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१४. जीवन कार्य के लिए महात्मा गांधी के विचार

राजेश यादव
सहायक प्रोफेसर, वी. के. कृष्णा मेनन कॉलेज, मुंबई, महाराष्ट्र

1. सार

गांधी को साहसी, निस्वार्थ और अहिंसक पद्धतियों के लिए महात्मा (महान आत्मा) के रूप में जाना जाने लगा, जो उनके जीने के तरीके के साथ-साथ अपने साथी नागरिकों और दुनिया की बेहतरी के लिए सुधार लाने के उनके प्रयासों की विशेषता थी। इस अध्याय में हम गांधी द्वारा प्रस्तावित सीखने के मार्ग को समझने की कोशिश कर रहे हैं । स्वदेशी, स्वराज, सत्याग्रह और सर्वोदय की गांधी की रचनात्मक दृष्टि को समझाने का प्रयास किया गया है: निर्माण करता है कि उन्होंने जीवित अर्थव्यवस्थाओं और लोकतंत्रों के निर्माण के लिए अनुकूलित किया। काम करने की मानवीय क्षमता और प्रयास की पवित्रता एक न्यायपूर्ण और निष्पक्ष समाज के साथ-साथ एक समृद्ध अर्थव्यवस्था की उनकी दृष्टि के केंद्र में थी। उनके अनुसार, अंत तक पहुंचने का साधन अंत की तरह सम्मानजनक होना चाहिए और दृढ़ विश्वास का साहस ही निर्णय को आगे बढ़ाता है।

कीवर्ड: श्रम की गरिमा, शोषण, गांधी, वैश्वीकरण, सामाजिक न्याय, सत्य,कार्य-आधारित शिक्षा

2. परिचय

"सा विद्या या विमुक्तये:" जो मुक्त करता है वह है शिक्षा (विष्णु पुराण १.१९.४१)। महात्मा गांधी एक ऐसा नाम है जिसे न केवल हर भारतीय बल्कि दुनिया के अधिकांश हिस्सों में लाखों अन्य लोग भी पहचानते हैं। गांधी दो सौ से अधिक वर्षों के ब्रिटिश उपनिवेश के खिलाफ स्वतंत्रता के लिए भारतीय संघर्ष का चेहरा थे और उन्हें राष्ट्रपिता के रूप में जाना जाता है। एक और गहरे स्तर पर, मोहनदास करमचंद गांधी हमारी सभ्यता के सक्रिय और व्यावहारिक आध्यात्मिकता के प्रमुख समर्थकों में से एक थे। गांधी के दर्शन के केंद्र में सत्याग्रह की धारणा निहित है, एक ऐसा शब्द जिसे उन्होंने दो संस्कृत शब्दों को एक साथ लाने के लिए गढ़ा था: सत्य (सत्य) और अग्रहा (आग्रह)। इसलिए सत्याग्रह का अर्थ सत्य पर जोर देना है।

सविनय अवज्ञा। दरअसल, इसी आध्यात्मिकता ने उन्हें महात्मा या महान आत्मा की उपाधि दी। इस अध्याय का उद्देश्य गांधी के शैक्षिक विचारों से लिए गए सिद्धांतों के अनुशासन की जांच करना है। प्रारंभ में ही यह कहा जाना चाहिए कि गांधीवादी दृष्टिकोण आधुनिक सभ्यता के सिद्धांतों को खारिज करता है। वास्तव में यह अस्वीकृति इतनी प्रबल थी कि गांधी आधुनिक सभ्यता को शैतान के राज्य के रूप में वर्णित करते हैं। गांधीवादी दृष्टिकोण का एक अन्य पहलू जो विशेष रूप से प्रासंगिक है, वह है

उनके कार्य और शिक्षा का विवरण। गांधी ने नई तालीम (बुनियादी शिक्षा) के विचार को समाज के अपने दृष्टिकोण के एक अभिन्न अंग के रूप में देखा। यहाँ फिर से, अध्यापन के साथ अध्यात्म का सम्मिश्रण है। यह दृष्टिकोण ज्ञान और सीखने को कार्य और प्रयास से अलग नहीं करता है। गांधी ने भारत में अंग्रेजों द्वारा शुरू की गई शिक्षा को चरित्र में बहिष्कृत और काम और ज्ञान के बीच कृत्रिम रूप से स्थापित द्वंद्व का परिणाम देखा। उन्होंने देखा कि जिन लोगों ने अपने हाथों से काम किया और धन का उत्पादन किया, उन्हें औपचारिक शिक्षा तक पहुंच से वंचित कर दिया गया, जबकि औपचारिक शिक्षा तक पहुंच वाले लोगों ने न केवल उत्पादक शारीरिक काम को बदनाम किया, बल्कि इसके लिए आवश्यक कौशल का भी अभाव था। गांधीवादी दृष्टिकोण एक शैक्षणिक जुड़ाव की मांग करता है जैसे कि काम के साथ जुड़ाव ज्ञान प्राप्ति, मूल्यों के विकास और कौशल निर्माण का माध्यम बन जाए। इस दृष्टिकोण ने उत्पादक कार्य को किताबी और सूचना-उन्मुख शिक्षा के लिए मारक के रूप में पहचाना।

