hence more savings
9. BOTs are much faster than humans and hence lead to a reduction processing times. Speed of carrying out operations is only limited by the response time of applications on which the BOTs operate.

10. Full Compliance to regulations in operations since BOTs do not need to take any short cuts like humans to complete the tasks faster. By following Full Compliance according to rule book in Banking and Financial Areas like Know Your Customer (KYC) and Anti-Money Laundering (AML), Fraud and Lapses which are possible by Human Staff can be eliminated to a greater extent.
11. Complete Audit trail of all operations carried out by BOTs is logged and available.
12. Real time dashboards of BOT operations are available at all times.

Conclusion

To summarize, RPA is the automation of repeatable and rule based tasks by the use of non-invasive software called BOT which can mimic actions performed by human users on computers to complete various business processes. Everybody has to accept the fact that everything which can be automated will be automated. There is a popular adage in English: if you can't beat them, join them. So there is no point resisting this change. It is high time that all the people working on the mentioned repeatable kind of jobs, get themselves re-skilled in RPA technologies. This challenge is in fact an opportunity in disguise for people with knowledge of processes and domain. Since RPA technologies do not require much of programming background, people with knowledge of processes would be at much greater advantage and well positioned compared to pure software professionals to carry out these automations. RPA technologies are indeed a death knell to dead-end jobs, since the capability of current RPA tools are such that if a person can do an activity, RPA tool can also do it. But for people willing to embrace this change, this an opportunity to climb up the ladder instead being stuck in drudgery and monotony. RPA technologies will take Robot out of humans. Till now, it has been observed that every technological advancement has opened new vistas and opportunities. As long as people are ready to reskill and

embrace change, there is no need to fear Automation in general and RPA in specific by unnecessarily branding them as Job-Killers.

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(Issued on the behalf of Editorial Board CSI Communications)

Dr. S.S. Agrawal
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Cloud based ICT infrastructure for Endangered Language Protection and Preservation

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Introduction:

Each and every living being communicates with each other for expressing their thoughts, exchanging required messages etc. Every species has its own kind of communication medium like various expressions, sounds they made etc. From the very first day of human civilization, we the human beings also have some sort of communication medium say Languages. For us, Language is not only a component for exchanging needful thoughts but also it has been the most creative art to express each and every single part of the human's world, their life, their imaginations and so on from the ancient era of time. And from the birth moment of human being till now this language had been created, changed, reformed, reconstructed and also died so many times.

As the report from UNESCO says, every two weeks a language is dying worldwide. And with it, a wealth of knowledge, wisdom, and a culture of an era, of some people dissolves with time forever. If we consider our own country there are more than 780 languages in India from various corner of this culturally rich country, and dangerously it is true that here the rate of language death is also very high. Report says, in the last 5 years, India has lost near about 220 languages, and we have lost our forefather's rich culture forever. This loss is pathetic. Thus to find out the root of the problem of such loss various survey has been performed, and according to the survey by UNESCO till now almost 197 languages has been categorized as endangered and the list is again subcategorized in four groups mentioned as, (a) Vulnerable, (b) Definitely Endangered, (c) Severely Endangered, and (d) Critically Endangered. In the further sections we will discuss how a language is

considered as endangered, the criterion to consider such, why Indian languages are facing endangerment in such high rate, how to protect and make it possible to stop the loss of the endangered languages from dying, and finally we will discuss the proposed cloud based ICT infrastructure for language protection and preservation system.

When a Language is considered as Endangered:

As language is the medium for exchanging thoughts and to communicate with each other, a language will be popular when as much as people will use it as their communication carrier. So, it is very clear that as less people will choose a particular language as their though exchanging medium, day by day that language will lose its popularity, and as human is not immortal, by death of those very less amount of people, that particular language will also be tends to death. There is a threshold number that at least how many people are using a particular language to consider it as endangered. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), that threshold number is mentioned as of 10,000 persons. The language which is spoken or used as communication medium by less than that threshold number of persons is considered as Potentially Endangered. As report says, in our country Potentially Endangered languages are those languages which the Government of India has refused to include in the official list of Indian languages, as less than 10,000 people use it to communicate. This decision was taken by the Government after the 1971 census. As per the survey [1] made by renowned literary critic and activist Prof. Ganesh Nrayan Devy, there are more than 600 languages are

potentially endangered in India, out of almost 780 languages of this country. Although there is a hope still alive that every language which is potentially endangered need not be tends to die immediately, but we have to find some solution to stop that termination from ever happening in reality.

Here the subcategories of Endangerment of Languages are discussed below [2]:

- **Safe Languages** : According to the survey the languages which are spoken widely by all the generations and when intergenerational transmission of culture, medium of thoughts in the form of language is uninterrupted, then those languages can be listed as Safe Languages. But they are not included in the Atlas.
- **Vulnerable Languages** : Most of the young generation speaks in this language as well as the old generations but it may be restricted in some domain such as restricted in home, within a family or within a narrow community.
- **Definitely Endangered Languages:** Young generations no longer learn and speak the languages as their mother tongue. Thus there is a huge chance for the language to be disappeared with the death of the old generations.
- **Severely Endangered Languages:** Languages which are only spoken by the grandparents i.e. the older generations in a family, and the parents i.e. the next generation can understand that but cannot speak usually in themselves and also with the children i.e. the young generations. So these languages will be definitely lost by time and with passing of the older generation.
- **Critically Endangered Languages:**

The languages which are in critical endangerment are mostly spoken by the grandparents such that the older generations when they were younger and also these were spoken very infrequently and partially.

- **Extinct Languages:** As survey says there are no more speaker left to speak in these languages as included in the Atlas since 1950s, so these are presumably extinct.

Reasons for facing Endangerment of Indian Languages:

Now the most important question which is arising in many of our minds that why Indian Languages are facing so much endangerment and also extinction in such a high rate! There are many reasons behind this threat – and the most notable one is the popularity of English Language which is widely used by the emerging young generation throughout India.

In our country English has become the language for becoming more eligible to be employed and to be knowledgeable and smart to fit in this competitive society. For using internet and other necessary application based device English is also essential one. The youth Indians are losing interest to learn, speak, and write their mother tongue and gaining interest to speak and learn English madly.

This language is establishing and also spreading its domination across the digital world and also throughout the competitive field of employment in our country – which is one of the reasons for facing such a high rated extinction of the native languages.

From the above discussions it is very clear that advanced knowledge and information are not produced and delivered to us in any of the regional languages, thus for advanced studies and to ensure the flow of learning uninterrupted people are forced to learn English and their mother tongue and other native languages are becoming the language for translation. It makes them marginal and then those languages are facing the threat to ultimate extinction also.

There is another reason except the wide popularity for English. There are some native languages which are

existing without script and have been spread throughout the time from man to man by generation to generation only as the spoken languages. But it is also a fact that without script only through dialect no language can survive long as by disappearing of the people who use them the dialect will also disappear if the younger generation does not speak in those languages. As example a language of Andaman and Nicobar islands, namely, Aka-Bo has died recently when its last speaker died in 2010. But it is also notable that there are also many popular languages which have not their own script but have different dialects or accents. Such as English, French, and Spanish have same and common script but the dialects are different. And they all become very popular in their own place. There are more such classes of common script but different languages i.e. Bengali, Assamese have common script, Hindi, Marathi, Konkani, Nepali have common script which is called Devanagari script, similarly Urdu, Arabic, and Persian have same script. Each of the above mentioned language has their own importance and popularity among the people of the respected countries and places. Thus it is very clear that for a language to be alive, popularity is one of the necessary parameter whether they have own script or not, whether they used in advanced information generation or not.

As per the report of People's Linguistic Survey of India (PLSI), in the last five decades Hindi and English became the major and popular languages in India as the world's Hindi speaking person rate has been increased from 260 million to 420 million and for English the rate has been increased from 320 million to 480 million. And this increment in the popularity rate for English and Hindi has been come in return of a very high cost by disappearing of almost 250 regional languages in India over the last 5 decades.

From the discussion it can be felt that native languages are dying due to globalization but that is not fully true. Globalization is affecting the survival of regional languages by becoming the reason for shrinking the domain

of some native languages- many languages under pressure are losing oral literature and words related to culture, especially, food items, dress and ornaments, rituals, flora and fauna. But globalization is not the cause of language death, says the CIL.

Cloud based ICT infrastructure for Endangered Language Protection and Preservation:

To protect languages from dying or disappearing forever we have to preserve them efficiently. There are many preserving system for languages in which many linguists are working. But in this era of globalization, where globalization itself is one of the notable causes for extinction of many native languages, we can use it in a twisting concept to execute a unique and efficient idea for preserving language. This is nothing but the concept of digital preserver, where data collected from various sources are stored and processed and then implemented in various applications to boosting the popularization of the native languages. The concept of the preserving model is based on Information and Communication Technology (ICT). In last few decades India has been developed a huge technological support system to mankind with Information and Communication Technology (ICT) such as various ICT based applications like health care, education infrastructure, research infrastructure etc [3]. Cloud Computing is another era of computing which supports scalability and elasticity [4]. It allows an organization to focus on its core competencies by allowing the cloud provider to deal with all of the hassles involved with the development, maintenance, storage, on demand requirement of resources and up gradation of business applications [5]. As, India is one of the faster growing economies in the world, IT sector of India is now moving towards cloud computing paradigm.

In our proposed Cloud based ICT infrastructure for Endangered Language Protection and Preservation model there are three modules as show in Fig-1, which will perform the overall protection, preservation and popularity boosting task in a very synchronous manner. The three modules are (i)

Linguistic Data Acquisition module, (ii) Linguistic Data Processing and Analysis Module, and (iii) Application Development and Implementation for Endangered Language Module. These three modules will perform their corresponding tasks in different layers.

The very first module which is the Linguistic Data Acquisition module will collect and store all kind of linguistic data and this will be performed in collaboration with a cloud server by performing the following tasks simultaneously:

- (i) Collection of Text data such as from various books, newspapers, written documents etc.
- (ii) Collection of Speech data such as by talking to various people from different age and different regional community.
- (iii) Collection of Video data such as from movies, documentary films, personal family videos etc. from different community.
- (iv) Collection of Audio data like recordings, songs, recitations, lectures, news etc. again from different regional areas.
- (v) Collection of other data such as ancient paintings, wall paintings by the native people, where we can get some scripts.

The next module is the Linguistic Data Processing and Analysis module which will process the linguistic data acquired from different sources in different forms such as text, speech, audio-visual documents etc. and stored in the cloud server. After processing the data will be analyzed like script detection, grammar modification, script – dialect mapping etc. And these processing will be done by performing the following tasks:

- (i) Native Language Corpus Construction which means constructing separate databases with the collection of each type of written and spoken language i.e. the native or regional languages.
- (ii) Phoneme Recognition and Classification which means recognizing and classifying the distinct units of sounds generated in the dialects from each and every specific language.
- (iii) Dialect Recognition and

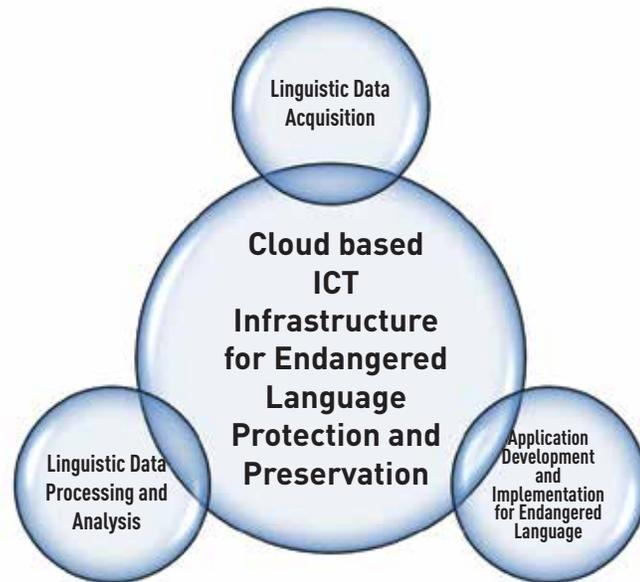


Fig-1: Overview of main component of Proposed Infrastructure

- Classification such that recognizing every single type of dialect and classifying them corresponding to the regional languages.
- (iv) Language Root Investigation using Machine Intelligence (MI) Techniques i.e. investing and finding the source of any language which may be also another regional language from different culture or community.

And lastly the very important module mentioned as Application Development and Implementation for Endangered Languages, which can actually make possible to stop the endangered languages from dying forever and can also increase the interest for using those languages among the people especially the youths. By which the native languages can be able to gain popularity and can also be a crucial part of globalization. This module is nothing but developing various applications where the endangered native languages will be used and by which people will get interest in those languages and will start use them. The entire developing and maintenance process will be done by performing the following tasks:

- (i) Virtual Keyboard Design such that developing virtual keyboards in various native languages by which people can write anything digitally using their very own native

languages.

- (ii) Game Development where the native languages will be used as the communication medium.
- (iii) Mobile Application Design where the languages used will be the endangered languages.
- (iv) Desktop Application Design using various regional languages.
- (v) Text Reader Development for various endangered native languages which will help those people who cannot read but still can get information from those texts by listening them in their own mother tongue which will be some endangered languages
- (vi) Translator Design for the native languages which will definitely enhance the use of those languages. Someone who does not know any particular native language but still want to use that can use it with the help of the Translator.

As previously said, in our proposed system the above three modules are functioning in three different layers (Fig. 2) with different interfaces. The most outer layer of the proposed system is the Application Development and Implementation for Endangered Languages, which will actually function in user interfaces. The various apps developed by the software engineers

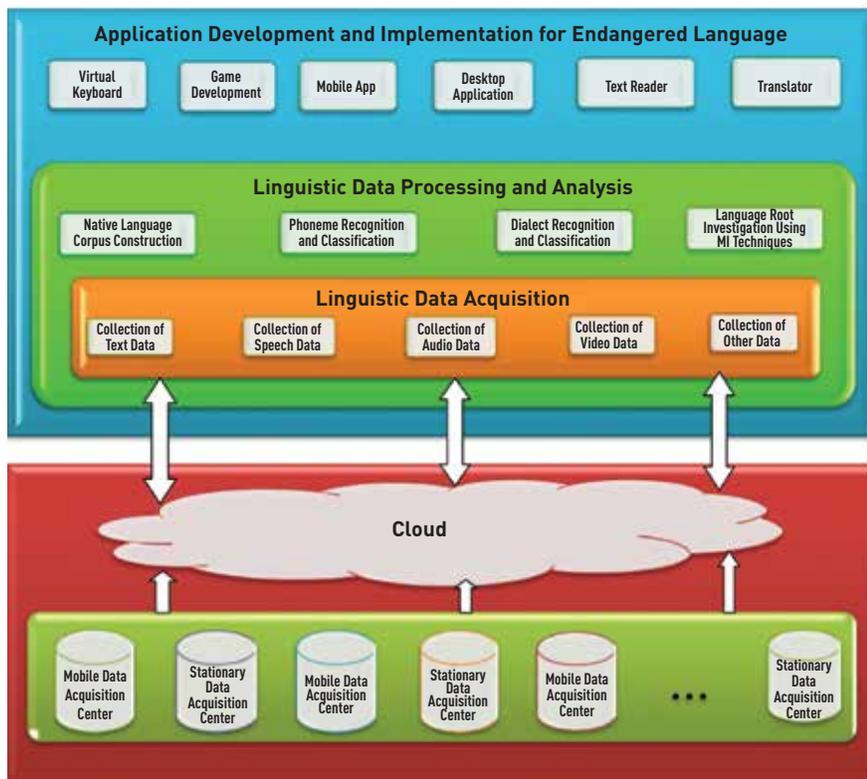


Fig. 2 : Proposed Cloud based ICT infrastructure for Endangered Language Protection and Preservation

for the endangered languages can be used by the common people freely. The next inner layer is the Linguistic Data Processing and Analysis, which will be handled by the language scientists and language engineers in an internal technical as well as linguistic interface. And the most inner layer of the model named as Linguistic Data Acquisition is the basic module which will function in user interface as well as technical interface simultaneously. Linguistic data can be acquired by any person

including the technical survey members who will be registered member with the system. Data can be acquired in two ways such as Mobile Data Acquisition, and Stationary Data Acquisition. Both data acquisition can be possible for any registered person and the acquired data will have to send to the system through an application which will be stored in the cloud server and finally accepted by the language scientists after performing some filtering on them. As collection of data for each and every native languages

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throughout an wide geographical area of our country is not as easy as a cup of tea, so we have considered any little contribution of any person regarding endangered regional languages as important for our proposed system to be functioned efficiently.

