



CSI Communications

Knowledge Digest for IT Community

Volume No. 39 | Issue No. 9 | December 2015

₹50

ISSN 0970-647X



Golden Jubilee Annual Convention

New Delhi, INDIA | 02-05 Dec. 2015 | Theme : Digital Life
www.csi-2015.org



ICT APPLICATIONS

Research Front

Hyperspectral Image Denoising and
Unsupervised Classification 26

Security Corner

Security Enhancement in ICT for
Education using WiMAX Networks 36

■ KNOW YOUR CSI ■



Executive Committee (2015-17) »

President
Prof. Bipin V. Mehta
 Director, School of Computer Studies, Ahmedabad University, Ahmedabad
 Email : president@csi-india.org



Hon. Treasurer
Mr. R. K. Vyas
 70, Sanskrit Nagar Society, Plot No-3, Sector -14, Rohini, Delhi
 Email : treasurer@csi-india.org



Vice-President
Dr. Anirban Basu
 309, Ansal Forte, 16/2A, Rupena Agrahara, Bangalore
 Email : vp@csi-india.org



Immd. Past President
Mr. H. R. Mohan
 40B/41, 15th Cross St, Wood Creek County, Chennai
 Email : ipp@csi-india.org



Hon. Secretary
Mr. Sanjay Mohapatra
 D/204, Kanan Tower, Patia Square, Bhubaneswar
 Email : secretary@csi-india.org.



Nomination Committee (2015-2016)

Chairman
Dr. Anil K. Saini
 GGSIP University, New Delhi



Mr. Rajeev Kumar Singh
 SAIL, Ranchi



Prof. (Dr.) U.K. Singh
 DG, IIBM, Patna



Regional Vice-Presidents

Region - I
Mr. Shiv Kumar
 National Informatics Centre, Ministry of Comm. & IT, New Delhi
 Email : rvp1@csi-india.org



Region - II
Mr. Devaprasanna Sinha
 73B, Ekdalia Road, Kolkata Email : rvp2@csi-india.org



Region - III
Dr. Vipin Tyagi
 Jaypee University of Engineering and Technology, Guna - MP
 Email : rvp3@csi-india.org



Region - IV
Mr. Hari Shankar Mishra
 Doranda, Ranchi, Jharkhand
 Email : rvp4@csi-india.org



Region - V
Mr. Raju L. Kanchibhotla
 Shramik Nagar, Moulali, Hyderabad, India
 Email : rvp5@csi-india.org



Region - VI
Dr. Shirish S. Sane
 Vice-Principal, K K Wagh Institute of Engg Education & Research, Nashik, Email : rvp6@csi-india.org



Region - VII
Dr. K. Govinda
 VIT University, Vellore
 Email : rvp7@csi-india.org



Division Chairpersons

Division-I : Hardware
Prof. M. N. Hoda
 Director, BVICAM, Rohtak Road, New Delhi, Email : div1@csi-india.org



Division-II : Software
Dr. R. Nadarajan
 PSG College of Technology, Coimbatore, Email : div2@csi-india.org



Division-III : Applications
Mr. Ravikiran Mankikar
 Jer Villa, 3rd Road, TPS 3, Santacruz East Mumbai, Email : div3@csi-india.org



Division-IV : Communications
Dr. Durgesh Kumar Mishra
 Prof. (CSE) & Director-MIC SAIT, Indore Email : div4@csi-india.org



Division-V : Education and Research
Dr. Suresh C. Satapathy
 ANITS, Vishakhapatnam Email : div5@csi-india.org



- ▲ an individual.
- ▼ – 2 are friends.
- ◀ – 3 is company.
- ◆ – more than 3 makes a society. The arrangement of these elements makes the letter 'C' connoting 'Computer Society of India'.
- ◀◆ – the space inside the letter 'C' connotes an arrow - the feeding-in of information or receiving information from a computer.

CSI Headquarter :

Samruddhi Venture Park, Unit No. 3, 4th Floor, MIDC, Andheri (E), Mumbai-400093 Maharashtra, India
 Phone : 91-22-29261700
 Fax : 91-22-28302133
 Email : hq@csi-india.org

CSI Education Directorate :

CIT Campus, 4th Cross Road, Taramani, Chennai-600 113, Tamilnadu, India
 Phone : 91-44-22541102
 Fax : 91-44-22541103 : 91-44-22542874
 Email : director.edu@csi-india.org

Publication Committee

	Chairman
Prof. M.N. Hoda	Member
Dr. R. Nadarajan	Member
Mr. Ravikiran Mankikar	Member
Dr. Durgesh Kumar Mishra	Member
Dr. Suresh C. Satapathy	Member
Dr. Vipin Tyagi	Member
Dr. R.N. Satapathy	Member

CSI Registered Office :

302, Archana Arcade, 10-3-190, St. Johns Road, Secunderabad-500025, Telengana, India
 Phone : 040-27821998

Important Contact Details »

For queries, correspondence regarding Membership, contact helpdesk@csi-india.org



CSI Communications

Contents



Volume No. 39 • Issue No. 9 • December 2015

Chief Editor

Dr. A. K. Nayak

Guest Editor

Dr. Vipin Tyagi

Published by

Hon. Secretary
Mr. Sanjay Mohapatra
For Computer Society of India

Design, Print and

Dispatch by

CyberMedia Services Limited

Please note:

CSI Communications is published by Computer Society of India, a non-profit organization. Views and opinions expressed in the CSI Communications are those of individual authors, contributors and advertisers and they may differ from policies and official statements of CSI. These should not be construed as legal or professional advice. The CSI, the publisher, the editors and the contributors are not responsible for any decisions taken by readers on the basis of these views and opinions.

Although every care is being taken to ensure genuineness of the writings in this publication, CSI Communications does not attest to the originality of the respective authors' content.

© 2012 CSI. All rights reserved.

Instructors are permitted to photocopy isolated articles for non-commercial classroom use without fee. For any other copying, reprint or republication, permission must be obtained in writing from the Society. Copying for other than personal use or internal reference, or of articles or columns not owned by the Society without explicit permission of the Society or the copyright owner is strictly prohibited.

Cover Story

- 14** Understanding Data Mining Applications for E-Governance **by Rajan Gupta, Sunil K. Muttoo and Saibal K. Pal**
- 17** A Prototype for Monitoring and Analysis of Garbage Collection Process based on Image Processing and Machine Learning **by Pawan Kumar**
- 19** Vision Based Gait Analysis Techniques in Elderly Life : Towards a better life **by Chandra Prakash, Rajesh Kumar and Namita Mittal**
- 22** ICT Applications: Objectives, Challenges and Path to Solutions in Social and Personal Context **by Mayank Pathak, Bhupendra Verma and Ravindra Patel**
- 24** ICT in Higher Education of India **by C. Rajanandhini, M.Chandrakumar Peter and A.B. Karthick Anand Babu**

Research Front

- 26** Hyperspectral Image Denoising and Unsupervised Classification **by B. Saichandana and K. Srinivas**
- 28** Extensions to the K-means Algorithm for Segmentation of cDNA Microarray Images **by P. V. Lakshmi and J. Harikiran**

Articles

- 30** Retention of Quality for Sustainability of an Industry in Industrial Market Dynamics **by Suma V.**
- 32** Social Network Analysis and Visualization using Gephi **by Prajakta S. Vispute and Shirish S. Sane**

Practitioner Workbench

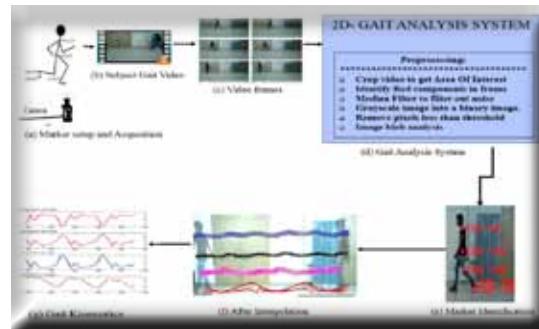
- 35** Working With Files and Directories in Python **by S. Gowrishankar**

Security Corner

- 36** Security Enhancement in ICT for Education using WiMAX Networks **by Chithra Rajagopal and Kalaavathi Bhuvaneshwaran**

Case Study

- 40** Digital Transformation: A Wealth Management Case Study **by Amit Badheka and Atul Patankar**



PLUS

CSI Elections 2016-2017/2018	8
Brain Teaser <i>Dr. Durgesh Kumar Mishra</i>	44
On the Shelf!	45
Reports	46
Student Branches News	48

Complaints of non-receipt of CSIC may be communicated to Mr. Ashish Pawar, 022-29261724, ashish@csi-india.org, indicating name, membership no, validity of membership (other than life members), complete postal address with pin code and contact no.

Printed and Published by Mr. Sanjay Mohapatra on Behalf of Computer Society of India, Printed at G.P.Offset Pvt Ltd. Unit-81, Plot-14, Marol Co-Op. Industrial Estate, off Andheri Kurla Road, Andheri (East), Mumbai 400059 and Published from Computer Society of India, Samruddhi Venture Park, Unit-3, 4th Floor, Marol Industrial Area, Andheri (East), Mumbai 400093. Tel.: 022-2926 1700 • Fax: 022-2830 2133 • Email: hq@csi-india.org **Editor: Dr. A. K. Nayak**



Dear Fellow CSI Members,

Information and Communication Technology (ICT) is the area that provides techniques of processing information and communicating it. It has created a large number of innovative applications that makes life of a common man easier. ICT e-applications provide an efficient medium to deliver a large number of services for all. These e-applications are enablers for development. ICT applications help in improving living conditions of all. There is a need of right approach, context and implementation techniques, to get required productivity and quality improvements from ICT applications. ICT applications in our daily life have converted our life into Digital life.

Keeping in mind the importance of ICT and its applications, the publication committee of Computer Society of India selected the theme of CSI Communications (The Knowledge Digest for IT Community) Dec. 2015 issue as "ICT applications". We shall also be discussing about "Digital Life" in CSI Golden Jubilee annual convention in this month in Delhi.

The first cover story included in this issue "Understanding Data Mining Applications for E-Governance" by R. Gupta, S. K. Muttou and S. K Pal discusses the role of data mining in e-governance. Next cover story "Monitoring and Analysis of Garbage Collection Process based on Image Processing and Machine Learning" by P. Kumar proposes a prototype for monitoring and analysis of garbage collection process based on ICT, image processing and machine learning. Third cover story "Vision Based Gait Analysis Techniques in Elderly life: Towards a better life" by C. Prakash, R. Kumar, N. Mittal gives a review that will help research and clinicians for a general insight of the opportunities and gaps in currently available system for gait analysis.

Cover story "ICT Applications: Objectives, Challenges and Path to Solutions in Social and Personal context" by M. Pathak, B. Verma and R. Patel explains various challenges related to ICT applications. Last cover story "ICT in Higher Education of India" by C. Rajanandhini, M. Chandrakumar Peter and A. B. K. A. Babu discusses some ICT initiatives in the field of higher education in India.

In Research Front category, "Hyper spectral Image Denoising and Unsupervised Classification" by B. Saichandana and K. Srinivas presents a mechanism for increasing the accuracy of Genetic algorithms based unsupervised classification. Next article "Extensions to the K-means Algorithm for Segmentation of cDNA Microarray Image" by P.V.Lakshmi, J.Harikiran gives an algorithm that can be used for segmentation of microarray image.

Article "Retention of Quality for Sustainability of an Industry in Industrial Market Dynamics" by Suma V. gives an overview of ways to maintain quality for sustainability. Another article : Social Network Analysis and Visualization using Gephi" by P. S. Vispute and S. S. Sane gives an overview of Gephi tool.

In Security Corner, we have included "Security Enhancement in ICT for Education using WiMAX Networks" by C. Rajagopal and K. Bhuvaneshwaran that discusses various ICT tools for E-Learning with enhancement in security to users of E-Learning systems.

A case study "Digital Transformation: A Wealth Management " by A. Badheka and A. Patankar gives the way to transform legacy



solutions in a business like Wealth Management (WM) using emerging technologies.

As a part of Golden Jubilee articles Prof. D. G. Dastidar, Fellow, Computer Society of India, Former Professor of Computer Science & Engineering, Jadavpur University, Kolkata has shared his memories with CSI in "CSI and Me : the Path Revisited". In another article "On Some Chapters of CSI in the Eastern Region : A Recollection", Mr. Devaprasanna Sinha, Fellow, Computer Society of India and RVP-II has shared his experience with CSI, in particular, in eastern regions.

This issue also contains Practitioners' workbench, Crosswords, CSI activity reports from divisions, chapters, student branches, Calendar of events and Book review.

I take this opportunity to express my sincere thanks to Dr. Vipin Tyagi, Guest Editor, for bringing this issue successfully. I extend my gratitude to the entire ExecCom and particularly to Prof. M. N. Hoda and Dr. D. K. Mishra for their continuous support in bringing this issue successfully.

On behalf of publication committee, I wish to express my sincere gratitude to all authors and reviewers for their contributions and support to this issue.

I hope this issue will be successful in providing various aspects ICT and its applications.

Finally, we look forward to receive the feedback, contribution, criticism, suggestions from our esteemed members and readers at csic@csi-india.org.

Prof. A.K. Nayak

Chief Editor

Prof. A.K. Nayak, Director, Indian Institute of Business Management, Patna, aknayak@iibm.in

PRESIDENT'S MESSAGE



01 December 2015

Dear Members,

Greetings!

As you are aware, Computer Society of India is organizing its "50th Golden Jubilee Annual Convention" on the theme "Digital Life" from 2nd to 5th December, 2015 at Bharati Vidyapeeth Educational Complex, New Delhi. Golden Jubilee celebrations will be inaugurated by Shri R. S. Sharma, Chairman, TRAI in the august presence of Shri J. S. Deepak, Secretary, DEITY on 2nd December at FICCI Auditorium, New Delhi. The organizers have put their sincere and untiring efforts to make this convention a great success. I wish them a grand successful convention.

The convention programme is well organized in which renowned IT leaders, scientists and academicians from industry and academia are delivering their talks. The paper presentations of more than 500 papers, coverings all the tracks and special sessions are well planned. During the convention, it will be great opportunity for the CSI fraternity to recognise the significant contribution by the members for CSI and in the field of Education, Research and Innovation, by honoring them with awards. The Awards Committee of CSI under the Chairmanship of Shri H. R. Mohan, immediate Past President, CSI and the committee members finalised the awardees for Honorary Fellow, Life Time Achievement and Fellow Awards. These prestigious awards will be given away during the convention inauguration. Besides these awards, CSI - Nihilant e-Governance Awards, Chapter level and Student Branch level awards will be given away during the convention. My congratulations to all award winners. I am sure they will continue to serve CSI with same zeal and passion.

On behalf of ExecCom, I invite CSI members to attend this mega convention and also inform other members, professionals and academicians for their participation in convention. The convention gives a platform to Fellows, Members, Student Branch Coordinators, Student members and Delegates from chapters to interact, networking and participate in various meetings being organized during the event.

In the recent visit to Singapore, our Prime Minister Shri Narendra Modi signed a bilateral agreement between India and Singapore for enhanced cooperation in the area of Cyber Security. Such agreements will help the country in enhancing its security measures. CSI can play an important role in the area of Cyber Security through CSI-SIG on Security.

One more significant step taken by Facebook is expanding the reach of its Internet.org, now called Free Basics, platform in India. This will help India in transformation into Digital India.



The election process for election of ExecCom and Managing Committee of Chapters is initiated. I humbly request members to come forward and take some responsibility and leadership role at national level and chapter level for the professional growth of CSI. I request members to participate in the election process by using your right to vote.

You will be happy to note that CSI Bangalore Chapter is organising 10th National Conference on IT for Defense 2016 with a special theme "Trusted Computing in Defence" at Bangalore during 11-12 January, 2016. The Special Interest Group of CSI on Information Security & Formal Methods is holding this Conference every year.

With best wishes,

Bipin V. Mehta

Bipin V. Mehta

Prof. Bipin Mehta, Director, School of Computer Studies, Ahmedabad University, Ahmedabad, president@csi-india.org



1. I am sure that most of our members will agree that from April of this year, Computer Society of India is undergoing major changes. Thanks to the efforts of Hon'ble Secretary Mr. Sanjay Mohapatra, systems and processes are falling in place and there has been more thrust on accountability. The Membership Committee under the Chairmanship of Mr. Mohapatra is trying to increase our membership, and is getting the priority it deserves.
2. All Members are requested to help in adding more members and efforts are on to involve our members in our different activities.
3. List of Distinguished Speakers from CSI Members has been prepared and being published Region-wise in the CSI web site. These Speakers can be requested to share their expertise in different events.
4. Efforts of the Publication Committee led by Prof. A. K. Nayak has helped in transforming CSI Communications as a means of decimation of information to our members. Dr. Vipin Tyagi is working hard to bring out CSIC in time and with the desired quality. In the days to come, we hope to see more CSI publications including one dedicated for students.
5. Nomination Committee is working on streamlining the electoral system and trying to ensure that both National level and Chapter level elections are synchronized and conducted as per the guidelines. There have been complaints about elections and the NC along with Hon'ble Secretary have been working to ensure elections are held in the right spirit.
6. While we are trying to strengthen all the Special Interest Groups (SIGs), SIG e-governance is working in the right direction. Thanks to the support of Nihilent, the CSI e-governance awards are being given by SIG-E-governance after rigorous evaluation of the competing entries. This model of tying up with large corporate houses and recognizing teams for their significant contribution in a particular area can be followed by other SIGs.
7. I am happy to note that the organizers of CSI conferences have started paying more attention to the quality of publication of the papers presented. Attempts are being made to tie up with Springer, Taylor and Francis etc. for publishing the proceedings.
8. CSI Delhi Chapter is making all efforts to hold our flagship event namely CSI Annual Convention : CSI 2015 in a



befitting manner. The members of ExecCom are looking forward to meeting our Members and Student Branch Coordinators during the convention and exchange ideas and discuss suggestions.

Best wishes,

Dr. Anirban Basu

Vice President, CSI

■ REGIONAL VICE PRESIDENT'S DESK ■



Dear CSians,

Since its inception in 1965, CSI, a pioneer body of IT professionals, has provided a common platform for all of us to share and exchange ideas through variety of useful events. CSI has played a vital role in spreading awareness of IT and use of IT for the betterment of society.

During my tenure as RVP for CSI Region VI, I have observed that the Chapters and student branches in Region VI are quite vibrant and are conducting several useful activities regularly. We had a meeting of OBs from all chapters from the region at Mumbai. I also separately conducted meetings at Pune, Aurangabad, Mumbai, Nagpur and Nashik chapters. I am happy that with the support from local Institutes and Industries in Nagpur and ExecCom members, we could revive CSI Nagpur Chapter.



CSI Nashik in association with the local Govt. Authorities, Industries and Institutions and MIT Media Asia Lab, Boston, USA, has motivated, encouraged and guided students in development and use of smart IT solutions for Kumbhmela 2015 at Nashik through series of six workshops throughout the year. All Chapters have excellent opportunity to play a vital role in the development of smart solutions, as Govt. of Maharashtra has selected ten cities for Smart City projects. I am sure all chapters are contributing in such and other projects having social importance.

CSI should play specific role in following areas, through joint efforts with Universities, Professional bodies and Industry associations:-

1. To organize expert talks, training and certifications programs.
2. To provide guidance to the students for carrier counselling and organize events to make students Industry ready.
3. To guide and motivate graduates and young professionals for start-ups.
4. To promote activities to share and exchange best practices and experiences, may be through CIO Club

I am sure you are receiving a copy of CSI Communications every month. I request members to write articles as well as book reviews. One may also publish research findings in CSI Transaction on ICT. Student members may publish their work in CSI Adhyayan. I would like to request Fellows, Patrons, OBs & MC members, RSC, SSCs and SBCs to contribute by their active participation to take the society at a greater height and recognition. May I request each Chapter and branch to regularly update their website and send monthly activity report before 20th of every month?

Last but not the least; may I request you all to inform interested professionals to take advantage of attractive offer for CSI Life Membership that will end by 31st December 2015 and also to ensure maximum Industry memberships and to establish new student branches?

Prof. Dr. Shirish S. Sane
Regional Vice President (Region- VI)

We live in an era of technology. We as a country, are progressing, day by day we are moving forward to stand as a competition to the super powers of the world. And this is something every Indian wishes to do. But, this is not as easy as it seems. We all need to work very hard to achieve what we want our country to achieve. One question that I ask myself every time I think about India as a developed country is : what are we lacking? We have second largest human force; we have given the world some of the greatest minds, and still are training many. This means we don't lack in number or in brilliance. Every time I get same conclusion, we are most probably lacking the technology and infrastructure required. We need to make progress in technology; we need to cover the gap present in latest technology, environment to be smart.



I finally conclude saying CSI is celebrating Golden Jubilee, all the CSI members work together, we will be able to achieve our goals. Train new generation and mould them into good engineers/ entrepreneurs/ scientists so that they can develop our country and produce a developed India.

Dr. K. Govinda
Regional Vice President (Region - VII)



Computer Society of India™

CSI Elections 2016-2017/2018

Following is the final election slate by the Nominations Committee (2015-2016) for the various offices of the Computer Society of India for 2016-2017/2018.

For the term 2016 - 2017 (April 1, 2016 - March 31, 2017)

Vice President cum President Elect

- Mr. D.B.V. Sarma
- Dr. Hari Shankar Sharma
- Mr. Sanjay Mohapatra
- Dr. Deepak V. Shikarpur

National Nomination Committee

- Mr. Subimal Kundu
- Mr. Sushant Rath
- Mr. Sudhakar Challapalli
- Mr. Vijay Rastogi
- Dr. Santosh Kumar Yadav
- Mr. Ved Prakash Goel
- Dr. Rabi Narayan Satpathy

For the Term 2016-2018 (April 1, 2016 - March 31, 2018)

Hon. Secretary

- Mr. Apoorva Agha
- Prof. A.K. Nayak
- Dr. P. Sakthivel

Regional Vice President (Region 2)

- Mr. Devaprasanna Sinha
- Mr. Radha Tamal Goswami

Regional Vice President (Region 4)

- Mr. Hari Shankar Mishra
- Mr. Mukesh Kumar

Regional Vice President (Region 6)

- Mr. George Arakal
- Mr. Ravi Eppaturi
- Dr. Shirish S. Sane

Divisional Chair Person Div. 2 (Software)

- Mr. Bharat Patel
- Mr. S. Ramasamy
- Mr. Saurabh Agrawal
- Prof. P. Kalyanaraman

Divisional Chair Person Div. 4 (Communications)

- Dr. Durgesh Kumar Mishra
- Dr. R.M. Suresh
- Dr. Phalguni Mukherjee

Note to Members

- Please exercise your vote for the posts of Vice President cum President elect, Nomination Committee (3 members), Hon. Secretary, RVP-2, RVP-4, RVP-6 and Div- 2, Div-4. In case of RVP'S members belonging to a particular region would only vote for that region's RVP.
- Election site wil be open on 18 Dec. 2015. Please visit www.csi-india.org for more details.

Code of Conduct:-

Canvassing (both individually and in group) during the election period directly or indirectly through post/email/social media / SMS is not allowed / permitted. Action would be initiated against the members/non-members found involved in such an act of canvassing or otherwise, in accordance with latest version of information technology act of the Govt. of India.

Thanking you and with season' greetings

Nominations Committee 2015-2016

Dr. Anil Kumar Saini
Chairman-Nominations Committee

Mr. Rajeev Kumar Singh
Member-Nominations Committee

Prof. (Dr.) U.K. Singh
Member-Nominations Committee

Kind Attention: Prospective Contributors of CSI Communications

Please note that Cover Themes for forthcoming issues are planned as follows:

- January 2016 - Open Source Software • February 2016 - Computer Networks • March 2016 - Digital Forensics

Articles may be submitted in the categories such as: Cover Story, Research Front, Technical Trends and Article. Please send your contributions before 20th Dec. 2015 for December issue. The articles may be long (2500-3000 words maximum) or short (1000-1500 words) and authored in as original text. **Plagiarism is strictly prohibited.**

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

Please send your article in MS-Word and/or PDF format to **Dr. Vipin Tyagi**, Guest Editor, via email id dr.vipin.tyagi@gmail.com with a copy to csic@csi-india.org.

(Issued on the behalf of Editorial Board CSI Communications)

Prof. A. K. Nayak
Chief Editor



CSI and Me : the Path Revisited

Debabrata Ghosh Dastidar

Formerly Professor, Computer Science & Engineering, Jadavpur University, Kolkata

I was 1961, and I had just completed my post-graduation; I joined an undergraduate college in Kolkata as a Lecturer. A year later, I had started my research work under the guidance of a faculty member in Applied Physics Department, Calcutta University. Suddenly, the following summer (1963), my Research Supervisor left his job and joined IIT Kanpur in the Applied Mechanics department. I accompanied him to help him settle down there. During my stay there for a week, he asked me to sign a form. I signed the form and left for Kolkata. In the month of July, I received a letter from IIT Kanpur offering me a research scholarship. I was very reluctant to leave my job and friends in Kolkata and decided not to go. One day, around end of July, my Ex-Research Supervisor came to my house - told my parents that I must not miss such an opportunity, and also persuaded me to leave the job. I agreed to join him in IIT Kanpur and this changed my life.

You must know that IIT Kanpur, along with three other IITs came into existence in the year 1962. Each of the IITs was started with the help of different countries. UK helped in setting up IIT Delhi, Russia helped set-up in IIT Bombay, Germany helped IIT Madras and for IIT Kanpur, it was USA.

I had started my research work in August 1963 but it was not producing any fruitful results. One day, in January 1964, I met one of my old friends at IIT, Kanpur. He informed me there was an IBM 1620 computer at IIT Kanpur donated by USA and in that machine there was a 3rd generation language compiler known as FORTRAN (FORmula TRANslation). Research scholars and faculty members from different Institutes and Universities all across India were coming here to learn that language. 4 out of those 40 students where from ISI and Jadavpur University and my friend was one of them. He advised me to learn Computer along with this language as it might help me in my research work.

