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From the Desk of Chairman, Publication Committee



Dear Fellow Members,
Greetings.

We see informative articles being published in CSIC and Journal of computing (JC).

Adyayan has been started with good innings under the guidance Prof Bipin Tyagi. With this all three journals of CSI are in full swing. Indeed the support of Prof A. K. Nayak, IPP is commendable. Adyayan was there earlier and if my memory serves me right it had the patronage late Prof D.V.R Vithal who was an academician to the core.

We invite informative articles from final year students of CSE/IT/Data Science and related disciplines. Basically, Adyayan is to encourage students. From my experience, I can say that some students are very brilliant and have innovative ideas and here is a channel where they can give vent to their innovative ideas.

A word about World-Wide-Web

It was Sir Tim Berners-Lee who invented the world-wide-web in 1989. He worked for world wide Consortium (W3C) – a web standards organization founded in 1994 which

developed interoperable technologies to lead the web to its full potential.

In 2004 Tim Berners-Lee was awarded a knighthood by Queen Elizabeth II of the United Kingdom.

In 2013 Sir Tim along with his colleague was awarded the Queen Elizabeth Prize for ground breaking innovations in engineering.

In 2017, Sir Tim was awaded the ACM A.M Turing Prize for inventing the world wide web – the first web browser. The Turing prize is considered as one of the most prestigious awards in Computer Science.

I do hope that these contributions from legends in Computer Science will motivate our members /professionals.

With best compliments

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Editorial



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Editor

Dear Readers

"Real search is about providing valuable information when it's really needed to those who are actually looking for it."

- David Amerland

The above quote by **David Amerland**, a business journalist, author and international speaker depicts our current desirability of finding relevant online in the present times when there is stupendous data available. Simply explained, Semantic Web is an extension to World Wide Web in which data in web pages is structured and tagged in a way that the computers can directly read it.

We dedicate this issue to understanding and appreciating how Semantic Web is altering the online world. Continuing with our invited series Titbits from the History of Computing –X by the legendary Prof. V. Rajaraman, this issue discloses, "**Invention of Global Positioning System**" This article traces the birth of the Global Positioning system facility. The first article, "An Overview of Semantic Web" by Karishma Hegde and Snigdha Sen details the nuances of Semantic Web. The article, "Semantic Web in Clinical Research" by S. N. Kakarwal et. al. discusses the application of Semantic Web for smart clinical research. The next article, "Semantic Web: The New Era of Internet" by I. Elizabeth Shanthi and K. T. Mathuna highlights the basics of Semantic Web technology. The next article, "Semantic Web and its Applications" by K. Shanmugan et.al. delves into the varied applications of Semantic Web.

The research front showcases, "Semantic Web empowered Software Testing in both Industry and the Scholarly Community" by L. Jerart Julus and D. Manimegalai highlighting how Semantic Web empowered software testing can be applied to both the industry and the scholarly community. The next article, "Instigating Tensor Flow in Machine Learning for Image Recognition" by Madhulika Bhatia, Vipin Katara and Eshan Bajal evaluates improvement in machine learning based image recognition techniques through tensor flow. The next article, "Content Resemblance based Text Categorization System using Unordered Fuzzy Rule Induction" by Ankita Dhar et. al. details the application of Content Resemblance for text categorization.

The technical trends commences from the article, "The Dining Table and Cutlery have Artificial Intelligence" by Xavier Chelladurai furnishes the well-known Dining Table problem through the Artificial Intelligence perspective. The technical trends section also discusses the Current pandemic COVID-19 threatening the existence of mankind in the article, "Twitter Sentiment Analysis on Social Distancing in India: A Key to Preventing Transmission of an Epidemic Outbreak of COVID-19" by Parth Goel, Dweepna Garg and Amit Ganatra. This section also reports the challenges and opportunities involved in applying Semantic Web for Healthcare Systems. The article, "Semantic Web for Effective Healthcare Systems: Challenges and Opportunities"

by P. Ranjana and Thangakumar Jeyaprakash introduces the same. The next article, "Semantic Web meets Cognitive Robotics" by Snehasis Banerjee highlights the conglomeration of Semantic Web with Robotics. The last article, "Journey of Machine Learning, A Subset of Artificial Intelligence" by Jyotishmann Ray explains the intricacies of machine learning.

The issue also reports various webinars and faculty development programmes conducted by various regions of CSI. We applaud all chapters and branches for conducting such activities even in these hard times. We also whole-heartedly congratulate all the members of the Executive Committee along with our honourable President, Shri R. K. Vyas. We hope that they will have a successful tenure.

The issue also reports the bibliography of Sir Tim Berners Lee, director of the World Wide Web consortium. Varied student branch activities as well as workshops carried by different regional chapters of CSI like industrial visit and programming competitions have also been reported.

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

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

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

With kind regards,

Prof. (Dr.) S. S. Agrawal

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President's Desk

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It's my pleasure to greet you all once again under the difficult situation prevailing in country due to COVID-19 and convey my heartfelt respect & gratitude to all the CSI members.

After taking the charge on 1st April 2020, ExecCom conducted its first online meeting on 6th April 2020 where almost all members were present and deliberated on activities to be conducted and various plans for growth of CSI for the coming year.

I together with the Executive Committee & with continued support of members, trying to achieve the aims of CSI, through the online activities being conduct by Chapters & student branches. I am thankful to all the experts & organizers for conducting these activities, with dynamic support of Office Bearers & active cooperation of ExecCom. members. We are trying to enhance CSI membership growth at student, professionals & life membership and trying to control finances. I hope by the joint efforts of all the members we will be able to accelerate the rate of growth, despite of prevailing situation in the country.

I shall try with my level best for promoting the research activities, collaboration with other professional & research bodies along with the efforts for the exponential growth of membership with my best effort for the inclusive growth of the society.

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. In spite of the lockdown. Many of them have conducted good & quality activities on online platform by using Zoom, Google meet etc. I congratulate all the respective Chapters and Student Branch Organisations including all the office bearers, managing committee, members & student members at a large for their tireless effort & significant contribution.

CSI is going to witness a good number events in next few months in both by online & offline mode at different locations of the Country to be conducted by different Regions, Divisions, Chapters,

Student Branches & SIGs. I congratulate & sincerely thanks to all fellow brothers & request them for communicating the Reports of all activities to the Editors, Publisher & CSI Education Directorate so that the same can be published in CSI Communication. This Issue has also covered the report of the state student convention held at Symbiosis Institute of Applied Sciences in the month of March as well as the report of a Student Branch Inauguration. I congratulate the concerned authorities for their sincere effort & contribution to make both the function possible & most successful.

I take this opportunity to seek the active & support of the Hon'ble Fellows, ExecCom Members, Chapter Managing Committee, Student Branch Coordinators, NSC, RSCs, SSCs & Members at large to make CSI more Dynamic, Vibrant and Productive .

Recently I have sent an appeal to all respected LTA, Fellows and Past Presidents of CSI to help me to diffuse the current situation in CSI so that we can take CSI to new heights. I am getting positive feedback from them and hope to diffuse situation very soon with support of all.

I once again request all Executive Committee Members, Management Committee of chapters, of CSI, to conduct more and more online activities for CSI members & IT professionals at large. The staff at HQ & ED office is also supporting members and available online to members.

Lastly, I will say at this juncture when country is facing acute problem due to COVID-19, stay home, stay safe and updated through various e-activities conducted by CSI.

With warm regards,

Mr. Ram Krishan Vyas
President, CSI

Titbit from the History of Computing–10

Invention of Global Positioning System

► **V. Rajaraman**

Emeritus Professor in the Supercomputer Education and Research Centre, Indian Institute of Science, Bangalore. Email: rajaraman.v37@gmail.com

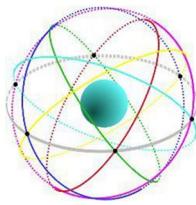
“The history of innovations is the story of ideas that seemed dumb at the time”

— Andy Dunn

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

Prologue

Global Positioning System (GPS) has become indispensable in our daily life. It is an essential tool in navigation and is used by airplanes, ships, and cars. We use it in our smart phones along with Google maps to locate an address. It is even used to tag some prisoners on bail. GPS depends on accurate timing signals sent from a constellation of satellites maintained by the Governments of various countries. The one maintained by the USA is commonly used. The timing signals are derived from atomic clocks placed in the satellites. The constellation of satellites maintained by the USA and Russia covers the entire world. The system maintained by the US defence department has a constellation of 27 satellites with four satellites each in six orbits (and three spare satellites) travelling at a distance of 20,200 Km above earth. Each satellite orbits the earth once every 12 hours. (Currently the number of satellites in orbit has been increased to 31).



Satellite orbits of GPS
(Photo thanks to Wikimedia)

Four out of the 31 satellites are visible from anywhere in the world. The signals from the satellites can be used by any one free of cost. A GPS receiver measures its distance from a satellite by sensing the timing signal sent from it using radio waves which travels at the speed of light. To detect its position (latitude, longitude, altitude) and velocity a GPS receiver uses the timing signals received from four satellites using a process

known as *trilateration* [1, 2].

Originally GPS was intended only for the use by the defence forces of the USA. In 1983 a Korean Airlines plane, due to poor navigation instruments, strayed into the Soviet airspace and was shot down by the Soviet Union leading to the death of 269 innocent people. This tragic event persuaded the then US President Ronald Reagan to allow GPS to be used for navigation by anyone in the world free of charge. The positional accuracy for civilian use was initially limited to about 100 metres. This restriction was removed by the then US President Bill Clinton in 2000 and a positional accuracy of around 4 metres was available to anyone. The accuracy, however, depends on the quality of the GPS receiver and the atmospheric conditions. It is now capable of an accuracy of 30 cm. in ideal conditions with very good receivers. Even though GPS is freely available now for all to use, it is controlled by the US Department of Defence and the signals can be blacked out in any region at its will which the US government did in 1999 during the Kargil War. That is the reason India has its own GPS called IRNSS (India Regional Navigation Satellite System) maintained by the Indian Space Research Organization that covers India and the surrounding areas.

Inventors of GPS

Three engineers are credited with the invention of GPS [3]. Roger Lee Easton Sr. was the head of the US Naval Laboratory's space application branch. When Sputnik, the first satellite in the world, was launched by the Soviet Union in October 1957 Easton invented a method to accurately track it. He conceived the idea of putting very accurate electronic clocks in multiple satellites that could be used to determine the precise location of an object on the ground. The idea was tested by launching two satellites TIMed nAvIGATION (TIMATION) I and II in 1967 and 1969 and two navigation technology satellites NTS 1 and NTS 2 in

1974 and 1977. He was awarded eleven patents for various inventions related to GPS. In 2004 he received the US National Medal of Technology and innovation from the US President “for extensive pioneering achievement in spacecraft tracking, navigation, and timing technology that led to the development of the NAVSTAR Global Positioning System”.



Roger L. Easton
(Photo thanks to Wikipedia.org)

Bradford Parkinson, a colonel in the US Air Force with a Ph.D. in Aeronautics and Astronautics from Stanford University was asked to revive an Air Force programme called 621B that provided latitude, longitude, and altitude information for navigation based on satellite signals. Later the Department of Defence of the US government decided to develop a joint program for navigation purposes combining the work done by the Navy and the Air Force with Army as a user.



Bradford Parkinson
(Photo thanks to wikipedia.org)

Invited Article |

Parkinson was made in-charge of the program called NAVSTAR GPS joint program office from 1972 to 1978. He replaced the clock used in TIMATION by an accurate atomic clock, used the novel radio signal structure from the Air Force program 621B, and the orbital prediction method from another Navy sponsored system called TRANSIT developed by Johns Hopkins University Applied Physics Department. This integrated system formed the NAVSTAR Global Positioning System. The citation by the Inventors' Hall of Fame to which he was inducted in 2004 acknowledges Parkinson "as the program's first manager, he has been the chief architect of the GPS throughout the system's conception, engineering development, and implementation". He is known as the "Father of GPS".

The third person recognized for operationalising GPS is Ivan Alexander Getting who was the founding president of The Aerospace Corporation at Los Angles that was set up to assist the aerospace efforts of the US Department of Defence. A complex project such as GPS that was very expensive (as it needed many satellites to be



Ivan Alexander Getting
(Photo thanks eth.org)

launched) and used technologies developed by two different branches of the US defence

forces, namely, the Navy and the Air Force with their own agendas, required a diplomat and a technologist who could steer the project through a labyrinthine bureaucracy.

Ivan Getting was a skilful coordinator besides being a respected senior engineer. He is credited with a deep knowledge of the technology of GPS besides his persuasive abilities. The US National Academy of Engineering awarded him the Charles Stark Draper prize along with Parkinson for the "design of GPS, on its operational value, and on planning, negotiations, and reaching agreements with all the system's stakeholders that was critical to its becoming a reality". Getting is also credited with proposing a three-dimensional, time-difference-of-arrival position finding system for navigation.

Besides these three engineers who were directly responsible for designing and operationalising GPS, a mathematician Gladys Mae West who was employed by US Naval Weapons Laboratory is also recognized for proposing the optimal orbits for the GPS satellites.



Gladys Mae West
(Photo thanks to Wikipedia)

She used the powerful IBM 7030 'Stretch' computer to process data from

satellites to determine their exact location. She was inducted into the US Air Force Space and Missile Pioneers' Hall of Fame in 2018 for her programming effort that "delivered increasingly refined calculations for an extremely accurate geodetic earth model, a geoid, optimized for what ultimately became the Global Positioning System orbit".

Epilogue

The idea of launching a Global Positioning System was conceptualised in 1972. The development effort with all approvals lasted till 1978 when the first four satellites were launched. It became fully operational with the launch of all 24 satellites (and 3 spare satellites to substitute if one or more satellite failed) after seventeen years in 1995. An accuracy of around 4 metres was available only in 2000. This time line illustrates how long it takes for an important invention to be available for general use. Today GPS receivers on the ground are inexpensive. A GPS fitted to a car to find its position costs around Rs.5000. Free Apps are available on mobile phones that uses GPS to detect its position. This position information is shown on Google maps to find out the street address of the location of the mobile phone. Some recent Apps in mobile phones have a voice guidance system that tells a driver the route from a location A to a location B while he/she drives a car.

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- [1] K.C.T. Swamy, Global Navigation Satellite System and Augmentation, Resonance, Indian Academy of Sciences, Vol.22, Issue 12, December 2017, pp. 1155-74
- [2] How does GPS work? www.physics.org/article-question.asp?id=55
- [3] Geo Editor, Who Invented GPS? People Behind the GPS, www.geowesomeness.com

About the Author



Prof. V. Rajaraman (CSI Fellow) Ph.D. (Wisconsin) is Emeritus Professor, Supercomputer Education and Research Centre, Indian Institute of Science, Bangalore. Earlier Prof. Rajaraman was Professor of Computer Science and Electrical Engineering at IIT, Kanpur (1963-1982), Professor of Computer Science and Chairman, Supercomputer Education and Research Centre, Indian Institute of Science, Bangalore (1982-1994) and IBM Professor of Information Technology, Jawaharlal Nehru Centre for Advanced Scientific Research (1994-2001).

A Padma Bhushan awardee in 1998, he is also a recipient of the Shanti Swarup Bhatnagar Prize in 1976. He is a lifetime contribution awardee of the Indian National Academy of Engineering and the Computer Society of India. (A detailed biodata may be found in en.wikipedia.org/wiki/Vaidyeswaran_Rajaraman).

An overview of Semantic Web

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► Snigdha Sen

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Introduction

The word semantic is related to syntax or the rules that govern the format of a language. While syntax relates to how the instructions are written, semantics are concerned with the meaning of the instruction. The concept of semantics is important for communication.^[1] With the advent of the Web, communication between computers became a more convenient task. It became a synonym for a very large document storage and retrieval source. The communication process requires a user to send a request to the respective host through the computer which in turn returns the requested content or data as a response. The instructions to the computer on how this data should be presented is written in what is known as the Hyper Text Markup Language or, the HTML. This may sound convenient, but there are underlying problems. With this existing process of obtaining document, machines simply retrieve websites and information for users without understanding the meaning of the content they are handling. They simply transfer data from one end to the other, purely based on the keywords in the requests they receive. They are built only to understand the syntax, but not perceive the semantics. Well known companies like Best Buy, BBC World Cup site, Google, Facebook has started using semantic web for running their commercial application.

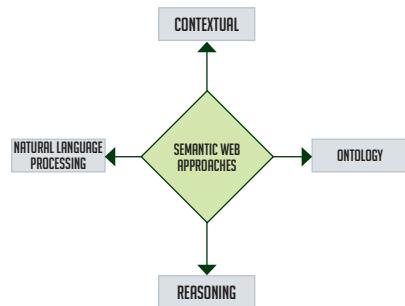


Fig.1 : Types of semantic web approaches^[4]

If we could get computers to understand the data and queries that they are handling, they can actively participate in

serving requests, rather than being passive components in the web cycle. Thus, came the concept of the Semantic Web. Generally, The Semantic Web is an extension of the World Wide Web through standards set by the World Wide Web Consortium (W3C). The goal of the Semantic Web is to make Internet data machine-readable. It was developed by the W3C. To put in simple words, the role of the semantic web is to help the machine i.e. the computer to understand the meaning of the content inside a web page. The semantic web is not a separate entity, rather it is an extension to the existing web. It adds new data and metadata to existing Web documents, extending them into the data. This extension enables the web to be processed automatically by machines and also manually by humans. The web of today is a web of 'documents', while the semantic web aims to change it to the 'Web of Things'. The word 'things' here implies to real world objects such as persons, places, movies, books, organizations, etc. The semantic web

not only works to convey the meaning of these things to the computer web, but also aims to help the machine understand the inter-relations between them.

We must understand that the semantic web is not something we must be expecting in the future, but is already under development. The possibilities that come out of this concept are numerous. For example, if a music blog has embedded semantics into its HTML, it could pick a particular music artist and help the user find all music by that artist on that website or even help discover related content on other websites. The semantic web is guaranteed to make web searches more accurate since it does not merely rely on keywords or search box entries.

Semantic Web Tools

The Semantic Web is a distributed data objects framework, and can therefore be called as an Object-Oriented Framework^[3]. It is also perceived as a Unified Markup Language (UML) diagram to express a

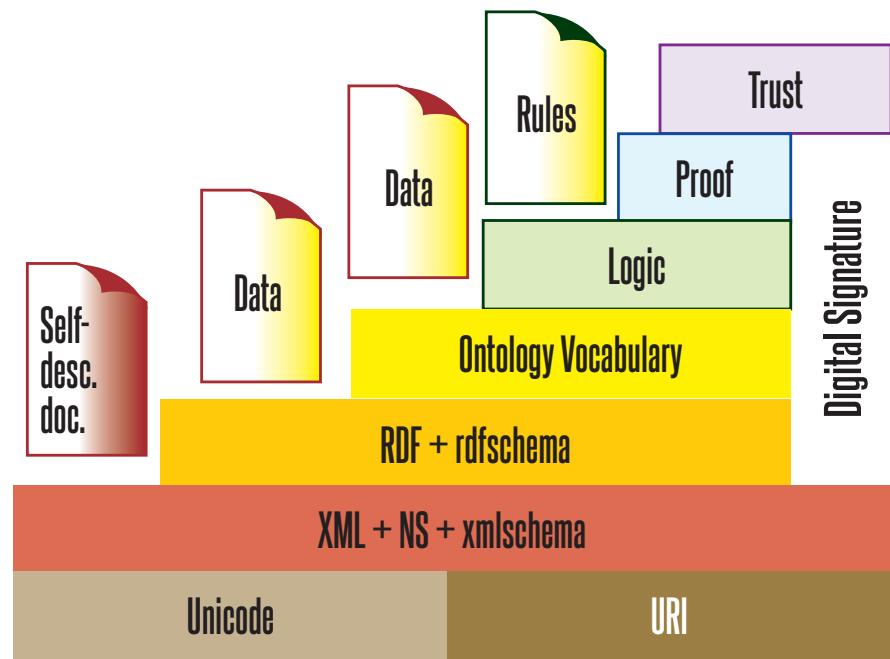


Fig. 2 : The Semantic Web Layer Tower by Tim

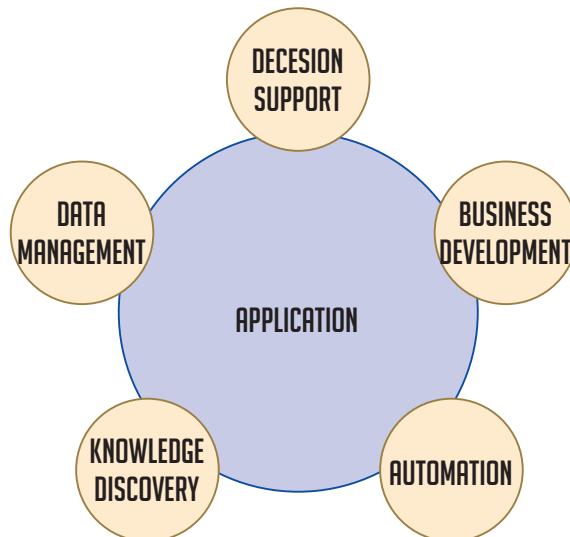
Semantic Web graph. Both Semantic web and Object-Oriented Programming have objects, attributes and instances. There are several promising technologies to incorporate semantic understanding in existing syntactic instructions. Some examples include microformats and RDFa (Resource Description Framework in Attributes).^[3]

RDF is a framework or a markup language for describing resources on the web. RDF XML considered as the quality interchange format for RDF on the Semantic Web. However, it is not the sole format. Since RDF is a generic format, it becomes easy to process. It already has numerous parsers. The benefit that one gets from drafting a language in RDF is the mapping of information directly and unambiguously to a decentralized model and for which there are many generic parsers already available.

The Semantic Web aims to build an open source framework to allow data to be available across application, enterprise, and community boundaries. It is also about how the language interprets data to real world entities. Semantic Web technologies have a layered architecture. Each layer rests on and extends the functionalities of the layers below it.