Conclusion:

In this article, we have proposed a cloud and ICT integrated approach for protection and preservation of endangered languages of India. As we discussed earlier it is very large project, so huge funding is necessary. On the other hand, this project needs to collaborate different diverge academic and research institutes for implementation of this infrastructure. In this proposed system, it will not only preserve and enhance the popularity of endangered languages but also an overall overview of all the native languages throughout the country can be obtained from this system, which will reflect the root of Indian culture and traditions.

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A comparative study of Open source Deep Learning Libraries for Beginners

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Deep Learning (DL) has made tremendous contributions in complex fields, such as, computer vision, natural language processing overtaking statistical and machine learning approaches in terms of efficiency. The success of DL can be attributed to availability of tools, large amount of data and processing power to build state of art models. This was only possible in last few years, where we had both huge amount of data as well as cheap computing and storage capabilities resulting in widespread development of tools, and libraries for DL and major technology organizations are open sourcing their DL libraries, like Google open sourced TensorFlow. There are good number of open source libraries available in different technologies that can easily overwhelm a beginner willing to learn and use this amazing power of Artificial Intelligence (AI). The list of available libraries includes, but not limited to “DeepLearning4j”, “Mxnet”, “deepnet”, “H2O”, “Keras”, “Theano” and “TensorFlow”. In this paper, we present a comparison of these libraries on the basis of i) technology stack ii) ease of model development iii) GPU / Cluster computing Support iv) deep learning architecture supported and v) performance using different datasets. The analysis will be of great help to beginners in choosing the right library and technology for quick progress.

Key Words: Deep Learning, Neural Nets, Convolution, Python, R, Java

Introduction

Deep Learning (DL) is a collection of algorithms wherein high level abstractions are modeled through multiple non-linear transformations. DL is a part of machine learning (ML) and gained unprecedented popularity in the recent past. An algorithm is considered to be deep if the input data is passed through a series of nonlinearities or nonlinear transformations before it becomes output. Due to the multi-layered architectures and non-linear transformations at each layer, neural networks fits naturally into the principle of deep learning and therefore led to the development of Deep Neural Nets (DNN), Deep Belief Networks (DBN), Convolution Neural Networks (CNN) and Recurrent Neural Network (RNN) models and so on (Figure 1). For further details on these deep network models, please to refer to the sea of information on internet media.

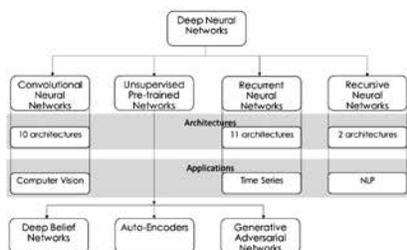


Fig. 1 : Different types of DL models, number of architectures and popular applications

There have been increasing number of success stories on the application of DL in areas, like, computer vision, audio/video/image processing, natural language processing and pattern recognition. The reason for the success is that the state of art deep learning models are able to outperform statistical and machine learning models as well as humans in some of these areas. To identify the complex features from the

data, in particular, image data, sound or text, more number of layers are needed in a neural network, leading to an exponential increase in the number of parameters to be optimized as we add more layers. Therefore, to fully optimize the deep neural network we require huge amount of training data as well as processing power to compute these parameters. This has become a reality due to great contributions from many research groups in industry and academia.

There are many open sourced libraries available for everyone to try and explore and the information can easily be overwhelming to any new deep learning enthusiast. These libraries are built on different technology stacks, e.g., deeplearning4j [3] is library developed in Spark Java, Theano [4] is developed in python and so on. There are certain differences in each of the libraries, all of them possess some advantages and disadvantages over others, say in terms

of speed, different neural network architecture support and interface with different technologies. Many of these libraries are written in C++ and can be easily integrated with Python whereas few of them are also in R, Java, Lua etc. So, one has to consider many factors before selecting one of these libraries. Based on our experience on each of the libraries, we will present a detailed analysis of above mentioned libraries with respect to each of the following factors:

- a) Technology stack.
- b) GPU / Cluster computing Support.
- c) Ease of model development
- d) Performance on CIFAR dataset.

Further, we use some of the above mentioned tools and apply CNN to classify CIFAR dataset and also present a comparison of the results. Although it is known that these tools can perform better on GPUs, we have carried our experiments only on CPUs.

2. Technology Stack

Usually, technology stack refers to i) programming language used to develop the library and ii) interfaces that these libraries support to build our models. This plays a vital role in the choice of the tools as models that are built may have to finally get integrated with the applications. Thus, developing models on stack that can easily be integrated with rest of application is vital decision to make before proceeding to use the libraries. The following diagram presents a clear view of the open source tools with respect to: i) developed technology ii) technologies supported and iii) availability of add on packages (Fig. 2):

Though there are many ML APIs available in latest versions of Spark and Java, there are not many java based tools available in open source to develop deep learning models. Deeplearning4j [3] is one of the few tools built on Spark Java and it can be easily scaled to work on multimode Hadoop clusters. Recent release of Deeplearning4j supports RBM, CNN, Recursive auto-encoders, RNN like LSTM and Bi-LSTM, Deep belief network and deep auto-encoders and is compatible with the current version of Spark. Also, one can import models built on Keras and execute using deeplearning4j. In

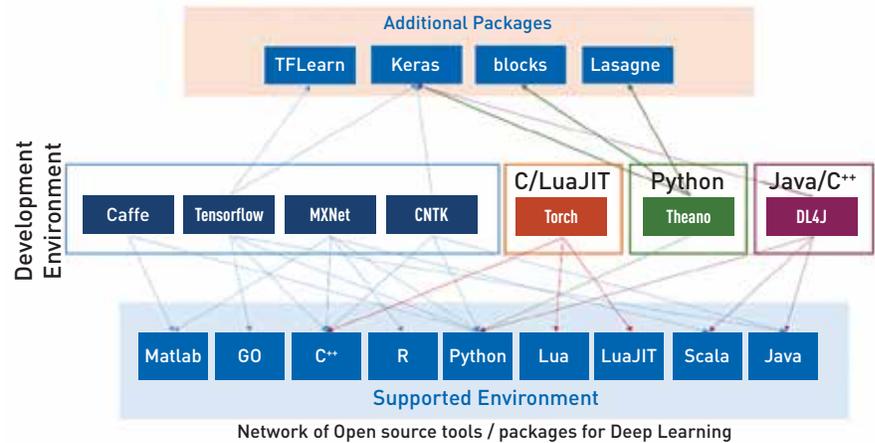


Fig. 2 : Network of open source tools / packages for Deep Learning

spite of these features, the popularity of Deeplearning4j is not on par with similar tools built on C++ and python.

If one is interested in R, there are good number of options, Deepnet [5] is a package in R is one of them. Mxnet [6] is written in C++ and provides models for convolution neural networks and it provides interface in R as well as Python. Similarly H2O [7] is a machine learning platform built on java but it also gives interface for R even though all the major computation takes place in java. Interestingly, the availability of packages for CNN or DBN or RNN is rather limited in R resulting to its low popularity in the space of DL.

In the recent past, Python has overtaken all other modeling environments for machine learning and deep learning applications. Clearly, there are more libraries built in C++ and are compatible with Python; Google's TensorFlow [8] is the most popular framework having good community support in development [16]. TensorFlow which was open sourced at the beginning of 2016 provides an interface to build deep learning models in Python. Theano [4] is a similar framework built in Python and provides interface with tools such as Keras, Lasagne and Blocks. Keras [9] is a DL library written in Python and can be used on top of Theano, TensorFlow, Deeplearning4J, CNTK and so on. Keras development is supported primarily by Google. Another important library to mention that has interface for Python

is Caffe [10], one of the most adopted libraries among research community.

3. GPU / Cluster computing support

Since optimizing a deep neural network model requires a huge amount of data, the processing power to finish the training in stipulated amount of time cannot be achieved using multicore CPU machines. Training of Deeper neural network can be achieved either by using large clusters of computers connected by system like Hadoop or by using GPU's with multiple cores for training. Unlike CPU, GPU's has more number of cores and can be used to perform the calculation using CUDA. Currently CUDA supports only NVIDIA series GPUs [11]. It is important to note that the parallel processing of algorithm can be achieved in two ways (Figure 3):

1. Data parallelism.
2. Model parallelism.

Deeplearning4j [3] uses iterative MapReduce operation to perform data parallelism where same model works on each node but on a partition of data i.e. mapper from MapReduce. And reducer collects the various network parameter trained on different data partitions on different core and calculate the mean parameter value and again run the Mapper on dataset using new network weights.

On the other hand, model parallelism is to split the model among GPUs and use the same data for each model; so each GPU works on a part of the model rather than a part of the data. In deep learning, one approach is

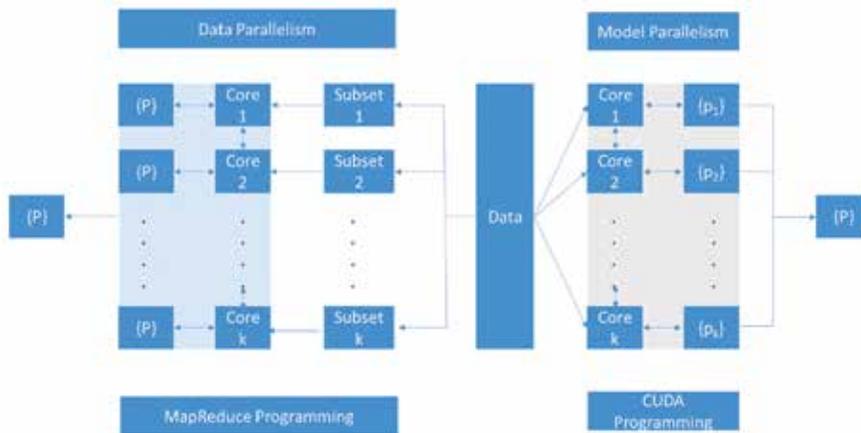


Figure 3: Data parallelism versus model parallelism

to do this by splitting the weights, e.g. a 1000×1000 weight matrix would be split into a 1000×100 matrix if we use ten GPUs.

H2O [7], deeplearning4j [3], TensorFlow provide both GPU processing as well as Cluster distributed computing. Whereas, the libraries like Theano [4] (works better on single GPU. Having issues with multiple GPUs), Keras [9], Mxnet [6] have optimized its execution time for GPUs thus increasing the performance for larger dataset. But in case there is no availability of either high end GPU or distributed cluster, for quick experiment and prototyping the models can be run on the CPU instance of any of the above libraries using few iterations (epoch). To leverage the high accuracy of the well trained deep network model, one can easily use the pre-trained state of art models that have been trained on standard datasets to get state of art accuracy. For example, in case of Image classification, the state of art model that has won Imagenet challenges [12, 13] over the year, like, Alexnet [14], Microsoft’s Resnet [15] are available as pre-built models. Google’s Inception models are also freely available to be downloaded with its weights optimized on Imagenet data. If the data set in the training and test sample belongs to same genre as the dataset used in Imagenet challenge, fully connected layers can be trained back on the new training dataset to classify by freezing the initial convolution layers. With little fine tuning and computation time high accuracy can be achieved without high

end systems.

Pre-trained models can be easily integrated and trained on Keras [9], Mxnet [6], deeplearning4j [3], Theano [4] and TensorFlow [8].

H2O natively supports only feed forward neural network, but H2O’s deep water project supports CNN and RNN using integration of third party libraries such as TensorFlow, Caffe and Mxnet. Similarly deeplearning4j package of R supports feed forward neural network and RBM and DBN, but we couldn’t find CNN or RNN. MXnet finds implementation of feed forward neural network and convolution neural network. Keras, Theano and TensorFlow has feed forward neural network, RNN, CNN as well as different variants of Deep Autoencoders.

4. Ease of model development

Creation of DL models using

TensorFlow and Theano is made simpler by using readymade APIs in Keras that works on top of both these packages. A sample python code of a 2 layered CNN using Keras is presented below for better understanding:

```

model = Sequential()
model.add(Conv2D(32, kernel_size=(3, 3),
                activation='relu',
                input_shape=input_shape))
model.add(Conv2D(64, (3, 3), activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.25))
model.add(Flatten())
model.add(Dense(128, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(num_classes, activation='softmax'))

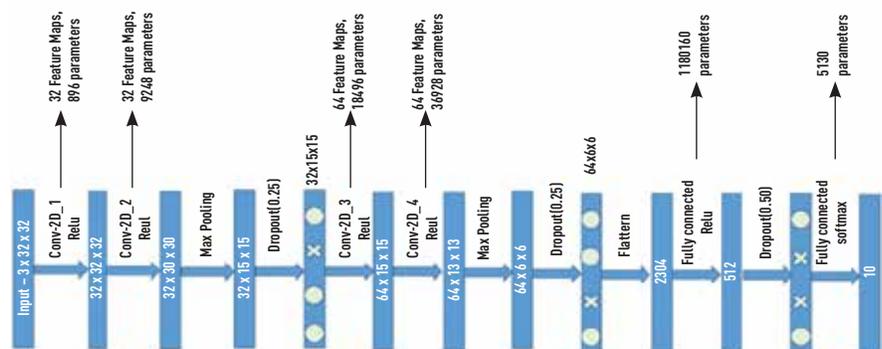
model.compile(loss=keras.losses.categorical_crossentropy,
              optimizer=keras.optimizers.AdamDelta(),
              metrics=['accuracy'])

model.fit(x_train, y_train,
        batch_size=batch_size,
        epochs=epochs,
        verbose=1,
        validation_data=(x_test, y_test))
    
```

From the above code snippet it can be seen that Keras treats model as an object and there are methods to i) add layers to the model and ii) to compile and fit the DNN on training samples. Similarly, developing complex models in H2O, deeplearning4j and Mxnet is easy and one can configure each layer and its parameters, which is not possible in other R packages, such as, deeplearning4j.

5. Classification of CIFAR data

Canadian Institute for Advanced Research (CIFAR) datasets (CIFAR-10 and CIFAR-100) have been very popular since 2009, particularly, in the application of deep learning for computer vision [Ref]. The dataset has 60000 images of 32x32 color images belonging to 10 different classes and is split into a training sample of 50000 images and a test sample of 10000 images. Usually, this dataset is used to test and benchmark models built



6 Layered CNN with 4 Convolutional Layers and 2 Fully Connected Layers Takes 32 x 32 x 3 image as input and gives probabilities of 10 labels at output

Fig. 4 : 4 layered convolutional neural network model to classify CIFAR data

on CNNs in different packages and environments. We have trained a 4 convolution layered network model (Fig. 4) using the following architecture [17]:

No. of parameters at each convolution layer

$$= \text{Bias (No of Feature maps)} + \{\text{No of feature maps} * \text{Depth of each feature map} * \{\text{filter size}\}\}$$

Example:

No of parameters at first convolution layer = $32 + \{32 * 3 * \{3 * 3\}\} = 896$

No of parameters at second convolution layer = $32 + \{32 * 32 * \{3 * 3\}\} = 9248$

In total, a maximum of 1,250,858 weights are optimized in each iteration or epoch during the process of training the model. Our experiments with CIFAR data set yielded classification accuracies varying between 61% and 74% with models in Keras on TensorFlow yielding 61 % and models in keras on Theano yielding 74.1% after 25 epochs (Table 1). We observed that training the model on 50000 images using TesnorFlow is faster than training the same using Keras on TensorFlow.

Table 1: Classification accuracies

using different tools

Model	Accuracy (%)
Keras on TensorFlow	61
CNN in TensorFlow	60.57
Keras on Theano	74.1
DeepLearning4j	71.15

It is important to note that the number of parameters (weights) grow exponentially when we train the models with deeper architectures such as Resnet50 or VGG19 and so on. At the same time, they are expected to perform lot better as it is reported that a model trained VGG19 architecture has resulted to an accuracy of above 90% on the same data set [18].

6. Feature Comparison

In addition to the above parameters, such as, choice of technology, language support, availability of architectures, performance of the model during training and testing is another important parameter to choose the appropriate tool. Typically, performance of the deep neural net depends on the hardware, data and choice of the technology. While libraries like,

TensorFlow and Theano are excellent as they are receiving great support from the open source communities. Table 2 presents a comparison of the features of these tools and packages, in addition to the summary of the other aspects discussed so far.