I enrolled in the second batch. This

course was of 11 days duration and each day there were 3 hours theoretical lectures from 9:00 AM to 12:00 noon. That was followed by 3 hours practical class from 2:00 PM TO 5:00 PM. Theory Classes were conducted by three professors, one hour each - Prof. Harry Douglas Huskey, Elec. Engineering, UC Berkeley for Computer, Prof. Forman Acton, Electrical Engineering, Princeton for Numerical Methods, and Prof. Irving Rabinowitz, Computer Center, Princeton University for FORTRAN language

The practical classes were for solving problems using FORTRAN. The input of IBM 1620 was punched card and output were also punched cards which could be printed with the help of a printing machine. To solve one problem it generally took 2-3 runs on an average. After the first run the computer would indicate which code was not as per FORTRAN language syntax and also the possible mistakes. Next run could only be done after correcting those mistakes and punching new cards. After going through few such runs a correct solution could be achieved. The correct solution was also dependent on the steps taken for solving the other problem.

After 11 days I became so interested in computers that I started to spend most of my time at the computer centre. For the next batches, I volunteered to help the students in their practical classes. It helped me a lot to learn the language thoroughly.

It opened up a new horizon. I could solve my research problems very conveniently. A non linear equation, which was very difficult to solve manually became easy with help of Numerical Methods and Computer. During that time, IIT Kanpur had a rule where one could only reserve a 30 minute slot for the computers during 8:00 AM to 8:00 PM. For the rest of the time one could have unlimited access. During the day time I used to check my problems in the 30 minute slots and during night I could give regular runs for several hours. It helped me pace up my

research work and by May, 1965, I was done with my research.

In the meantime, I had started attending computer classes offered by Prof. Huskey and Prof. Robinowitz for technical assistants of the Computer Centre and other research scholars. Prof. Robinowitz offered classes in the computer Centre for a year. Prof. Gio Wiederhold from Computer Center, University of California, joined in his place from October 1964 to October 1965 followed by Prof. Jerry Johnson.

Prof. Johnson started teaching machine language and other aspects of Computer. In the year 1965, IIT Kanpur received another Computer - IBM 7044 which was faster than IBM 1620. The input of this machine was magnetic tape and output was either magnetic tape or line printer. We used to create tape with the help of IBM 1410 and that would be the input of IBM 7044. Prof. Johnson took up one month course for us on the Assembly Language of IBM 7044 and the language was known as MAP (Macro Assembly Program).

In the month of December 1965, I had submitted my thesis and was free to leave IIT. During early 1966 in an informal discussion, Prof. Johnson wanted to know about my future plans. I told him that I had not decided anything. He asked me whether I was interested to join the Computer Centre at IIT Kanpur. I immediately responded in the affirmative.

He discussed the same with Prof. Keshavan, who was the Head of the department, and Prof. Rajaraman, a senior faculty member of the Department and Prof. Huskey. A few days later he asked me to meet Prof. Keshavan. Prof. Keshavan wanted to know about my present job. I told him that I had already submitted my thesis and awaiting the results.

I informed Prof. Johnson about my interview with Prof. Keshavan. He told me to wait for few more days. After a week or two I met Prof. Rajaraman within the Computer Centre. He told me that a seven member committee had taken

a decision to give me an appointment but the letter could not be given to me as one of the members of the selection committee had not yet signed. It turned out that the particular member was none other than my thesis supervisor. When I met my supervisor, I told him about the circumstances. He immediately went to meet Prof. Rajaraman and did the needful. A few days later I received the appointment and joined Computer Centre as a permanent staff with a salary two and half times more than my research fellowship.

My new job demanded two specific things - to perform some tasks on IBM 7044 given by Prof. Johnson and to help Prof. Rajaraman in his class (a theoretical class known as TA306). My job was to help students in the lab class. I still remember those wonderful days with my colleagues Hari Sahashrabuddhe, R. N. Basu, Ravi Kumar, Surendra Kapoor (with whom I am still in touch), Hitkari and others. Amongst others, I remember Prof. H. N. Mahabala and Prof. Muthukrishnan from those days who later on became Presidents of CSI.

Note : A special incident from 1965 needs to be mentioned here - a day when Prof. Bejoy Chatterjee and Prof. Huskey informed us (a group of 20 users) to assemble in a classroom to let us know that they were thinking of forming a user group of computer users from all over India. Subsequently they went to ISI Kolkata which was pioneer in the usage of Computer since 1954-55 to form the group. Later we came to know that Computer Society of India was formed where all the users could be a member.

My association with computer continued as I joined Jadavpur University Computer Centre which was within Electronics and Telecommunication department in the year 1968. By that time Jadavpur and ISI have indigenously developed a 2nd generation computer [ISIJU-1 : first of its kind in India] and also around the same time I was using 2nd generation computer at IIT Kanpur. ISIJU-1 was the brainchild of Prof. J. S. Chatterjee, Head of the Department of Electronics and Tele-Communication Engineering, Jadavpur University and Prof. Samar Mitra, Director, ISI. The persons behind the development were Prof. Asish Sen, Prof. Ambarish Ghosh,

Prof. Mohit Kr. Roy, Prof. P K Mitra and others of IST and Prof. Biswajit Nag of Jadavpur University.

This encouraged UGC to let Jadavpur university open a one year course called as Post Graduate Diploma in Computer Science and Engineering. The input criteria of the students will be either BE/BTech in any branch or M.sc in Physics, Mathematics or Statistics. The total number of students was 10 in Software and 10 in Hardware. The course started in the year 1968. Students from all over India were selected. The examination centres were at Jadavpur University, IIT Madras, IIT Bombay and at IIT Delhi.

The course started in the month of August. I started teaching FORTRAN language. However, when our students were doing project work, they had to write in machine language of ISIJU-1 as there was no assembler or compiler. Here, the input was paper tape and output was also paper tape. We punched paper tapes with the help of a flexo writer. If there was a mistake we had to rectify the error bits sitting on the console of the computer. It was essential to know in which location of the memory those particular bits were residing. It was very tedious job. For FORTRAN, we used to write these programs on papers and sent those pages to the Computer Centre of IIT Kharagpur (In 1964 along with IIT Kanpur, IIT Kharagpur, Utkal University, CMERI Durgapur and one central Government agency received IBM 16320). One of our associates in IIT Kharagpur Computer Centre made sure that these programs were punched properly. Once the programs were punched, myself and Prof. M. K. Roy along with all our students used to go to IIT Kharagpur in the morning 7 AM train to run these programs. Initially, there were mistakes. After 3-4 runs each student used to get the output. The students became so engrossed that time flew like anything and each student was able to finish only 3 to 4 programs. We used to return to Kolkata by the evening train. The course contained 4 theoretical papers and one project. This course continued till 1977.

During those ten years many students got their diploma and settled in good companies. Some of them became famous

in their fields. I feel proud for these students. Even some of them joined CSI as a member and later on became fellows of CSI.

From the year 1971, we discontinued going to IIT Kharagpur and instead started using IBM 1130 computers initially at a company and then at Radio Physics department of Calcutta University. During this period we modified our course by including assembly language like Autocoder which was available in IBM 1401 computers and high level languages like ALGOL (ALGOrithmic Language) available in ICL 1900 computers. Unlike FORTRAN which was developed by IBM itself, for ALGOL, there was a committee and they took time to develop a block structured language. Most of the European companies used ALGOL, whereas American companies kept using FORTRAN. ICL was an UK based company. At that time several commercial houses had started using computers for the data processing works and the machines were mainly IBM 1401 and Autocoder was the assembly language of this machine. However, it was very difficult for us to get any time to run these programs in these commercial houses. With the help of some good friends we could run these programs - in some places students were not allowed to enter ; their programs were written on papers and sent; our friends would run and send the results. By this time the commercial houses also started requiring handling large volumes of data. This led on the appearance of another language in the market known as COBOL (COmmon Business Oriented Language).

This language became very popular all over the world and particularly in the business houses as it could handle large volumes of data in the forms of files. These files were stored in magnetic tapes. I started teaching this language from 1974 and students would run their programs in Indian Oxygen Computer Center. The students were running their programs on an ICL 1900 computer. The results could be stored either on a magnetic tape or printed it on a line printer, in late 70s another language came in the market known as PL/1. This language was a combination of Scientific, Engineering and Business purposes. This

was a product of IBM. However, it was not very popular and became obsolete soon after. Another language known as PASCAL also became popular for solving scientific and engineering problems about the same time.

In the year 1977, a computer known as Burroughs 6700 was installed in the Jadavpur University Campus. So far all the computers used to run in a single user mode. The Burroughs computer was the first one where multiprogramming environment was possible. Here the users submitted the programs on punched cards to a person and the person after collecting several programs gave to the console operator who in turn fed it to the computer in a batch processing mode. There was no intervention directly between the user and the computer. After some time a person returned the deck of cards and the printed sheet of papers to the users. If there was any mistake the user corrected those by punching new cards in place of error cards and deposited again the deck of cards to the person. In this computer we could run programs written in ALGOL, FORTRAN and COBOL languages. By now hard disk also became available in the market. So, both magnetic tape and magnetic disk could be used and as we know the magnetic disk slowly replaced the use of magnetic tape.

From 1978 onwards Electronics and Telecommunication Engineering department started offering a fourth specialization in its ME course as Computer Engineering. There were five theoretical papers in this specialization. A student needed to complete 6 theoretical papers to complete a ME Course - with at least three from his/her specialization and other three from any other specialization. Most of the students started taking three papers from computer engineering group, after meeting the mandatory requirement of taking three from their own specialization. The students believed that these would give them a better opportunity in the job market.

From 1981, a separate BE course known as Computer Science and Engineering started. Electronics and Telecommunication Department now had 3 different BE courses - Electronics and

Tele-Communication, Instrumentation and Electronics Engineering and Computer Science and Engineering. From early 1980s personal computers came in the market and students could run their computer programs sitting in front of their machines. BASIC (Beginners All Purpose Symbolic Instruction code) was very popular during this time - a person could test the programs very easily as it had both interpreter and compiler. In these computers input and output could be on floppy disks. However, these results could also be printed using the dot matrix printer. By 1988 due to the development of personal computers and communication system people started using the name Information Technology and no one was using the term data processing.

In the year 1988, Jadavpur University decided to create 3 separate departments for the 3 courses. These departments were ETCE (with a student capacity of 30), IEE (with a student capacity of 20), and CSE (with a student capacity of 30). My friend Prof. Mohit Kumar Roy and I became the part of CSE department.

Under CSE department, from 1985 we started Master of Computer Science and Engineering and from 1988 we started a new course known as Master of Computer Applications (MCA), the minimum criteria for the 4 year CSE course was higher secondary or equivalent and students were taken through West Bengal Joint Entrance examination in engineering. The minimum criterion for the new 3 year MCA course was 55% marks in graduation. Initially the University was taking students through their own selection process but presently students are taken from a separate examination conducted by West Bengal Joint entrance Board. The following years since then have seen a boom of computer science and information technology and it has been an overwhelming experience for me to be a part of it since the beginning of 1963 till date through various associations.

My Association with CSI : My memoir would not be complete without talking about my association with Computer Society of India (CSI). Initially from 1969, I became institutional member of CSI. Later on, I changed

over to individual member and after 3-4 years I became a life member. In late 70s I started attending CSI meetings. I became acquainted with Mr. Amal Roy, Mr. P. B. Ghosh, Mr. N. K. Roy, Mr. A. Roy Chowdhury, Prof. Anadi Daw, Prof. Ashok Agarwal, Mr. Amar Deb, Mr. Amar Nath Dutta, Mr. Santanu Chatterjee, Mr. A. N. Goswami and others who were then very much attached with CSI.

In the year 1984 I became the Secretary of Calcutta Chapter of CSI. At that time our monthly meetings used to take place mostly in Mr. N. K. Roy's office at Shakespeare Sarani. Sometimes Mr. Amar Deb arranged meetings at the office of IDM at Camac Street. WE did not have any permanent office of our own. Mr. P. B. Ghosh was instrumental to have the permanent office of the then Calcutta Chapter of CSI at the present location i.e. 5 Lala Lajpat Rai Sarani, Kolkata 700020. I remember the first annual convention of CSI which took place in the year 1966. The Annual Convention also took place later in Kolkata, the Silver Jubilee being in the year 1990. I was not directly involved in those Conventions.

I remember vividly the 1994 Annual Convention of CSI at Kolkata which was held at Netaji Indoor Stadium. In this Convention, Mr. Santanu Chatterjee was the Chairman of the Organising Committee, Mr N K Roy was the Chairman of the Exhibition Committee, Mr. Amar Deb was the Chairman of the Finance Committee and I was the Chairman of Programme Committee. I received immense help from quite a few persons like Mr. C. V. Singh of Telco, Mr. D. P. Sinha, Mr. Anirban Mukherjee, Mr. P. S. Datta Roy, Prof. D. D. Sinha, Prof. N. Chaki and others. There were more than 1300 delegates. The speakers were from Japan, USA, IIT Bombay and different other reputed institutions of India. It was a grand success.

As a parting note, I would like to thank CSI where I became Fellow in the year 2002. The fellows of CSI before me from West Bengal included Prof. D. Dutta Majumder, Prof. B. Nag, Prof. Anadi Daw, Mr. Amal Roy, Mr. P.B. Ghosh, Mr. Santanu Chatterjee and Mr. N. K. Roy.



On Some Chapters of CSI in the Eastern Region : A Recollection

Devaprasanna Sinha

RVP- II, Formerly Director, CAD CAM Consultants Pvt. Ltd, Kolkata

1. Is it because of the fact that I am allowed to write something of Kolkata Chapter of Computer Society of India and perhaps, other chapters in the erstwhile Eastern Region, chiefly because of my CSI pro-activism, over the last four decades and close interactions with leaders of the chapters, from time to time ? Is it also an accepted maxim that some of the seniors or veterans hardly write on nostalgic events, bitter or sweeter, but speak in closed circles ? Is it true that I have been fortunate enough to work within the ambit of CSI, to converse with them on diverse aspects of computer science and engineering, management, information technology and allied areas in different sectors and strata of life, from yesteryear's anti-automation to today's over-computerization days ? Many have left us. Some are spending their times with inner circles. A few happen to be active on certain aspects with the society and/or elsewhere.
2. Our activities continue to be profuse, particularly in the oldest chapter, Kolkata. I cannot miss the activities of other chapters like Jamshedpur, Patna, Bhubaneswar, Rourkela, Ranchi, Durgapur, Guwahati, Siliguri, Bokaro etc. Some have become inoperative while some are still organizing events on a regular basis. It will not be appropriate to list down all the activities of all the chapters known to me. I can cite my own references, the first being published in the Souvenir of Silver Jubilee convention of CSI at Kolkata in 1990. Some of the write-ups often co-authored with other senior members of CSI, Kolkata chapter on activities of the chapter were also published in other Souvenirs that came out on the occasion of Annual Conventions of CSI held in Kolkata in later periods. The chapter newsletter also published several histories of early parts of CSI, in this part of the country in CSI Communications in 2011. I was also instrumental in receiving and publishing the articles of Mr. N. K. Roy, Prof. D. Ghosh Dastidar and Prof. M. K. Roy. It contained other articles as well from this part of the country by Prof. D. Dutta Majumder and also by some professionals working in India and abroad. I should not repeat my list.
3. I will also not attempt to write the names of all persons whom I met and worked with. It will be never be complete in that respect. I have advocated for a history on computer at various occasions, even with oral histories from the living legendaries. At the juncture of golden Jubilee of CSI, I may try to present some reminiscences, where some incidents, some thoughts might not only please some older professionals but also trigger the new generations for years to come.
4. Fifty years of any society is an event to be pondered on. More so, with CSI, where many generations have been witness to revolutionary changes. I used to tell my younger ones and often to others that I should better forget many things what I learnt and practised in the first thirty years or so. This not true for other engineering disciplines, not to speak o basic sciences.
5. Prof. M. K. Roy, a passionate teacher at Jadavpur University, once told me about his initial days working with computers; he worked with machine level languages, later went to IIT Kanpur to study and work with Assembly Level Language. He felt that his present job might be insecure because he did not know assembly level language at that time. Later on, high level languages came in torrents and one had to learn, teach/train and practise those languages from time to time, apart from other powerful application development tools.
6. I remember an incident while working with Price Waterhouse in Kolkata. My office was in Gillander House, in the central part of the then Calcutta. It had and still has, in its vicinity, a large number of Banks with branches. In mid-eighties, anti-automation activities still prevailed. Almost all the bank officers/ workers in those days assembled downstairs in one of the days of protests, demands and issues, one of them being countering computerization. Bank employees with relatively younger age, went upstairs and came to my office, when I was the Secretary of the Chapter, to collect application forms for COBOL Programming Course approved by Bank Management to attend courses conducted by CSI.
7. It reminds me another event when we had to change the invitation card for the inauguration of CSI-86, Annual Convention of CSI held at Kolkata in 1986. Sri Jyoti basu was the Chief minister of West Bengal, but the ruling party did not allow him to come to the Convention to inaugurate the Convention. Instead, later a veteran RSP Minister attended the Convention. However, in 1990, the Silver Jubilee Convention which was an astounding success in terms of metrics like exhibitions and participation, we were fortunate to have the Chief minister to inaugurate the convention in Kolkata. Dr. Rattan K. Datta was the president of CSI in that year.
8. In 1978, I was at RCC, Kolkata.

There were communication links established with Burroughs 6738 at Kolkata with MECON, Ranchi. This was also a part of Exhibition there in CSI-1978. Dr. Utpal K. Banerjee used to come down from Jamshedpur (working in TISCO at that time) to function as Chairman. Programme committee of CSI-1978. Mr. R. K. Sandhir was there from MECON. Many of us now know that the First Convention of CSI was held in the then Calcutta in 1966 and the recent last in 2012, both at Indian Statistical Institute, Kolkata. We have had the perfect blend of persons from academic institutions, government, industry houses and in those days, almost all manufacturers and software houses.

9. Not only the Conventions held in Kolkata in 1966, 1978, 1986, 1990, 1994, 2001, 2006, 2012 were headed and supported by many computer professionals, there were also other conferences of

different nature. I owe to them for carrying on many activities. Many programmes meant for school students and aiming at spreading computer literacy programmes were organised, even today's "Reach Out" programmes. Many names and photographs, not only of the office bearers but also other active members, appeared in the small booklet published on the occasion of the Golden Jubilee Celebration in 2014 in Kolkata. CSI Kolkata Chapter had published many quality proceedings not only on the basis of papers presented/accepted in Annual Conventions of CSI, but also on emerging applications of information technology.

10. I must mention two chapters - one Patna and Bhubaneswar though I know other chapters and their continuing activities. Some chapters are not in Region II now. Jamshedpur chapter, one of the few oldest chapters of CSI, was one of the vibrant chapters

in those days. For many years, Jamshedpur chapter was the host for Regional Conventions. Both Patna Chapter and Bhubaneswar Chapters started in early nineties also hosted Regional Conventions later. Prof. U. K. Singh and Prof. A. K. Nayak are still active in the Patna chapter and also in other capacities ; so is also Mr. Sanjay Mahapatra from Bhubaneswar Chapter. In recent times, I have been witness to many programmes of varied nature organized by these two chapters. Siliguri, though a small chapter, organised some conferences, from time to time. I met Prof. R. K. Samanta, a veteran CSI member, during the last conference. It is unfortunate now that Durgapur and Guwahati Chapters have become inoperative, but a lot of activities pertaining to computerization in those areas used to be reported and discussed in regular technical meetings of those chapters.

Call for Contributions in CSI Adhyayan

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

India's IT sector continues to a trajectory of high growth since 1990s. Our education system, the prime mover of industrial growth and modern development, has seen a phenomenal growth in terms of quantity and quality - making it the third largest education system in the world after the US and China. With double digit economic growth demanding a sustained supply of knowledge workers, India has emerged as one of the world's largest consumer of education services.

India has the potential to provide the best education services with strong relationships among education, research and industry sectors.

Today, IT is a trillion dollar opportunity - so is higher education. We can proudly say that both the Indian IT and Indian '**guru**' are now revered globally. Both have potential and ability to scale up with global mindset. With regard to emerging technologies, they typically follow a strategy 'Start small, Grow real fast and Attempt to conquer'. In the backdrop of the above and with a view to consolidate the achievements of more than four decades of Computer Society of India (CSI) and new found vitality in education and research community, we have revived our publication of **CSI Adhyayan** after a gap.

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

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

We especially invite news and updates from our member institutions and student branches.

Please send your article to csi.adhyayan@csi-india.org.

For any kind of information, contact may be made to Dr. Vipin Tyagi via email id dr.vipin.tyagi@gmail.com.

On behalf of CSI Publication Committee

Prof. A.K. Nayak

Chairman

Email - aknayak@iibm.in

Understanding Data Mining Applications for E-Governance

Rajan Gupta

Dept. of Computer Science, University of Delhi,
Delhi, India

Sunil K. Muttou

Head & Associate Professor, Dept. of Computer
Science, University of Delhi, Delhi, India

Saibal K. Pal

Scientist, SAG Lab, Defense Research &
Development Organization Delhi, India

Background

The rising technology usage resulted into generation of huge amount of digital data which thereby resulted in large storage database. This expansion of database occurred in many prominent areas like government datum, transaction details of supermarket, mobile phone call details, record of credit card usage and also in much more complex areas like astronomical data records, medical data and the likes. With this much growth in data, there is an intelligent need of extracting useful information from these databases which might result into some beneficial information to the user. This task of exploring data to convert it into more meaningful patterns/information is known as data mining.

Data mining is defined as a field of exploring data in search of novel and potential information which result into some relevant patterns on the basis on which some systematic relationship can be developed^[1]. Data mining also known as Knowledge discovery in databases (KDD), where KDD is a traditional method of converting large amount of

data into meaningful interpretation and analysis^{[2][3]}.

Data mining is an emerging field and is known to be a combination of three computing techniques viz., databases management, artificial intelligence, and statistics^[5]. Data mining can be categorized into different types of task on the basis of different objective function for the user performing data mining^[1]. Some of them are as follows.

Exploratory Data Analysis (EDA) - The main objective of EDA is to explore data without having any prior plan of what to search in data. EDA techniques are very interactive and visual graphical method. This method works on relatively small-dimensional data.

Predictive modeling - In this task a model is built that allows value of dependent variable to be predicated from the value of independent variables. Prominent techniques are Classification and Regression. When the dependent variable to be predicted is categorical in nature, the technique used is classification, while for continuous quantitative dependent variable regression is used.

Descriptive modeling - It is used to describe the entire data by generating some information. This task is further divided which include density estimation which gives complete probability distribution of data^[6] (Scott, 2015). Prominent techniques are Clustering and segmentation which are based on grouping the data in given dimension space^[7] (Wedel & Kamakura, 2012). Dependency modeling is also descriptive modeling which is to describe relationships between different set of variables.

Pattern discovery and rules - This task detects meaningful pattern from the database to fulfill any known or unknown objective. For example detection of frequent transaction behavior in any business or detection in space can be categorized under pattern discovery. These kinds of patterns are detected by an algorithmic technique called association rules.

Rising E-Governance Data

India has recently observed a major increase in e-governance transaction which is more than a billion^[8] (Srikant,

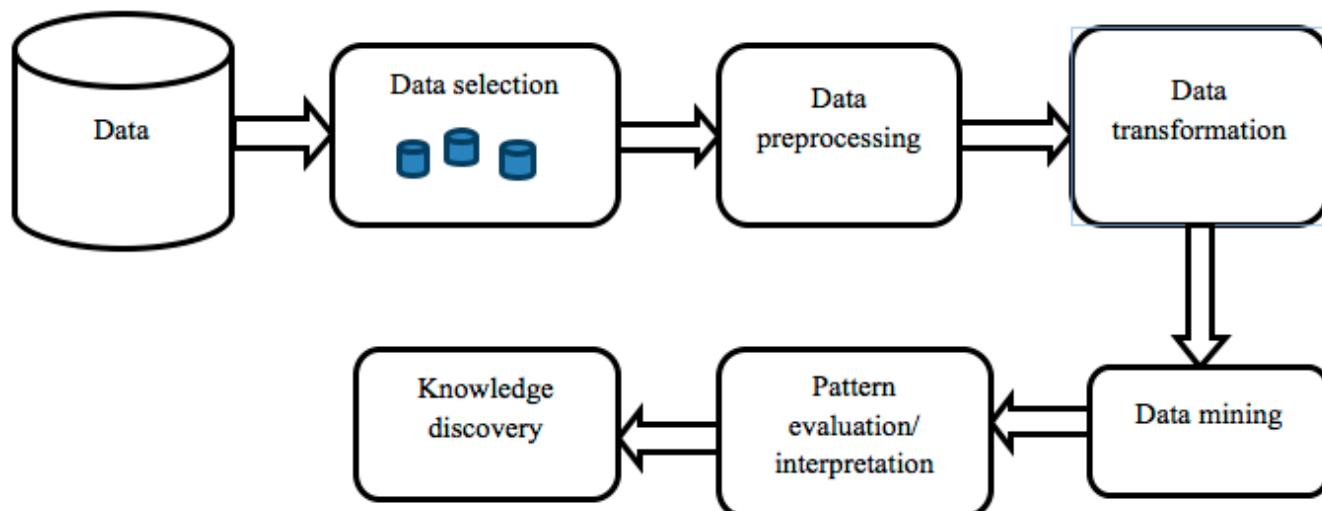


Fig. 1: Knowledge discovery process (Source:^[4])

2013). Among all the states, Gujarat tops this list with more than 389 million transaction recorded in the year 2015 till now. India is on the way of implementing

of data mining techniques. With the incorporation of this strong and powerful technique, government can change its way of conducting various G2G, G2C and

consumers, so that government could provide exact services to right consumers.

Decision tree

Decision tree works by classifying data on the basis of series of questions and these questions depend on features that are associated with data. At each step of decision tree a parent node contains a question which divides child node data into possible answers. This hierarchical structure continues until some conclusion is recorded at child node. The decision tree can be applied in any of the e-governance sector like economic sector for checking total GDP per capital, for calculation of health issue in different age groups. Fig. 2 illustrates a decision tree developed on literacy rate and number of deaths caused during maternity.

Clustering on E-Transactions

Clustering is technique of dividing data into groups containing different characteristics and data within every group having similar characteristics. Clustering can help to divide e-governance data and develop some patterns on the basis of which government can build certain decision for data presented in one type of cluster. For example, clustering can be applied on e-transaction rate on different states of India which will divide the data into cluster having set of states with similar e-transaction rate. This will be helpful in preparing similar strategies for high transaction oriented states and low transaction oriented states respectively.