Coming to Semantic Web languages, some noteworthy programming languages are:

- Ontology Inference Layer / Ontology Interchange Language (OIL)
- The DARPA Agent Markup Language (DAML)



[4] Fig. 3 : Applications of the Semantic Web

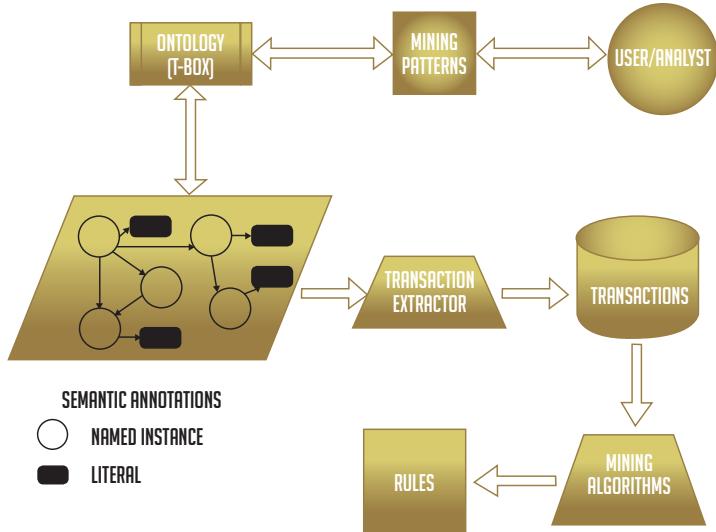


Fig. 4 : Data Mining of Semantic Web

- The Web Ontology Language (OWL)
- Web Service Modelling Language (WSML)

Recent Applications of Semantic Web

Semantic Web technologies are popular in domains like research in biological and medicinal sciences. Useful data helps doctors and researchers by integrating data on different medicines and illnesses that have follow different taxonomies. With the help of the semantic web, websites that offer this type of information can organize their data better, which in turn makes it available to the respective end-users in a more convenient fashion. Oracle is one of

the top organizations that are implementing semantic web concepts through its Oracle Technology Network, called the OTN Semantic Web.

Search engines on the internet are one of the top entities to adapt the semantic web. Unlike traditional search engines that are purely based on keyword dependent algorithms, these search engines are based on the meaning and structure of the search query to implement semantic properties. Some popular search engines that operate on semantic web framework are DuckDuckGo, SenseBot, etc. Google is also based on a semantic technology.^[4] To summarize, a semantic web search engine handles data and the search process is better optimized in aspects such as:

- Resource Utilization
- Logical Structure
- Data Management
- Machine Understandability
- Effective Interconnection of Web Information

Semantic Web Mining is a combination of 2 large domains in technology, namely – Semantic Web and Data Mining. While Semantic Web is used to structure the existing data to make it available more easily, data mining is used to discover patterns from the homogeneous data. Mining data from a semantic source would cut down considerable amount of work and help the user reach the desired data in a faster method. Twine's semantic web portal service stores data using RDF and OWL which is

made of more than 3 million of semantic tags. It is however notable that the entire process of getting data to be compatible to semantic web mining is a complex process considering the heterogeneity and vastness of data itself.

The use of semantic web technologies is aiding the dealing of high levels of drug discovery over recent years.^[2] Semantic web technology has enabled the representation of the data in a formal, structured, interoperable and comparable way, and has facilitated to discover links between drug data (such as identifying new drug-targets or relevant compounds, or links between specific drugs and diseases). Furthermore, there are many scientific queries that cannot be answered with a single data source. Elkseth et al, took up 37 datasets and marked them up semantically in a linked data format. The data was the normalized such that they could use the same concepts across the different datasets. KnittingTools is a semantic search engine built for these datasets. A similar web-

based application called PIBAS FedSPARQL was created by Djokic-Petrovic et al which uses semantic technologies to facilitate researchers in searching across multiple chemical, biological and pharmacological datasets. Another application named Open PHACTS (Open Pharmacological Concept Triple Store), was written as part of the Open PHACTS project to combine data pertaining to drug discovery. These are clear examples of how existing data in the domain has been integrated with semantic web to lead drug discovery into new innovations to provide a new layer of knowledge.

To conclude, the best way to describe a new format of the web or the Web 3.0 is that it will be intelligent.^[3] It will be a large network where profiles, applications, concepts, and data will all be connected. As everything will be linked, it also raises concerns about privacy and security. The idea is that if a web search can know the user's preferences and be able to show them the type and amount of data in the most effective way, it would

increase the overall productivity from an individual all the way to an organization. In this vast ocean of data called the web, a technology like Semantic web would help achieve systematics and consequently better management.

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Publisher

Semantic Web in Clinical Research : Review

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Introduction

There is a large amount of information available on internet world. This information is available in scattered manner and unstructured way. Multiple user have created the information in real world scenario as per their requirement. This information is going to access by other users through internet and also these users are going to update it, append the data in it or delete the data from available Information. It indicates that information is changing as it passes from user to user. Multiple copies of data is created over the internet world per user wise. It means that unnecessary bulk of information is available in scattered format. Due to this there is strong demand in internet world that variety of information required for user from different domain can fetch the information in proper channel and try to avoid duplication over the internet. Same information can be possible to search by different groups of users may access the same information. These user can append their contribution in that existing dataset. To manage such bulk of scatter information there is strong need of semantic web concept.

This concept is totally depending on collaboration task performed by various

users on scatter data used by different organization to available under one roof. This can be accomplished using semantic web.

Various case studies have been available on semantic web that successfully implemented semantic web concept into their organisation benefit [1][2][3][4].

Case Study on clinical research by Chimezie Ogbuji et.al

In Clinical research, Chimezie Ogbuji et.al.[1] have discuss the case study on impact of semantic web in clinical research.

There are various issues occurs in clinical data related to patient data. The data of patient is stored in scattered format in terms of hospital wise, pharmacy wise. To work on such diverse data is taking lots of permutation to access the exact history for the patient.

The case study explains that cleverland clinic have introduces the web semantic concept into their online data collection system to improve the performance of their patient data accessibility.

They have use the RDF, SPARQL with existing URI mechanism. They have design the well formatted repository semanticDB which stores their scatter data in well

organised format.

From this repository they can fetch the data in web semantic format whenever they needed.

Through this repository they are having automated system which integrate their data as per their required format.

Conclusion

Use of web semantic in clinical research by cleverland clinic goes to new height for data abstraction and accessibility of data in structured format. Using automation, they can integrate their information with external resources.

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Semantic Web: The New Era of Internet

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I have a dream for the Web become capable of analysing all the data on the Web – the content, links, and transactions between people and computers. A “Semantic Web”, which makes this possible, has yet to emerge, but when it does, the day-to-day mechanisms of trade, bureaucracy and our daily lives will be handled by machines talking to machines. The “intelligent agents” people have touted for ages will finally materialize. [1]

– Tim Berners-Lee

Introduction

In 1999 Tim Berners-Lee coined the term *Semantic web*. Semantic web is the extension of the World Wide Web (WWW) in which standards were set by the World Wide Web Consortium (W3C). The ultimate aim of W3C is to set up semantic in internet data to understand the meaning rather than syntax alone. The first web page was activated on August 1991 and now there are over a million of webpages serving the users of various domains. It has now come to a level where without *Internet* nothing happens. Current web browsers search contents by moving from one link to the other consuming more time. This could be further improved through the concept of Semantic Search. Semantic search helps in finding the appropriate webpages through meaningful understanding from the search terms similar to human brain understanding.

History of Web

The rise of *Internet* tracks back three

decades ago when the scientific community required a platform to share information. Computers were developed but there were no standard protocols to connect between systems. And at this time the “Web” was developed by researcher “Tim Berners-Lee”, who was then called “Father of the Web” [2]. In 1989, Tim Berners-Lee proposed software that used Hypertext to visualise data. Later on HTML, a standard platform for web designing was developed along with Uniform Resource Locator (URL) and Hyper Text Transfer Protocol (HTTP).

By the year 1994, web usage increased tremendously among professionals and a group of students from Illinois University including Marc Andreessen, added Graphical User Interface with Microsoft windows graphical environment. Mosaic browser was released by NCSA (National Centre for Supercomputing Applications) and it reached to all the internet users at that time.

Meanwhile Andreessen and others developed Netscape Communication Corporation that turned into Mozilla browser and Microsoft developed Microsoft Internet Explorer browser. Since then the Web has grown faster than any other known technological means. Browsers act as a bridge between users and servers for providing services like request, information and viewing the webpages over monitors. E-mail, news groups, webcam, file transfer, voice calls and many more services were enabled through Web [2]. Table 1 shows the evolution of Web.

What is Semantic Web?

In linguistics, Semantic is the study of meanings. A *Semantic Web* is the extension of current web with much more meaningful search delivered from the queried search terms. It is the vision for making information in the web for machine readable understanding. Programming softwares could exchange information through

Table 1: Evolution of Web

Web 1.0	Web 2.0	Web 3.0
<p>Evolved in 60's and is the basic form with text alone and read only option using ELISA browser. Then emerged HTML visualization and later on with Mozilla and Internet Explorer. Typical Design Elements:</p> <ul style="list-style-type: none"> ▪ Static pages for users. ▪ Use of frames. ▪ Own HTML extensions such as blinking and marquees, labels introduced during the browser wars. ▪ Guest books. ▪ GIF buttons. ▪ HTML forms sent through e-mail 	<p>Tom O'Reilly in 2004 labelled the term Web 2.0 as the second generation of the web. Users can modify the content and format for the services provided via Internet. Decentralization, interaction between users through social media, standardized language are the improvements in Web 2.0.</p> <p>Principles of model 2.0:</p> <ul style="list-style-type: none"> ▪ A Platform. ▪ Data is the ultimate of internet. ▪ Internet is effective with the increasing of active users. ▪ Various characteristics of network can be developed independently. 	<p>The term Web 3.0 appeared in an article by Jeffrey Zeldman in 2006 could be the next version of Web.</p> <p>It aims in :</p> <ul style="list-style-type: none"> ▪ Creating platform for data available in any language and in any formats suitable for all softwares. ▪ Transforming the network into a database, including artificial intelligence, geospatial web, 3D Web. ▪ Fastening the search through Semantic Knowledge over web.

effective understanding of webpage content rather than syntax alone.

For example, if a person has to visit a cardiologist and on the way have some vegetarian food in restaurant; the Semantic web would provide links or information considering both the requirements, more like a Personal assistant. In this way the current World Wide Web (WWW) is taken to the next higher level of search. Some of the similar semantic technology is the Natural Language Processing (NLP) that deals with software to process and understand natural languages.

Semantic Web – Major Areas

In recent technology, Semantic web can be framed as a combination of Three things:
a) Automation of Information Retrieval,
b) Internet of Things and c) Personal Assistance. Figure 1 shows the three things under Semantic Web [3].

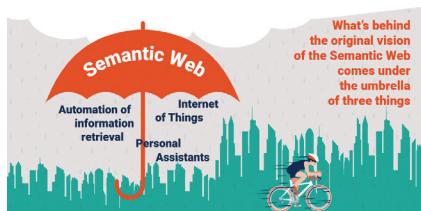


Fig. 1 : Three things under Semantic Web [3]

Automation of Information Retrieval is used to improve the relevant search terms by reducing information overload. Information retrieval systems aids in accessing webpages, books, journals and documents. It provides facilities to store, access and manage those documents in secured manner. Web search engines are the most visible information retrieval platforms.

Internet of Things (IoT) is an environment where network connection and computing tasks are applied on objects, sensors and daily life appliances other than computers, laptops and desktops. These allow data to be interchanged and perform appropriate actions without human intervention [4].

Personal Assistant also known as the Intelligent Personal Assistant (IPA) is a programmed software designed to assist people for fulfilling basic requirements like weather, route directions, sports news via natural language. These IPA also perform tasks to monitor health, alerts, calendar, and reminders and so on. Usually the commands

are replied through voice using a natural language user interface [5].

All the above technology lays hand in hand for the development of the World Wide Web to become a Semantic web network. The future of Web is the advancement in technological growth that humans might have not thought off.

Components of Semantic Web

The technologies and formats essential to develop a Semantic Web form the components of the Web. W3C provides some of the components like Resource Description Framework (RDF), RDF Schema (RDFS), Simple Knowledge Organization System (SKOS), SPARQL, Notation3, N-Triples, Turtle (Tenser RDF Triple Language), Web Ontology Language (OWL) and Rule Interchange Format (RIF) for the functionality of Semantic Web. Of this RDF is the fundamental component used to break down the sentences into Subject, Verb and Object required to find the actual sense of the document [1].

Challenges in Semantic Web:

As the future heads up with more technologies there are still many more challenges to be encountered. Semantic Web also experiences challenges like vastness, vagueness, uncertainty, inconsistency and deceit [1].

- **Vastness**, there are over millions of webpages over the Internet. Various Ontologies are available for different domains with each consisting of over lakhs of class names.
- **Vagueness**, arise from the way user enter search terms. Concepts like "young" or "tall", where the terms are different, but still have to be processed to provide a result.
- **Uncertainty**, these are concepts with uncertain values. For example, if a patient has n-number of symptoms and there is a confusion regarding diagnostic test to suggest.
- **Inconsistency**, logical contradictions that arise as a result of combining heterogeneous ontologies.
- **Deceit**, relating to the security issues of the information where the user is misled by a third party service provider.

Research scientists are looking for a better way to handle these challenges and would lead a road to next generation Web technology the "Semantic Web".

Applications of Semantic Web

Semantic web is adopted in Oil and Gas industry to predict daily events, for easy and timely access with data to provide right time information and to combine heterogeneous sources for decision making process. Media and Publishing industry semantically enrich their contents over documents, pages, blogs to offer most relevant news, easily correlated topics are delivered based on user's interest and they also support content packaging to the users. With the widespread of online banking, competitors requisite advance techniques to retain customers through additional facilities. Semantic Web technology support for effective risk profile evaluation and improves self-service applications [6].

Applications in Health Care

Healthy living is vital for human happiness and economic growth. Health determines all actions of a person. Health care sector ensures in providing services through reduced cost, effective treatment and advanced equipment's. Hence, timely and secure information sharing increases the recovery of patient's health. Information sharing between health sectors improves betterment through advance medicines. Web mining and information retrieval contributes health care sector for analysis. Therefore, Medical ontologies assist professionals to analyse reports of patients to find better treatment drugs and therapies.

Semantic Web imbues in knowledge translation to increase diagnosing effect and in integrating multiple health care systems. It supports in Electronic Health Records (EHR), Interoperability, Clinical Decision Support Systems, Clinical Pathways, Ontologies and Rule Based Healthcare systems [7]. Semantic Web aids in relating diseases with its corresponding drugs and treatment measures through its medical data knowledge. Eventhough, some advancement has to be incorporated in future, still Semantic understanding lifts up the earlier Internet standards in a much more meaningful way.

Conclusion

In recent trends, usage of data is the ultimate business in every aspect of life. Humans have turned out to be the basic information producers with or without knowledge. Each and every piece of information is counted. It is a situation

where without machines we cannot step ahead; however machines are still under human control and we are functioning to make machine work as human brain thinks. Semantic knowledge is one such technique that works on programs to make machine understand the meaning of documents automatically. Semantic Web is the extension of current World Wide Web (WWW). In this paper, the history of Semantic Web and its evolution was discussed. The three things that comprise Semantic web, its components and challenges were interpreted and finally

the role of Semantic Web in Health care was also discussed. In future, the term Semantics will be of great support in all fields including government, education and business.

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Semantic Web and its Applications

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Introduction

World Wide Web (WWW) being the main source of information is a data warehouse containing a large amount of information. Semantic Web services are one among the web services provided to the user and recent growing areas. The web contents gas to be enriched semantically by which it becomes more efficient. Therefore to make the current web service more efficient such that it is more helpful to mankind semantic web service must be provided.

Semantic Definition:

Meaning of semantic as per dictionary is related or associated or meaning of something. Semantic provides a result on understanding the required data. This is rebuilding the current web into semantic web by addition of semantic annotations that provides the exact information as per the need or requirement of the user.

Semantic Web:

The semantic web is a place where the data can be sent, received, used by both human beings and machines with ease. The main aim of semantic Web service is to make web service such that web content is more accessible to automated agents. The semantic web tries to improve the environment status by extending the WWW from just to human to the software agents too such that the agents could aid the human as per the user's requirement or need.

WWW requires a human user who understands the contents with semantic knowledge. Whereas semantic web makes the agents to perform these tasks rapidly, more accurately, concisely thus helping the human user to concentrate on the decision making process.

Why Semantic Web:

- Hyper Text Markup Language (HTML) – the current conventional web isn't suitable for machine understanding due to underlying HTML.
- Existing web service – ontology model

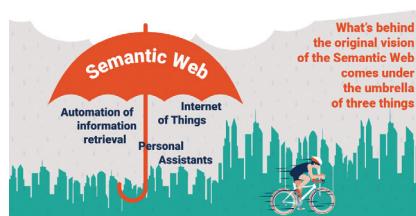


Fig. 1 : Semantic Web –Three Things

in semantic web is similar to human brain. The neurons in brain are similar to the annotations in semantic web. These annotations are not present in current web.

Factors Based:

- The first factor supplies the semantic markup information – for the web contents semantically marked up web pages must be produced later.
- The second factor develops software agents to search and process the semantically marked up webpages from the first pillar.
- The third factor is computational ontology – the web contents and agents commit themselves to mutually

agreement to understanding things that are also understandable by machines.

Languages used in semantic definition:

The semantic definition languages include

- Web Services Description Language (WSDL) : described the functionality of web services.

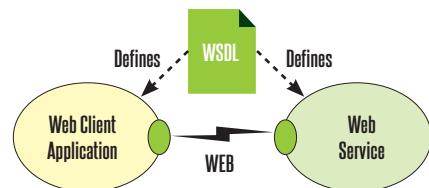


Fig. 3 : Web services: WSDL

- DARPA agent markup language for services (DAML-S) – it is a model of collection of processes where each exchange information with web service clients and also describing the related ontologies.
- Web Ontology Language (OWL-S) – upper ontology for describing properties and capabilities of web services.

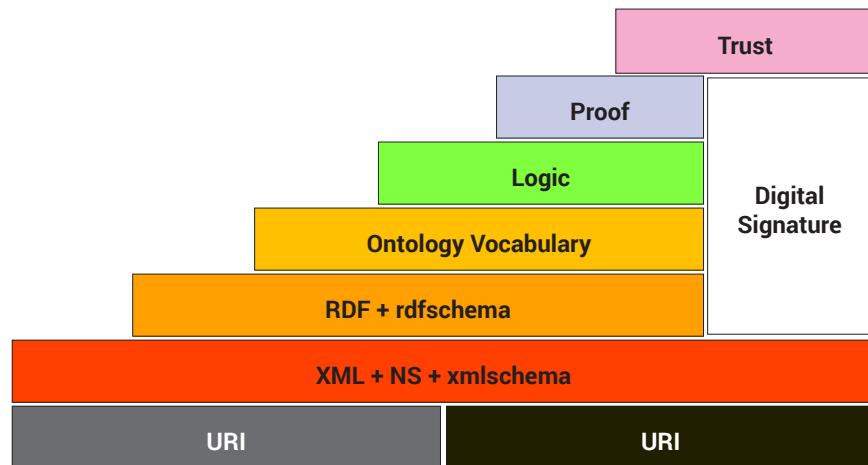


Fig. 2 : Agents on the Semantic Web

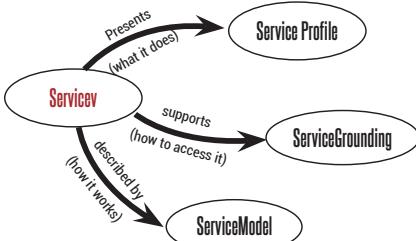


Fig. 5: OWL-S : Semantic Markup for Web services

Related Technologies:

There are two service technologies that are united for data processing in world Wide Web the technologies are software agent technologies and semantic web service.

Software Agent Technologies

The software agent model is a dynamic development in the evolution of software engineering. Self-rule in the software agent So It offers an interoperable gateway to an arbitrary program and/or serves as a human agent operating on its own purpose for certain clients. This agent can be either mobile or stationery.

Stationery agents stay resident on a single platform while mobile agents are able to alter operation on a platform and switch under their own authority to another, where they restart execution for the purpose of fulfilling the user-specified mission. It chooses when and where it will move and may even disrupt its own operation elsewhere on the network by transmitting data and messages in an erratic sporadic fashion.

Mobile agent appliance asynchronous interaction the efficiency of m-commerce transactions and also meets the mobile computing. It delivers fault retrieval mechanisms, overcomes energy limitations, manages disconnection case control.

Semantic Web Services

Semantic web focused on three foundations. The first component helps the textual mark-up knowledge by presenting it. The second foundation will build intelligent s/w agents to scan and process web pages labelled semantically. Thirdly, cognitive ontology-the mechanism of site content and s/w agents will adhere to a collectively understood interpretation of items, generally called ontology, in order to render the contents clear for machines as well.