7. Conclusions

From above discussions it can be concluded that among many options available, the choice can be made based on language or environment. Most of the libraries support CNNs, DBNs and RNNs and can be used with little effort to create deep learning models. If R is preferred choice of language, then Mxnet can be handy to develop some quick prototype of deep learning model on smaller dataset. Whereas, if one wants to run larger series in less time, GPU with Mxnet can do the trick or H2O with GPU or Hadoop cluster of many nodes can be library of choice. Similarly if Python is the language of choice, one can use Keras to quickly develop some interesting neural network models. For running models on single machine, keras on top of Theano outperforms the others. Whereas, TensorFlow

Table 2: Comparison of features of open source DL tools / packages

Libraries	Technology Stack		GPU / Cluster computing support	Deeplearning Architecture supported	Ease of building Deep learning Model	Performance
	Built on	Interface for				
H2O	Java	R, Python, Spark, Scala	Yes	Feed Forward Network	Easy	Performance is quite good in terms of time due to GPU and Cluster support
Theano	Python	Python	Yes	All Major architecture	Little Difficult	Performance is excellent on single GPU but has some issues when it comes to multiple GPU
Tensorflow	C++	Python	Yes	All Major architecture	Little Difficult	Performance is highly optimised in multiple GPU clusters. The heavy community support makes it more robust .
Deepnet	R	R	No	Feed forward network, DBN, RBM	moderate	Not par with other libraries in list
MXNet	C++	Python, C++, R, Scala, Julia, Matlab and JavaScript	Yes	All Major architecture	Easy	Has good performance on single as well as mulitple GPU cluster
Keras	Python	Python, R	Yes	All Major architecture	Easy	Keras is most widely used non frame-work library on top of tensorflow, theano,CNTK. Although its performance seems there are some known issue with tensorflow as backend as of now.
Deeplearning4j	Java	Java, Scala	Yes	All Major architecture	Little Difficult	Great java based library. Excellent support in terms of distributed fast training of models



CSI student branch opening of MATS School of Information Technology - Raipur Chapter activity



The MATS School of Information Technology, MATS University, Raipur conducted national seminar on 20th April 2018 at MATS Impact center, Raipur. The event is become milestone day for department because of opening ceremony of CSI student branch of University. The department of IT took the privilege to invite eminent personalities from CSI in this occasion.

The Department of IT is institutional member of CSI from last two years and looking to the benefits for students career, started the CSI student Branch from 2017-18. The ceremony is witnessed by students, scholars and faculties of University. The official announcement of CSI branch is done by Prof. A K Nayak, Chief guest and National secretary of CSI. The event is started with the lighting of lamp and worship of Goddess Saraswati. The Head of the department Ms. Rita Dewanjee welcomed all the guest of seminar and recalled the commitment of department of IT that University is always abide to provide better

opportunity and academic support for creating academic environment. Prof Nayak in his speech explained the benefits of CSI for students and organization. He has also explained the importance of IT and how the new technical innovations are helping people to resolve their issues and helping for survival of people for better life. He has conveyed his good wishes to the department and University to grow in future and also shown commitment to provide help from CSI in all aspect. The eminent speaker Shri Jayant Bhide explained the importance of disaster communication and how institution can establish their own satellite lab for training purpose. The speaker Dr. Sanjaya kumar Panda elaborated the topic Big Data and Cloud computing: Innovation, Opportunities and Challenges.

The Vice Chancellor and management of University congratulated the department of IT for their efforts and wished to grow and get benefitted by this new association. The vote of thanks given by Dr. Bhawna Narain, State Student Coordinator, Raipur Chapter and Associate professor, MSIT.



» outperforms all other libraries when it comes to speed while using many machines connected in form of clusters of many CPUs or GPUs.

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I3: Intelligent Image Interpolation for Super-Resolution of Retinal Images in Automatic Eye Disorder Diagnosis System

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Super-resolution (SR) of medical images improve the quality of medical analysis and helps effective diagnosis. Machine intelligence helps the medical image analysis process through computer-aided diagnosis (CAD). The quality of analysis depends upon the quality of the digital images. This article proposes an architecture for CAD that focuses on retinal image analysis and uses an intelligent image interpolation scheme (I3) to generate high resolution retinal images from low resolution images. The quantitative results, in terms of peak signal-to-noise ratio (PSNR), are promising when compared to the existing image super-resolution algorithms.

Key Words: Super-resolution, smartphone funduscopy, computer aided diagnosis.

Introduction

Internet of Things (IoT) is the world is talking about for some time now. The vast application areas where it can cater amazes the human race and even other materials available in the universe. Internet of Everything (IoE) is the way forward in the fast paced research world [1]. When talking about applications of technological advancements, one cannot help him/her without thinking about healthcare or clinical applications. The developments in the technical fields that aid the clinical practices make this more sensitive area to incorporate the rapid changes. Computer aided diagnosis finds its application in the detection of breast cancer, lung cancer, colon cancer, coronary artery disease, pulmonary embolism, congenital heart defect, pathological brain detection (PBD), Alzheimer's disease, interstitial disease, nuclear medicine, diabetic retinopathy etc. [2, 3]. These systems use digital images as the primary source of investigation. But, obtaining high resolution images, that have more information, is a difficult ask in several complex applications.

Funduscopy forms the base for the

diagnosis and treatment of eye diseases by providing photo documentation of the retina. The acquisition of high-quality fundus image requires a combination of appropriate optic lens and coaxial light source. Traditional fundus cameras have difficulties with convenience, compatibility and portability. Whereas, smartphone funduscopy uses smartphones which are readily available, relatively cost effective, easy to operate and compatible across various platforms. There are several smartphone based ophthalmological applications available across various platforms. The Welch Allyn iExaminer system is one such ophthalmological application which enables an iPhone to operate like a pan optic ophthalmoscope. The retinal images that are captured using smartphone funduscopy are low quality images that show a smaller field of view, lower resolution, and poorer contrast due to the hardware limitations. The experiments on smartphone funduscopy suggest that the limitations of the technique and its applications lie in the image quality [4]. Image super-resolution is one way of

achieving high resolution images from the available low resolution images. SR algorithms are device independent [5, 6]. The following section gives the details about an architecture for CAD that uses SR of retinal images.

Proposed CAD and I³ Architecture

A CAD architecture that focuses on diagnosing diabetic retinopathy, cataract, corneal ulcers, plus disease, retinal tear and detachment, glaucoma, melanoma, macular degeneration, vitreous floaters, conjunctivitis, retinopathy of prematurity etc. is explained in this section. The proposed CAD system applies intelligent interpolation techniques for generalizing, learning and diagnosing retinal images. The architecture is given in Fig. 1.

The system has several blocks taking care of some dedicated tasks. The retinal images of patients are captured as the initial task. The electronic health records (EHRs) and the retinal image repository form the data for analysis and learning. The machine intelligence block consisting intelligent image interpolation (I3) and

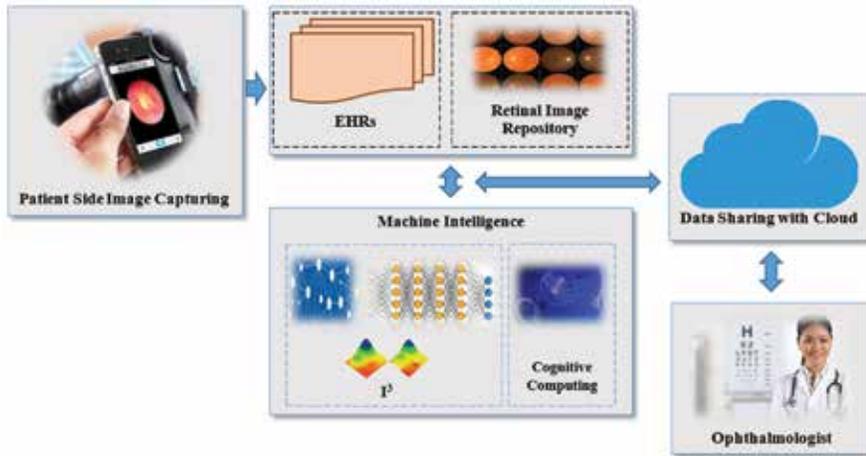


Fig. 1 : CAD architecture for retinal disease diagnosis

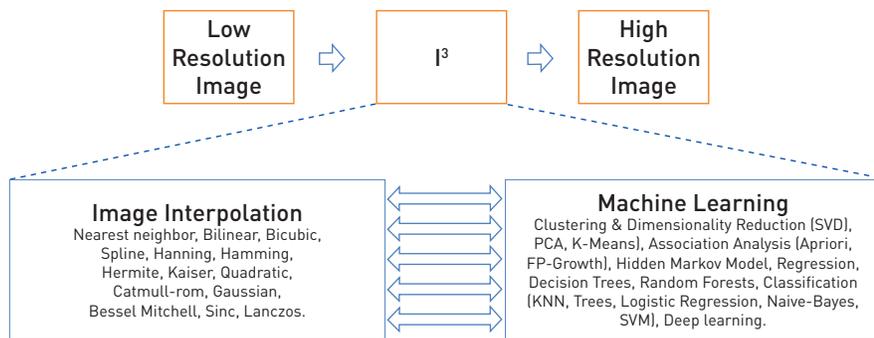


Fig. 2 : Intelligent Image Interpolation

Table 1 PSNR values (in dB) obtained from experiments with magnification factor 2

Images	Interpolation		Interpolation with Machine Learning			
	Nearest Neighbor	Bicubic	Sparse Coding with SVR [7]	Linear SVR [8]	Sigmoid SVR [9]	Proposed
Image_01	33.38	34.94	35.34	35.45	35.68	35.71
Image_02	33.68	35.27	35.68	35.75	36.00	36.04
Image_03	34.66	36.29	36.70	36.81	37.04	37.09
Image_04	34.42	36.03	36.44	36.52	36.79	36.82
Image_05	33.78	35.36	35.78	35.88	36.11	36.14
Image_06	33.93	35.51	35.90	36.03	36.24	36.29
Image_07	33.80	35.72	35.78	35.80	36.13	36.24
Image_08	34.10	36.04	36.10	36.12	36.45	36.56
Image_09	33.79	35.72	35.77	35.79	36.13	36.24
Image_10	33.95	35.88	35.94	35.96	36.29	36.40

cognitive computing. The data sharing with cloud oversees the transmission and communication. Finally we have the physicians who would evaluate the performance of the proposed system.

The core operation is the generation of high resolution images from a single or a set of low resolution images. The introduction of the new pixels in the high resolution images is achieved

with the help of intelligent interpolation technique I^3 .

This intelligent interpolations technique learns, predicts and reconstructs the missing pixels. The learning outcomes of Deep learning and other machine learning algorithms are used for decision making. The results obtained from the intelligent interpolation technique gives better retinal images for image classification and diagnosis. The intelligent interpolation block combines image interpolation techniques with machine learning techniques as depicted in Fig.2. Deep learning is also used in the generation of high resolution results. The deep convolutional neural networks (DCNN) are used in the generalization and reconstruction of retinal images. I^3 is a series of operations looping between learning and prediction process time and time again before arriving at a decision based on the required image magnification factor.

Apart from machine learning and interpolation techniques, the proposed scheme uses sparse coding and probability theory as well. Since, any high resolution image can be visualized as the sparse representation of low resolution patches, the application and generation of sparse representation reduces the number of non-zero entries. This effectively increases the speed in which the system produces the results.

The application of probability theory does impact the decision on the reconstructed result. These mathematical expressions help reducing the prediction error also known as reconstruction error. That means, the high resolution patch which corresponds to the least error will be considered as the best possible result.

The machine intelligence block will then make the final decision with the high resolution retinal image generated by I^3 . The application of big data analytics and the cloud computing techniques make the system to be more complete.

Performance Analysis

The experiments were carried out by using the retinal images captured with the help of Welch Allyn iExaminer system. . The quantitative performance

of the super-resolution technique is measured with respect to peak signal-to-noise ratio and structural similarity. The qualitative performance will be based on the results of retinal image analysis. The PSNR values obtained from the experiments are tabulated in Table 1. The tabulated values are grouped in to two categories namely interpolation and interpolation with machine learning. The higher PSNR values indicate better image quality.

The average PSNR values are tabulated in Table 2. Table 2 that indicates the proposed scheme performs better than the existing algorithms. The results indicate that this intelligent interpolation technique produces better high resolution images in terms of PSNR when compared to the other existing image super-resolution algorithms.

Table 2 Average PSNR values obtained from experiments

SR Methods	Average PSNR Values
Nearest Neighbor	33.95
Bicubic	35.68
Sparse Coding with SVR [7]	35.94
Linear SVR [8]	36.01
Sigmoid SVR [9]	36.29
Proposed	36.35

Conclusion

An intelligent image interpolation scheme for retinal image super-resolution was proposed. The CAD system architecture for automatic eye disorder diagnosis was also proposed. The application of I³ helps the system to produce high resolution retinal images from the low resolution ones. The proposed scheme uses the combination of machine learning and interpolation techniques. Quantitative results indicate that the proposed I³ generates images with better PSNR values.

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IoT based Sensors for Agriculture Applications

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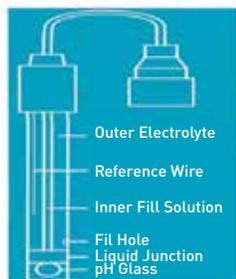
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Crop monitoring is one of the major factors for the development of a country. Due to less monitoring on crops led to the destruction of plants on large scale. This can be avoided by regular uses different types of sensors to monitor the crops. Sensors can detect the major threats that decrease the growth of the plants Agriculture is the backbone of the Indian economy. Mostly it uses about 1/3 of the world's largest amount of water resources in the world. The percentage of water content and consumption irrigate the land based on the different types of soil, conditions and water requirement needed for each type of soil. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes to waste. In modern drip irrigation systems, the most significant advantage is that water is by which a large quantity of water is saved. The reduction of water consumption, type of the soil with what level of water needed for irrigation can all be determined with the help of sensors monitoring on crops using automated machines.

Sensors for Monitoring the Crops

pH sensor

pH sensors used in measuring the acidity of soil is electrochemical pH sensors. These sensors have two major divisions measuring electrode and reference electrode. Change in pH value is detected by measuring electrode while reference electrode provides stable value for comparison. Compared with typical pH electrode probe pH sensors work slight differently. While pH sensors have 2 electrode pH probe has 3 electrodes. The 3rd electrode is used as grounding which prevents reference fouling.



Humidity sensorT

Humidity sensor is used to report and measure the moisture content and the air temperature present in the atmosphere. It is also used for agriculture purposes to determine the moisture content

Relative humidity & Absolute humidity

It is used to measure the volume, weight, dew/frost point in the crops. It is also used to analyze the amount of moisture content of the air to the maximum(saturated) moisture level that air can hold at a same given temperature and pressure of the gas. Absolute humidity is the measure of water vapour in the air, regardless of temperature.



Temperature sensor

Temperature sensor is a device, typically a thermocouple or Resistance thermometer, which provides for temperature measurement through an electric signal. A thermocouple made from two dissimilar metals generates an electrical voltage which is proportional to the temperature change.



Electrochemical sensor

Using the potentiometric electrochemical sensors consisting of ion selective electrode and ion sensitive field effect transistor which is used to detect the nitrogen, phosphorous, potassium content present in the soil and also they provide information on the pH and soil nutrient levels. The sensor electrodes work by detecting the specific ions in the soil and they are

mounted to specially designed “sleds” help gather, process, and map soil chemical data.



Sensor used for types of irrigation

Drip irrigation

This can be done in two ways by automatically and manually using the Arduino kit and raspberry pi board, soil moisture sensor and temperature sensor module. In modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants by drip by drip due to which a large quantity of water is saved. The process sometimes consumes more water or sometimes the water reaches late due to which crops get dried. The problem is only rectified if we use two automatic micro controller based drip irrigation, where the irrigation takes place only if there is an acute requirement of water. Transistor and resistor plays an essential role in this project which helps the water pump automatically ON/OFF. LED light is fixed along it to indicate water pump is running or not.



source:dreamstime.com

Subsurface drip irrigation using sensor

Subsurface drip irrigation (SDI) is the irrigation of crops buried through plastic tubes containing embedded emitters located at regular spacing. It is installed below the ground surface. The potential exists to use SDI bellow planting and tillage operations even in standard row-crop production systems.SDI includes the advantages of management of water near the root of crops, minimizing losses due to the evaporation, zoning of areas based

on water supplies and differing water needs of soil and crops. The water supply should be free of algae source water pH that is slightly acidic id preferred, since higher pH levels tend to precipitate the minerals within the irrigation system, proper care must be given to the filtration and chemical injection treatment to prevent emitter plugging.



source: the pump house

Plants and soil welfare using the types of sensor

Using the soil moisture or electrochemical sensor we can identify and predict the plant type for suitable acid soils, alkaline soils and neutral soils

Conclusion

Using the sensor, Arduino board we can assist farmers in getting live data about the temperature, pest control and soil moisture for the efficient environment monitoring which is used as smart farming and increase their overall yield and quantity of crops and there are plenty

Plants for sandy soil

Plants for sandy soils	Plant type	Suitable for acid soils	Suitable for alkaline soils	Suitable for neutral soils	Extra features
Eucalyptus	Tree	*		*	Eucalyptus
Cotoneaster	Shrub	*	*	*	Cotoneaster
Rosemary	Shrub	*	*	*	Rosemary
Achillea	Perennial	*	*	*	Achilles

Plants for clay and silt soils

Plants for clay and silt soils	Plant type	Suitable for acid soils	Alkaline soils	Neutral soils	Extra features
Magnolia	Tree	*		*	Magnolia
Sorbus (Rowan)	Tree	*		*	Rowan
Berberis	Shrub	*	*	*	Berberis
Aconitum	Perennial	*	*	*	Aconitum

of options like Sensor-based field and resource mapping, Climate monitoring and forecasting, Remote equipment monitoring, Livestock tracking and geofencing,Stats on livestock feeding and produce, Predictive analytics for crops and livestock, Smart logistics and warehousing.