Correlation & Mining for decision making on public opinions

E-governance could be enhanced with an effective and transparent communication with the citizens. The data collected from the public opinion column of e-governance website contains massive data with public opinions belonging to different sectors. Investigation on this data and building conclusion can be accomplished with help of data mining techniques. Based on the public opinion data, different Correlation variables can be declared for instance agriculture, education, finance etc. Correlation analysis method reflects different interconnected things between these variables, and search some latent rules which are valuable to the government and gives mutual relationship of variable from data. For example, various conclusions can be developed from public opinion like which government sector corresponds to which type of issue or

Table 1. Number of Electronic Transactions that occurred in 2015 for various Central Government schemes (Source: www.etaal.gov.in)

S.No	Central government projects	No. of E-transaction
1	Agriculture	1,94,36,87,588
2	Central Public Works Department (CPWD)	12,32,844
3	Co-operative Banks	92,75,007
4	CSC	7,53,32,807
5	Dial.gov	46,423
6	Directorate General of Foreign Trade	1,24,963
7	e-Panchayat	6,60,742
8	e-Procurement	11,33,758
9	Finance	3,29,95,699
10	Food and Civil Supplies	23,17,462
11	Health	2,45,46,926
12	Immigration, Visa and Foreigners Registration & Tracking (IVFRT)	1,09,72,068
13	Jeevan Pramaan : Life Certificate for Pensioners	4,66,758
14	Judiciary	5,82,95,596
15	Labour and Employment	2,11,808
16	MCA21	30,62,161
17	MGNREGA	786
18	NIC Services	8,245
19	Passport	6,09,92,818
20	Pensioners Portal	22,631
21	Postal Services	3,99,38,212
22	Pradhan Mantri Jan-Dhan Yojana	1,82,02,695
23	Public Distribution System	82,43,156
24	Right To Information(DOPT)	24,673
25	Telecommunications	3,36,36,781
26	Transport	56,18,961
27	UPSC	37,42,966
	Total e-Transactions	2,33,47,94,534

a large number of e-governance programs to develop a strong linkage between government, citizens and business houses. This huge data will get stored on large government databases and therefore will require efficient data mining techniques to extract relevant patterns or structures from these datasets to improve the overall performance and growth rate of the country. Table 1 shows the e-transaction rates corresponding to different central government projects^[9] Etaal (2015).

G2B services. Government can extract right information records as per the specific requirements and can use data mining techniques for pattern discovery. Some prominent application areas as per different techniques are discussed below.

Classification for customized E-Governance services

The classification technique can be applied in E-Governance with different features based on given information for different profiles. A citizen profile mainly includes demographics like Gender, Age, Occupation/job, marital status, etc. This information can help in developing personalized E-Governance services, and also to understand the needs of

Application of Data Mining in E-Governance

Government can enhance e-governance strategies more efficiently with the help

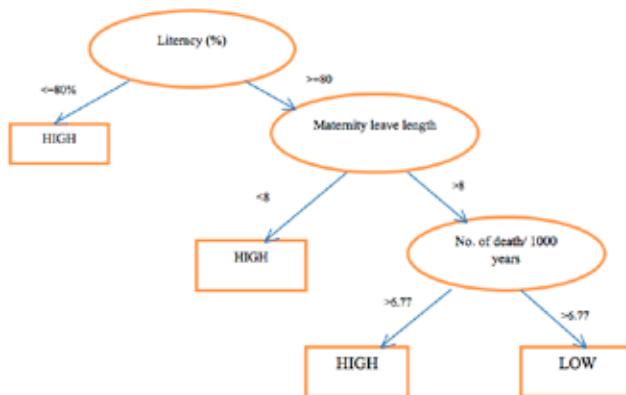


Fig. 2: Decision tree on literacy rate

which sector needs much attention for improvement or whether making changes in any sector will enhance e-governance usage or not.

Classification, Clustering and association on social and economic factors

Social and economic factors can be easily integrated with Data mining techniques for planning and decision making. For example, factors like agriculture, crime sector, literacy rate, rainfall prediction, population count can be the areas where combination of techniques can be used. Combining 3 techniques of data mining (classification, clustering and association rules), strong conclusions on these factors can be demonstrated. For instance, in agriculture sector classification can be used for agriculture count prediction in different parts of India. After classification, clustering can be applied for generating various agriculture patterns in different states. Association rules can be applied on clustering result for generating relationships among variables like different agricultural products viz., pluses, vegetables, spices, grains, etc and the results may suggest areas

which requires better scope of improvement. Another example is of crime detection rate, various crimes can be classified per year, so as to demonstrate different crime rate in different years. With help of data mining techniques different types of crime can be detected within various levels of society. These techniques can also be applied on e-voting to study changing patterns of voting style within different age groups.

Conclusion

E-governance is associated with massive amount of data and it is predicted that this size of data will increase in future enormously. When this massive data is appropriately used, it may lead to some great development to the country by making correct decision for various sectors. Data mining techniques is much more needed today in order to effectively use this large amount of data. With the help of data mining, government can recognize the actual need of citizens or business houses, which thereby will the help government in taking accurate decisions and in return provide effective development services.

This article discussed the role of data mining in e-governance. Data mining consist of various techniques like clustering, classification, association rules, decision making based on these concepts various data mining application are suggested in order to bring development in e-governance. The application of data

mining in E-governance sector is relatively very less at present but this application may result as a major support to the government in future.

References

- [1] Hand, D J, Mannila, H, & Smyth, P (2001). *Principles of data mining*. MIT press.
- [2] Baker, R S J D (2010). Data mining for education. *International encyclopedia of education*, 7, 112-118.
- [3] Maimon, O, & Rokach, L (2005). Introduction to knowledge discovery in databases. In *Data Mining and Knowledge Discovery Handbook* (pp. 1-17). Springer US.
- [4] Fu, Yongjian. "Data mining." *Potentials, IEEE* 16.4 (1997): 18-20.
- [5] Agrawal, Rakesh, and Ramakrishnan Srikant. "Privacy-preserving data mining." *ACM Sigmod Record*. Vol. 29. No. 2. ACM, 2000.
- [6] Scott, David W *Multivariate density estimation: theory, practice, and visualization*. John Wiley & Sons, 2015.
- [7] Wedel, M, & Kamakura, W A (2012). *Market segmentation: Conceptual and methodological foundations* (Vol. 8). Springer Science & Business Media.
- [8] Srikant.J (2013), "E-governance hopes rises as India crosses 1 billion transaction" , 'Economy, News Available at: http://articles.economictimes.indiatimes.com/2013-10-29/news/43495939_1_e-governance-cyber-cafes-deloitte-touche-tohmatsu-india. [Accessed on 17 September 2015].
- [9] Etaal (2015), "Total no. of e-Transactions", Etaal, Department of Electronics & Information Technology. Available at link: <http://etaal.gov.in/etaal/CentralChart.aspx>. [Accessed on 17 September 2015]

About the Authors



Mr. Rajan Gupta is currently Research Scholar with University of Delhi. His area of interest includes E-Governance, Public Information Systems, Multimedia Data processing and Data Analysis/Mining. He has over 25 publications at national and international forums. He can be reached at : guptarajan2000@gmail.com.



Dr. Sunil K. Muttoo is Head & Associate Professor at Department of Computer Science, University of Delhi. His area of interests includes Digital Watermarking and Steganography. He has over 200 publications at national and international forums.



Dr. Saibal K. Pal [CSI-00917125] is Scientist in SAG Lab, Defense Research & Development Organization and has keen interest in Data Mining, Multimedia Data Processing and E-Governance. He has over 100 publications at national and international forums.

A Prototype for Monitoring and Analysis of Garbage Collection Process based on Image Processing and Machine Learning

Pawan Kumar

Asst. Prof., School of Computer Applications, Lovely Professional University, Phagwara (Punjab)

Abstract: This paper proposes a prototype for monitoring and analysis of garbage collection process based on ICT, image processing and machine learning. The idea is to feed random images from garbage collection points to a computer system that can classify these images as normal and abnormal and can raise alarms to concerned authorities. The paper also attempts to identify potential positive outcomes of the proposed approach from administration and citizens' perspective.

Introduction

Garbage collection process offers a lot of scope for improvements as it is not up to the mark at present. In terms of cleanliness, our cities are lagging behind by miles when compared to the status in developed countries^[1]. The efficiency of this process is bound to contribute in health care also.

Current process: Presently, every city has a municipal corporation which has fixed up some locations where garbage is supposed to dump. The municipal corporation employees collect the garbage from these locations on daily basis.

There are certain deficiencies in the current process. The monitoring of the current process is purely manual. The concerned authorities either depend on the complaints filed by citizens or they make onsite inspections on their own. This manual dependency many a times result in delayed action, more time consumption in resolving a complaint, lack of accountability and lowers down faith of the people in efficiency of civic bodies.

This article proposes an automation of the monitoring and analysis of the above process using Image acquisition devices, Image processing and machine learning.

Proposed Process

The idea is to use advancements in the field of ICT, particularly Image acquisition, image processing systems and machine vision applications^[2]. In the proposed process, images of garbage collection points at random or fixed point in time will be captured by fixed cameras or flying drone cameras. These images will be input to a computer system that can identify

images or garbage collection points where work is pending or not done properly. For example, the system will be able to identify areas or locations where garbage containers are overflowing or area of garbage spread is significantly larger than normal. The computer system will be able to raise alarms for all cases which need attention of the higher authorities at different levels depending upon measure of discrepancy.

The implementation of the proposed system will require: (i) Installing CCTV cameras at garbage collection points or using drone cameras for image acquisition (ii) Training of a computer system using machine learning algorithms like Artificial Neural Networks or classification techniques that can differentiate between normal and abnormal images^[3]. Normal image refer to locations where garbage

collection is done properly. Abnormal images refer to locations where garbage collection is either pending or not done properly^[2]. (iii) To provide software capability to the system to raise alarms, generate reports of routine type or analysing specific questions etc.

A block diagram of the proposed system is given below:

Outcomes of the proposed process

The possible positive results of the proposed process, from perspective of different stakeholders i.e. administration, citizens and policy makers, are:

Fast and Accountable: Unlike current system, the monitoring in the proposed process can be made fully automated. The system will immediately raise alarm indicating location, nature and level of discrepancy or pendency. It will help civic bodies and administration to bring more accountability.

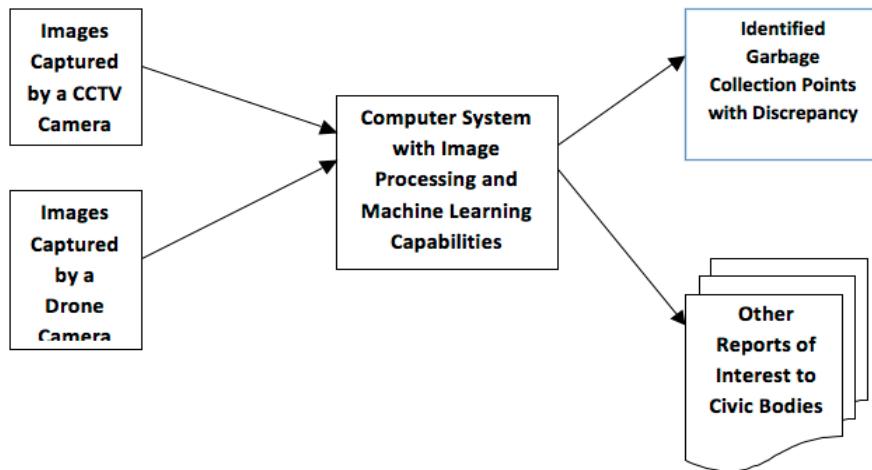


Fig. 1: Block Diagram of the proposed system

Performance Analysis: As the proposed system can store and process images and discrepancies over a period of time, it will help civic authorities to monitor performance of different stakeholders like Workers, Municipal Corporations and take corrective actions. For example, the performance analysis can be extended from within a district to inter-district or inter-state.

Flexibility and Scalability: There is flexibility in the sense that using fixed cameras we can monitor essential or fixed locations. However, using flying cameras, we can acquire and collect images of locations of our interest. This randomness will act as a deterrent to all concerned as all locations can be inspected at random. In later stages, this surveillance can be extended from public locations to finer locations inside a Gali, Near Schools, and Markets etc.

People Involvement: Suitable rewards can be announced to better performing wards or areas. This will help citizens become more aware and dedicated towards following administration instructions and keeping their area clean. Awareness and appreciation SMSs can be sent to residents of concerned areas. "Dear Resident, Your ward has been declared as best in maintaining cleanliness. Don't forget to say thanks to sweeper of your street." This type of initiatives can contribute in making

people motivated towards cleanliness and improving connect between citizens and the administration.

Input from citizens as whistle blowers: The system will make a way to provide a platform to all citizens to feed their complaints into the system. For example, if there is a problem related to garbage collection in an area, any concerned citizen can click a photograph and upload to the system by using a mobile application. The problem will be reported automatically with proof.

Pattern Detection: As a further step, the system can help authorities to study patterns that are useful in decision making. For example, the system can raise alarm if there is a sudden increase in garbage volume in a particular area or during a particular time period. The civic authorities can investigate the reasons and make strategies for future occurrences of such events. For example, making extra arrangements and charging extra during diwali festival or bringing awareness among people in advance.

Other types of Surveillance: The cost incurred on installation of cameras can be justified further in the sense that these cameras can be shifted to other locations and can be used for other welfare objectives if these are no more required. For example, cameras can be shifted from relatively clean areas to areas that need more attention or more coverage. Also, the

installed cameras can help in maintaining the general security concerns of the areas adjoining garbage collection points.

Better Health: Another positive outcome of the proposed system is that it will directly contribute to the health and wellness of the residents.

Conclusions

The use of image processing and machine learning can significantly increase the efficiency of the garbage collection process. It is particularly true for countries like India where maintaining cleanliness of the city is considered as responsibility of the administration only. The investment involved in installation of cameras and computer system can be justified by the fact that this process affects every citizen or resident and there are multiple positive outcomes like increased accountability and efficiency of administration, increased involvement of residents, better health and making India advance towards cleanliness of its cities.

References

- [1] <http://www.firebaseio.com/2010/04/21/environment-cleanest-countries-business-iceland-cleanest-countries.html>
- [2] Gonzalez and Woods, "Digital Image Processing" 3rd Edition, Pearson.
- [3] <http://disp.ee.ntu.edu.tw/~pujols/Machine%20Learning%20Tutorial.pdf>

About the Author



Mr. Pawan Kumar [CSI - 1183942] is working as Asst. Prof., School of Computer Applications, Lovely Professional University, Phagwara, Punjab. His research interests are Image Processing, Machine Vision and ICT Applications in health care. He can be reached at pawan.11522@lpu.co.in.

Guidelines of Sending CSI Activity Report

- Student Branch activity Report : send to: sb-activities@csi-india.org with a copy to admin.officer@csi-india.org and director.edu@csi-india.org

The report should be brief within 50 words highlighting the achievements and with a photograph with a resolution higher than 300 DPI.

- Chapter activity Report: send to: chapter-activities@csi-india.org

The report should be within 100 words highlighting the objective and clearly discussing the benefits to CSI Members. It should be accompanied by a photograph with a resolution higher than 300 DPI.

- Conference/ Seminar Report : should be sent by Div Chairs and RVPs to : conferences@csi-india.org

The report should be brief within 150 words highlighting the objective and clearly discussing the benefits to CSI Members. It should be accompanied by a photograph with a resolution higher than 300 DPI.

Dr. Vipin Tyagi, Guest Editor (dr.vipin.tyagi@gmail.com) will be coordinating publishing of reports of these activities.



Vision Based Gait Analysis Techniques in Elderly Life : Towards a better life

Chandra Prakash

Junior Research Fellow (JRF),
MNIT Jaipur

Rajesh Kumar

Associate Professor, Dept. of Electrical Engineering,
MNIT Jaipur

Namita Mittal

Assistant Professor, Dept. of CSE,
MNIT Jaipur

Abstract: we address the significance of Vision based Human gait analysis in real time application especially for elderly person. Most gait capture systems use direct measurement techniques to acquire specific motion information, but at the high cost and affects normal walking pattern. This review will help research and clinicians for a general insight of the opportunities and gaps in currently available system for gait analysis.

Introduction

According to United Nations ESCAP report, Asia is a home to close to two-thirds of the world's population of disabled people and this figure is expected to ascent over the next decade. There are more opportunities for better quality of life for the disabled community worldwide with conjoining biomechanical modeling with advanced measurement technology.

Nearly 50% of people over age 65 have gait problem. Around 33 percentage of Australians elder citizen above 65 year are prone to falling. For USA this statics is around 20% of aged people. Occurrence of falling in Honk Kong is 19.3%, 50% in Canada. Study also indicates that half of elder adult falls are recurrent falls^[1]. Around 90% of U.S elder citizen who has cerebral palsy (CP) required continuous special assistance.

There is higher risk of death in case of elder adult falling and bone fractures. This increase the overall falls-related healthcare costs. Approximately, 3 billion dollars has to spend for the treatment of fall-related injuries. This include the figure of physical and psychological trauma^[2]. Therefore, scientifically diagnostics of the poor postural condition is receiving more and more attention from health, medical and sports academy in the past decades since it can detect an incipient fault at an early stage.

Though no authenticated statistics for Indian elderly population could be found, it can be easily presumed that situation is no more different in India as increased urbanization and nuclear family concept which has led to breakdown of traditional healthcare of elderly.

So there is need of monitoring the gait pattern of elder adults.

Conventionally, the human gait has been considered subjectively through visual observations but now with technological advancement, human gait analysis can be done objectively and empirically. Physiotherapists, orthopedists and neurologists are examining human motion for long to evaluate a patient's status, treatment and rehabilitation.

Gait Analysis: Techniques

Pattern of locomotion such as walking, running, crawling etc. combined with their posture is known as gait. It is combined effort of brain, nerves and muscles.

Research associated with human walking is known as gait analysis. It is a systematic technique of recognizing explicit deviations in the gait pattern and determining their reason and effects. Human gait analysis has numerous uses, such as medical diagnostics, security, animation industry & sport science.

In 1878, Edweard Muybridge & Leland Stanford was the first one to study the gait mechanism. In gait analysis for medical

diagnostic optical-based motion analyzer systems have been widely used to monitor a patient's response. Gait analysis includes the measurement of temporal, Kinematics, Kinetics and Dynamic electromyography based parameters and inferences about the subject age, gender, velocity, weight, etc. can be drawn.

Application of Gait analysis

Average adult takes 5000-8000 steps a day. Dysfunctional gait can arise from acute or chronic injury or either because of improper biomechanics. Literature revels that physiotherapists and orthopedists can monitor and analysis gait movement variables i.e. stride length, step length, cadence, stance and swing phase etc. of such patients, to point out if improvement has taken place.

Fig. 1 shows some of the parameters used in Gait analysis. There is need of standard dataset or normal pattern on the basis of which health-care professionals can compared the subject data to decide if the patient is impending normal

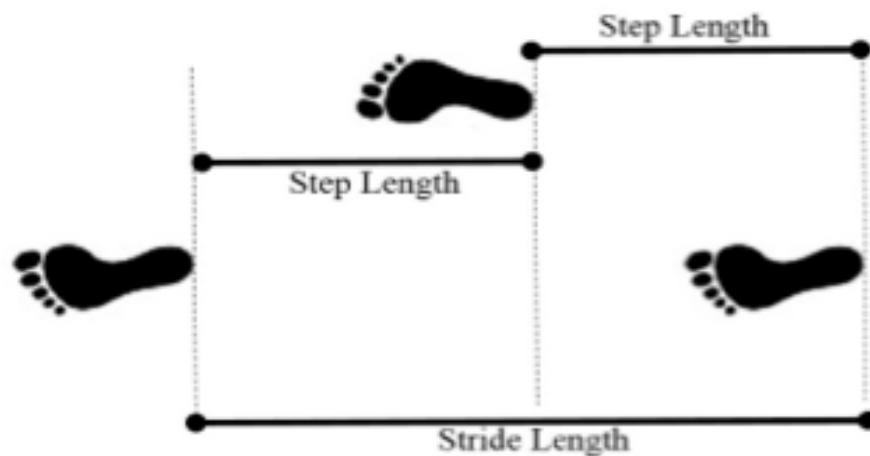


Fig. 1: Distance and temporal factor in gait

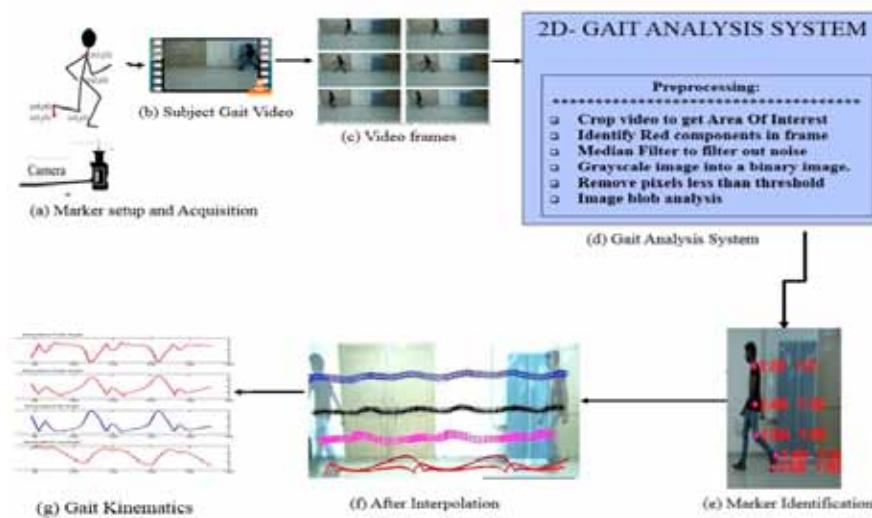


Fig. 2: Gait analysis using Passive marker

representation or not. Physiotherapists; orthopedists and neurologists use quantitative gait parameters for better realization of patient's gait pathology^[9]. Availability of quantitative gait parameters is essential for uncovering gait related syndromes and estimation of medical gait diagnostics and rehabilitation developments.

Health is now professed as a key requisite towards a good life. In the present era, the problems of postural defects and Walking Gait in elder adults have become more substantial and of greater concern.

The desire to improve the quality of life and reliability of rehabilitation drives new research and development activities in several countries. Researchers are evaluating the causes and consequences of various faults in Postural deformities and walking Gait conditions.

The empirical and quantitative study of gait may suggest potential injury, subject can take preventive action. In case of injury, gait analysis can aid in selecting best available treatment options.

Gait analysis can supply useful information about kinematics and kinetics of human walking to be used in the design and manufacturing of humanoid robots. Now, with the new techniques, clinicians are able to exploit instrumental gait analysis as their regular clinical practice to assess a patient's status, healing and recovery for complex musculo-skeletal and neurological disorders. With this in mind, this report aims to highlight the gaps to repair the

disabled community through artificial intelligence techniques.

This article suggests that there is a strong need of a structure that can monitor the gait of elder adult and take precautionary steps or aid after injury. Motion based gait analysis system can play an important role in monitoring elder adult gait using body worn sensors or camera. Once identify the deviations, it should automatically notify the concerned physician and he can suggest diagnosis.

Current Status and future work

Motion capture is considered as one of the methods to capture the subject data to identify gait related problems. Currently, there are various methods for motion capture. With the help of Micro-Electro Mechanical Systems based accelerometers and gyroscope, we can capture the motion.

Another method to capture motion is by using cameras for rebuilding of the human-body movement with the help of computer vision. Combination of cameras and markers or tag attached can be implement to capture the subject motion. For this generally infra-red (IR) cameras are used and the body stance is remodeled from the location of the retro-reflective markers.

Some specific devices are designed to measure joint deflection angels by simulation of tremor-a sign in Parkinson's disease. But in this system user need to carry this huge device and this prevent the subject to carry out normal daily

activity. Another approach is know as semi-automated where a subject is being monitored for long time with the help of pocket PC. According to the gather data, we can determine the normal walk pattern of subject and predict the probability of fall based on some rule.

At present, many commercial camera-based motions capture system for both 2D analyses are available. Kinematic gait analysis can be subdivided into two types^[18]. First one is direct measurement or contact based techniques. These include accelerometers and goniometers sensors. Another is optical or non-contact based measurement technique. Optical based techniques using active or passive makers, were developed to perform real time kinematics gait analysis. Active marker is triggered to illuminate as they use light-emitting diodes (LEDs). This signal is used to specify the position of the marker. The benefit is that each markers work have its own identity by its predefined frequencies. Passive markers are spheres covered with reflective scotchlite tape that reflects incident light.

These LED based systems are highly accurate however such benefits come at a price and subject has to carry many cables or other components that can effect subject walking pattern. Accelerometers, gyro-meter, and magnetic sensors are used to measure the patio-temporal gait parameters but again this increase the cost of the gait analysis. In India, it may not be within the budget of most hospitals. So, there is urgent need of an alternative cost effective but reliable system.

Most of the problems can be overcome by optical or imaging measurement techniques. Researchers proposed more affordable quantitative methods based on optical based gait measures using personal computer to obtain important parameters but, this is time consuming. Using this process we are not able to collect kinematic parameters.

Prakash et al. proposed a new simple 2D passive marker-based motion capture Model by using five simple red colored markers with a single camera as show in Fig. 3^[3]. A home based camera is used to record the video of the subject. Each frame is analyzed using pre-processing techniques mentioned in Fig. 3 (d). Once the marker co-ordinates are extracted, a trajectory of marker can be used to extract the gait kinematics (joint angles). Based

on these healthcare professionals can check the progress of the subject.

Researchers also focuses on home monitoring for elders for continuous and unobtrusive assessment of mobility and walking speed in the home. This reduces the casualty because of fall risk assessment of elder adults. Developers are using functional assessment instruments and inexpensive passive infrared motion sensors^[4]. Numerous mobile apps are also available in today's worlds to predict the abnormality in normal gait pattern.

Another limitation is that currently there is no database available for human gait pattern for Indian society. As a future

work we will develop a database for normal and abnormal Indian gait pattern. It will assist the health professional to compare and suggest the better treatment. Currently, the experiment is being preformed in controlled environment, either the walkway is fixed or subject has to carry the hardware, with result in deviation from normal behavior.

Acknowledgment

The authors gratefully acknowledge the support from Department of Science and Technology, India for funding this project.