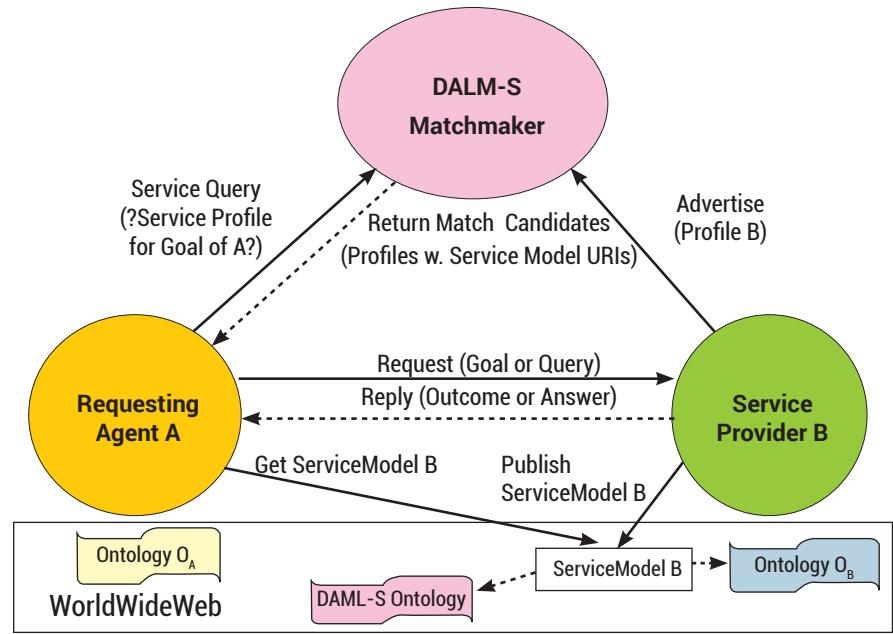


Fig. 4 : Basic DAML-S Semantic Web Service

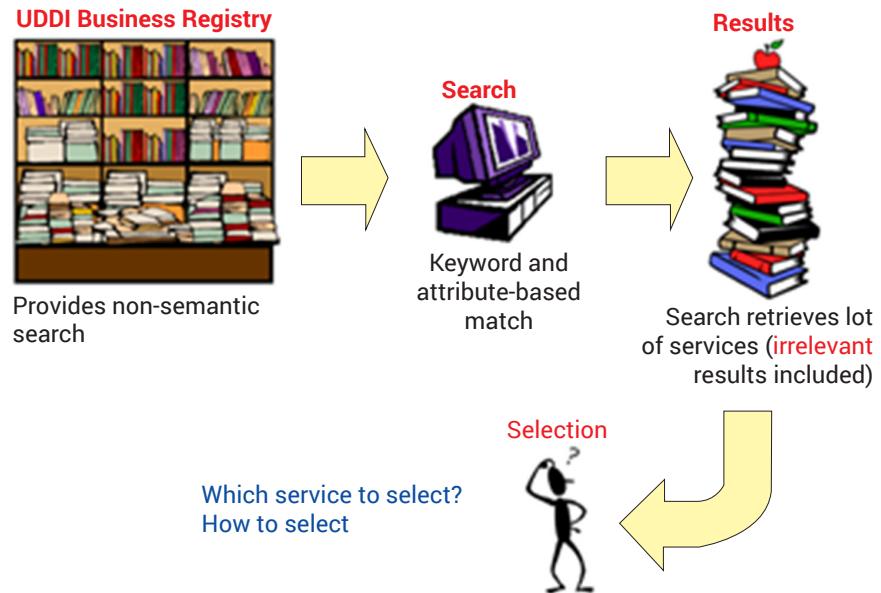


Fig. 6 : Semantic Web service Discovery

- They support ontology as underlying data models to allow machine-based data
- Analysis and identify semiconductor technologies for web site use process Automation. Semantic web services strive to include structured definitions of requirements and web resources that can be used to simplify many processes throughout the implementation cycle of web services, including dynamic service discovery.
- **Semantic web service discovery**
There are a lot of web services that are available on the web. The semantic web helps us find the right match by discovering the web according to our needs.
- **Applications for pharma and life science:**
Life science and pharma organizations contain a lots of data that comes from various sources like biomedical, patents, clinical trial reports, health care records etc. they have highly wide sense of internal and external information flow. In such cases the

semantic web helps in maintaining licensing and also helps maintain intellectual property risks.

- Integration of tourism information system:**

The development of open specifications messages based on Extensible Markup Language (XML), to ensure the interoperability between trading partners and working groups is not sufficiently expressive to guarantee an automatic exchange and processing of information to develop dynamic applications. Hence a more appropriate solution can be given with the help of semantics and ontologies.

- Publishing and media:**

Digital media and publishing gives a huge platform for information providers to bring new contents to users and for expanding their business. In this case, finding new and effective ways to compete is really essential in media and publishing industry. In such cases, semantic web helps in enriching contents and enhances the ability to discover.

- Applications for oil & gas sector:**

The oil and natural gas mining is a heavy industry that consists of a huge amount of data. in the oil and gas sector, ever step, from discover to production is highly data intensive. In such cases semantic web helps in combining and analysing data in order to understand and predict events.

Future Scope:

Like the world wide web, the semantic web also does not belong to any organization

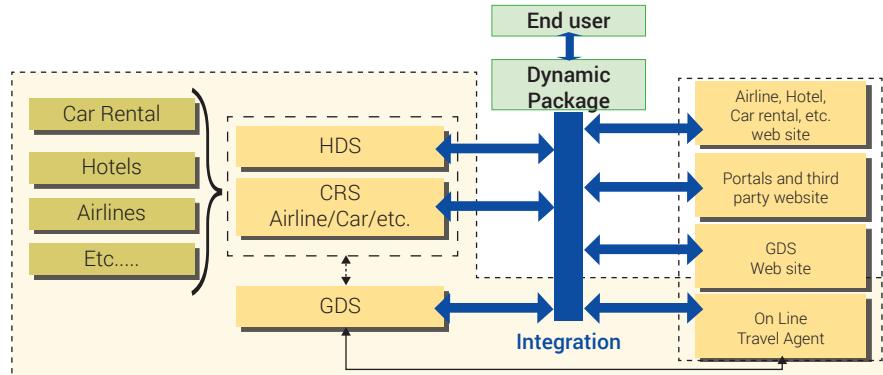


Fig. 7 : Tourism information system

or enterprise, i.e. it is decentralized. In future the semantic web and W3C will use sophisticated applications manipulate the data web. A distributed file system is changed to a distributed database by the data web.

Conclusion:

The semantic web is still being developed and further may be used in many fields and industries in the near future. It may evolve further before it is recognized as a valuable asset by enterprises and other organizations. The searches on the web today are based on word by word matching which is not the best strategy always. In future, semantic web will multiply this versatility a thousand fold. The implementation of semantic stack along with refinement of ontology techniques is still to be done. The possibilities are endless and it is probably to

be achieved in near future.

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Semantic web empowered software testing in both industry and the scholarly community

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"Errors are more common, more pervasive, and more troublesome in software than with other technologies."

— David Parnas

Introduction

Validation and verifications are the leading activity of software testing. This enables different quality tests for providing better software products. The software products are highly validated and verified to provide a better-quality assurance in the market [1]. Advances in innovation and the development increase the complexity and acute type of applications need test strategies, to accomplish high caliber and solid software products. The software products are engaged with different testing methods. But software testing is normally performed under tight asset and time requirements, and subsequently, analysts are consistently looking to grow new ways to face this issue. In the software development cycle, each level is applied to the principles of knowledge management. Software testing is a sub-domain of software engineering and it provides support to convert the testing into automation with the help of testing knowledge. Knowledge management provides different testing knowledge and support for the testing community [2]. The integration of software testing and knowledge management helps to debug the failures easily.

Modern approach

Due to advancements in technology, a new approach is established by using semantic web technology. This new approach Semantic web data model is used for joining software testing with knowledge management and act as a good applicant for automation test improvement. This method has rationale-based nature, induction capacity and machine understandability, also an acceptable contender for giving this formalism and improving test robotization [3]. Semantic web technologies are additionally supporting other software

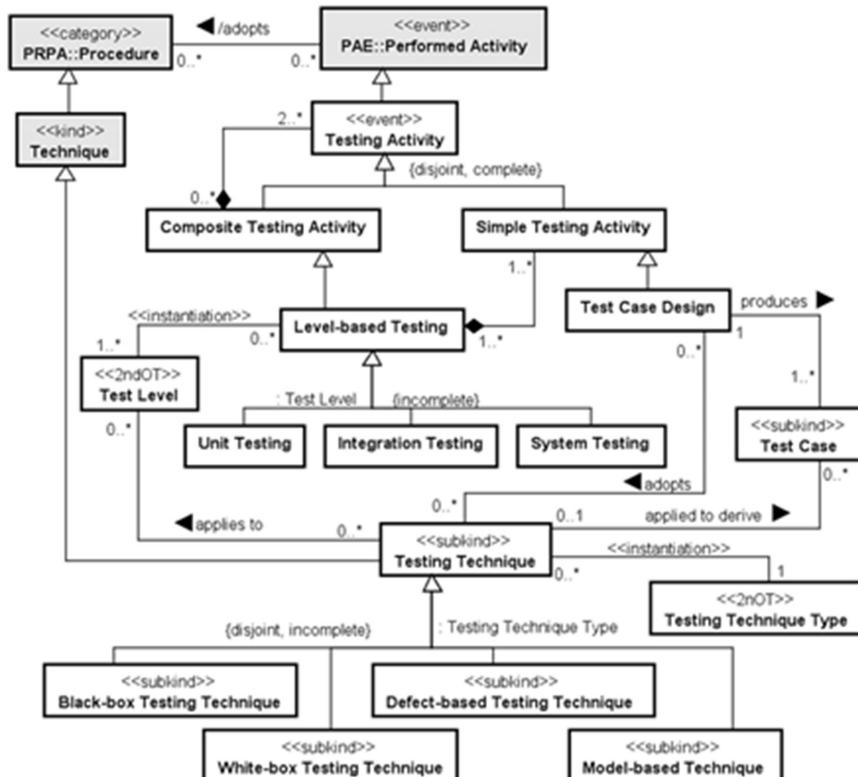


Fig. 1 : Sub-ontology of ROoST's Testing Techniques [4]

testing exercises, e.g., source of test data, test database and test reprocess. The major benefit is providing a distinct knowledge from the domain logic associated with an application domain. Many different types of investigations are made to identify the support of semantic web technologies for software testing methods. There are two types of requirements functional and non-functional requirements. The challenges faced by the semantic web are to support both the requirements, coding languages and

methods that have been utilized in creating knowledge for software testing.

Principle behind Semantic Web

The term semantic web speaks to both semantic web innovations as a stack of innovations for information portrayal and preparation [4]. The Semantic Web as a huge vault of machine-processable datasets are distributed and dependent on those innovations. The architecture used by the semantic web is layered architecture and each layer uses its abilities [5]. The layered

architecture is also represented as layered semantic web cake and semantic web stack. The W3C has standardized the layers and it is mostly used as middle layers for developing semantic web applications.

The semantic web technology consists of ontologies which are present at the center and provides domain knowledge to the real world. Gruber [7] characterizes an ontology as an express detail of a conceptualization, where a conceptualization outlines a unique, improved image of the world utilized for portrayal and assignment. Figure 1 shows the sub-ontology of ROoST's Testing method [6]. The figure shows the UML diagram relating the class relationships with various testing methods. Ontologies and semantic reasoners can give a superior portrayal design and improving examination and handling of information or data. The further extension of hypertext is the semantic web. Semantic Web technologies have been researched in numerous controls, where data reuse and incorporation guarantee a good promising method. The knowledge management layer consists of six layers. They are

Conclusion

The semantic web is more beneficial for the software testing community. The knowledge-based software testing provides better automation and data can be undergone into different layers testing to increase the accuracy. The future work can be concentrated based on the semantic

Table 1: List of different knowledge management layers

S. No.	Layers	Functions
1.	Ontology layer	Data model of the semantic web supports the integration of software testing and knowledge.
2.	Reasoning layer	The recent data model values from the existing system to feed the knowledge base.
3.	Sharing layer	The competency testing level is shared between the project manager and testing specialist.
4.	Enrichment layer	It helps the knowledge domain to search and retrieve data for testing specialist.
5.	Retrieval layer	Retrieving of data at the knowledge domain.
6.	Storage layer	Provides data storage platform in other layers

web-empowered methodologies that have not gotten adequate consideration from the investigations.

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Instigating Tensor flow in Machine Learning for Image recognition

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Machine Learning is the new hot topic on the market. Everyone from the collage freshers to HR managers are scampering about to learn more about this technology. In layman's terms, a machine or software is allowed to learn and improve itself, thorough repeated training with minimum or no human intervention. Although the buzz and hype are pretty recent, mostly due to the advancement in hardware to support its application in usable time, the technology has been around for a long time. The first crude application of Machine Learning was in 1963 when Donald Michie created a machine that played tic-tac-toe and got better as it played more games. Soon other researchers started discovering other algorithms and methodologies to improve this system such as the Support Vector Machines, IBM Deep Blue etc. Now it has reached a point where systems such as Facebook's DeepFace can recognise human faces with 97.35% rivalling human performance. Who knows what will happen in the future, maybe we will create a machine that cannot be distinguished from a human, one that will pass the Turing test? But that is still a long way off. Recently due to the tremendous work done in the fields of Artificial Intelligence, Machine Learning, Deep Learning, even a high school student with the basics of Python can start building their own Machine Learning applications. There are many tools available on the market each having their merits and demits, which are left to personal preference of individuals. Google's TensorFlow package is one of the most popular front runners with its massive set of functionalities and an equally impressive support team to back it up. One of the main reasons it gained such acclaim is because it felicitates a simplistic and intuitive way of building applications.

TensorFlow

The prodigy of Google Brains, TensorFlow was first made public in 2015 with the stable release following in 2017. It is a collection of libraries that specializes in large scale numeric computation which is critical of the techniques used in machine learning. Like most machine learning libraries, TensorFlow is open source under the Apache license for open source applications. The core of TensorFlow uses a graph like framework where each node called op node represents an operation and the edges denote the flow of data. Due to the vast support, openness, and flexibility has pushed TensorFlow to be implement in real world applications like image mining, data analysis, voice processing, autonomous IoT and much more. Some features of TensorFlow that make it so appealing for machine learning are:

- TensorFlow uses intuitive and easy to learn syntaxes that make the learning curve a lot easier and provide quality of life improvements to long time developers.
- It provides a finer level of control as it is a low-level library. We can create functions, modify services and

micromanage all the aspects of our neural network if we wish to, something we cannot do easily in other libraries.

- Being a lightweight library, we can run its applications in almost any edge device including smartphones and IoT devices such as Raspberry Pi.
- It is designed to be easily scalable and ready for wide scale service. You can use it on datasets of 10 elements and also on datasets with 100,000 elements without any noticeable performance degradation.
- Although strictly speaking TensorFlow is a functional library for mathematical computation, Google provides a wide range of complementary cutting-edge services to facilitate better ease of use and better support for other platforms. These services and features include:
 - i. Tensorflow.js which is a JavaScript library to build deploy and train an existing or a novel model in the browser itself. It provides a slew of APIs which are flexible and highly intuitive to make this process a walk in the park even for non-ML participants.
 - ii. TensorFlow lite is a lightweight solution for mobile and other similar embedded devices. It supports on device learning with the Android ML API while providing low latency and built-in hardware acceleration.
 - iii. TensorFlow Hub for reusing machine learning models and codes previously used. It allows for transfer of model parts and even the 'learning' itself between different machines or models.
 - iv. Tensor Board: A visual representation of the dataflow and node usage inside the machine model. It improves debugging ten folds as a graphic representation gives us a better understanding of the node or edge most likely causing an error.
 - v. Other libraries like Sonnet built on top of TensorFlow make it very versatile and provide usability in a vast number of associated fields.

Currently, the most recent version is TensorFlow 2.0. It was a widely anticipated version that brings a number of greatly admired changes that improves the ease of use and lowers the initial learning curve. Firstly, it supports Eager Execution natively meaning the code can be written and run

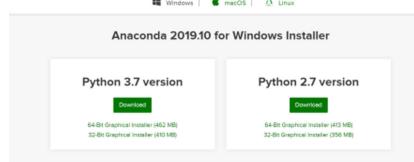
RESEARCH FRONT

like any other Python code. Gone are the days of uncertainty when the entire module would work like a black box without showing its internal workings. Now a simple 'print' command shows all the variables. Next, Keras has been integrated as the go-to high level API inside TensorFlow. Now we can run Keras codes without going thorough the hassle of installing it and writing bridge codes. All Keras functions are natively supported in tf.keras package. A lot of the APIs in TensorFlow 1.x have been unified and simplified. Redundant APIs such as tf.app, tf.flags, and tf.logging have been removed and replaced by simpler Keras alternatives. Codes can now be shared easily and 1.x codes can also be transcribed into 2.0 codes with pre-compiled scripts. Finally, the biggest and most important asset is the backward compatibility with 1.x codes written in version 1.x can be easily run in this version without any major hurdles. This is quite important for developers who do not want to spent hours rewriting their previous codes. Although the old code limits usage to features of version 1.x, it makes the ineludible transition to version 2.0 a lot smoother.

Getting Started:

- To build your very own machine learning model, first you have to install the required software. First go to <https://www.anaconda.com/> or simply google anaconda for python.

Next click on download and you would be redirected to a page showing the different versions that you can download.

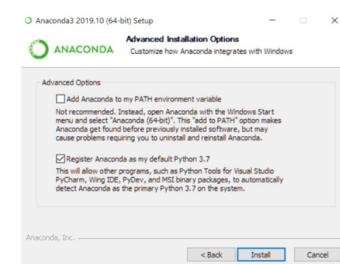
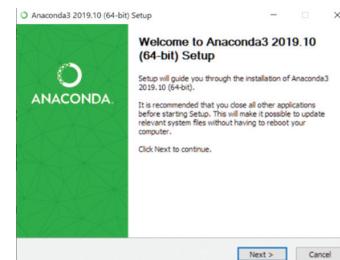


Chose your Operating system and then select the version you wan to install. We will use version 3.7 and recommend you do the same.

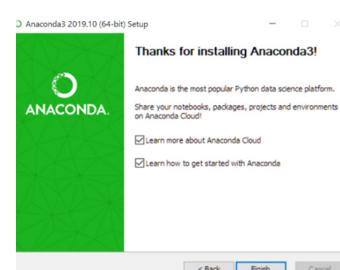
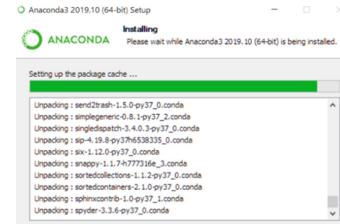
- Once the software has finished downloading, click on it to open it. Once the installer opens click next and agree to the user agreement. Click next

Anaconda3-2019.1....exe

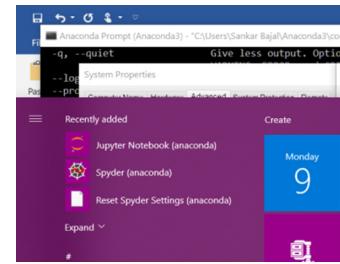
and chose a directory to install,we will let it install in the default directory.



- Select the option to use this version as the default python and click install. Wait till the installation is done, then click finish and you have installed Anaconda.



- You should now see Anaconda shell and Spyder notebook in your windows Start Menu.



- Click on Anaconda and in the window that opens type 'where conda' and

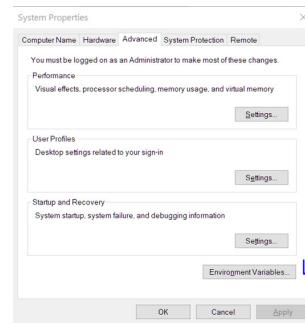
'where python'.

```
(base) C:\Users\Sankar Bajal>where conda
C:\Users\Sankar Bajal\Anaconda3\library\bin\conda.bat
C:\Users\Sankar Bajal\Anaconda3\Scripts\conda.exe
C:\Users\Sankar Bajal\Anaconda3\condabin\conda.bat

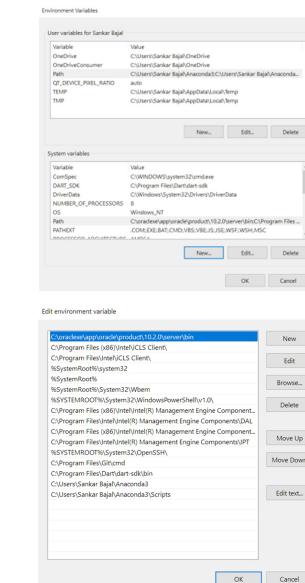
(base) C:\Users\Sankar Bajal>where python
C:\Users\Sankar Bajal\Anaconda3\python.exe
C:\Users\Sankar Bajal\AppData\Local\Programs\Python\Python37-32\python.exe
C:\Users\Sankar Bajal\AppData\Local\Microsoft\WindowsApps\python.exe
```

- If nothing shows, then you have to set the paths manually.

In the start menu type system variables> Click on Edit the Environment



Variables> then select path under system variables select edit and enter the path of the folder where you installed anaconda.



- Now you should be able to use python and its libraries. Repeat step 5 to make sure the path is set correctly.

- Now open Anaconda terminal and type "conda install tensorflow". Wait for it to download the packages and press 'y' to continue. Do the same and install "keras", "matplotlib" and "pandas".

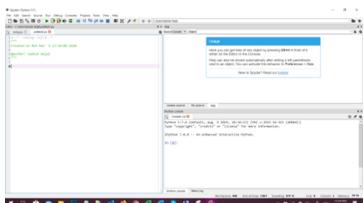
```
[base] C:\Users\Sankar Bajal>conda install tensorflow
Collecting package metadata (current_repodata.json): done
Solving environment: done
```

```
# Package Plan #0
environment location: C:\Users\Sankar Bajaj\android\anaconda
added / updated specs:
  - tensorflow

The following NEW packages will be INSTALLED:
  tensorflow          pkgs/main/win-64::tensorflow-2.3.0-mkl
  abi3-py             pkgs/main/win-64::abi3-py-0.1.0-py37_0
  astroid              pkgs/main/win-64::astroid-2.8.1-py37_0
  blinker              pkgs/main/win-64::blinker-1.4-py37_0
  cachetools            pkgs/main/win-64::cachetools-3.1.1-py_0
  gax                  pkgs/main/win-64::gax-2.2.0-py37_0
  google-auth           pkgs/main/win-64::google-auth-1.11.2-py37_0
  google-auth-oauthlib   pkgs/main/win-64::google-auth-oauthlib-4.1-py37_0
  google-auth-oauthlib-py  pkgs/main/win-64::google-auth-oauthlib-py-0.4.1-py37_0
  google-pasta           pkgs/main/win-64::google-pasta-0.1.6-py37_0
  grpcio                pkgs/main/win-64::grpcio-1.27.2-py37h51948e_0
  keras-applications    pkgs/main/win-64::keras-applications-1.0.8-py_0
  keras-preprocessing     pkgs/main/win-64::keras-preprocessing-1.1.2-py37_0
  libcloud               pkgs/main/win-64::libcloud-2019.0.5-py37_0
  libprotobuf             pkgs/main/win-64::libprotobuf-3.11.4-hbd57fa_0
  markdown               pkgs/main/win-64::markdown-3.1.1-py37_0
  oauthlib                pkgs/main/win-64::oauthlib-1.1.0-py_0
  opt_einsum              pkgs/main/win-64::opt_einsum-3.1.0-py_0
  protobuf                pkgs/main/win-64::protobuf-3.1.0-py37h51948e_0
  pyasn1                 pkgs/main/win-64::pyasn1-0.4.8-py37_0
  pyasn1-modules         pkgs/main/win-64::pyasn1-modules-0.2.7-py37_0
  pygments               pkgs/main/win-64::pygments-2.7.1-py37_0
  requests-oauthlib      pkgs/main/win-64::requests-oauthlib-1.3.0-py37_0
  rsa                    pkgs/main/win-64::rsa-4.6-py37_0
  tensorflow             pkgs/main/win-64::tensorflow-2.3.0-py37h977152_0
  tensorflow-base        pkgs/main/win-64::tensorflow-base-2.3.0-py37h230818c_0
  tensorflow-estimator   pkgs/main/win-64::tensorflow-estimator-2.3.0-py37h54b68b_0
  tensorflow-metadata    pkgs/main/win-64::tensorflow-metadata-1.1.0-py37_0

Proceed ([y]/n)?
```

- 9) Now open spyder notebook.