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Sensors for Internet of Animal Health Things

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In recent times, Internet of Things (IoT) is becoming an emerging area of technical, social, and economic significance. The new evolution of the Internet is to connect things which are nothing but objects. The world of animal medicine has seen drastic technological advances in the last 20 years. The animals are the source of entertainment and economic for the people. Veterinary science is waiting for more technologies to monitor animal health. This article provides the concept of the Internet of Things, Internet of Internet of Animal Health Things (IoAHT) as well as explore basic types of sensors on the IoAHT.

Internet of Things

Every object connected to the Internet for communication to become smart in IoT. The Internet-connected objects have embedded wireless or wire-line connectivity to control systems that support data analysis, data collection, decision making, and actuation. The things can be anything like machinery, home appliances, vehicles, individual, persons, pets, cattle, animals etc.

Initially, the things identified by Unique Identification (UID) or Electronic Product Code (EPC). In EPC, the information is stored in a radio frequency identification (RFID) electronic tag and the information is uploaded by noncontact reading using RFID reader. In midterm devices were embedded with intelligence and embedded active wireless capabilities to perform a variety of data collection and control functions. Now sensors are employed in the IoT and IoT with these Sensor approaches use distributed wireless Sensors Networks (WSN) system.

Figure 1 depicts the classification of communication between the objects in IoT. In Human to Human (H2H) communication sensor devices are used for communication between human. The interaction takes place between machines through sensors in Machine to Machine (M2M) communication. In Human to Machine (H2M) communication human can

control the machines and Machine in human (MiH) communication includes implantation of the chips on the human body, medical monitoring probes, etc... IoT focuses mainly on M2M, H2M and MiH communication.

In M2M communication, interactions between two or more entities do not necessarily require human intervention but in H2M communication human intervention is required. In MiH communication, the machine i.e. sensors are deployed in the human body to collect the data and transmitted to the internet. MiH communication is mainly focused in the field of biomedical.

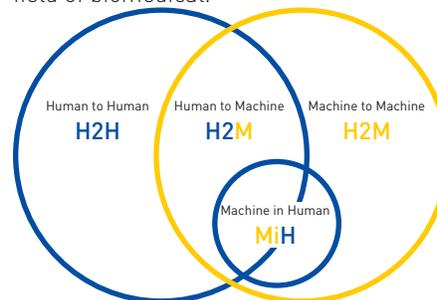


Fig. 1 : Communication between the Objects in IoT.

Internet of Animal Health Things

All animals have equal rights to live in the world. Taking care of animals is a direct or indirect responsibility of human. Human makes use of an

animal for the purpose of economic or entertainment. The human-animal bond is a mutually beneficial and dynamic relationship between people and animals are essential to the health and well-being of both. The veterinarian's role in the human-animal bond is to maximize the potentials of this relationship between people and animals. Now IoT is a trend which connects every object to the Internet through sensors. The important role of IoT is to solve the animal health problem. Use of IoT in animal health issue is called the Internet of Animal Health Things (IoAHT).

IoAHT APPLICATIONS

Earlier veterinarians' knowledge of their patients is limited to a brief consultation. By using sensor devices, however, they can monitor post-surgery recovery, track reactions to prescribed medications, and even communicate remotely with pet owners. Animals' activities are monitored and controlled using sensors. IoAHT created flexibility in veterinary science and made monitoring and treatment task easier. The impact of IoAHT will grow either by personalizing veterinary care or improving livestock efficiency, the long-term effects of IoAHT could revolutionize treatment across the animal health spectrum.

Sensors for IoAHT

Every animal is connected to the

internet and monitored in a remote place. Illnesses of the animal's data are collected dynamically. IoT for animals is basically same as Human to machine Communication, except for the fact that the source of data collection will be animals instead of humans. There are two types of sensors

1. **Active sensors:** sensors are put into the bag and fixed to the animals so that dynamically animals are monitored as they move around the world.
2. **Passive sensors:** these types of sensors are kept in one place and when the animal comes to the range, they are monitored.

There are several types of sensors on animals as follows:

- **Medical sensors:** To acquire signals such as ECG (Electro Cardio Graphic), body temperature and blood oxygen saturation.
- **Motion sensors:** To track animal health based on the movement
- **Environmental sensor:** To monitor humidity and temperature to know the effect of it on animal health.
- **RFID:** To match the respective animals and to monitor activities.
- **Temperature sensors:** to increase

the comfortable zone of animals and to find the variations of body temperature.

- **Smartphone:** smartphones also act as sensors to monitor remotely the health of animals
- **Heart rate sensors:** It detects the heartbeat speed to monitor animal health.
- **Rumination sensors:** To take care of digestion related health issues rumination sensors are used.
- **Oxygen sensors:** These sensors are used in fisheries to know the oxygen level.
- **PH sensor:** these sensors are used to know the deficiencies in the milk or any water-related issues.

The summary is, Sensors are used on animals for the following purpose:

- To monitor animals
- To analyze the behavior of animals
- To detect ECG data
- To find motoric dysfunction

Sensors are not harmful to the animals but should know the way of deploying or attaching it.

Conclusion

As we all are towards the smart

world, connecting every object to the internet is very much essential. People should aware of an object communication. This article gives a glimpse of an IoT so that contribution towards veterinary science is very helpful to protect the animals for a better environment.

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Social Ramification of Fire on Forest using IoT

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In this era, it is a hard issue to realize that huge number of trees are being cut down for various reasons by the human beings which is a well known factor. The unknown / unpredictable factor is forest fire. It is a difficult task to predict and avoid fire in forests. By the time the information about the forest fire reaches the concerned authorities, most of the trees would have burnt and the task of controlling the same is almost impossible and it is very to control the fire if it gets triggered. Most valuable trees will be lost because of this unexpected fire. In order to avoid this, a fire detector sensor can be in place, which can be used to control the fire by placing appropriate fire controlling devices and also warn the nearby regions and thereby avoiding the loss of life. Based on the data available in the sensors it is possible to predict the fire and thereby avoiding the same.

Key Words: IoT, Smart devices, RFID, Fire

Introduction

The technology that the rules the world as on date is Internet of Things (IoT). IoT is defined as the networks of the physical objects. Internet of things is an interaction between sensors and devices. These devices also communicates / shares the data among the peer entities. IoT allows things to be connected any time at any place and using any network and or any type of service. In order to achieve this there should be a common middleware that should control/interact/communicate with each other. The middleware platform enables sensor data collection, processing and analysis. This article covers the implementation details of the proposed middleware solution namely Mobile Sensor Data Processing Engine (MOSDEN)[2].

MOSDEN is designed to support sensing as a service model natively. MOSDEN is a true zero programming middleware. The MOSDEN middleware can be able to push and pull data streaming process. For data transaction between android mobile and sensors a special plug-in has been developed that is used for better communication between the sensor and human.

IoT Fundamentals

In this section, background of

IoT and the motivation behind this work is discussed. By using IoT, we can connect to billions of components to the Internet. This method is not possible and practical to connect all of them to the Internet directly[4]. This is mainly due to resource constraints (ex. Network, communication capabilities and energy limitations) connecting directly to the Internet are expensive in terms of computation bandwidth usage and hardware cost point of view[1]. Enabling persistent Internet access is challenging and also negatively impacts on miniaturization and energy consumption of the sensor. Due to such difficulties, IoT solution need to utilize different types of devices with different resource limitation and capability.

An ideal IoT middleware solution should be able to take advantage and adapt to these different types of devices in order to make the solution more efficient and effective. One of the most critical decision that need to be taken in the domain of IoT is where and when to process the collected data.

There will be prior knowledge or input on Fire on forests. In the present scenario, only after the fire catches the measures to clear the fire will take place[1]. But before taking the action, most of the trees which is highly valuable would have been completely

burnt in fire. The time taken to identify the location of the fire, intimate the fire personnels and finally the fire personnels reaching the target lands up in huge loss in terms of trees and to the society. All these problems can be rectified by applying the IoT technology in detecting and identifying the location in a much faster pace than the existing manual based scenario.

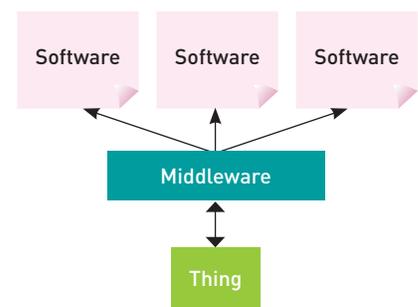


Fig. 1.: IoT Architecture

The component labeled as “Thing” is the physical device that detects or measures the properties of the item and transforms the collected data to the middleware. The middleware is responsible for connecting to different types of sensors and the application layers communicates with

the controlling / monitoring software. The software should provide a user interface and has the ability to control the sensors and middleware through hardware instructions.

Identification of Forest Fire is critical and there are several reasons behind this. With the help of technology advancements, it will be possible to identify the spreading of fire in less time. A fire detecting sensor can be used to detect the fire in forests[2]. When the tree starts burning, it emits Carbon monoxide and Carbon dioxide and the temperature and humidity values increased. Along with fire sensors, CO and CO₂ gas sensors can also be placed and these sensors are quick enough to forward the required information to the concerned. These sensors can be solar powered. So there is no necessity of exclusive electricity supply to the sensors[4].

Working Principle

To receive the signal from the forest Arduino UNO board is used. The signal received from the board can be treated as an alarm / warning of fire. The Arduino board is connected to the gas sensor. The gas sensor is capable of sensing the gases like CO and CO₂. As these are the gases are emitted during the burning of trees. The gas sensors are placed at different locations for identification of smoke / fire in the regions where forest fire is of major concern[3]. The Arduino board is controlled using a smart device that runs on and android platform. The data shared by the Arduino board are received by the smart device. Depends on the threshold that has been set for detection of fire, the smart device will communicate to the concerned authorities and thereby taking the appropriate action.

The data from the sensor and the android based smart device are integrated by using the IP (Internet Protocol) address of the chip and Ethernet server functionality[2]. Smart device receives the HTTP request in JSON (JavaScript Object Notation) format and the signal will be sent from chip within the server. Alerting of messages can be shared with the concerned authorities.

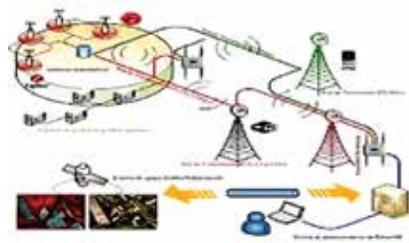


Fig. 3 : Interaction between Smart Phone and Chip Interaction

Fig. 3 represents the working model of the proposed system. The components are :

- The Wireless Sensor Network.
- The Communication Network.
- The Reception Center.

Sensor a physical device which measures the physical property. Wireless sensor network is a group of dedicated sensors for monitoring and recording the physical condition of the environment and organizing the collected data at a central location. Communication network is used to broadcast the communication between the nodes. It takes message from a single sender and transmit to all endpoints on the network. Mainly it is used for serial data transmission and is the platform to monitor and control the automation systems in a timely basis. Reception center observe and monitor the specific area regarding to the allocation the task.

Results

The physical device detects or measures a physical property and records. The data will be dispatched to the forest workplace with the assist of the wireless communication and this communications is of type serial. Every physical device might be updated and discovers the physical property statistics to the forest workplace at each and every second. Assume if any unexpected event occurred (like fire) with the help of the proposed architecture, alarms the forest officer for making necessary action to prevent / control the fire by observing the cameras.

Conclusion

Identification of forest fire is a critical and a difficult task. The

proposed methodology for detection of forest fire decreases the time to take the appropriate action and the intimation time to the concerned. Moreover, the system uses solar powered sensors and therefore the use of electrical supply is not of a major concern. The cost involved in setting up the proposed methodology is negligible when compared with the loss of trees.

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About the Authors



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Inauguration function of CSI Kancheepuram Chapter



The Inauguration function of CSI Kancheepuram Chapter was held on 18th May 2018 at Valliammai Engineering College, Kattankulthur by 3.00 pm. The function had started with the Welcome Address delivered by Dr. B. Chidambararajan,

Principal, Valliammai Engineering College. He had given the importance of opening up a new chapter. After lighting the lamp, Dr. M. Senthil Kumar, Associate Professor had given the Introduction about the Chief Guest of the function. The chapter was inaugurated by Dr. M. Sundaresan, Regional Vice-President (Region VII), Computer Society of India. He had narrated on the organization of the CSI Chapter, the roles and responsibilities of the members, the recognition awards, the do's and don't's in the chapter, the activities to be conducted in a chapter etc. It was informed that Kancheepuram Chapter is the 77th Chapter in India and 16th Chapter in Region VII. The Kancheepuram Chapter is set to be on a new innovative path to enhance the technical knowledge of the Faculty Members, Students, IT professionals, Industrial persons in the rural areas of Kancheepuram District. Dr. M. Murugan, Vice Principal, Valliammai Engineering College had felicitated the gathering.

The aim of the CSI chapter had been commenced on the day of Inauguration with a Technical Talk on "Internet of Things (IoT)" by Mr. Saravanan Ganesan, Programmer Analyst, Cognizant Technology Solutions. The presentation was beneficial as it had insights about the field of IoT, the hardware and software available, etc. Finally, the function had come to an end through proposing the Vote of Thanks by Dr. Rajeswari Mukesh, HOD, School of Computing Sciences, Hindustan Institute of Tech. & Science. More than 80 CSI life members from various institutions and industries in the Kanchipuram district were attended the event. The event was coordinated by Dr.M.Senthil Kumar of Valliammai Engineering College

Implementation of Software Defined Network on Mininet Emulator

► Sangeeta Mittal

Assistant Professor (Senior Grade) in Jaypee Institute of Information Technology, Noida

Software Defined Networks (SDN) is a recent paradigm to provide flexibility of implementation and control to networking. Implementation of Wireless Sensor Networks as SDN can lead to huge energy efficiency. Openflow is an important framework for implementing southbound API of SDN. Mininet is an emulator to emulate Openflow based Southbound API of SDN.

Installation of Mininet

Install mininet as Ubuntu based Virtual Machine.