References

- [1] United nations ESCAP, 2014. Disability-inclusive Disaster Risk Reduction in Asia and the Pacific, Retrieved August 10, 2015.
- [2] M W Whittle, Gait Analysis: An Introduction, 4th Edition, Elsevier, 2007.
- [3] Chandra Prakash, Kanika Gupta, Anshul Mittal, Rajesh Kumar, Vijay Laxmi, Passive Marker Based Optical System for Gait Kinematics for Lower Extremity, Procedia Computer Science, Volume 45, 2015, Pages 176-185, ISSN 1877-0509.
- [4] Howcroft, Jennifer, Jonathan Kofman, and Edward D Lemaire. "Review of Fall Risk Assessment in Geriatric Populations Using Inertial Sensors." Journal of NeuroEngineering and Rehabilitation 10 (2013): 91. PMC. Web. 13 Aug. 2015

About the Authors



Mr. Chandra Prakash is currently Junior Research Fellow (JRF) at MNIT Jaipur. He is pursuing Ph.D. in computer Science Engineering in MNIT Jaipur. He has 4 years of teaching experience in Academics in LPU India. His areas of interests are Gait analysis, Machine Learning, NLP and Data Mining. Mr. Prakash has published 15 paper in international conference and journals. He can be reached at cpiiitm2010@gmail.com.



Dr. Rajesh Kumar [CSI – L150211] presently working as an Associate Professor at Department of Electrical Engineering at MNIT Jaipur. He has been with National University of Singapore as Post Doctorate Research Fellow. He has published more than 200 research articles at peer reviewed International Journal and Conferences more than 60 talks, 4 patents and 1 on-going research project. His area of interests includes bio-inspired algorithms, system prediction models, smart power networks, medical assistive systems and data analysis. He can be reached at rkumar.ee@gmail.com.



Dr. Namita Mittal is presently as Assistant Professor at Department of CSE, MNIT Jaipur since 1996. She is recipient of Career Award for young Teachers. She has published several research papers in reputed international conferences and journals. Her area of interest includes Information Retrieval, Data mining, NLP and DBMS.

MEMORY

Brig. K.G. Behl (Retd.)
Life Member Computer Society Of India [CSI - 7050]

Human memory is part of the brain and is located in the head, But computer memory is part of the system and is wide spread, Memory has been split in computers essentially divided into two, Primary remains built in, but Auxiliary / Secondary outside grew, There is no count for human memory but computer has bytes array, Computer memory is expressed in multiples of 210 , called one K, Memory can be stored in extremely fine and tiny computer chips, It is marvel of electronics that circuits can be set in very thin strips,

Memory is virtually a store house for information and data, From where it could be retrieved without distortion or errata, Surprising though it sounds, computer memory can be cleared, And even without memory certain actions can be steered,

Good memory, as you know, helps in any intelligence test, And only those reach top few, whose memory is generally the best, In ancient times, memory was developed by Yoga and Meditation, And Rishis and Munis attained them by penance of extreme gradation,

The Shlokas and Mantras in those days, were learnt only through memory, Printing was not in vogue, and listening and recitation was only customary,

So knowledge , in olden days, was passed through memory lane, Only selected few attained it, without any fear of theft or brain drain, Abhimanyu's memory, they say, was so very distinguished and sharp, He learnt Chakravyuh in mother's womb and reproduced without any warp,

By 'Dhyana' (Meditation), human memory can be grown like a natural tree, To give vision of past, future or present, to learn intricacies one can't see,

Memory gives extra power to think, in any language programmed to blink, With slight touch of memory , one can reach the highest peak or link,

If some one could combine, computer and human memory together, The hidden secrets of life, would come out adding new feather.



ICT Applications: Objectives, Challenges and Path to Solutions in Social and Personal Context

Mayank Pathak

Associate Professor, Department of Computer Science and Engineering, Technocrats Institute of Technology, Bhopal, India

Bhupendra Verma

Technocrats Institute of Technology Bhopal, Madhya Pradesh, India

Ravindra Patel

Associate Professor, Department of Computer Applications, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

The families, societies, organizations, humanity, civilization, prevailing value-system, moral values and ethics, different cultures are facing radical transformations with the outstanding emergence of extra-wide, global and virtual digital landscape spreaded beyond the geographical and political boundaries. Due to outbreak of this digital revolution, new and varied type of e-mediated relationships, family-ties, communities, social groups, cultures, creativeness, opportunities, possibilities; along with virtual zones, clubs, organizations and personal and business associations are upcoming on the floor. Such type of transformations will lay the mainstay for the coming generations and their surrounding ambience. With these developments, our ambience is getting progressively intelligent, autonomous, gentle, automatic and aesthetic. Furthermore, our interaction experience with digital systems is also becoming more hominine, outstandingly useful, more facilitating, more ergonomic. This digital ecosystem will also nurture e-media mediated many nascent and their own type of virtual business-houses/communities/societies/groups. They gradually get evolved on the basis of their virtual presence, identities, personalities and projections on electronic media and people willingly happen to be member of such communities, societies, business processes as per their own self-choice, self-requirements and self-decision.

How this digital technology can help us to better live in this global digital world with the attributes like safety, security, ownership, honesty and others. Are only making the standards/rules, technological provisions and cyber-laws along with ensuring their abidance will be sufficient enough to transform the digital world into a superior place to be a part of? The past experience does not favour this. Every now and then we come to know about nagging and nefarious

use of digital technology in the form of financial fraud; swindle through spoofing; intentional defamation attempts; attack on privacy and relationships; content-piracy; unauthorized and unwanted spying; collecting and unauthorized sharing of information and data for using it to promote products; breach of common code of conduct etc. Therefore, there is a need of general awareness, catalytic pursuing technological backdrop with a proper conducive environment for positive mind-making and transparent functioning. Specific care must be taken particularly for the adolescents, neophytes, non-tech savvy, physically challenged persons and old-age people who may be victimized easily being more vulnerable. ICT design and development has to incorporate extra-usability issues and look ahead towards exploring other co-related disciplines and alternative designing methodologies/techniques. The ICT field must be able to support, enable and optimize the people in their personal, cognitive and social practices like decision-making, habit-changing, problem-solving, creating, analyzing, learning or performing a skill, generating innovative ideas.

Even if we foresee the not-too-distant futuristic computing and communication environment then it is going to be tightly intermingled physical-virtual pervasive space that is always available, always aware, always active, always accessible, always helping, and always ready to be used. There will be highly diversified assortment of intelligent electronic devices communicating to each-other and to us through range of modalities. In this physical sensory-networked, hyper-connected, bio-physical, psychosocial, cyber-rich ambience, humans are going to create their virtual identities, virtual values and also project their virtual presence. We need to move ahead from user-centred approach to human-centered design in order to exclusively address the higher-level concerns (e. g. societal,

ethical and moral concerns) discussed earlier to steer the entire process and practice resulting more toward 'human' directions. Inarguably, it is only the deeper understanding of the human and their behavioural characteristics that leads us towards making ICT design successful. In order to appropriately facilitate the human-beings with better and much better technical systems, in all respects, human's perceptual abilities/capabilities; memory system and associated patterns/structures; information processing system; problem solving and decision-making process; and finally their sensory motor-process system needs to be deeply understood. Cognitive psychology along with the study of human physiology is the field that lights on all these issues. In order to reveal and understand overall human interactive behaviour with respect to outside world's technical systems some models had been proposed. These models comprehensively describe human's perception through their input/output channels; interpreting and managing the sensory sensations; the human motor processor system; and the cognitive processing i.e. the information processing, problem-solving, learning and decision-making process.

The interaction patterns, behaviour and experience, mediated through such technical systems, directly or indirectly affects and alters peoples personal, organizational and social functioning over a period of time. Considering the today's greater, deeply-influencing, far-reaching and long-lasting impact of use of technical systems on human response and behaviour; frame-of-mind, temperament and attitude creation; personality building; personal and social functioning; social signalling and society building, it was found important to develop a modelling framework for conceptualizing holistic kind of interaction. Holistic interaction design refers to an approach for interaction design in such an elegant

way that promote creativity, productivity, inspiration, belongingness, performance, safety, team-spirit, effective habits, and personal escalation, particularly in relation to individuals' personal requirements, objectives, interests and preferences. It is the speciality of holistic interaction that it contributes towards better social signalling and society building through a robust value system in place. For all this to realize individual's cognitive and perceptual capabilities along with bio-physical capabilities, emotional status, personality characteristics, and situational aspects need to be taken into consideration.

If the computational model can be developed to imitate human's affective and cognitive intelligence through machines then definitely such machines can add a lot to shape up human mind set, habits, approaches, decision making etc. This requires formalization of computational model that determines the affective state of a user may be on

3-dimesional (representing Personality, Emotions and Mood) vector. After identifying this, the model should use its cognitive reasoning to determine and exhibit the personalized and adaptive responses to the user thus making the system a better companion. This way the process of affect detection can facilitate the cognitive development process of the system. With these capabilities the system behaves in hominine way, offers a better personalized experience, increases the user's faith in the system and makes the interaction more natural, entertaining and believable. This type of interfaces can greatly contribute to the betterment of the society in many respects. Since, these interfaces can behave like companion, they can significantly reduce the adverse effect of loneliness, boredom, fatigue which are believed to be responsible for unethical and immoral behavior especially in children, adolescents and old age people. Therefore, it can facilitate the society to be safer, trustworthy and a better place

to live in, by making users more sensible, helpful, responsible and honest.

In summary, as periphery between digital and physical spaces diminishes sharply, there is a need to look forward, beyond the usability issues, towards offering high-quality enchanting holistic interaction environment enriched not only with the abilities of behaving intelligently, autonomous personalization and adaptation but importantly also ensemble persuasive, engaging abilities in the perspective of social signaling, social context, human values and ethics. Emphasis must be given to incorporate the mechanisms to handle digital-technology mediated post-deployment multidimensional effects and consequences occurring during interaction and beyond interaction, in relation to human-human concerns, family-ties, social composition and also to various other stack-holders of society.

About the Authors



Mr. Mayank Pathak did his B.E. in 2001 and then completed his M. Tech. in 2003 in Computer Science and Engineering from SATI, Vidisha, M.P., India. He is Pursuing his Ph.D. in Computer Science and Engineering from Rajiv Gandhi Prodyogiki Vishwavidyalaya, Bhopal, India. He is serving as Associate Professor in Department of Computer Science and Engineering in Technocrats Institute of Technology, Bhopal, India. He has 11 years of teaching experience. He has authored 15 papers, published in journals and conference proceedings. His research area includes Artificial Intelligence, Human Computer Interaction, Soft Computing and Computer Graphics.



Dr. Bhupendra Verma [CSI - 01122904] has done B.E and M.Tech in Computer Science and Engineering from SATI, Vidisha, M.P., India. He has completed his Ph.D. in Computer Science and Engineering from Rajiv Gandhi Prodyogiki Vishwavidyalaya Bhopal in 2008. He has served SATI, Vidisha for the 16 years as faculty member in Computer Science & Engineering and Information Technology departments. Dr. Verma has joined TIT Group of Institutes in 2008 as Director, PG Courses and Research. He has published 52 research papers in journals and conferences. His area of research includes but not limited to Artificial Intelligence, Soft Computing, Computer Security, Evolutionary Computation, Human computer Interaction.



Mr. Ravindra Patel has done Master in Computer Applications from Barkatullah University, Bhopal, India in 1998. He has completed his Ph.D. in Computer Science from Rani Durgawati Vishwavidyalaya, Jabalpur, India. He is Associate Professor in Department of Computer Applications in Rajiv Gandhi Prodyogiki Vishwavidyalaya, Bhopal. He has published 31 papers in journals and conferences. He has more than 12 years of teaching experience. His area of research includes but not limited to Data Mining, Computer Networks, Cyber Security, Human computer Interaction.

Benefits for CSI members: Knowledge sharing and Networking

- Participating in the International, National, Regional chapter events of CSI at discounted rates
- Contributing in Chapter activities
- Offering workshops/trainings in collaboration with CSI
- Joining Special Interest Groups (SIG) for research, promotion and dissemination activities for selected domains, both established and emerging
- Delivering Guest lectures in educational institutes associated with CSI
- Voting in CSI elections
- Becoming part of CSI management committee



ICT in Higher Education of India

C. Rajanandhini

Asst. Prof., Dept. of Electronics and Communication Engineering, Periyar Maniammai University,Vallam,Thanjavur

M. Chandrakumar Peter

Asst. Prof., Department of Software Engineering, Periyar Maniammai University, Thanjavur

A.B. Karthick Anand Babu

Managing Director, KK Infotech, Thanjavur, Tamilnadu

Information and Communication Technologies refers to a system (Hardware or Software) that supports users with information storage, manipulation, retrieval and transmission to others in the digital form. ICT applications are numerous; some of them are agriculture, health, decision making, administration, and education.

This article aims to disseminate some of the notable ICT initiatives by the Higher Education department of MHRD (Ministry of Human Resource Development), Government of India. To utilize the fullest potential of ICT in higher education and to enhance the enrollment in higher education, "National Mission on Education through Information and Communication Technology (NMEICT)" has been envisaged by MHRD. The detailed mission document can be obtained from the mission official website of MHRD^[1]. The constitution of NMEICT offers many benefits to teachers, learners and administrators of all higher education institutions in the form of Computer Assisted Learning(CAL), Virtual Classroom, Virtual Laboratory, Collaborative Learning, Online Learning & electronic learning (e-learning) and so on.

Computer Assisted Learning (CAL)

Computer Assisted Learning is a dynamic and interactive educational method that helps learners to improve their skill set among themselves with the help of computers.

To support this self learning of learners, a programme is initiated under the project title called "Spoken Tutorial". This project is being developed at IIT Bombay for MHRD, Gol. This Project is to support the teaching and learning of Free and Open Source Software (FOSS) such as C/C++, Libreoffice, Scilab , Java, Linux, LaTeX, PHP & MySQL and many other languages to the students of various levels. This spoken tutorial can be accessed at <http://spoken-tutorial.org/>.

Virtual Classroom

Virtual classroom refers to Online/ Web based Classroom that allows learners to

share their knowledge with one another in the form of text/audio/video and other mode of interaction.

To offer this kind of facilities to the learner of our country, a platform (operating system) independent with scalable content-delivery tool for web based e-learning system is designed in the name of "Brihaspati" (visit : <http://202.141.40.215:8080/brihaspati/servlet/brihaspati>).

In addition to the 'Brihaspati', Virtual Classroom is another notable application for E-Learning, supported by Ministry of Communication & Information Technology , Govt. of India. This application aims to aid the Educational Institution towards better mentoring for their distance education learning programme. The kind of infrastructure offers and facilitates the quality of Education and Research at State and National Level educational institutions. (for more information <http://virtualclassroom.nic.in/> and <http://vle.du.ac.in/>)

Virtual Laboratory

Virtual Laboratory is defined as "an interactive environment for creating and conducting experiments in a simulated environment"^[2]". It offers many features that include reduction in physical distance, resource optimization, knowledge sharing and a cost effective solution to theoretical implementation.

<http://www.vlab.co.in/index.php>, offers this virtual laboratory facility in science and engineering discipline to the teaching and learning community of under graduate, post graduate and research scholars. Experiments for various categories and subjects for this laboratory are supported by various premier institutes^[3].

Collaborative Learning

Collaborative learning refers to teaching or interacting with large number of learners and teachers that go beyond the geographical location through live AV (Audio Video) streaming with synchronized content sharing.

To support this collaborative learning,

AMRITA University along with IIT Bombay designed an interactive e-learning system called A-VIEW (Amrita Virtual Interactive e-Learning World) under NMEICT.

A-VIEW is now deployed at several higher educational institutions towards sharing of knowledge. (AVIEW can be accessed and downloaded at <http://aview.in/>)

Online Learning & electronic learning

Online learning refers to usage of web in learning environment^[4]. E-learning involves the "usage of electronic gadgets for teaching and learning "^[5].

This Online and E-learning is now offered to the learners and teachers through National Programme on Technology Enhanced Learning (NPTEL). NPTEL is a joint initiative of the IITs and IISc. It offers learning material in the form of Videos, Animations and Text. It also offers online courses and certification in various topics to support the all kind of learners thereby to eradicate the digital divide.

Conclusion

Information and Communication Technologies (ICT) is going to play a pivotal role in the years to come particularly in the domain of education. ICT will not be able to replace a teacher or a learner but it will aid teacher and learner for better knowledge representation. It is in the hand of educators and learners to utilize these technologies towards their betterment also for the future generation thereby building a cent percent literate society.

References

- [1] http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/MissionDocument.pdf
- [2] <http://pages.cpsc.ucalgary.ca/~pwp/bmv/vlab-for-linux/html-docs/environment.html>
- [3] <http://www.vlab.co.in/>
- [4] <http://www.ed.ac.uk/studying/postgraduate/degree-guide/online-learning/about>
- [5] <http://www.derekstockley.com.au/elearning-definition.html>

■ COVER STORY ■

About the Authors



Ms. C. Rajanandhini [CSI- 01069781] is presently working as Asst. Prof. in the Dept. of Electronics and Communication Engineering, Periyar Maniammai University,Vallam,Thanjavur. Her area of interest is Digital image Processing and Mobile Computing.



Mr. M. Chandrakumar Peter is Assistant Professor, Department of Software Engineering, Periyar Maniammai University, Thanjavur. His area of interest includes Mobile Computing, Hardware Reuse and e-learning.



Mr. A.B. Karthick Anand Babu [CSI-01069790]is presently working as Managing Director, KK Infotech, Thanjavur, Tamilnadu. He has rich experience in teaching and software development. He can be reached at : karthickanandbabu.ab@gmail.com.

(ADVERTISING TARIFF)

Rates effective from April, 2014



Computer Society of India™

Unit No. 3, 4th Floor, Samruddhi Venture Park, MIDC, Andheri (E), Mumbai-400 093

Tel. 91-22-2926 1700 • Fax: 91-22-2830 2133

Email: hq@csi-india.org

CSI - Communications

COLOUR

Colour Artwork (Soft copy format) or positives are required for colour advertisement

Back Cover	Rs. 50,000/-
Inside Covers	Rs. 40,000/-
Full Page	Rs. 35,000/-
Double Spread	Rs. 65,000/-
Centre Spread (Additional 10% for bleed advertisement)	Rs. 70,000/-

MECHANICAL DATA

Full Page with Bleed 28.6 cms x 22.1 cms

Full Page 24.5 cms x 18.5 cms

Double Spread with Bleed 28.6 cms x 43.6 cms

Double Spread 24.5 cms x 40 cms

Special Incentive to any Individual/Organisation for getting sponsorship **15% of the advertisement value**

Special Discount for any confirmed advertisement for 6 months **10%**

Special Discount for any confirmed advertisement for 12 months **15%**

All incentive payments will be made by cheque within 30 days of receipt of payment for advertisement.

All advertisements are subject to acceptance by the editorial team.

Material in the form of Artwork or Positive should reach latest by 20th of the month for insertion in the following month.

All bookings should be addressed to :

Executive Secretary

Computer Society of India™

Unit No. 3, 4th Floor, Samruddhi Venture Park, MIDC, Andheri (E), Mumbai-400 093

Tel. 91-22-2926 1700 • Fax: 91-22-2830 2133 Email: hq@csi-india.org



Hyperspectral Image Denoising and Unsupervised Classification

B. Saichandana

Asst. Professor, Department of CSE, GIT,
Gitam University, Visakhapatnam

K. Srinivas

Prof., Dept. of Computer science and Engineering,
VR Siddhartha Engineering College, Vijayawada

Introduction

The process of acquiring information about an object on the earth using satellites without making any physical contact is called remote sensing. The classification of objects on the earth by using electromagnetic radiations reflected or emitted by the surface is the main goal of remote sensing technology. New opportunities to use remote sensing data have arisen, with the increase of spatial and spectral resolution of recently launched satellites. In remote sensing, sensors are available that can generate hyperspectral data, involving many narrow bands in which each pixel has a continuous reflectance spectrum. Unsupervised image classification is an important research topic in hyperspectral imaging, with the aim to develop efficient algorithms that provide high classification accuracy.

Hyperspectral remote sensors collect image data for a large number of narrow, adjacent spectral bands. Every pixel in hyper spectral image involves a continuous spectrum that is used to classify the objects with great detail and precision. This article presents hyperspectral image denoising mechanism using Empirical Mode Decomposition (EMD) and genetic algorithm for unsupervised classification of hyperspectral image. 2-D Empirical mode decomposition method is used to divide the hyperspectral image belonging to each band into finite number of components called Intrinsic Mode Functions (IMF). The last component is called residue. As the first IMF contains high frequency component, it is filtered using wavelet based denoising method. The summation of this filtered first IMF and remaining IMFs gives the denoised image in each band. This reconstructed hyperspectral image bands are used for classification using Genetic Algorithm (GA). This denoising mechanism increases the classification accuracy of hyperspectral images.

2-D Empirical Mode Decomposition

Empirical mode decomposition^[1] is a signal processing method that nondestructively fragments any non-linear and non-stationary signal into oscillatory functions by means of a mechanism called shifting process. These oscillatory functions are called Intrinsic Mode Functions (IMF), and each IMF satisfies two properties, (a) the number of zero crossings and extrema points should be equal or differ by one. (b) Symmetric envelopes (zero mean) interpret by local maxima and minima. The signal after decomposition using EMD is non-destructive means that the original signal can be obtained by adding the IMFs and residue. The first IMF is a high frequency component and the subsequent IMFs contain from next high frequency to the low frequency components. The shifting process used to obtain IMFs on a 2-D signal (image) is summarized as follows:

- Let $I(x,y)$ be a image used for EMD decomposition. Find all local maxima and local minima points in $I(x,y)$.
- Upper envelope $Up(x,y)$ is created by interpolating the maxima points and lower envelope $Lw(x,y)$ is created by interpolating minima points. This interpolation is carried out using cubic spline interpolation method.
- Compute the mean of lower and upper envelopes denoted by $Mean(x,y)$.

$$Mean(x,y) = \frac{(Up(x,y) + Lw(x,y))}{2}$$

- This mean signal is subtracted from the input signal.

$$Sub(x,y) = I(x,y) - Mean(x,y)$$

- If $Sub(x,y)$ satisfies the IMF properties, then an IMF is obtained.

$$IMF_i(x,y) = Sub(x,y)$$

- Subtract the extracted IMF from the input signal. Now the value of $I(x,y)$ is

$$I(x,y) = I(x,y) - IMF_i(x,y)$$

Repeat the above steps (b) to (f) for the generation of next IMFs.

- This process is repeated until $I(x,y)$ does not have maxima or minima points to create envelopes.

Original Image can be reconstructed by inverse EMD given by

$$I(x,y) = \sum_{i=1}^n IMF_i(x,y) + res(x,y)$$

Image Denoising using EMD

The mechanism of denoising using EMD is summarized as follows

- Apply 2-D EMD for each band in the hyper spectral image to obtain IMF_i ($i=1, 2, \dots, k$). The k^{th} IMF is called residue.
- The first intrinsic mode function (IMF_1) contains high frequency components and it is suitable for denoising. This IMF_1 is denoised with wavelet threshold method presented in^[2]. This denoised IMF_1 is represented with $FIMF_1$.
- The new band is reconstructed by the summation of $FIMF_1$ and remaining IMFs given by

$$RI = FIMF_1 + \sum_{i=2}^k IMF_i$$

Where RI is the reconstructed band.

- Perform classification using GA.

Genetic Algorithm

Genetic Algorithms (GA)^[3] belong to the class of evolutionary algorithms that are based on principles of natural selection and genetics. It is a search technique used in computing true solutions to optimization problems that is driven by natural evolution process. GA performs parallel search of the solution space rather than point by point search. Genetic Algorithm consists of three operators namely, Selection, Crossover and Mutation. The Genetic Algorithm mechanism can be abstracted as follows.

a) The initial population of solutions is randomly generated across the search space.

b) Using an objective function, the fitness of each individual solution in the population is evaluated.

c) Using this fitness values, the solutions in the population are selected. The measure of problem solving ability by an individual in the population is determined by its fitness value.

d) New population is created from selected solutions using the crossover and mutation operators. This new population has more problem solving ability.

e) The new population is replaced instead of old population.

f) Repeat iteratively from (b) to (e) until a stop criterion is satisfied. Each iteration of this GA process is called generation.

Image Classification using GA

The Genetic Algorithm is applied as follows.

a) Assume P chromosomes in the population where P is the size of the population. Each chromosome is encoded

with K cluster centers that are randomly selected from the image.

b) Using an objective function, the fitness value of each chromosome is evaluated. Different indices, such as cluster distance, separation index, Fuzzy C-Means, K-means (KMI), Davies-Bouldin Index (DBI), and Xie-Beni Index (XBI) are used as objective functions. The k-means index^[4] is used as the objective function in this GA process. The k-means index (KMI) is defined as

$$KMI = \frac{1}{\sum_{k=1}^K \sum_{i=1}^N \|x_i - v_k\|^2}$$

Where K number of clusters and V_k is the cluster centers

c) The selection of chromosomes is done based on the fitness value using roulette wheel technique.

d) By applying crossover and mutation operators with rate 0.8 and 0.07, a new population is produced from the parents. This new population replaces the old population.

e) Maximum number of iterations is used as stopping criteria.

After the execution stops, the highest fitness value chromosome is selected and the values in this chromosome represent the solution to the classification of image.

The algorithm is tested on Pavia University hyperspectral image data set^[4]. The data set contains 103 spectral bands and image in each band consists of 610*340 pixels. The result is shown in Fig. 1

Conclusions

This article presents a mechanism for increasing the accuracy of GA based unsupervised classification. First 2-D EMD is used for dividing each hyperspectral image band in to IMFs. The first IMF is denoised using wavelet and the summation of remaining IMFs with denoised IMF gives more accurate results in the output of classification algorithm on hyperspectral image.