3. गांधी का कार्य और जीवन के लिए सीखना

मनुष्य को काम करना चाहिए इस लेखन की विशेष प्रासंगिकता गांधी का यह दावा है कि जीने के लिए मनुष्य को काम करना चाहिए। टॉल्स्टॉय द्वारा अपनी पुस्तक द किंगडम ऑफ गॉड इज़ विदिन यू (टॉल्स्टॉय, 1894) में ब्रेड लेबर के विवरण को पढ़ने के बाद यह पहली बार उनके घर आया। गांधी ने कहा, वही सिद्धांत, भगवद गीता के तीसरे अध्याय में निर्धारित किया गया है जहां यह समझाया गया है कि जो बिना बलिदान के खाता है वह चुराया हुआ भोजन खाता है। गांधी ने बलिदान की व्याख्या रोटी श्रम से की, जब उन्होंने कहा: रोटी श्रम का अर्थशास्त्र जीवन जीने का तरीका है। इसका अर्थ है कि प्रत्येक मनुष्य को अपने भोजन और वस्त्र के लिए अपने शरीर के साथ श्रम करना पड़ता है। अगर मैं लोगों को मूल्य और रोटी श्रम की आवश्यकता के बारे में समझा सकता हूं, तो रोटी और कपड़े की कभी कोई कमी नहीं होगी। गांधी के अनुसार, यदि सभी अपनी रोटी के लिए काम करते हैं, तो पद के भेद समाप्त हो जाएंगे। अमीर तब भी होंगे, लेकिन वे खुद को केवल अपनी संपत्ति के ट्रस्टी समझेंगे, और इसका इस्तेमाल मुख्य रूप से सार्वजनिक हित में करेंगे |

जिस तरह से गांधी ने हमारे जीवन में काम के उद्देश्य पर प्रकाश डाला, वह कैरियर के विकास की धारणा के लिए प्रासंगिक है। कार्य मनुष्य का निरंतर साथी रहा है। कुछ के लिए, काम शायद आगे बढ़ने, शीर्ष पर पहुंचने, सामाजिक स्वीकृति और प्रतिष्ठा हासिल करने का एक साधन है। गांधी के (1933) के सूत्रीकरण में, कार्य आत्म-साक्षात्कार का एक साधन हो सकता है: यदि हर कोई उस कार्य के बारे में सोचता है जो वह कर रहा है, और इसलिए बुद्धिमानी से काम करता है, तो उसे सबसे अच्छी शिक्षा मिलेगी, अपने काम को दिलचस्प लगेगा, अपनी बुद्धि का विकास, विस्तार और शुद्धिकरण करेगा। उसका दिल, अपने काम में दक्षता हासिल करता है और आविष्कार और सुधार करता है जिससे दुनिया

को फायदा होगा। जैसे-जैसे काम और दिलचस्प होता जाता है, यह उसे खुशी देता है; उसे करने में कोई थकान नहीं होती है और काम कलात्मक हो जाता है |

4. काम के दर्शन के रूप में कताई चरखा या चरखा गांधी

कताई चरखा या चरखा गांधीके साथ निकटता से जुड़ा हुआ है। जब गांधी ने चरखा देखा, तो उन्हें लगा कि यह उनके विचारों का प्रतिनिधित्व करने के लिए एक शक्तिशाली प्रतीक हो सकता है। उन्होंने चरखा को मुक्ति के प्रतीक और विकास के उपकरण के रूप में इस्तेमाल किया।

गांधी द्वारा चरखे की शुरूआत और इसका क्या अर्थ था, भारत में राष्ट्रवादी आंदोलन के सबसे महत्वपूर्ण एकीकृत तत्वों में से एक था।कताई को एक आर्थिक और राजनीतिक गतिविधि के रूप में देखा जाता था जो देश की विविध आबादी को एक साथ ला सकती थी, और पूर्व में कुलीन राष्ट्रवादी आंदोलन को व्यापक भारतीय आबादी से जुड़ने की अनुमति देती थी। कताई के आधार पर काम करने का दर्शन यह है कि गांधी ने इसे सेवा के एक साधन के रूप में चित्रित किया। चरखा पर सूत कातने के प्रतीकवाद ने व्यक्ति की सबसे बुनियादी जरूरतों, अर्थात् कपड़ों के लिए आत्म-निर्भरता का प्रदर्शन किया। चरखे ने आर्थिक और आध्यात्मिक दोनों तरह से मुक्ति के मार्ग के रूप में काम पर ध्यान केंद्रित किया। गांधी का मानना था कि यदि सभी भारतीय ब्रिटिश निर्मित कपड़ा खरीदने के बजाय खादी (कपड़ा) बनाने के लिए अपनी खुद की कपास कातेंगे, तो वे आत्मनिर्भर बन सकते हैं। कताई ने काम के प्रति सम्मान को बढ़ावा दिया जैसे कि रोटी श्रम की धारणा ने गांधी द्वारा प्रचारित श्रम की गरिमा को उजागर किया।

चरखा को गांधी के शिक्षाशास्त्र में भी केंद्रीय बिंदु बनना था, क्योंकि गांधी ने महसूस किया कि सच्ची शिक्षा तभी संभव है जब सीखने से सीखना संभव हो। चरखे ने उस जुड़ाव को करके सीखने को महत्त्व प्रदान किया।

5. नई तालीम: गांधी की शिक्षा का दर्शन

समकालीन भारतीय विचारकों ने इंगित किया है कि किसी ने भी औपनिवेशिक शिक्षा को उतनी तीव्र और पूरी तरह से खारिज नहीं किया जितना गांधी ने किया था, और न ही किसी और ने उनके द्वारा प्रस्तावित कट्टरपंथी के रूप में एक विकल्प को सामने रखा | गांधी के विचार में, प्रचलित ब्रिटिश शिक्षा प्रणाली का भारतीय बच्चों को भारतीय समाज की मुख्य धारा से दूर करने का नकारात्मक प्रभाव पड़ा, इसने शारीरिक श्रम के प्रति तिरस्कार को बढ़ावा दिया और एक नए अभिजात वर्ग के विकास को बढ़ावा दिया। उनका मानना था कि सभी कामों के साथ समान व्यवहार किया जाना चाहिए। उनके अनुसार, जितना अधिक शिक्षित होगा, उतना ही अधिक व्यक्ति वास्तविक जीवन से दूर हो जाएगा क्योंकि शिक्षा का यह रूप अमूर्त बुद्धि विकसित करने पर आधारित था जो दैनिक जीवन की वास्तविकताओं के संपर्क से बाहर था। इसने औद्योगीकरण और शहरीकरण की बढ़ती समस्याओं में योगदान दिया और भारत में जीवन की वास्तविक स्थितियों से कोई संबंध नहीं था (गांधी, 1931)।

