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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.

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Editor: S. S. Agrawal

Editorial

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

Dear Fellow CSI Members,

"NANOTECH holds the future"

"Nanotechnology is the idea that we can create devices and machine all the down to the nanometer scale... about half the width of human DNA molecule" ***- Paul Mc Euen***

Nanotechnology is rapidly gaining attraction of many researchers, scientists and across a range of industries, from agriculture to water treatment to energy storage. Nanotechnology is a field encompassing nanostructures, nanomaterials and nanoparticles. The basic science behind the nanoscience is the manipulation of matter at the atomic and molecular level. Today, nanotechnology is one of the most innovative, cutting-edge areas of scientific study and leaders in nanotechnology are creating the latest breakthroughs in the field. Major applications of Nanotechnology include Nanoparticles for cancer treatment: Nanoparticle Chemotherapy, Nanomedicine, Water Treatment: Safe Purification, Nanoagriculture and Energy Storage: Solar Power etc.

The cover story "Nanotechnology and its impact on High Performance Computing" is given by Prof. Bala Krishnan and Prof. Ragavi of Sri Krishna College of Engineering & Technology. Apart from its very special properties and applications the article highlights, the features which have been used to develop efficient computing systems. The other article on cover story given an idea of historical growth of nanotechnology based on rapid progress in material characterization and nano-material synthesis. The technology is certainly making a difference in making high efficient miniature devices and systems for engineering applications. The articles on voice Biometric and Voice based authentication shows that interest is growing on the use of these technologies in forensic science, similarly the application of block chain technology in securing health care records. The issue also contains several other articles of general interest.

On the technical trends and research front articles related to Prostate Cancer detection and on Genetic algorithms for solving inventory problems are not only interesting but useful.

The issue contains announcement regarding Four Regional students conventions are being organized at four different regions. Students are encouraged to participate actively in the conventions and win prizes / awards.

The results of the elections of the EC for the period 2019-2020/ 2021 for various posts have been declared and published in this issue. Hearty congratulations to all the elected members. We wish them a successful and productive tenure.

Information regarding organization of various Conferences, Workshops & Seminars to be held in near future and the activities reports of different events conducted by the CSI Chapters are also given. I welcome and feel privileged to be associated with Dr. Sunil Kumar Pandey as Guest Editor of this February issue of CSIC on Nanotechnology and his highly valuable contributions.

I would like to thank all the authors for their valuable contributions and look forward to get their cooperation in future also. My special thanks to Prof. A. K. Nayak, Vice President cum President Elect of CSI for his constant support and encouragement in this work.

With kind regards,

Prof. (Dr.) S. S. Agrawal
Director General KIIT & Emeritus Scientist (CSIR)

Message from the Vice President cum President Elect

From : Vice President, Computer Society of India
Date : 01 February, 2019
Email : vp@csi-india.org / Cell : (91) 82106 93239

Nanotechnology is the study and application of extremely nanoparticles,used across all the field of applications concerning with Chemistry, Biology, Physics, Materials Science, Engineering, Electronics, Environment, Consumer Products, Sporting Goods etc.

The application of nanotechnology in medicine currently being developed involves employing Nanoparticles to deliver Drugs, Heat, Light or other substances to specific types of cells, such as Cancer cells. The Nanotech based products that are in the market today are mostly gradually improved products where some form of Nano-enabled material or Nanotech process is used in the manufacturing process.

The recent trends in research to improve existing products by creating smaller components and better performance with a lower cost, the companies that will manufacture nano products will grow very fast and soon. On this context I feel choosing Nano technology as the theme of February 2019 issue of CSI Communication is praise worthy.

CSI Election

The results of elections for the Executive Committee of Computer Society of India for the period 2019-2020/2021 for various posts have been declared and published in this issue. Hearty congratulations to all the elected members. I wish them all the success for their effective & productive tenure & hope their efforts will take CSI to the height of excellence. In the same time I congratulate the Nomination Committee Chair Sri Anand Rao and members Md. Shams Raza & Sri Sanjay Kumar Mohanty for their great effort to conduct the election in a very transparent way within the time schedule.

Inauguration of New Student Branch at Shri Sankaracharya Technical campus at Bhilai

Expansion of CSI continues all over the country by establishing more & more Chapters & Student Branches. The establishment of a new Student Branch at Shri Sankaracharya Technical Campus at Bhilai, Chhatisgarh is another milestone which is the clear indication that more & more academic Institutions & students are extending their faith & confidence in CSI by enrolling themselves under CSI Domain. The society achieved the substantial growth in student membership enrolment in the current year comparison to the previous year. I take this opportunity to congratulate the Management & Student Members of Shri Sankaracharya Technical Campus for their great efforts.

Momentum in Chapter activities

Most of our Chapters & Student Branches are quite dynamic & Vibrant in organizing quality activities from local level, state level, national level to international level seminars/workshops/ conferences. Many of them have conducted good & quality activities. I congratulate all the respective Organisors & members for their tireless effort & significant contribution. Particularly the Lucknow Chapter has continuously organized a series of activities in past two to three months. I congratulate Prof. Arvind Sharma, RVP-I and members & Managing Committee members of Lucknow Chapter for their pioneer efforts & leadership to organize the various events successfully & effectively in excellent manner.

Forthcoming Events

CSI is going to witness a record number events in the month of February & March 2019. The organization of five Regional Student Conventions in the span of one month starting from Regional Student convention of Region-I at Chitkara University on 15-16, February 2019, Regional Student Convention of Region-VI at Nashik on 22-23, February, 2019, Regional Student Convention of Region-II at Patna on 23-24, February, 2019, Regional Student Convention of Region-V at Bangalore on 1st & 2nd March, 2019 & Regional Student convention of Region-III at Indore on 15-16, March 2019 apart from several State Student Conventions. The same time will also witness three International Conferences at Sikkim Manipal Institute of Technology at Gangtok on 25-28, February, 2019 at Bangalore on 1st & 2nd March, 2019 & IndiaCom at Bharati Vidyapeeth Institute of Computer Applications and Management, New Delhi on 13th to 15th March 2019. Other prominent activities are one day National Conference at MATS University, Raipur on 13th February, 2019, National IT Convention at Institute of Technology & Science on 14th to 15th March, 2019 & Global IT day on 30th March, 2019. Many more number of activities are also conducted by different Chapters, Student Branches & SIGs which reports are not coming to the notice of CSI Communication & to the Members also. I congratulate & sincerely thanks to all fellow brothers & request them for communicating the Reports of all activities so that the same can be published in CSI Communication.

I take this opportunity to seek the active & kind support of the members to make CSI more Dynamic, Vibrant, Productive & Sustainable to achieve the height of excellence.

Let us come forward to make Clean CSI & Green CSI with transparent activities & visions to make it Swachh, Pardarshi & Hara Vara.

Prof. Akshaya Nayak
Vice President, CSI

Final Election Result of CSI National Elections for various posts for the year 2019-2020/2021

Sl. No.	Name of the Post	S. No.	Name of the candidate	CSI Membership No.	Remarks/Election Result
1	Vice President Elect [2019-20; Upto March 31,2020]	1	Sh. R. K. Vyas New Delhi	2472LM	Elected via Evoting
2	Hony Treasurer [2019-21: Upto March 31, 2021]	1	Prof. Durgesh Kumar Mishra, Indore	00152632	Elected Unopposed
3	Regional Vice President (Region1) [2019-21; Upto March 31, 2021]	1	Arvind Sharma, Lucknow	00174902	Elected Unopposed
4	Regional vice President (Region 3) [2019-21; Upto March 31, 2021]	1	Jayant S Bhide Gwalior	11130	Elected Unopposed
5	Regional Vice president (Region 5) 2019-21 (Upto March 31, 2021]	1	Prof. M. S. Surendra Prasad Babu, Vishakapatnam	10173908	Elected Unopposed
6	Regional Vice President (Region 7) 2019-21; (Upto March 31, 2021]	1			No Nomination Received
7	Chairperson – Division-1 2019-2021 (Upto March 31,2021]				No Nomination Received
8	Chairperson – Division-3 2019-2021 (Upto March 31, 2021]	1	Prof S C Tyagi Ghaziabad	0146563	Elected Unopposed
9	Chairperson – Division-5 2019-2021 (Upto March 31, 2021]	1	Dr. Subhash Chandra Yadav, Ranchi	00093637	Elected Unopposed
10	Nominations Committee (NC) 2019-2020 (Upto March 31, 2020]	1 2 3	Arvind Mohan Nayak Jabalpur Dr. Ratnadeep Deshmukh, Aurangabad Deepak Sharma LKNW	SM12793 00100518 10011371	Elected Unopposed Elected Unopposed Elected Unopposed

We the members of the Nomination Committee hereby place before the Executive Committee the final result of the CSI elections for various posts for the period 2019-2020/2021. No Nomination has been received for the post of RVP 7 and Divn Chairperson 1. For all other posts the candidates have got elected unopposed.

30.1.19
Dr. Shams Raza
Member, NC

30/01/19
L. S. Mohanty
Member, NC

30/1/19
N. Anand Rao
Chairman, NC

For Computer Society of India
Dr. S. K. Jadhav
Hon. Secretary

Nanotechnology and its impact on High Performance Computing

S. Balakrishnan
Professor, Department of Computer Science and Engineering,
Sri Krishna College of Engg. and Tech., Coimbatore, Tamilnadu, India.

V. Ragavi
Professor and Head, Dept. of Science & Humanities,
Sri Krishna College of Engg. and Tech., Coimbatore, Tamilnadu, India.

The term nanotechnology is defined as "the design, characterization, production and application of structures, devices and systems by controlled manipulation of size and shape at the nanometre scale (atomic, molecular and macromolecular scale) that produces structures, devices and systems with at least one novel/superior characteristic or property". The broad utilization of PC and its wide application in the cutting edge world have constrained the analysts to enhance and make a littler, quicker and a progressively dependable PC. This target can be satisfied by nanotechnology. As indicated by M.C. Roco, "the third and fourth era of nanotechnology would depend intensely on research in software engineering".

1. Introduction

Nanotechnology can be characterized as the designing of utilitarian frameworks at the atomic scale. And furthermore Nanotechnology alludes to the control of issue on a nuclear and sub-atomic scale. A nanometer is "one billionth of a meter (10^{-9}m) - around one hundred thousand times littler than the measurement of a human hair, a thousand times littler than a red platelet, or about a large portion of the extent of the breadth of DNA".

Nanotechnology has an exceptional guarantee for the production of new materials with improved properties and features. These properties, for instance, a lot of notable chemical potency, accumulated electrical conduction and improved hardness and quality, are a consequence of the larger surface region of nanomaterials per unit of volume and quantum impact on the millimicron scale ("nanoscale"). As of now, nanomaterials are used or tested during a wide selection of merchandise, like sunscreens, composites, restore and electronic gadgets and concoction impetus. Like the achievements of nanotechnology in purchasing goods and in various areas, nanomaterials have promising natural applications.

1.1. Objectives

The first objective is to construct machines on the dimensions of atoms. Essentially, "nanotechnology works with materials, gadgets and totally different structures with no but one measuring calculable from 1 to 100 nanometres". Models are as follows: robot arms, a couple of nanometres wide-engine, novel semiconductor gadgets, little electronic parts and even entire

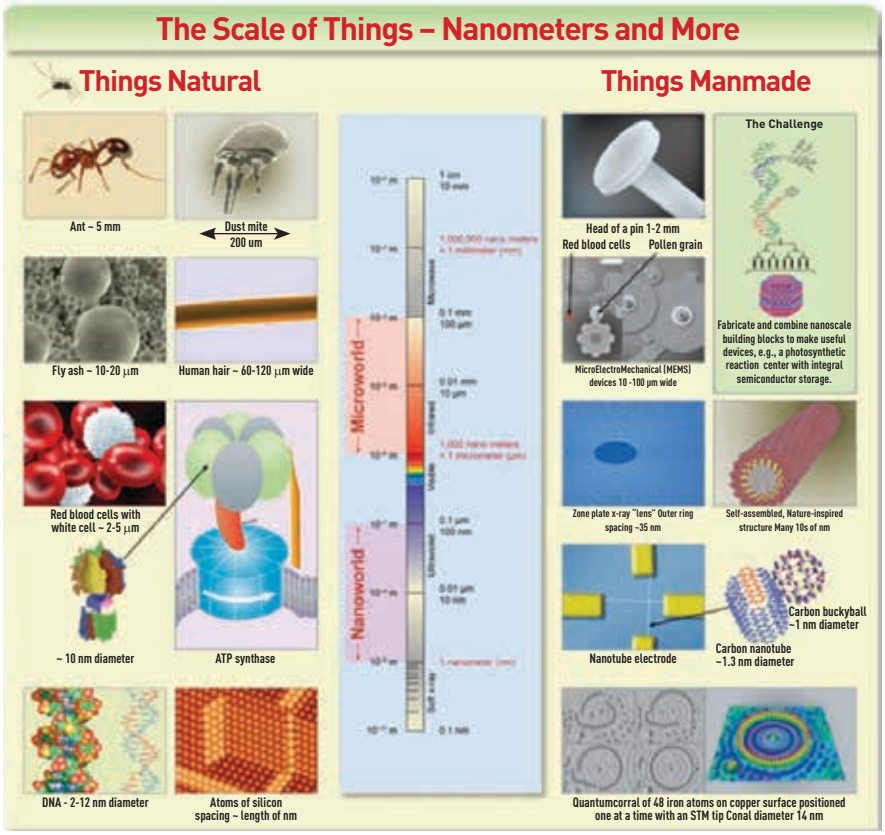

Fig. 1 : Scale of Things - Nanometers

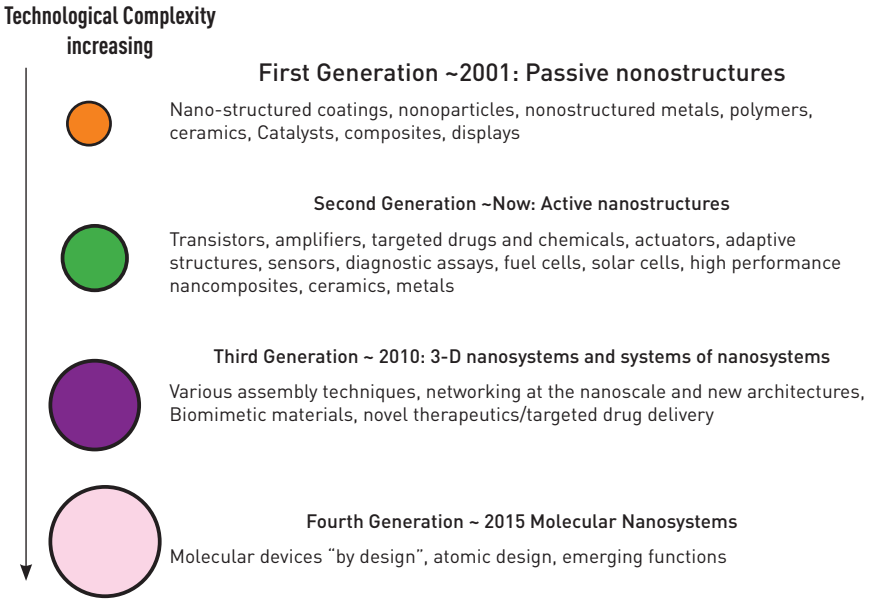

Fig. 2 : Nanotechnology Development Stages

computer far little than a cell.

2. Why we use nanotechnology in computer?

Nanoscale transistors that are quicker, additional powerful and additional energy-efficient; the whole memory of your pc will be keep on atiny low chip shortly.

2.1 Computer Memory Improvements with Nanotechnology

Hard drives utilized as memory in PCs devour more power and have more shot of disappointment than strong state memory that doesn't have any moving parts. Consequently, strong state PC memory has turned out to be prominent on littler PCs, for example, tablets. This strong state PC memory consume up less room, utilizes less battery control, and is less inclined to be harmed if the gadget is dropped. Nanotechnology is being utilized to enhance the thickness of strong state PC memory.

Table 1: Company and their Nano Products

Company	Products or Projects
Everspin Technologies	Magnetoresistive Random Access Memory (MRAM)
HP	Memristor
IBM	Nanophotonics
Intel	Integrated circuits with nano-sized features

3. Nanotechnology Techniques

- Quantum dots
- Nanofabrication
- DNA computing
- Carbon Nanotubes
- Nano Design (software system)
- NVRAM (non volatile RAM)

3.1 Quantum dots

Quantum dots are a brand new material created by the nanofabrication methodology bottom-up. These are "crystals that emit only one lightweight wavelength once the electrons are excited". Quantum dots might in future be used as quantum bits and type the premise of quantum computers.

3.2 Nanofabrication

It is a gathering of advances which are used in making small scale gadgets.

Top-down nanofabrication

- Start with huge material and convey it down to the nanoscale.
- It includes cutting out or including few particles to a surface. This strategy is "commonly utilized by gadgets industry in a procedure called photolithography".
- Photolithography is that "the procedure that exchanges the geometric form on a canopy to the surface of a semiconductor wafer by introduction to ultraviolet light through focal points".

Bottom-up nanofabrication

- Start with individual particles and manufacture upwards to make a nanostructure.