References

- [1] B Saichandana, et al., "Clustering Algorithm Combined with Empirical Mode Decomposition for Classification of Remote Sensing Image", IJSER, volume 5, issue 9, sep 2014, pp. 686-695.
- [2] Anutam and Rajni, "Performance Analysis of Image Denoising with Wavelet Thresholding Methods for different Levels of Decomposition", The International Journal of Multimedia and its applications, vol6, No.3, June 2014, pp 35-46.
- [3] J Holland, Adaptation in Natural and Artificial Systems. Ann Arbor, MI: Univ. of Michigan Press, 1975.
- [4] http://www.ihu.eus/ccwintco/index.php?title=Hyperspectral_Remote_Sensing_Scenes

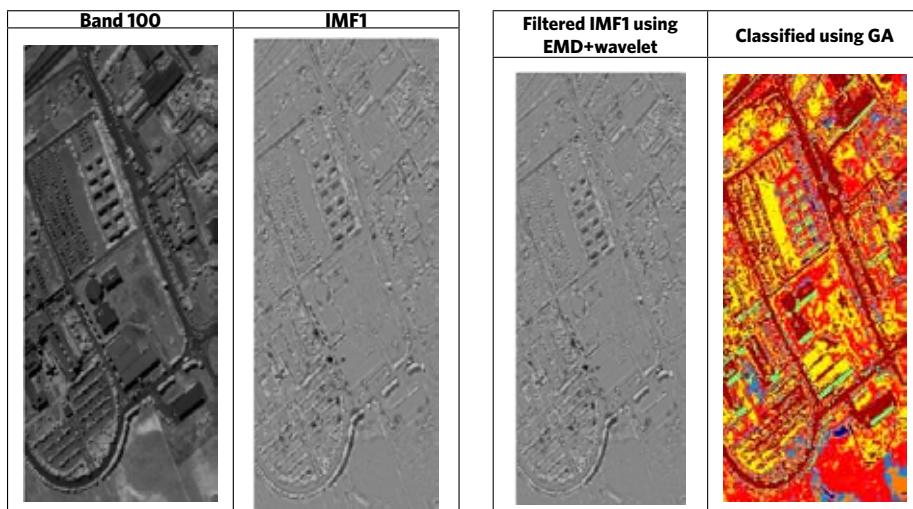


Fig. 1: Denoising and Classification on hyperspectral image

About the Authors



Ms. B. Saichandana [CSI- I1500881] is currently working as Assistant professor in the Department of CSE, GIT, GITAM University. She received B.Tech and M.Tech degree from JNTU Hyderabad and Andhra University in the year 2005 and 2007 respectively. Her research interest include image classification, pattern recognition etc. Currently she is pursuing Ph.d from JNTU Kakinada. She can be reached at bschandana@gmail.com.



Dr. K. Srinivas is working as Prof., Department of Computer science and Engineering, VR Siddhartha Engineering College, Vijayawada. He received MCA, M.Tech and Ph.d degrees from Andhra University, JNTU Kakinada and Acharya Nagarjuna University. His research interest include image processing and bioinformatics.



Extensions to the K-means Algorithm for Segmentation of cDNA Microarray Images

P. V. Lakshmi

Prof. and BOS chairman, Dept. of Information Technology,GITAM University, Visakhapatnam

J. Harikiran

Asst.Professor, Dept. of IT, GIT, GITAM University, Visakhapatnam

Introduction

By using Microarray technology, in a single experiment one can study the function of thousands of genes in parallel. Microarrays are used in various applications like disease diagnosis, drug discovery and bio-medical research. A Microarray image contains thousands of spots and each of the spot contains multiple copies of single DNA sequence. The analysis of microarray image is done in three stages: gridding, segmentation and information extraction. The microarray image analysis takes the spot intensity data as input and produces the spot metrics as output which are used in classification and identification of differently expressed genes. The intensity of each spot indicates the expression level of the particular gene^[1]. This article presents different clustering algorithms which extend the k-means algorithm for segmentation of microarray image. These algorithms are more efficient than k-means in segmenting the spot area, thus producing more accurate expression-ratio.

K-means Algorithm

The k-means clustering algorithm^[2] for segmentation of microarray image is described as follows:

1. Randomly consider K initial clusters {C₁, C₂,...,C_k} from the m*n image pixels {I₁, I₂, I₃,...,I_{m*n}}.
2. Assign each pixel to the cluster C_j {j=1,2,...,K} if it satisfies the following condition

$$D(I_i, C_j) < D(I_i, C_q), q = 1, 2, \dots, K$$

$$j \neq q$$

Where D(., .) is the Euclidean distance measure between two values.

3. Find new cluster centroid as follows

$$C_i^{\wedge} = \frac{1}{n_i} \sum_{I_j \in C_i} I_j, i = 1, 2, \dots, K$$

Where n_i is the number of pixels belonging to cluster C_i.

4. If

$$C_i^{\wedge} = C_i, i = 1, 2, \dots, K$$

Then stop.

Else continue from step 2.

K-medoids Algorithm

The k-medoids clustering algorithm^[3] for segmentation of microarray image is described as follows:

1. Randomly consider K initial medoids {M₁, M₂,...,M_k} for the clusters {C₁, C₂,...,C_k} from the m*n image pixels {I₁, I₂, I₃,...,I_{m*n}}.
2. Assign each pixel to the cluster C_j {j=1,2,...,K} if it satisfies the following condition

$$D(I_i, M_j) < D(I_i, M_q), q = 1, 2, \dots, K$$

$$j \neq q$$

Where D(., .) denotes the dissimilarity measure.

3. Find new medoids M_i[^] belonging to clusters C_i, i = 1, 2, ..., K. It is the pixel value with minimum total dissimilarity to all other points.

4. If

$$M_i^{\wedge} = M_i, i = 1, 2, \dots, K$$

Then stop.

Else continue from step 2.

K-modes Algorithm

The k-modes clustering algorithm^[3] is similar to k-medoids where modes are used instead of medoids. The K-modes algorithm for segmentation of microarray image is described as follows:

1. Randomly consider K initial modes {MO₁, MO₂,...,MO_k} for the clusters {C₁, C₂,...,C_k} from the m*n image pixels {I₁, I₂, I₃,...,I_{m*n}}.

A mode is a pixel value with in a cluster that is repeated more often

than any other value.

2. Assign each pixel to the cluster C_j {j=1,2,...,K} if it satisfies the following condition

$$D(I_i, MO_j) < D(I_i, MO_q), q = 1, 2, \dots, K$$

$$j \neq q$$

Where D(., .) denotes the dissimilarity measure.

3. Find new medoids MO_i[^] belonging to clusters C_i, i = 1, 2, ..., K.

4. If

$$MO_i^{\wedge} = MO_i, i = 1, 2, \dots, K$$

Then stop.

Else continue from step 2.

Fuzzy K-means Algorithm

The Fuzzy k-means clustering algorithm^[4] for segmentation of microarray image is described as follows:

1. Randomly consider K initial clusters {C₁, C₂,...,C_k} from the m*n image pixels {I₁, I₂, I₃,...,I_{m*n}}.
2. The membership matrix u_{ij} is initialized with value from 0 to 1 and value of m=2. The summation of pixel memberships representing particular cluster should be equal to 1.
3. Assign each pixel to the cluster C_j {j=1,2,...,K} if it satisfies the following condition

$$u_{ij}^m D(I_i, C_j) < u_{iq}^m D(I_i, C_q), q = 1, 2, \dots, K$$

$$j \neq q$$

Where D(., .) is the Euclidean distance measure between two values.

4. Find new membership and cluster centroid values as follows

$$u_{ik} = \frac{1}{\sum_{j=1}^K \left(\frac{D(C_i, I_k)}{D(C_j, I_k)} \right)^{\frac{1}{m-1}}}, \text{ for } 1 \leq i \leq K$$

u_{ik} denotes the kth object in the ith cluster.

$$C_j^{\wedge} = \frac{\sum_{j=1}^n u_{ij}^m I_j}{\sum_{j=1}^n u_{ij}^m}$$

$$u_{ik} = \frac{1}{\sum_{j=1}^K (\frac{D(M_i, I_k)}{D(M_j, I_k)})^{\frac{1}{m-1}}} \text{ for } 1 \leq i \leq K$$

u_{ik} denotes the k^{th} object in the i^{th} cluster.

4. Continue 2-3 until each object is assigned to the cluster that has maximum membership.

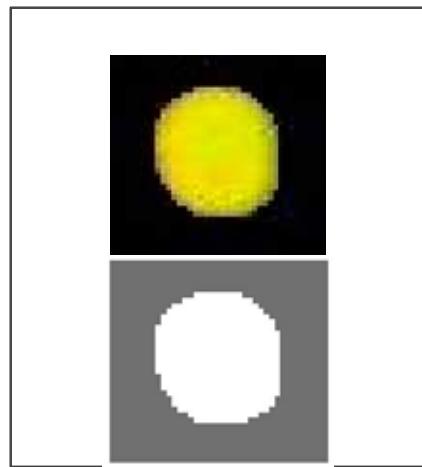


Fig. 1: Fuzzy K-means clustering

Conclusions

Microarray technology provides simultaneous monitoring of thousands of gene expression levels. The main steps in microarray image analysis are gridding, segmentation and information extraction.

5. Continue 2-3 until each object is assigned to the cluster that has maximum membership.

Fuzzy K-medoids Algorithm

Segmentation

The Fuzzy k-medoids^[3] clustering algorithm is the extension of fuzzy K-means algorithm replacing means by medoids. The algorithm for segmentation of microarray image is described as follows:

1. Randomly consider K initial medoids $\{M_1, M_2, \dots, M_K\}$ for the clusters $\{C_1, C_2, \dots, C_K\}$ from the $m \times n$ image pixels $\{I_1, I_2, I_3, \dots, I_{m \times n}\}$.
2. Assign each pixel to the cluster C_j $\{j=1, 2, \dots, K\}$ if it satisfies the following condition

$$u_{ij}^m D(I_i, M_j) < u_{iq}^m D(I_i, M_q), q = 1, 2, \dots, K$$

$$j \neq q$$

Where $D(\cdot, \cdot)$ denotes the dissimilarity measure.

3. Find new membership and cluster medoid values.

About the Authors



Dr. P. V. Lakshmi [CSI-I1503032] is professor and BOS chairman in the Dept. of Information Technology, GITAM University, Visakhapatnam. She has 22 years of teaching experience. She has authored book, several book chapters and research papers in International Conferences and Journals. Her research areas include Cryptography, Algorithms in Bioinformatics, Network Security and other areas. She can be reached at pvl.7097@gmail.com.



Mr. J. Harikiran, working as Asst. Professor, Dept of IT, GIT, GITAM University. He has authored 20 research papers in International conferences and Journals. He can be reached at jhari.kiran@gmail.com.



Congratulations !!!

Dr. G. Satheesh Reddy, SA to Raksha Mantri was conferred with the Honorary Degree of Doctor of Science (D.Sc. h.c.) by Amity University, Noida and Jawaharlal Nehru Technological University Kakinada (JNTUK), India in recognition of his significant national contributions to Defence Science and Technology.

Clustering algorithms that are extensions to K-means are used for segmentation of microarray image. The output of Fuzzy K-means clustering algorithm is shown in Fig. 1. Log ratio of R/G gives the abundance of expression level of the corresponding gene.

References

- [1] Dr. P V lakshmi and J Harikiran, "Unsupervised method for cDNA Microarray Analysis", CSI Communications -Data Mining, volume 39, Issue 7, October 2015, pp 22-23.
- [2] D RamaKrishna, et.al, "Various versions of K-means clustering algorithm for segmentation of microarray image", International Journal of Electronics Communication and Computer Engineering, volume 4, issue 1, pp.113-116.
- [3] M Anirban, et.al., "Multiobjective Genetic Algorithm based Fuzzy Clustering of Categorical Attributes", IEEE transactions on Evolutionary Computing, volume 13, number 5, pp.991-1005.
- [4] J Harikiran, et al., Multiple Feature Fuzzy C-means clustering algorithm for segmentation of microarray image", Internatonal journal of Electrical and Computer Engineering, vol 5, 2015.

Retention of Quality for Sustainability of an Industry in Industrial Market Dynamics

Suma V.

Professor, Dept. of Info. Sc. and Engg,
Dayananda Sagar College of Engineering, Bangalore

Evolution of mankind has consistently shown an exponential growth curve both in terms of intellectual abilities and in the field of Science and Technology. One such instance is origin of software to aid in reduction of human efforts. Since then, software has evolved from its most preliminary abilities such as calculation of addition in earlier days to today's high performance computation in order to explore unknown science. Further, advancement of technology has led software to be one of the basic components of any system. Hence, software has laid its impact on all applications which includes agriculture, health care, commerce, educational, defence and so on. Due to varied benefits of software, it has become one of the most essential components in all applications developed in any industry. Consequently, attainment of total customer satisfaction, which is only mode of industry existence, is

achievable through development of high quality software. Therefore, industries comprising of both manufacturing systems and software development organizations strive towards retention of high quality in software. Need for retention of quality in industrial market is depicted in Fig. 1.

Conception of quality was first seeded by Philips Crosby^[1]. It has become so prominent since then, that without quality anything which is existing or created becomes a total waste. However, it is worth to recall that quality is not a state but a continual process. Anything related to quality needs to be measured as quality is quantifiable unit.

However, quality can be perceived from various dimensions, viz., Product Quality, Process Quality and People Quality. Product Quality is measured in terms of total number of defects that exists in the product. Henceforth, production of product (hardware components or software products) with zero or

minimal defects enables one to achieve quality. However, quality of the product can yet be perceived through various quality attributes such as, availability, likeability, adaptability, interoperability, maintainability, sustainability, reliability, controllability, observability, operability, visibility, testability, understandability, simplicity, recoverability, performance, efficiency to mention a few. Thus, every employee of an organization should consistently strive to achieve product quality by ensuring development of every product with the aforementioned quality attributes. Though, there is always threat for synergy, trade off and other such product associated constraints, it is always a best practise to develop the product having required minimum quality attributes to a desirable level, which surely results in production of high quality product.

Thus, it is vital to ensure that every major stake holder and highly potential stake holders are completely satisfied when they purchase the products^[3]. Nevertheless, quality of the product cannot be achieved without an effective and efficient process. Hence, quality of the process becomes one of the mandatory facets of quality attainment in the end product.

Process quality can be assured through certification programmes and through adherence to standards, compliance with specifications and also through metric evaluation techniques. Further, process quality includes quality control and quality assurance techniques. Testing the product is a quality control activity while walkthrough, review and inspection are deemed to be quality assurance techniques. Quality control is for product while quality assurance is a quality check gateway for the process. An interesting but proven aspect of quality is that inspection enables one to detect most of the static defects and

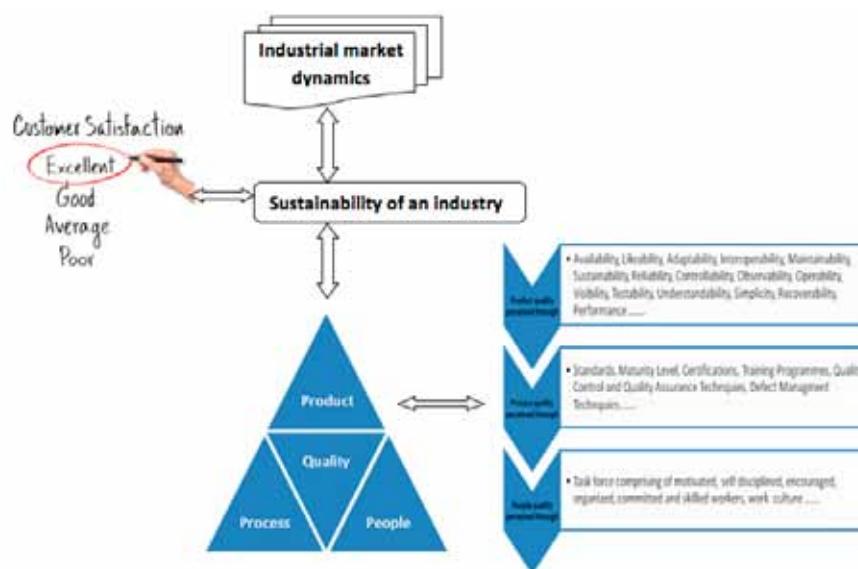


Fig. 1: Need for retention of quality in industrial market

hence if strictly followed, it reduces time required to test and eliminate defects^{[4][5]}. Hence, every employee in an organization consistently needs to contribute by following certification standards of their organization during developmental activities. Validation of end products for customer acceptance and further development process should ensemble with best practises in order to keep their contributing curve to exponentially grow.

It is worth to once again recall the fact that sustainability of any industry in this market dynamics having high end competition is possible only with retention of total customer satisfaction, which in turn is achieved through generation of high quality products. But, quality in a product can be realized only through qualitative process. However, process is driven by people.

Therefore, quality accomplishment is completely oriented and modulated by the task force of extremely motivated, self disciplined, encouraged, organized, committed and skilled workers^{[6][7]}. Thus, every personnel in the industry need to work with same zeal and penchant to achieve high quality in their production systems as the industrial atmosphere demands total customer satisfaction in every product released to the market.

Yet another significant factor which draws ones attention towards generation of high quality product is to ascertain zero defects or minimal number of defects. Defect is defined as any imperfection or flaw or mistake found either in the product or in the process of developing the product^[8]. Unfortunately, defect has an intrinsic nature of swelling itself while propagating thereby alerting one with the fact that defect too is not a state but a continual process. Thus, effective defect management is one of the core activities of any industry. This is because of the actuality that

every customer reported defect is very expensive in terms of rework pertaining to cost, time, efforts and other such resources. There exists several defect management techniques such as defect removal techniques, defect prevention and defect prediction techniques which has gained their significance as one of the mandatory strategies in any organization^[9]. Hence, every employee should work with a single focal mind that they eliminate every defect if injected as near to its origin and worse in the shop floor before deployment to the customers in the field.

Current trend in the industrial sectors has directed their focus towards metrics and measurements as one of the modes through which quality can be perceived. Metric and measurement are used as indicators of the quality of product, the process and people as well to reflect maturity level of the organization^[10]. Consequently, every quality gate has to be meticulously inspected and non-compliance has to be converted to compliance by adhering to above-mentioned core principles of organization and by following quality policies and best practices. It is certainly possible to produce every product which is of high quality and which leads towards total customer satisfaction. Further, adherence to quality polices also yields increase in productivity and reflects continual process improvement.

References

- [1] Philip B Crosby, Quality without Tears, McGraw-Hill Book Company, 1984, pp. 64.
- [2] Stephen H Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley publisher, Edition 2, Boston, MA, USA, 2003.
- [3] Gerald M Weinberg, Quality Software Management: Systems Thinking, Dorset House publisher, 1997, ISBN-13: 978-0932633224.
- [4] Denger Christian and Forrest Shull, A Practical Approach for Quality-Driven Inspections, IEEE Software Journal, Vol. 24, No. 2, pp. 79-86, 2007.
- [5] T R Gopalakrishnan Nair, Suma. V, "Impact Analysis of Inspection Process for Effective Defect Management in Software Development", Software Quality Professional Journal, American Society for Quality (ASQ), USA, Vol. 12, Issue 2, 2010.
- [6] Watts S Humphrey, Introduction to the Team Software Process, SEI Series in Software Engineering, Addison Wesley Longman Inc publisher, July 2004, ISBN 02014771X.
- [7] Watts S Humphrey: Introduction to the Personal Software Process, SEI Series in Software Engineering, Addison Wesley Longman Inc publisher, August 2004, ISBN: 0201548097.
- [8] Stefen Biffl and Michael Halling, Investigating the Defect Detection Effectiveness and Cost Benefit of Nominal Inspection Teams, EEE Transactions on Software Engineering, Vol. 29, No. 5, 2003, pp. 385-397.
- [9] V Suma, T R Gopalakrishnan Nair, "Better Defect Detection and Prevention Through Improved Inspection and Testing Approach in Small and Medium Scale Software Industry", International Journal of Productivity and Quality Management (IJPQM), InderScience Publishers, USA, Vol.6, No. 1, 2010, pp. 71-90.
- [10] David F Rico, (Forward by Roger S Pressman): ROI of Software Process Improvement Metrics for Project Managers and Software Engineers, J Ross Publishers, 2004, ISBN: 1-932159-24-X.

About the Author



Dr. Suma V. [CSI - 01150179] is currently working as Professor in Dayananda Sagar College of Engineering, Bangalore, India. She holds a B.E., M.S. and PhD in CSE. She has vast experience spread across Industry, Academics and R&D. She has published several International publications and an invited author for an International book chapter. She is listed in various International Biographical centres and recipient of various recognition awards. She can be reached at sumavdsce@gmail.com.

Social Network Analysis and Visualization using Gephi

Prajakta S. Vispute

Asst. Prof., Dept. of IT, K K Wagh Institute of Engineering Education and Research, Nashik

Shirish S. Sane

Vice Principal, Prof. & Head, Dept. of Computer Engineering, K K Wagh Institute of Engineering Education and Research, Nashik

With the increase use of social media, the Social Network is growing rapidly. To work with such huge networks, different graph mining tools are available. Visualizing and analyzing of these graphs is a vital task. Gephi is one of the useful and open source tools for visualizing these kinds of graphs. A network can be represented by a graph where an individual or group will be represented by a node (or a vertex) and interaction between them will be represented by an edge. This kind of network can be heterogeneous in nature i.e. a node is connected to another node (or nodes) of different social media types (ex. Twitter, Facebook, what's up etc.)

Gephi is network exploration and manipulation software. Gephi can be downloaded from <http://gephi.org>. Gephi was initially released in 2008 with the version 0.6a1 and currently Gephi 0.8.2-beta version is in use. One can import, filter, spatialize, modify, visualize and export variety of networks using Gephi. It can work with small as well as large networks (Up to 50,000 nodes).

Gephi is developed in Java and thus it is platform independent application. It can work on Windows, Linux and Mac. Gephi provides perhaps the fastest graph visualization engine, which is useful for pattern finding and better understanding of the graph. It works with all types of networks such as directed, undirected or mixed types of networks.

The screen is divided into different panels, providing options to open a new project or a sample project or one of the recent projects.

To work with New project, Gephi needs a database. Fig. 2 shows sample dataset

"Les Misérables.gexf". This dataset consists of 77 nodes and 254 edges.

The window provides all the details of the graph. On the right upper corner the no. of nodes and the edges are given. Gephi can even import standard

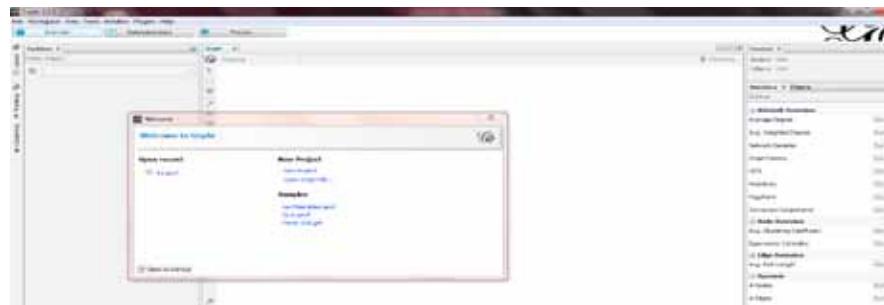


Fig. 1: Initial screen of Gephi

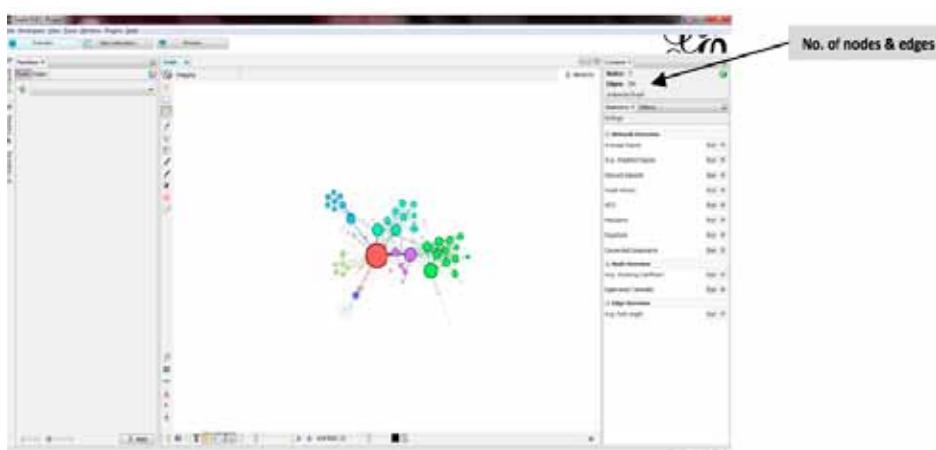


Fig. 2: Screen after opening the dataset "Les Misérables.gexf"

graph file formats like GEXF, GraphML, Pajek NET, GDF, GML, GraphViz DOT, UCINET DL, Tulip TLP, CSV, Netdraw VNA, Spreadsheet etc. Based on the application and visualization needs, one can choose the format to encode the data. For example, the CSV provides lowest functionality support to a graph as it works with edge list or matrix structure and edge weight whereas GEXF file format provides the highest functionalities, as it works with XML structure, edge weight, attributes, visualization attributes, attribute default value, hierarchical graphs, dynamic graphs etc. Thus it is recommended using GEXF file format.

Gephi generates files in CSV, GDF, GEXF, GraphML, Pajek NET, Spreadsheets, PDF and SVG.

Gephi works with three types of data: nodes, edges and attributes. An attribute has name and value and may be associated with the nodes or edges.

Gephi works in three modes viz. overview mode, data laboratory mode and preview mode.

In overview mode (Fig. 3), variety of manipulations on the graph may be carried out. The different subsections in the overview mode are:

Partition: This mode partitions the graph into smaller components as per partitioning parameters.