शिक्षा के पश्चिमी मॉडलों के इन अवलोकनों के आधार पर, गांधी आश्वस्त हो गए कि भारत को एक पूरी तरह से अलग रास्ते की जरूरत है, एक ऐसा रास्ता जो अपने बच्चों की शिक्षा के लिए अपनी संस्कृति में अंदर की ओर देखे। उन्होंने जोर दिया कि शिक्षा को जीवन को आकार देना चाहिए और लोगों की जरूरतों का जवाब देना चाहिए और जैसा कि उन्होंने कहा, "किसान के बेटे को बेहतर किसान बनाने में विफल होने पर यह कोई शिक्षा नहीं है" (गांधी, 1931, पृष्ठ 54)। वह चाहते थे कि उत्पादक कार्य बचपन से ही शिक्षा का एक साधन बने। यह पथप्रदर्शक था और इसका उस संस्कृति पर प्रत्यक्ष सुधारात्मक प्रभाव पड़ा जिसमें व्यावसायिक भूमिका आवंटन एक गहरी जड़ वाली जाति व्यवस्था पर आधारित थे।

6. निष्कर्ष

गांधी के जीवन की नींव जिस आधारशिला पर टिकी थी, वह सत्य के प्रति एक गहरी और अटल प्रतिबद्धता थी। यह वह सर्चलाइट थी जिसे उसने बिना किसी हिचकिचाहट के अपने आप चालू कर दिया। यद्यपि गांधी ने अपने विचारों को भारतीय पुरातनता से प्राप्त किया, उन्होंने परंपरा को अपनी व्याख्या दी और इसे व्यक्तिगत पसंद की स्वतंत्रता और आर्थिक स्वतंत्रता के आधुनिक विचारों के अनुकूल बनाने की मांग की। इसलिए भले ही हम अतीत से सीखते हैं, गांधी की तरह, हम कभी भी उससे बंधे नहीं रह सकते।एक अंतिम बिंदु जिसे निष्कर्ष में उजागर किया जाना चाहिए वह है जिस तरह से गांधी ने अपना जीवन जिया। उन्होंने अपने लिए एक मूल मार्ग तराशा और साहस और निष्ठा के साथ उस पथ पर चलते रहे। वह हमारे लिए गहन कैरियर मार्गदर्शन सिद्धांत का प्रतीक है कि अंततः, काम का आनंद उसका अपना प्रतिफल है।

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Examining the Impact of Service Quality on the Satisfaction of Health Insurance Policyholders

*Sheeba Nair**

The study aims to identify the dimensions of service quality in the health insurance business and examine the impact of various factors on the overall satisfaction of policyholders in general insurance companies. It identified five factors/dimensions of service quality in health insurance business, viz., reliability, empathy, access, responsiveness and tangibles. The study revealed that reliability, empathy, access and responsiveness have a significant and positive impact on overall satisfaction in the public and private sector general insurance companies. Tangibles has an insignificant and no positive impact on overall satisfaction in the public sector general insurance companies; and in the private sector firms, it has a significant minimal positive impact on overall satisfaction. This paper contributes to the literature on the service quality dimensions in health insurance and their impact on customer satisfaction. It could have potential practical implications for companies offering health insurance products. The management of the companies can increase their understanding of the service quality dimensions and their impact on customer satisfaction.

Introduction

India is considered to be one of the important countries in global trade of the service sector. The economic development of any nation depends on its financial system, of which the insurance sector is an important player (Bhatia and Bansal, 2018). In the financial sector of India, insurance sector has appeared as one of the most vibrant segments, particularly since the liberalization of the market in the year 2000. In the last few years, the health insurance sector has emerged as the second-largest growing sector in the non-life/general insurance industry after the motor insurance sector in India. It has emerged as a significant business for general insurance companies. There are several factors attributed to the growth of health insurance sector in India, for example, increasing awareness of health insurance, rising healthcare cost, rising disposable income, changing lifestyle and growing lifestyle-related ailments.

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Service organizations in India are facing fierce competition in the global market because of liberalization and globalization of the Indian economy (Irulappan and Roseline Bincy, 2014). According to Panda (2003), the success of a service provider depends on the high-quality relationship with customers. There is a close relationship between service quality and customer satisfaction (Parasuraman *et al.*, 1985 and 1988; and Bitner *et al.*, 1990). Many researchers have found that service quality and customer satisfaction are related to customer loyalty through repurchase intentions (Levesque and McDougall, 1996; Newman, 2001; and Caruana, 2002). Satisfaction is particularly crucial in organizations that deliver services, rather than goods (Nicholls *et al.*, 1998).

Customer satisfaction in the health insurance industry is achieved not only at the time of purchase of the policy but also at the time of claim settlement. There have been many instances where there was mis-selling of policies due to lack of knowledge of salesperson, delay in the issue of a policy document, renewal notice, and non-payment of claim amount. These instances, in turn, result in conflicts between the policyholder and the insurance company. Quality of service plays an essential role in an insurance company while designing a product and its marketing. Winning over and retaining satisfied customers by delivering quality service leads to increased revenue, lower cost, increased profitability, reduced switchover, repeated purchases to the insurance company. Therefore, in today's competitive market, service quality and customer satisfaction are imperative for the success and survival of an insurance company. It costs between five to six times more to attract a new customer than to keep an existing customer. Happy customers tell at least four others of a positive experience, whereas dissatisfied customers tell as many as twelve about a negative experience (Nagajothi, 2010).

Literature Review

Numerous studies have been undertaken by various researchers to study the concept of service quality and customer satisfaction.