The section on the left is where you type your code. The terminal on the bottom right gives the output. The codes are written in python which is used for most ML projects. If you do not know python, you can look up introductory videos online. It is pretty intuitive and the easiest language in today's market that you can learn. We will run a code to train our model to recognize ASL hand gestures.

- 10) Most ML codes are run in cells which are a block of code that will execute similar tasks.

```
Editor - C:\Users\Sankar Bajaj\spyder.py\temp.py
temp.py ① untested.py ②
import numpy as np
from matplotlib import pyplot as plt
from tensorflow import keras
[s]

[train_data = pd.read_csv('sign_mnist_train.csv'),
 test_data = pd.read_csv('sign_mnist_test.csv')]
13
14 labels = train_data['label'].values
15
16 unique_val = np.array(labels)
17 np.unique(unique_val)
18
19 train_data.drop('label', axis = 1, inplace = True)
```

Select a section of the code and press ctrl+Enter to run the segment . The corresponding output will be displayed on the terminal.

In [3]:

```
In [3]: import numpy as np
...: import pandas as pd
...: from matplotlib import pyplot as plt
...: from tensorflow import keras
```

In [4]:

- 11) Now we import the pictures that we will use to train the model . These pictures would be analysed and converted into matrices or tables with each element

holding the value of a pixel at a position. For the simplicity of this model ,we have taken a dataset that is already processed in a .csv form.

```
train_data = pd.read_csv ('sign_mnist_train.csv')
```

```
test_data = pd.read_csv ('sign_mnist_test.csv')
```

These two lines will import the dataset and store them objects train_data and test_data. We train our model on the training set and test it on the test set.

```
labels = train_data['label'].values
```

```
unique_val = np.array (labels)
```

```
np.unique(unique_val)
```

This piece of code assigns a unique label to all the elements.

```
images = train_data.values
```

```
images = np.array([np.reshape(i, (28, 28)) for i in images])
```

```
images = np.array([i.flatten() for i in images])
```

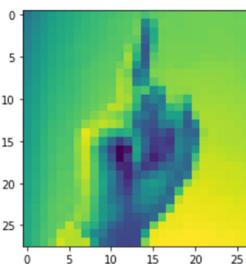
This change the images into a grid of 28 by 28 pixel each having a different value based on the colour and illumination.

```
13) from sklearn.preprocessing
    import LabelBinarizer
    label_binarizer = LabelBinarizer()
    labels = label_binarizer.fit_
    transform(labels)
    labels
```

```
Out[17]:
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 1, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 1, 0]], dtype=int32)
```

It creates an empty matrix and assigns it binary value based on the labels from the images.

```
plt.imshow(images[0].reshape(28,28))
```



It shows the image formed after the normalization and processing is done. All images are converted in this form so that the

machine can read the values from the matrix.

batch_size = 128

num_classes = 24

epochs = 50

We define the parameters batch size , number of classes and the number of times it will be trained(epoches). These value are changed to get high level of accuracy in other models. Generally 50 is a good number of epoches, the larger the number the better the machine should be at predictiting results.

```
14) from keras.layers import Dense,
    Conv2D, MaxPooling2D, Flatten,
    Dropout, BatchNormalization
    from keras.models import Sequential
    plt.imshow(images[0].reshape(28,28))
    model = Sequential()
    model.add(Conv2D(64, kernel_size=(3,3), activation = 'relu', input_shape=(28, 28, 1)))
    model.add(MaxPooling2D(pool_size = (2, 2)))
```

```
model.add(Conv2D(64, kernel_size = (3, 3), activation = 'relu'))
model.add(MaxPooling2D(pool_size = (2, 2)))
```

```
model.add(Conv2D(64, kernel_size = (3, 3), activation = 'relu'))
model.add(MaxPooling2D(pool_size = (2, 2)))
```

```
model.add(Flatten())
model.add(Dense(128, activation = 'relu'))
model.add(Dropout(0.20))
```

```
model.add(Dense(num_classes, activation = 'softmax'))
model.compile(loss = keras.losses.categorical_crossentropy,
optimizer=keras.optimizers.Adam(),
metrics=['accuracy'])
```

This code is the main driving force behind training our model. Instead of creating a neural network from scratch, we use the functions of the tf.keras library to built a model from pre existing templates and train it according to our needs. Here we are setting the size of images, the type of optimization to be used, parametrts for flatening the image and feeding it to the neural network.

```
images = images/255
images = images.reshape(images.shape[0], 28, 28, 1)
```

```
history = model.fit(images, labels,
epochs=epochs, batch_size=batch_size)
```

RESEARCH FRONT |

At this point the model is trained , now it should be able to take data which are image data in our case and predict the sign.

- 15) Before we feed the test data to this model we have to process it so that the machine can understand it. This process is the same as in the case of our training data, only we use a different dataset that we kept aside for training.

```
test_label = test_data['label']
test_data.drop('label', axis = 1, inplace = True)

test_images = test_data.values
test_images = np.array([np.reshape(i, (28, 28)) for i in test_images])
test_images = np.array([i.flatten() for i in test_images])

test_labels = label_binrizer.fit_transform(test_label)

test_images = test_images.reshape(test_images.shape[0], 28, 28, 1)

test_images.shape

y_pred = model.predict(test_images)

from sklearn.metrics import accuracy_
score

accuracy_score(test_labels, y_pred.
round())
```

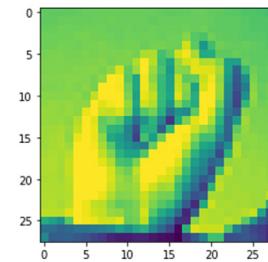
- 16) We now define the class so that the images have corresponding alphabets that they represent. We can skip this step if we are dealing with objects that everyone knows like apples and oranges.

You can use any value.
n = 2421
plt.imshow(test_images[n].
reshape(28,28))

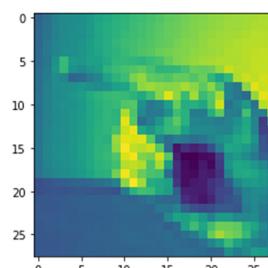
```
print("prediction : "+class_names[np.
argmax(y_pred[n])])
print("Actual: "+class_names[np.
argmax(test_labels[n])])
```

Finally we test an image manually. N is the index of the image in the dataset. Plt.show() shows the image and the next two lines print what the image actually is and what the machine thought it to be. You can change the value of N and run this cell to try.

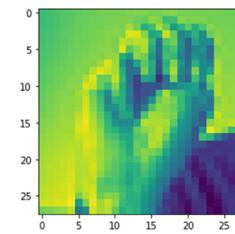
```
In [18]: n = 287
...: plt.imshow(test_images[n].reshape(28,28))
...: print("prediction :
"+class_names[np.argmax(y_pred[n])])
...: print("Actual:
"+class_names[np.argmax(test_labels[n])])
prediction : R
Actual: R
```



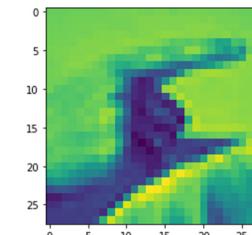
```
In [19]: n = 1546
...: plt.imshow(test_images[n].reshape(28,28))
...: print("prediction :
"+class_names[np.argmax(y_pred[n])])
...: print("Actual:
"+class_names[np.argmax(test_labels[n])])
prediction : O
Actual: O
```



```
In [20]: n = 5462
...: plt.imshow(test_images[n].reshape(28,28))
...: print("prediction :
"+class_names[np.argmax(y_pred[n])])
...: print("Actual:
"+class_names[np.argmax(test_labels[n])])
prediction : L
Actual: L
```



```
In [21]: n = 3967
...: plt.imshow(test_images[n].reshape(28,28))
...: print("prediction :
"+class_names[np.argmax(y_pred[n])])
...: print("Actual:
"+class_names[np.argmax(test_labels[n])])
prediction : G
Actual: G
```



Figures:

- Fig 1 : Homepage of Python
- Fig 2 : Downloaded file
- Fig 3, 4,5,6: Installing Python
- Fig 7: Launch Spyder in Taskbar
- Fig 8: Checking paths
- Fig 9,10,11 : Manually setting path if needed
- Fig 12: Success
- Fig 13: Installing Dependencies
- Fig 14: Default view of Spyder notebook
- Fig 15: writing our code
- Fig 16: Import libraries
- Fig 17: Matrix output
- Fig 18: Normalized image
- Fig 19-26: Running any value of n and their corresponding outputs.

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Content resemblance based text categorization system using Unordered Fuzzy Rule induction

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The advent of technology has helped people from almost every section of society in numerous ways. Students have benefited largely from the technological advancements as well. Huge volumes of easily accessible information are now available over the Internet for the students' aid in their studies. Such information in different non-Indic languages like English is present in a highly organized manner but the case is not so for Bangla which is the 6th most spoken language in the world. There are a huge number of students who look for study materials in Bangla over the Internet. This demand for a system which can automatically categorize such study materials in Bangla based on subjects. SubDif (Subject Differentiator) is a system aimed towards the task of categorizing Bangla texts based on the subject. The system has been initially tested with 38,42,913 tokens from two main streams namely literature and science and the highest accuracy of 98.48% has been obtained based on content-resemblance feature using FURIA machine learning approach. Experimental results reported that FURIA notably outperformed the standard RIPPER classifier as well as other rule-based classifiers concerning the classification accuracy.

Keywords: Text categorization, Content-resemblance, FURIA.

I. Introduction

In our day to day evolving digital world, retrieving useful information from the digital texts which can prove to be fruitful for several users, it is necessary to process and categorize the random text data into their respective text categories based on their contents. The text categorization problem is a challenging task which becomes more strenuous for the resource-poor language such as Indian languages especially Bangla. Manual categorization of text documents is suitable while dealing with fewer texts but it demands more time and effort and is also unattainable when it comes to dealing with a large number of text documents. Thus automatic text document categorization that involves techniques based on certain algorithms is one of the possibilities of coping up with such kinds of difficulties which reduces human involvement as well as enhances the performance of the system. But in information science is better due to the huge amount of documents available. Text categorization or text classification is the task of assigning any text document to its respective text categories. The main aim of this proposed work is to present an algorithm that can be used in solving the various information retrieval and other

natural language processing problems for Bangla language.

Bangla is the 6th most popular language in the whole world with approximately having 243 million first-language speakers and the 3rd most spoken language in India and also it is the official language of Bangladesh and the regional language of West Bengal, India [7]. This demands a system that may help the users effectively using IT being non-proficient in western languages. Thus the paper aims to present the content-resemblance based text categorization system using unordered fuzzy rule induction (FURIA) for Bangla texts covering pre-defined domains such as literature and science. The present experiment was performed on a total of 38,42,913 tokens and obtained an accuracy of 98.48% based on a certain number of words from a text document. These results proved the effectiveness of the system in classifying Bangla texts into their respective text domains based on the volume of the texts as well. The proposed research model can be efficiently used for the implementation of the directory search, organization of documents and other various information retrieval applications.

In the remaining part of the paper,

literature review is presented in Section II followed by Section III illustrating the proposed methodology for the present work; Section IV, provides the results and analysis followed by Section V concluding the paper demonstrating the future directions in this field.

II. Related work

Several works have been performed by researchers in various languages such as English, Japanese, Chinese, Arabic but very few researches have been carried out in resource less Indian languages especially in Bangla language. For instance, Lin [9] evaluated the cost of the energy for various classification algorithms and tried to decrease the cost by parallelization to inspect which algorithm's performance is better in terms of efficiency and effectiveness. Experimental results show that the modified version of Naive Bayes (NB) had better performance in comparison with Support Vector Machine (SVM) while having a lower cost of energy which is again reduced by a factor of 10 using parallelization for RCV1 database. Jin et al. [6] introduced a Chinese text classification system based on particle swarm optimization problem. They carried

out their experiments on 2,816 documents and obtained an accuracy of 93.99% using SVM for 10 fold cross-validation. Bekes [1] experimented with a few recent techniques for categorizing Japanese text documents within the architecture of the functional properties of Halliday's system. The model adopted in their work depends on the nature of the evidence of the sentences represented by evidential adverbs and thorough modality. Marie-Sainte [11] proposed a categorization technique based on the firefly algorithm for Arabic text categorization and obtained a precision value of 0.994 using the SVM learning algorithm.

Gupta and Gupta [3] introduced a hybrid scheme by merging NB and ontology-based classification algorithm for Punjabi text categorization. Their experiment was performed on 184 Punjabi documents from 7 sub-classes of sports category and it was observed from the experimental outcome that the hybrid scheme outperformed other traditional classifiers. Swamy and Hanumanthappa [14] followed Zipf's law, vector space model and TF-IDF for extracting features from 100 documents each from Tamil, Telugu, and Kannada and applied DT, KNN and NB classifiers for classifying those documents. Patil and Bogiri [12] implemented the Label Induction Grouping model on the user's profile. The performance was tested on 200 text documents from 20 classes. In the work of Rakholia and Saini [13], the NB classifier was implemented on 280 Gujarati text documents from 6 categories and reported an accuracy of 88.96% and 75.74% with and without feature selection respectively. Despite having several shortcomings, some efforts have been made for the development of the Bangla text categorization system. Islam et al. [5] obtained an accuracy of 92.57% on text documents from 12 categories based on TF-IDF and SVM respectively. Alam and Islam [10] applied textual features for categorizing 3,76,226 documents and reported the precision of 0.96 based on the neural network classification model.

III. Proposed methodology

The working methodology is diagrammatically demonstrated in Figure 1 that involves data collection from various online sources followed by pre-processing of texts. Then content-resemblance feature is used to train the fuzzy rule-based classifier in order to determine the text categories of

the given text documents.

A. Data Collection

Since there is an unavailability of domain-wise Bangla database consisting of a sufficient amount of text documents from every domain being considered and thus we had to develop our database that incorporates real-world characteristics and disparity required to generate a robust system. The experiment involves the classification of text documents from two different subjects, that is, literature (l) and science (s) and the documents from these two domains have been extracted from various online news corpus, magazines, and webpages. We have extracted a total of 4,691 text documents distributed as 2,303 documents from the literature domain and 2,388 documents from the science domain. The sources from which texts were extracted are provided in [8].

B. Pre-processing

Digital texts are comprised of series of characters, terms, and phrases which are required to be segmented for further processing into tokens depending on 'space' delimiter and the process is called 'tokenization'. After segmenting the sentences, the total terms counts to be **38,42,913**. However, all the token are not essential to be retained in the feature vector and thus were treated as stopwords [15] and eliminated in order to clean and filter the dataset. The total terms counts to be **30,41,259** after the stopwords removal task.

C. Feature Extraction

We proposed a 'content-resemblance' feature that measures the closeness of the contents between two texts. In some scenarios, it has been noted that the texts belonging to two different categories have similarities in their contents leading to the misclassification of texts. Therefore, an attempt was made for the extraction of relevant features by minimizing the rate of ambiguities in the contents. The 'content-resemblance' feature $\text{Cont_Siml}(p,q)$ are calculated by the following equation.

$$\text{Cont_Siml}(p,q) = \frac{\sum_{i \in T(p|q), j \in T(q|p)} \text{Sft_Cos}(i,j)}{|T(p|q)| * |T(q|p)|} \quad (1)$$

Here, $T(p|q)$ represents the contents of text p but not of text q, $T(q|p)$ represents the contents of text q but not of text p and $\text{Sft_Cos}(i,j)$ is the closeness between the contents of two articles measured using

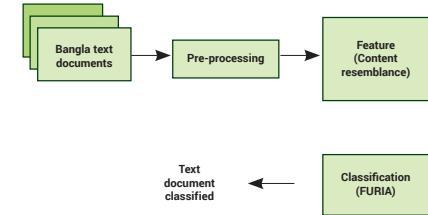


Fig. 1 : Outline of the methodology

soft cosine. Soft cosine has been used to calculate the closeness of features between two vectors which is an advantage over traditional cosine similarity measure which treats the features as an individual feature. siml_{rs} is the similarity between feature r and s. D denotes the dataset.

$$\text{Sft_Cos}(i,j) = \frac{\sum_{r,s \in D} \text{siml}_{rs} a_r b_s}{\sqrt{\sum_{r,s \in D} \text{siml}_{rs} a_r a_s} \sqrt{\sum_{r,s \in D} \text{siml}_{rs} b_r b_s}}. \quad (2)$$

D. Classification

Classification entails allocating the instances to a specific function based on the problem being defined. Several classification algorithms have been developed over the years to solve the complexities associated with the problems of the real world. Dealing with indefinite and uncertain text data is a familiar issue in text categorization tasks and the fuzzy rule-based classifier can prove to be really useful for managing the problems compared to the crisp rule-based classifier. Hence, FURIA (Fuzzy Unordered Rule Induction Algorithm) has been used for the categorization of the text documents to their specific domains [4]. It is an upgraded version of the standard Repeated Incremental Pruning to Produce Error Reduction (RIPPER) classifier and is capable of dealing with large feature dimensions. Since the crisp rules developed from training set gets biased towards a specific text category thus FURIA is implemented with various modifications on fuzzy rules and its unordered records.

Moreover, it uses the rule stretching techniques while dealing with exposed instances and involves pruning while generating the substitution and adaptation rule. Here, pruning was modified and performed based on the equation below where PR and NR represent the positive and negative samples identified by the rule.

$$\text{pruning} = \frac{PR + NR}{PR + NR + 1}. \quad (3)$$

The purity used for calculating the rate of fuzzification in the present work is given below.

$$purity = \frac{\sum_{i \in S_+^1} F_i(x)}{\sum_{i \in S_+^1} F_i(x) + \sum_{i \in S_-^1} F_i(x)}, \quad (4)$$

IV. Result and Analysis

A. Results

The present experiment was carried out on 6 datasets (D1-D6) with each document having the number of words: 750, 500, 250, 100, 50 and 25. The distribution of text documents for datasets (D1-D6) corresponding to two categories is mentioned in Table I. The experiment was performed depending on some words so that the system is capable of categorizing the documents with contents of short length as well. The feature set for all the datasets (D1-D6) was fed to the FURIA classification algorithm using 5 folds cross-validation for evaluating the task. The result obtained using FURIA, standard rule-based classifiers (RIPPER, PART and Decision Table (DT)) and other commonly used machine learning algorithms (Naive Bayes Multinomial (NBM) and Multi Layer Perceptron (MLP)) is given in Table II where it can be observed that for D5 having 50 word length documents, the accuracy of FURIA is maximum (98.06%) and thus FURIA is further studied on the dataset D5.

Table I : The distribution of text documents for each dataset

Domain	No. of files for each dataset					
	D1	D2	D3	D4	D5	D6
Literature	7111	7436	8903	12297	18089	27301
Science	6210	6528	7115	9224	12728	20994

Table II : Comparison among several classifiers

Dataset	Accuracy (in %) of different classifiers					
	FURIA	RIPPER	PART	DT	NBM	MLP
D1	97.79	96.23	96.18	93.57	97.29	97.50
D2	97.83	96.47	96.22	93.74	97.54	97.58
D3	97.37	96.11	96.15	94.27	96.88	96.56
D4	97.88	96.54	96.38	94.60	97.09	97.33
D5	98.06	96.72	96.66	95.33	97.48	97.44
D6	97.45	96.42	95.89	93.78	95.74	95.90

We had obtained maximum accuracy of 98.06% for dataset D5 using the FURIA classification algorithm depending on the default parameters such as 5 fold cross-validation, amount of data used for pruning to be 3 and action being performed was rule stretching technique. Now the further studies were expanded keeping cross-validation folds being 5, the amount of data used for pruning being 3 while varying the actions performed to deal with uncovered instances. The results have been illustrated in Table III where it can be observed that among all the three actions being performed, the rule stretching technique gives better results. Thus further experiments have been

carried out considering this technique.

Table III : Comparison among several actions used in FURIA

Actions	Accuracy (in %)
Rule stretching	98.06
Vote for most frequent class	97.34
Reject the decision and abstain	96.69

Now the further studies were expanded keeping cross-validation folds being 5, actions performed to deal with uncovered instances being rule stretching while varying the amount of data used for pruning. The results have been provided in the following Table IV where it can be observed that among various folds being studied, for 4 folds, that is, 1 fold for pruning and 3 fold for generating the rules we obtained maximum accuracy. Thus further experiments have been carried out considering this number of folds. It can also be seen that in this scenario of 1:3, 23 rules have been generated which is minimum among all the folds.

Table IV : Outcome of various folds for pruning and generating rules

No. of folds; 1 for pruning, rest for generating rules	Accuracy (%)	No. of rules
2	98.11	25
3	98.08	24
4	98.29	23
5	98.08	25

We have also experimented for the different number of cross-validation folds keeping actions performed to deal with uncovered instances being rule stretching and the amount of data used for pruning being 4. The results obtained for various folds have been given in Table V where it can be observed that for 7-folds cross-validation we get maximum accuracy of 98.48%.

Table V : Performance of FURIA for different cross-validation folds

Folds	3	4	5	6
Accuracy (%)	97.69	98.17	98.29	98.33
Folds	7	8	9	10
Accuracy (%)	98.48	98.37	98.37	98.21

The confusion matrix obtained on the dataset D5 using FURIA classification algorithm based on 7 cross-validation folds, techniques used while dealing with uncovered instances was rule stretching and the amount of data used for pruning being 4 is illustrated in Table VI.