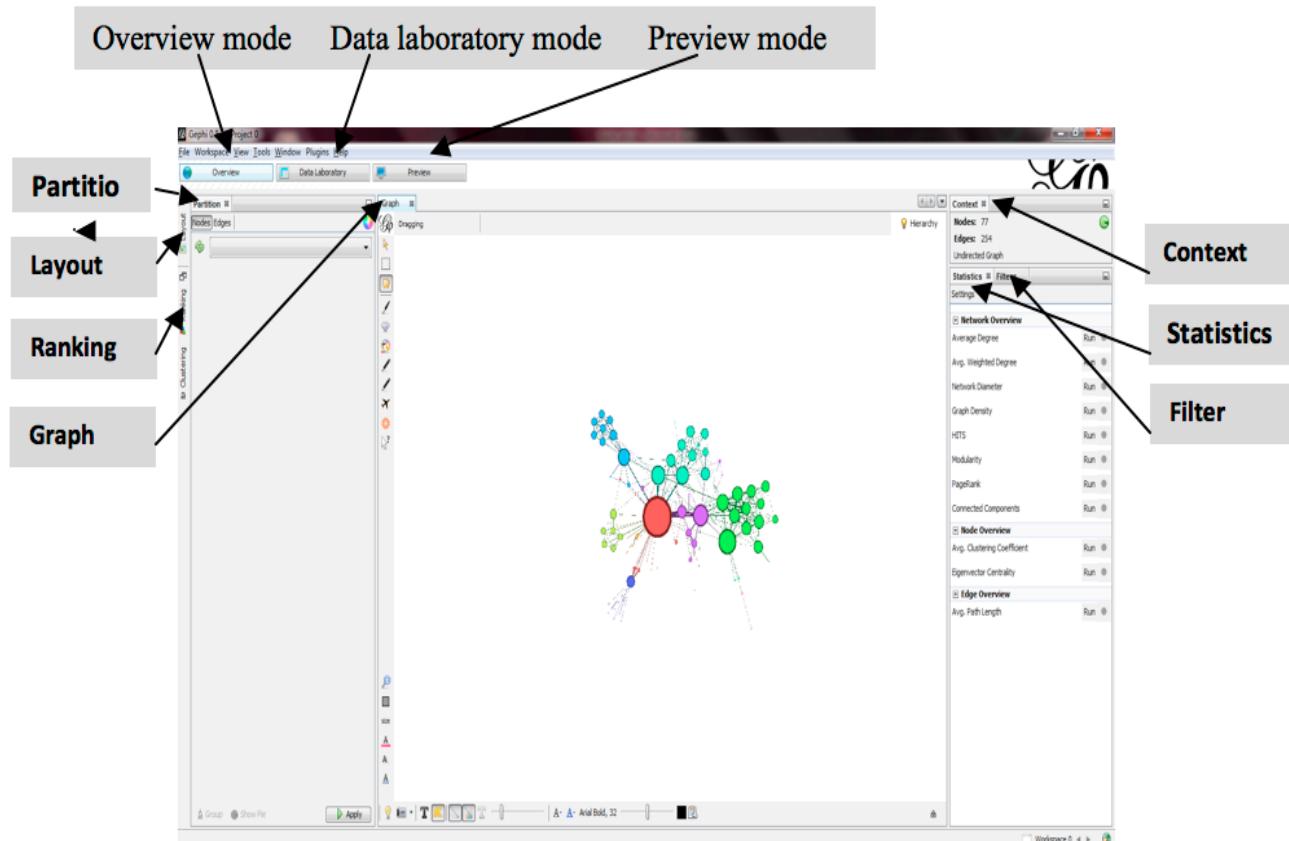


Fig. 3: Gephi in overview mode

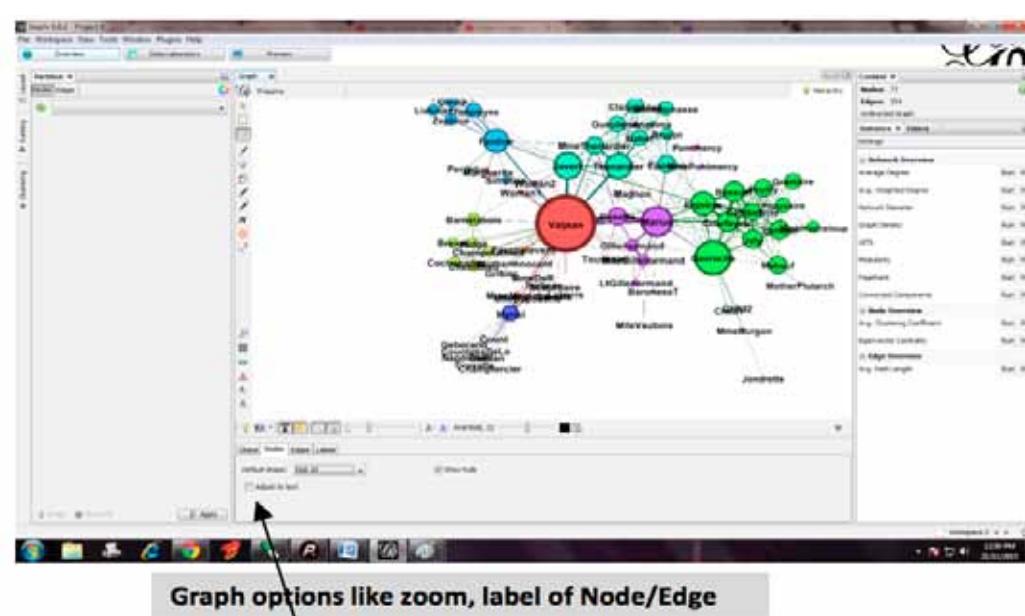


Fig. 4: Screen shot showing Filtering options

Ranking: This mode ranks the nodes of the graph using parameters such as degree, modularity class edge weight and so on.

Layout: In this mode, a graph can be visualized in different ways using numerous graph layout algorithms like Force Atlas, Fruchterman Reingold, and Yifan Hu.

Graph: In this panel basic graph modification operations are listed such as resizing, coloring, labeling a node etc.

Context: Context provides the basic properties of the graph i.e. the type of graph, number of nodes and edges etc.

Statistics: This panel

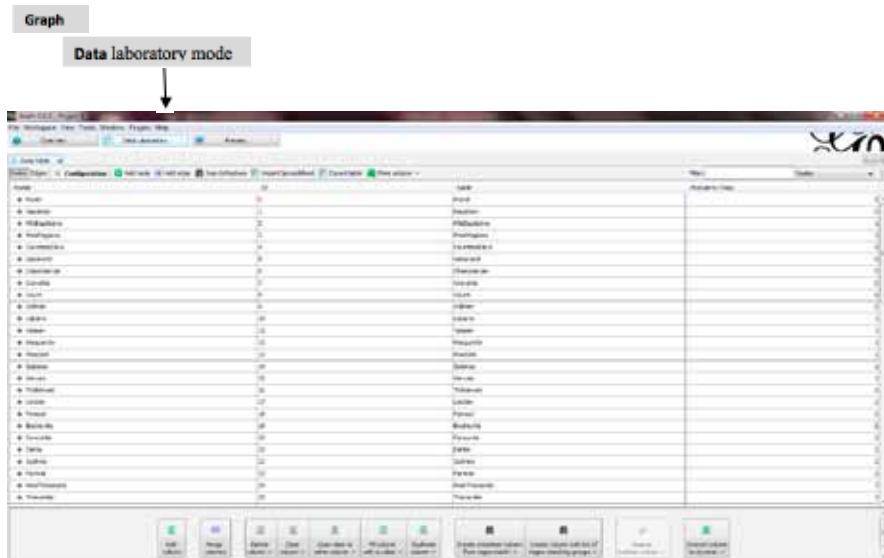


Fig. 5: Gephi in Data Laboratory Mode

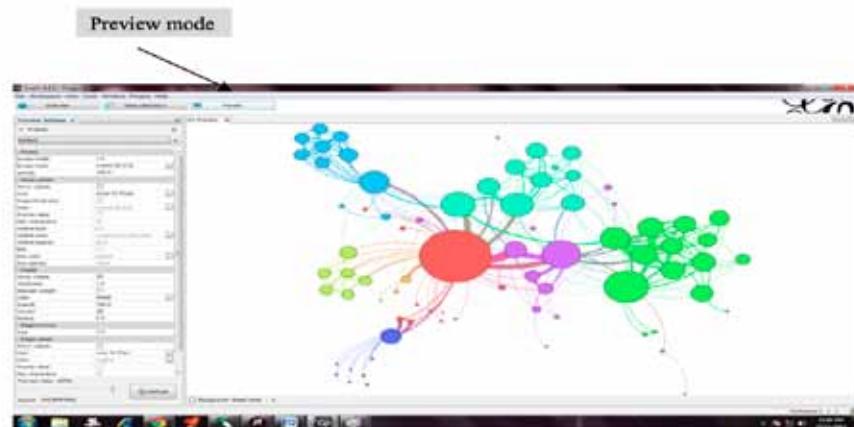


Fig. 6: Gephi in preview mode

provides the statistical matrices of the graph as well as Community detection functionalities.

Filter: This part provides a graph filtering facility depending on the different filtering parameters. To visualize the details of the graph, different tabs are provided at the bottom of the central window as shown in Fig. 4. One can zoom the graph, show the labels of the node or edges, adjust the text and so on.

In Data Laboratory mode, it allows modifying the graph information in the tabular format. This mode provides two buttons Edge and Node buttons. Node button provides the details of node in the tabular format like node id, label, degree etc. whereas the Edge button provides its source and target with its id, type, label, weight etc. Fig. 5 shows Gephi in Data Laboratory mode.

The preview mode [Fig. 6] allows the user to decide the way in which it would like to visualize the graph. It provides the preview setting button, where different settings can be done for graph visualization.

Gephi also works with Dynamic and multilevel graphs. After visualization and analysis these graphs can be saved. These graphs can be exported in PDF or PNG formats. Gephi is easy, useful and powerful graph analysis and visualization tool in the world of Network analysis.

Reference

- [1] <http://gephi.org>.

About the Author



Ms. Prajakta Vispute [CSI-I1502341] is working as Assistant Professor in the Department of Information Technology, K. K. Wagh Institute of Engineering Education & Research (KKWIEER), Nashik. She obtained her Bachelors Degree from JNEC COE, Aurangabad and Post-graduation from KKWIEER, Nashik. Currently pursuing her Ph.D Program at KKWIEER. She can be reached at psvispute@kkwagh.edu.in.



Dr. Shirish S. Sane [CSI- 8480] obtained his Bachelors from PICT, Pune, M. Tech from IITB and Ph.D from COEP, Pune. He is currently working as Vice Principal, Professor and Head of Dept of Computer Engineering at KKWIEER, Nashik. He worked as Chairman BOS in Computer Engineering, University of Pune as well as member of BOS for various Universities such as North Maharashtra, YCMOU, Nashik. He has authored text books, published 50+ research papers and recipient of Best Teacher Awards. Currently he is working as RVP for CSI Region VI (Maharashtra & Goa). His area of interests are Data Mining and Databases. He can be reached at : sssane@kkwagh.edu.in.



Working With Files and Directories in Python

S. Gowrishankar

Associate Prof., Dept. of CSE, Dr. Ambedkar
Institute of Technology, Bangalore, Karnataka

File management plays a very important role in automating various tasks. This code snippet shows various interesting ways to manipulate files and directories using Python programming language. Knowledge of these techniques play a pivotal role in easing a Programmer's life. We have defined three functions, namely `Delete_File_Recursively()`, `Compare And Delete Uncommon Files()`, `Rename Files With Specific Extension()`.

The function `Delete_File_Recursively()` is used to delete all the files from a directory and also its subdirectories but not the directories itself.

The function `Compare And Delete Uncommon Files()` is used to delete unwanted files from a folder by comparing it with the source folder. Here we are making use of a method called `dircmp(directory1, directory2)`, which returns a list of common files found in both the directories. The method `dircmp()` is defined in the `filecmp` module. Once we have list of common files, we can start eliminating the files from the other directory by using `remove()` method.

The function `Rename Files With Specific Extension()` is used to select files with particular extension and rename those files. The method `glob.glob()` searches the directory for all the files with the particular extension which can be renamed using `rename()` method.

```
import os
from filecmp import dircmp
import glob

def Delete_File_Recursively():
    folderPath = input('Enter the path for the Folder from which you want to delete files recursively')
    for root, dirs, files in os.walk(folderPath):
        for file in files:
            file_path = os.path.join(root, file)
            try:
                print('Name of the deleted file is {}'.format(file_path))
                os.remove(file_path)
            except Exception as e:
                print(e)

common Files = []
def Compare And Delete UncommonFiles():


```

```
srcFolder = input("Enter the path for the Source Folder")
otherFolder = input("Enter the path for the Other Folder from which you want to remove uncommon files")
compareDirectories = dircmp(srcFolder, otherFolder)
for name in compareDirectories.common:
    print("common files are {}".
format(name))
    commonFiles.append(name)

for root, dirs, files in os.walk(otherFolder):
    for file in files:
        if file not in commonFiles:
            try:
                fileFullPath = os.path.join(root, file)
                print("Name of the deleted file is {}".format(file))
                os.remove(fileFullPath)
            except Exception as e:
                print(e)

def RenameFilesWithSpecificExtension():
    folderPath = input('Enter the path for the Folder')
    fileExtension = input('Enter the File Extension you want to select')
    try:
        identifiedFile = os.path.join(folderPath, "*."+fileExtension)
        counter = 1
        for file in glob.glob(identifiedFile):
            os.rename(file, os.path.join(folderPath, str(counter)+"*."+fileExtension))
            counter+=1
    except Exception as e:
        print(e)

def main():
    Delete_File_Recursively()
    CompareAndDeleteUncommonFiles()
    RenameFilesWithSpecificExtension()

if __name__ == '__main__':
    main()
```

About the Authors



Dr. S. Gowrishankar [CSI - I1502016] is currently working as Associate Professor in the Dept. of CSE at Dr Ambedkar Institute of Technology, Bangalore, Karnataka, India. He has earned his Ph.D. from Jadavpur University, Kolkata. He has rich experience of serving both Academia and Industry in various capacities. His research interests includes Internet of Things, Data Science and Wireless Communications. He can be reached at gowrishankar@computerengineer.in



Security Enhancement in ICT for Education using WiMAX Networks

Chithra Rajagopal

Assist. Prof., Dept. of Information Technology, K. S. Rangasamy College of Technology, Thiruchengode, Namakkal, Tamil Nadu

Kalaavathi Bhuvaneshwaran

Prof. and Head, Department of Computer Science and Engineering, KSR Institute for Engineering and Technology, Thiruchengode, Namakkal, Tamil Nadu

Abstract : The technology enabled teaching and learning process enhances the learning experience. The usage Information Communication Technology tools for E-Learning changed the way of teaching and learning. The E-Learning systems interoperate with the communication systems to provide any time anywhere services. These communication technologies impose security problems during learning. In this paper the various ICT tools for E-Learning with enhancement in security to users of E-Learning systems is discussed.

Introduction

The E-Learning systems use the communication technologies to enhance the teaching and learning process. The flexible and on demand feature of E-Learning enhances attention of E-Learners. The resources offered through E-Learning can be accessed by multiple users at the same time. The approaches in E-Learning can be either synchronous learning or asynchronous learning.

In synchronous learning teaching and learning process occur parallel. Hence, the learners and the teachers are permitted to interact in real-time. The learners can also interact with the co-learners of the same session. Thus, live collaborative learning experience is obtained with synchronous learning. The synchronous tools for learning include video conferencing tools, chats which supports concurrent exchange of message. However, the synchronous learning is suitable for learners without other busy schedules.

Asynchronous learning supports the learners and teachers in offline mode. In asynchronous learning, the learners also have the freedom of selecting the appropriate course material for learning based on their interest. This kind of learning environment can be useful for learners having their own schedules. However, the asynchronous learning may not be suitable for learners having lack of motivation to carry out their work. The queries posted through forums, emails are good examples of asynchronous learning. This kind of learning environment enhances the learners to enrich their knowledge through self learning. The host network

acting as a backhaul for internet access plays a significant role during E-Learning. The communication technology such as WiMAX^[4] with broadband internet access support provides sophisticated infrastructure for E-Learning.

The introduction of ICT tools for E-Learning improved the quality of teaching and learning. The ICT tool also improves the practical, presentation skill of the learners. The ICT tools deepens the understanding, motivates for learning also represents new ways of interaction. Several ICT tools are available and they are used based on the necessity of the teachers and learners. Hence, the slow learners are given the option to select the appropriate platform for learning and to make their own evaluation.

Role of ICT in Education

The growth of communication technology with broadband services enables to use new ICT tools for teaching and learning process. The introduction of new technologies in education enriches the role of the teachers. Thus, the easy accessibility of information through the communication technology changed the mode of knowledge sharing. Hence, the ICT based education enhances the enrichment of knowledge among the learners with minimum cost. The use of ICT in education introduces new pedagogy in learning. The potential of ICT in teaching and learning permits the users to take part in collaborative learning for enhancing the knowledge. Thus the technology based learning promotes interactive learning environment to achieve the outcome of learning. The application of ICT in education also has translated the role of teacher as facilitator.

The ICT enables the teachers and learners to acquire in depth knowledge. The learners are added with the responsibility for finding the resource, sharing the information with others. The ICT in education enhances the collaborative learning; knowledge sharing and learner centered interaction among the learners. ICT tools^{[8][9]} have changed the teaching and learning environment. It enables the learners to continue learning beyond the class room. The different accessing modes of ICT tools through the internet change the mode of teaching and learning. Hence, efficient learning tool is selected based on the learning environment. The ICT based education also introduces challenges to the facilitator to have updated skills to use the tools effectively. The ICT tool can be broadly categorized as Learning Management System and Synchronous collaboration tool. The ICT tools can be further classified as Input source, Output source, others. The performance of the learners is improved by the usage of the ICT tools.

Learning Management Systems

The Learning Management System supports learners by providing learning environment and also helps the teachers for managing the session including the content delivery, monitoring the learning process. The various Learning Management systems are as follows:

Edmodo: This Learning Management system supports the learners^[10] in taking quiz. It also provides answers to the learners after the completion of the session. This tool also provides the feedback in real time to the user regarding the areas of improvement based on the performance

■ SECURITY CORNER ■

of the E-Learners. Learning communities in the form of groups can be formed by either ad-hoc manner or learners from the classes. The interesting feature of Edmodo is Spotlight where the teachers post the learning resources either for free or paid. Edmodo also supports appstore called Edmodo store where the teachers share the information with parents about the learners performance. It also supports planner to view the assignments, track the progress of the learners.

Edulide: Edulide is a web based Learning Management System^[11] which can be accessed through the desktops and mobile devices. This tool supports customizing learning environment. It also provides updates information about the learning progress. It also supports templates to enhance the learning materials with dynamic content. The learning environment with notifications is streamlined in this system. The reporting feature allows monitoring the progress of the learners. It also allows the tracking of assignments and assessment of the learners. The Learning content can be posted dynamically by the teachers using either course creation tool or using the existing templates.

MOODLE : MOODLE is an open source Learning Management System^{[2][15]} used for education, training and development. MOODLE also supports enhancing learning environment by incorporating the customized plugins. The developers are allowed to enhance the modules in it based on the necessity. MOODLE can run on any system supporting PHP and database. Thus the MOODLE can be accessed through the mobile devices, desktop.

Types of authentication supported in MOODLE can classified based on manual account or using email based self registration. Manual account is used for maintaining the administrator accounts. Email based self registration plugin can be used for creating user accounts by themselves. However, the user validation is achieved through e-mail. To protect the users from spammers creating the unnecessary accounts the option in manage authentication part of MOODLE is set as denied e-mail.

The common security issues in MOODLE include Dictionary attack and

session hijacking .The dictionary attack is a mechanism where the malicious user s provides the user credentials for login using the predetermined usernames and passwords. The dictionary attacks can be avoided when the users are insisted to provide passwords consisting of uppercase, lower case characters and digits.

In Session hijacking attack session hijacking the users valid session can be gained by unauthenticated users. The mechanism for hijacking the user session is through the session sniffing and cross side scripting attack. In session sniffing the user login credentials are monitored to gather the session Identity. The cross side scripting attack is also known as XSS attack. Script is included within the client side browser to forward the user session Identity to the unauthorized users.

In MOODLE, depending on the nature of authentication the users are provided with separate plugins to handle the process of validating the users. Normally, the MOODLE administrator accounts are maintained using manual accounts and the teachers and learner account are maintained using LDAP plugin.

EDU2.O : This is a web based Learning Management System^[11].This is a E-Learning platform supports learning content including multimedia. The content is represented in terms of lessons. The learners can also post their own messages in this platform. The learners can be assessed by providing assignments, quiz. It supports collaborative tools including wikis, blogs, forums, chat rooms. EDU supports hosting in cloud environment. The learners can be monitored by their parents and supports immediate feedback.

eFront : eFront is an open source E-Learning platform^[12] which supports online learning through icon-based user interface. The interface is user friendly supporting the balance between the system functionality and user need. The interface in eFront can be customized supporting next generation learning environment. This platform has features including assignment management, content delivery, and discussion forum. The users can also create their own repositories from a centralized repository

to share the knowledge among the learners.

Dokeos : Dokeos is a open source E-learning software. It also a cloud based E-Learning software^[13]. In Dokeos based Learning Management systems, the learning resources are hosted in the cloud without burdening the individual systems for accessing the resources. So the system set up economical where it can be set up quickly and managed easily. It supports E-Learning and blended learning where the effort of the teachers are reduced with minimum number of interaction with the learners.

Claroline : Claroline is an open source E-Learning platform^[16] permitting enhanced teaching and learning activities. The management of this platform is simple .It supports Wiki, other online content tools. Caroline consists of various course space supporting various tools based on the pedagogical activity for learning. It supports the teacher to write a course description, publish documents, creating user groups.

Synchronous collaboration tools

The synchronous collaboration tools support feasible live cost effective learning support. It also enhances the sharing of knowledge among the remote learners, conduct online learning meeting and establish virtual class room arrangement among learners^[14]. It also supports the learners to attend the presentation of remote teachers. The synchronous collaborative tools include Astound, PlaceWare, HorizonLive, Learn Linc, Interwise, Centra, Raindance Wimba. It also supports the learners in clarifying the content delivery, raising doubts about the presentations.

Wimba : This tool supports interaction between teacher and learner. The recording facility enables to play the video of the past session in E-Learning. This tool is compatible with other tools.

Centra : It is a synchronous E-Learning tool that aids in set up of a virtual class room environment. It supports the assessment of learners by conducting tests and quizzes. This tool has the feature of integrating with other learning management system.

The Collaborative tools with the option for including videoconferencing, chatting will further improve the learner environment.

■ SECURITY CORNER ■

Learning Management tools	Synchronous Collaboration tools
Edmodo Eduslide MOODLE EDU 2.0 eFront Dokeos Caroline	Astound PlaceWare HorizonLive LearnLinc Interwise Centra Raindance Wimba

The tools are selected based on the nature of the learning environment. The new methodology of learning using ICT tools increases the teacher and learner relationship. Even though the adoption of new technologies changed the usual chalk and talk way of teaching, the interoperability of communication systems with the ICT tools leads to security problems. Even though the ICT in education introduces the difficulties such as need for broadband internet access, enough teacher skill, it can be beneficial when ICT is introduced for learning to transforming the traditional practices in learning. Hence, the ICT tools in E-Learning can be effectively used under secured environment. The following section provides solution to overcome security issues of ICT tools in E-Learning using WiMAX networks.

Security Enhancement in WiMAX based MOODLE

The introduction of changes in teaching and learning process without affecting the core educational values is a major challenge. However, the usage of ICT tools should not affect the characteristics of an educational system. Hence, secured usage of ICT tools without sacrificing the originality of educational system is needed. Thus the interaction between the communications systems with learning technologies impose a major issue to support secured learning environment. The communication technology acts as a platform for E-Learning where the ICT tools can be accessed through the devices available with each learner. The WiMAX technology acting as backhaul for internet access provides better quality of wireless access suitable for educational applications^[1]. The digital devices connected through the communication network enables just -in -time process of learning by

accessing the resources through the internet. This in turn impose a challenge to learners to have the essential skills to effectively use the devices and the communication network in a secured manner. Security in WiMAX is a major challenge^{[6][7]} to support ICT tools for E-Learning. The MOODLE in WiMAX based E-Learning system is susceptible to session hijacking problems. The same session can be accessed by different user by logging in with different browser in the same system or from different system. The authentication process in E-Learning system must be secured. The session based authentication protocol^{[13][5]} can be used for securing the authentication process in WiMAX based E-Learning System using MOODLE. The learners of MOODLE based E-Learning System are requested to perform repeated authentication. The repeated authentication process introduces additional delay in accessing the session.

The delay in authentication can be reduced with the minimum number of authentication message exchanges with the authentication server. The profile cache based authentication scheme and key caching based authentication can be carried at the authentication server for verification of E-learners. In the profile cache based authentication scheme, after initial authentication, the E-learners credentials are cached at the authentication server. When the same user request for re-authentication the credentials cached at the server is verified and provides new session key for the same session. Thus, the users are updated with new session key during each repeated authentication process. Hence the security of the MOODLE based E-Learning system is enhanced.

However, the proposed profile based authentication scheme requires

the increased number of messages to be transferred during each repeated authentication process. Hence this scheme increases the delay in authentication resulting in disturbing the E-Learning session.

The delay in repeated authentication can be further reduced with minimum number of message transfer between the E-Learning users and the authentication server. The Key caching based authentication scheme^[4] is proposed to ensure secured efficient authentication. At the initial stage of the session, the user credentials are verified and authenticated at the authentication server. The authentication process provides new session key, authentication key, and session key identifier to users. The MAC address of the subscriber station, Base Station MAC address, Authentication Key, Session Key, Lifetime of the Session Key, and the unique identifier SKID are cached at the Access Service Network (ASN) Gateway. The same user request for re-authentication by transmitting the session key (SK), Timestamp of authentication (TS), Session key Identifier. The user requests are forwarded to the ASN gateway through the base station in WiMAX. The ASN gateway performs the re-authentication process by generating the new session key identifier using the credentials cached at the ASN gateway.

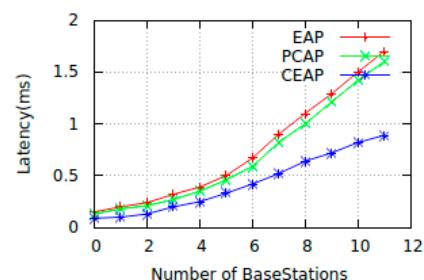


Fig.1: Authentication latency improvements in MOODLE

The latency in authentication of the E-learners using the profile cache based authentication and the key cache based authentication is represented in the Fig. 1. From the figure it is shown that the latency in profile cache based authentication of E-Learning is reduced when compared with the traditional EAP based authentication scheme. However, the performance can be further improved by using the key

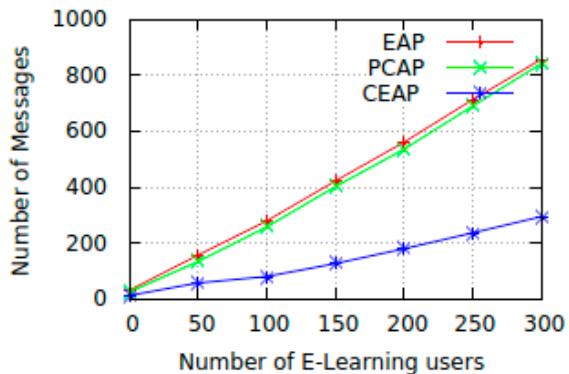


Fig. 2: Authentication cost

cache based authentication in MOODLE for WiMAX networks.