Service Quality

It is difficult to evaluate service performance because of its unique features, viz, intangibility, heterogeneity, inseparability and perishability (Parasuraman *et al.*, 1985). Service quality has been considered as an elusive and abstract construct as it is difficult to define and measure (Parasuraman *et al.*, 1988; Brown and Swartz, 1989; and Carman, 1990). Parasuraman *et al.* (1988) have distinguished service quality and satisfaction. According to them, service quality is perceived as a global judgment or attitude which is related to the superiority of the service delivered, while satisfaction is related to a specific transaction. Bitner *et al.* (1990) illustrated that service quality is the customer's overall impression regarding the relative inferiority/superiority of the organization and services provided by them. Cronin and Taylor (1992) proved that service quality is an important antecedent of customer satisfaction. Anderson (1996) found that customer expectations have a strong impact on a firm's evaluation of its service quality. Spreng and Mackoy (1996) revealed that higher service quality leads to higher customer satisfaction. Angur

et al. (1999) recommended that the SERVQUAL scale is multidimensional and it can provide more analytical information due to its greater variability. Malherbe and Pearse (2003) defined service quality as being about value conformance to standards, excellence, and meeting or exceeding customers' expectations, resulting in delight. Ladhari (2008) opined that service quality is an important tool to differentiate an organization's services and it also provides a competitive edge over its competitors. Chau and Kao (2009) found that all the factors of service quality directly influence customer satisfaction.

Customer Satisfaction

Yi (1990) opined that customer satisfaction is a feeling which the customers experience following their purchase or based on the series of consumer-product interactions. Bateson (1991) developed a model of sources of customer satisfaction. According to the researcher, satisfaction results from a comparison between expected service and perceived service. Johnson and Fornell (1991) defined customer satisfaction as a customer's overall evaluation of the performance of a product or service. According to Fornell (1992), higher customer satisfaction is a key indicator of high perceived quality. Zeithaml *et al.* (1993) opined that customer satisfaction is a function of the customer's assessment of service quality, product quality and price. Rust and Oliver (1994) defined customer satisfaction as a summary of cognitive and affective reaction to service quality as the customers compare their perceptions of service quality with their expectations of service performance. Howat *et al.* (1999) revealed that an organization that deals with the customer's complaints significantly can influence customers' overall satisfaction, their perceptions of service quality and their word-of-mouth communication to other customers. In the past few years, customer satisfaction has gained new attention among the researchers as there is a leap from transaction marketing to relationship marketing (Martin *et al.*, 2002). Yi and La (2004) opined that relationship marketing is concerned with all the marketing activities directed toward establishing, developing, and maintaining successful relational exchanges. According to Kotler and Armstrong (2006), customer satisfaction depends on how well perceived service performance matches the customers' expectations. If the difference between expectations and perceptions of services is negative, the customer is dissatisfied. If the performance matches expectations, the customer is satisfied. If the performance exceeds expectations, the customer is highly satisfied. According to Zeithaml *et al.* (2008), the concept of satisfaction is influenced by five variables, viz., service quality, product quality, price, situation and personality.

Service Quality and Customer Satisfaction in Insurance

Sachdev and Verma (2004) explored the relative importance of service quality, i.e., tangibility, reliability, responsiveness, assurance and empathy, in various sectors, viz., banking, insurance, fast food and beauty salon. Gayathri *et al.* (2005) indicated a high degree of correlation between reliability, responsiveness and empathy. Assurance, empathy and reliability are the three important dimensions which affected the satisfaction levels of insurance companies. Tsoukatos and Rand (2006) utilized a path analysis to study a model to link service quality, customer satisfaction and customer loyalty. The researchers

developed a SERVQUAL type service-quality instrument for Greek insurance. Vanniarajan *et al.* (2008) identified eight service quality factors in life insurance industry, viz., customer recognition, customer confidence on employees and agents, agent's customer relationship, timely service, customer orientation, employee's skills, approach and grievance redressal, and customer comfort. Duodu and Amankwah (2011) found that reliability and responsiveness have a significant impact on customer satisfaction in the insurance industry. Upadhyaya and Badlani (2011) analyzed the effect of service quality factors (pricing, employee competence, product and service, technology, physical appearances, trust, service delivery, advertising and service management) on customer satisfaction of life insurance customers in India. Gorji and Sargolzaee (2011) studied the relationship between service quality and customer satisfaction in the public and private sector insurance industries using SERVQUAL model. Sandhu and Bala (2011) identified seven factors representing proficiency, media and presentations, physical and ethical excellence, service delivery process and purpose, security and dynamic operations, credibility and functionality to measure customers' perception towards service quality of Life Insurance Corporation of India. There is a strong and positive relationship between service quality and customer satisfaction in the automobile insurance industry (Jajaee and Sheikh, 2012; and AnanthaRaj and Huam, 2014). Dash and Gunwant (2012) revealed that intangible action involved security and reliability that are perceived as being more vital dimensions of service quality for customer satisfaction in life insurance sector. Dash and Gunwant (2012) found that appealing brochures and pamphlets, time-related promises being kept, services being provided at the promised time and employees' individual attention to customers influence the perception of overall service quality. Santhiyavalli and Karthika (2013), evaluated the service quality (reliability, responsiveness, assurance, empathy and tangibles) of selected health insurance companies in India. Al-Qudah *et al.* (2013) found that there is a significant link between seven dimensions of service quality (competence, credibility, reliability, responsiveness, assurance, tangibles and communication) and customer satisfaction in Jordan insurance companies. Rahman *et al.* (2014) showed that the customers' patronage decision is affected by the service quality dimensions such as the perceived value and corporate image (reputation of the healthcare insurance company). Manimaran (2014) observed that there is a significant indirect impact of service quality (reliability, responsiveness, knowledge and recovery and tangibles) on customer satisfaction and loyalty. Keong *et al.* (2014) pointed out the positive relationship of service quality, perceived value, corporate image, complaint behavior and role of the agent with customer satisfaction. Parthiban (2014) found a significant relationship between service quality dimensions and overall customer satisfaction in life insurance companies. Rajkumar and Kannan (2014) identified eight service quality factors, viz., employee competence, credibility, timeliness and promptness, convenience, accessibility, communication, customer orientation, and responsiveness, to analyze the policyholders' perception towards service quality of life insurance companies.