Table VI : Confusion matrix obtained on D5 for 7-folds cross-validation

	Literature	Science
Literature	17814	275
Science	193	12535

A. Statistical Significance Test

The Friedman test [2] was performed for a statistical significance test. The value of k (classifiers) and N (datasets) were considered to be 6 and 5 respectively. The test was performed using dataset D5 for which we have obtained maximum accuracy. The classifiers were ranked based on their accuracies. The accuracies and the ranks for the classifiers are provided in Table VII. The statistics of this test obtained using equation 5 is 22.1429 for degree of freedom (df), a and p-value being 5, 0.05 and 0.000492.

$$\chi_F^2 = \frac{12N}{k(k+1)} \left[\sum_j R_j^2 - \frac{k(k+1)^2}{4} \right]. \quad (5)$$

The result shows FURIA surpasses all other learning models by achieving mean rank 1.0 and the lowest rank (6.0) was obtained by the DT classifier.

B. Comparison with Existing Methods

The performance of our system is compared in terms of robustness and accuracy, by implementing the available systems in Bangla was also applied to our dataset D5. The same frameworks as mentioned in [5], [10] have been used in our experiment and the results for all the approaches are demonstrated in Table VIII.

Table VIII: Comparison with previous works

	Feature	Classifier	Result
Islam et al. [5]	tf.idf	SVM	96.65
Alam and Islam [10]	tf.idf	Logistic Regression	96.81
Our method	content-resemblance	FURIA	98.48

V. Conclusion

This paper proposed a content-resemblance feature used to train FURIA learning model for categorization of Bangla text documents from literature and science that may help the students in retrieving information regarding two major subjects. The system is capable of categorizing the documents with an accuracy of 98.48%. The system's performance was also compared with the existing works in literature. Our plans encompass the use of other classification techniques such as deep learning and various feature selection techniques as well. Also, we plan to experiment with a larger dataset consisting of more text categories.

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Table VII : Accuracies and ranks for the classifiers

Classifiers		Parts of the Dataset					Mean Rank
		#1	#2	#3	#4	#5	
FURIA	A	98.44	98.72	98.43	98.54	98.27	1.0
	R	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	
RIPPER	A	97.72	97.77	97.08	97.41	97.77	2.4
	R	(2.0)	(2.0)	(4.0)	(2.0)	(2.0)	
PART	A	97.44	97.27	97.89	96.91	97.40	3.6
	R	(4.0)	(5.0)	(2.0)	(4.0)	(3.0)	
DT	A	95.42	95.65	93.44	94.19	94.73	6.0
	R	(6.0)	(6.0)	(6.0)	(6.0)	(6.0)	
NBM	A	97.11	97.37	96.57	96.82	96.73	4.8
	R	(5.0)	(4.0)	(5.0)	(5.0)	(5.0)	
MLP	A	97.69	97.72	97.21	97.02	97.34	3.2
	R	(3.0)	(3.0)	(3.0)	(3.0)	(4.0)	

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The Dining Table and cutlery have Artificial Intelligence

IoT captures signals and data about nutrients in the food

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In the recent past, there is a lot of hype about Artificial Intelligence. Everyone has started talking about AI. Every country, every organization, every business and every industry claims to transform itself and wants to provide solutions based on AI.

Artificial Intelligence is a field of study in the direction of creating a machine as capable as human beings. The machine must be as capable as you. We want a machine that does everything a human being does. That is the direction in which Artificial Intelligence is moving. In order to make artificial intelligence work we need sensors to convert real world scenario into data. This is where Internet of Things play a major role.

Human beings are capable of doing a few simple tangible physical activities with the organs he possesses such as SEE (eyes), HEAR (ears), SMELL (nose), ACT (hands, legs, etc.), SPEAK (mouth). In addition to these tangible physical activities, humans have the higher-level capabilities (usually called cognitive) capabilities such as remember, understand, apply what we have understood into another scenario, analyze, evaluate and create entirely a new concept / application. Broadly we can divide them into Physical and Cognitive. Also, every physical skill is effectively utilized by humans only with the help of cognitive skills. Physical skills alone are of very limited use for the humans. For example, as you see with your eyes, you remember the scenario that you see, you recognize what it is with your understanding. You remember your historical scenarios and you could compare what you see here with the historical scenarios and analyze, evaluate the scenario and even use it for creating this into a story with your perception added. Same set of cognitive skills are utilized for

Cognitive	Create				
	Evaluate				
	Analyze				
	Apply				
	Understand / Recognize				
	Remember				
Physical	SEE	HEAR	SMELL	ACT	SPEAK
				 	

Fig. 1 : Human Capabilities – Physical and Cognitive





Fig. 2 : Tools to make food (Agriculture)

what we hear, what we smell, act or speak.

Human beings were using their hands, legs, eyes, mouth, nose etc. to effectively earn their food, clothes and a safe shelter. In the early part of the history, tools made of stones and metals helped in hunting and farming. However, over a period of time humans invented tools that mimic the capability of his hands, legs, eyes, mouth etc. but has a higher efficiency in terms of speed and productivity.

Let us see how the inventions happened in each of human capabilities mentioned above.

1. Human Capability to SEE (Eyes)

Humans have the capability of seeing. First human beings wanted to have a tool that can capture what they see and store them to recall later. Inventions in the field of photography began the support for see and remember. Research in the field of Computer vision such as Image processing, Image recognition, Face Identification, Face Recognition helps human beings in the field of medical diagnostics, security, banking, government and several other areas.

2. Human Capability to HEAR (Ear)

Hearing the sound and understanding the weather was a capability which helped humans from early days. This also helped him to hide in safe places when he heard dangerous animals. Inventions in the hearing started with microphones and telephones. Today Amazon Alexa, Google Home and Microsoft Cortana are the examples of growth in the technology of Speech Recognition. The growth of these

technologies coupled with their variants for every language and culture has opened the doors for enormous volume of innovative solution makers.

3. Human Capability to SMELL (Nose)

In the early days, with the smell, human

beings were able to identify locations where fruits are ripe for collection, recognize the presence of animals and birds and so on. Today with Computer Technology, we have odor sensors helping the humans in the field of security, medical diagnosis, production surveillance and many more.

4. Human Capability to SPEAK (Mouth)

When human beings learned to live as a group and society, communication gained importance. That is how the concept of a language came in. Communication through SPEECH became a science. This brought the concept of Telephone, Storing songs in a media, and today we have the speech recognition technology used in Voice based systems such as Alexa, Siri, Google Homes etc.

5. Human Capability to ACT (Hands and Legs)

Hands and legs are great assets of human life. Several technologies and tools have been developed in the early history for hunting and agriculture.

Lever and wheels are simple tools

Human Eyes SEE		
Domain	Technology	Applications
Photography	Image Recognition	Security
Smart Phone	Face Recognition	Medical Diagnosis
Videography	Medical Image Recognition Satellite Image Recognition Biometrics (Retina, Thumb impression, etc.)	Government Immigration Control

Human Nose recognizes SMELL		
Domain	Technology	Applications
Odor Recognition Pollution Management	Odor Recognition	Odor Recognition sensors in Smart Cities where the system recognizes bad smell and sends message to civic authorities automatically. Used in Chemical Factories for safety.

Human Mouth Speaks		
Domain	Technology	Applications
Radio	Speech Recognition	Security
Television	Natural Language Processing	Government Immigration
Music / Media	Natural Language Generation	Voice based systems such as Alexa, Siri, Google Homes etc.
Knowledge Management	Machine Translation	

Instrument type	Instrument
Mechanical Instruments	<ul style="list-style-type: none"> ▪ Bicycle ▪ Bullock cart ▪ Cycle-Rickshaw
Electrical Instrument	<ul style="list-style-type: none"> ▪ Electrical Iron box ▪ Electric stove ▪ Electric water heater ▪ Electric bulb ▪ Electric motor ▪ Fan ▪ Electric washing machine
Automobiles	<ul style="list-style-type: none"> ▪ Lorry ▪ Car ▪ Bus ▪ Scooter ▪ Motor Bike ▪ Auto – Rickshaw
Electronic Instruments	<ul style="list-style-type: none"> ▪ Electronic calculator ▪ Electronic digital watch ▪ Electronic telephone diary (Digital organizer) ▪ Television ▪ VCD Player

After the invention of computers these instruments are controlled by computerized controllers.

Human Hands and legs work		
Domain	Technology	Applications
Mechanical Engineering		Industry 3.0
Electrical		Industry 4.0
Electronics		Robotic Process Automation
Automobile		Autonomous Cars
Aeronautics		Artificial Intelligence based Robots

to enhance the efficiency. Bicycle is a mechanical instrument built with these tools to travel easily. After the invention of electricity and motor, several Electrical instruments and Automobile instruments have made the life easy and comfortable. The growth in the electronic industry has given birth to electronic calculator, electronic watch and television.

So far, we have seen how the Artificial Intelligence technologies are evolving in the human history. We have seen that AI based systems are the best tool man has invented so far and improving rapidly with new avatars such as Social Media, Mobility, Analytics, Cloud and more technologies.

Applying Artificial Intelligence in Health Industry

In the healthcare industry, proactive health monitoring refers to the tracking and analysis of an individual's medical records,

physical activities, food habits, quality and quantity of water intake, and many more variables. Internet of Things (IoT) has come out with innovative wearable devices that can capture signals and data from the activities of individuals, load this data into the cloud, and process it to support proactive healthcare monitoring.

Food for thought – AI for a better diet

When you sit at the dinner table and start eating, wouldn't it be great to have a system that can automatically sense the content of food on your plate, recognize elements such as vitamins, fats, fibres, potassium, calcium, iron etc., and then compare these with your intake over the past 30, 60 or 90 days? What if this system could integrate this data with your medical record and prescriptions, and provide you a summary chart together with warnings and comments in an easy-to-read dashboard? Also, what if the system could

measure and analyse your speed of eating and advise you on the benefits of eating at a slower pace?

So far, we have seen how the Artificial Intelligence technologies are evolving in the human history. We have seen that AI based systems are the best tool man has invented so far and improving rapidly with new avatars such as Social Media, Mobility, Analytics, Cloud and more technologies.



Fig. 3 : Smart Plate

From smartphone to "smartplate"

At a recent industry event in Las Vegas, I saw this exact system right before my eyes during a demonstration of a smartplate by a company, Indiegogo. It's a plate made up of three compartments with a sensor at the bottom that's connected to the cloud. After downloading Indiegogo's mobile application on your smartphone and placing your food onto the plate, a sensor analyses your meal and its weight and relays this to the cloud.

Artificial Intelligence informs exactly how healthy you're eating

Using the mobile app, a photo of the food is taken and sent to the cloud as well. Backend intelligence in the cloud is capable of recognizing more than 1,000 international food items, along with calculating quality and calories. As per your pre-defined profile, health record and physical activity history, you get real-time information and advice on your dietary habits.



Fig. 4 : Artificial Intelligence working on your dining table

They also demonstrated an intelligent water bottle that can sense critical content in the water and assess its quality. This is also connected to the cloud and your mobile app,

so it's simultaneously tracking your water intake.

So it's clear that IoT supports Artificial Intelligence in making human life

increasingly safer and healthier. We have started leveraging Artificial Intelligence to improve the quality of human life and make us safer, healthier and happier

About the Author



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Three weeks Practical Training Program on Cyber Security / Digital Forensics

Dat : 3rd to 28th February, 2020 • Venue: Central University of Jharkhand, Ranchi

Technical Collaboration: Computer Society of India (Division 5 - Research and Academic)

Reported by **Dr. Subhash Chandra Yadav**, Professor and Head, Dept. of CS & Tech., Central University of Jharkhand, Brambe, Ranchi-835 205.



The three weeks training program was inaugurated by Prof. N K Yadav "Indu", Vice-Chancellor, CUJ and guided, monitored by Prof A K Nayak with Technical Collaboration of Computer Society of India (Division 5 - Research and Academic). Training Program was being organized by Dr. Subhash Chandra Yadav, Professor and Head, Department of Computer Science and Technology, Central University of Jharkhand, Ranchi for M.Tech (CST), 2nd sem. (Session 2019/2020)

During three weeks training program the students were able to learn practical training program on Cyber security and Digital Forensic related tools out of which one week training were being held at Cyber Thana, Ranchi. The training was conducted by subject expert Mr. Sumit Prasad, Dy. S P Cyber Crime, Ranchi, Mr. Kumar Saurabh and Mr. Shivendra Kumar both are Senior Technical Officer's at Cyber Thana Ranchi.



Themes for CSI Communications

2019		2020	
Month & Year	Theme	Month & Year	Theme
May, 2020	Semantic Web	September, 2020	Digital Twins
June, 2020	Quantum Computing	October, 2020	Robotics
July, 2020	Virtual Reality	November, 2020	Deep Learning
August, 2020	Open source software	December, 2020	Industry 4.0

Twitter Sentiment Analysis on Social Distancing in India: A key to prevent transmission of an epidemic outbreak of COVID-19

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Introduction:

Novel coronavirus 2019 (COVID-19) was originated from Wuhan, China in December 2019 and the spared of this virus has impacted severely over all the world within 2 months. The World Health Organization (WHO) declared public health emergencies for the coronavirus outbreak on January 31, 2020 and as a pandemic on March 11, 2020 [1]. As of April 19, 2020, 22,03,927 confirmed cases and 1,48,749 death cases have been reported in the world by WHO [2] and 15,712 confirmed cases, 2,231 recovered cases and 507 death cases have been reported by the Ministry of Health and Family Welfare, Government of India [3]. Government, police officers, social organizations and hospital workers are trying hard to mitigate from the impact of this deadly virus. Medicine or vaccine has not been discovered yet. However, many clinical trials are ongoing by medical researchers. As coronavirus is very contagious, people were informed to stay at their home and maintain social distance from each other because India was at high risk with the second highest population in the world. Government of India had announced lockdown of 21 days from 25th March, 2020 and it was extended till 3rd May, 2020 on 14th April, 2020 by looking situation of India.

This article represents the sentiment analysis of Indians by social distancing during the global pandemic of COVID-19 from Twitter social media platform. Sentiment analysis is an application of Natural language Processing (NLP) and Text Mining. Messages in the form of text have been analyzed and categorized in positive, negative and neutral. Sentiments help us to find public reactions which may guide to take further steps.

Methodology:

In this article, we have considered

► Dweepta Garg** & Amit Ganatra***

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a total of 5,500 English tweets for sentiment analysis. Tweets were extracted to find sentiment on social distancing. #SocialDistancing, #Social_Distancing, #togetherAtHome, #stayAtHome, and #StayHomeStaySafe have been considered for finding sentiments. Sentiment analysis has been performed using the Orange Data Mining tool. Orange is an open-source GUI-based tool for data analysis and visualization [4]. It consists widgets for data preprocessing, supervised and unsupervised modelling, text mining, data visualization and many more. The Orange tool doesn't have the facility to filter the tweets based on country. So, we have considered #coronaindia, #covid19India, and #COVID2019India to get maximum tweets from India. The Orange tool uses VADER (Valence Aware Dictionary and sEntiment Reasoner) sentiment analysis algorithm [5] which is a lexicon and rule-based sentiment analysis tool that is specifically attuned to sentiments expressed in social media. Sentiment analysis has been performed by the following approach:

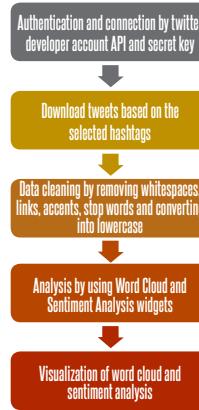


Fig. 1: Workflow of twitter sentiment analysis using Orange tool

Results and Discussion:

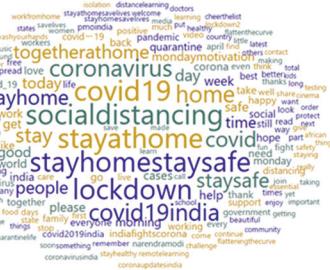


Fig. 2 : Word cloud of tweets on social distancing

Fig. 2 shows the word cloud of keywords of 5,500 tweets on social distancing. "Socialdistancing", "Stayathome", "lockdown", "stayhomestaysafe", "coronavirus", "quarantine" words are the most prominent. "safe", "good", "time", "help", "social", "love", "happy", "hope", "family", "life", "fight", "well", and "positive" were also frequently occurred followed by them. These words reflect the mood of people that, though people are in fear, sadness, and worry because of COVID-19 pandemic but on the other hand, they are also united to flatten the curve of confirmed cases in India. Preemptive steps such as social distancing, lockdown, quarantine were declared by WHO to prevent transmission of coronavirus and all countries have followed to mitigate from the worst situation. The government of India has taken preemptive measures at an early stage and announced lockdown on 24th March, 2020 for 21 days and also extended on 14th April till 3rd May, 2020 because the social distancing is the only way to keep people safe and both lockdowns were also very well supported by Indians.

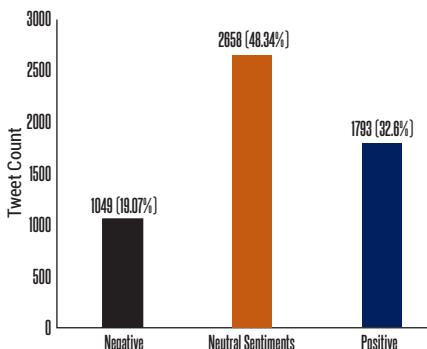


Fig. 3. Twitter Sentiment Analysis on Social Distancing

Fig. 3 illustrates the sentiment analysis of social distancing. 1,793 (32.6%) positive, 1049 (19.07%) negative and 2658 (48.34%) neutral tweets have been evaluated by VADER algorithm. Positive and negative tweets were analyzed and came to know that people were worried for their daily essential services and how people would be able to buy other necessary items such as milk products, vegetables, fruits, and grocery items. However, on the positive side, stores have been permitted to open for the citizen on a timely basis. Labours who earn daily wages, also faced trouble and stressed and they started to migrate to their native place. The Indian government has handled

the situation very proactively and migrants were provided with shelter home during the lockdown for their and national safety. People have also appreciated the efforts given by police officers for maintaining social distancing. Indian actors have also advertised a message for social distancing and "stay at home" which are retweeted by many people. To further analysis on tweets, people mentioned that they were also happy to maintain the social distancing because they got a chance to work from home and gave more time to family.

Conclusion:

In our article, we have illustrated the public reactions, beliefs and emotions using sentiment analysis on social distancing during the outbreak of COVID-19. Sentiment analysis totally depends on the feeling of a person who wrote a message and not all, people show the same feeling at the same time. However, our analysis shows that people have shown their sentiment more towards positive and optimistic than negative on social distancing. Moreover, the frequency of the words related to joy and trust have been seen higher in the word cloud. It shows that Indians have supported social distancing and have achieved significant success in controlling the spread of COVID-19 in India compared to other

countries around the world.

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Semantic web for effective Health Care Systems: Challenges and Opportunities

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The Semantic Web is the extension of World Wide Web (WWW), which provides a vision of web as structured data. Semantic web enhances the traditional web by coding and linking the necessary concepts, which is easily available for end-users. In the current scenario, Health care is one of the important subject areas in Semantic Web. Eventhough, the query has been transformed into different form to match the indexed documents, end users facing difficulties to search for the exact documents. The challenges and opportunities of Semantic web technologies used in healthcare domain such as information retrieval system, IoT in health care, Big data, ontology-based health care, and data mining have been discussed.

Keywords: Semantic web, Health care, Information retrieval.

Introduction:

The operations performed on health care records by the health care professionals are: Coding and Classification of information, organising, analysing and evaluating the documents for taking decision, applying security measures on the information, following Standards and regulations in health records, validating the health information and analyzing health care record for research purposes. Figure 1 explains the Information management system of health care.

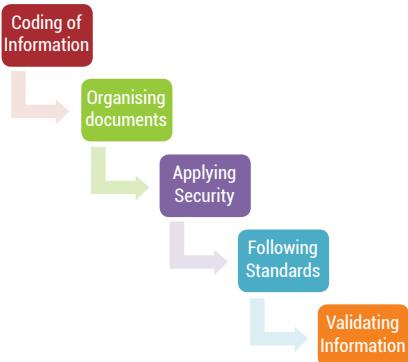


Fig. 1 : Health care Information Management system

When these health care operations have more complexity with respect to time, Semantic Web, an intelligent networking technology is used to make these processes

simpler and easier. In this article, some of the health care applications, their impacts and challenges in semantic web have been discussed.

Semantic Web for Information management in Health Care:

Semantic Web shares the information in the health care system and enables to manage to promote interoperability [1].

Challenges:

The main challenge faced in healthcare field is to extract information from the heterogeneous data available from the different data sources which can be used for health professionals.

Opportunities:

Using the semantic web, the information retrieval is performed at 5 levels [2][3][4]

1. Systems
2. Syntax
3. Structure
4. Semantics
5. Pragmatics

Fig. 2 state the information management in Semantic Web. The syntax addresses syntactic operability, the semantic level gives the meaning and the pragmatic level gives the contextual information. With the help of Information management using Semantic web, a proper information sharing is performed and thus

the health care professionals access the accurate information and making decisions.

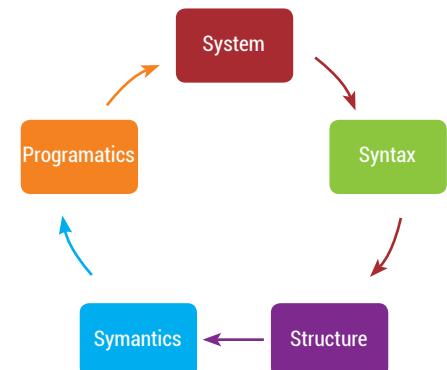


Fig. 2 : Information management in semantic web

Semantic web in IoT Health care:

Challenges:

In IoT based healthcare systems, the healthcare professionals face difficulty in communicating with the patients using the heterogeneous IoT devices for monitoring the health condition. The integration of multiple types of those heterogeneous devices causes hindrance in the implementation of IoT in the healthcare sector. This non-uniformity slows down the performance and decreases the scalability of IoT in healthcare.