The number of message transferred between user and the authenticator also affects the latency in authentication. The Fig. 2 represents the number of messages transferred in profile cache based authentication and key cache based authentication schemes.

The profile cache based scheme requires all authentication messages to be exchanged with the authentication server for each re-authentication process. Hence, when the number of users increases the number authentication message exchanges are also increased. In key cache based authentication the ASN gateway of the WiMAX network cache the user key. The cached key can be used for user verification and existing user can be provided with new session key at rapid rate with reduced number of message exchanges.

Conclusion

The E-Learning with the ICT tools can

enrich the learning process by focusing on learner centered learning. These tools can be used with enhanced security. In this paper the security of ICT tool specifically, MOODLE for WiMAX networks is improved with the proposed cache based authentication scheme. The profile cache based scheme can be used for class room learners with minimum strength. The key cache based authentication scheme can be used when training is given for the teachers.

References

- [1] Felician Alecu, Paul Pocatilu, Sergiu Capisizu,"WiMAX Security Issues in E-learning Systems", Journal of mobile, Embedded and Distributed Systems,vol2(1),2010.
- [2] Colton Floyd, Tyler Schultz and Steven Fulton," Security Vulnerabilities in the open source Moodle eLearning System", 16th Colloquium for Information Systems Security Education, Lake Buena Vista, Florida June 11 - 13, 2012.
- [3] Manorma Kausik, Sweta Kaushik,"An overview of various security aspects for WiMAX Network Technology", International Journal of Electronics and Computer Science Engineering, 2012.
- [4] Chithra Rajagopal and Kalaavathi Bhuvaneshwaran," Security Enhancement Using Cache Based Reauthentication in WiMAX Based E-Learning System", The Scientific World Journal,2015.
- [5] Chithra Rajagopal and Kalaavathi Bhuvaneshwaran," Secured Session Based Authentication Protocol for E-Learning using WiMAX Networks" International Journal of Advancements in Computing Technology, Volume 7 Issue 5, Pages 8-13 September, 2015.
- [6] Chithra Rajagopal and Kalaavathi Bhuvaneshwaran," Review on Security Issues in WiMAX Networks for E-Learning",International Journal of Computer Science and Mobile Applications",Vol. 3 (9), 2015.
- [7] Chithra Rajagopal, Kalaavathi Bhuvaneshwaran, Christy Lavanya," Survey of Key Management Algorithms in WiMAX", International Journal of Mathematical, Computational, Natural and Physical Engineering, World Academy of Science, Engineering and Technology, Vol. 8, No. 9, 2014.
- [8] www.alphr.com/features/372979/10-free-online-tools-for-teaching-and-learning
- [9] www.slideshare.net/rc_sharma/role-of-ict-tools-in-teaching-and-learning
- [10] www.edmodo.com
- [11] www.eduslide.com
- [12] www.lms.org/reviews/efront
- [13] www.dokeos.com
- [14] <https://net.educause.edu/ir/library/pdf/SER06075.pdf>
- [15] <https://www.packtpub.com/sites/default/files/2640OS-Chapter-4-Authentication.pdf>
- [16] <https://en.wikipedia.org/wiki/Claroline>

About the Authors



Ms. R.Chithra is currently working as Assistant professor at KS Rangasamy College of Technology affiliated to Anna University. She has published research papers in reputed international journals. She has presented 7 research papers in various international and national level conferences. Her research interest include Wireless Networks, Network Security, Cloud Computing, E-Learning. She can be reached at chithra@ksrct.ac.in



Dr. B.Kalaavathi [CSI - 00136704] received the B.E. (Computer Science and Engineering) degree from Bharathiyar University in 1993, M.Tech from Pondicherry University in 2000 and Ph.D from Periyar University, India, in 2010. She is currently working as a Professor and Head in Department of Computer Science and Engineering, K.S.R Institute for Engineering and Technology, Affiliated to Anna University. She has published more than 20 research papers in reputed international journals. She has also published more 15 research papers in the various national and international conferences. She is a life member of CSI & ISTE India. Her current areas of interest include Mobile Computing, Data Structures and Algorithms Analysis,E-Learning.



Digital Transformation: A Wealth Management Case Study

Amit Badheka

Senior Technical Architect, IGATE Global Solutions,
Mumbai, India

Atul Patankar

Director, IGATE Global Solutions, Mumbai, India

Abstract: In this paper, we present a case study on how we can transform legacy solutions in a business like Wealth Management (WM) using emerging technologies. We have developed a proof-of-concept that demonstrates how adaptability and efficiency can be added to existing business processes, thereby enhancing business agility and customer experience. Social, Mobility, Analytics, and Cloud (SMAC) technologies are applied to build a platform that helps wealth management advisors find new customers, and also help customers to reach to advisors whenever they need. Examples of use cases from the wealth management process, and its benefits to customers, as well as to the advisors, are described to show how they help in fulfilling transformed business objectives.

Introduction

The wealth management process in practice today is still very traditional where investors invest in some asset classes based on an investment advisor's recommendations. However, investor preferences across mass affluent, high net worth and ultra-high net worth individuals are changing with technology advancements like mobile, social network collaboration, which are influencing daily life activities of these individuals.

The digital revolution has changed many things around us such as socializing, shopping, business and entertainment. Digital technology has played a key role in transforming the way we do banking and manage our finances. Similarly there is a huge potential for digitization and self-service in wealth management process. Wealth managers are in constant need to innovate in order to adopt to rapid changes in customer expectations, industry events and various factors impacting wealth related decisions by individuals. Wealth management systems must be redesigned and revamped to improve the overall value proposition by using emerging technologies to better understand the customer needs, and improve the overall service quality and efficiency.

This paper describes how digital technologies can help in transforming enterprise applications supporting wealth management, to get more business agility and enriched customer experience. We present a step-by-step approach for analyzing existing processes/ systems, and identifying business objectives that can be met

with emerging technologies. How such a platform can be realized and used is then described through various scenarios from wealth management business.

Transformation Approach

To take advantage of the digital revolution, an enterprise first needs to look at existing processes and analyze the opportunities to address challenges in the existing systems. This section will help to understand current landscape and define the roadmap for future solutions.

Current Landscape

As per industry experts^[1], the wealth management industry in general, has lagged behind in emerging technology adoption. Most of the wealth managers have been offering online tools and platforms to the advisors/customers, through the web channel. Now, customer demands of digitized services, supported by technology advancements and availability of infrastructure to analyze large volume of data have facilitated creation of an environment conducive to build autonomous, intelligent and self-service capabilities^[2] for wealth management.

So far, wealth management systems used mobile technology, only to send secure alert messages to investors, and to enable users to access account information. Till recently, it was a challenge for mobile-enabling a wealth management application that can provide information on the go. For example, it was a problem for an advisor to access customer, account and portfolio data while in the field with the customers due to lack of integration among various systems such as CRM,

Portfolio Management System, Portfolio Accounting System, Reference Data System, etc. The fact that tools available to advisors and customers were not designed specifically for an engaging user experience made it more difficult to make use of available technology.

There was a lack of strategic focus to invest in emerging technologies to target self-directed affluent individuals. Instead, the focus was on services that require engagement with advisors and hence the self-service offerings were very limited. The cost of technology to improve user experience and difficulties of calculating ROI resulted into limited investments in these areas. Also, the lack of advanced technology to provide value-added services such as what-if analysis, portfolio back testing, and personalized recommendation using big data & analytics contributed to the sub-standard client experience.

Future Roadmap

Wealth management firms are now recognizing the fact that client experience is an important factor and digitized service offerings can provide competitive advantages. Wealth management companies need to define a clear digitization roadmap^[4] to address the gap between existing service offerings and what they require to do moving forward in order to address some challenges of existing business processes. (See Fig. 1)

The following are a few guidelines that can help wealth management companies to formulate a clear vision for digitization:

- Identify digitization and self-service expectations by internal stakeholders such as board of

CASE STUDY

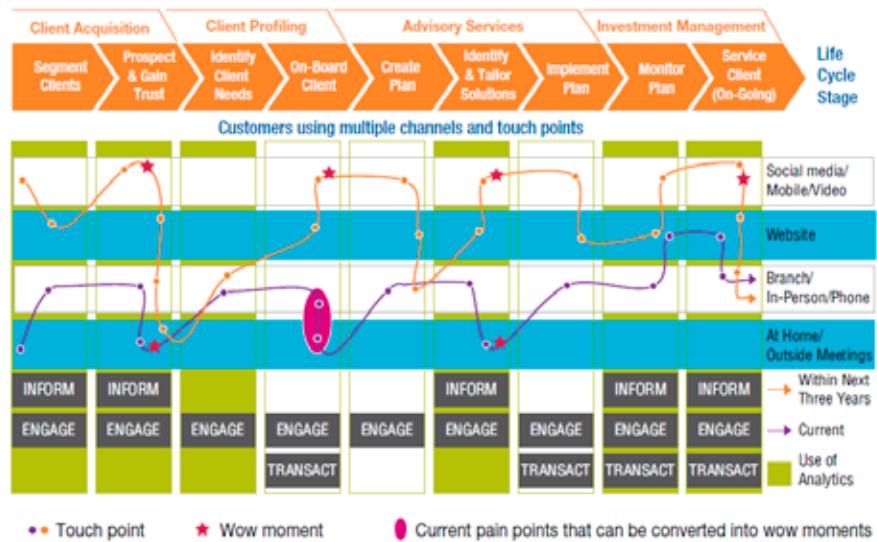


Fig. 1: Example of future state of wealth management

directors, shareholders, etc., since mindset of top management in such firms are changing from cost savings to investing in innovative services keeping the customer-advisor relationship at the center.

- Identify digitization expectations of current/future clients, and make use of mobile, social and video channels instead of just web-based platforms. Also, service offerings need to cater to various factors such as cultural/geographical preferences. For example, clients in US/Asia are more willing to share information over a technology platform. However, clients in Europe prefer long-standing advisor relationships and are more private, and like to restrict their information exchange to client-advisor interactions.
- Understand technology evolution, and how it is driving digitization in the industry like using expansion of investment & trading platforms with advanced analytics, unstructured data processing and real-time technologies. Advanced analytics, combined with behavioral analytics, can lead to holistic solutions to serve investors.

In addition, further work is required to prioritize digitization implementation with focus on front-office (external

focus) or middle & back-office (internal focus) or both. Also, governance aspect of digitization initiatives should be well defined as there is clear demarcation required between enterprise level services and individual business unit services.

Objectives and Technology Enablers

In recent times, wealth management firms have started creating robust infrastructure to handle unstructured data and using predictive analytics to improve their services. The digitization expectation from end-users has created a demand for services like Robo advisors (e.g. Betterment^[5]) which analyze, allocate and create a bespoke portfolio in an automated manner. For a small fee, investors in this category can connect with an advisor though the investor information is handled in an automated manner (e.g. Learnvest^[6]). Active investors can also take advantage of a peer's successful track record (e.g. Covestor^[7]).

These disruptions are challenging the way private banks and wealth managers provide their services across various investor classes and channels. The objective of using digital technology channels are mainly:

- Create virtual presence using technologies such as social media channels, mobile channel for virtual assistance, real-time communication over web channel for video conference etc.
- Using big data analysis to process

structured/ un-structured data to perform market analysis, provide what-if analysis capabilities, identify personality attributes of investors to find compatible advisor, etc. with improved efficiency and ease of use

- Using interactive and portable visualization to provide advisors and investors with various views of data on the go.

These technology advancements along with self-service capabilities can help in transforming wealth management process and digitization of services.

- Front Office: The key ask for front office teams are prospect management, client on-boarding and portfolio management. Digitization of front office services can help in providing on-the-go data access, contextual and near real-time advice, virtual assistance and video conferencing capabilities to advisors as well as investors. These advanced features can break the time and location barriers as well as allow the investors to participate in decision making process based on near real time view of their portfolio
- Middle Office: The middle office teams are responsible for portfolio tracking, risk management and performance measurement. Digitization of such services can benefit from tracking of client activities, social trend analysis, and product reviews. It will lead to more accurate risk assessment.
- Back Office: The back office teams are tasked with customer support, grievance management and collateral/position management. Digitization of back office services can help in early detection of client sentiments and grievance redressal, interactive reporting of data anytime anywhere, and improved client reporting. Insights generated using data analytics can be used to offer personalized services to customers.

Solution

Ten point Strategy^[3]

In order to address the need of digitization and self-service offerings by the wealth managers, a ten point program based on

CASE STUDY

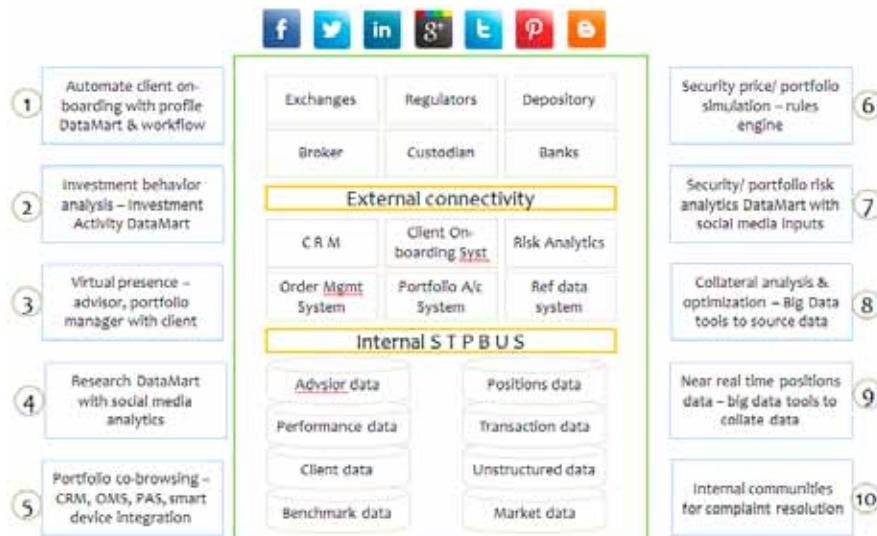


Fig. 2: Digital strategy for wealth management

emerging digital technologies is proposed in Fig. 2.

The strategy is defined by the domain experts with several years of experience working with various wealth management firms, custodians and private bankers in order to help these organizations implement their digital strategy. At the heart of this approach is the concern for traditional wealth managers to go digital while appreciating their existing IT infrastructure. It focuses on re-design some of the core front-office, middle-office and back-office functions using emerging technologies

Solution

Our solution for digital transformation of wealth management business is based on three main technology areas, namely, virtual presence, analytics and visualization across mobile and web channel. The solution enables integration of various data sources, e.g. social data, CRM data, etc., process the data in structured/ unstructured format and derive insights and reports. The key technology services of the solution (Fig. 3) are:

- Visualization - This service includes user interface (UI) and interaction level services such as content management and channel adapters. The main functions are support for multiple channels, virtual presence and real-time communication.
- Data Management - This service enables data management

functions such as data extraction, retrieval & aggregation, and archiving.

- Analytics Services - This service enables data analytics using various schemes and algorithms. It includes functions such as classification, predictive and prescriptive recommendations.

Case Study - Advisor Desktop

The application 'Advisor Desktop' is a pilot application (Figure 4) that showcases various business use cases from wealth management business process

supported by the digital technologies discussed earlier. Some of the use cases implemented are as below:

- a. Prospect Management: The application uses social network data to analyze and identify potential prospects that are searching for investment products. It enables advisors to connect with prospects using their preferred networks.
- b. Initial Connect - Advisors can connect with prospects/ customers using live video conference over web/ mobile channel to exchange information.
- c. Advisor Allocation - Advisor allocation for new customers is an important step in wealth management process since the investment decision largely depends on investor-advisor relationship.
- d. 3600 View & Recommendations- The application provides various views of data in order to analyze portfolio and also to identify cross/up sell opportunities. The application uses advanced analytics to generate product recommendations for customer based on various parameters.

The application is built using open source technologies that provide multi-channel support, real-time communication



Fig. 3: Wealth management solution

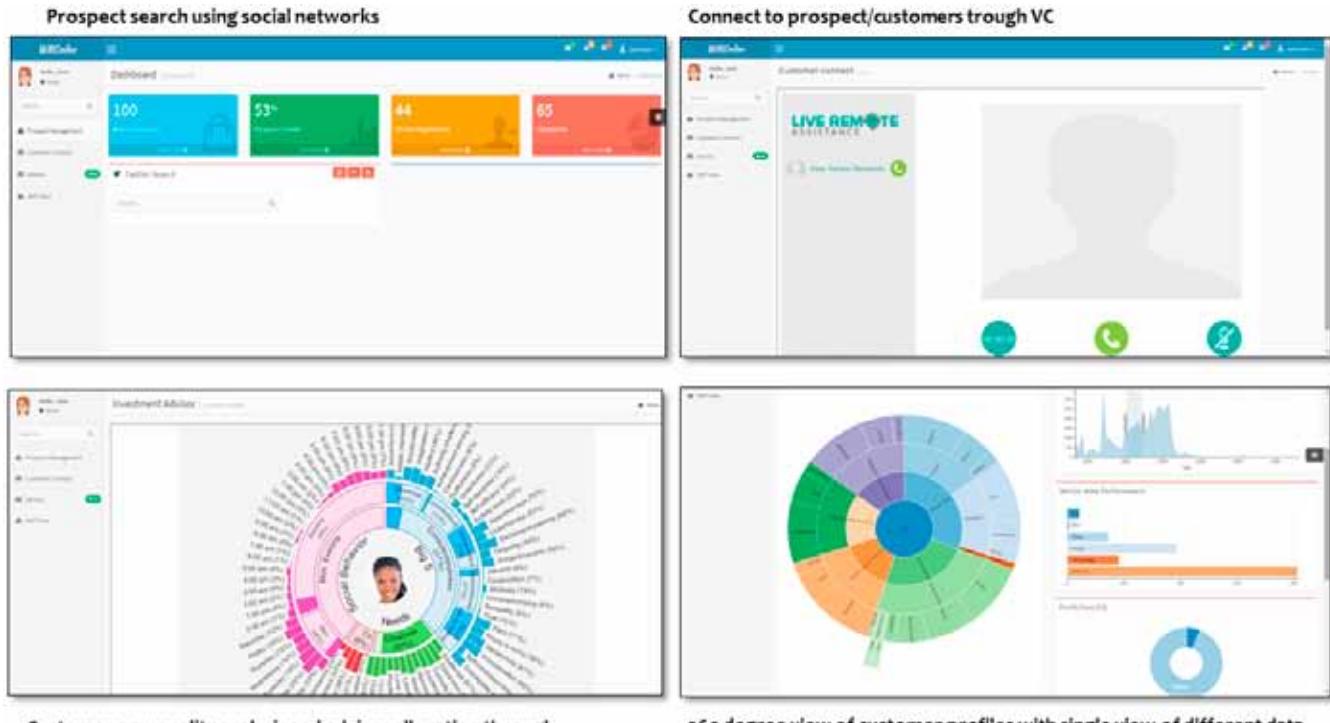


Fig. 4: Advisor desktop application

and data analysis and visualization. The application also uses a third-party advanced analytics tool for analyzing personality attributes of the customer in order to find a compatible advisor who matches the personality attributes of customer. It helps in establishing better comfort and confidence building between customer and advisor.

Conclusion

Technology was one of the factors that propelled financial services industry into the high growth trajectory after the financial crisis of 2008-09. Social media and smart devices have removed the barriers of time, place and availability by allowing access to information anytime, anywhere. Wealth

management companies must recognize the benefits from defining a strategic approach for digitization and self-service capabilities and gain the trust and confidence of their customers. Self-service capabilities will play a critical role in enhancing customer experience. In the near future, wealth management firms can expect involvement of digital channels in client's journey at all the stages of investments and they must be ready to grab the tremendous opportunities that are ready to explode.

References

- [1] World Wealth Report 2014, Capgemini and RBC Wealth Management. <https://www.capgemini.com/thought-leadership/world-wealth-report-2014-from-capgemini-and-rbc-wealth-management/>

- [2] management
Self Service in Wealth Management, Capgemini Financial Service, 2014. https://www.capgemini.com/resource-file-access/resource/pdf/self-service_in_wealth_management_whitepaper_2014.pdf
- [3] Wealth Management in Digital Era, Atul Arvind Patankar, IGATE Global Solutions, 2015.
- [4] Taking Wealth Management Digital, Strategy&, 2013. <http://www.strategyand.pwc.com/media/file/Strategyand-Taking-Wealth-Management-Digital.pdf>
- [5] Betterment, <https://www.betterment.com/>
- [6] LearnVest, <https://www.learnvest.com/>
- [7] Covestor, <http://covestor.com/>

About the Authors



Mr. Amit Badheka is a Senior Technical Architect in the Research & Innovation group of IGATE Global Solutions, Mumbai. He is a TOGAF certified enterprise architect with 15 years of IT experience in various roles. His current areas of interest are applications of emerging technologies such as Context Aware Computing, Internet of Things and Advanced Analytics. Some of his prior work related to High Performance Computing using GPGPU, Multi-core programming, and Context Aware Intelligence have been published in various different forums. He can be reached at amit.badheka@igate.com.



Mr. Atul Arvind Patankar is Director - Consulting in the Consulting practice of the BFS BU in IGATE – Capgemini at Mumbai. He has about 8 years of experience in financial services Industry and more than 15 years in the software industry. His areas of specialization are investment management and capital markets. He has practical experience of IT solutions and services in front, middle and back office functions. Atul has been a Member, Board of Studies, Mumbai University for Post Graduate Management programs. IP filing has been initiated for one of his inventions – FS Test Pack. He can be reached at atul.patankar@igate.com.

BRAIN TEASER

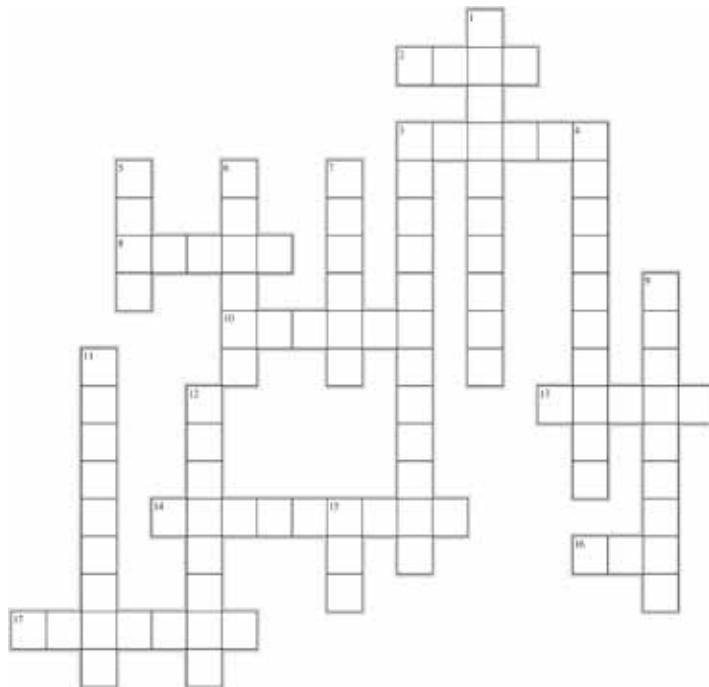


Dr. Durgesh Kumar Mishra, Chairman, CSI Division IV Communications, Professor (CSE) and Director Microsoft Innovation Center, Sri Aurobindo Institute of Technology, Indore, drdurgeshmishra@gmail.com

Crossword »

Test your knowledge on ICT Applications

Solution to the crossword with name of first all correct solution provider(s) will appear in the next issue. Send your answer to CSI Communications at email address csic@csi-india.org and cc to drdurgeshmishra@gmail.com with subject: Crossword Solution - CSIC December Issue.



These IoT Applications will change the world...

- Home appliances and equipment remote control: IoT enabled appliances allow us to control them remotely. We can use Smartphone to monitor and control these devices remotely!
- Smart Street Lights: These IoT based lights will control themselves according to traffic and environmental conditions saving power.
- Bluetooth connected Tooth-brush: This tooth brush will sense the condition of the tooth which can be seen on your Smartphone and can also be sent to your dentist for further actions.
- Baby activity monitor: When attached to your baby, it will send the report in real time to you about the activities of your baby that may include baby's posture and breathing patterns and many more!
- Navigator Shoes: Just set the destination, these shoes won't allow you to deviate!

Rashid Sheikh
Associate Professor, Sri Aurobindo Institute of Technology
Indore

We are overwhelmed by the response and solutions received from our enthusiastic readers

Congratulations!

All nearby Correct answers to October 2015 month's crossword received from the following reader:

Dr. Samiksha Shukla Christ University, Bangalore
Mr. Shubham Joshi MIT Pune

CLUES

ACROSS

2. An image-compression format
3. A small file saved in the browser during a website visit
8. Microsoft Cloud Service
10. A target of hyperlink
13. Short for picture element
14. A high speed connection to the Internet
16. Set of protocols and formats for secure credit card transactions
17. An application program to access WWW

DOWN

1. Clarity and sharpness of picture and text on screen
3. A many-to-many communication facility
4. Technique to hide secret message
5. Unsolicited emails
6. A website that provides a broad array of services and resources
7. A popular web server software
9. A standard for short range radio frequency
11. Display of sequence of images to give an impression of movement
12. An internal network of an organization built on internet technology
15. A logical fault in a computer program

Solution to November 2015 crossword

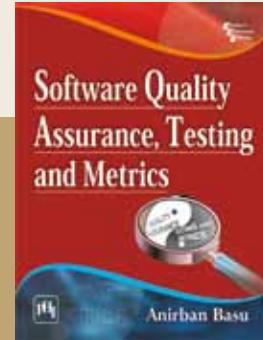




Book Review »

Software Quality Assurance, Testing and Metrics

Book Title	: Software Quality Assurance, Testing and Metrics
Author:	: Prof. Anirban Basu
ISBN	: 978-81-203-5068-7
Price	: Rs. 295/-
Publisher	: PHI Learning



This book is written for students of undergraduate, post graduate courses as well as for IT professionals, and helps them in understanding different aspects of software quality engineering with ease. It focuses on three fundamental aspects: Quality Assurance (QA), Quality Control (QC) and Metrics.