Qureshi and Bhat (2015) revealed six dimensions of service quality in life insurance, viz., assurance, personalized financial planning, tangibles, corporate image, similarity

with agent and competence. Further, their study indicated that there is a service quality shortfall, i.e., perceptions are lower than expectations in all the six service quality dimensions of the study, with personalized financial planning, followed by competence and assurance being more concerning dimensions. Bhatia and Bansal (2018) revealed five factors of service quality influencing customer satisfaction in health insurance service, viz., trustworthiness, competitiveness, add-ons, peace and coverage and customer responsiveness. Samarasinghe *et al.* (2018) showed that SERVQUAL dimensions have significant effect on the level of customer satisfaction in life insurance industry. Arun and Krishnaveni (2018) revealed that the type of policy and type of insurance company play a significant role in the satisfaction level of health insurance policyholders. Rathnayake (2019) showed that there is a positive relationship between service quality (tangibility, assurance, corporate image and competence) and customer satisfaction in the life insurance industry in Sri Lanka, whereas technology and personalized financial planning and customer satisfaction have an insignificant positive relationship.

Objective and Hypotheses Development

- To identify the factors/dimensions of service quality in the health insurance business; and
- To examine the impact of service quality factors on the overall satisfaction of health insurance policyholders in the public and private sector general insurance companies.

To address the research objective 2, the null and alternative hypotheses framed are as under:

Null Hypothesis (H_0): There is no positive impact of service quality factors on the overall satisfaction of health insurance policyholders in the public and private sector general insurance companies.

Alternative Hypothesis (H_1): There is a positive impact of service quality factors on the overall satisfaction of health insurance policyholders in the public and private sector general insurance companies.

Data and Methodology

A sample of 800 health insurance policyholders in the Greater Mumbai region, Maharashtra, India, was selected using the simple random method. Primary data was collected with the help of a structured questionnaire (see Appendix) from the public and private sector general insurance companies. The time period for the primary data collection was September, 2018 to January, 2020. Statistical tools used in the study are Factor Analysis, Structural Equation Modeling, Correlation Matrix and Regression Coefficient. The measurement model was evaluated using AMOS Software ver.21.0.

The demographic profile of the 800 health insurance policyholders of Greater Mumbai region with regard to their gender, age, educational qualification, occupation, family

monthly income and marital status is presented in Table 1. It is observed that most of the respondents are males, i.e., 59.8%. A majority of the respondents belong to the age group of 41-50 years (33.2%), followed by 31-40 years (29.4%). It is further noticed that 58.9% of the respondents have completed graduation. It is found that 56.6% respondents are in the service class and 34.1% respondents have a family monthly income of ₹50,000 to ₹100,000, followed by less than ₹50,000. A majority of the respondents are married.

Table 1: Demographic Profile of the Respondents

			Public Sector	Private Sector	Total
1.	Gender	Male	240 (60.0)	238 (59.5)	478 (59.8)
		Female	160 (40.0)	162 (40.5)	322 (40.2)
		Total	**400 (100)**	**400 (100)**	**800 (100)**
2.	Age	21-30	47 (11.8)	95 (23.8)	142 (17.8)
		31-40	104 (26.0)	131 (32.7)	235 (29.4)
		41-50	162 (40.5)	104 (26.0)	266 (33.2)
		51 and Above	87 (21.7)	70 (17.5)	157 (19.6)
		Total	**400 (100)**	**400 (100)**	**800 (100)**
3.	Educational Qualification	Upto SSC	55 (13.8)	41 (10.3)	96 (12.0)
		HSC	63 (15.7)	40 (10.0)	103 (12.9)
		Graduation	222 (55.5)	249 (62.2)	471 (58.9)
		Postgraduation	60 (15.0)	70 (17.5)	130 (16.2)
		Total	**400 (100)**	**400 (100)**	**800 (100)**
4.	Occupation	Service	229 (57.3)	224 (56.0)	453 (56.6)
		Business	62 (15.5)	61 (15.2)	123 (15.4)
		Profession	62 (15.5)	64 (16.0)	126 (15.8)
		Others	47 (11.7)	51 (12.8)	98 (12.2)
		Total	**400 (100)**	**400 (100)**	**800 (100)**
5.	Family Monthly Income (₹)	Less than 50,000	110 (27.5)	153 (38.2)	263 (32.9)
		50,000-100,000	139 (34.8)	134 (33.5)	273 (34.1)
		100,001-150,000	71 (17.7)	43 (10.8)	114 (14.3)
		150,001 and Above	80 (20.0)	70 (17.5)	150 (18.7)
		Total	**400 (100)**	**400 (100)**	**800 (100)**
6.	Marital Status	Married	344 (86.0)	280 (70.0)	624 (78.0)
		Unmarried	56 (14.0)	120 (30.0)	176 (22.0)
		Total	**400 (100)**	**400 (100)**	**800 (100)**

Note: Figures in bracket indicate percentages.

Results and Discussion

Identifying the Factors/Dimensions of Service Quality in the Health Insurance Business

Reliability Analysis

Initially, the author has adopted the dimensions of service quality SERVQUAL proposed by Parasuraman *et al.* (1988) with five dimensions to measure service quality, viz., tangibles, reliability, responsiveness, assurance and empathy with modifications to go with the present study. Three items defined tangibles; five items explained reliability; five items explained responsiveness; three items represented assurance and five items explained empathy (Nair, 2020). For each item, a difference score '*G*' is calculated ($G = P - E$), where *P* and *E* correspond to Perceptions and Expectations ratings for each statement (Parasuraman *et al.*, 1988).

As per Nunnally's (1978) recommendations, the coefficient alpha values should be >0.70. The overall coefficient alpha value for the statements is 0.926 (Table 2).