3.3 DNA computing

It is a way to deal with nanocomputers. DNA processing utilizes base up methodology or strategy to make DNA atoms and DNA rationale doors.

3.4 Carbon nanotubes

It is a "carbon tube-shaped material measured in millimicron scales. Researchers used this material to make electronic parts like transistors, diodes, relays and logic gates with the advancement of nanofabrication technology". These parts are applied on to advanced computers.

3.5 Nanodesign (software system)

A NASA research group has developed the Nano Design software system to design molecular machines and investigate fullerene nanotechnology. Nanodesign's software package design is intended to support and permit your cluster to develop complicated molecular simulated machines. The most purpose of developing this package is to style and simulate nanotechnology-based materials.

3.6 NVRAM (non volatile RAM)

Argonne Research has developed a NVRAM (non-volatile RAM) composed of small ferroelectric crystals engineered in nanotechnology. Since the "tiny nano-engineered ferroelectric crystals do not spontaneously revert, RAM produced with them would not be erased if a power failure occurred". The use of NVRAM laptop computers would no longer require batteries to be backed up, allowing them to become smaller and smaller. This achievement of nanotechnology is regarded by the computer industry as a long-standing dream.

4. Information Technology and Electronics Applications

Nanotechnology is now being used in many communications, computing, and different gadgets applications. These continuously evolving applications include:

- Nanoscale transistors
- Magnetic random access memory (MRAM)
- Displays for many new
- Other computing and electronic products

About the Authors

Dr. S. Balakrishnan, (CSI Membership 2060000034) is a Professor at Sri Krishna College of Engineering and Technology, Coimbatore, Tamilnadu, India. He has 17 years of experience in teaching, research and administration. He has published over 15 books, 3 Book Chapters, 6 Technical articles in CSI Communications Magazine and over 100 publications in highly cited Journals and Conferences. His professional awards include: 100 Inspiring Authors of India, Deloitte Innovation Award, Cash Prize Rs.10,000/-, from Deloittee for Smart India Hackathon 2018, Patent Published Award, Impactful Author of the Year 2017-18, Best Faculty-Computer Science and Engineering, Teaching Excellence Award, I2OR - Bright Researcher Award, Best Outstanding Faculty Award, Best Teacher Award, Best Research Paper Award, Best Book Publication Award and Best Book Chapter Award, Special Contributor Award and Star Performer Award. His research interests are Artificial Intelligence, Cloud Computing and IoT. He has delivered several guest lectures, seminars and chaired a session for various Conferences. He is serving as a Reviewer and Editorial Board Member of many reputed Journals and acted as Session chair and Technical Program Committee member of National conferences and International Conferences at Vietnam, China, America and Bangkok. He has filed/published Patents on IoT Applications. Dr. Balakrishnan is a life member of ISTE, IAENG, IEAE, IARDO, CSI, UACEE, SDIWC and CSTA.

Dr. V. Ragavi is a Professor and Head, Department of Science & Humanities at Sri Krishna College of Engineering and Technology, Coimbatore, Tamilnadu, India. She has 18 years of teaching, research and administration experiences. She has organized many technical symposiums, workshops, FDPs, motivational talks. She has published many papers in highly cited Journals and Conferences. Her research interests are Network Security, Cryptography, IoT and Image processing. She has two ongoing DST projects and she also mentors three more DST projects under various schemes. She has filed/published patents on IoT Applications. She is a life member in Indian Science Congress, IAENG and a senior member in IRED.

Nanotechnology Driven Past, Present and Future

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S. N. Kakarwal
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Introduction:

Nano means one billionth of a unit. A nanometer is about a few 10's of 1000 times thinner than human hair but still significantly bigger than size of atom (0.2 – 0.4 nm in diameter). Materials when reduced to nano size found to exhibit different or/and enhanced properties mainly due to larger surface area, and significant quantum effects. Increased surface area per unit mass enhances materials' chemical reactivity and dominating quantum effects significantly change materials' optical, magnetic and/or electrical properties.

First visionary of nanotechnology, Richard P. Feynman on 29th September 1959 while delivering lecture on, *"There is plenty of room at the bottom"*, at the annual meeting of the American physical society opened up a completely new field, of nano technologies. His suggestion to start from bottom or nano level is in fact the key of the advancement of nanotechnology. In turn, Norio Taiguchi in 1974 while describing thin film deposition and iron beam milling, first coined the term *"nanotechnology"*. NASA describes 'nanotechnology' as, *'The creation of functional materials, devices and systems through control of matter on nanometer length scale (1-100 nm) and exploitation of novel phenomena and properties at that length scale'*.

Nano material synthesis involves *'bottom up'* and *'top down'* approach. In bottom up approach synthesis is carried out at molecular level using techniques such as inverse micelles, sol gel processing and chemical vapour deposition. Top down approach of nano material synthesis involves cutting, carving and moulding etc. using techniques such as laser ablation, ball milling, nano-lithography, hydrothermal, electroplating. Synthesis of uniform sized nanoparticles of identical properties is in fact the great challenge till today.

In the field of computer science, nanotechnology is playing a crucial role in producing electronic components, devices, functional matter and systems at atomic level incorporating concepts from in almost all disciplines. S1 MP3 chipset from The Flying Electron Inc. is the so called first is nano computer or a quantum computer and is being used in audio players.

Nature's - The Nanotechnologist:

Nanotechnology has the ability to work at the atomic and molecular level and surprisingly, it has been used by nature since the beginning of the progression of biological species [1]. And so, the nature is the leading motivation for nanotechnologists. Over the millions of years, many nanoparticles and devices have been perfected by nature through the process of evolution. Mere observation of the natural phenomena around us can reveal new directions and insights in nearly all domains of research.

The webs of web-spinning spiders are made up of nano fibres that are light, insoluble in water, stronger than steel, can withstand environmental effects such as rain, wind and sunlight. With enough supply of raw resources of own a spider is able to spin the web over great distances compared to its body size and that too at amazing speed, in an organized manner is fascinating. Just to quote another example, nano spikes available on the surface of lotus leaf makes them self cleaning, rolling off with ease, the water droplets and dust particles and providing protection. Aquaporins in plants, as well as some animals regulate the movement of water into and out of cells and survive them. Plants extract water from the soil into the roots using aquaporins. Gecko lizards can walk across a ceiling upside - down because of billions of nano hairs (*spatulae*) well organized in groups (*setae*) each about 200 nm wide on the soles of their feet Setae are in turn arranged in rows, which are visible to the naked eye (*Image 1*). These hairs when wedged between surface atoms form molecular bonds with the wall or ceiling, putting the gecko in direct contact with its environment. Further, enormous amount of surface area of these nano hairs outweighs the animal's body weight and dismiss the laws of gravity. Gecko nano hairs have encouraged scientists in trying to produce a stickier, stronger, reusable self-adhesive tape.

Image 1: Setae on the soles of gecko feet Credit: Max Planck Institute for Metals Research

Nano scale structures are involved even in milk - a nano scale colloid. Nano sized structures in the sophisticated proteins control a various biological actions, such as flexing muscles, releasing energy and repairing cells. Looking to the sensory mechanism of nature, electronic nose, electronic tongue etc. consisting of nano sensors each with a specific code have been developed. Data storage capacity of electronic devices is being continuously enhanced by looking at nature's wonder- DNA, a nano molecule that not only stores but also manifests the entire personality of a species.

Surprisingly, all such nano molecules get synthesized very efficiently and quickly that too under ambient conditions in contrast to artificial synthesis methods adopted are based on high-energy processes, usually involving temperature, electrical or other forms of energy, low or high pressures, etc.

Nanotechnology - From Past To Present:

Gold and silver nanoparticles have been used as coloured pigments in stained glass and ceramics since the 10th century AD. Depending on their size, gold particles can appear red, blue or gold in colour. Lycurgus Cup (*Image 2*), containing silver and gold bimetallic nanoparticles at British Museum appears red with transmitted light and green with reflected light [2].

Image 2: The Lycurgus Cup (a) reflected and (b) transmitted light

In the middle ages, '*Drinkable gold - gold colloid pink in color*' was used to cure some diseases like dysentery, epilepsy, tumors and for the diagnosis of syphilis [3]. Recently in 1989, IBM logo is demonstrated (*Image 3*) by Don Eigler and Erhard Schweizer at IBM's Almaden Research Centre by moving thirty five individual xenon atoms around chilled nickel crystal under controlled conditions with the help of scanning tunnelling microscope.

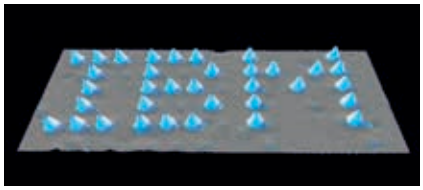

Image 3: Don Eigler spelled out IBM's logo using xenon atoms in 1999 (IBM)

In 2010, silicon tip (500 nm long; only few nm at its apex) was used by IBM to carve a substrate to craft a complete nano scale three dimensional relief map of the earth in 2 minutes and 23 seconds (*Image 4*). The complete map "written" on a polymer called polyphthalaldehyde, measured only 22 by 11 micrometers. At such size, thousands of world maps could fit on single grain of salt.

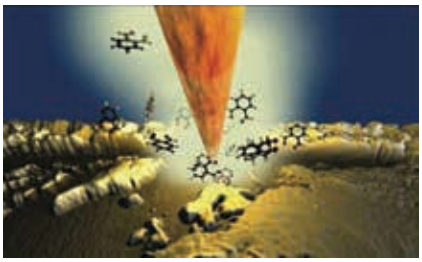

Image 4: 3D rendered image showing a heated nano scale silicon tip creating the map of the world (Image: Advanced Materials)

This powerful patterning technique for building nano scale (about 15 nm) patterns and structures at greatly reduced cost and complexity opened up new prospects in the area of electronics, optoelectronics, medicine and life sciences.

Evolutionary Nanotechnology:

Technologies in various streams that are in practice have been drastically modified and improved considerably with emerging field of nanotechnology. The most noticeable is that the sizes of almost all electronic devices have been greatly reduced. Nano particles of titanium and zinc oxide in sunscreen lotions are transparent to visible light but can absorb and reflect ultraviolet rays. Carbon fibres and bundles of multi walled CNTs are used in polymers to manage or improve conductivity, with applications such as antistatic packaging. Carbon black nano particles are used as filler to reinforce the car tyres. Clay particle based composites containing nano sized flakes of clay are being used in car bumpers. Coatings of highly hydrophobic and antibacterial titanium dioxide to windows make them self cleaning. Wear and scratch resistant hard coatings are significantly improved by nano scale intermediate layers between hard outer layer and the substrate material. Nanotechnology finds its application even in textile industries to manufacture breathable, waterproof and stain resistant fabrics. To bore holes in circuit boards the wear and erosion resistant, durable cutting tools are made from nanocrystalline materials. Nanoparticles incorporated paints make them lighter, thinner and environment friendly. Carcinogenic chlorinated hydrocarbons into harmless end products in ground water. Light weight and high energy density batteries that are in high demand are being manufactured using nano nickel - metal hydride. Magnetic nano materials are widely used in data storage devices, MRI machines and micro sensors. Nanocrystalline zirconium oxide is used in medical implants. It is hard, wear resistant, bio-corrosion resistant and bio-compatible. Artificial heart valves could be made from nanocrystalline silicon carbide due its low weight, high strength and inertness. Nanocrystalline silicon nitride and silicon carbide are used in automotive applications as high - strength springs and ball bearings. Nano engineered membranes are used in water purification. Nanotechnology is widely used in agriculture and agriculture related industry for quality agricultural yields. Nanoparticles can deliver nutrients to the specific part at a specific time very precisely. Use of nano- based agro-chemicals such as pesticides, ceramic devices and filters have great potential well organized and efficient agriculture compared to conventional one [4]. Conservation of soil, forest and water, waste water treatment, soil resource management, animal breeding, aquaculture, poultry farming and food processing now a day makes use of nanotechnology in efficient way. Nanotechnology engineered materials such as 20 nm zinc oxide powders are playing major role in the recognition of latent fingerprints. Nano zinc oxide powder give better print, are UV fluorescent and even work in wet conditions. Also the technology can simplify the issues related to gun crime. Nanotechnology has the potential to make a positive social contribution [5].

Nanotechnology in Future:

With the development of nano rods, nano pores, nano sponges and

nano gels, etc. in near future the field of medical diagnosis, treatments and therapies is bound to become simpler, cost effective and life saving too. Just to quote few examples nano robots will be deployed for cellular level repairs, for targeted drug deliveries in cancer affected cells, targeted heat therapy to destroy tumours of breast cancer, to repair damaged tissue, it is possible to have early detection of diseases such as cancer, damages to kidneys, and hence reducing the health hazards, reduce damages to healthy cells by treating only infected cells. With new technologies specific nano particle may be used to detect and defeat even single viruses. Such nano particle will be able to prevent virus reproduction in the patient›s bloodstream by delivering an enzyme. Specially, developed "nano sponges" can absorb toxins and remove it from the bloodstream. Neurodegenerative disorders such as Parkinson's disease and Alzheimer's disease could also be treated with nanotechnology in a better way. Nanotechnology will have its contribution in even stem cell research for its isolation and grouping [6]

Further miniaturization of computer chips in order to sustain Moore's Law, could be possible with carbon nano tubes. IBM is building transistors using six carbon nano tubes arranged in parallel, which may replace silicon transistors in near future. Researchers at the University of Wisconsin-Madison recently developed a carbon nano tube transistor capable of outperforming a similar silicon transistor. Carbon nano tube transistors are expected to be five times faster than silicon transistors. A nano tube's nano dimension allows current signal through it to change quickly leading to higher bandwidth of wireless communications devices. With nano photonics data could be transferred onto a chip efficiently at low power [7]. In near future, in the view of fast-progressing nanotechnology, nano computers will eventually scale down to the atomic level and will be measured in nano meters. Nano robot, or nano bots, will be controlled and managed by nano computers. Nanotechnologists are working even on genetically modified crops, precision farming techniques, precise and micro management of soil, new toxin formulations for pest control in the interests of humanity.

Conclusion:

In the view of rapidly progressing advanced materials' research, nano material synthesis with novel methods, precise characterization and manipulation of the nano particles in a controlled manner, the nano technology has became promising technology. Today, nano technology is working in coordination with almost all areas/discipline such as electronics and computer science, agricultural and food related industries/issues, health and medicine, forensic science, automobile industries, textile industry, paints, cosmetic etc. Nanotechnology in present times has proven to be advantageous to masses and has prospective future.

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'NANO' making a big difference!

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Introduction

Nanotechnology deals with synthesis, characterization of variety of nano particles. Further it includes visualization, organization and manipulation of nano particles so as to build various devices for desired applications.

In general chemical routes of nano particles' synthesis are efficient and widely followed. These includes sol gel auto combustion, hydrothermal, micro emulsion etc. Characterization of nano structures usually calls for sophisticated characterization tools. Different methods of characterization are employed to determine phase, structure and properties of the nano materials. Some of the equipments used in characterization of nano materials are, X-ray diffractometer, Scanning electron microscope, transmission electron microscope, scanning tunneling microscope, atomic force microscope, small angle X-ray scattering, wide angle X-ray diffraction, field iron microscope, 3 dimensional atom probe (3DAP) and many more can be listed here. Device fabrication technique mainly involves top down (lithographic processes, etching techniques) and bottom up (growth, assembly and chemical vapor deposition) approaches. Fabrication of flexible electronics is fast progressing field today. This article focuses on the modifications material properties due to size reductions to nano level.

Size Dependence of Properties

The modifications in the properties of a material due to reduction in the grain size to nano dimensions are not only very large but in most cases the resultant properties are superior to those of conventional materials. It is no wonder that nano materials are finding use in large number of applications. More and more potential applications of nano materials are being discovered.

For example, the change in properties of Nickel when it is made in nanocrystalline form is shown in Table 1. It should be recognized however that there are secondary effects on properties, since commercially pure Nickel contains impurity atoms that would prefer to segregate the boundaries between the grains. The higher concentration of the impurity atom at the grain boundaries will alter the bulk properties of solids.

Quantum chemistry and solid state physics converge at **nano** level. At nano sizes, the material exhibit properties from both phase regions. Quantum chemistry deals with chemical systems where the charge carriers are restricted in the electrostatic potential of nucleus. And, in solid state physics infinitely large systems where charged carriers travel as quasi free particles.

Nano structured materials are composed of grains and grain boundaries. Nanometer sized grains contains, few hundreds to approximately a million atoms on an average. And large number of atoms resides at the grain boundaries. For example, for a spherical nano particle of 3 nm diameter almost 50% of atoms or ions reside on the surface **[1]**. These surface atoms offer more coordination sites enhancing probability of manipulation to make them highly reactive. Hence, the surface and surface atoms plays a crucial role in assigning various properties to the material.