The book starts with basic concepts on different quality models, phases in software development, software development life cycle models, cost of poor quality, software configuration management etc.. As part of Quality Assurance, various standards such as ISO, CMMI, TMMi are covered. Relevant aspects of Six Sigma methodology are discussed. The importance of Reviews, Inspection and Walkthroughs, the roles of stakeholders in a inspection process are covered in Chapter 3 along with inspection metrics. Chapter 4 introduces Quality Control techniques and the testing techniques used in different contexts. Variety of testing techniques including Risk based Testing, OA Testing, Mutation Testing etc. are discussed with examples. The book goes on to discuss different structural testing techniques and different test coverage criteria such as statement coverage, condition coverage, path coverage, data flow coverage, MC/DC coverage, LCSAJ coverage etc. These are explained in simple but in sufficient details. Integration testing, both functional and non-functional testing are discussed in subsequent chapters. The book includes Chapters on Test automation covering current trends in test automation in precise and Test Management. OO Testing, and Cloud Testing are also covered in the book. Chapter 13 covers the important

topic of Software Metrics, while Chapter 14 discusses tools for quality improvement.

The book contains Quizzes, Multiple Choice Questions and Review Questions at the end of each chapter which help both the reader and the instructor to ensure that he/ she has understood the contents. These also help in the international certification examinations.

While there are a number of books in the area of Software Quality and Testing, most of the books cover primarily theoretical concepts while others trivialise the techniques used. Also the books lack elaborate coverage of the techniques used in the industry, which a student passing out of an academic institution is expected to know before joining the industry. The book covers most of the techniques which will benefit a student as well as an IT professional. The book covers the techniques used in the industry, which a student passing out of an academic institution is expected to know before joining. The contents of the books helps an young IT professional who after joining the industry needs to get a good understanding of the concepts behind the work assigned to him/her.

The thrust is on making readers know the subject and understand the fundamental concepts without much difficulty and is recommended to both students as well as to IT professionals.

Review by: **Mr. Anbunathan R.** Test Manager, LG Soft India Private Limited, Bangalore

CSI-2015

50th Golden Jubilee Annual Convention

On

Digital Life

(02nd - 05th December, 2015)

Hosted by: Computer Society of India (CSI), Delhi and NCR Chapters

<http://www.csi-2015.org/>

Contact :-

Prof. M. N. Hoda

Secretary,

Programme Committee (PC),

CSI - 2015

Director, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM)

A-4, Paschim Vihar, Rohtak Road, New Delhi - 110063 (INDIA)

Tel.:+ 91-11-25275055

Fax:+ 91-11-25255056

Mobile: +91-9212022066

E-Mail IDs: mca@bvicam.ac.in; csci2015.delhi@gmail.com

Category of Delegates / Authors	Registration Fee Details					
	Early Bird on or before 10 th October, 2015		After 10 th October, 2015		Spot Registration (only in Cash)	
	CSI Members	General	CSI Members	General	CEI Members	General
Indian Authors & Delegates (in INR)						
Full Time Students	5.00	7.50	7.50	1,000.00	1,000.00	1,250.00
Teachers / M.Tech. and Research Scholars	3,000.00	4,000.00	4,000.00	5,000.00	5,000.00	8,000.00
Industry / Govt. / PSU	5,000.00	6,000.00	6,000.00	7,000.00	7,000.00	9,000.00
Combo Registration Pack (Convention Registration + Life Membership of CSI)	-	8,000.00	-	9,000.00	-	10,000.00
Foreign Authors & Delegates (in USD \$)						
Full Time Students	100.00	150.00	150.00	200.00	200.00	250.00
Teachers / Research Scholars	250.00	300.00	300.00	350.00	350.00	400.00
Industry	400.00	450.00	450.00	500.00	500.00	550.00
Pre – Convention Tutorials: Student delegates can attend any one Pre-convention Tutorial @ Rs. 500.00 while all delegates under other categories can attend it @ Rs. 1000.00						
Note:						
1. Service tax, as applicable, shall be charged extra, in all categories of the registration fee.						
2. 10% discount shall be given on five or more registrations while a 20% discount shall be on 10 or more registrations from one organization.						
Please note that, Under Combo Registration Pack, the discount shall be applicable on the registration fee component only and not on the Life Membership fee component, which is Rs. 500.00.						
3. Please note that BCA / B.Sc. / B.Tech. / M.Sc. / MCA / students shall be considered as Full time Students whereas M.Tech. and Ph.D. Scholars shall be considered as Research Scholars.						
4. Benefice students as on 31 st October, 2015, must submit the Bonafide Certificate from their Institution / College / Department. Student delegates shall be given only soft copy of the Proceedings.						



Goa Chapter

Computer Society of India - Goa Chapter in collaboration with Department of Computer Science & Technology (DCST), Goa University organized a four day workshop titled "Programming with Scratch" during the Diwali vacations. The objective of the workshop was to introduce computer programming concepts to Secondary school students of Classes VI to IX.

The workshop was held from 18 to 21 November 2015 at Don Bosco College, Panjim. Fifteen students from various schools in and around Panjim participated in the workshop and learnt to create interactive games, stories and school assignments using Scratch, a software developed by Lifelong Kindergarten Group at the MIT Media Lab. Mrs. Shailaja Sardessai, Secretary, CSI - Goa Chapter planned and coordinated the event. Student volunteers from M.Tech, DCST, Goa University viz. Ms. Priya Lotilker, Ms. Ulfa Khwaja, Ms. Rumana Pathan, Mr. Gaurang Bane and Mr. Akshay Dalvi conducted the training and Lab sessions.

The workshop concluded with a Prize Distribution ceremony graced by Dr. V. V. Kamat, Professor & Head, DCST, Goa University and a CSI Life Member and by Rev Fr. Wilfred Fernandes, Manager, Don Bosco Institutions. Participants displaying creativity and problem-solving skills overall were awarded Certificates of Excellence. Three toppers each in the 2 groups Class VI & VII and Class VIII & IX were awarded prizes for design of an original game as the final project. All students were given Participation Certificates.



Gwalior Chapter

ITM University Gwalior in association with Computer Society of India, Gwalior Chapter, Region 3 and IEEE organized a three - day International Conference on Communication Networks (ICCN) during 19th - 21st Nov. 2015. The event spread into three days witnessed presence of more than 300 research scholars, students, academicians and industrialists that included experts and speakers of repute. Research scholars from leading different universities around the world showed their interest for this conference. The conference was inaugurated by Mr. Atul Singh, S. P. Lokayukt, Gwalior. On this occasion Shri. Rama Shamker Singh, Hon'ble Chancellor, Dr. Daulat Singh Chauhan, Managing Director, Dr. Vanadana Kushwah, Hon'ble Vice Chancellor, Dr. Omveer Singh, Registrar, Dr. Ranjeet Singh

Tomar, Dean, Dr. Shyam Akashe, Dr. Sanjay Jain, Dr. Pallavi Khatri and Dr. Shashi Kant Gupta were present. Prof. N. S. Chaudhary, delivered his talk on Communication Networks. The objective this conference was to bringing together researchers, developers, and practitioners from academia and industry working in all areas of Computer Communications and Networks and to present results of ongoing research in the most state-of-the-art areas. It also provided the premier interdisciplinary forum for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns, practical challenges encountered, to exchange ideas, techniques and tools, raise awareness, and share experience related to security and privacy and the solutions adopted in the field of Computer Communications and Networks.



Kolkata Chapter

- **Lecture Meeting on Old Age Care and IOT** was held on August 29, 2015 at CSIKC auditorium. The keynote speaker was Mr. Supratik Gupta the senior member of CSI.
- **Sundarban Programme 2015 (Reaching Out)** – Dr. Pinakpani Pal, Chairman CSIKC, Dr. R. T. Goswami, immediate past Chairman, CSIKC, Dr. Ambar Dutta, Treasurer, Mr. Subir Lahiri, Secretary, CSIKC, Prof. J K Mandal, Vice Chairman, Mr. Chandan Pal and Mr. R. K. Sambui, and two office staff Dulal Sengupta and Buddhadeb Kayal of CSIKC attended Six consecutive programs at six schools of Sundarban area under "Reaching Out" scheme of CSI Kolkata Chapter on 12th, 19th, 26th September 2015 3rd , 10th and 17th October 2015. The programme and schools Names are : Kalidanga Junior High School, Kalidanga, Basanti, (12/09/2015), Jotishpur High School, Jotishpur, Basanti (19/09/2015), Netaji Vidya Pith, Hiranmoypur, Basanti, (26/09/2015), Pathankhali Adarsha Vidya Pith, Pathankhali, Gosaba, (03/10/2015), Amlamethi Sashibhusan H.S School, Amlamethi, Gosaba,(10/10/2015), Kalidanga Junior High School, Kalidanga, Basanti, (17/10/2015).

Siliguri Chapter

National Conference on Recent Trends in Computer Science and Application (NCRTCSA-2015) jointly organized by CSI, Siliguri Chapter and Siliguri Institute

■ FROM CHAPTERS AND DIVISIONS ■

of Technology (SIT), Nov. 7, 2015 at SIT, Siliguri. Mr. Apurba Chakraborty, Organizing Secretary, NCRTCSA-2015 gave the welcome address. Keynote addresses were delivered by Prof. Subrata Ghoshal, Kumar Mangalam University, Haryana (Robotics and Artificial Intelligence) and Prof. Kameshwari Chebrolu, IIT Bombay (How to do Quality Research). Mr. Devaprasanna Sinha, RVP, Region II, spoke on the history of CSI in a session. Prof. J. K. Mandal, Kalyani University delivered the invited address on "Chaos based Authentication in Public Domain Networks". Twelve papers were presented at the Conference and have been published in the Proceedings brought out on this occasion.

Vellore Chapter

A one day workshop on "Basic Photography Techniques" on 31-10-2015 at VIT University, Vellore. Mr. Satishkumar. G., Design Animator, Cool Animations, Vellore, explained the different photography techniques. Around 35 participants attended the workshop organized by Prof. G. Jagadeesh and Prof. K. Govinda.

A one day workshop on "Insight of Data Analytics" on 14-11-2015



at VIT University, Vellore. Mr. Nikhil Dokania, Senior Business Analyst from Antuit India Pvt.Ltd, Bangalore covered Introduction to data analytics and explained different approaches in machine learning like association rule mining, clustering and classification used for business intelligence applications and his experience working on different verticals like healthcare, retail, insurance and supply chain management, demonstrated with demo on all the verticals using business intelligence tools to extract the business data. Around 90 participants attended the workshop organized by Prof. G. Jagadeesh and Prof. K. Govinda.



Warangal Chapter

A Faculty Development Programme was organized by the Dept. of CSE, KITS, Warangal in association with Computer Society of India on "Research Insights in Cloud and Big Data" during 19-20 September 2015. 95 members were selected for participation. Eminent speakers from different organizations including Osmania University, DRDO and industry were called.

The Inaugural function was graced with Sri. K. Mohan Rao, Vice-President, EES as presiding officer, Dr. S. Ramachandram, Principal, University College of Engineering, Osmania University, Hyderabad as Chief Guest of this function, Sri. K. Mallaiah, Scientist-D, DRDO, Hyderabad as Guest of Honor to this function and Dr. Y. Manohar, Director, KITSW, Dr. K. Gururaj, Principal, KITSW, Dr. P. Niranjan, Head, Dept. of CSE, KITSW, Dr. P. Suresh Kumar and Sri. B. Sridhara Murthy, Assistant Professors of CSE, Coordinators of this FDP, Sri. C. Srinivas, CSI State Coordinator.

The keynote address was delivered by Prof. S. Ramachandram, Principal, University College of Engineering, Osmania University, Hyderabad on the topic "Research Insights in Cloud Computing". In his talk, he discussed about the importance of Cloud computing, its applications, research directions and current opportunities in cloud computing era.

Mr. K. Mallaiah, Scientist-D, DRDO, Hyderabad spoke on the topic "Cloud Security challenges, protection techniques and Tools". Dr. D. V. Ramana, Senior Manager, Wissen Infotech, Hyderabad delivered lecture on the topic "Research opportunities in Big Data". Mr. S. Naga Raju, Kakatiya Institute of Technology & Science (KITS), Warangal given a lecture on "Mining Techniques in Big Data". Dr. P. Suresh Kumar, KITS, Warangal delivered a lecture on "Big Data Analytics challenges in Healthcare Domain". Mr. K. Vinay Kumar, Kakatiya Institute of Technology & Science (KITS), Warangal dealt a topic "Storing and Processing of Big Data - Hadoop, MapReduce Tools".



Like Computer Society of India on Facebook: <https://www.facebook.com/CSIHQ> for updates.
RVPs, Divisional Chairpersons, Chapter OBs and Student branch coordinators may send the activity reports, Photographs, or any other information to update on the page to nourine@csi-india.org.

■ FROM STUDENT BRANCHES ■



REGION-III

POORNIMA COLLEGE OF ENGINEERING, JAIPUR



31-10-2015 – during Inaugural Ceremony of CSI student Branch

GYAN GANGA INSTITUTE OF TECHNOLOGY AND SCIENCE, JABALPUR



29-10-2015 – during event on Battle of the Brains

REGION-IV

SILICON INSTITUTE OF TECHNOLOGY, BHUBANESWAR



5-11-2015 - Mr. Nitai G. Dhall, Honourable Trustee of Silicon Institute of Technology with the Winners during the Computer Quiz 2015

REGION-V

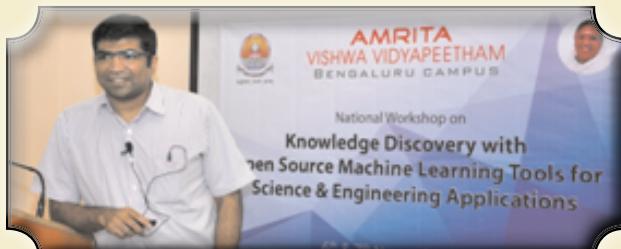
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL



19 & 20-9-2015 - Keynote address by Prof. Ramachandram during two days FDP program on Research Insights in Cloud and Big Data

REGION-V

AMRITA VISHWA VIDYAPEETHAM (UNIVERSITY), BANGALORE



6 & 7-11-2015 - Dr. Srinath Srinivasa delivering lecture during Two days National workshop on Knowledge Discovery with Open source Machine Learning Tools for Science & Engineering

AMRITA VISHWA VIDYAPEETHAM (UNIVERSITY), BANGALORE



20-11-2015 – during Technical talk

REGION-V

GITAM UNIVERSITY, VISAKHAPATNAM



26-10- 2015 - during APP BUZZ - a one day workshop on Mobile Application Development

LAKI REDDY BALI REDDY COLLEGE OF ENGINEERING, MYLAVARAM



30 & 31-10-2015 - during two days workshop on Ethical Hacking & Cyber Security

■ FROM STUDENT BRANCHES ■

REGION-V	
CVR COLLEGE OF ENGINEERING, HYDERABAD	CVR COLLEGE OF ENGINEERING, HYDERABAD
	
16-11-2015 - Mr. Pawan Shukla, Microsoft, Hyderabad delivering lecture during invited talk on Internet Of Things (IOT)	9-11-2015 - Dr. Suresh Chandra Satapathy, Chairman, Div-V, Sri. Raju Kanchibotla, RVP-V & Sri. Mohan Raidu during Student Branch Inauguration
REGION-V	
BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD	K E SOCIETY'S RAJARAMBAPU INSTITUTE OF TECHNOLOGY, RAJARAMNAGAR
	
7-10-2015 - during One Day Workshop on IBM BLuemix	19-7-2015 - Dr. Kulkarni, Director inaugurating the event on Open Discussion on Final Year B Tech Project
REGION-VI	
MGM'S JAWAHARLAL NEHRU ENGINEERING COLLEGE, AURANGABAD	NANDHA COLLEGE OF TECHNOLOGY, ERODE
	
30 & 31-10-2015 - Gaurav Kashikar, Ms. Parminder Kaur, Mr. Nitin Nalgirkar, Dr. Kale, Dr. Sudhir Deshmukh & Dr. Musande during Student Convention on the topic AGNITIO	6-8-2015 - during Industrial Seminar on the topic Art of Exploitation
REGION-VII	
ADHIYAMAAN COLLEGE OF ENGINEERING, HOSUR	NANDHA COLLEGE OF TECHNOLOGY, ERODE
	
6 & 7-11-2015 - Dr. Vijaya delivering lecture during National Workshop on Research Trends in Advanced Data Mining Techniques	30-9-2015 during Inter Department Meet



Rules / Procedure for Approval of Technical Collaborations, for Technical Events Organized by the Non-CSI Entities like Organizations / Institutions / Universities, etc., by CSI Chapters / Regions / Divisions, without any Financial liability to CSI

Technical sponsorship / collaborations to good quality technical events, without any financial liability, subject to the following conditions, can be approved, on case to case basis:-

1. The concerned Organization / Institution must be a valid Institutional member of Computer Society of India (CSI). If they are obtaining fresh membership, they should be encouraged to take membership for longer duration like 10 / 20 years.
2. As part of this Technical Sponsorship, at-least one Life Member or 05 individual annual professional members must be generated, out of this event. For this, a copy of CSI Life Membership Form should be distributed, in the registration kit, to all the non-CSI Member delegates and arrangements should be made to collect the filled in membership form, payment details (Bank counter folio after depositing the payment in the bank or cheque, payable at par, in favour of Computer Society of India) of the interested delegates, on the spot. This can be done through keeping a counter of CSI having copies of CSI forms and other related information through a person deputed there by the organizers, on the venue of the event.
3. In order to justify the CSI Technical Sponsorship and also to motivate the delegates / participants to obtain the CSI Membership, delegates / participants must be given at-least 20% discount in registration fee, to existing CSI Members or would be CSI members (if they deposit the fee and CSI membership form on the spot).
4. If the Institution does not have the CSI Students' Branch, at-least after the event is over, they should work hard to establish the Students' Branch. This will be a compulsory condition for their 2nd event to be approved for technical sponsorship.
5. Quality of papers, technical materials and publications should be of high standard and be checked thoroughly by Turnitin or any other licensed antiplagiarism / cross check / similarity index softwares to avoid embarrassment to the society, at later stage. Open source softwares, for antiplagiarism checking, are not recommended, as their database is very limited and the reports are not authentic.
6. OBs and few related ExecCom members, with the consent of the sponsoring heads, be involved in the Advisory Committee or Steering Committee of the event.
7. Two delegates, based on the recommendation of the sponsoring / collaborating head, be given complimentary registration. They will be monitoring the execution / conduct of the event and submit a brief report, after the event, to the respective sponsoring / collaborating head.
8. After the event is over, a DVD having copies of the related presentations / papers / other technical materials be submitted to CSI for uploading them on CSI Digital Library (DL).
9. After the event is over, a post event report with few good quality photographs having CSI logo be submitted to the CSI HQ for its record and publication in CSI Communications.
10. The event must be planned in advance and be included, through the sponsoring / collaborating head, in the event calendar published in the CSI Communications.
11. The CSI logo, including the Golden Jubilee logo (till December, 2015), as available at CSI website www.csi-india.org and also available on the header line of this document be included at prominent places of all the flyers, backdrops, banners, publications, and other printed materials, under the head; Technical Sponsor, if there is only one sponsor, otherwise, as Technical Co-Sponsor.

A proposal giving details of the programme may be submitted to corresponding chapter/ region/division, at-least 06 months in advance.



Anirban Basu, Vice President, CSI & Chairman, Conf. Committee, Email: abasu@pqrssoftware.com

Date	Event Details & Contact Information
12-14 Dec 2015	International Conference on Computational Intelligence and Communication Networks (CICN 2015) www.cicn2015.info Contact : Dr. Santosh Vishwakarma santoshscholar@gmail.com
22-23 Dec 2015	National Conference on Recent Trends in Electronics, Telecommunications and Information Technology (NCRTEIT-2015) , organized by Department of E&TC and IT MIT College of Engineering, Pune. In association with IETE and Computer Society of India Division IV Communications. Contact : Dr. Vivek Deshpandey vsd.deshpande@gmail.com Ph - +919422519649
26-27 Dec 2015	International Conference on Communication and Network ComNet 2015 at Ahmedabad Management Association, ATIRA Campus, Ahmedabad 380015 www.comnet2015.org Contact : Email id comnet2015@csiahd.org
8-9 Jan 2016	Third International Conference on Information systems Design and Intelligent Applications (INDIA 2016) at Anil Neerukonda Institute of Technology and Sciences (ANITS), Vishakapatnam, Andhra Pradesh in association with CSI Div-V and Proceedings Support from Springer AISC. http://www.conference.net.in/india2016 Contact : Prof. Pritee Parwekar, ANITS pritee2000@gmail.com Prof. S. C. Satapathy, ANITS sureshsatapathy@ieee.org
4-5 March 2016	Second International Conference on ICT for Competitive Strategies (ICTCS-2016) at Udaipur. (Organized by ACM Udaipur Chapter, in association with CSI Udaipur Chapter) www.csi-udaipur.org/ictcs-2016 Contact : Mr. Amit Joshi amitjoshiudr@gmail.com
5 March 2016	First National Conference on Challenges and Opportunities in Computer Engineering, (NCCOCE 16) Conference organized by Department Computer Engineering, Christ University, Bangalore In association with Computer Society of India Division IV Communications. Website : http://cse.christuniversity.in/nccoce Contact : Dr. Samiksha Shukla samiksha.shukla@gmail.com nccoce@cse.christuniversity.in Ph - +919880462311
10-11 March 2016	First International Conference on Data Engineering and Communication Technology-ICDECT at LAVASA, Pune www.icdect.com Contact : Prof. Suresh Limkar icdect2016@gmail.com 9823328686
16-18 March 2016	INDIACOM - 2016; 3rd 2016 IEEE International Conference on "Computing for Sustainable Global Development Organized by Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM) New Delhi www.bvicam.ac.in/indiacom Contact : Prof. M. N. Hoda, Conference@bvicam.ac.in , indiacom2016@gmail.com

Guest Editor - Dr. Vipin Tyagi

Dr. Vipin Tyagi, Guest editor for December Issue of CSI Communications, is working as faculty in Dept. of CSE at Jaypee University of Engg and Technology, Raghogarh, Guna (MP) India. He is Regional Vice President of Computer Society of India of Region 3. He is also associated with CSI Special Interest Group on Cyber Forensics. He has about 20 years of teaching and research experience. He is a senior life member of Computer Society of India. He was President of Engineering Sciences Section of the Indian Science Congress Association for the term 2010-11, and recorder for the term 2008 - 2010. He is a Life Fellow of the Institution of Electronics and Telecommunication Engineers. He is actively associated with professional societies like CSI, IETE, ISCA, Indian Society of Remote Sensing, IEEE etc. He was nominated by Indian National Science Academy (INSA), New Delhi under international collaboration to visit Czech Republic, for two weeks in May 2012. He has published more than 100 papers in various reputed journals, advanced research series and has attended several national and international conferences in India and abroad. He is Principal Investigator of research projects funded by DRDO, MP Council of Science and Technology and CSI. He is serving CSI Communications as Guest Editor since May 2015 issue.

He is an expert in the area of Cyber Security, Cyber Forensics and Image Processing. He can be reached at dr.vipin.tyagi@gmail.com





CSI-2015
50th Golden Jubilee Annual Convention
on
Digital Life
(02nd - 05th December, 2015)



Hosted by: Computer Society of India (CSI), Delhi and NCR Chapters

Convention Website: <http://www.csi-2015.org/>

Announcement and Call for Registration and Participation

On the sound foundation of previous 49 editions of CSI Annual Conventions, held regularly every year, in different cities of the country, Computer Society of India (CSI), takes pride in announcing its 50th Golden Jubilee Annual Convention; CSI-2015 to be held at New Delhi, the national capital of the country. **CSI-2015** will be an amalgamation of the following ten different tracks organized parallel to each other, in addition to few theme based Special Sessions:-

Track # 1: ICT Based Innovation

Track # 2: Next Generation Networks

Track # 3: Nature Inspired Computing

Track # 4: Speech and Language Processing for Human-Machine Communications

Track # 5: Sensors

Track # 6: Big Data Analytics

Track # 7: System and Architecture

Track # 8: Cyber Security

Track # 9: Software Engineering

Track # 10: 3-D Silicon Photonics & High Performance Computing

CSI-2015 will be held at **Bharati Vidyapeeth Educational Complex, A-4, Paschim Vihar, New Delhi (INDIA)**. The convention will provide a platform for technical exchanges amongst scientists, teachers, scholars, engineers and research students from all around the world and will encompass regular paper presentation sessions, invited talks, key note addresses, panel discussions and poster exhibitions.

Over 1300 papers, from all across the country and abroad, have already been received. Paper submission process has been closed on 17th August, 2015, strictly as per the last date announced. Accepted papers shall be published by **Springer** in **AISC series**, which is indexed with world's leading **Abstracting & Indexing (A&I)** databases, including **ISI, SCOPUS, DBLP, EI-Compendex, Google Scholar**, etc. in the form of Convention Proceedings, both, Soft Copy as well as Hard Copy. Over two dozens of leading experts, in their respective field have already confirmed to be the Speakers during the convention. Over 2000 delegates, from all walks of life, including top researchers, teachers, Govt. Officers, technocrats, industry leaders, representatives of the regulatory agencies and other stake holders are expected to attend the convention. Convention is fortunate to have the blessings of the following top visionaries, in their respective field.

Chief Patron	Patrons	
Padmashree Dr. R. Chidambaram Principal Scientific Advisor (PSA), Govt. of India	Prof. S. V. Raghavan Scientific Secretary, Office of the PSA, Govt. of India	Dr. G. Satheesh Reddy Scientific Advisor to Defence Minister, Govt. of India
Chair, Programme Committee	Chair, Finance Committee	
Prof. K. K. Aggarwal Chancellor, KRM University, Gurgaon and Former Founder Vice Chancellor, GGSIP University, New Delhi	Mr. Satish Khosla Managing Director, Cognilytics Software and Consulting Pvt Ltd.	

Registration Fee Details

Available at Page no. 45

For more details, please refer the convention website at <http://www.csi-2015.org/>

All correspondences, related to **CSI-2015** must be addressed to

Prof. M. N. Hoda

Secretary, Programme Committee (PC), **CSI - 2015**

Director, Bharati Vidyapeeth's

Institute of Computer Applications and Management (BVICAM)

A-4, Paschim Vihar, Rohtak Road, New Delhi – 110063 (INDIA)

Tel.:+ 91-11-25275055 Fax:+ 91-11-25255056 Mobile: +91-9212022066

E-Mail IDs: mca@bvicam.ac.in; csi2015.delhi@gmail.com; Visit us at <http://www.csi-2015.org/>