Table 2: Reliability Statistics

Cronbach's Alpha	*N* of Items
0.926	21

As per Table 3, the value of Kaiser-Meyer-Olkin (KMO), which is a measure of sample adequacy, is found to be 0.893. KMO value 0.60 is suggested as the minimum value for good factor analysis. The result of Bartlett Test of Sphericity shows that it is highly significant (*p*-value = 0.000) with an approximate Chi-Square of 3,196.415 with 210 degree of freedom. The result of Exploratory Factor Analysis (EFA) also shows five factors/dimensions of service quality (Nair, 2020). But after the factor analysis, statements related to Reliability and Tangible factors retained all the original statements in their respective factors, but the statements related to factors, viz., Responsiveness, Assurance and Empathy, in the questionnaire broke into various factors. The factors have been accordingly renamed based on the common characteristics the statements shared. The results of EFA of service quality of health insurance are summarized in Table 4.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.893
Bartlett's Test of Sphericity	Approx. Chi-Square	3,196.415
	df	210
	Sig.	0.000

Confirmatory Factor Analysis (CFA)

After EFA, CFA was performed to assess the uni-dimensionality, reliability, and validity of health insurance service quality measures. CFA was performed on the measurement

model comprising five factors, which are Reliability (R), Empathy (E), Access (A), Responsiveness (RE) and Tangibles (T). The measurement model was evaluated by using AMOS Software ver.21.0. Table 5 provides the summarized results of the CFA. The results show that chi square statistics (χ^2 = 809.235, df =182) was significant at $p < 0.01$, indicating that fit of data to the model was good and should be accepted.

Table 4: Results of Exploratory Factor Analysis

Dimensions	Cronbach's Alpha	Items	Factor Loadings	Eigen values	Percent Cumulative Variance
Factor 1: Reliability: Ability to perform the promised service dependably and accurately	0.854	The insurance company delivers the services on time (timely settlement of claim) (R4)	0.739	8.528	40.607
		When the insurance company promises to do something by a certain time, they do so (R1)	0.717		
		The services of the insurance company are performed correctly right at the first time (R3)	0.702		
		Customers have a problem; Excellent insurance companies show sincere interest in solving it (R2)	0.642		
		The insurance company insists on error-free records (R5)	0.588		
		Customers of the insurance company feel safe in all their transactions (A1)	0.580		
		Tells customers when exactly the services will be performed (RE1)	0.516		

Table 4 (Cont.)

Dimensions	Cronbach's Alpha	Items	Factor Loadings	Eigen values	Percent Cumulative Variance
Factor 2: Empathy: Caring, individualized attention the firm provides to the customers	0.837	Employees/Agents of the insurance company give their customers personal attention (E1)	0.778	1.593	48.194
		The insurance company has the customer's best interest at heart (E2)	0.701		
		Employees/Agents of the insurance company understand the specific needs of their customers. (E3)	0.628		
		Easy to approach the staff of the insurance company (A3)	0.484		
Factor 3: Access: Easy accessibility and simplified procedure	0.792	Easy online access (E4)	0.732	1.333	54.539
		The insurance company has got simplified formalities for transactions (RE3)	0.693		
		Easy telephone access (E5)	0.523		
Factor 4: Responsiveness: Willingness to help customers and provide prompt service	0.756	Willingness of the employees/agents to help customers (RE4)	0.815	1.220	60.350
		Employees/Agents of the insurance company give prompt service (RE2)	0.736		

Table 4 (Cont.)

Dimensions	Cronbach's Alpha	Items	Factor Loadings	Eigen Values	Percent Cumulative Variance
		Employees/Agents are never too busy to respond to customers' request (RE5)	0.556		
		Employees/Agents have the knowledge to answer customers' questions (A2)	0.468		
Factor 5: Tangibles: Physical facilities and communication material	0.770	Convenient location of the branch office (T3)	0.848	1.002	65.121
		Materials associated with service, i.e., clarity of policy statements (T2)	0.814		
		Visually appealing materials (e.g., brochures) (T1)	0.615		

Note: Extraction Method: Principal Component Analysis (PCA); Rotation Method: Varimax with Kaiser Normalization