As the grain size decreases there is significant increase in the volume fraction of grain boundaries or interfaces and triple junctions. With increase in defect density, or in other words when the fraction of items residing at defect cores like dislocations, grain boundaries and triple junctions becomes comparable with that residing in the core, the properties of the material are bound to be govern to a large extent by defect configurations, dynamics and interactions. Nanoparticles have higher values of surface to volume ratio, as the surface area is varies with square of radius ($4\pi r^2$) while volume varies with cube of radius ($4/3\pi r^3$). Due to higher surface to volume ratio and large number surface atoms, the surface energy plays dominant role in assigning properties to a material. Enhancement in chemical activity of catalyst is familiar **[2]**. Besides the modifications in physical properties, quantum confinement of electron has influenced the electrical resistivity and magnetic susceptibility of the materials **[3]**.

Nanocrystalline ceramics are tougher and stronger than those with coarse grains. Nano sized metals exhibit significant increase in ill strength and toughness decreases. Electrical properties, chemical reactivity, melting point and optical absorption etc. depends on particle size when particles reach the nanometer scale. Magnetic nano particles behave differently than

Property	Change in property in comparison to bulk
Hardness	5times increased
Strength	3 to 10 times increased
Wear resistance	170 times increased
Frictional coefficient	Reduced to half
Corrosion resistance	Reduced or localized corrosion is stopped
Magnetic properties	Lower coercivity, decrease in saturation magnetization
Electrical properties	Resistivity increased by 3 times

Table 1: Change in the properties of Nickel as grain size is changed from 10μm to 10 nm

its bulk counterparts. As particle size decreases, remnant magnetization and saturation magnetization increases. **[4]**. When the size of the magnetic nanoparticles reaches single domain, a new sort of magnetism is exhibited and is called as superparamagnetism. For superparamagnetic materials its coercivity and remnant magnetization vanishes. Net magnetic moment of superparamagnetic particles in zero field averages to zero at temperatures higher than absolute zero. In presence of field, magnetic moments get aligned statistically similar to paramagnetism. And the magnetic moment is that of single domain particle consisting 10^5 atoms instead of a single atom. Superparamagnetic material has much higher susceptibility as compared to paramagnetic. Superparamagnetism can enhance the efficiency of systems subjected to high frequency alternating magnetic fields like transformers. In a traditional magnet exposed to an alternating magnetic field, the magnet cycles through its hysteresis loop often reduces its efficiency with increase in temperature. The increase in temperature is due to the frictional heating that occurs when magnetic domains change their orientations. Amount of energy lost per cycle is proportional to the area enclosed by the loop, so a smallest loop is preferable. It has also been shown that particle size has a large effect on microwave absorption. Particles of nano meter size greatly improve the absorptive efficiency and broaden the bandwidth **[5]**.

In conventional soft magnetic alloys low coercivity has been achieved using coarse grained materials so that magnetic flux pinning at the grain boundaries is avoided. In nanocrystalline materials when the grain sizes are much smaller than domain wall width, the magnetic anisotropy is averaged over many grains and hence the coercivity is significantly reduced and permeability is enhanced. These alloys exhibit nearly magnetostriction. In such alloys the small single domain Fe particles gives its unique magnetic behavior of lowest energy losses of any high permeability.

Nanoparticles exhibit different behaviors from bulk materials because a significant number of atoms are located at the surface or interface. The surface effect may dominate material properties. In magnetic nanoparticles, this difference becomes more obvious because the normal macroscopic domain structure transforms into a single domain state when grain sizes are reduced to nano scale. Unique magnetic properties, such as giant magneto resistance **[6]** and superparamagnetism, can be found in many types of magnetic nanoparticles. Associated with the above scientific uniqueness, many applications have been developed, for example, high density magnetic recording media **[7]**, ferrofluids, catalysis **[8]** and biomedical applications **[9]** etc.

For nanoparticles having large surface/volume ratio, the spin disorder may modify the magnetic properties. Spin-disorder may occur because of broken exchange bonds that produce a spin glass like surface, lowering the coordination of the surface atoms with a high anisotropy surface layer. Disorder is a strong effect in nanocrystalline particles such as ferrites where the super-exchange interaction occurs through the oxygen ions. The cation distribution may also differ at surface and non-surface atoms **[10]**. Spinel ferrites have shown interesting dielectric properties in their nanocrystalline form compared with the micrometer sized grains **[11]**.

Nanocrystalline spinel ferrites have been the subject of many studies due to their enhanced optical, magnetic, and electrical properties, when compared with their bulk counterparts, rendering such nanoparticles of interest for a variety of applications, for example, as electrodes in energy storage devices, as catalysts, and as magnetic storage devices **[12]**. In general, because of following reasons, nanoparticles become important in many applications.

- Possesses intermediate properties of both, atomic/molecular and bulk, regions.
- Suitable synthesis methods with controllable sizes in nanometer range.
- Tunable properties by varying composition, size and shape.
- Can communicate closely with bio molecules and facilitate intimate interactions with cells, molecular constituents etc.
- Nanoparticles are biocompatible and detectable.
- Superparamagnetic nanoparticles are suitable for drug delivery, imaging etc.

Figure 1 shows the way in which properties of nano structured material change in general **[13]**.

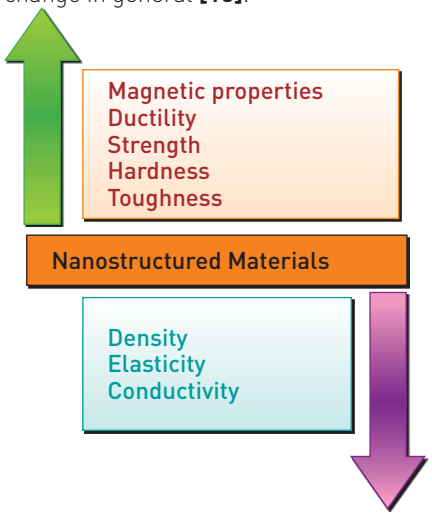

Fig. 1: Schematic diagram showing how different properties are affected in the nano regime

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Computational Analytics for Prostate Cancer Detection using MRI and Machine Learning

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MRI imaging is a technique which is noninvasive form of observing the human body. This means that there is no need to be opened surgically to analyze the physiological characteristics. From past few decades, there has been a pivotal role played by medical image processing for diagnosis and detection of life threatening diseases. Sometimes medical image processing act as the primary step for prevention of spread of disease. Recently medical imaging has not just grown but has matured significantly. MRI, CT Scans, Ultrasound imaging and X-Ray are few of the techniques which are being used recently [6]. With the progress done in the field of Computational analytics, it is being used for accurate diagnosis of the disease [8]. Medical imaging has now become a multidimensional field requiring expertise from Computer Science, Physics, Mathematics and medicine. The present article highlights the modern aspects of MRI in prognosis of Prostate Cancer with Automated approach.

I. Introduction

With the advent of X-Rays in 1895, there has been a significant progress in the medical imaging. Computed tomography (CT), Ultrasonography, Magnetic resonance imaging (MRI) and its variants are the new modalities which are recently developed. In the past, the medical images were produced through either of the techniques and were presented to the radiologist/ physician for the analysis and diagnosis of the present state of the patient. This diagnosis was a result of the decision making process by a knowledgeable Radiologist. Thus, the diagnosis of a disease was a result of image interpretation and decision making. As the improvement in the computational technique the decision making process has been Recently with the evolution of various computational techniques the diagnosis results are considerably improving thus resulting into superior decision making by the physician.

Prostate cancer is the deadly disease affecting wide number of men in the world. It is said to be a heterogeneous disease because the gland has the specific growth pattern with the age of the person [1][2]. Due to this occurrence of the cancer is relatively high as it is mostly considered as age related phenomenon.

There are multiple invasive techniques for the diagnosis which requires needle insertion to get the required tissue sample profoundly called as needle biopsy. The noninvasive techniques are widely preferred after the evolution of the Medical imaging. Mortality in the patients are often due to the spread of the cancer to different body organs. Practically, if this cancer is detected earlier it can be restricted from metastasis.

Magnetic Resonance Imaging (MRI) along with the automated analysis is improving the clinical procedures for radiation therapy treatment, cell biopsies, or planning of surgeries.

This article provides the highlight of the various analytical method used for the improvement of the diagnosis.

II. MRI For Cancer screening.

There are multiple superconducting magnets which are used in the scanning of the tissue within the human body. These scans are produced with very high magnetic fields which has the temperature equal to the liquid helium.

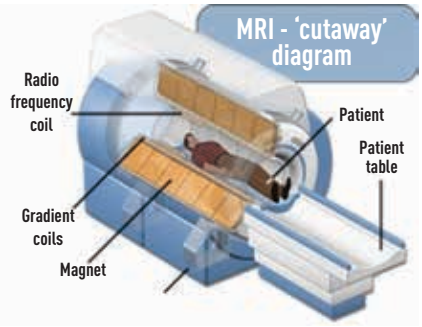


Figure 1.0 : Medical MRI Scanner

As shown in the figure the patient is placed within the field of rotation magnet. There are multiple coils for transmitting and receiving the radio frequency signals. By taking a series of these image for each of the plane i.e Sagittal Plane, Coronal plane, Transverse Plane prostate gland can be studied for the carcinogenic growth. For our study and analysis, we have used the T2 Weighted Coronal plane image. Below image shows the three dimensional figure of the planes which are formed using the Magnetic resonance imaging when a human body is placed for the imaging.

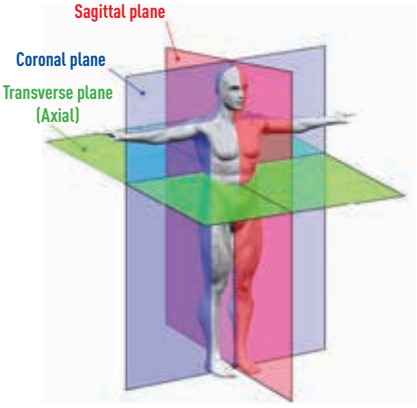


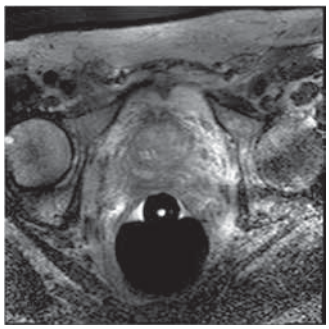
Fig. 2 : Axis of MRI images.

III. Image processing Methodology

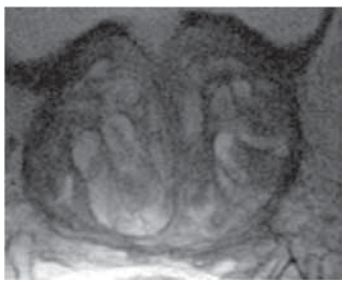
There are few methodologies from Image processing which are used for the Prostate cancer detection.

1. Image acquisition
2. Enhancement
3. Normalization
4. Computational Analysis.

The Image processing techniques are used significantly to segment and identify the region of interest from the image. In the present case the prostate cancer is our major region of interest. Below results are obtained after applying these techniques.



a) Prostate Image



b) Prostate Image after Enhancement

Fig. 3 : Prostate MRI Image

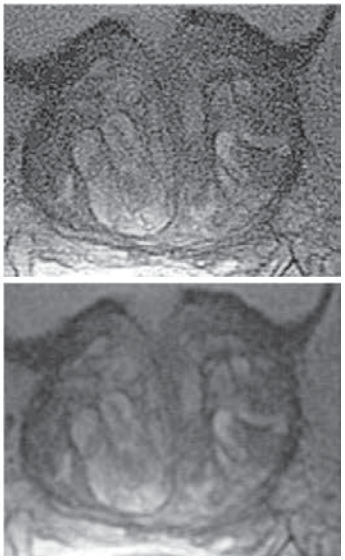


Fig. 4 : Images after Normalization

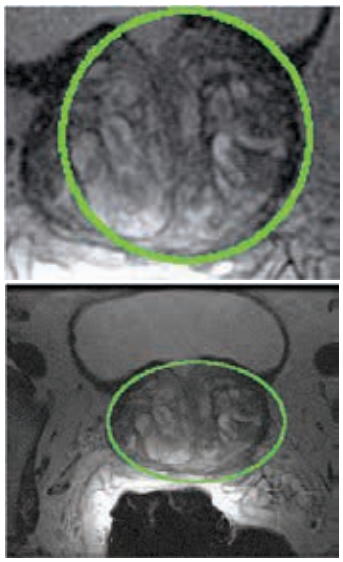


Fig. 5 : Prostate Detection

IV. Computational Analytics

The term computational analytics refer to acquiring, pre-processing, storing and analyzing a high volume, high velocity and high variety data. As the data obtained from the above method is relatively large thus the computation techniques can be applied for decision making which is difficult through human perception.

In this method, the feature extracted are assigned class labels based on the predefined algorithms which helps in the prediction of the outcome. [5]. With the advancement of research in the field of computational analytics multiple algorithms or their variants can now be used to improve the performance of the outcome. Few frequently used techniques are Decision trees, Naïve Bias, and SVM's which helps in the near to accurate analysis. In this article we will study the results using the SVM classifier.

SVM (Support Vector Machines) classifiers

This is one of the discriminative classifier where a separating plane is used to identify the class label. It is one of the most widely used Supervised learning algorithm for decision making and classification. There are many variants of these which are profoundly used like P-SVM and R-SVM.

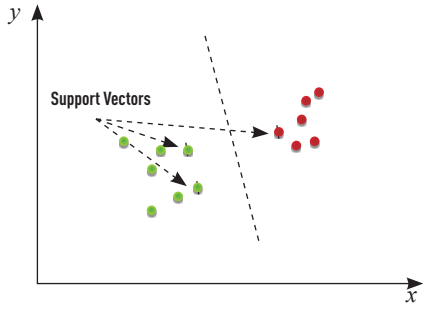


Fig. 6 : Support vector machine

With respect to the prostate cancer data the Prostate volume is calculated using the multiple parameters which are then passed to these classifiers. These classifiers assign the class labels as the outcome which are then validated with the already verified test samples.

Performance analysis of the algorithm is then done with the help of ROC- Receiver operating characteristic and the confusion matrix as below.

		Actual Values: Positive (1)	Actual Values: Negative (0)
Predicted Values	Positive (1)	TP	FP
	Negative (0)	FN	TN

Fig. 7 : Confusion matrix

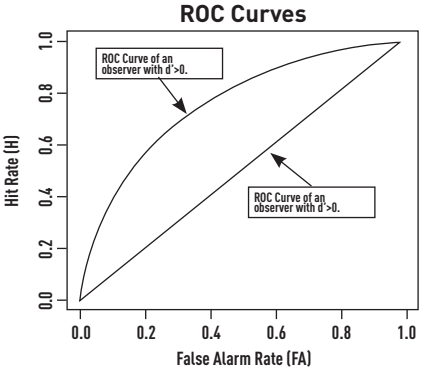


Fig. 8 : ROC Curve using Confusion matrix

V. Conclusion

Medical imaging along with computational analysis is resulting into a boon to the healthcare industry. Automated diagnosis is resulting into better diagnosis of various life threatening diseases. Medical Imaging along with Computational analytics has thus contributed significantly to the betterment of the society.

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On Genetic Algorithm for Solving a Deterministic Inventory Problem for Deteriorating items with Shortages

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The objective of this paper is to modelling a deterministic inventory problem of the single deteriorating item with a constant rate of deterioration considering the demand rate being ramp type (function of time) and also considering the shortages are allowed. During the shortage period, the backlogging rate is a variable (depending on the length of waiting time over the replenishment period). A real-coded Genetic algorithm with random sampling (with replacement) has been developed and a numerical example has been solved with the proposed GA as well as using the Generalised Reduce Gradient Method. Sensitivity Analysis also carried out with respect to different parameters.

Keywords : GA, Inventory problem, Deterioration, Ramp-type, partial backlog.

1. Introduction

In solving optimization problems using traditional methods like conjugate gradient, quasi-Newton, DFD's etc. which have some limitations like initial solution dependent, not efficient in handling problems having discrete variables and very often stuck to local optima etc.

To overcome some difficulties researchers tried to make use of principles of evolutionary algorithms one such technique is Genetic Algorithm (GA). GA's [12,13,15,16,20,21] are executed iteratively on a set of randomly generated coded solutions, which is known as population. GA's are adaptive Computational procedures i.e., soft Computing in nature. Within each iteration of GA, there basic operations are like selection, crossover and mutation are performed. Since GA's work simultaneously on a set of randomly generated coded solutions ,have very little chance to get stack at local minima. A very few researchers have applied GA in the field of inventory system. Sankar and lutfar(22), Sarkar and Newton(23), Mondal & Maity (18), Pal et. al (19), Roy et. al (25) have appled the GA in the field of inventory system.

2. Mathematical Modelling

To formulate the mathematical model we assume initially that a company purchases (S+R) units of the item. After fulfilling the backorder quantity the initial stock will be S. Due to deterioration effect and to meet customers' demand the stock level will be depleted. At time t=t1, the stock level will reach zero. After that, the shortages are accumulated during the time interval (t1, T) and all demands in that interval are backlogged.

The backlogging rate is given by

$$[1 + \delta(T-t)]-1$$

From the above assumption of demand rate D(t) , we have

$$D(t) = D0 . \mu \; ; \; 0 \leqslant t < \mu$$
$$= D0 . t \; ; \; \mu \leqslant t \leqslant T$$

Where the demand of an item is dependent on relative size of μ .