Create SDN with mn command

Command for creating a star topology with single switch connected to 3 hosts with simplified dummy MAC addresses

```
mininet > sudo mn --topo=single,3
mininet > dump
mininet > net
```

Output of this command can be seen in the screen below.

```
mininet@mininet-vm:~$ sudo mn --topo=single,3
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1) (h3, s1)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s1-eth2
h3 h3-eth0:s1-eth3
s1 lo: s1-eth1:h1-eth0 s1-eth2:h2-eth0 s1-eth3:h3-eth0
c0
```

Other options for flag -topo are linear, tree and torus topologies. In tree topology, values for fanout and depth are also given. Dump and net commands give information about current topology.

```
mininet@mininet-vm:~$ sudo mn --topo=linear,3
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1 s2 s3
*** Adding links:
(h1, s1) (h2, s2) (h3, s3) (s2, s1) (s3, s2)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 3 switches
s1 s2 s3 ...
*** Starting CLI:
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s2-eth1
h3 h3-eth0:s3-eth1
s1 lo: s1-eth1:h1-eth0 s1-eth2:s2-eth2
s2 lo: s2-eth1:h2-eth0 s2-eth2:s1-eth2 s2-eth3:s3-eth2
s3 lo: s3-eth1:h3-eth0 s3-eth2:s2-eth3
c0
```

```
mininet@mininet-vm:~$ sudo mn --topo=tree,depth=2,fanout=3
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8 h9
*** Adding switches:
s1 s2 s3 s4
*** Adding links:
(s1, s2) (s1, s3) (s1, s4) (s2, s3) (s2, s4) (s3, s4) (s3, s5) (s4, s6) (s4, s7) (s4, s8) (s5, s9)
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9
*** Starting controller
c0
*** Starting 4 switches
s1 s2 s3 s4 ...
*** Starting CLI:
```

Besides this, a custom topology can be written as python script, along with specific delay and bandwidth for each link.

```
mininet@mininet-vm:~$ sudo mn --link tc,delay=10ms
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2
*** Adding switches:
s1
*** Adding links:
(10ms delay) (10ms delay) (h1, s1) (10ms delay) (10ms delay) (h2, s1)
c0
```

```
mininet> sudo mn --custom
your_topology_file.py --
topo your_topology_name --
link tc --test pingall
```

```
mininet_topo.py: Topo
class MyTopo(Topo):
    "Single Topo example"
    def __init__(self):
        "Create single topo"
        # Initialize topology
        topo = self
        # Add hosts and switches
        leftHost = self.addHost('h1')
        rightHost = self.addHost('h2')
        s1 = self.addSwitch('s1')
        s2 = self.addSwitch('s2')
        leftSwitch = self.addSwitch('s1')
        rightSwitch = self.addSwitch('s2')
        # Add links
        self.addLink(leftHost, leftSwitch, delay='10ms')
        self.addLink(h2, leftSwitch)
        self.addLink(leftSwitch, rightSwitch)
        self.addLink(rightSwitch, rightHost)
        self.addLink(s1, rightSwitch)

if __name__ == '__main__':
    net = Mininet(Topo)
    net.start()
    net.pingall()
    net.stop()
```

All switches in SDN are dumb initially, they get all routing commands from Controller. Following command initializes a SDN without any controller, so switches will not be able to make any entry.

```
mininet > sudo mn --topo=single,
3 --controller=none --mac
```

```
mininet@mininet-vm:~$ sudo mn --topo=single,3 --controller=none --mac
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1) (h3, s1)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 1 switches
s1
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2
h2 -> h3
h3 -> h1
stopping h1
```

ovs-ofctl command can be used to manually add flow entries.

```
mininet > sh ovs-ofctl show s1
```

This command shows mappings of open flow ports and physical ports.

```
mininet> sh ovs-ofctl show s1
DPID: 0000000000000001
n_tables:254, n_buffers:256
Capabilities: FLOW_STATS TABLE_STATS PORT_STATS QUEUE_STATS ARP_F
actions: OUTPUT SET_VLAN_VID SET_VLAN_PCP STRIP_VLAN SET_DL_SRC S
M_SRC SET_MH_SET_MH_DOS SET_TP_SRC SET_TP_DEST ENQUEUE
1(s1-eth1): addr:90:2f:a6:77:7b:ce
  config: 0
  state: 0
  current: 10GB-FD COPPER
  speed: 10000 Mbps now, 0 Mbps max
2(s1-eth2): addr:5e:a4:42:5f:71:b9
  config: 0
  state: 0
  current: 10GB-FD COPPER
  speed: 10000 Mbps now, 0 Mbps max
3(s1-eth3): addr:4e:c3:b4:53:14:d6
  config: 0
  state: 0
  current: 10GB-FD COPPER
  speed: 10000 Mbps now, 0 Mbps max
LOCAL(s1): addr:72:85:88:76:ae:4e
  config: 0
  state: 0
```

First flow entry to make the switches work like a normal TCP/IP switch is added as follows:

```
mininet > sh ovs-ofctl add-flow
s1 action=normal
mininet> pingall
mininet > sh ovs-ofctl dump-
flows s1
```

Each flow entry shows the time for which it has been in the table.

```
mininet> sh ovs-ofctl add-flow s1 action=normal
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2
h2 -> h3
h3 -> h1
*** Miniswitch 0: dropped (64 received)
mininet> sh ovs-ofctl dump-flows s1
open:FLOW_ENTRY (id=1001)
flow:table=0, priority=1, match=, n_packets=24, n_bytes=1500, idle_age=0,
actions=CONTROLLER
mininet>
```

To delete all flow entries of s1

```
mininet > sh ovs-ofctl del-flows s1
```

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Pings will not work now. A more specific flow entry to send everything on port1 to port2 and vice versa would be follows.

```
sh ovs-ofctl add-flow s1
priority=500, in_port=1,
actions=output:2
```

```
sh ovs-ofctl add-flow s1
priority=500, in_port=2,
actions=output:1
```

```
mininet> sh ovs-ofctl del-flows s1
mininet> sh ovs-ofctl add-flow s1 priority=500,in_port=1,actions=output:2
mininet> sh ovs-ofctl add-flow s1 priority=500,in_port=2,actions=output:1
mininet> h1 ping -c4 h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data:
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=0.690 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.067 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.096 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.057 ms
--- 10.0.0.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 2999ms
rtt min/avg/max/mdev = 0.057/0.175-0.690-0.176 ms
mininet> h1 ping -c3 h3
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data:
P:
--- 10.0.0.3 ping statistics ---
0 packets transmitted, 0 received, 100% packet loss, time 2915ms
mininet>
```

Check flows with h1 ping -c2 h2 which works and h3 ping -c2 h2 - will be unreachable as no entry for port3 has been done.

Priority concept for same pair of source and destination

When incoming traffic matches against multiple rules, rule with highest priority is matched.

```
mininet > sh ovs-ofctl add-flow s1
priority=32768, actions = drop
```

Above rule will match all traffic as a default rule and no traffic would be routed. Possible priorities values are in range 0-65535.

```
mininet> sh ovs-ofctl dump-flows s1
NO:2 FLOW reply (xid=847)
cookie=00, duration=51.278s, table=0, n_packets=0, n_bytes=0, idle_age=0, priority=32768,in_port=1,actions=output:1
cookie=00, duration=50.298s, table=0, n_packets=0, n_bytes=0, idle_age=0, priority=32768,in_port=2,actions=output:1
mininet> h1 ping -c4 h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data:
P:
--- 10.0.0.2 ping statistics ---
0 packets transmitted, 0 received, 100% packet loss, time 3020ms
mininet>
```

Layer - 2 matching based on MAC address

```
mininet> sh ovs-ofctl add-flow s1
dl_src=00:00:00:00:00:01,
dl_dst=00:00:00:00:00:02,
actions=output:2
```

MAC address of a node h1 can be found by h1 ifconfig - a command.

A reverse flow rule also has to be added.

```
mininet> sh ovs-ofctl add-flow s1
dl_src=00:00:00:00:00:02,
dl_dst=00:00:00:00:00:01,
actions=output:1
```

```
mininet> sh ovs-ofctl add-flow s1 dl_src=00:00:00:00:00:01,dl_dst=00:00:00:00:00:02
mininet> sh ovs-ofctl add-flow s1 dl_src=00:00:00:00:00:02,dl_dst=00:00:00:00:00:01
mininet> sh ovs-ofctl dump-flows s1
NO:2 FLOW reply (xid=847)
cookie=00, duration=51.278s, table=0, n_packets=0, n_bytes=0, idle_age=0, priority=32768,dl_src=00:00:00:00:00:01,dl_dst=00:00:00:00:00:02,actions=output:2
cookie=00, duration=50.298s, table=0, n_packets=0, n_bytes=0, idle_age=0, priority=32768,dl_src=00:00:00:00:00:02,dl_dst=00:00:00:00:00:01,actions=output:1
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data:
From 10.0.0.1: icmp_seq=1 Destination Host Unreachable
From 10.0.0.1: icmp_seq=2 Destination Host Unreachable
mininet> h1 ping h3
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data:
From 10.0.0.1: icmp_seq=1 Destination Host Unreachable
From 10.0.0.1: icmp_seq=2 Destination Host Unreachable
mininet>
```

Destination hosts are still unreachable due to missing ARP entry that is made as follows

```
mininet > sh ovs-ofctl add-flow
s1 dl_type= 0x806,
nw_proto=1,action=flood
```

```
mininet> sh ovs-ofctl add-flow s1 dl_type=0x806,nw_proto=1,action=flood
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data:
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=0.832 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.137 ms
mininet>
```

Only h1 and h2 will be able to ping each other and h3 will not connect.

Layer-3 matching on IP address

First clear previous rules and then add rules to match against IP address ranges. Protocol code for IPv4 is 0x800.

```
mininet > sh ovs-ofctl del-flows s1
mininet > sh ovs-ofctl add-flow
s1 priority=500, dl_type=0x800,
nw_src=10.0.0.0/24,nw_dst=10.0.0.0/24,actions=normal
```

Now add ARP entries:

```
mininet > sh ovs-ofctl add-flow
s1 arp, nw_dst=10.0.0.1,
actions=output:1
mininet > sh ovs-ofctl add-flow
s1 arp, nw_dst=10.0.0.2,
actions=output:2
mininet > sh ovs-ofctl add-flow
s1 arp, nw_dst=10.0.0.3,
actions=output:3
```

Check for correct entries by pingall and dump-flows command.

```
mininet> sh ovs-ofctl add-flow s1 priority=500,dl_type=0x800,nw_src=10.0.0.0,nw_dst=10.0.0.0/24,actions=normal
mininet> sh ovs-ofctl add-flow s1 arp,nw_dst=10.0.0.1,actions=output:1
mininet> sh ovs-ofctl add-flow s1 arp,nw_dst=10.0.0.2,actions=output:2
mininet> sh ovs-ofctl add-flow s1 arp,nw_dst=10.0.0.3,actions=output:3
mininet> sh ovs-ofctl dump-flows s1
NO:2 FLOW reply (xid=847)
cookie=00, duration=11.750s, table=0, n_packets=0, n_bytes=0, idle_age=0, arp,nw_dst=10.0.0.1,actions=output:1
arp,nw_dst=10.0.0.2,actions=output:2
arp,nw_dst=10.0.0.3,actions=output:3
cookie=00, duration=20.323s, table=0, n_packets=0, n_bytes=0, idle_age=0, priority=500,dl_src=10.0.0.0/24,nw_dst=10.0.0.0/24,actions=normal
mininet> Pingall
mininet> ping -t testing ping reachability
h1 -> h2 h3
h2 -> h1 h3
h3 -> h1 h2
^C
mininet>
```

Layer -4 matching

Delete previous flow entries using del-flows command and run a HTTP server on one of the hosts, say h3. The flow entry will now be done for matching destination port of application, which is 80 in this case.

```
mininet> h3 python -m
SimpleHTTPServer 80 &
mininet> sh ovs-ofctl add-flow s1
arp,actions=normal
mininet> sh ovs-ofctl add-flow s1
priority=500,dl_type=0x800,nw_
proto=6,tp_dst=80,actions=output:3
```

```
mininet> h3 python -m SimpleHTTPServer 80
mininet> h3 ps -ef |grep Simple
grep httpd on 0.0.0.0 port 80
root      1159  4900  0 22:17 pts/10   00:00 python -m SimpleHTTPServer 80
mininet>
mininet> sh ovs-ofctl add-flow s1 priority=500,dl_type=0x800,nw_proto=6,tp_dst=80,actions=output:3
mininet> sh ovs-ofctl del-flows s1
NO:2 FLOW reply (xid=847)
cookie=00, duration=22.026s, table=0, n_packets=0, n_bytes=0, idle_age=22, priority=500,arp,actions=normal
cookie=00, duration=4.802s, table=0, n_packets=0, n_bytes=0, idle_age=1, priority=500,dl_src=10.0.0.0/24,nw_dst=10.0.0.0/24,actions=normal
mininet> h1 wget h3
--2017-12-13 22:22:24-- http://10.0.0.3/
Connecting to 10.0.0.3:80
mininet> sh ovs-ofctl add-flow s1 arp,actions=normal
mininet> h1 ping h3
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data:
P:
--- 10.0.0.3 ping statistics ---
0 packets transmitted, 0 received, 100% packet loss, time 3027ms
mininet> h1 wget h3
--2017-12-13 22:27:53-- http://10.0.0.3/
Connecting to 10.0.0.3:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 604 [text/html]
Saving to: 'index.html.2'
100%[*****] 604 --- -Krs  in 0s
```

The flag nw_proto=6 is for tcp. Now add return traffic rules to route traffic from server to requesting host.

```
mininet> sh ovs-ofctl add-flow
s1 priority=800,
ip,nw_src=10.0.0.3,
actions=normal
```

Check connectivity by downloading page from server.

```
mininet> h1 wget -O - h3
mininet> h2 wget -O - h3
```

Working in Parallel Sessions of SDN Using PuTTY Terminal

Mininet Virtual Machine provides a single interface to work with. PuTTY, a popular SSH client can be used to create multiple sessions simultaneously.



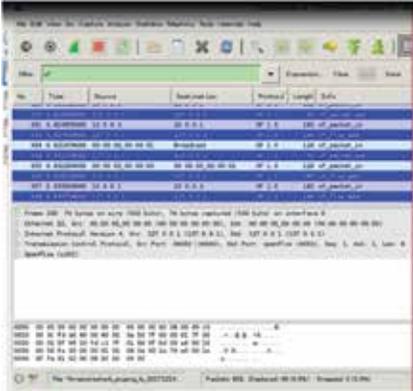
Wireshark Captures of Openflow Network Traces

Network traces of any experimental network setup are very crucial for detailed study and analysis of traffic and performance. Wireshark instance can be run on each host by first opening a host GUI by xterm command and then running a wireshark instance on each.

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```
mininet > xterm h1
mininet > sudo wireshark &
```

Openflow packets can be highlighted using "of" filter.



Working with POX Controller

A controller module can automatically add flow entries to otherwise dumb Openflow switches. There can be three ways to add a controller to a SDN. First one is to use the reference controller built in mininet. This is also the default controller. All initial commands have been run using this controller. Second is to use a remote controller running on different port of same machine. POX Controller inbuilt into mininet emulator is an example of this. Third option is to run a controller on different machine and establish a remote connection with that. HP-VAN, OpenDaylight and Floodlight are examples of these controllers.



```
mininet@mininet-vm:~$ cd
pox
mininet@mininet-vm:~/pox sudo
python pox.py log.level -DEBUG
forwarding.hub
```

POX controller's hub type forwarding module starts in listening mode. Typical hub behaviour is to broadcast each receive packets to all connect ports except the incoming port. Output is shown in next pictures.



As hub behaviour is not efficient in terms of throughput, hence a switch keeps tables of all its incoming and outgoing ports. Thus each incoming forwarding request is routed to only correct destination port. Level-2 switch behaviour of POX Controller is shown below.



Load balancing is one of the major functions of a controller. IP Load

balancer module of POX works in 3 steps.

```
mininet>sudo mn -topo single,5 -
controller=remote
```

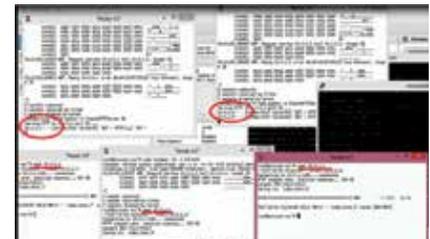
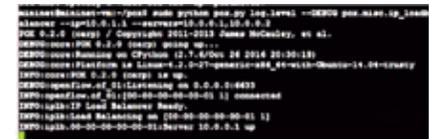
Run HTTP Servers on h1 and h2.

```
mininet>h1 python -m
SimpleHTTPServer 80 &
mininet>h2 python -m
SimpleHTTPServer 80 &
```

Open POX Controller in another remote login in load balancing mode.