Table 5: Goodness of Fit and SME Fit Convention Indices

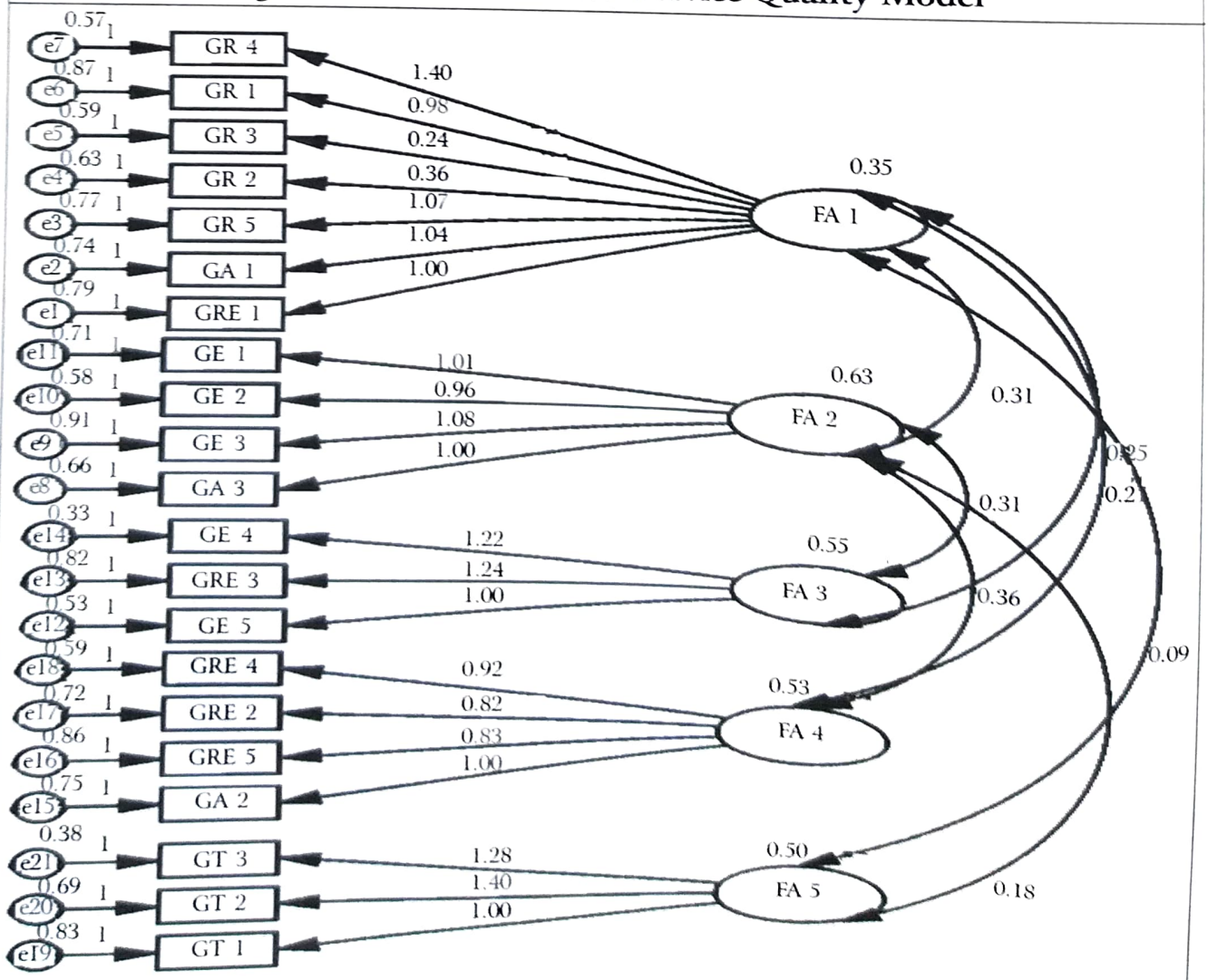
A. Default Model (for Goodness of Fit)			
	Calculated	**Critical/Table/Expected**	**Result**
Pearson chi-square value	809.235	229.30	significant
Degree of freedom	182	–	–
p-value	0.000	Less than 0.01	significant
B. SME Fit Convention Indices			
CMIN			
CMIN/DF	4.446	Less than 5	Tolerable
p-value	0.046	Greater than 0.05	Insignificant (close)
RMR, GFI			
GFI	0.904	Greater than 0.9	Tolerable
AGFI	0.915	Greater than 0.9	Tolerable
PGFI	0.9005	Greater than 0.9	Tolerable

Table 5 (Cont.)

	Calculated	Critical/Table/Expected	Result
Base Line Comparison			
CFI	0.899	Greater than 0.9	Tolerable but not exact
Parsimony-Adjusted Measures			
PCFI	0.872	Greater than 0.9	Tolerable but not exact
RMSEA			
RMSEA	0.064	Less than 0.7	Tolerable
PC CLOSE	0.032	Greater than 0.05	Insignificant (close)

Thus, service quality dimensions: reliability, empathy, access, responsiveness and tangibles together form a good model fit in this study which is presented in Figure 1.

Figure 1: Health Insurance Service Quality Model



This model supports our study and shows the service quality dimensions were key antecedents to the health insurance service quality of general insurance companies. Service quality dimensions—reliability, empathy, access, responsiveness and tangibles produced significant results.

The factors/dimensions of service quality in health insurance business identified in the EFA have been confirmed by using CFA and are summarized in Table 6.

Table 6: Factors/Dimensions of Service Quality of Health Insurance, Cronbach's Alpha, Factor Load, Eigenvalue and Percentage of Variance

S. No.	Factors/ Dimensions	Number of Items	Cronbach's Alpha	Factor Load	Eigen value	Percentage of Variance
1.	Reliability	7	0.854	4.484	8.528	40.607
2.	Empathy	4	0.837	2.591	1.593	7.586
3.	Access	3	0.792	1.948	1.333	6.346
4.	Responsiveness	4	0.756	2.575	1.220	5.810
5.	Tangibles	3	0.770	2.277	1.002	4.772

Impact of Service Quality Factors on the Overall Satisfaction of Health Insurance Policyholders

To study the impact of service quality factors/dimensions (reliability, empathy, access, responsiveness and tangibles) on the overall satisfaction of health insurance policyholders, the author has used Pearson correlation and regression coefficient analysis. Overall satisfaction with the services of the insurance company was considered as dependent variable and service quality factors (reliability, empathy, access, responsiveness and tangibles) as independent variables.

Correlation Analysis

A Pearson's correlation analysis was performed to check the relationship between all service quality factors and overall satisfaction with the service of the insurance company in the public and private sectors.

In the case of public sector general insurance companies, all the four dimensions of service quality (reliability, empathy, access and responsiveness) and overall satisfaction have a significant positive relationship (0.366, 0.467, 0.372 and 0.425). In contrast, tangibles service quality dimension has a significantly low degree positive (0.087) relationship with overall satisfaction.

In the case of the private sector general insurance companies, all the four dimensions of service quality (reliability, empathy, access and responsiveness) and overall satisfaction have a significant positive relationship (0.284, 0.364, 0.361 and 0.435). In contrast, tangibles service quality dimension has a significantly low degree positive (0.167) relationship with overall satisfaction.

Multiple Regression Analysis

Multiple regression analysis was done to examine the impact of service quality dimensions on the overall satisfaction of health insurance policyholders. It is a constructive statistical technique that can be used to analyze the association between a single dependent and several independent variables (Hair *et al.*, 1998). Based on this method, the five main independent variables (service quality dimensions) and dependent variable (overall satisfaction of health insurance policyholders) were entered together. The details of the regression output are shown in Tables 7 and 8.