Case-1: $t_1 \leqslant \mu$

The profit function π_1 (average profit per unit time) is given by,

$$\pi_1(t_1, T)= [p(S+R- D') - c_3 (S+R)-C_4 - C_{hold} - C_{short} -C_5S] / T. \quad (1)$$

our problem is to solved,

Maximize $(\pi_1(t_1,T))$

Subject to $t1 \leqslant \mu$. (2)

Case-2: $t1 \geqslant \mu$

The profit function π_2 (average profit per unit time) is as follows :

$$\pi_2 (t_1, T)= [p(S+R- D') - c_3 (S+R)- C_4 - C_{hold} - C_{short} -C5S] / T. \quad 3)$$

Where,

$$C_{hold} = C_1[\{(\Theta 2S-D0) \{1-\exp(-\Theta \mu)\}/\Theta - D0(\Theta \mu 2 - 2 \mu)/2\}/\Theta 2 + D0 \mu\{\exp(\Theta(t1 - \mu) - 1)/ \Theta + \mu - t1\}/ \Theta] \quad (4)$$

$$C_{short}= C_2 D_0 \mu[(T- t_1) \ln|1+ \delta(T- t_1)|+(T-t1) (1+\delta(T-t_1)) \ln |1+ \delta(T- t_1)|/ \delta]/\delta] \quad (5)$$

In this case our problem is to solve,

Maximize $(\pi_2(t_1,T))$

Subject to $t_1 \geqslant \mu$ (6)

The problem (2) can be solved either GRG (Generalized Reduced Gradient) method or soft computing method like GA. Now, we shall develop an algorithm for determining the optimal value at t_1 and T with the average profit of the proposed inventory system by a real coded Genetic Algorithm for two continuous variables. The stepwise procedure of GA is shown as follows :

Step 1: Initialize the parameters of GA, bounds of variables and different parameters of the inventory system .

Step 2: Let t=0 // t represents the

number of generations
Step 3: Initialized P(t) // P(t) represents the population at t^{th} generation
Step 4: Evaluate P(t).
Step 5: Find optimal result from P(t).
Step 6: Increment t by 1
Step 7: If (t > maximum generation number) Print optimal result and Stop
Step 8: Select P(t) from P(t-1) by any selection process like Rowlett wheel selection, random sampling selection, ranking selection etc.
Step 9: Alter P(t) by genetic operations // like crossover and mutation operation.
Step 10: Evaluate P(t).
Step 11: Find optimal results from P(t).
Step 12: Compare optimal result of P(t) and P(t-1) and store better one and goto step 6.
Step 13: Print optimal result and Stop.

For implementing the above GA in solving constraint maximization developed in case 1 of the model, the basic components considered are as follows –(1) Values of parameters (population size ,probabilities of applying genetic operators, maximum number of generation etc) of GA, (2) Chromosome representation, (3) Initialization (4) Evaluation function (5) Selection process (6) Genetic operators (crossover and mutation) that alter the genetic composition of parents during reproduction.

3. Parameters of the Genetic Algorithm

GA depends on different parameters like population size (POPSIZE), the probability of crossover (PCROS), the probability of mutation (PMUTE) and a maximum number of generation (MAXGEN). About the population size of GA, there is no clear indication how large it should be. If the population is too large, there arise some difficulties in storing of the data for large population size. However, if the population size small, the crossover operation cannot be implemented accordingly. Again, according to genetics, it is obvious that the probability of crossover operation cannot be implemented accordingly. Again, according to genetics, it is obvious that the probability of crossover is always greater than that of mutation. Generally, the probabilities of crossover and mutation are taken as 0.6 to 0.8 and 0.05 to 0.2 respectively. In our present study, we have taken the values of these parameters as follows:
POPSIZE=250, PCROS=0.8, PMUTE=0.1, MAXGEN=250.

3.1 Chromosome representation

The main problem in applying a GA is to design an appropriate chromosome representation of the solution to the problem with genetic operators. Traditional binary vector is used to represent the chromosome which is not so effective in many highly physical non-linear problems. Here are proposed model is highly non-linear, to mitigate this difficulty, thus a real number representation is used here. A real row matrix Vj=[vj1, vj2] is used to represent a chromosome where Vj1 and vj2 represent the variables t1, the no-shortage period and T, where T is the cycle length.

3.2 Initialization

To initialize a population in GA, generally POPSIZE number of chromosomes $V_1,V_2,.....,V_{POPSIZE}$ are generated randomly. However, it is very much difficult for complex optimization problems to produce feasible chromosome explicitly . Generally , for each chromosome V_i ,every gene is randomly generated within the desire domain randomly in such a way that it should be feasible in nature.

3.3 Evaluation function

Evaluation function acts like the same role in GA as that which the environment plays in natural evolution. Generally, evaluation function, EVAL(X) for the chromosome X is equivalent to the objective function f(X). After getting a population, our objective is to find out a chromosome which gives the better value of the objective function. For this purpose, we have to calculate the fitness for each chromosome. The value of the objective function due to the chromosome Vi and it is denoted by eval (Vi).

3.4 Selection

The purpose of selection is, of course, to emphasize the fitter individuals in the population for recombination in hopes that their offspring will in turn have even higher fitness. The selection has to be balanced with variation from crossover and mutation where strong selection means that sub-optimal highly fit individuals which will take over the population, by reducing the diversity needed for further change and progress; weak selection will result to–slow evolution. In our work, the roulette wheel selection (called also Stochastic Sampling with replacement) is used. The algorithm for the selection process is as follows:
Step-1: Compute the total fitness of the population F= $\sum_{i=1}^{POPSIZE} eval(V_i)$
Step-2: Compute the probability p_i of selection for each chromosome V_i by the formula $p_i = eval(V_i)/F$
Step-3: Compute the cumulative probability q_i for each chromosome V_i using the $q_i = \sum_{j=1} P_j$
Step-4: Generate a random number r in [0,1].
Step-5: If r < q_i then select the chromosome V_i, otherwise go to step-6.
Step-6: Repeat step-4 and step-5 and obtain POPSIZE copies of chromosomes.

3.5 Crossover operation

The exploration and exploitation of the solution space are made possible by exchanging genetic information of the current chromosomes. Crossover operator operates on two parent solution (chromosomes) at a time and generates offspring by combining both parent solutions features. For this operation, expected PCROS*POPSIZE number of solution (chromosomes) will take part. Hence, in order to perform the crossover operation, PCROS*POPSIZE number of chromosomes are to be selected. For this purpose, we adopt the Random Stochastic sampling scheme (without replacement). After selection of chromosomes, the crossover operation is applied. Here, non-uniform arithmetic crossover operation is used. Different steps of crossover operation are used. Different steps of crossover operation are given below:
Step-1: Assign N←PCROS*POPSIZE
Step-2: Assign Dst ←1/N
Step-3: Generate a random number 0 and Dst and store it in Cdst.
Step-4:If Cdst > cumulative probability q_i for i^{th} chromosome V_i then chromosome V_i will be selected for crossover.

Step-5: Cdst is increased by Dst.
Step-6:Repeat the step (iv) and (V) ,N times
Step-7: Generate a proper fraction λ by the formula

$$\lambda = p_{max}/(p_{max} + p_{min})$$

Where p_{max} = Max[p_j; j=1,2,.....,popsize] and p_{min} = Max[p_j; j=1,2,.....,popsize]

Step-8: Choose any two parent chromosomes V_k and V_l from selected chromosomes .
Step-9: P two offspring V'_k and V'_l by

$$V'_k = \lambda.V + (1-\lambda)V_l$$

$$V'_l = \lambda.V_l + (1-\lambda)V_k$$

Step-10 : Repeat Step-8 and Step-9 for N/2 times.

3.6 Mutation operation

To prevent the search process from converging to local optima rapidly, Mutation operation is used . Mainly ,this operation is responsible for fine tuning of the system and is applied to a single chromosomes only. Here , we shall use non uniform mutation whose action is dependent on the age of the population .If the element (gene) V_{ik} of V_i is selected for mutation and domain of V_{ik} is $[l_{ik},u_{ik}]$,then the reduced value of V_{ik} is given by

$V'_{ik} = V'_{ik} + \Delta(t-u_k)$ if a random digit is 0,

$V'_{ik} + \Delta(t,V_k-l_k)$ if a random digit is 1,

Where k €{1,2} and the function $\Delta(t,y)$ returns a value in the range [0,y] such that the value of $\Delta(t,y)$ being close to 0 as t increases. This property cases this operator to search the space uniformly initially(when t is small) and very locally at the later stages.

In our study, we have taken

$$\Delta(t,y) = y[1-r^{(1-t/T)^b}]$$

Where r is a random number from [0,1],T=MAXGEN, t represents the current generation and b(which is called the non-uniform mutation parameter) is constant.

The algorithm of mutation operation is as follows:
Step-1: i=1
Step-2: generate a random number r from [0,1].
Step-3: If r < PMUTE, then select the chromosome V_i and go to step-5.
Step-4: i=i+1
Step-5: select a particular gene V_{ik} of selected chromosome V_i
Step-6: Create new gene corresponding to the selected gene V_{ik} by mutation operation.
Step-7: repeat the step 1-6 for PMUTE*POPSIZE times.

Termination

The termination of the process depends on the iteration of MAXGEN. The process is going on if the number of iteration is less than or equal to MAXGEN, then. Otherwise, the process terminates.

4. Numerical examples

To illustrate the model, an example has been considered here. Though the values of the model parameters have not been selected from any study, the values considered here are feasible.
Let C_1=1, C_2=10, C_3=10,C_4=100, C_5=0.5, D_0=150,p=15, Θ=0.08, μ=2 in appropriate units.

solving the non-linear optimization problem(2) and (6) by GA and GRG methods ,the optimal value of t_1, T,S,R and corresponding the average profit for different values of the backlogging rate parameter ∂ are obtained. The corresponding result are shown in Table 1 and Table 2 respectively.

From Table 1 and Table 2, it is seen that case 1 gives the better results than Case 2 .Also, GA method gives the better results than GRG method for Case 1 where it is reverse for case 2. But, for GA method, all results are global optimum and for GRG method it is local optima only.

5. Sensitivity analysis and conclusion

In this section, sensitivity analysis is performed to study the effect of under or overestimation of various parameters on stock-in period, cycle length, maximum inventory level, maximum shortage level and the average profit for a particular given numerical example. This analysis is performed by changing the system parameters from -20% to 20%, taken one parameter at a time and keeping the others at their original values. The results of this analysis are shown in Table 1 and Table 2.

It is seen that GA gives better and global optimum values than the conventional GRG method which gives local optima only.

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Table 1:Optimal Results of both cases for different values of ∂ by GA method

case	Optimizer Status	∂	T_1	T	S	R	Profit
I	Global Optimum	0.5	1.8452	2.2027	281.9341	97.1094	381.8904
		1	1.8414	2.1835	280.7013	86.8151	373.6248
		10	1.9013	2.0930	300.2468	31.8319	322.2299
		20	1.9269	2.0615	308.8260	19.4629	300.6084
		100	1.9627	2.0027	321.0159	4.7971	290.3024
II	Global Optimum	0.5	2.0001	2.2998	334.0086	83.7763	375.8383
		1	2.0001	2.3000	334.0088	78.6681	368.9848
		10	2.0000	2.2011	334.0054	33.0647	320.8240
		20	2.0004	2.2003	334.0152	24.1357	384.8990
		100	2.0009	2.2001	3340301	9.1217	276.6531

Table 2 : Optimal Results of both cases for different values of ∂ by GRG method

case	Optimizer Status	∂	T_1	T	S	R	Profit
I	Local Optimum	0.5	1.9822	2.3341	327.7595	97.2337	377.9514
		1	1.9697	2.3051	323.4480	86.7106	370.4410
		10	1.9358	2.1265	311.8191	31.8964	321.8222
		20	1.9411	2.0724	313.6237	19.2405	307.8612
		100	2.0000	2.0378	334.0047	4.6944	289.9669
II	Local Optimum	0.5	2.0000	2.3520	334.0047	97.2766	377.4980
		1	2.0000	2.3354	334.0047	86.7746	369.7147
		10	2.0000	2.1899	334.0047	31.9318	320.8861
		20	2.0000	2.1305	334.0047	19.2522	307.1690
		100	2.0000	2.0378	334.0047	4.6944	289.9669

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Voice Biometric: Revolution in Field of Security

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Introduction:

Voice biometric is the process of recognizing a person from their voice characteristics. Voice biometric also refers as speaker recognition or speech recognition. Speaker identification or voice identification is the process of evaluating different speech features and calculating match score with the given voice samples [1] [2].

Recognizing a person's identity using voice is known as speaker recognition. Speaker recognition is a behavioral biometric used for authentication. Voice of individual has unique and having different speech parameter for measurement. Speaker recognition task categorized into two types it may be speaker identification (i.e. who is speaking) or it may be speaker verification (i.e. validating someone that has been claimed their identity) [3-5].

Use of voice biometric for security purpose as well as forensic is high research area in recent scenario. Speech signal (voice) is enrich with speaker information. It is the only biometric that did not need to present someone personally for authentication i. e. it allow authentication remotely [6].

Voice biometric technique is used to authentication for speakers and use to control access to different services such as voice mail, telephone shopping, voice based banking, database access services, remote computers accessibility, voice based telecommunication, security control for confidential areas, database access services, security control for confidential information and the most importantapplication is in forensics etc. [3-5].

The use of voice biometric system have grown-up quickly due to continuous development made in the area of AI, machine learning as well as user acceptance. Speaker recognition is an application of science use to identification of unknown speaker for security purpose. As compared to other biometric voice biometric is easy to access and implementation by the users for example DNA is not easily available, it can't be recorded, for taking DNA sample to be present physically while in this digital era voice sample easily available and recorded unknowingly without the knowledge of the speaker. In addition, voice based authentication systems breaks all restrictions of accessing a secured area instead of PIN, password, or any other fallible device which are easily stolen or forgotten [7-8].

Speaker recognition technology can be categorize into two major factor i.e. speaker verification/ authentication and speaker identification. In case of forensic, both technologies are needed to perform i. e. identification and verification. Initially performs speaker identification after that perform speaker verification process. From security perception identification & verification are different from each other [2].

General Principle of Speaker Recognition:

Individual speaker have behavioral and physiological characteristic of their voice due to the speech production system of individual. A speech signal contains both i.e. vocal tract characteristics and voice source characteristics also known as spectral features and supra-segmental features [8-10].

Speaker verification is a method either accepting identity or rejecting identity. In general those application where voice is use for confirm someone identity is speaker verification system. The basic difference between speaker verification and identification is only the number of decisions, in speaker verification only two decisions are possible i. e. accept or reject (1: 1) while in identification decision depends on size of database (1:n). Therefore performance of speaker verification is independent from size of voice database while performance of speaker identification decreases by the size of voce database increases [4] [9-10].

Further speaker recognition can be classified as text-dependent and text-independent recognition system. In case of text-dependent speaker required to speak same words/ sentence in both the time i. e. training and testing (recognition) phase whereas in case of text-independent speaker do not required to speak same words/ sentence. Speaker recognition can be categorized into open-set and closed-set identification. In case of open-set identification, unknown speaker's reference models do not exist in the database hence the unknown speaker does not match any of the registered speaker [6] [9-10].

Voice biometric has numerous applications in forensic and surveillance, such type of applications required text-independent recognition system that means these systems do not use predefined words/sentences. Therefore text-independent recognition method found more consideration as compared to text-dependent recognition systems. In addition, one more advantage of text-independent recognition system is that it performs matching process sequentially. Text-dependent recognition systems working based on HMM (hidden Markov model) and DTW (dynamic time warping), while text-independent recognition systems working based on VQ-Based method, Ergodic-HMM method, Long-Term-Statistics method etc. [4] [6-7] [9].

Applications of Voice Biometric:

Voice recognition systems are easy to access and provide more security as compared to other biometric techniques. Since such type of systems works on simple by speaking hence user acceptance is more. The uses of voice recognition system are in-home digital appliances as well as security in different areas including both private sector and Government sector. For

example National Security Agency (NIA) using voice based security system from 2004 [8] [12].

In 1983, Michele Cavazza, Alberto Ciaramella from the telecommunication research in CSELT filed first international patent.

Barclays was the first private banking division to use voice biometric for customers authentication, the customers feedback about the technology is "9 out of 10" in term of accessibility and security. Following are the major areas where voice biometric is used [4] [8].

- **Access control:** To access remote computer and data networks
- **Forensics:** Crime investigation, web services, matching voice sample.
- **Information retrieval:** Used in speech skimming devices
- **Law Enforcement/ Monitoring:** Residential call observing and remote time logging.
- **Transaction authentication:** Prevent from unauthorized access, voice based banking.

Advantages and disadvantages of voice biometric/speaker recognition:

Voice biometric provides another medium of security. In addition, it is used for more secure resources of authenticating the people without remembering any password, PIN or any lock combination PIN etc. **Advantages of voice biometric:** voice biometric is more usable since the following factors [6] [7-8]-

- non intrusive
- acquiring speech signal is easy
- minimum cost (since large voice database stored in small space)
- Easy to access

Speaker recognition has some disadvantages related to accuracy rates, still research in progress for improving system accuracy [6-8]. Following are some factors which affect the system performance-

- Affected by background noise and channel distortion
- Channel mismatch
- Susceptible to age, health, emotion etc.