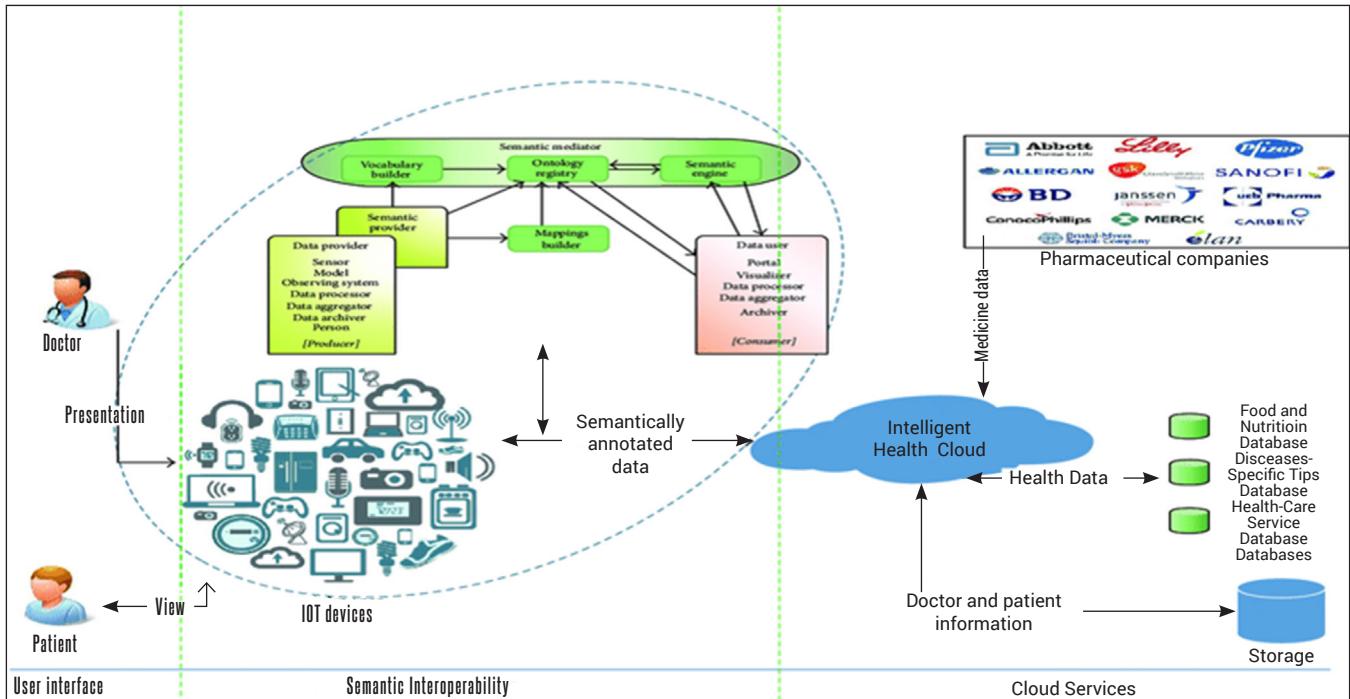


Fig. 3: Architectural model for Semantic Interoperability in IoT [6]

Opportunities:

Health care professionals communicate with their stakeholders for health monitoring with a variety of IoT devices through semantic interoperability. The data or the information between the professionals and patients will be annotated semantically. Sohail Jabba et al [5] proposed light weight model named Resource Description framework (RDF) to provide annotation for data. Resource Description framework is a semantic web framework which annotates patient's data semantically interoperable. RDF graph uses SPARQL [5] query to extract graph for system simulation. Fig. 3 explains the architectural model for semantic interoperability in IoT for health care.

Semantic web for Big data in Healthcare care Sector:

Challenges:

Healthcare data is rapidly growing day by day where so many researchers are leveraging these data sets to improve the quality of healthcare. Challenges are caused mainly in analysing the data. Due to huge volume of data, it takes more time to select the proper data set which affects data accuracy.

Opportunities:

For an effective data analysis, it requires

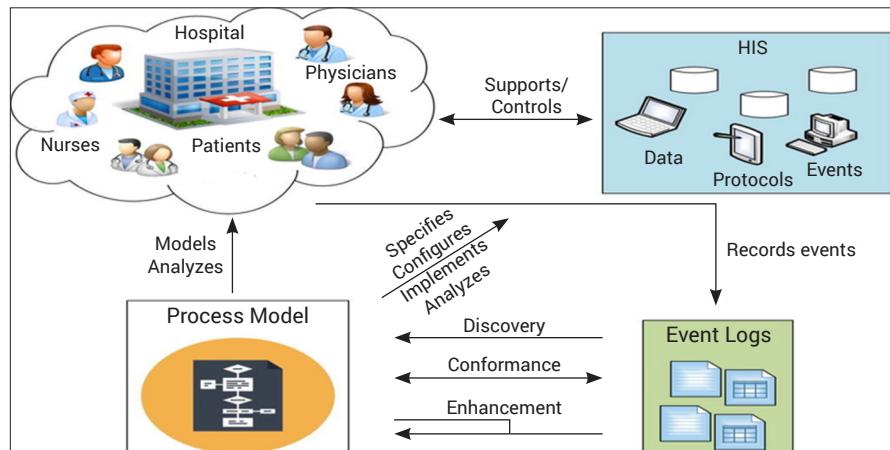


Fig. 4 : Semantic Web for Data Mining in Health care [9]

significant time, energy, and fundamental knowledge to identify, understand, and choose the right datasets. The data need to be segregated in chunks without overloading with precise accuracy for better results. Overloading of data might affect the decision-making process in the hospitality sector in the longer run.

Semantic web with Ontologies in healthcare:

Challenges:

Extraction of specific data is very difficult due to different types of data format from various data sources, fragmented and non-standardised semantics and schemes. Due to this inaccurate data of the patients from the past, future acquaintance becomes difficult.

Opportunities:

Ontologies helps in improving the interaction in healthcare system, since it is a

challenging work in healthcare. The semantic web with ontology helps to transit and reuse the patient record by integrating the semantic web with the Meta data, i.e., integrating the data with two levels. The document level and paragraph level which shares the personal information of the patients. Semantic web reduces medical errors, increase the efficiency, patient's safety and satisfaction through ontological driven process using Active Semantic documents (ASD) which automates the annotation of documents and rule processing [7]

Semantic web with Data Mining in health care

Challenges:

Data mining techniques are used for discovering new statistical results. Most of the time in healthcare records are spent to identify the hidden patterns [8]

Opportunities:

Data mining has a large set of tools and techniques like classification, clustering and analyzing techniques with semantic web. Data mining tools will increase the usability and usefulness of the semantic web. Figure 4 explains importance of data mining in

health care sector.

Conclusion:

In this article, the challenges and opportunities of Semantic web technologies used in healthcare domain such as information retrieval system, IoT in health care, Big data, ontology-based health care, and data mining have been discussed. The objective of this article helps the researchers to do more research on semantic web to make the health care system services as standardised services with cost effective, self-maintainable, reusable and interoperability.

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

Semantic Web Meets Cognitive Robotics

► Snehasis Banerjee

Scientist, TCS Research, Tata Consultancy Services. (Treasurer, CSI Kolkata Chapter) Email: joysnehasis@gmail.com

The fields of Semantic Web and Robotics has remained mostly disjoint to each other. Recent interest in cognitive aspects of Machine Intelligence in Robotics has led to exploration of rich semantic techniques as an enabler. Semantic Web Technology (RDF, OWL, SPARQL and custom Rules) becomes a natural choice in Robotics that demands software that is adaptable and robust. A typical robotics solution has 3 key components – Sensing (like Vision, IMU), Actuation (via motors in wheels or arms) and Decision (AI planning and ML based inference). The main scope of semantic web technology's usage in robotics is where inferences from standard ML models are inadequate to make good decisions - or in cases where guidance and prior world knowledge aids the overall decision making process. Computer vision as a discipline has progressed in leaps and bounds due to deep learning, but has drawbacks. Initial needs of large amounts of training data, issues with transferring simulation models to real world and unknown scenarios make robotic solutions difficult. Here, we take support of a case study in indoor robot navigation to illustrate the leveraging of semantic web in a practical scenario.

In our daily lives, we often forget things. Suppose, a service robot is given a Task - "find my mobile". This object search (phone) can be formulated as a Visual Semantic Navigation Task [1] in indoor setting (Fig. 1).

The robot follows visual cues from its start location and does semantic processing to explore scenes with high probability of finding the object. For example, washroom has low probability of having the target object 'mobile' while places like table, bed, work desk have higher possibility. Here, semantic knowledge aids in exploration like mobile phone is a type of electronic device having rectangular shape and usually lies on (top of) other objects. A mix of semantic web with machine vision yields good results.



Fig. 1: Webots [2] Simulation: Indoor Scene

Perceived images (~30 fps) are processed (with smart frame drops) in real-time using fast object detectors like YOLO [3] classifier.

Cognitive Engine (refer Fig. 2) is the brain of the system which takes care of planning the robot's motion that results in the final actuation movements – velocity of wheel motors. Here, RGB camera serves as the Perception – streaming visual input as well as feedback on actuation. Depth camera if added, scene processing becomes richer. Actuation decision is based on objects in current scene (with high classification score) and their semantic inter relationship among themselves; to target object; and context. As an example, some semantic web based snippets pertaining to the Task are shown:

OWL (ontology files):-

```
<o:Mobile> <o:type> <o:Electronic_Device>
<o:Mobile> <o:type> <o:Sound_Emitter>
<o:Mobile> <o:type> <o:Private_Asset>
```

RDF fact files:- (can be linked to Web)

```
<o:Mobile> <o:hasShape> <s:Rectangle>
<o:Electronic_Device> <o:hasState> "on"
<o:Electronic_Device> <o:hasState> "off"
<o:Mobile> <p:CanLieOn> <o:Table>
<o:Mobile> <p:CanLieOn> <o:Work_Desk>
```

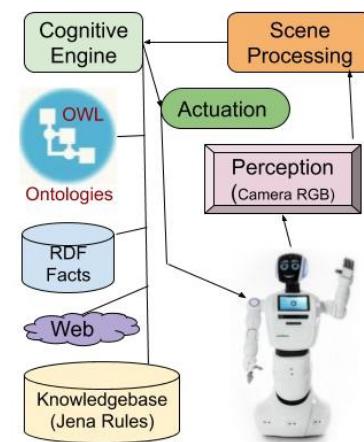


Fig. 2: Simplistic View of Architecture

Jena custom Rules (triggers on new scene):

```
[Rule1 : (<r:currentScene> <r:has> ?objs .
jena:evalScene (?objs , ?targetScene ) ->
(<r:currentScene> <p:type> ?targetScene )]
```

SPARQL query (runs in flexible intervals) :-

```
select ?direction where {
<r:currentScene> <p:type> ?targetScene .
<r:Task> <r:ObjectFind> ?target .
?target <s:usuallyLocatedIn> ?targetScene .
?target <r:hasProbableLocation> ?direction .
?direction <r:hasConfidence> ?score .
FILTER (?score > 0.5 ) } //0.5 is threshold
```

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- [3] Redmon, Joseph, and Ali Farhadi. "YOLO9000: better, faster, stronger." Proceedings of the IEEE CVPR. 2017.
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About the Author



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Journey of machine learning, a subset of AI

► Jyotishmaan Ray

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The journey of machine learning was unveiled more than 60 years ago. It was first, Arthur Samuel in 1959, had defined machine learning as a new area of study for the computers to learn without really writing any programs. However machine learning took a back stage in the interim period, and nothing new happened for some time period till recently in 1990s. Allan Turing, the father of theoretical computer science, wrote first in a research publication of the Mind in a published paper "Computing Machinery and Intelligence" - Are the machines /computers thinkable or thinkers? Machine learning took a momentum in its evolution, with the reinvention of backpropagation in mid 1980s.

Machine learning has taken birth from the field of artificial intelligence. Deep learning took its birth from machine learning. Machine learning used symbolic methods/ techniques inherited from AI. Machine learning algorithms basically used a method of parsing the input data fed into it, step wise to learn from the parsing, and make a decision exactly on this learning to further take intelligent decisions and make predictions based on this. Machine learning and data mining generally used the similar methods to overlap in its working model. Machine learning focused on predictions, based on known characteristics learned from the actual sample data. Data mining focused on the new findings of unknown characteristics associated with the data. Data mining process applied machine learning methods, having goals unlike from machine learning. Machine learning has applied the data mining methods such as "unsupervised learning" as a way of preprocessing the data in stages to better the accuracy of the learning methodology. Graphically, machine learning can be expressed as :-

Input → Learning process →

Intelligent Decisions/ Predictions

Machine learning has been broadly classified into :

- Supervised learning
- Unsupervised learning
- Semi-supervised learning
- Reinforcement learning
- Active learning
- Similarity learning
- Topic modeling

I. Supervised learning:

Supervised learning is that area of machine learning where the predictions are made based on the labelled data sets. These labelled data sets are known as the independent variable and the predicted values are known as the dependent variable. For example in email filtering, we have a spam folder in our free email account like yahoo etc which detects spam emails with a great accuracy. Here the input is the incoming email and the output is the spam folder where the mail is stored upon redirection when it is classified as spam/not spam. If it is a spam email, it will be stored in spam folder else in inbox. Areas of application of supervised learning algorithm includes **Regression, Decision Tree, Random Forest, KNN, etc.** In general supervised learning algorithms constructed a mathematical representation of a set of sample data set which had both the initial inputs and the expected outputs. An algorithm is then applied to this constructed representation to predict the output from the given inputs to make the final predictions.

To justify, let us take an example of supervised learning, in details. Say we take three types of geometrical figures as data-the hexagon, the triangle, the circle. Each one of them has unique characteristics/ features, and based on them, it has been categorised as a hexagon, a square or a triangle. It has been broadly divided into mainly two types : (i) **Classification algorithms** and (ii)

Regression algorithms (i) Classification algorithms are generally applicable when the predicted outputs have values within a set of limited values. Such an algorithm may include : **Fraud detection, Email spam detection, Diagnostics, Image classification etc.**

(ii) Regression algorithms are applicable to tasks when the outputs have real numerical values within a range of values. Such real values may be of the following types -temperature, length or price of an object. More over there are many types of regression algorithms in machine learning. When to use which algorithm depends much on the data and the kind of distribution under consideration. In real analysis normally 2 to 3 types are generally preferred over the rest of

regression algorithms . To illustrate it say, we have in the real world three types of objects/ figures defined well by their corresponding model as demonstrated below:

- | | |
|-------------------------------|----------|
| ◆ Model Representation | Hexagon |
| ▲ Model Representation | Triangle |
| ● Model Representation | Circle |

Once the model learns the unique properties of a given geometrical figure, it becomes easy to identify the specific figure as a hexagon, or a triangle or a circle, the next time it interacts. Mathematically, a regression (coined by Francis Golton in the 19th century) can be defined based on two variables, the dependent variable (y), and the independent variable (x). If the relationship is between one dependent and one independent variable then such a regression is called as a simple linear regression. If the relationship is between one dependent and more than one independent variable (s) then regression is called as multiple linear regression. There are different types of Regression algorithms. They are : (i). Linear Regression (ii) Polynomial Regression. (iii) Logistic Regression (iv) Quantile Regression. (v) Ridge Regression. (vi) Lasso Regression. (vii) Elastic Net Regression. (viii) Principal Components Regression (ix) Partial Least Squares (PLS) Regression (x) Support Vector Regression (xi) Ordinal Regression (xii) Negative Binomial Regression (xiv) Quasi Poisson Regression (xv) Cox Regression (xvi) Tobit Regression. A few of them are defined below:

- (1) Linear Regression : as described above, can be simple/ multiple linear regression
- (2) Polynomial Regression : is a method based to fit a nonlinear equation by taking polynomial functions of independent variable.

A regression in brief utilizes the data over a period of time to study the relationship between an independent and a dependent variable to make predictions of the future values of the dependent variable. Any type of business queries of any type of tasks uses regression to ultimately determine the real values of the **annual sales, prices of any object, currency exchange rates, and annual gains/profits etc. It can be further underfitting or overfitting type of regression depending on the case but balanced type of**

fit is preferred over these two.

(3) **Logistic Regression** : is a method of regression which can be applicable to a business problem when the dependent variable is categorical. This can be illustrated with an example say once you are selected by a company in any interviewed job, whether you join the company is categorical in nature. It has two values generally-say yes/no type and so it is called binary in nature. In case of the independent variable, it can be either binary or continuous in nature of having the real values of data. If in case the dependent variable have more than two categorical values, then it is called as multinomial logistic regression.

II. Unsupervised learning :

Unsupervised learning, being a type of machine learning, is a subset of AI, and it allows to self-improve based on real world experience. Unsupervised learning takes as input the unlabelled data, with minimum human supervision and no outputs as such. Here the unsupervised learning algorithm looks for previously undetected patterns, with no preexisting labels. Examples includes the domain/areas of Visual recognition, Human behavior, Robotics etc. A recent example of AI powered disease-alert systems about corona virus came on December 30, 2019 from the automated Health Map system at Boston Children's Hospital. Practically a computer gives us easily, unlabelled data but to obtain the labelled data it needs programming the computer as such. Broadly it has been further divided into two main types : i) Cluster Analysis ii) Principal Component Analysis. Adarsh Pyarelal, a 30 year old Indian research scientist in the US funded DARPA (Defence Advanced Research Projects Agency) is creating AI agents that understands humans and their interactions to work as teammates.

(i) Cluster analysis is a branch of unsupervised learning that groups the data points which is not simply labelled/tagged as of now, before the analysis process of real data has begun.

A more detail example of unsupervised machine learning would be the case of a new born off

spring and its mother, whom the new born saw and identifies the being as its mother. Say now, the baby interacts with her aunty, and tries to recognise. But since the new born off spring saw her for the first time, so identifies aunty's features like eyes, nose, mouth, ears, hands and may be smell too etc and identifies the new guest as an aunty or someone other than its mother as the features appears to be same but different hence the new born or the young off spring tends to avoid her. This is a real example from daily life where, the new born was not taught, about it, but it learnt from the given sample data. Unlike the case of a supervised learning where, in that case of a new born, it would have been told to the new born, that she is her aunty. Thus for all future interactions, the new born baby would take this learning as its experience, to identify its mother. This holds true for not only human beings but also in case of animals too.

(ii) Principal component analysis is an analytical method of finding the least squared distance of a point to the line drawn to fit into chosen data points in a graph. The procedure is repeated similarly for other points to the next befitting line drawn perpendicularly to the earlier drawn line. Such lines forms the principal components of data and the whole procedure along with analysis is called principal component analysis.

III. Semi-Supervised learning :

Semi-Supervised learning algorithms learns from a sample dataset which includes a few tagged and large amount of untagged data. In this type of learning algorithms, learning task can be seen as a exam and labelled data as sample programs which the teacher solves in the class. Semi supervised learning can be either termed as transductive or inductive learning. In case of the transductive learning, the unsolved problems are considered the exam questions and in case of inductive, the unsolved problems become the sort of practice problems that will make the exam.

IV. Reinforcement learning :

Reinforcement learning algorithms use positive or negative kind of feedback

in a dynamic environment. It often finds application in self driven vehicles or in learning to play a game against a human opponent and the machine. It differs from supervised learning in that in which it does not need any labeled input/output pairs. The focus is on exploration of future knowledge data and exploitation of the current data knowledge.

V. Active learning :

Active learning is a methodology in which the user/ teacher is queried to tag the new data points with a label. In case of a huge amount of data points the process of querying can be iterative in nature and hence it is called active learning. The user can be a algorithm used to learn the huge amount of data under consideration to put the tags/ labels associated with the new data points.

VI. Similarity learning :

Similarity learning is a sub set of supervised machine learning. The objective is to learn from examples and predict a similarity function that measures the degree of similarity between two objects under consideration. It finds its use in ranking, face and speaker verification etc. For an example clustering groups similar objects in the same group. It also includes K-nearest neighbor algorithm which relies upon labels of nearby objects to decide on the label of a new object based on this similarity measure.

VII. Topic modeling :

Topic modeling is a method of learning in which the computer program is given a document to study based on statistical basis to find the group of same or similar words used in the context of a given topic in a document. The basis to find the topics is based on a mathematical model to find such similar words in a document or in the remaining portion of the chosen documents under consideration is called topic modelling.

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- [4] Times of India : Times Trends
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- [6] Research Papers on www.totbots.com

About the Author



Jyotishmaan Ray

- A Study on Network Security System, CSI Communications, January 2010 publication.
- Central Authentication System, published in July 2009 issue of CSI Communication.
- B. Tech in computer science and engineering from NERIST, 1995 passed out.

WEBINAR on “Cyber Security in Lockdown times”

Organised by Sri Aurobindo Institute of Technology, Indore

Reported by Dr. Nitika Dohan

CSI-student branch of SAIT, Indore, M.P. in association with CSI come up with a webinar on “Cyber Security in Lockdown times” at 12 noon on April 30, 2020.

The event was started with the mantra

“शुभं करोति कल्याणमारोग्यं धनसंपदा।
शत्रुबुद्धिविनाशाय दीपज्योतिर्नमोऽस्तुते॥

The eminent speaker of this webinar is Dr. Varun Kapoor, ADGP Rustamji Armed Force Training, Indore. He is the holder of world record for holding the highest cyber security workshops in the world. He has won various International, National Awards, Medals and received distinguish recognition in cyber security. He is the first Police Officer who received the Honorary Doctorate in Cyber Security.

Dr. Varun Kapoor has made us aware on cyber security during this lockdown time. He briefed us on digital footprint, Phishing, Vishing, Smishing, Social Media overuse/ misuse and on Monitoring Children (online gaming, online bullying).

In the end, he summed up with the five key points:

1. Mindset of Safety and Security
2. Avoid shortcuts ...greed
3. Think before you act
4. Have full knowledge
5. Don't trust Blindly

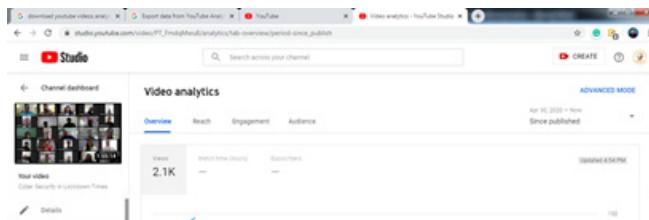
More than 2000 registrations were received across the Nation. Around 400 are the professionals, 550 are the faculty members, students are 1100. Event was hosted on ZOOM, YouTube, Facebook live. Recording was also taken care of.

Questionnaire session is taken care by Dr. Durgesh Mishra ji and Prof. Amit Holkar ji. YouTube participants asked around 10 questions and eminent speaker has given the answers. Also in ZOOM many participants asked their question and answer has been taken care by Dr. Varun Kapoor ji.