```
mininet@mininet-vm:~/pox
sudo python pox.py log level --
DEBUG misc.ip_loadBalancer
-ip=10.0.0.1 --
servers=10.0.0.1,10.0.0.2
```

Open terminals of clients h3 to h5 and download pages from servers.



It can be seen that requests from each hosts are served by the servers one by one. Repeated requests from host h5 are served by both servers one by one.



There are several other modules in POX controller to customize other SDN functions like DHCP services etc. Moreover, customized controller applications can be developed in python and scripts can be added.

About the Author



Dr. Sangeeta Mittal [CSI Membership No: 2010000096] is Assistant Professor (Senior Grade) in Jaypee Institute of Information Technology, Noida. Her areas of research interest include Software Defined Networks, Network Security, Cryptography and Sensor Based Smart Environments. She has published several papers in international conferences and journals of repute. She is PhD, M.E. and B.E. in Computer Science and Engineering. She has 15+ years of experience in teaching UG and PG computer science courses. She is a member of ACM and life member of CSI.

A Speculation : Prevalent Virtualization Software in demand

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Virtualization is a technique in which the user required services run remotely in a ubiquitous environment which gives scalable resources. Virtualization is being used in cloud computing for load balancing and aggregation of cloud resources. Virtualization provides higher hardware utilization. It is also being used for partitioning of computational resources and hence supports sharing of resources. Virtualization has different types such as Native virtualization, Full virtualization, Operating system level virtualization and Para virtualization. Other than these there is Resources virtualization, Desktop virtualization, Server virtualization, Data centers virtualization and application virtualization. The resources virtualization is implemented in different forms such as the Full virtualization, Native virtualization, Para virtualization, Operating system (OS) layer virtualization or Hosted virtualization. Virtual machines and Virtual machine monitors (VMMs) have been developed to offer better energy efficient solutions to the virtualization problems. Virtualization tools like OpenVz, Xen, VmWare etc. are very much popular Industry.

Introduction

Virtualization is one of continuous humming word these days moving towards reducing the requirement of physical infrastructure in current data center implementations.

Virtualization technologies have been providing Compute, Storage and Network support to small and large organization. But what exactly is it? Is it right for everyone? And how can it benefit your organization?

Virtualization believed to be in computing world in 1960's actually been around more than three decades. Virtual computing power is available to all kind of users at a very affordable cost and sometimes free. (thanks to open-source initiatives). Various applications can be deployed and executed in totally virtualized environment by paying only for instance. This article aims at introducing about the software that are used for virtualization.

1. VMware

It's a virtualization and cloud software provider based in Palo Alto, California. Founded in 1998, VMware is a subsidiary of Dell Technologies. EMC Corporation originally acquired VMware in 2004; EMC was later acquired by Dell Technologies in 2016. VMware bases its

virtualization technologies on its bare-metal hypervisor ESX/ESXi in x86 architecture.

VMware software provides a uniform platform for managing OS and application updates, enabling the easy migration to new OS while running legacy applications safely. With the help of this software more than one operating systems and applications can collectively in virtual machines on a single Intel-based computer. Since VMware software allows multiple hardware configurations and operating systems to co-exist and be easily updated, you can:

- Run multiple operating systems concurrently on the same computer, including multiple versions of Microsoft Windows®, Linux, and DOS.
- Create suspended virtual machine instances that can be stored and restarted at any time.
- Move between operating system environments without repartitioning or rebooting.
- Develop, test, and deploy new software without adding hardware.

VMware virtual machine software has been deployed in large production IT environments on a wide scale. VMware software helps companies facing the challenges of OS migration and application compatibility by:

- Facilitating smooth desktop transitions in shorter time frames.
- Extending the life of current applications.
- Eliminating the need to port legacy applications.
- Avoiding the costs of hardware acquisition.
- Minimizing user pain during transition.
- Making testing and deployment of new systems easier.

➤ VMware Infrastructure

It's a complete bundle of providing Infrastructure for providing complete scope of virtualization, starting from resource management, no resource get underutilized, VMware Infrastructure virtualizes and covers entirety of latent hardware across different systems and render pools of virtual resources to the datacenter in the virtualized

environment. In addition, VMware Infrastructure also brings about a set of distributed services that enables allocation of resources according to policies and facilitate taking backup of the complete datacenter. There are many components which are part of VMware Infrastructure.

VMware ESX Server – It's a robust, production, proven layer on virtualization which execute servers physically that abstracts memory, processor, storage, and networking resources into number of virtual machines.

VirtualCenter Management Server (Virtual Center Server) – The central point for configuring, provisioning, and managing virtualized IT environments.

Virtual Infrastructure Client (VI Client) – This provide allows end user to associate remotely to the VirtualCenter Server or individual ESX Servers from any Windows computer.

Virtual Infrastructure Web Access (VI Web Access) – This helps in use of interfacing with web and allow virtual machine and helps in accessing it through remote consoles.

VMware Virtual Machine File System (VMFS) – A high performance cluster file system for ESX Server virtual machines.

VMware Virtual Symmetric Multi Processing (SMP) – This allow a single virtual machine to access many physical processors.

VMware VMotion – When one machine is migrating live one to another then there should be minimum down time. and keep on providing continuous services. This feature is made available by the above stated software,

VMware HA –When there is failure in server and there is need of easiness and effective costing and high availability then using this software machines in a virtualized environment will automatically initiated on server doing production on the basis of free capacity.

VMware Distributed Resource Scheduler (DRS) – Virtual machine use variety of resources this software is used to assign and balance the computing capacity at run time.

VMware Consolidated Backup (Consolidated Backup) – This feature

provide user friendliness and centrally managed facility for backup of machines in virtualized environment. It makes the task of backup administrator easy and reduces the load on ESX Servers.

VMware Infrastructure SDK – VMware Infrastructure is accessible to third party solution and provide feature to use standard interface that provides a standard interface for VMware .

Hyper V

Whilst the initial implementation of virtualization can be traced back to IBM in the 1960s, there is no denying the fact that virtualization is only now taking the information technology industry by storm. Requirements to reduce costs through maximized server utilization and minimized power consumption have converged to highlight the importance of virtualization in ways that could not have been imagined just a few years ago.

A number of large vendors (Citrix, VMware and Sun Microsystems to name just a few) have entered the virtualization space either through product development or company acquisition. No entry into the market has been more widely anticipated, however, than the arrival of Microsoft's Hyper-V technology.

Released in 2008 and bundled at no extra charge with Windows Server 2008, Hyper-V has quickly gained widespread adoption and favorable reviews.

2. VSphere

VMware vSphere leverages the power of virtualization to transform datacenters into simplified cloud computing infrastructures and enables IT organizations to deliver flexible and reliable IT services. VMware vSphere virtualizes and aggregates the underlying physical hardware resources across multiple systems and provides pools of virtual resources to the datacenter.

As a cloud operating system, VMware vSphere manages large collections of infrastructure (such as CPUs, storage, and networking) as a seamless and dynamic operating environment, and also manages the complexity of a datacenter. The

following component layers make up VMware vSphere:

Infrastructure Services -There are lot of services provided to abstract, collect and allocate hardware or infrastructure resources. Infrastructure Services can be categorized into:

- VMware vCompute—This has the capability to abstract away the underlying server resources belong to server. Then these services sum up the resources across number of servers and allocate them to applications.
- VMware vStorage—This include the techniques of using storage in effectively.
- VMware vNetwork—this include techniques which make the helps in enhancing the network in virtual scenarios.

Application Services -

This provide number of services that ensure all time availability of services.

VMware vCenterServer

There is a need of central control over data center. VMware vCenter Server provide this control. It provides services such as controlling the access, keeping check on performance of data center.

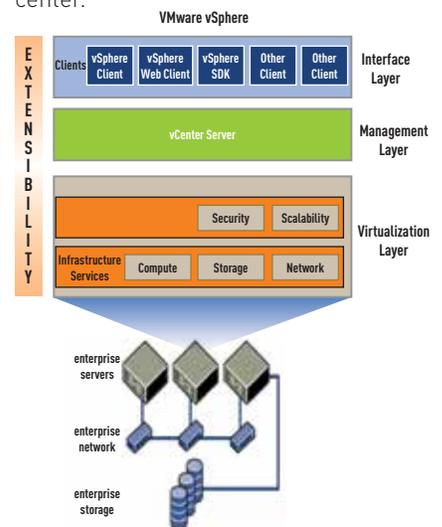


Fig. 1 : Relationships between the component layers of VMware vSphere

Clients - Users can access the VMware vSphere datacenter through clients such as the vSphere Client or Web Access through a Web browser.

Relation between the both shown in figure 1.

3. Xen

The virtual environment of Xen made up of many features that work collectively to provide virtualized environment.

-Xen Hypervisor

This provide basic abstraction layer of software that rely on the physical devices under any operating systems. It's main responsibility is to schedule the resources and partition the storage of machines running in virtual environment on the physical device. It's the responsibility of hypervisor to keep the hardware in a logical layer and also control execution of machines.

Domain Management and Control

A series of Linux daemons are divided as Domain Management and Control by the open source community. These services support the overall management and control of the virtualization environment and exist within the Domain 0 virtual machine

Xend

For Xen environment this considered as manager of system. Xen hypervisor is called by leveraging libxenctrl. All requests processed by the Xend are delivered to it via an XML Remote procedure call by an intermediate module called Xm.

Xm

A tool runs on command line in which user gives input and interfaced with Xend via XML RPC.

Libxenctrl

It's a library in C which have a ability to Xend the ability to talk with the Xen hypervisor via Domain 0.

Qemu-dm

Every HVM Guest running on a Xen environment requires its own Qemu daemon. This tool handles all networking and disk requests from the domain. HVM Guest to allow for a fully virtualized machine in the Xen environment. Qemu must exist outside the Xen hypervisor due to its need for access to networking.

A new tool, Stub-dm, is in development for future versions of Xen that will remove the need for a Qemu

running for every Domain. HVM Guest and will instead provide a set of services available to every Domain. This feature is not available in Xen 3.2 but is currently part of the xen-unstable tree and will be released as part of Xen 3.3.

Xen Virtual Firmware

The Xen Virtual Firmware is a virtual BIOS that is inserted into every Domain U HVM Guest to ensure that the operating system receives all the standard start-up instructions it expects during normal boot-up providing a standard PC-compatible software environment.

Xen Operation

This section demonstrates how a paravirtualized Domain U is able to communicate with external networks or storage via the Xen hypervisor and Domain 0.

Domain 0 to Domain U Communication

As stated earlier, the Xen hypervisor is not written to support network or disk requests thus a Domain U PV Guest must communicate via the Xen hypervisor with the Domain 0 to accomplish a network or disk request. The example presented below shows a Domain U PV Guest writing data to the local hard disk.

The Domain U PV Guest PV block driver receives a request to write to the local disk and writes the data via the Xen hypervisor to the appropriate local memory which is shared with Domain 0. An event channel exists between Domain 0 and the Domain U PV Guest that allows them to communicate via asynchronous inter-domain interrupts in the Xen hypervisor. Domain 0 will receive an interrupt from the Xen hypervisor causing the PV Block Backend Driver to access the local system memory reading the appropriate blocks from the Domain U PV Guest shared memory. The data from shared memory is then written to the local hard disk at a specific location.

The event channel is shown below as a direct link between Domain 0 and Domain U PV Guest which is a simplified view of the way the system works. In fact, the event channel runs through the Xen hypervisor with specific interrupts registered in Xenstored allowing both the Domain 0 and Domain U PV Guest

to quickly share information across local memory.

Xen PCI Passthru

It's a newly added feature which helps in improving performance completely and helps in reducing the reduce the load. It does not have direct access to local hardware. It has to use the Domain 0 for accessing hardware.

4. QEMU

QEMU is a generic and open source machine & userspace emulator as well as virtualizer.

- Qemu can Emulate a complete machine without hardware virtualization
- Emulate with Xen/KVM hypervisors
- Provide user space API virtualization

QEMU can do user-mode emulation and system emulation for many architectures. We can select the build targets when configuring.

- For system emulation, we need `--enable-system` and have `--softmmu` in `--target-list`.
- For user-mode emulation, we need `-linux-user` in `--target-list`. Sometimes we need to choose the ABI we need (e.g. o32 and n32 in MIPS).

Building QEMU

```
mkdir build & cd build ../configure
--enable-system --enable-kvm
--target-list=x86_64-softmmu,arm-softmmu,arm-linux-user,mipsel-linux-user
```

Create a disk image

```
qemu-img create -f qcow2 disk.
img 10G
```

Install a system on the virtual disk

```
qemu-system-x86_64 -enable-kvm
-cdromcdimage.iso -drive file=disk.
img,format=qcow2 -boot order=d
```

Create a network card

```
-netnic -net user
```

Map VM's port 22 to local port 2222

```
-netnic -net user,hostfwd=t
cp:127.0.0.1:2222-:22
```

For x86, QEMU uses SeaBIOS as boot firmware by default. We can use other firmware.

Use coreboot

```
qemu-system-x86_64 -bios build/
coreboot.rom
```

Use OVMF

```
qemu-system-x86_64 -bios OVMF.fd
```

QEMU supports booting with a kernel, without a bootloader in the virtual disk.

Boot with a kernel

```
qemu-system-x86_64 -m 2G -enable-kvm -kernel /boot/vmlinuz-4.4.0-21-generic -initrd /boot/initrd.img-4.4.0-21-generic -append 'root=/dev/sda1' -drive file=ubuntu-16.04.1-qcow2.img,format=qcow2
```

But we can only do this when using SeaBIOS as firmware in x86.

We can let the kernel output the kernel message to serial console, and QEMU can redirect the console output to a file.

kernel message to stdio

```
qemu-system-x86_64 -m 2G -enable-kvm -kernel arch/x86/boot/bzImage -append 'console=ttyS0,115200' -serial stdio
```

QEMU can run an ELF binary of target platform.

In this example, we run a MIPS binary and debug it with gdb.

Run a MIPS binary