Conclusion:

Speech is the most common way of communication between people. Progress in speech and speaker recognition technology is about more than 6 decades. While still work in progress for improving system performance and some other crucial factors such as speech features, modeling techniques etc. Till date lots of development has been made yet existing systems needs improvement to achieve the ultimate goal in terms of to develop machines which are more natural with people. In addition, future speaker recognition systems require having a competent approach of characterizing, storing, and retrieving "information".

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Voice Based authentication used in Forensic Lab

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Privacy and authentication is a major concern for many individuals. On the other hand, there is a development ofvoice-based authentication, which is used in the field of forensic science. The speech-based verification is used to apprehend. For verification,the speech database is created and the sample data is matched for authentication of the user. It is an independent service to find out the criminal without using chemical sedatives. There are various techniques are present for speech recognition such as BWT, SVD, and MFCC. In voice recognition,the machine used the trained dataset to identify the individual. A voice structure is a form of signal or wave, which is converted into a binary signal. In today's world, the most effective way of communication is speech, and the English language is one the recognizable way to connect with machines. From last few decades of progress in Speech Recognition technology will use in forensic voice authentication. In the year 2003, scientists conveyed that, there is no logical process present to recognize the individual person's voice. The identification process is done only by using the filters. Here are some of the filters

- **Wiener filter** is used to estimate the unknown signal using the known signal which is taken as an input and filtering that recognized the signal and produce the output [3]. In Wiener filter, the noisy signal is disseminated with a Finite Impulse Response (FIR) filter and the factors are assessed by diminishing the Mean Square Error (MSE) among the clean and the desired signal. It is used to estimate the desired noisy signal by using the linear time-invariant (LTI) filtering. The noisy signal is consist of a stationary signal and noise spectra and additive noise. In Wiener filter is used to minimize the mean square error (MSE) value between the random process and the desired process. The signal consists of a various unknown signal and it also corrupted with additive noise. The filter is used to extract the noise from the corrupted signal.
- **Bionic Wavelet Transform (BWT)** is used totransform thenon-linear adaptive wavelet. BWT is used to enhance the threshold of speech signal so that it is audible to the human cochlear.
- **Singular Value Decomposition (SVD)**is used for noise reduction in the voice signal. It was first developed in 18th and 19th century by group mathematicians named as Eugenio Beltrami, Camille Jordan, James Joseph, Erhard Schmidt, and Hermann Weil. It uses the complex matrix to find the Eigenvalue and Eigenvectors.

In the spectral method, the noise spectrum is estimated by non-speech segment. The noise signal is subtracted from speech spectrum which helps in to provide the higher accuracy at mismatch condition. Cepstral features extraction is used to distinguish the information in a wide range of data values. Mel-Frequency Cepstral Coefficients (MFCC) [6] is used for susceptible noise where an abnormality of speech signal present due to the critical bandwidth for human ears. The low-frequency range speech is removed by a higher frequency range. In this, the speech sample is first split infragments and using the windowing process the sample of speech is converted into frequency using Fast Fourier Transform (FFT).The time domain transformation is done by using Direct Cosine transform (DCT) where it co-relates features and re-arrange in descending order. Linear Predictive Cepstral Coefficients (LPCC) feature extraction uses the pole filter to prototypical and human vocal with speech formant. The narrow band of 4 kHz is best for the LPCC clean. Mel frequency cepstral coefficients (MFCCs) is used to transform by using the Fast Fourier Transformation (FFT) to produce the spectrum in linear scale. The band-pass filter uses the Mel frequency scale as output were FFT output is warped with the Mel scale. The different researcher has proposed a speech enhancement techniques for authentication and verification [7] [8]. A method like SVD which is used to provide an accurate way for eliminating the noise in the sub-space division. QiLiand Yan Huang [1] proposed a cochlear filter cepstral coefficients (CFCC) for speech enhancement. It uses the Set of the auditorytrans form for refinement of the speech. The High Accuracy is provide in the restricted environment. Douglas A. Reynolds [2], proposed as NN and GMMs technique to encode the temporal speech signal. It check the likelihood of the test sequence. It provide the robustness and accuracy to the channel. S. V. Chougule and M. S. Chavan [4] uses the Normalized Dynamic Spectral Features (NDSF) technique for the speech enhancement. It uses the Dynamic spectral information and Gaussian feature wrapping for extraction. It provide the less accuracy for the unconstrained situation. Md. Afzal Hossan et al. [5], proposed a DCT-II and D-MFCC, and DD-MFCC for feature extraction and speaker verification. It is less robust at recognition rate. Min-Lun Lan et al. [9], proposed an GA and BPNN based speech recognition. It

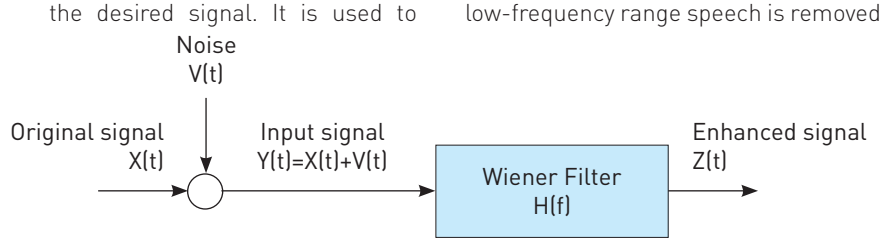

Fig. 1 : Optimal filtering signal flow

uses the optimal weight in a neural network to find the local optimum. It also provide the higher Recognition Rate at restricted language. Ahmed Salman et al. [11], proposed a cochlear filter cepstral coefficients (CFCCs) for processing of the signal. In a challenging environment, the training and testing result is revealed. The results are compared in terms of peak to signal noise ratio and perceptual speech quality. A. K. Paul et al. [12], proposed a soft computing approach for speech recognition. It uses a Genetic algorithm for the training of speech sample and artificial neural network for recognition. Amin Zehtabian et al. [13], proposed a subspace approximation using the singular value and vector for noisy speech. B. Jiao et al. [14], proposed a Normalized Dynamic Spectral Features (NDSF) spectral feature extraction technique for additive white noise. M. Goyani et al. [15], is proposed the parameter based feature extraction technique using PLP and MFCC. This model [10] will trained the speech sample using a neural network and then it use in prediction of the unknown sample. Sheeraz et al. [16], proposed a Delta-Delta MFCC for increasing the performance using the Discrete Cosine Transformation (DCT-II).

Working Objective

The principle of speaker recognition is used to recognize the culprit using voice print. Using the biometric technique for voice print uses the biological and behavioral property of the individual user.Differentusers have various speech pattern, for detection, it needs to develop a robust system which helps in to recognize the culprit in any efficient environment. Using different enhancement technique is used for refinement of the original speech signal.

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A Comparative approach to Investigate Different Software Testing Techniques

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The aim of software testing is to identifying the presence of error, faults and failures in software. Although, in practices, after completion of testing, it is not guarantee that software is completely error free, because it is not possible to test the whole software exhaustively with respect to each value that the input can assume. Practically software testing aims to minimize errors, reduce maintenance effort and cut down software costs. There are different techniques through which the testing can be achieved. This paper focuses on the comparison of widely used software testing tools and techniques in order to find out the most suitable techniques for Software Testing.

Index Terms : Software testing, testing techniques, testing processes, testing principles, validation and verification.

I. Introduction

According to *ANSI/IEEE* standard, A process to analyzing any software item to detect the differences between existing and expected conditions and to evaluate the features of the software item is known as Testing. Testing a program involve providing the program with a set of input values and observing that the program behaves as expected. If the software fail to act as expected, then the test cases and the conditions under which failure occurred are noted for the error correction[1]. It is myth that testing is one of the phases in SDLC, but the fact is that testing starts with very first phase of SDLC. The basic terminology associated with testing are asfollows:

***Error*:** It is a mistake committed by the development team. It is the difference between computed and desiredoutput.

Bug: Error introduced during the coding phase is known as bug.

Fault: it represents a condition due to which software fail to perform its desired functionality.

Failure: it is a manifestation of an error. Presence of an error my not necessarily lead to a failure.

Testing Activities: The process of testing involves the following activates-

1. Test suit design: it is process to design different test cases using different designing test cases design techniques.
2. Running test cases: after designing the test cases, run each test case and calculated results are compared with the expected results. Mismatch between expected and observed valued is an indication of software failure.
3. Debugging: For each observed failure, debugging is carried out to identify the statement where the error is located.
4. Error Correction: After the identification of location of error, the appropriate changes performed to correct the error.

II. Testing Techniques

After the development of the code, it is mandatory to test the software to identify all the errors and they must be debugged before the release of the software. Although it is impossible to identify and debug all the errors in the large software but at every phase it is tried to remove all the errors as possible. Testing helps in finding the bugs, it cannot conclude that the software is bug free. We broadly categorized testing techniques into following categories:

Random testing is a black-box technique. Therefore, this is useful, when information of internal structure of the software is not required. This technique is most effective when the output from the result of each test can be automatically checked. This technique is based on generating test cases without any predefined guidelines. But, pure randomness infrequently occurs in reality. There may be two versions-

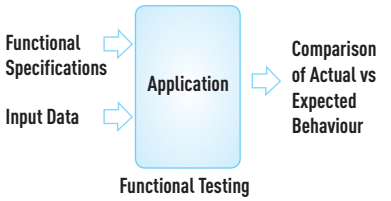
1. Pure random: Test cases are generated randomly until appear to be enough.
2. Guided by number of cases : Test cases are generated randomly until a sufficient number of cases has been reached.
3. Error guessing : Test cases are generated by the subject's knowledge of what typical errors occur during programming. It stops until they all appear to have been covered[6].

Black Box Testing test cases are designed from an examination of the input/output values only and no knowledge of design or code is required. It emphasizes on the external behavior of software. There are following approaches of functional testing.

1. Equivalence Partitioning: In this technique partitioning of input is done in such that every input data belonging to the same equivalenceclasses.
2. Boundary Value Analysis: It involves designing test cases using

the values at the boundaries of different equivalence classes.

3. Fuzzing: This technique feeds random input to application. It is used for finding implementation bugs, using malformed/semi-malformed data injection in an automated or semi-automated session.
4. Cause-Effect Graph: In this technique, testing begins by creating a graph and establishing the relation between effect and its causes.
5. Orthogonal Array Testing: It can be applied where input domain is very small, but too large to accommodate exhaustive testing.
6. All Pair Testing: In this technique, test cases are designed to execute all possible discrete combinations of each pair of input parameters. Its main objective is to have a set of test cases that covers all the pairs[2][3].



Advantages:

1. By achieving reasonable testing number of test cases can be reduced.
2. Testing is totally based on user's point of view.
3. Tester and programmer are independent from each other.
4. For large code segments it is the most efficient and well suited technique.
5. No code accesses are required.

Disadvantage:

1. Not well suited and efficient test.
2. There are chances of duplication of tests that are already tested by programmer.
3. Test cases are difficult to design without clear requirements.
4. Some parts that are at back end are not tested at all.

White Box Testing A large no of white box testing strategies exist. Each testing strategy designs test cases based on analysis of some aspect of source code and is based on some heuristic. A white box testing strategy can be divided into two category[4].

1. **Fault-based testing:** A fault based strategy targets to detect certain types of faults. These fault that a test strategy focuses on constitutes the fault model of the strategy. An example of this testing is mutation testing.
2. **Coverage–based testing :** A coverage based testing strategy attempts to execute certain elements of a program. Popular examples of coverage-based testing strategies ate stamen coverage, branch coverage and path coverage- based testing.

Advantages:

1. Forces test developer to reason carefully about implementation.
2. Reveals errors in "hidden" code.
3. Spots the Dead Code or other issues with respect to best programming practices.

Disadvantages:

1. Expensive as one has to spend both time and money to perform white box testing.
2. Every possibility that few lines of code are missed accidentally.
3. In-depth knowledge about the programming language is necessary to perform white testing.

Gray box testing:

This is testing technique in which there is little knowledge of internal work of application. This technique is language and platform independent. Grey box combines the benefits of white box and black box testing. To design test cases it use algorithms and internal data structure less than white box testing but more than black box testing. Grey box=white box + black box, To test a piece of software against it specification but having some knowledge of internal working this technique will be used. Widely used in integration testing but it can also applied to most testing phases.

Most widely known grey box software testing techniques are the following.

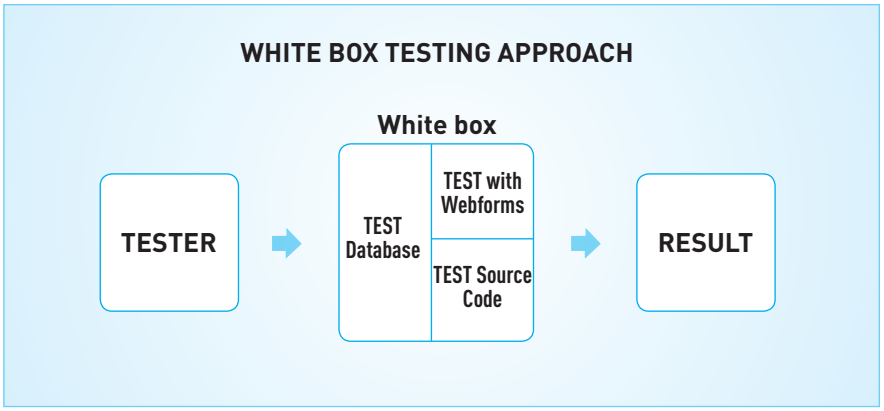
1. Orthogonal Array Testing: This type of testing use as subset of all possible combinations.
2. Matrix Testing: In matrix testing the status report of the project is stated.
3. Regression Testing: If new changes are made in software, regression testing implies running of test cases.
4. Pattern Testing: Pattern testing verifies the good application for its architecture and design[5].

Advantages:

1. Grey-box testing provides combined benefits of both white-box and black-box testing
2. It is based on functional specification, UML Diagrams, Database Diagrams or architectural view
3. Grey-box tester handles can design complex test scenario more intelligently
4. The added advantage of grey-box testing is that it maintains the boundary between independent testers and developers

Disadvantages:

1. In grey-box testing, complete white box testing cannot be done due to inaccessible source code/binaries.
2. It is difficult to associate defects



when we perform Grey-box testing for a distributed system.

II. Comparison between Black Box, Grey Box and White Box Techniques.

When software or an application is created, it is vital to make several types of tests, to make sure the product is complete, secure and efficient. To make these tests, several methods are available: "black box", "white box" and "grey box". Each of these methods offers different possibilities.

"Black box" tests consist in reviewing only the functionalities of an application, ie if it does what it is supposed to, no matter how it does it. Its internal structure and functioning are not studied.

"White box" tests consist in reviewing the functioning of an application and its internal structure, its processes, rather than its functionalities.

"Grey box" testing compiles the two previous approaches: they test both the functionalities and functioning.

S.N.	Black Box Testing	Grey Box Testing	White Box Testing
1	The Internal Workings of an application are not required to be known	Somewhat knowledge of the internal workings are known	Tester has full knowledge of the internal workings of the application
2	Also known as closed box testing, data driven testing and functional testing	Another term for grey box testing is translucent testing as the tester has limited knowledge of the insides of the application	Also known as clear box testing, structural testing or code based testing
3	Performed byh end users and also testers and developers	Performed by end users and also by testers and developers	Normally done by testers and developers
4	Testing is based on external expectations - internal behavior of the application is unknown	Testing is done on the basis of high level database diagrams and data flow diagrams	Internal workings are fully known and the tester can design test data accordingly.
5	This is the least time consuming and exhaustive	Partly time consuming and exhaustive	The most exhaustive and time consuming type of testing
6	Not suited to algorithm testing	Not suited to algorithm testing	Suited to algorithm testing
7	This can only be done by trial and error method	Data domains and Internal boundaries can be tested, if known	Data domains and Internal boundaries can be tested

IV. Result and Conclusion

It is necessary to compare the effectiveness of different testing strategies in detecting faults. We can compare the two testing strategies by determining whether one is stronger, weaker, or complementary to the other. A white box testing is said to be stronger than another strategy, if all types of program elements covered by the second testing strategy are also covered by the first testing strategy, and the first strategy additionally covers some more types of elements not covered by second strategy. If a stronger testing has been performed, than a weaker testing need not be carried out.

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CSI CALENDAR 2018-19

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20, 2019	**8th CSI-InApp National Student Project Awards 2019** Organised by CSI Trivandrum Chapter. Email: csiawards@inapp.in
22-23, 2019	**Regional Student Convention-2019** Organised by CSI Nashik Chapter. Hosted by **MET's Institute of Engineering**, CSI Accredited Wing Department of Computer Engg., IT & MCA **Co-Ordinator :** Prof. P. M. Yawalkar, Prof. P. S. Lahane (9970442081)

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Understandability Assessment Model through Object Oriented Design Metrices

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Estimation is a fundamental piece of any developing discipline. Measuring the quality parameters of the software engineering will reveal great fits of knowledge about the design. It will likewise help experts and practioners to select the best hit of elective structures that addresses their issues. This work makes ready for analysts to begin exploring approaches to quantify understandability. Estimation of quality properties is basic for this sub-field of software designing. This article quantifies the understandability of software at design stage, a few factors that influence them.