The webinar “Cyber Security in Lockdown times” conducted by Dr. Nitika Vats, Professor and SBC-CSI SAIT, Indore, M.P., India. She has given the vote of thanks. She thanks to management SAIT, Vice President of SAIMS group Shri. Kinshuk Trivedi ji, Dr. Varun Kapoor ji (speaker of webinar), Dr. A.K. Nayak ji (Immediate Past President of CSI), Professionals, faculty and students who participated all over the Nation. She ended his thanks with the quote

“A good event never ends in the world they take only a pause and keep us awaiting for the next”.

1) You Tube analytics is attached:



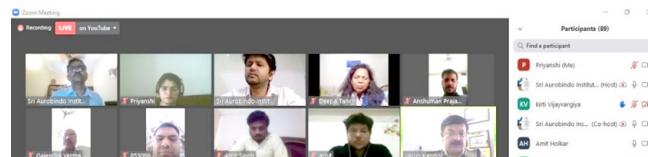
Over 2000 participants have attended the webinar and 2.1k views are visible.



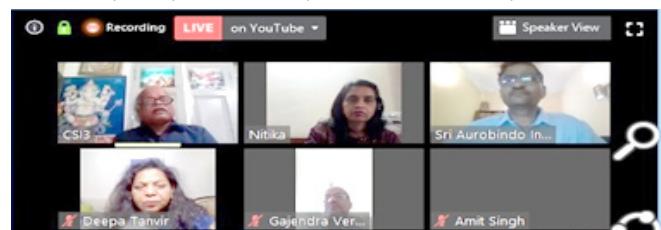
Program Coordinator Dr. Durgesh Mishra ji and Vice President of SAIMS group Sh. Kinshuk Trivedi ji in the webinar.

2) ZOOM Reporting:

Around 95 participants attended the webinar from ZOOM. Snapshots are given here by.

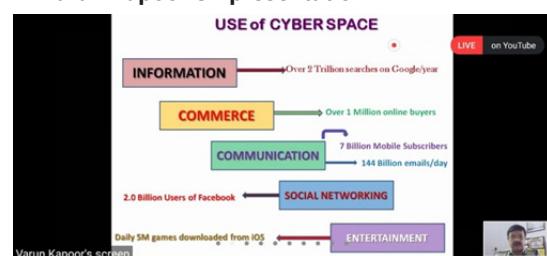


Vice President of SAIMS group Mr. Kinshuk Trivedi has attended the event as a participant and has questioned with the expert.



Participants in ZOOM attending the Webinar. Dr A K Nayak, immediate Past President of CSI attended this webinar and motivated the students in his address to work out with Dr. Varun Kapoor's advice.

3) Dr. Varun Kapoor Sir presentation:



Dr. Varun Kapoor ji telling the participants use of Cyberspace. Information plays a very important role in the cyber security. Communication and social networking both are different. In lockdown times entertainment is another very important feature of cyberspace as one have to furnish his/her details.



Dr. Varun Kapoor ji has told us about the Phishing attack and how one should be aware of the fake messages, sms, email. It can come in anyways. One should be aware of all such things.

Dr. Varun Kapoor ji in the last focus on the five points which are necessary for human beings to take care every time. He said mindset of safety is most important and one should not be greedy and should always avoid the shortcuts methods to reach the destination or to achieve the goal. A person should think twice before act. By this a wise decision can be taken of. And in last he emphasizes on trust and asked nobody should trust blindly on any one.

Webinar on E-Governance for National Development

Organized by CSI Student Branch, NSIT Patna

Reported by **Gopal Krishna**, NSIT



20th April, 2020, CSI Student Branch, Netaji Subhas Institute of Technology, Patna successfully conducted Webinar on "E-Governance for National Development". In the first session Prof. A K Nayak, Immediate Past President, Computer Society of India and Member of Board of Studies, Computer Science & Information Technology, AICTE, Govt. of India inaugurated the webinar by addressing the participants. He addressed the participants from all over the India. He emphasized on the issues and challenges for the proper execution of E-Governance in Indian context with respect to its diversified culture, languages and other prospects. He also said that CSI student branch of NSIT is one of the most active student branch of India. Md. Shams Raza, RVP CSI region-2 has delivered his content on the importance and opportunities of E-Governance. Mr. Gopal Krishna, State Student Coordinator, CSI-Bihar has hosted this webinar and introduced the webinar and addressed the webinar focusing on the significance of webinar during the period of lockdown. Dr. Aniket Dutt, Dean-Academics, NSIT proposed the vote of thanks and said there are lots of opportunities in R&D in the field of E-Governance for the students.

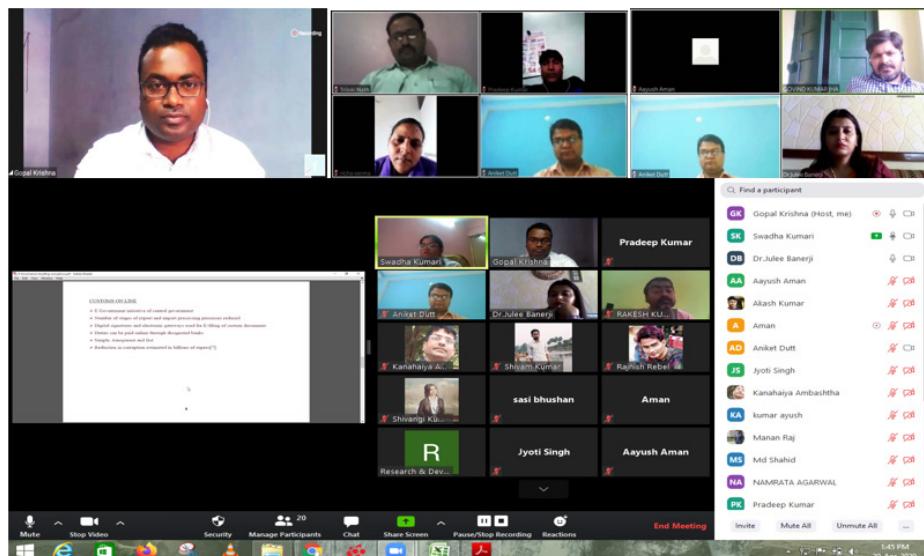
In the second session, national level student's PPT competition was organized on the topic of "E-Governance: Issues & Challenges". Judges of Student's PPT Competition were Dr. Aniket Dutt, Dean Academics, NSIT, Patna; Dr. Julee Banerji, CEO, JBHR Innovation Services; Mr. Govind Kumar Jha, Assistant Professor, Dept. of CSE,

BCE, Bhagalpur; Mr. K L Ambastha, HOD-IT, International School of Management, Patna.

This webinar attracted students and faculties from more than 20 different colleges of India with active participation. Few Notable among them are: United Groups of Institution, Allahabad; ISM Patna; Ramswaroop Group of Institution, Lucknow; LNMI, Patna; Bhagalpur College of Engineering; IIMT, Greater Noida; Patna women's College; Arcade Business College; IGNOU.

In the PPT competition Filza Zarin, Swadha Kumari and Juhi Kumari secured the first, second and third position respectively. Performance of Akash Kumar, NSIT, Patna; Kumari Shivangi, United Group of Institution, Allahabad; Shivank Gupta, United Group of Institution, Allahabad; Namrata Agarwal, IIMT College Of Engineering, Greater Noida; Aman Kumar, NSIT, Patna; Shivam Kumar, ISM, Patna was also remarkable.

Mr. Triloki Nath, Asst. Prof., CSE, NSIT and Mr. Rakesh Kumar, Asst. Prof. & former IT Consultant, Govt. of Bihar also addressed the webinar. Mr. Pradeep Kumar, Mrs. Deepa Sonal, Mrs. Richa Verma, Mrs. Kalpana Kishore, Mr. Ramesh Kumar has also participated actively to make this webinar a grand success. Students of NSIT Shashank Kumar, Vice President; Aayush Aman and Kumar Aysuh, Secretary, Student Council, CSI student branch coordinated the webinar from their ends.



Faculty Development Program

D. Y. Patil College of Engineering, Akurdi, Pune

Three Weeks 8 credits course – “WhatsApp FDP on Outcome Based Education”

Objective of FDP: Dissemination of NBA Manual and its terminologies in your own perspective.

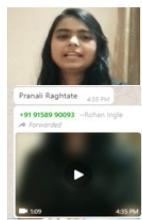
Inauguration: Three weeks 8 credit course Faculty Development Program “WhatsApp FDP on OBE” was inaugurated online on 24th March by Dr. Amit Dutta, Deputy Director, AICTE, Dr. Jayakrishnan M. Senior Scientist, NPTEL,IIT, Madras, Dr. Sameer S Sahasrabudhe, Senior Project Research Scientist, IIT Bombay, Dr. Vijay Wadhai, Principal & Dr. Mrs. P. Malathi, Vice Principal D Y Patil College of Engineering, Pune by sharing audiovisual clips in six WhatsApp groups of the participants.

Participants: Total 1365 participants were registered for the FDP from different 15 states of India such as Maharashtra, Haryana, Uttar Pradesh, Madhya Pradesh, Punjab, Goa, Kerala, Rajasthan, Bihar, Karnataka, Orissa, Manipur etc from 81 different cities/locations. 610 participants actively participated in different daily puzzles & assignments. 122 Senior faculty members Principal, Head of the department, 433 Assistant professors & 55 lectures from different engineering, polytechnic, pharmacy & management institutes actively participated.

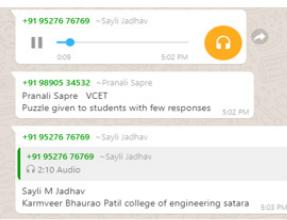
Mode of execution: Entire FDP was conducted on whats app. All the participants attempted daily quizzes, puzzles, assignments, reflection spots from 8.30 am till 11.30 pm. The study material, NBA Manual & NBA evaluation guidelines was given to all participants.17 different

Student Learning Outcomes:

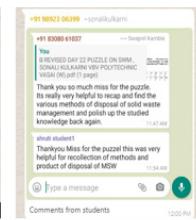
Video Forum:



Audio Forum:



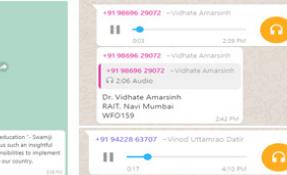
Text Forum:



Video Forum:

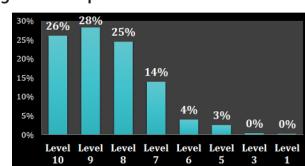
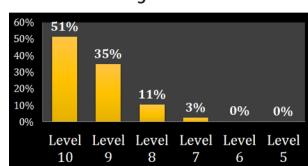
Audio Forum:

Text Forum:



On the last day of FDP, 14th April online feedback was taken from all the participants on different parameters, as follows:

1. Overall Rating of FDP wrt OBE Learning



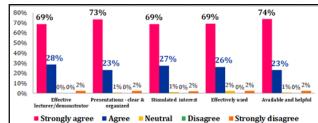
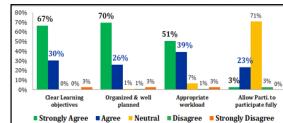
types of quizzes & puzzles based on NBA manual was created by the team of organizing members. The types of puzzles created by the organizing team members were crossword, Emoji, Jumbling words, Snake & Ladder, Path finding,Cryptogram,GIF. Also different knowledge based activities were also conducted such as how to use google form to create quiz, how to search jobs using naukri.com, how to use whatsapp on PC/Laptop, how to record screen using active screen recorder app, how to file copyrights application, how to create YouTube channel, how to do data analysis using excel sheet. Also three participants from different institutes contributed in creating puzzles for other participants.

Criteria for Certificate: For each participant 610 Google folders were created with each 7 sub-folders for Course journal, CO-PO Mapping table, Puzzles, CO-PSO table, quizzes, FDP Summary & Outcome report. The eligibility of certificate was decided on the submission of daily FDP documents on puzzles, online quizzes, learning outcomes in respective Google folders.

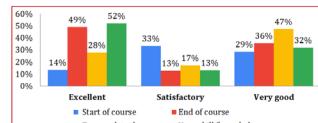
Outcome & Feedback: To check the usefulness & learning outcomes of different puzzles & quizzes conducted during FDP, participants were requested to conduct such types of assignment to their students for their respective courses & share student's views with their learning outcomes. Following are the few feedback of students' in audiovisual form. Participants also shared their feedback on learning outcomes in audiovisual forms.

3. FDP Course Contents

4. Skills & Responsiveness of instructors



5. Contribution to learning (Level of skill/knowledge)



Organizing Team: The team of 14 faculty members of different institutes of three different states Maharashtra, Kerala & Gujarat constituted the organizing team and coordinated by Dr. Vinay Kulkarni, HOD, Mechanical Engineering D. Y. Patil College of Engineering, Akurdi, Pune.

Mentors: FDP was mentored by Dr. Vijay Wadhai, Principal & Dr. Mrs. P. Malathi, Vice principal, D.Y.Patil College of Engineering, Pune.

Support & Guidance: Faculty development program was conducted under the guidance & support of,

- Hon. Padmashree Dr. D. Y. Patil (Ex-Governor, State of Tripura, Bihar) Founder, D. Y. Patil Group
- Hon. Dr. Sanjay Patil President D. Y. Patil Pratishthan
- Hon. Shri Satej D Patil Vice President & Chairman, D. Y. Patil Pratisthan
- Hon. Col. S. K. Joshi Campus Director, D.Y . Patil Educational Complex

Technology and Outreach Partner to Planet-B – Region-VI

Reported by **Pradeep Rathi**, Regional Vice President (Region-VI)



CSI this year was **Technology and Outreach Partner to Planet-B** event and Mr. Pradeep Rathi, RVP-6 was Judge and Jury for the said event. Planet-B is a Business Plan Competition of NM College of Commerce and Economics hosted by Insight- A Business, Finance and Economics Meet. Planet-B events aim is to help entrepreneurs turn ideas into viable businesses by providing assistance in evaluation of plans, providing knowledge, networking and professional mentorship.

Planet-B provides Idea stage and early stage start-ups an opportunity to be part of a competitive ecosystem that gives them a meaningful learning experience. The two-month timeline of this competition enabled the startups to refine their start-up business models and also enabled their founders the opportunity to inculcate invaluable entrepreneurial skills.

The winners of the event were awarded with cash prizes of ` 1.5

Lakhs. The event provided startup founders an opportunity to pitch their business ideas in front of leading venture capitalists, angel investors and other industry leaders and a chance to seek funding from them for their start-up. The event also provided networking opportunities with events esteemed advisory board, jury and the seasoned industry leaders.

The event enabled startup founders an opportunity to seek mentoring from esteemed panel of mentors provided by CSI and advisors that include entrepreneurs, TEDx speakers, CEOs of successful startups and companies. During the two month tenure of the event CSI organized training workshops that were exclusively designed for the shortlisted participants covering various subjects such as Mind Mapping, Business Modelling, Design Thinking, Digital Marketing, Entrepreneurship, Training and development of Pitch.



National Level 48 Hrs. Online Android App Development Challenge

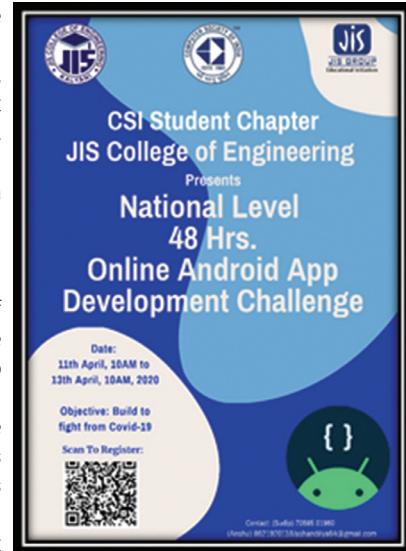
Organised by JIS College of Engineering, Kalyani, West Bengal

Reported by Sudipta Sahana, Assistant Professor, Department of CSE, JIS College of Engineering, Kalyani, West Bengal 741 235



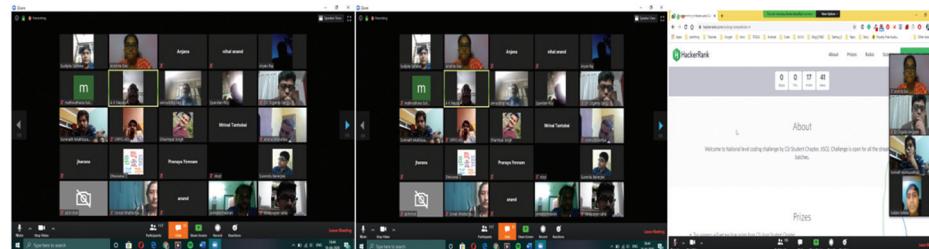
National Level 48 hours Online Android App Development Challenge was held on 11th April, 2020 by the CSI Student Branch of JIS College Engineering, Kalyani. The challenge started from 11th April, 2020, 10:00 A.M. to 13th April, 2020, 10:00 A.M. The objective of the App was to bring into account, an idea which may help in tackling this difficult situation during the COVID 19 outbreak. This event had an impressive number of 213 participants registering from 14 states across the country, having 12 of them from Andhra Pradesh, 14 from Assam, 2 from Bihar, 1 from Chhattisgarh, 6 from Gujurat, 23 from Jharkhand, 2 from Madhya Pradesh, 27 from Maharashtra, 2 from Odisha, 3 from Sikkim, 51 from Tamil Nadu, 2 from Telangana, 9 from Uttar Pradesh and 59 from West Bengal. The Inaugural Session of Online Android App Development Challenge commenced from 9:30 a.m. on 11th April, 2020. It took place on a reputed online platform. The session was hosted by Anshu Kumar Shandilya, of 4th year CSE Department. Prof. (Dr.) Partha Sarkar, Principal of JIS College of Engineering, delivered the welcome speech and told the audience how

his team conceptualize the idea of this program. Mr. Md Shams Raza, Regional Vice President of CSI, Region-II, delivered the inaugural speech, Dr. Aniruddha Nag, Chairman, CSI Kolkata Chapter, Dr. Dharmpal Singh, Head of the Department of Computer Science and Engineering also delivered their speech in which they have emphasized need of this type initiative during this lockdown condition., Mr. Sudipta Sahana, Student Branch Counsellor, CSI Student Branch, JIS College of Engineering, offered the vote of thanks. The faculty members of CSE department of JIS College of Engineering, CSI Student Volunteers of JIS College of Engineering and all the participants were present during the session virtually.



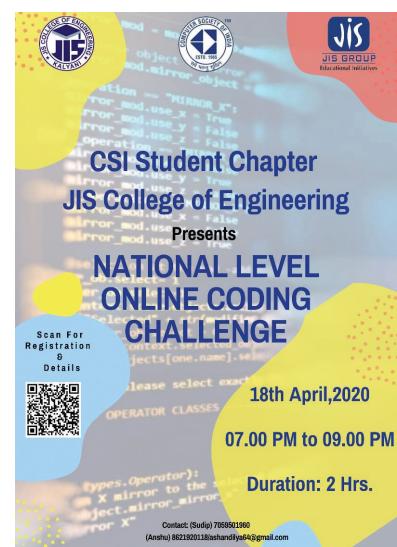
National Level Online Coding Challenge

Organised by JIS College of Engineering, Kalyani, West Bengal



CSI Student Chapter of JIS College of Engineering arranged National Level Online Coding Challenge on 18th April, 2020 which commenced at 7:30 PM sharp and was continued for 2 hours as designed. 650 number of participants registered from 17 States throughout the country which itself an impressive number. This was possible for the continuous encouragement and support from our beloved Prof. (Dr.) Partha Sarkar, Principal of JIS College of Engineering. The Inaugural Session of National Online Level Coding Challenge commenced from 6:00 PM. It took place on a reputed online platform. The session was hosted by Aindriya Das, of 3rd year CSE Department. The Head of the department of Computer Science and Engineering, Dr.

Dharmpal Singh addressed the welcome speech. Prof. A. K. Nayak delivered the Inaugural speech. Dr. Aniruddha Nag, Chairman, CSI Kolkata Chapter, Dr. Somnath Mukhopadhyay, Regional Student Coordinator, CSI Region II, Dr. Diganta Sengupta, State Student Coordinator, CSI West Bengal were also present and presented their views to the online audience.



Devang Patel Institute of Advance Technology and Research

Charotar University of Science and Technology

Reported by **Drashti Garadharia**, Asst. Professor cum Research Fellow, Devang Patel Institute of Advance Technology and Research, Charusat



Students while listening a talk



Hands-on Experience

1. One Day Workshop on Hands-on: Programming with 'R'

Devang Patel Institute of Advance Technology and Research (DEPSTAR) always inspire students for the overall development in academics and co-curricular activities. The institution is devoted to intellectually vibrant atmosphere of research and imparts education in learning of sciences.

Department of Computer Science and Engineering organized a one-day workshop on Hands on-programming with 'R' for the students of CE/CSE/IT department at DEPSTAR Conference room, 3rd floor, DEPSTAR building on 14th March 2020.

The aim of the workshop is to introduce students to Basics of R. This workshop aims at meeting a growing need in Data Analytics among the students. It was delivered with a comprehensive overview of R in Data Analytics, and hands-on experience in applying them. R is a programming language and software environment for statistical analysis, graphics representation, and reporting. R provides graphical facilities for data analysis and display either directly at the computer or printing at the papers. R is the world's most widely used statistics programming language. It's the first choice of data scientists and supported by a vibrant and talented community of contributors.

2. Web Designing & Development Competition-2020

Devang Patel Institute of Advance Technology and Research (DEPSTAR) always inspire students for the overall development in academics and co-curricular activities. The institution is devoted to intellectually vibrant atmosphere of research and imparts education in learning of sciences.

Devang Patel Institute of Advanced Technology and Research organized an online Web Designing & Development Competition for the students of CE/CSE/IT department at DEPSTAR on 13th April 2020.

The main objective of this event was to introduce the learners about environment of coding competitions. Learners can get information about various online Platforms for programming, which integrates computation, visualization, and programming in an easy-

The R programming language has become an important tool for computational statistics, visualization, data science, and predictive modelling. It is used to solve challenging problems in fields like computational biology, quantitative marketing, and finance. It is an integrated suite of software that effectively handles data analysis and storage, performs calculation on arrays, integrates a collection of statistical analysis tools, and operates as a general matrix calculation toolbox. They can also make use of user-created packages which allow specialized statistical techniques, graphical devices (ggplot2), import/export capabilities, reporting tools, etc.