```
/sourcecode/qemu/build/mipsel-linux-user/qemu-mipsel -g 1234 bin/hello
```

We can also use gdb to debug in system mode.

Because QEMU can emulate an architecture and Linux syscalls, we can chroot to a filesystem with QEMU. First, we need to build a statically linked QEMU and copy it to the target root filesystem. Then we set up binfmtmisc: https://wiki.gentoo.org/wiki/Embedded_Handbook/General/Compiling_with_qemu_user_chroot At last, do the normal chroot procedure to the filesystem.

5. Oracle VM

Oracle VM server virtualization is designed to support both x86 and SPARC architectures and a variety of workloads such as Linux, Solaris and Windows. It also provides virtualization built in it and uses its platform to deliver complete and solution optimized for your whole cloud environment. With tight integrated management support in Oracle Enterprise Manager, customers benefit from simplicity of management

and automation in the IT process to further reduce cost and increase efficiency.

Oracle is the one which provides the industry's fully integrated virtualization solutions portfolio that can help in virtualizing and managing the full hardware and software stack. It also focuses on managing the whole environment for testing and gives support for application. Oracle's unique approach to virtualization not only helps consolidate IT resources – it enables IT to deliver on demand services rapidly and efficiently.

Oracle VM server virtualization provides value beyond simple server consolidation. Using Oracle VM Templates, sophisticated enterprise applications such as Oracle Database, Oracle Real Application Clusters, Oracle JD Edwards Enterprise one can be deployed in matter of minutes compared to traditional server virtualization. With over 100 Templates pre-configured, pre-tested, pre-patched by Oracle, deploying a complete infrastructure with Oracle Linux, Oracle Middleware and business applications is reduced from months and weeks to days. In addition, Oracle VM Templates can be customized for non-Oracle applications. Oracle VM Templates ensures IT standardization of the compute stack deployment from operating systems to database to applications, helping to reduce risk and ensure faster delivery of services.

Oracle VM is a critical component in the Oracle cloud strategy. Oracle VM is integrated into nearly all layers of the Oracle product offering. With Oracle Engineered Systems, Oracle VM is the foundation for Oracle Database Appliance, Virtual Compute Appliance, Oracle Exalytics In-Memory Machine, Oracle Exalogic and Oracle Storage as well as Oracle x86 and SPARC servers.

At the Application level, Oracle VM Templates provide a highly cost effective, standardized integrated support for rapid deployment of Oracle Database and Oracle applications.

For orchestration and app to disk view and management, Oracle VM is tightly integrated into Oracle Enterprise Manager. With this tight integration, administrators have a full 360 view of their datacenter operations from Oracle Database monitoring to patching Guest OS and monitoring server capacity.

Oracle VM subscription includes the Oracle Enterprise Manager Basic monitoring package at no additional cost.

Features Highlights

- Rapid Application Deployment – using pre-configured Oracle VM Templates of Oracle Database, Oracle Real Application Clusters (RAC), Oracle Linux, Middleware, Applications can be deployed 7-10x faster than traditional server virtualization products on the market.
- Server consolidation, load balancing for increased utilization of hardware resources.
- Live Migration—movement of one virtual machine from to other without reconfiguring it.
- Highly scalable server virtualization supports up to 128vCPU allowing for room to grow and future proofing capacity for handling business-critical production environments in data centers.
- Oracle VM Manager – This is responsible for managing the resources centrally provide interface to manage setting of configuration without requirement of any other external software, this can be done using a web interface.
- Integrated Management – Oracle virtual machine is tightly integrated with Oracle Enterprise Manager to provide for application and services provisioning for cloud infrastructures and services such as monitoring, self-provisioning, chargeback, etc.
- Single vendor support provided by the world's largest software support organization for all layers of your cloud infrastructures.
- Certification of Oracle Database, Middleware, Applications, and Real Application Clusters, Oracle hardware running Oracle VM .
- Oracle virtual Machine templates give high returns after investment and make Ownership cost low. support which saves the space, cooling, power and recurring operational savings. ■

About the Authors



Dr. Madhulika is working as a Associate Professor in Department of Computer Science and Engineering at Manav Rachna International Institute of Research and studies. She holds diploma in Computer Science Engineering, B.E in Computer Science Engineering, MBA in Information Technology, M.Tech in Computer Science & Ph.D from Amity University, Noida. She has total 12 years of Teaching experience. She published almost 25 Research Papers in National, International conferences and Journals. She is also Author of two Books. She Filed two Provisional Patent. She attended and organized many workshops, Guest Lectures, seminars. She is also member of many Technical societies like IET,ACM , UACEE.



Sarthak Singhal is pursuing B.Tech in Computer Science & Engineering with specialization in Business Analytics & Optimization in association with IBM at Manav Rachna International Institute of Research & Studies, Faridabad. He has participated in many conferences & workshops.



Dipesh Jain is pursuing B.Tech in Computer Science and Engineering with specialization in Business Analytics and Optimization in association with IBM at Manav Rachna International Institute of Research and studies, Faridabad. He has participated in many conferences and workshops.

Book Review



Dr. Subhash Chandra Yadav

Associate Professor and Head

Centre for Computer Science and Technology

Central University of Jharkhand, Brambe, Ranchi.

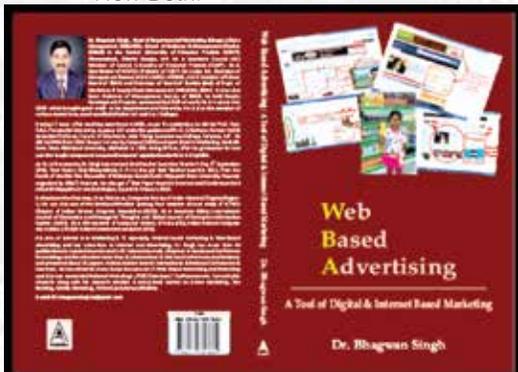
Book Name: **Web Based Advertising: A tool of Digital & Internet Based Marketing**

Author : **Dr. Bhagwan Singh**

Associate Professor and Head
Department of Marketing & Supply Chain Management
Central University of Himachal Pradesh (CUHP)

Dharamshala, Himachal Pradesh - 176215,

Publisher : Anamika Publishers & Distributors (P) Ltd., New Delhi



The author is at present head department of Marketing and Supply Chain Management in Central University of Himanchal Pradesh. The book seems to be reach in depicting the concepts of internet marketing, digital marketing, web marketing, and web marketing management, e-commerce, web-based advertising and the like very beautifully. The book comprises of fourteen chapters, starting from brief introduction about internet based marketing. Particularly

the customers approach towards the digital marketing. Book covers design and devilment issues related with website from the business point of view in the domain of business advertising scenario. Book also depicts successful web based advertising models.

Well known fact that the internet has power to connect millions of people from around the world and, thus it has the potential to bring business to millions of market worldwide. The concepts of e-business, e-commerce, e-banking etc. are the indicators of flourishing business on internet. Advertisement is one of the prime aspects associated with business. Media is the platform from where the advertisement is released. Advertising agencies depends mainly on print, audio and audio-visual media for their advertisement based on the product and public demand.

Information Technology particularly web bases and internet technologies has connected the customers across the globe. The marketing services have utilized the technology very beautifully for reaching out through multimedia leading to the concept of web based marketing. And now a day's web based technologies are playing a dominating role in ad campaign on internet. The effectiveness of ad campaign can be easily measured using web analytics and cost-volume-profit analysis tools, which provides quantifiable input to one's business. The young generation is very techno savvy and skilled enough to control web-based-marketing with proper use of creative contents in the form of print, audio, audio-visual and animation as well. That is the biggest driver to web based advertising in order to create Ad flash and Ad promotions which is back boon of web based advertising. The book will be definitely of vital use for academia and as well as for the corporate world.

CSI Nashik : A glorious journey of 30 years

▶ Shirish S Sane

Past Chairman, CSI Nashik & Regional Vice President, CSI Region VI (Maharashtra & Goa) 2013 - 2015 & 2015 - 2017

CSI Nashik is one of the most vibrant chapters not only from CSI Region VI (Maharashtra & Goa) but across the whole country. Established on 27th April 1988, the chapter this year is celebrating its 30th birthday on 27th April 2018. Nashik chapter despite being a small chapter from a small city like Nashik has organized many pioneer activities such as Chapter news letter since year 1998, Essay Competition for school students, IT Quiz, Programming contest by SEARCC and Project competitions since 1990, training of bank employees (1995), IT Exhibitions, National and Divisional events such as Big 95 in 1995, ConMicro conference in 1997 and 2005 with CSI Division 1, WRC (Western Region Conference) and Regional student convention in 2000, Conference on IEET in 2008 with CSI Division 3, Futurenet 2011 with CSI Division 4, YITP Regional rounds in 2006 and 2012 and National round in 2017 are some of the prominent events conducted by the chapter in past 3 decades.

The chapter established first student branch of CSI at K K Wagh Institute of Engineering Education & Research (Formerly known as K K Wagh Engineering College) in 1996 and today it has 29 Institutional members and 12 Student Branches at various Engineering colleges and Polytechnics in and around Nashik, Dhule, Jalgaon and Ahmednagar Districts.

More than 250 professionals from Industries and academic institutes and 1500+ students are members of CSI. The student branches are quite vibrant and conduct several lecture programs, Conferences, workshops, seminars, symposiums, STTPs and FDPs for the benefits of students, professionals and faculty members with assistance from Principals, HODs and SBCs from all CSI student branches.

Useful contribution has been made by members attached to Nashik Chapter to CSI at Regional and National level. Mr.

Shrikant Karode who worked as Hon. Secretary of CSI and RVP for CSI region VI, Dr. Shirish S. Sane as RSC and RVP for CSI Region VI, Dr. Mrs. Patil, Prof. Jhade and Dr. Kharat as RSC for CSI Region VI. Mr. Ugaonkar and Mr. Anurag Kenge helped CSI HQ for membership services and CSI website respectively for some time. The chapter invited members of Executive committee of CSI twice for their EXECom meeting at Nashik in 2003 and 2017.

The Chapter celebrates Information Technology Day every year since 2000 and gives away a well known "Yashokirtee" award and felicitates toppers of final year among all Engineering, Polytechnic and Science colleges in and around Nashik and felicitates IT Professionals from Nashik for their significant contribution. Many famous IT Professionals from Industry, Govt. Departments and academia from Region VI are recipient of prestigious "Yashokirtee" award at the hands of stalwarts, CSI Fellows and distinguished personalities. The award has been sponsored by senior Life member and Chapter Patron Mr. A D Shirode.

The Chapter has a tradition of conducting joint events with prominent IT Industries for the benefit of the members and citizens. IBM, INTEL, DLINK, SAP, CISCO, VMWARE, Persistent Systems, Hitachi, Infor are some of these industries who participated as knowledge partners in these events. Thanks to our past chapter chairmen/ OBs/MC members Mr. Dahale, Shenoy, Vyas, Shukla, Tiwari, Pandya, Gogate, Pisolkar, Yawalkar, Karkhanis, Rakibe, Mahapatra, Mulgaonkar, Gosavi and Dr. Patil for their significant contribution in arranging such events.

The chapter Office Bearers (OB) and Managing Committee (MC) members have made significant contribution for the development of IT industries in Nashik such as establishment of STP at Nashik way back in 2002, guidance for entrepreneurs and students for

developing useful IT applications and mobile apps during Sinhasta Kumbhamela 2015. Thanks to special efforts by Mr. Pagare for this effort. Mr. Shekhar Paranjpe conducted guidance and career counseling sessions on every Wednesday for almost 3 years. Several programs were organized by the chapter to create awareness about IT, Internet & E-commerce, Information security, Digital India movement etc for citizens of Nashik with some of the activities conducted jointly with other prominent professional bodies, Local Bodies and Industries such as IE (I), IETE, ACM, District collector, Nashik Municipal Corporation, ESDS, NETWIN, Persistent Systems and TCS.

Several awards such as Best Regional Chapter and Best Regional News letter, Best Regional Student Branch, Chapter Patrons, Significant Contribution and Fellowship awards were presented to the chapter, student branches and individual professional and student members. On the 30th birthday of the Chapter, all members recalled a small function held on 27th April 1988 at the Rotary club at Nashik when the chapter was formed with 50 members under the leadership of our founder Chapter Chairman and Chapter patron Mr. V S Datye.

The chapter has made a consistent development because of the initiative, drive and guidance it has received from none other than Fellow of CSI, Shri Shrikant Karode. The Chapter aims at conducting useful activities, regional, divisional and national level programs jointly with industry associations such as CII and NAASCOM and Professional bodies such as ACM, IEEE, IE(I), IETE, ISACA, Govt. Departments and various IT Industries and make effective use of technology for further improving membership services. It also intends to motivate student and professional members to publish articles, success stories in CSI Communications and CSI Adhayan. ■



CSI Division-I “Systems” Divisional Activities Report

CSI Special interest Group on Digital Judiciary – ICT & Cyber Laws

Convener – Er. Apoorva Agha, Chairman Div.-I “Systems”

Kolkata – CSI 52nd Annual Convention - Jan., 21, 2018



The **Special Interest Group of Computer Society of India on Digital Judiciary – ICT & Cyber Laws** was inaugurated on January 21, 2018 by the President Mr. Sanjay Mohapatra with Mr. Apoorva Agha, Chairman Div.-I as its Convener and Mr. Anuj Agarwal, Adv. Cyber Expert as the Co-Convener, during the 52nd Annual Convention of CSI held at Kolkata. One Track on “*IT in Judiciary*” was also organized at the Convention, which was addressed and conducted by Mr. Apoorva Agha. Mr. Anuj Agarwal spoke on “*Cyber Crime Prosecution & Privacy Issues*”, Ms Indrani Ghosh, Principal Consultant, TCS spoke on “*Information Technology in Courts*”, Mr. Tuhin Bose, VP & CTO, Videonetics Technology Pvt. Ltd. spoke on “*Intelligent Video Surveillance for Indian Judiciary*”, and Mr. Jitendra Sharma, Director, Wacom India, Delhi spoke on “*Wacom in Paperless e-Courts*”. The theme was so well received that several members present at the Convention representing different Chapters from parts of the Country called for organizing events on the theme at their Chapters in order to promote the understanding of application of digital technologies in the institutions of justice. As a result, three National Summits on Digital Judiciary were organized, at Delhi Chapter on 25 Feb. 2018, Gwalior Chapter on 15 Apr. 2018 and Dehradun Chapter on 06 May 2018 respectively, which pulled wide participation from excellent speakers from across India and inquisitive delegates.

National Summit on Digital Judiciary –

Technologies for Justice – A Report

Delhi Summit - February 25, 2018

The CSI Div-1 and CSI Delhi Chapter in collaboration with IETE Delhi Centre, organized a *National Summit on the theme “Digital Judiciary – Technologies for Justice”* on 25th February, 2018 at Seminar Hall of IETE Delhi Centre. The Summit was attended by experts from the fields of Judiciary, Information Technology, Cyber Security, Digital Recordings, Controlling Cyber Crimes and others and students with the total participation of more than 90 participants. The Chief guest of the Summit was Hon’ble Mr. Justice Sunil Ambwani, Ex. Chief Justice Rajasthan High Court and Ex. Chairman e-Committee, Supreme Court of India. The Summit started at 10am with Registration. Er. Manoj Sethi, Chairman CSI-DC welcomed the Chief Guest and the participants. Er R.S.Chauhan, Chairman IETE and Mr. R. K. Vyas – Ex National Hon. Treasurer, CSI addressed the gathering. The Chief Guest spoke on, “*e-Committee: Present journey and the Road Map ahead*”. He highlighted the importance of standardization of rules in High Courts for having common systems across all High Courts, he took the audience to the journey of computerization of Courts and benefits of digital technology in judiciary. He further explained the requirement of having a national data repository.



Mr. Tanmoy Chakrabarty, VP & Global Head GISU, TCS spoke on “*e-Courts - A holistic approach with total focus on outcomes*” and highlighted integration of different public services through digital infrastructure. It was followed by a talk by Ms. Suhasini Gotamare, IA&AS on “*GSTN and its challenges*”. GSTN is still an evolving system and is going to be stabilized soon and it is the world’s first and largest system to handle such a volume of data across the length and breadth of the country. The GSTN, while running online, will attract its own cyber crime challenges, to be addressed by the law enforcement agencies, she added. Mr. Manoj Kumar Tuli, Scientist F & Sr.

Technical Director, NIC spoke on *"ICT enabled Justice Delivery System"*, he elaborated on how the proceedings in the Court, both for the Judges and the Litigants & Lawyers have become smooth and availability of documents better. Mr. Anuj Agarwal, Chairman, Centre for Research on Cyber Crime & Cyber Law and Co-Convenor SIG on Digital Judiciary and Cyber Laws of CSI spoke about the *"Risks in online transactions and safety tips"*. He narrated the legal challenges of apprehending cyber criminals because of their possibility of committing crimes from a different jurisdiction and lack of training and proper equipment with law enforcement agencies. Mr. Dhaval Kotecha –Managing Director, Rapid Radio Solutions Pvt. Ltd. spoke about the *"Use of RFID tags for physical file tracking"* for smooth Court proceedings and Mr. Avinash J. Trivedi – VP, Videonetics Technology Pvt. Ltd spoke about the *"Issues of low pixel quality cameras leading to challenges for the Courts on not accepting the video digital evidence"*, while in the end Mr. Manoj Kumar Singh, AIIMS IT department talked about *"Creating software tags for faster implementation of e-Courts"*.

The Summit was conducted by Dr. Vinay Kumar, Hon. Secretary CSI-DC and DEAN VSIT, VIPS, Delhi and finally, the Vote of Thanks was given by Mr. B B Rishi, Hon. Secretary, IETE. The participants also interacted with each other during lunch and the Summit came to an end at around 3.30 pm.

National Summit on Digital Judiciary –

Building Smart Courts – A Report

Gwalior Summit - April 15, 2018



The CSI Div-1 in association with CSI SIG Digital Judiciary, CSI Gwalior Chapter, IE(I) Gwalior Centre, IETE Gwalior Centre, IEEE MP, MITS Gwalior, Madhav Law College, Gwalior, Amateur Radio Club Gwalior and SSKS Foundation Gwalior organized a *"National Summit on Digital Judiciary – Building Smart Courts"* at Gwalior on 15 April 2018 at the MITS Auditorium.

Following the Lamp Lighting and Saraswati Vandana, speaking on the occasion, Chief Guest Hon'ble Mr. Justice Vivek Agarwal, Judge, MP High Court sitting at Gwalior, highlighted the benefits of using digitization in Courts by way of their workflows in traditional versus digitized processes giving citations of different cases. Guest of Honour, Justice Brij Kishore Dubey (Retd.) gave a vivid overview of the journey of digitization of Courts and the roadmap ahead. Earlier, Er. Apoorva Agha, Chairman, Div-I CSI HQ & Convenor CSI SIG Digital Judiciary introduced the CSI, SIG and the Theme of the Summit and explained the need for using smart features in working of judiciary in the event of humongous pendency of ever increasing cases right from District Courts and High