Index Terms : GA, Inventory problem, Deterioration, Ramp-type, partial backlog.

I. Introduction

Understandability, interestingly, implies the capacity of a task framework to modify self-governing the arrangement to meet new, beforehand obscure requests e. g. from the demand [8]. Understandability is then the capacity to acknowledge new conditions of the in, out and throughput. Moreover, the framework's reconfiguration must be acknowledged as fast as the natural changes [1, 5]. In this way, to be Understandable, the speed of adjustment is essential. Software applications are not just single components frameworks, they are made up by gathering of components. These components ought to be produced such that the code composed once can be reused ordinarily by doing a few changes in the code, which can decrease the improvement time, cost and effort [6]. Infrequently changes present another fault that corrupts the usefulness of the framework.The utilization of object-oriented property innovation for creating software has turned out to be very across the board. Specialists state that object-oriented property hone guarantees great quality software, that is, especially software that is anything but difficult to keep up, reuse, and expand. The appraisal of the understandability of software frameworks is of real worry for purchasers of substantial frameworks found in quick moving spaces [2, 4].

Planning and keeping up frameworks in a dynamic contemporary condition requires a reevaluating of how frameworks offer some incentive to partners after some time [7]. Growing either traditionally or alterable strong frameworks are ways to deal with advancing quality sustainment. In any case, in definition ambiguity crosswise over framework spaces has brought about a powerlessness to determine, outline, and check to utilities that advance esteem sustainment [3].

II. Need to measure understandability

Measuring understandability is important for many reasons:

- It can enable administrators to understand the bearing that the software item is taking and help assess the work done by various individuals from development team.
- Object oriented property can likewise help engineers to enhance their software and configuration hones and to estimate where understand requirements to happen. Likewise it can help scientists endeavouring to understand how software develops.

Keeping in observation the end goal to quantify transforms it isnot extraordinary to gauge the frameworks at two focuses: in time when occasion or time interim and after that process the estimations.

III. Model Development

A good evaluation of quality factors will result in a value closer to desired value for each of the metric values of class and if a class has a closer desired value then the design needs not to be revised and which improved. This step evaluates the understandability of software at design stage using the desired values which are defined by the experts and practitioners for a specific domain environment and application.

In order to establish the relationship between various numbers of factors, they effected to each other's. Figure 1

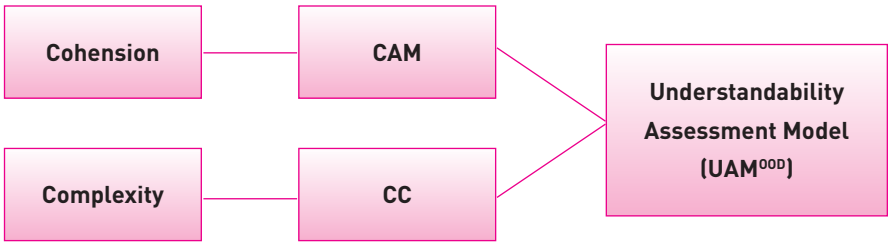

Fig. 1 : Relationship View

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \ldots\ldots \alpha_n X_n \quad \text{Eq (1)}$$

Where

- Y is dependent variable
- X1, X2, X3...Xn are independent variables.
- α 1, α 2,.... α n are the regression coefficient of the respective independent variable.
- α 0 is the regression intercept.

shows the relationship view between quality factors and object oriented design metrics

The values of metrics can be easily identified with the help of class hierarchy diagram. This model used the suited metrics namely Cyclomatic Complexity (CC), Cohesion Among Method (CAM), to describe a range of measurement for software and defined in terms of design characteristic [8]. In order to developed the equation using multiple linear method in equation 1

Utilizing Statistical Analysis software named as 'SPSS' values of all its independent factors (measurements), relapse catch and coefficient of the dependent factors are ascertained. Based on the various straight relapse condition ideas, Requirement Understandability display has been produced that is given in equation (2). The standard values have taken from [9]. Factor of a class rely on at least one number of object oriented software measurements, quality factor might be settled by utilizing model. The data used for establishing Understandability model is taken from [8, 9] as shown in Table 1. Model summary table 4 for proposed model proves that all the two selected metrics are statistically significant at confidence level of 95%.

Table 1 : Data Calculation

Project	STD	CAM	CC
P_1	6.134	0.284211	1.15
P_2	5.175	0.3	1.3846
P_3	4.385	0.518519	1.4444
P_4	3.01	0.342857	3.1429
P_5	2.111	0.333333	1.1111
Understandability Assessment Model (UAM) = 6.19 - 2.7* CAM - 0.66* CC Eq (2)			

Table 2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998[a]	.996	.995	.088351
a. Predictors: (Constant), CC, CAM				

Table 3 Understandability Data Table

Project	CAM	CC	Calculated Index	Standard Index
P_1	.314	1.571	4.304	4.385
P_2	1.000	3.400	1.246	1.580
P_3	.938	3.000	1.679	1.667
P_4	.241	1.444	4.587	4.660
P_5	.338	1.542	4.530	4.491
P_6	.556	1.833	3.480	3.500
P_7	1.000	1.667	2.390	2.920
P_8	.556	3.333	2.490	2.510
P_9	.667	4.333	1.530	1.582
P_{10}	1.000	2.000	2.170	2.915

IV. Empirical Validation

This segment of work demonstrates that how enormous proposed think about, where metrics and model can evaluate the understandability quality list of object oriented at necessity time. The empirical validation is imperative period of research to assess the proposed understandability quality model for abnormal state adequacy and proper execution. Empirical validation is the fine approach and best hone for guaranteeing the model acknowledgment. To legitimize asserting methodology for acknowledgment of model, a trial validation of the proposed understandability evaluation model at necessity time has been completed utilizing tests. In order to validate proposed model values are shown in table 3.

It is compulsory to test the legitimacy of proposed model for acknowledgment. A 2 test t test applies for check the centrality between standard understandability and figured understandability. 2t- test are handy theory tests in measurements when analyze implies shown in table 4.

Null hypothesis (H0): There is no significant difference between Standard and Calculate Understandability **H0: μ1-μ2 = 0**

Alternate hypothesis (HA): There is significant difference between Standard Integrity and Calculate understandability. **HA: μ1-μ2 ≠ 0**

In the above hypothesis μ1 and μ2 are being the sample means of population. Mean value and Standard Deviation value have been calculated for specified two samples and represented in table 4.

Correlation comes out to be 0.979, that shows the standard and calculated understandability is highly correlated. The hypothesis is being experienced with zero level of significance and confidence level is checked as 95%. The p value is 0.06. With result of probability 'P' value, the alternate hypothesis is directly discarded and the null hypothesis is accepted. The developed equation used for understand ability estimation is accepted.

V. Conclusion

After the successful implementation of quantify the security [10] the next assessment model is to quantify

Table 4. 2 t- test between Standard and Calculate Understandability

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	CAL	2.84054	10	1.284041	.406050
	STD	3.02100	10	1.211071	.382974

the Completeness [11], Traceability [12], Functionality [13]. The Software understandability is an average errand on the grounds that no appropriate approach was existed for estimating this property. Here in this paper we developed Understandability Model for measure the understandability file at starting time of software development life cycle. A different approach is utilized for measure the index values. The measurable significance and validation of model has been done in this paper for acknowledgment.

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CSI CALENDAR 2018-19

>> (Contd. from pg. 30)

Date	Event Details & Contact Information
FEBRUARY 23-24, 2019	**Regional Student Convention - CSI Region-2** Organized by Netaji Subhas Institute of Technology Bihta, Patna and CSI Student Branch, NSIT **Organizing Secretary :** Mr. Gopal Krishna, SBC, CSI, NSIT, Mob: 8271309236, Email: gopal.cse@nsiterp.in Mr. Triloki Nath, Asst. Prof., CSE, NSIT, Mob: 8409489144, Email: triloki.cse@nsiterp.in
25-28, 2019	**Second International Conference on Advanced Computational and Communication Paradigms (ICACCP-2019)** International Symposium on Computer Vision and Machine Intelligence in Medical Image Analysis (ISCMM) http://symposium.icaccpa.in/ Venue: Sikkim Manipal Institute of Technology **Convener :** Prof. Debanjan Konar, Sikkim Manipal Inst. of Technology, Sikkim, India **Co-Convener :** Prof. Chinmoy Kar, Sikkim Manipal Institute of Technology, Sikkim, India
MARCH 01-02, 2019	**2019 International Conference on Data Science and Communication (IconDSC)** in technical association with IEEE-Bangalore Section, IEEE-ComSoc, Bangalore Section and CSI Division IV, Communication. Submission Deadline: 10 November'18, https://christuniversity.in/icondsc/ Contact : Dr. Samiksha Shukla, 9880462311 samiksha.shukla@christuniversity.in
13-15, 2019	**INDIACom-2019 (IEEE Conference ID: 46181 | SCOPUS Indexed)** 13th INDIACom; 2019 6th IEEE International Conference on "Computing for Sustainable Global Development" Contact : Prof. M. N. Hoda, General Chair, INDIACom-2019, Director, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM) E-mails: conference@bvicam.ac.in, indiacom2019@gmail.com Tel.: 011-25275055 TeleFax: 011-25255056, Mobile : 09212022066
14-15, 2019	**I.T.S National Convention** I.T.S, Mohan Nagar, Ghaziabad in association with CSI Students Branch @ I.T.S, Ghaziabad Contact : **Dr. Sunil Kr Pandey**, Mobile - 8447744063, Email: sunilpandey@its.edu.in and **Dr. Ajay Kumar**, Mobile - 8447744073, Email: ajaykumar@its.edu.in
30, 2019	**Global IT Day** I.T.S, Mohan Nagar, Ghaziabad in association with CSI Students Branch @ I.T.S, Ghaziabad Contact : **Dr. Sunil Kr Pandey**, Mobile - 8447744063, Email: sunilpandey@its.edu.in and **Dr. Umang**, Mobile - 99100 55457, Email: umangsingh@its.edu.in

Application of Blockchain Technology in Securing Healthcare Records

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The modern day methods used to record as well as share patient related data are deeply flawed. These shortcomings limit the amount of access patients have to their clinical records, reduce availability of essential data to healthcare providers, and thus stand as an obstacle in creating the ideal health care system. Storing crucial patient related data on a Blockchain can help overcome the shortcomings posed by the current model. This paper explores the application of Blockchain as a novel approach to secure storage of patient data, facilitate its secure sharing and revolutionize the health care industry.

Keywords : Blockchain; Healthcare; Data

I. Introduction

With more and more healthcare facilities shifting their patient data to the modern Electronic Health Records (EHRs), their inability to maintain shareable health records is one of the many problems they face today. A more extensive implementation of these systems has led to previously unimaginable levels of breaches in health care data. [1] Patients are fairly concerned about the security of their health care data. Some have even gone to the extent of refusing to share crucial personal health data to their healthcare service providers, owing to these concerns. [2] The lack of an efficient, smart and secure system to solve the problem of securely sharing data amongst the healthcare providers,

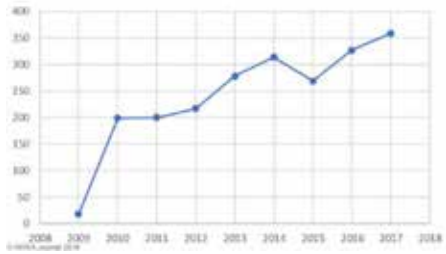

Table 1: Annually Reported Breaches. Source: HIPAA Journal

patients and medical researchers is the primary hurdle in the widespread implementation of these Electronic Health Records. Although the patient records stored at health care facilities around the world aren't shared very often, they are still vulnerable to severe data breaches.

II. Blockchain

Blockchain serves as an ultra-modern digital ledger which can be tweaked to not only record monetary transactions but virtually, anything of value. [5] The digital data that is put away on a Blockchain exists as a mutually shared — and a perpetually logged — database. This decentralized system and its utilization has valuable benefits for virtually every industry where it is applied. Records to be stored on a Blockchain are appended to the chain only once their integrity is verified. These records are decentralized having no central storage location for a hacker to exploit. The data at any particular instance of time is hosted on millions of computers across the globe, each having the same copy that is visible to everyone present on that network.

III. Security in Blockchain

Blockchain represents a revolutionary new technology that facilitates secure storage of data over the internet. The decentralization aspect of the technology does away with the need to have a central administrator, enabling true peer to peer networking and eliminating the risks associated with centralization.

Ever since the Bitcoin Blockchain was first officially implemented, it has functioned without succumbing to serious disruptions. Building upon the nearly infallible reputation of the internet, the framework aims to revolutionize the way data is stored and shared; a boon for the technology as it makes its way out of the developmental stage. [6]

IV. Blockchain Security Advantages:

The Blockchain framework represents a true peer to peer network which aids its users in maintaining a collective, reliable and a decentralized database. Courtesy of the latest cryptographic algorithms, a Blockchain can be thought of as a continuously growing list of data stored in blocks which is immune to tampering and modification [7]. A typical Blockchain system consists of a series of blocks which are connected in a specific order. This chained representation is from where Blockchain derives its name. The users in the system, also known as 'nodes', perform the task of validation and storing the data in blocks. The consensus algorithm used to confirm transactions and add new blocks to the chain is called Proof of Work (PoW) algorithm. Each block in the chain mainly comprises of a cryptographic hash of the past block, transaction related information and a timestamp [8]. This recurrent process validates the legitimacy of the preceding block, starting from the Genesis block [9].

The various security advantages of Blockchain are listed below.

i. Privacy Protection:

Blockchain adopts Peer to Peer networking system which eliminates the need of a centralized database for storing confidential information. This in turn eliminates centralized points that a hacker might target and steal valuable information. Similarly, a Blockchain does not have a central point of failure making it more robust than centralized networking systems. Blockchains employ Asymmetric Cryptography wherein each user has 2 keys: a public key that is visible to everyone on the network and is used to encrypt messages/transactions for the particular user as well as a private key which can only be used to decrypt the message encrypted via the user's public key. A user's public key has no relation to his/her public address and, computing a user's private key from his/her public key is an impossible task. Thus, Blockchain maintains user anonymity and privacy.

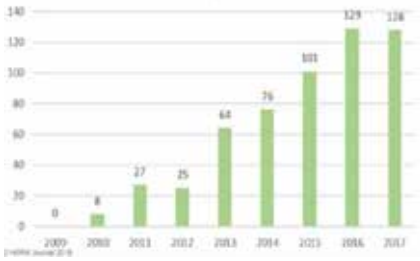

Table 2: Unauthorized Access/Disclosure Incidents. Source: HIPAA Journal

ii. Crash Recovery:

Data on a Blockchain is distributed amongst peer nodes unlike a traditional database where all the data is stored at a central location. Each user on the Blockchain has the right to generate and maintain a full copy of the data. Although this causes data redundancy, it vastly improves the reliability and fault tolerance of the network. In case some of the nodes are attacked or compromised, it will not cause damage to rest of the network.

iii. Preventing Data Manipulation:

Blockchain has a unique data writing mechanism which prevents the data in a block from being modified once written. This mechanism involves the generation of a timestamp the instant a new record is created. [10] Modification of data henceforth is prohibited. Also, the recording of a new transaction is decided using a consensus mechanism which generally requires the mutual agreement of over 50% of the users of the network.

V. Applications of Blockchain in Healthcare

i. Secure Exchange of patient data:

The effective and secure exchange of patient data is one of the fundamental problems with the present day EHRs. Blockchain enabled healthcare information systems can be expected to provide the technological breakthrough that the healthcare industry is looking for. The primary problems associated with the exchange of patient data would be interoperability of the data amongst the various concerned parties and the maintenance of its privacy, security and integrity. Migrating the EHRs onto a Blockchain would lead to the inception of information exchange systems that are both cryptographically secured and immutable.

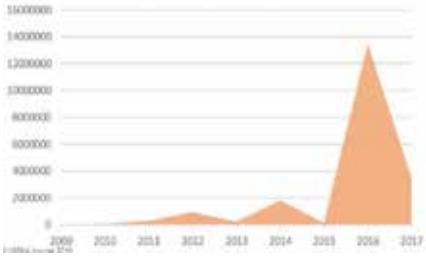

Table 3 : Records Exposed by Hacking/IT Incidents. Source: HIPAA Journal.