In this workshop, the students got an overview of basic R syntax, R interface, and best programming practices. Extensive hands-on exercises given on how to clean, manipulate, export data using logic, loops and functions in R. The participants gained skills required to analyze large data sets and to develop modeling solution to support decision making.

The workshop consisted of both theory and practical sessions. No registration fees for attending the workshop. The resource persons of the workshop are Mr. Chandrashekhar Pawar and Ms. Priyal Vaghela.

to-use environment where problems and solutions are expressed in familiar mathematical notation.

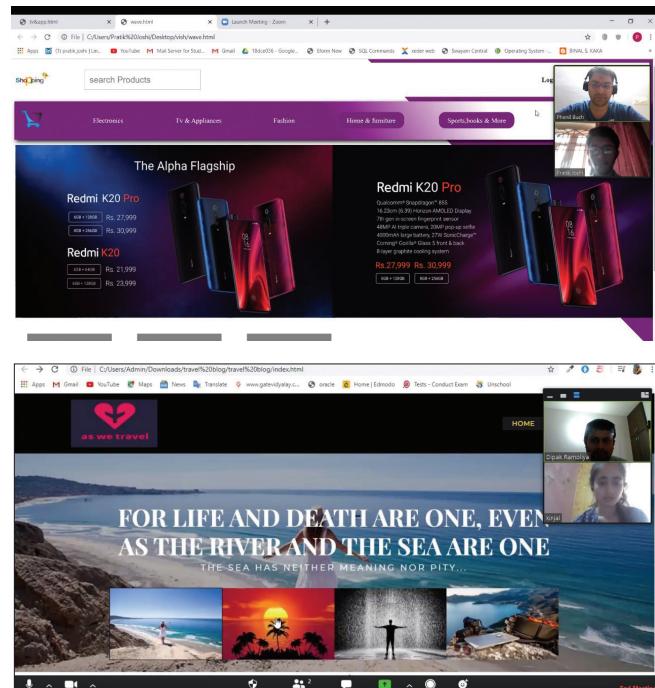
We introduced a new challenge for students to build the amazing One Page Website and host it on any Server within given time. Out of 15 most popular types of websites, students can challenge any one out of it listed below:

- Blog: A regularly updated, casual stream of content.
- Business: A place for customers or clients to find more information about a business online.
- Brochure: A simple, informational site that is particularly apt for small businesses.

- Crowdfunding: A fundraising site to help bring your ideas to life.
- Directory and contact pages: A directory or contact page is a place where users can connect with you or others.
- Ecommerce: A site that sells a product or service directly.
- Educational: A website that is made to help people learn things!
- Landing Page: A standalone web page, created specifically for a marketing or advertising campaign.
- Media or Entertainment: A site featuring regularly updated content on current events.
- Magazine: articles, photos and videos that are informational and educational
- Non-profit: A site that makes it easier for visitors to support the organization.
- Personal: A site that functions as a portfolio, a CV, or just a space for your thoughts.
- Portal: An organized presentation of information from across the web.
- Portfolio: More in-depth than a personal website!
- Product: any product like Amul etc.

The faculty members of DEPSTAR held review online through Zoom meeting or Google Meet.

Some glimpses of the Online Review are:



GMR Institute of Technology, RAJAM (Region-V)

Speakers: **Mr. Y. N. Reddy & Mr. D. Ramesh** from RINL, Visakhapatnam.

Reported by **M. Satish**, Sr. Assistant Professor, Department of CSE, GMRIT, Rajam, AP, India



(L to R) Mr. M. Satish CSI SBC, Dr. A. V. Ramana HOD-CSE, Mr. Y. N. Reddy GM Vizag Steel, Mr. D. Ramesh DGM Vizag Steel, Dr. Ajit Kumar Rout HOD-IT

6th March 2020: Guest Lecture on "Software Engineering Practices" on the eve of CSI Foundation Day

In the Guest Lecture Mr. Y. N. Reddy has discussed about Software Engineering Practices at Industry level, particularly at RINL (Rashtriya Ispat Nigam Limited, is also called as Vizag Steel), Visakhapatnam. Further he discussed about CMM Models, Software Testing.

Mr. D. Ramesh has mainly discussed about ABAP. He discussed about Introduction to ABAP, Fundamentals and building blocks of SAP ABAP Programming Language. In the end the speakers and HoDs of CSE & IT were distributed certificates to Winners of the CSI events conducted at GMRIT, Rajam in the previous year.



| A REPORT |

Webinar Sessions conducted by Student Branch

Chalapathi Institute of Engineering and Technology, Guntur

Reported by **K Kiran Kumar**, SBC, Chalapathi Institute of Engineering and Technology, Guntur

Webinar on Android App Development

A webinar on Android App Development was organized by the Department of CSE on 5th April 2020 in Association with CSI Student Branch of Chalapathi Institute of Engineering & Technology.

The session was started at 11:00 AM. The Program was hosted by Dr. K Kiran Kumar, HOD-CSE of CIET. In the first session of the event Sri. D Rajesh, Developer, Maltech Solutions Pvt Ltd, Chennai gave a lecture on basic points related to Android App Development. In the next session, he continued the lecture and gave demonstration on how to develop an app and publish in play store. He developed a small app and gave live demonstration how to deploy and run the developed app.

About 100 students participated and acquired good amount of knowledge. Entire workshop was coordinated by Dr K Kiran Kumar, HOD-CSE, CIET. We thank all the participants for making this event successful.

Webinar on Windows Desktop App Development

A Webinar on Windows Desktop App Development was organized by the Department of CSE on 6th & 7th April-2020 in Association with CSI Student Branch of Chalapathi Institute of Engineering & Technology. The session was started at 10:00 AM. The Program was hosted by Dr K Kiran Kumar, HOD-CSE of CIET. In the first day of the webinar, students are given overview of the windows apps, windows store, developer account, how to generate revenue using windows apps and the hardware and software requirements for developing an app. The complete procedure on what are the software's required and the installation procedure is shown.

Webinar on Recent Trends in Technology

Organised by Pragati Engineering College, Surampalem

Reported by **M Radhika Mani**, HOD-CSE, Pragati Engineering College, Surampalem



CSI Student Branch of Pragati Engineering College conducted a Webinar on "Recent Trends in Technology" on 18th April 2020 at 10:00 AM. The webinar was presented by Sri Nagarjun Malladi, Delivery Head-Life Sciences Vertical, Tech Mahindra, Hyderabad. The HOD of CSE Dept. Dr M Radhika Mani coordinated the event. Total of 249 students and faculty attended the webinar. The Principal of Pragati Engineering College Dr S Sambhu Prasad thanked the Resource Person for sharing his valuable thoughts in modern technological era.

Sri Nagarjun Malladi highlighted the Digital Transformation Trends in 2020 and beyond. He started the webinar with statistical presentation

The session at day two was started at 10:00 AM. The host gave a detailed live demo by developing an App from scratch. Multiplication tables is the app taken and starting from opening the software and tools needed to develop as well as the coding part needed to run the app is shown clearly. After the development of app is completed, the uploading procedure to the windows store is also shown.

About 110 students participated and acquired good amount of knowledge. Entire workshop was coordinated by Dr. K Kiran Kumar, HOD-CSE, CIET. We thank all the participants for making this event successful.

Webinar on E-Learning

A Webinar on E-Learning was organized by the department of CSE on 16th April-2020 in Association with CSI Student Branch of Chalapathi Institute of Engineering & Technology.

The session was started at 10:00 AM. The Program was hosted by Dr K Kiran Kumar, HOD-CSE of CIET. In the first session of the webinar, students are given overview of the different e-learning platforms that are available. The complete procedure how to register and how to take the course is shown. In the second session, the students were informed about the E-learning contest that is being organized by the department and how all the students can participate in the contest and win cash prizes and also described the different courses available for all branch students and how they can get benefitted in the lock down period by doing the online courses and gain knowledge.

About 454 students participated and acquired good amount of knowledge. Entire workshop was coordinated by Dr K Kiran Kumar, HOD-CSE, CIET. We thank all the participants for making this event successful.

of how the organizations across the world will contribute to global GDP by digitalization of their offerings, operations and relationships. He discussed crucial features regarding estimated potential of economic impact of technologies like Mobile Internet, Advanced Robotics, 3D Printing etc. across sized applications in 2025. He also shared his first journey on a Tesla car. He presented an interesting slide on the new future alphabetical abbreviations like A stands for Artificial Intelligence, B stands for Block Chain or Big data,etc.

He later explained the importance of self- learning by sharing great learning platforms for the students to get in-depth knowledge of the trending technologies. He shared his perspective that human beings are more powerful than machines and the technology is only up to limited extent. These lines really gave a good motivation to the students who are going to lead a new pathway to ponder about the future. Sri Nagarjun Malladi shared a significant contribution of his time for the participants, shared his knowledge and enlightened all the participants

The webinar session was followed by an interactive session with the participants where the Training and Placement officer of Pragati Engineering College Mr S Vamsi Kiran took the lead and finally thanked Sri Nagarjun Malladi for the success of the Webinar.

| A REPORT |

CSI State Student Convention for Madhya Pradesh at Symbiosis University of Applied sciences (SUAS), Indore

Reported by Neha Gupta Neema, Student Branch Coordinator

The Computer Society of India (CSI) Student Branch, Department of Computer Science & Information Technology, Symbiosis University of Applied sciences (SUAS), Indore, M.P., organised its First State Level Convention on 2nd & 3rd March 2020. Dr. Ashish Bansal, Director, CSIT, SUAS welcomed the guests and participants on behalf of CSI Student Branch, SUAS. One of the major attractions of the Inaugural ceremony, the Robot developed by SUAS students, offered bouquets to the dignitaries and joined hand with the CSI Student Branch members in welcoming the guests.

The Convention was inaugurated on 2nd March 2020 by the Chief Guest Mr. A. K. Nayak, President Computer Society of India with Dr. Sanjay Kumar, Vice Chancellor, SUAS, Mr. D. K. Mishra, National Treasurer, CSI, and Mr. Ram Kumar Pathak, Coordinator, CSI Student Branch. Technical sessions were conducted by Mr. Varoon Kapoor, ADGP, Bhopal, Mr. Sunil Sahu, CEO, Sunil Sahu Group of Companies, Mr. Pallav Bonlia, Director of Engineering, Systango, Indore, Ms.

Nisha Chauhan, Lead Trainer, iTrainU, Mr. Parag Gupta, Prosirius Technology.

A 2-day training on Ethical Hacking and Cyber Security organised during the Convention witnessed active participants from various colleges and universities. A Hackathon that commenced on 2nd March 2020 with teams belonging to various institutes in the preliminary round, concluded with presentations by all the finalists. The winners and runners up were awarded by Dr. Mamata Padole, Regional Coordinator, Student Branch, CSI, and Dr. Ashish Bansal, Director, School of CSIT, SUAS, in the Valedictory session held on 3rd March 2020.

Dr. Neha Gupta, Coordinator, CSI, Student Branch, SUAS, extended her gratitude towards the support received from CSI and Symbiosis University for conducting the CSI Convention successfully. The Vice Chancellor, SUAS, praised the CSI Student Branch members, coordinators and volunteers to organise this 2-day event with great zeal and enthusiasm.

GLIMPSES OF CSI M.P. STATE STUDENT CONVENTION 2020



Prof. A K Nayak, President, CSI while lighting the lamp along with Hon'ble Vice Chancellor and key note speaker.



The robot is presenting the momento to the dignitaries on the dias.



The e-Inauguration of the function by CSI President Prof. A K Nayak



The view of the gathering of the function

Webinar-2020 : A Report of Allahabad Chapter

Reported by Prof. Ratnesh Mishra, Chairman, CSI Allahabad Chapter

Webinar on: Impact on Indian Economy due to Pandemic Covid Economy-An Overview

The Indian economy has been experiencing significant slowdown over the past few quarters. In the third quarter of the current fiscal, the economy grew at a six-year low rate of 4.7%. The outbreak has presented fresh challenges for the Indian economy due to sudden break which have created lots of turbulence. In a way the current economy can be termed to be a pandemic economy with peace-meal policy measures undertaken allowing only bare essential sectors operational for survival such as food processing, pharmaceuticals and medical equipment. There will be muted consumption demand on account of reduced household income.

The expenditure of the Government is expected to be double in FY-2020-21 with negative consumption and investment; this implies that there will be no revenue resulting into negative GDP of -0.9%. 83.7% of informal workforce that are known to be casual labors mostly deployed in construction will lose their job as they don't have any formal contract with their employer, many of them have returned back to their villages and many are staying at 22,000 relief camps being run by central and state government agencies. During the pandemic period the entire focus is on health care sector for containment of covid-19 disease in such a populous country. The impact of this pandemic will be both on primary and tertiary sectors. Primary sectors include all those economic activities which are connected with extraction and production of natural resources for example agriculture, fishing and mining whereas tertiary sector are referred to be services sector. India is highly dependent on services and is regarded to be service economy. Sectors which are less affected are Agriculture, food, electricity, gas and water.

The sectors which will be seriously affected Tourism, Hospitality and Aviation are among the worst affected sectors that are facing the maximum brunt of the present crisis. Closing of cinema theatres and declining footfall in shopping complexes has affected the retail sector by impacting consumption of both essential and discretionary items. Consumption is also getting impacted due to job losses and decline in income levels of people particularly the daily wage earners due to slowing activity in several sectors including retail, construction, entertainment, etc. With widespread fear and panic now increasing among people, overall confidence level of consumers has dropped significantly, leading to postponement of their purchasing decisions. Travel restrictions have severely impacted the transport sector. Hotels are seeing large scale cancellations not only from leisure travelers but even business travellers as conferences, seminars and workshops are getting cancelled on a large scale.

Impact on Financial Market - Greater uncertainty about the future course and repercussion of Covid-19 has also made the financial market extremely volatile, leading to huge crashes and wealth erosion, which in turn is impacting consumption levels. An estimated ` 10 lakh crore of market cap was reportedly wiped off only due to single day fall in stock markets. The fall has continued till date as investors resorted to relentless selling amid rising cases of coronavirus. With equity markets likely to remain volatile in future as well, further wealth erosion of investors is expected. Manufacturing sectors like automobiles, pharmaceuticals, electronics, chemical products etc. are facing an imminent raw material and component shortage. This is hampering business sentiment and affecting investment and production schedules of companies. Besides having a negative impact on imports of important raw materials, the slowdown in manufacturing activity in China and other markets of Asia, Europe and the US is impacting India's exports to these countries as well. Impact on International Trade - China has been a major market for many Indian products like sea food, petrochemicals, gems and jewellery etc.

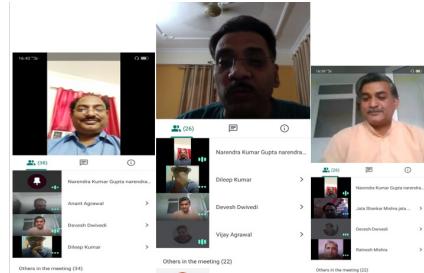
The outbreak of coronavirus has adversely impacted exports of these items to China. For instance, the fisheries sector is anticipated

to incur a loss of more than Rs 1,300 crore due to fall in exports. Similarly, India exports 36% of its diamonds to China. The cancellation of four major trade events between February and April is likely to cause an estimated loss of Rs 8,000-10,000 crore in terms of business opportunity for Jaipur alone. India also exports 34% of its petrochemicals to China. Due to exports restrictions to China, petrochemical products are expected to see a price reduction. While for some of the sectors, the work from home proposition is posing implementation challenges as it has a direct bearing on the business operations. This is particularly true for manufacturing units where workers are required to be physically present at the production sites, and services sector like banking and IT where lot of confidential data is used and remote working can enhance security threat. Hence companies operating in these sectors are finding it difficult to implement work from home facility without compromising with their day to day operations. MSMEs are likely to be severely impacted if the lockdown continues for a longer duration in wake of the Corona virus epidemic. A large number of MSMEs could incur business losses and also face severe cash flow disruption, which in all likelihood will have an adverse effect on the livelihood of several people working in this sector.

Webinar on Panel Discussion on

"Before Covid-19 and After Covid-19"

1. Prof. G P Sahu has discussed about on-line classes, Life style, hair cut, lack of money in the society, requirement of the food and rashan for poor people and unorganised business people.
2. Mr. Vijay Panedy has discussed about Work from home, How manage the industry people with respect of salary, food, monitoring of the work, manage the worker of the industries. Utilization and updating of the ERP system in your carpet industries.
3. Mr. D K Dwivedi has discussed about the cutler of the society before and after covid-19 and talked about the role of earning people for the society, because the number of peoples are requirement of food, grains.
4. Dr. Dushyant Singh discused about isolation in duration of Lockdown before Covid-19 and after covid-19.
5. Prof. Ratnesh Mishra has discussed about teaching, lifestyle of the society and unorganised business people in before and after the covid-19.
6. Mr. Raju Rathore has discussed about the industries people with respect of work culture and also discussed about the oscillate computer which can be donate to school and colleges, but Mr. Dk. Dwivediji participate in this discussion and finally outcome for donate to directly students because every where on-line classes has been started.
7. Mr. Guarav Gopal has discussed about the Industry system in before covid-19 and after covid 19.
8. Dr. Narendra Gupta has discussed about education system and society culture in before Covid-19 and after Covid-19.



STUDENT BRANCHES INAUGURATION

REPORT

ST JOSEPH'S COLLEGE OF ENGINEERING, CHENNAI (REGIONVII)



The CSI Student Branch of St Joseph's College of Engineering, was inaugurated on 25th February 2020 with the support of respected Dr. B Babu Manoharan M.A., M.B.A., Ph.D., Chairman, St. Joseph's Group of Institutions, Mrs. S Jessie Priya M.Com., Managing Director, Mr. B Shashi Sekar M.Sc., Director, Dr. Vaddi Seshagiri Rao M.E., M.B.A., Ph.D., Principal, St. Joseph's College of Engineering and Dr. B Parvatha Varthini M.B.A., M.E., Ph.D., Dean. The esteemed guest for the inauguration was Dr. B Chidambararajan, Chairman, CSI Kancheepuram Chapter. The inauguration started with the blessing of Lord Almighty through Tamilthai Vazhthu and

the dignitaries lighted the holy lamp.

The CSI student Office bearers of CSE and IT department students were introduced and the Principal felicitated the Chief Guest Dr. B Chidambararajan. The Chief Guest delivered the inaugural address.



He stressed the importance and role of the CSI student Branch for organizing professional activities. He also advised the students to enhance their technical knowledge and leadership qualities through the CSI activities. He also mentioned the benefits of professional bodies and how to make use of them. The inaugural function concluded with the vote of thanks. Dr. M Senthil Kumar, Hon. Secretary, CSI Kancheepuram Chapter also presented in the event. 100 students were participated in the inauguration. The session ended with National Anthem.

Call for Paper for CSI Journal of Computing

(e-ISSN: 2277-7091)

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

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

Prof. A K Nayak
Publisher

CHAPTER REPORT

KANCHEEPURAM CHAPTER



The Computer society of India, Kancheepuram chapter in association with the department of Computer Science and Engineering of Mohamed Sathak A J college of Engineering organized a invited Lecture on "Benefits of CSI Membership" on 20th February 2020. Dr B Muthu Kumar, HOD-CSE welcomed the guest speaker Dr M Senthil Kumar, Hon Secretary, CSI Kancheepuram Chapter for the event. Dr. K S Srinivasan, Principal, MSAJCE felicitated the Chief Guest.

The Session started with an appreciation from the speaker for their eagerness to know about the benefits of CSI and went on

with briefing the structure of the National Executive Committee members of Computer Society of India. He also gave a glimpse of the membership fee structure for both the students and life members. He also made an elaborate presentation on the benefits of CSI to the students, Institutional and life members. He clearly explained the different types of award nominations for Institution, students and faculty members in Computer Society of India.

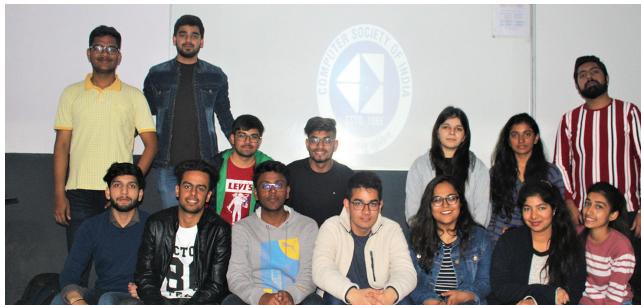
Finally, Vote of thanks was given by Ms. S Kayalvizhi, AP-CSE-CSI Student Coordinator. Totally 100 students and 20 faculty Members were benefited from this Guest Lecture. The Event was organized under the guidance of Dr. B Chidambararajan, Chairman, CSI Kancheepuram Chapter.



FROM CSI STUDENT BRANCHES

REGION-I

The NorthCap University, Gurgaon



17-2-2020 - Coding competition (Code-O-Fiesta)

REGION-III

Devang Patel Institute of Advance Technology and Research, Anand



14-3-2020 - Hands-on Workshop on Android Basics

REGION-VI

P.E.S. College of Engineering, Aurangabad



28-2-2020 - Workshop regarding awareness of National Science Day



29-2-2020 - Hand-on Workshop on Android

FROM CSI STUDENT BRANCHES

REGION-VI

Sipna College of Engineering and Technology, Amravati



14-3-2020 & 15-3-2020 - Workshop on HTML & CSS – Code the Web

REGION-VII

SRM Valliammai Engineering College, Kattankulathur



13-3-2020 - Intra College Technical Contest (Project Expo)

REGION-VII

Nandha College of Technology, Erode



15-2-2020 - Workshop on Machine Learning Using Python

Rajalakshmi Engineering College (Autonomous), Chennai



20-2-2020 - 7th Edition of Innovision - a Project Expo

REGION-VII

Marthandam College of Engineering & Technology, Marthandam



7-3-2020 - Motivational Talk

National Engineering College, Kovilpatti



13-3-2020 to 14-3-2020 - Hands-on Training Machine learning and applications using Python

Student branches are requested to send their report to

sb-activities@csi-india.org with CC to
mgsekar1962@gmail.com

Chapters are requested to send their activity report to

chapter-activities@csi-india.org with CC to
mgsekar1962@gmail.com

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