Courts to the Supreme Court. Mr. Jayant Bhide, Chairman CSI Gwalior Chapter in his welcome address greeted the dignitaries and delegates informing them about the activities organized by CSI Gwalior Chapter for helping the masses understand different computer technologies and applications. Prof. R.K. Pandit, Director, MITS in his address shared his experiences in using the digitized system of addressing Court cases, which his Institute is pursuing in the Courts and how the system has helped him in managing the same, effortlessly. The participation of such esteemed dignitaries at the Summit showed the growing influence, importance and stature of CSI and its SIG on Digital Judiciary.



The Technical Session which followed, was spearheaded by Mr. Anuj Agarwal, Advocate, expert on Cyber Crime/Laws, GDPR & Privacy and a TV & Print Media Commentator who explained the Cyber Crime scenario globally and relevant legal provisions and measures to tackle the Cyber Crimes. The Summit was thereafter addressed by Mr. Sudhir Agarwal, SP, Cyber, MP Police and Mr. Alok Sharma, Advocate, MP High Court who spoke on the Cyber Crime scenario in MP and their litigation issues. They explained how the introduction of digital technologies in day to day working of the Courts has improved the service delivery to the common litigant but also cautioned about the do's and dont's for a citizen in using the computer and mobile technologies without getting cheated and victimized.

Mr. Jitendra Sharma, Director, Wacom India, spoke about the paperless e-workflow in Courts. He mentioned that it costs 20 litres of water for producing one A4 size sheet of paper. Where a file may take two months time to travel from one place to another in the traditional system, in a paperless system it can happen in real time. Mr. Avinash J. Trivedi, Vice President, Videonetics explained the working of smart surveillance cameras and difficulties of using video images in investigation and judicial processes. Mr. Shashank Singh, Director IP Jacket, spoke about the emerging role of Cognitive Intelligence in the judicial decision making process. He also described a model for implementing the AI based judicial system and the benefits that will accrue from such a system.

The Summit was conducted by Dr. Neeti Pandey, Principal Madhav Law College and Dr. M. K. Sharma, Advocate representing Manavadhikar Ayog in MP and SSKS Foundation proposed the formal Vote of Thanks. It is noteworthy, that inspite of imposition of Section 144 in the city, the audience crossed 250 mark and the auditorium was packed to its capacity. Certificates were given to the Speakers and

Delegates, which was followed by Lunch at 3.30 pm to mark the close of the Summit. The Summit was extensively covered by Press & Media which published its report on the front pages of several News Papers on the next day.

National Summit on Digital Judiciary –

Smart Solutions – A Report

Dehradun Summit – May 6, 2018



The CSI Div-1 in association with CSI SIG Digital Judiciary, CSI Dehradun Chapter, IE(I) Uttarakhand State Centre Dehradun and Graphic Era Hill University, Dehradun organized a *National Summit on "Digital Judiciary – Smart Solutions"* on 6 May 2018 at the GEHU, Dehradun Campus.

The Inaugural Session started with lighting of lamp and Saraswati Vandana. Hon'ble Justice Sunil Ambwani, Former Chief Justice Rajasthan High Court and Former Chairman, e-Committee, Supreme Court of India in his address as the Chief Guest said that although the 2nd phase of computerization of Indian Judiciary will be over in 2019, we still need more aggressive and innovative use of ICT in the justice delivery system. Technologies relating to e-Filing, e-Courts, e-Services, e-Certified copies and others are still in development stages and we are still filling up Registers manually, stacking records and using abundant papers in Courts. Mr. Ram Singh Meena, IPS Addl. Director General (Police) Uttarakhand State, while speaking as the Guest of Honour, highlighted the success stories, where the law enforcement agencies have succeeded in solving the cases of Cyber Crimes and how they are trying to keep abreast with the latest developments in technologies and the Cyber Laws to match the expertise of the cyber criminals. Earlier, Er. Apoorva Agha, Chairman, CSI Div.-I and Convener SIG on Digital Judiciary while introducing the theme of the Summit described the different domains of judiciary where the technologies can address the unmanageability of the traditional manual system. The introduction of artificial intelligence in Courts for assisting the Advocates in preparing their cases and the Judges in writing the judgments based on the techniques of machine learning using the legal repository and past judgments will help in speeding up filing and disposal of larger number of cases giving consistent judgments/orders he added. Prof. (Dr.) Sanjay Jasola, Vice Chancellor, Graphic Era Hill University in his welcome address hoped that such events shall go a long way in popularizing the concept and practice of technology based workings in public systems to deliver services to the citizens in real time and also for making the system act as deterrent for the criminals. At the end of the Inaugural Session, Ms. Raj K. Dhar, HoD, School of Law,

GEHU, felicitated the Guests and proposed a formal Vote of Thanks.



Mr. Anuj Agarwal, Advocate & Cyber Expert speaking on *"Road Map of Law Enforcement Agencies in Cyber Age"* gave a vivid description of how the LEA are facing challenges from the Remote Access Trojans (RATs), which provide cyber criminals with unlimited access to innocent users' computers & mobiles to watch and listen through the camera and microphone, record all their on-screen activity, alter their personal files and use their device to distribute malware to other computers. He suggested precautions on how to save oneself from such malicious attacks and also spoke on the menace of deep web whose contents are not accessible by the standard web search engines but are helping the criminals and terrorists for illegal trade and unethical activities.

Ms. Ridhim Aggarwal, SSP Special Task Force, Uttarakhand State, spoke on the *"Challenges faced by the Law Enforcement Agencies in Handling Cyber Crimes"*. She shared some of the recent crimes busted by the Uttarakhand Police through interstate coordination showing remarkable results in terms of detection and investigation of cyber crime cases. The cyber criminals have all the freedom to span across international boundaries for committing their crimes and so there is an immediate need for international cyber laws to address such challenges, without which, the cyber criminals would always remain one step ahead of the Law Enforcement Agencies which lack adequate legal provisions and regulatory mechanisms to address international cases of cyber crimes. She also shared how the ATM cloning case which affected hundreds of people within a span of 2 days, was not only successfully worked out but all the accused were also subsequently arrested. It was a first of its kind successfully worked out case in our country, which has been picked up as a case study by various training Institutes.

Thereafter, Mr. Kapil Ajmani, Manager – Academics, SCC Online, Delhi presented *"Supreme Court Cases Online Application"*, which compiles all case laws, judgements/orders of Supreme Court of India, several High Courts, Tribunals, and International Courts s.a. Privy Council of the United Kingdom and others. It provides convenience of searching legal content on SCC online, saving time & doing effective research on Indian & foreign legal content published by various reputed publishers using the SCC Online App.

Mr. Jitendra Sharma, Director, (Business Solutions) -Wacom India Pvt. Ltd, New Delhi spoke on *"Paperless Workflow in Judicial Courts"*. He presented the devices, such as, Touch Screens and Pens which are used by Judges in e-Courts to access entire case files online and jot down remarks, which may be copied on a pen drive and taken home for using while writing judgements/orders.

Mr. Rishi Prakash, Jt. Director, CDAC, NOIDA spoke on e-Courts and Digital Preservation of Court Records

Paper files have become extremely unwieldy, costly, inefficient and cumbersome. India is on the verge of technology revolution and one of the driving forces behind it is digital revolution that enables law enforcement agencies and Courts to maintain the documents in digital format, leading over paper-centric world. Further, evidences produced and depositions of accused and witnesses were recorded in the courts were majorly in paper form and there was no way to cross check it with verbal artifacts. Therefore, video recording and conferencing of deposition inside the Courts to backtrack and cross check the depositions and evidences produced in the Courts is an add-on tool and integral component of the future e-Courts.

A pilot project for creating a Digital Preservation System named as “e-Goshwara” for the disposed case records with guidance of High Court of Delhi and e-Committee Supreme Court of India was initiated under the programme. As per the e-governance standards, system has been implemented by adopting & customizing these standards to suit the need in judicial scenario. Subsequently, Metadata Standards for Long Term Digital Preservation of Disposed Case Records has been framed for Judicial e-Records. Also, digital repository has been setup for Supreme Court and Delhi District Court (Karkardooma Court) at CDAC-Noida & Hyderabad Data Centre, he added.

Mr. Kumar Bhaskar, Pr. Technical Officer(Embedded Systems), CDAC, NOIDA spoke on “*Tamper Evident Recorder and Player (TERP) - A Path Towards Digital Judiciary – Building Smart Courts*”. In today’s day-and-age, the digital information can be easily distributed, duplicated, modified and re-distributed. Due to this, the information received from off-the shelf products has low legal sanctity as it can be easily tampered. Tamper Evident Recorder & Player (TERP) captures multiple forms of information along with the date, time, place and system information. It encapsulates the captured information(audio, video, time, place and Bio-metric [finger print] in a tamper evident manner) into one packet and saves a digitally signed copy of it, maintaining integrity & authenticity. The objective is to design and develop a digital information recorder to record various forms of information for use in evidence collection and other related areas to make law enforcement system and judiciary more digital, fast and transparent. The recorded information can easily be played on any available player.

Mr. Satish Pandya, Sr. Product Manager(Dragon Legal), ICONS Infocom Pvt. Ltd., Ahmedabad spoke on “*Streamlining Legal Documents - ALL BY VOICE*”, an application, which assists in recording the dictation using speech to text translation techniques. In order to make the dictation more and more accurate, medical, legal and other specialized vocabularies are provided for users of different domains and further, in order to recognize the typical accent of people hailing from North, South, East and West of India, special effects of such accents have also been incorporated.

Mr. Amit Agarwal, Corporate Manager, Business Development Group, Libsys Ltd., Gurgaon spoke on “*Files & Asset Tracking & Management using RFID Technology*”. RFID based file tracking system is used for monitoring the movement of files in or out of the departments for identifying files uniquely without line of sight by affixing the RFID tag. The

solution is designed to present a real time view of files across different departments and can be configured for a multi-tier security of important files.

Mr. Pankaj Kapoor, CMD, CSPL Computers Pvt. Ltd., Lucknow spoke on “*Document Security & Verification using Meta Data Comparison*”. He demonstrated how with a naked eye two documents appear exactly the same, whereas, with the help of meta data comparison the tampering can not only be identified but also located exactly. Such verification can also be used for securing documents and the certified copies issued by Courts.

At the end of the Technical Session, Mr. Anuj Agarwal, Co-Convener summarized the presentations and proposed a formal Vote of Thanks to the Speakers and Delegate participants (around 120 in numbers), who kept the speakers engaged with their questions and made the Summit informative and beneficial for the entire audience. He specially thanked the Graphic Era Hill University for sponsoring the entire event and making such wonderful arrangements for the National Summit at Dehradun. The Summit closed with issue of presentation and participation Certificates to Speakers and Delegates followed by Lunch at 3.30pm. Press & Media published nice coverage of the event in local dailies. ■

Call for Paper for CSI Journal of Computing

(e-ISSN: 2277-7091)

Original Research Papers are invited for the CSI Journal of Computing, published on line 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 **Prof. (Dr.) J. K. Mandal**, Editor-in-Chief, CSI Journal of Computing (csi.journal@csi-india.org).

Prof. A K Nayak

Hon. Secretary, CSI and Publisher, CSI Publications.

BANGALORE CHAPTER



Bangalore Chapter in collaboration with the Special Interest Group (Formal Methods), organized a three days symposium on Application of Formal Methods for Safety & Security of Critical Systems at Amrita Vishwa Vidyapeetham, Kollam from 26th February to 28 February 2018. The conference was inaugurated by D Jean Louis Boulanger, an independent safety assessor from France. Dr. Jayaraj Poroor, Professor and Chairperson of Dept of Computer Science, Amrita School of Engineering welcomed the gathering. Dr. Jean Louis Boulanger, Dr. Bhanumathi K S, Dr. Manju Nanda, Dr. Yogananda Jeppu, Dr. S N Jyothi and other dignitaries were attended the function. Dr. Tessy Thomas, the Missile Woman of India sent a written message addressing the guests which was read out during the inaugural ceremony.

Amrita's Computer Science Department has a strong research group in the area of Formal Methods. Formal Methods is a mathematical approach used to validate software in order to ensure security and reliability. As the world is becoming increasingly dependent on computing systems for critical functions, the need to obtain high assurance on safety and security of such systems is essential. The conference had guest speakers and participants from leading academia & industries. Invited speakers addressed the Application of Formal Methods, Ensuring Safety & Security in High Integrity Embedded Systems using Static Analysis Methods, Cyber-security, Dependability issues in Cyber Physical systems, Model Extraction and runtime verification of JAVA based AV, Formal Verification in the modern era, Refine-based verification of Free RTOS in VCC, and Failures in Safety Critical Systems. Papers presented discussed the Formal Method based work being carried out in the respective organizations. Based on audience evaluation, Springer certificates and coupons, worth 200 Euro were given to first prize winner from Siemens, 2nd prize coupons worth Euro 150 given to winner from ABB. The first winner from academic went to IIIT-Hyderabad, 2nd winner to Amrita Kollam of coupons worth Euro 150 along with Springer certificate.

HARIDWAR CHAPTER

Haridwar Chapter in association with Dept. CSE, Faculty of Engg. and Tech. organized an Invited lecture by Mr. Gurukiri on the topic Big Data and Docker Technology on March 20, 2018. Mr. Gurukiri told about the latest technologies that are driving the great companies, how linux and docker software are providing platform to run various applications based on big data. The informative theory session was followed by lab session in which participants were informed about the

installation of these software on a Linux based system. The event was coordinated by Mr. Namit Khanduja. Dr. Mayank Aggarwal presented vote of thanks and Mr. Nishant Kumar and Mr. Suyash Bhardwaj of dept of CSE were present in the event.



The chapter in association with FET, GKV has organized an expert lecture by Mr. Varun Chaudhary, Senior Software Engineer, Microsoft USA. He interacted students and guided them how to make yourself ready for the companies like Microsoft, Amazon and Google. He shared his rich experience and his journey to the Microsoft USA. He has also said that India is the second country after USA where all the giant companies are establishing data centres. Students enjoyed the session and have asked many questions about the Microsoft internal working. This session was quite interactive. On this occasion Dr. M M Tiwari, Dean greeted Mr. Varun Chaudhary and presented the memento. Dr. Dharmendra Balyan, Mr. Nishant, Mr. Namit Khanduja and Mr. Mukesh Chand from CSI Haridwar Chapter was present.

VELLORE CHAPTER



Vellore Chapter organized one day workshop on Data Science on 24th March 2018 at VIT University. Mr. Sai Krishna, Data Analyst, CTS, Hyderabad explained the basics features data, data warehousing and big data, gave real demo on how the data transformation done in production environment. Around 45 members participated in THE workshop, organized by Dr. R Rajkumar, Prof K Govinda, Past RVP VII.

REGION-I

Institute of Technology & Science, Ghaziabad



21-4-2018 – Prof. A K Nayak, Hon Secretary spoke during National IT Convention – 2018

The NorthCap University, Gurugram



11-4-2018 - Competitive Programming in Advanced Java

REGION-I

Shri Ram Murti Smarak College of Engineering & Technology, Bareilly



7-4-2018 - Technical Festival on COMPTECH 2018

REGION-III

Mody University of Science & Technology, Lakshmanagarh



19-4-2018 - Workshop on Big Data- Hadoop

REGION-IV

Silicon Institute of Technology, Bhubaneswar



16 & 17-2-2018 – Prof Kar, Prof Talukdar, Prof Misra, & Prof Baral during Annual Inter College Technical Festival (NOESIS)

Gandhi Institute for Education and Tech., Bhubaneswar



18-4-2018 & 19-4-2018 - Workshop on Dynamic Web Technology using Microsoft.Net

REGION-V

CMR Engineering College, Hyderabad



22-3-2018 - Event on Start-Up Hub

SRK Institute of Technology, Vijayawada



23-2-2018 & 24-2-2018 - Two-day Technical Symposium

▶ FROM STUDENT BRANCHES ▶▶▶

REGION-V

Anurag Group of Institutions, Hyderabad



25-4-2018 - FDP on Latex Tool



30-4-2018 to 2-5-2018 - Workshop on Internet of Things

Maharaja Institute of Technology, Mandya



28-4-2018 - Technical talk on Digital Image Processing Applications in Computer Vision by Mr Honnaraju



7-5-2018 & 8-5-2018 - Technical event CODE MASTER

REGION-V

R V College of Engineering, Bangalore



4-5-2018 & 5-5-2018 - National Conference on Security, Privacy and Analytics – SPA 2018

REGION-VI

PES Modern College of Engineering, Pune



28-3-2018 – State Level Project Competition : ASPIRE 2K18

REGION-VI

Dr. D Y Patil School of Engineering & Technology, Pune



22-3-2018 & 23-3-2018 - International Conference on Recent Innovation in Engineering & Technology ICORIENT-2018

K K Wagh Institute of Engg. Education and Research, Nashik



6-4-2018 - Mini Project competition on Embedded System and Internet of Things

▶ FROM STUDENT BRANCHES ▶▶▶

REGION-VI

Dr D Y Patil School of Engineering & Technology, Pune



1, 2 & 16-2-2018 -Workshop on Digital Marketing

REGION-VII

St Joseph's College of Engineering, Chennai



16-3-2018 – Guest Lecture on Emerging Technologies in Software Industry by Mr Vimal Balajee Viswanathan

REGION-VII

Valliammai Engineering College, Kattankulathur



16-3-2018 - Workshop on IoT in Cloud Architecture by Mr Sabarinath



23-3-2018 - Intracollege Technical Contest

Panimalar Institute of Technology, Chennai



21-3-2018 Workshop on IoT by Mr Muhammed Ilyas



22-3-2018 - Workshop on .Net by Mr Kannan

Hindustan Institute of Technology and Science, Chennai



11-4-2018 & 12-4-2018 - Project Design Competition DE-FUTUR-2k18

Jeppiaar Engineering College, Chennai



14-3-2018 – National Level Project Expo - 2K18



6th Workshop on Spoken Language Technologies for Under-resourced languages 29-31 August, 2018, Gurugram, India



SLTU'18

Organized by:

KIIT College of Engineering, Gurgaon, India in association with International Speech Communication Association (ISCA)
and The European Language Resources Association (ELRA)

Venue: KIIT Campus, Sohna Road, Gurugram

Proceedings will be archived in ISCA-Web

Call for Papers

Areas related to digital revolution for under resourced languages: ASR-KALDI Tool-Kit

- Language resource development, acquisition and representation
- Linguistic and cognitive studies
- Unsupervised discovery of linguistic units
- Code switched lexical modeling
- Multi-lingual and cross-lingual spoken language processing
- Speech-to-text, text-to-speech and speech-to-speech processing
- Machine translation and dialogue systems
- Application of spoken language technologies for under-resourced languages.

Tutorials

ASR-KALDI Tool-Kit

John Hopkins University, USA

Neural Machine Translation

John Hopkins University, USA

Paper Submission Guidelines

Paper should be up to 4 pages of text in two column format, plus one page for references only. Paper must be submitted through EasyChair Portal.

Paper submission Link

<https://easychair.org/conferences/?conf=sltu2018>

Important Dates

Full Paper Submission: 15 June, 2018

Notification Paper Acceptance: 10 July, 2018

Submission of Final Papers: 17 July, 2018

Early Registration: 24 July, 2018

Contacts

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