Enabling this would also provide cheap access to current as well as historic patient data. The recent collaboration of Guradtime, a data security company and the Estonian eHealth foundation has secured the health records of over a million patients. [3] Currently however, there are a lot of complications involved in the exchange of patient data between public and private parties that are preventing the Estonian model of healthcare security from being implemented elsewhere.

ii. Management of Claims and Patient Billing:

Apart from the Electronic Health Records, the patient billing management systems in use today are highly vulnerable to manipulation and fraud. It has been estimated that nearly 50% of all healthcare related costs are fraudulent as a result of either excessive billing or billing generated from services that weren't availed. For example, in the US alone, Healthcare fraud was responsible for around $30 million worth of losses in 2016 [4]. It was further observed that 80% of the total amount spent on Billing and Insurance related activities was essentially the result of inefficient financial systems [11]. It is believed that the advent of Blockchain powered healthcare systems would help in drastically cutting down the losses as a result of fraudulent medical billing. This can be brought about by automating the settlement of payments and related activities such as the generation of receipts. Furthermore, by cutting down intermediaries, Blockchain powered systems can also help curb administrative overheads and save time for suppliers and customers. The recent collaboration of Gem Health with Capital one Bank has resulted in the development of GemOS, [12] a Blockchain based solution to manage healthcare claims.

iii. Determining the Integrity of Drug Supply Chains:

The healthcare industry is suffering massive losses from the proliferation of counterfeit drugs. A recent global investigation uncovered roughly $74 Million worth of counterfeit drugs. [14] However, it is envisioned that with the proper implementation of Blockchain-based supply chain systems, the integrity of drugs and services can be assured. This will be made possible by maintaining a Blockchain based custody log that tracks and records every step and custodian in the drug supply chain. This would let pharmaceutical companies monitor their drugs down to the product level. Additional modules such as Smart Contracts [13] can be added to the system to help build trust between the suppliers and Pharmaceutical companies. Provenance has thus

come to become a major area for the application of Blockchain technology. Within a single supply chain of drugs and pharmaceuticals many use cases exist wherein Blockchain technology can be appropriately leveraged. A lot of this has to do with the fact that there are certain loopholes in the transportation processes, primarily due to the lack of transparency, that can be exploited to introduce counterfeit drugs into the chain. In an effort to curb the problem, Drug Supply Chain Security Act (DSCSA) has formally been implemented in the US to help combat the proliferation of counterfeit drugs.

VI. Conclusion

This paper explored the distinctive features provided by the Blockchain framework that can help healthcare facilities overcome the limitations of the current data models and supply chains. The proper implementation of Blockchain technology is the key to prevent data breaches, fraudulent billings and enhance the privacy and healthcare facilities of patients globally. It would facilitate the sharing of patient data between concerned parties in a safe and secure manner. Furthermore, it would assure that patients and pharmacies receive genuine drugs and not be victimized by the growing number of counterfeit drugs and fraudulent billings. Blockchain is the stepping stone to a safer, more transparent healthcare industry.

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Winter Workshop

The Department of Computer Science & Engineering of Supreme Knowledge Foundation Group of Institutions organised a 40 hours' workshop in the department for the 2nd, 4th and 6th Semester students of the college, from 8th - 15th January, 2019.

Few glimpses of the workshop are represented in the pictures

Basic concept and application of Arduino and IOT

Introduction to PHP and MySql

Introduction to Python

Basic Concept of web design& PC maintenance

Regional Student Convention
CSI Region-2
23rd - 24th February, 2019

Organized by Netaji Subhas Institute of Technology Bihta, Patna and CSI Student Branch, NSIT

About Event & NSIT CSI Student Branch

The main motive of the Regional Student Convention is to bring out the competitive skills of students from within themselves and participates among different technical and cultural events . It acts as a forum for exchanging the technical innovative concepts and emphasizing the role of students in converting intelligence with excellence.

CSI Student Branch, NSIT was inaugurated on 13th May 2017. Currently it has more than 150 student members. This CSI student branch regularly organizes various events like Expert Lectures, Workshop, Seminars, Industrial visits and other technical activities for learning.

Patron

- Mr. M.M. Singh, Founder Secretary, NSIT
- Mr. Krishna Murari, Registrar, NSIT
- Prof. M. P. Tripathi, Chairman, BOG, NSIT

Program Chair

- Mrs. Shraddha Pandit, Dean Academics, NSIT
- Mr. Aditya Shekhar, TPO, NSIT

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  Mob: 8409489144, Email: triloki.cse@nsiterp.in

Advisory Committee

- Prof. A K Nayak, Vice President, CSI
- Dr. Santosh Kumar Yadav, Hon Secretary
- Mr. Manas Ranjan Pattnaik, Hon Treasurer
- Mr. Sanjay Mohapatra, Immediate Past President
- Dr. Prabhat Kumar, State Student Coordinator, Bihar.

Organizing Committee

- Mr. S. C. Pandit, HOD, CSE, NSIT
- Mr. Rajani Ranjan, HOD, ECE, NSIT
- Dr. J. Dalai, HOD, EEE, NSIT
- Mr. Digvijay Singh, HOD, CE, NSIT
- Mr. Pushpam Sinha, HOD, ME, NSIT

Event List

Event List in CSI Regional Student Convention:

- Paper Presentation
- Poster Presentation
- Web Development
- Mobile App Development
- Debate
- Experts Talks
- Industry Presentation
- Group Dance
- Singing
- Short Films

✦ Registration Fee: ₹ 300 & ₹ 400 for CSI & Non-CSI Student Respectively.

Regional Student Convention-2019

(Region-VI)

On 22nd & 23rd February, 2019

Organised by CSI Nashik Chapter

Hosted by **MET's Institute of Engineering, CSI Accredited Wing Department of Computer Engg, IT & MCA**

MET Nashik

Institute Mumbai Educational Trust's (MET) is a public charitable trust establish in year 1989 with a mission to radically redefine education system in India. MET League of colleges has contributed over 30,000 professional to the Indian and global business houses. In line with its commitment to provide world class education in India . MET created state of the art Bhujbal Knowledge City at Nashik, promises to be the answer to the ever changing need of education scenario. Situated at the Adgoan, the campus 34 acres of lush green landscapes with 4 lack sq.ft of campus floor spaces. Institute of engineering offers various disciplines viz. Computer, IT, MCA Electronics and Electronics & Telecommunication, Mechanical, Civil and Electrical imparting UG and PG education along with research.

About MET

MET League of Colleges has contributed over 25,000 professionals to the Indian & global business houses. In line with its commitment to providing world class education in India, MET created the state of the art Bhujbal Knowledge City at Nashik. MET at Nashik promises to be the answer to the ever changing needs of the education scenario. Situated at Adgaon, the campus spans over 34 acres of lush green landscapes with over 4 lakh sq. ft. of campus floor space.

CSI Nashik Chapter

Nashik chapter of Computer Society of India (CSI) was formed in 1988-89. During the years, the chapter conducted several activities. CSI Nashik Chapter has won the Best Chapter award several times and making its own place under CSI Banner.

RSC 2019

Regional Student Convention RSC 2019 is a Regional level technical gathering comprising of students from all over the nation at one place for a technical activity. Enthusiastic students, learners participate in this meet to excel in their field. Curious students will get the guidance from eminent technical experts from industry and academia. Various events and lot more fun will all be combining at one place. RSC 2019 is a truly privileged union of knowledge and thirst quenched under the inspiration of esteemed delegates representing CSI in the campus of MET's IOE, Nashik.

Staff Co-Ordinator

Prof. P. M. Yawalkar
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CSI Student Committee

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I.T.S Mohan Nagar, Ghaziabad in association with CSI Student Branch @ I.T.S organized two days Technical Fest "Technovation-2019"

I.T.S Mohan Nagar, Ghaziabad organized two days Intra Institutional Technical Fest, "TECHNOVATION-2019" on 1st & 2nd February, 2019. The event was formally inaugurated by Shri Arvind Thakur - Vice Chairman & Managing Director, NIIT Technologies, who was invited as the Chief Guest, Guest of Honor, Dr. Satya Sheel, Former Director, MMMEC Gorakhpur, Shri Arpit Chadha, Vice Chairman – I.T.S The Education Group, Shri Surinder Sood – Director (PR), I.T.S The Education Group, Dr. Sunil Kr. Pandey - Director (IT), Dr. Vidya Sekhri – Director (UG) and Prof. Nancy Sharma - Vice Principal (UG) with lamp lightening. Over 500 students of BCA Course of I.T.S, Ghaziabad participated in various activities of the event in 2-Days.

Mr. Arpit Chadha, Vice Chairman, I.T.S- The Education Group, expressed his satisfaction for maximum participation in this fest. While addressing the participants, he said that I.T.S provides opportunities for students to demonstrate their talent in a healthy competitive environment through mutual understanding of this kind of event.

While addressing the students Mr. Arvind Thakur, said that the efforts made by I.T.S are commendable and such events will provide the participants a golden opportunity to display their talent in a healthy competitive environment. He said that such programs are very essential for the overall development of the students. Mr. Thakur said that is so fast changing scenario, keeping oneself continuously updated.

Guest of Honor, Dr. Satya Sheel, discussed the present scenario of Indian software industry and said that at present, the growth rate and profits of the industry are going through a critical phase. In his address Dr. Satya Sheel emphasized on the need of continuous reskilling and keeping students updated with latest changes and developments on Technology landscape.

Shri. Surinder Sood in his address gave good wishes to all the students present on this occasion and said that today is the time of competition. Real competition is not to win but to participate in the event. He said that it is the time to come out of the comfortable zone and to compete in the healthy environment.

While welcoming the Guests, Director-IT, Dr. Sunil Kumar Pandey, said that in present scenario, the need of the hour is to be innovative and trying alternative ways to solve a problem in best possible optimized manner. This event is an initiative to encourage, promote and inculcate this spirit and provide student students am opportunity to compete, assess themselves and work on identifying strength and weakness. He said that such programs give the opportunities to the students to showcase their talent.

Director Under Graduate Campus, I.T.S, Mohan Nagar, Ghaziabad, Dr. Vidya Sekhri, emphasized the need for an effective framework and the need for quick implementation of information and communication technology to reach every section of the country.

Before this Vice Principal, Under Graduate Campus, I.T.S, Mohan Nagar, Ghaziabad, Prof. Nancy Sharma, highlighted the outlines of the program and the activities involved in the event.

After the inaugural ceremony Mr. Arvind Thakur interacted with the students of BCA and BBA, In this session, students asked Shri Thakur to address the issues related to their career and IT industry, which he answered in detail. Students were very happy after interacting with Mr. Thakur.

TEC, Crossword HNOVATION-2019 comprised of total

14 activities including – IT Quiz, C-Programming, Java-Programming, Blind Coding, Project Presentation, Poster Presentation, Extempore, Sudoku, LAN Gaming, Web Designing, Video Making, Logo Design, Fastest Finger First and Crossword etc.

On the second day of the program, Shri Anil Swarup, Former Secretary, Ministry of HRD, Govt. of India was invited as the Chief Guest of the Prize Distribution ceremony. Before the prize distribution ceremony Mr. Anil Swarup, interacted with the students of the Under Graduate and shared his experiences. Speaking with the students, he said that the only mantra of success is to try to achieve goal with concentration, self-determination and dedication. Students asked questions related to employment opportunities in government and public sector. During the interaction he addressed various queries of students.

In the valedictory session of the event, all the Winners of 14 activities were awarded with Prizes, Certificates & Medals by the Chief Guest Shri Anil Swarup and Shri Arpit Chadha – Vice Chairman, I.T.S The Education Group. On this occasion Director (IT), Director (UG) and Vice Principal (UG) and all the faculty members of IT were present. In his address, while greeting to all the winners, Shri Anil Swarup spoke about the progressive changes in the field of business and education. In his address, he also talked about the new innovations and development works being done in the field of Information and Communication Technology.

The BCA 2nd Year Course of the Institute was awarded with TECHNOVATION-2019 overall Trophy based on the maximum activities won by the students of 2nd Year Course. A large number of students and faculty members were present on this occasion.

About the Guest Editor

Prof. Sunil Kr Pandey

Director (IT), Institute of Technology & Science (IT), Mohan Nagar, Ghaziabad

Prof. Sunil Kr Pandey, an Executive Data Scientist, with experience of over 22+ Years, is presently Director (IT) at I.T.S, Mohan Nagar, Ghaziabad and has been associated with I.T.S Ghaziabad for last about 2 decades. As Director (IT) and is responsible for IT Programs of the Institute and identify, design, deployment and maintenance of ICT Infrastructure. Prof. Pandey has been associated with various professional bodies and owns the responsible position as Stare Coordinator of Computer Society of Uttar Pradesh and Members of Editorial Committee of CSI Communication – A prestigious publication of Computer Society of India. He is also a Senior Member of IEEE, ACM, CSI, IETE and Indian Science Congress.

Dr. Pandey has been awarded with various prestigious awards of IT Industry including CIO Crown Award (2018), Change Agent 200 Award (2018), Cyber Sentinnel Award (2018), Next CSO (2018), BIG CIO 100 Award (2018), Data Centre Award (2018), Next100 CIO Award (2017), Top-200 CIOs Change Agent Award (2017), 3E Scholar Award (2017), Top 50 Most Innovative CIO/ CTOs Award of India (2017), CISO Platform Special Recognition Award (2017) of India's Top IT Security Influencers & Community Contributers" by CISO Platform-2017, "Data Center Award for Capacity Management of ICT Infrastructure & Services" (June, 2017) and Top College CTO Award by Digital Edge & Dell (2016).

He has published 66 Papers/ Articles/ Interviews in Journals/ Magazines/ Webportals of National & International repute and a regular speaker on various forums on Academia and Industry including CBSE Sahodaya Conferences, Summits, Conclaves, Meets, Seminars etc. He has also initiated organizing exclusive events for Industry as academic Institution including – CXO Meet, CEO Meet, Digital India Conclave, IT Summit etc in which Global Industry leaders of leading IT Companies, Govt. Offciailas and renowned & seasoned academicians from India & aborad have been partcipating every year. Dr. Pandey have been coordinating the training of Air Warriors of Indian Air Force for last 5 years and till date over 750 Air Force Officers and Staff have been trained on leading technologies.

He is associated with various professional bodies including Member – Editorial Board of CSI Communication, State Coordintaor of Computer Society of India for U.P., Member of Academic Advisor Council of CEGR, President, CEGR Ghaziabad Chapter and Sr. Vice President of ICPEI. He has been speaking at various Conclaves, Summits including World Education Summit, Edutech Congress, Indian Science Congress etc., National & International Conferences, Training Programs & Workshops across the country. He is also member of Board of Studies and panel of Doctoral Programs in many Universities.

I.T.S National Convention

In Association with Computer Society of India (CSI Student Branch @ I.T.S)

On 14th & 15th March, 2019

Contact Persons:
Dr. Sunil Kr Pandey: Mobile - 8447744063
Email: sunilpandey@its.edu.in

Dr. Ajay Kumar: Mobile - 8447744073
Email: ajaykumar@its.edu.in

I.T.S, Mohan Nagar, Ghaziabad in association with CSI Students Branch @ I.T.S, Ghaziabad is organizing the National I.T.S Convention on 14th & 15th March, 2019. The event shall witness the gathering of galaxy of guests from leading organizations of the country. The event is divided in two segments. The one would be experience sharing and addresses of Industry Leaders, Researchers, Policy Makers and seasoned Academicians of the Country. The second part would be the activities in which about 1000+ students from a large number of colleges, Universities are expected to participate in 20+ Activities comprising of IT Quiz, Java & C Programming, Blind Coding, Project Presentation, Poster Presentation, Business Quiz, Web Designing, Logo Designing,

Global IT Day

In Association with Computer Society of India (CSI Student Branch @ I.T.S)

On 30th March, 2019

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Dr. Umang: Mobile - 99100 55457
Email: umangsingh@its.edu.in

I.T.S, Mohan Nagar, Ghaziabad in association with CSI Students Branch @ I.T.S, Ghaziabad is organizing its Mega Event "GLOBAL IT DAY" on 30th March, 2019 at I.T.S, Mohan Nagar, Ghaziabad. The event shall be focused on discussions on leading technologies (IoT, Communication Networks, Data Analytics, Clouds, Block Chain etc), which are laying down the foundations for next generating computing and upcoming challenges in the field of Cyber Security due to growing connectivity of things/ devices and massive access of Infrastructures and IT Resources. On this occasion various experiential Sessions and Panel Discussions at the Venue and few Video Conferencing Sessions are also planned in which Top Industry Leaders, Researchers, Policy Makers and Academicians from different parts of the country and abroad shall be addressing the gathering during the day in this Mega Event. The Panels shall be designed in such a way that it address the concerns of different domains including – IT, Manufacturing, Retail, Health Care, Banking, Media, Agriculture, Political, Economic and Governance dimensions and many others. The event shall witness the gathering of galaxy of guests from leading organizations of the country.

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Student Branch Inauguration at Shri Shankaracharya Technical Campus, Bhilai

CSI Student Branch was inaugurated on 8th October 2018 at Shri Shankaracharya Technical Campus, Junwani, Bhilai. Starting with the lightning of lamp and Saraswati Pooja. The event was followed by inaugural of two technical events. At this occasion, Prof. Jaya Mishra (President, SGES), Dr. P B Deshmukh (Director, SSTC), Dr. Jaspal Bagga (HoD-IT), trainers from Kolkata Mr. Upasak Pal, Mr. Kamlesh Gupta, Mr. Aritra Dalal, and Ms. Stuti Kumari were present. The event was witnessed by around 300 people which included CSI members, student members, other faculty and students.

Eighty three students of different branches have become the member of CSI. Prof Jaya Mishra (President SGES) gave inaugural keynote, congratulated for institutional membership and declared the CSI Bhilai Student Branch open. Dr. P B Deshmukh marked the importance that CSI is playing a major role in IT Policy framework and encouraging the professionals by way of organizing conventions and various awards. Prof. Dolley Shukla, Student Branch Counsellor, stressed upon the importance and role of this branch for organizing professional activities. The branch will play a foremost role in achieving the objective of the CSI. CSI Student branch will provide connectivity between members. To enhance the knowledge of members, the branch will organize different workshops and conferences, Guest lectures, technical meetings, poster presentation/ exhibitions, seminars. The branch will also host regional, divisional, national and international events along with the various reputed sponsoring agencies. In this Context, two workshops i.e. Machine Learning using python and cloud computing with Amazon Web Services are being organized by Department of Information Technology from 8th Oct to 13th Oct 2018.

Call for Paper for CSI Journal of Computing

(e-ISSN: 2277-7091)

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

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

Prof. A K Nayak
Publisher

Computer Awareness Cum Family Get Together Programme

Organized by CSI Lucknow Chapter on Sunday, 20th January 2019

Vinay K. Johri
Member MC, CSI Lucknow Chapter

Lucknow Chapter of Computer Society of India organized a Computer Awareness cum Family Get Together programme on Sunday, 20th January 2019 at Scorpio Club, Lucknow for the benefits of CSI members and their families with an objective of spreading Computer Awareness among the family members in an interesting and meaningful way. Approx. 100 odd enthusiastic participants the CSI members, their spouse and children were the part of this programme on a very shining day. The ladies and the kids were very excited to be a part of the blind programme which was very well planned and organized by the Management Committee of CSI Lucknow Chapter along with the young CSI members viz. Shivanshi Puri and Swati Singh after giving a deep thought of involving each and every participant of all ages.

The programme started with welcoming the participants by the Chairman and other MC members followed by Morning Tea/Coffee and Snacks just to warm up the participants and make them ready for forthcoming Computer Awareness through various well thought games in a funny and interesting way involving even the youngest participant as well as the most experienced one. Games were so designed that it required the skills and coordination of the whole family in some games or individual skill was enough to achieve the goal in a particular game especially for the younger children/ladies. All the games were played by the participants showing successful execution of their skills achieving the end result i.e. winning various prizes in different games with the help of the leader i.e. Head of the family or showing their individual skill in particular games where individuality was the key to success.

At the end of the event, every participant felt that they learnt a lot about Computer discipline, decision making, coordination, timing, planning, successful execution, dependability etc. etc. to achieve a desired result through various games and events organized by the CSI Lucknow Chapter and they were very happy for being a part of such successful programme. The winning participants were suitably awarded with the Prizes by the Chairman and Senior CSI Members. Shri Rakesh Puri, Chairman of the Lucknow chapter thanked all the participants for being a part of enthusiastic gathering and expressed his hope that all the CSI members will attend Technical Sessions too with the same enthusiasm and positivity to make all the Technical Sessions also a grand success which are being organized by the CSI Lucknow Chapter regularly.

A two day Seminar Techno-Quest'18

Organized by Dept. of Computer Science and Applications of Lucknow Christian College, Lucknow.

Report by – Amrendra Sharma

A two day Inter Collegiate Seminar "**Techno-Quest'18**" , on Computer Technologies, was held in the Girilal Gupta Social Centre of Lucknow Christian College, Lucknow. The Seminar organized in association with Computer Society of India, Lucknow Chapter aimed at not only imparting the knowledge of technology but also on improving communication skills of the students.

Dr. Manorama Singh, Regional Director of Indira Gandhi National Open University (IGNOU) was the Chief Guest of the Inaugural Session whereas the Valedictory Session was chaired by Dr. Rajiv Pandey, Regional Higher Education Officer with the blessings of Hon'ble Bishop of Lucknow Episcopal Area Rt. Rev. Dr. Phillip S. Masih. The guests were welcomed by Prof. (Dr.) Mukesh Pati, Principal of Lucknow Christian College. Total 48 papers were presented by the students of Undergraduate level from different colleges on latest Computer Technologies and Applications.

The Presentation of Abhinav Dwivedi on Online Food Ordering System was adjudged to be the Best Presentation. Big Data by Akash Gupta bagged the Best Topic Coverage Award whereas the Best Paper award was given to Artificial Conciousness by Aman Pal Singh Rana. Sanchit Das was adjudged as the Best Speaker.

The Vote of Thanks was offered by the Incharge of the Department.

The 4th invited talk of the series of IEM-CSI-Student Branch

held on 30th January 2019 from 4 p.m. to 5 p.m. at Science Auditorium, Gurukul campus.

Topic : Blockchain

Invited Speaker: **Padma Shri Dr. Bimal Kumar Roy**

Head, R C Bose Centre for Cryptology and Security, Indian Statistical Institute

Professor, Applied Statistics Unit, Indian Statistical Institute, Kolkata

Head, Cryptology Research Group, Indian Statistical Institute, Kolkata

Founder and General-Secretary, Cryptology Research Society of India.

Web Development Workshop

Date: 10th & 11th January,2019

NMAM Institute of Technology, NITTE, Karkala,
Udupi, Karnataka, 574110

Organised by **Bangalore Chapter (Region V)**

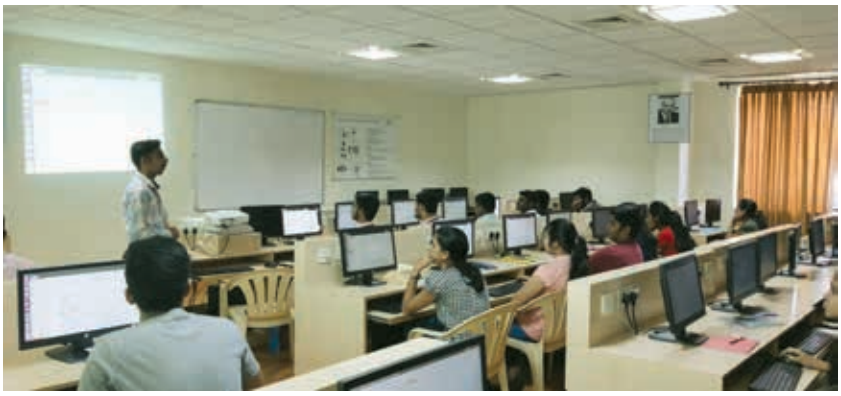
This workshop provided a great opportunity to the students to obtain knowledge on Web development. The resource person of this workshop was Mr. Hashif T P, CEO and Founder of A S Designs Pvt Ltd. Mr. Hashif then shared his experience and began with the importance of Web development. He then taught designing of the website using Dreamweaver application and helped students to understand better. On second day, students were taught to work with bootstrap and how to use functionalities.

Python Workshop

Date: 19th January, 2019

NMAM Institute of Technology, NITTE, Karkala,
Udupi, Karnataka, 574110

Organised by **Bangalore Chapter (Region V)**



Python workshop aimed at imparting knowledge in Python starting from the basics to some of the advanced topics. The resource person for the workshop were Mr. Pawan Hegde and Mr. Ramesh Shettigar, Associate Professors, CSE department, NMAMIT, Nitte.

This was one-day workshop, which witnessed participation of 25 members. In the morning session, the students were taught about the basics of Python, Data structures, Functions used in Python. And in the afternoon session, the concepts regarding Object Oriented Programming and GUI were taught.

EFFECTS OF DIFFERENT DIGITAL MODULATION SCHEMES FOR IMAGE TRANSMISSION

THROUGH WIRELESS FADING CHANNELS

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Arpita Chakraborty has joined Bengal Institute of Technology under Techno India Group, Kolkata, India in 2008 as Lecturer and presently she is working as Assistant Professor, Dept. of Electronics and Communication Engineering. She is awarded University medal for standing first in order of merit at the M.Tech examination in Jadavpur University, Kolkata, India. She is author of many research papers published in International Conferences & Journals. Her current research interests include Image Processing, Cognitive Radio Networks, Next Generation Wireless Communications, Digital Signal Processing & Advance Robotics.

Jyoti Sekhar Banerjee has joined Bengal Institute of Technology under Techno India Group, Kolkata, India in 2005 as Lecturer and presently he is working as Assistant Professor, Dept. of Electronics and Communication Engineering. He also served many other reputed educational Institutes in India in various positions. His areas of research interests include Image Processing, Cognitive Radio, Sensor Networks, Distributed Systems, Performance Evaluation & Network Security. He has contributed in many research-oriented books as chapter author & also published several research papers in International Conferences & Journals. Mr. Banerjee serves as an editorial board member of many reputed journals & conferences.

Review

We live in an age of communication, more specifically in wireless communication. Facebook, WhatsApp, e-mails, various social, networking, banking sites everything we use to communicate need a medium, known as channels. These channels may be wired (Twisted pair, coaxial cables, optical fibers etc.) or non-wired (wireless). In this book we will take the wireless part. In wireless communication system when any message (signals) propagates through air it experiences different restrictions and the signal is attenuated by means of power and strength. These facts are known as Multipath Fading of communication channels. Multipath fading is one of the significant factors that affect the performance of a wireless communications link. We are going to have a comparative study of these fading channels on different sender-receiver schemes (Modulation-Demodulation). Theoretical results exist for calculating performance in the presence of a fading channel for some modulation schemes and some types of fading. In other cases, link performance must be evaluated by simulation. Mathworks' Simulink is one tool used for these simulations. Mathworks provides pre-constructed blocks for both Rician and Rayleigh fading which accept parameters defining these fading models. The proper use of these blocks to include the parameters that define fading channels has been described. These blocks make it easy to model complex fading systems. Simulation results for link performance obtained using these channel-modeling blocks in BPSK and BFSK systems correspond closely to the theoretical results. The work presented here should be of interest to others studying wireless communications.

We have divided our comparative study of performance analysis of wireless channels based on simulative experiments in four broad sections.

Section 1: describes the brief theory of communication channels and the effect of fading in communication channels.

Section 2: describes modulation schemes, channel models we are using for experiment and related parameters for performance comparison. It also features a brief idea about image transmission.

Section 3: describes detailed view of our simulation; the blocks, their parameters, results and comparative study of the results (using graphs). It also features the study of image transmission via different channels using different modulation schemes.

Section 4: describes the future prospects of reducing fading in communication channels.

MATS School of Information Technology

Presents

TECH - MATS 2019

12th FEB 2019

Oxyzone

Venue - City Center Mall, Pandri Raipur
11:30 am onwards

Sur (Singing Competition)	
SOLO	DUAL
Registration Charge - 200/-	Registration Charge - 300/-
1st Prize- 3000/-	2nd Prize- 1500/-

Taal (Dance Competition)	
SOLO	GROUP
Registration Charge - 200/-	Registration Charge - 300/-
1st Prize- 3500/-	2nd Prize- 1500/-

RAMP SHOW	
SOLO	GROUP/PROFESSIONALS
Registration Charge - 300/-	Registration Charge - 500/-
1st Prize- 3000/-	2nd Prize- 1500/-

Vision Drawing Competition
10.00 am Onwards
Venue : YOGA Hall, MATS University, Pandri Raipur
Pre Junior Category : (UPTO 10 Years)
Time : 10:00 am to 11:30 am
Topic : Green India
Junior Category : (11 Years to 16 Years)
Time : 12:00 noon to 01:30 pm
Topic : Digital India
Senior Category : (17 Years to 22 Years)
Time : 02:00 pm to 03:30 pm
Topic : Clean India
Registration Charge For Pre Junior - 100/-
Registration Charge For Junior & Senior - 200/-
Prize - 2000/-, 1000/-, 5 Consolation Prize

Knowledge Buzz Quiz Competition
10 am onwards
Venue : Computer Lab, MATS University, Pandri Raipur
Prize -5000/-, 3000/-
3 Consolation Prize
Registration Charge - 500/- (Two Students in Each Group)

E-Sports
10.00 am onwards
Venue : Computer Lab, MATS University, Pandri Raipur
Mad Mikhe | Counter Strike | Ludo | Sunsetflower Pubg
SOLO Registration - 200/- | DUAL Registration - 300/-
Prize - 3000/-, 1500/-

13th FEB 2019

Computer Society of India

National Seminar

"Advances On Computational Technology And Its Applied Domain"
(ACTAD - 2019)
Venue : MATS Impact Center, MATS University, Pandri Raipur

14th FEB 2019

Science And Technology Exhibition

Venue : Pandit Deendayal Upadhyay Auditorium, G.E. Road, Raipur
Solo Registration - 200/- | Group Registration (MAX 3) - 500/-
Prize - 3000/-, 1500/-, 3 Consolation Prize

FUN FAIR

Venue : Pandit Deendayal Upadhyay Auditorium, G.E. Road, Raipur
Student Stall - 1500/- | Professional Stall - 2500/-

IT Uddhyamita III - 2019

(CONCLAVE OF ACADEMICIANS AND ENTREPRENEURS)
Venue - Pandit Deendayal Upadhyay Auditorium, G.E. Road, Raipur
10 am onwards
Key Speaker : Dr. Pawan Agrawal (Mumbai, Dabbawala)

FOR REGISTRATION CONTACT

Oxyzone
Mr. Purnendu Mishra 9713898831
Vision - Drawing Competition
Mr. Krishna Soni 7999178861
Knowledge Buzz
Dr. Umesh Pandey 7499388500
Mr. Amit Gautam 9826961129
E-Sports
Mr. Amit Sahu 9111922505
Mr. Shesh Narayan Mishra 9685437207
National Seminar
Dr. Bhawna Narain 9691849555
Dr. Snehalata Barde 9926137319
Science & Tech Exhibition
Dr. Gyanesh Shrivastava 7828249416
Mr. Nishant Namdeo 7869136260
FunFair
Mr.Krishna Pratap Singh 9406606633
Mr. Mahadev Bagh 9009824551
IT Uddhyamita-III
Mr. Pushpak Verma 9755116999
Event Convener
Ms. Rita Dewanjee 9926904828, 7999640929
email - msit@matsuniversity.ac.in

MATS University, MATS Tower, Pandri, Raipur (C.G) 492001 | For Details visit MSIT page @ www.matsuniversity.ac.in

** Incase of less than 10 participation in any category, the competition will subject to cancellation by committee shall be considered.

REGION-I

Maharishi Markandeshwar (Deemed to be University), Ambala

4-1-2019 & 5-1-2019 - National Workshop on Robotics

REGION-III

Babaria Institute of Technology, Vadodara

7-12-2018 & 8-12-2018 – Technical Fest on CODEVENZA - Computer Education Week

REGION-III

G H Patel College of Engineering & Technology, Vallabh Vidyanagar

5-1-2019 - Expert talk on Machine Learning : ALL ABOUT ML

10-1-2019 - Expert talk on Blockchain 2.0

REGION-III

B V M Engineering College, Vallabh Vidyanagar

5-1-2019 - Workshop on System Design using Machine Learning Techniques

REGION-V

Maharaja Institute of Technology, Thandavapura

10-10-2018 – Prof M S Veerendra Kumar , Chairman CSI Mysore chapter inaugurated CSI Student Branch

REGION-V

Anurag Group of Institutions, Hyderabad

5-1-2019 - Faculty Training Program on Enterprise Architecture with TOGAF

7-1-2019 to 9-1-2019 - Techhack 2k19 - A 36 Hrs Hackathon on Building "Chat Bot"

REGION-V

NBKR Institute of Science and Technology, Nellore

23-12-2018 - Motivation Session

2-1-2019 - Technical Quiz

CMR Technical Campus, Hyderabad

27-12-2018 - Guest Lecture on Python and Applications of Data Science

5-1-2019 & 6-1-2019 - National Level Workshop on Machine Learning and Deep Learning with Practical Approaches for Engineering Applications

New Horizon College of Engineering, Bangalore

11-1-2019 – FDP on Machine Learning with Python

21-1-2019 – FDP on Big Data Analytics

REGION-VI

Tatyasaheb Kore Institute of Engg. & Tech., Warananagar

22, 23, 28 & 29-12-2018 & 5-1-2019 & 6-1-2019 – Workshop on Android Mobile Applications

Guru Gobind Singh Polytechnic, Nashik

24-12-2018 - Mr. Vaibhav Shirpurkar addressing on Interview Techniques

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FROM STUDENT BRANCHES

REGION-VII

Chennai Institute of Technology, Chennai

9-1-2019 – Student Branch Inauguration & National Level Workshop on Advanced Machine Learning Tools

MIET Engineering College, Trichy

28-12-18 – CSI Student Branch Inauguration

Hindustan Institute of Technology and Science, Chennai

19-1-2019 - Workshop on Machine Learning

National Engineering College, Kovilpatti

19-1-2019 - Technical Talk on Selenium-Automation Tool

P A College of Engineering and Technology, Pollachi

28-9-2018 – Guest Lecture on Personality Development and Communication Skills

Viswajyothi College of Engg. and Tech., Ernakulam

10-1-2019 to 16-1-2019 – FDP on Embedded Systems and Data Mining

Student branches are requested to send their report to admn.officer@csi-india.org
with a copy to mgsekaran1962@gmail.com
Kindly send **High Resolution Photograph** with the report.