Table 7: Regression Coefficient Output of Public Sector General Insurance Companies

Factors/ Dimensions	R^2	Adjusted R^2	F	Unstandardized Coefficients	Standardized Coefficients	t (df = 399)	Sig. p-value
				B	Beta (β)		
Reliability	0.134	0.132	61.619	0.354	0.366	7.850	0.000
Empathy	0.219	0.217	111.294	0.386	0.467	10.550	0.000
Access	0.138	0.136	63.751	0.317	0.372	7.984	0.000
Responsiveness	0.181	0.179	87.951	0.390	0.425	9.378	0.000
Tangibles	0.008	0.005	3.032	0.078	0.087	1.741	0.082

Table 8: Regression Coefficient Output of Private Sector General Insurance Companies

Factors/ Dimensions	R^2	Adjusted R^2	F	Unstandardized Coefficients	Standardized Coefficients	t (df = 399)	Sig. p-Value
				B	Beta (β)		
Reliability	0.081	0.079	35.016	0.309	0.284	5.917	0.000
Empathy	0.133	0.130	60.835	0.318	0.364	7.800	0.000
Access	0.130	0.128	59.515	0.325	0.361	7.715	0.000
Responsiveness	0.190	0.188	93.149	0.454	0.435	9.651	0.000
Tangibles	0.028	0.025	11.349	0.146	0.167	3.369	0.001

Table 7 shows that in the public sector general insurance companies, reliability ($R^2 = 0.134$; $F = 61.619$; $\beta = 0.366$, $p < 0.01$); empathy ($R^2 = 0.219$; $F = 111.294$; $\beta = 0.467$, $p < 0.01$); access ($R^2 = 0.138$; $F = 63.751$; $\beta = 0.372$, $p < 0.01$) and responsiveness ($R^2 = 0.181$; $F = 87.951$; $\beta = 0.425$, $p < 0.01$) have a significant and positive impact on overall satisfaction. Moreover, it also depicts that the model explains (reliability-13.4%; empathy-21.9%; access-13.8%; and responsiveness-18.1%) of the variance in the overall satisfaction of health insurance policyholders.

Whereas, tangibles (R^2 =0.008; F=3.032; β = 0.087, $p > 0.01$;) has an insignificant and no positive impact on the overall satisfaction and it also depicts that the model explains only 0.8% of the variance in the overall satisfaction of health insurance policyholders.

Table 8 shows that in the private sector general insurance companies, Reliability (R^2 = 0.081; F = 35.016; β = 0.284, $p < 0.01$); Empathy (R^2 = 0.133; F = 60.835; β = 0.364, $p < 0.01$); Access (R^2 =0.130; F=59.515; β = 0.361, $p < 0.01$) and Responsiveness (R^2 = 0.190; F = 93.149; β = 0.435, $p<0.01$) have a significant and positive impact on overall satisfaction. Moreover, it also depicts that the model explains (reliability-8.1%; empathy-13.3%; access-13.0%; and responsiveness-19.0%) of the variance in the overall satisfaction of health insurance policyholders. Whereas, tangibles (R^2 = 0.028; F =11.349; β = 0.167, $p < 0.01$) has a significant minimal positive impact on the overall satisfaction and it also depicts that the model explains 2.8% of the variance in the overall satisfaction of health insurance policyholders.

Based on the values, empathy has the highest impact on the overall satisfaction of health insurance policyholders in the public sector general insurance companies and responsiveness has the highest impact on the overall satisfaction of health insurance policyholders in the private sector general insurance companies.

From Table 9, it is observed that:

- For public sector general insurance companies, in the case of all the factors of service quality, except tangible factor, the difference is significant, which indicates

Table 9: Summary of Hypothesis Testing

Service Quality Factors	General Insurance Companies	Null Hypothesis Accepted or Rejected	Difference	Impact
Reliability	Public Sector	Rejected	Significant	Positive Impact
	Private Sector	Rejected	Significant	Positive Impact
Empathy	Public Sector	Rejected	Significant	Positive Impact
	Private Sector	Rejected	Significant	Positive Impact
Access	Public Sector	Rejected	Significant	Positive Impact
	Private Sector	Rejected	Significant	Positive Impact
Responsiveness	Public Sector	Rejected	Significant	Positive Impact
	Private Sector	Rejected	Significant	Positive Impact
Tangibles	Public Sector	Accepted	Insignificant	No Positive Impact
	Private Sector	Rejected	Significant	Minimal Positive Impact

that there is a positive impact of service quality on the overall satisfaction of health insurance policyholders. In the case of tangible factor, there is an insignificant and no positive impact of service quality on the overall satisfaction of health insurance policyholders.

- For private sector general insurance companies, in the case of all the factors of service quality, the difference is significant, which indicates that there is a positive impact of service quality on the overall satisfaction of health insurance policyholders. In the case of the tangible factor, there is a significant positive impact, but that impact is minimal.

Conclusion

In today's competitive business environment, service quality plays a very crucial role in the success of a business. Service quality is a useful tool to ensure customer satisfaction and customer loyalty. An insurance company can maintain a long-term relationship with the customer if the customer is satisfied with the quality of services delivered by the company. The initial 21 attributes of SERVQUAL scale developed by Parasuraman *et al.* (1988) were used in this study with modifications. EFA and CFA identified five factors/dimensions of service quality in health insurance business, i.e., reliability, empathy, access, responsiveness and tangibles. This study also aimed to examine the impact of service quality factors on the overall satisfaction of health insurance policyholders in the public and private sector general insurance companies. The study revealed that in the public sector and private sector general insurance companies, the following factors/dimensions of service quality, namely, reliability, empathy, access and responsiveness, have a significant and positive impact on the overall satisfaction of health insurance policyholders. Whereas tangibles factor/dimension of service quality has an insignificant and no positive impact on the overall satisfaction of health insurance policyholders in the public sector general insurance companies, and tangibles factor/dimension of service quality has a significant minimal positive impact on the overall satisfaction of health insurance policyholders in the private sector general insurance companies. It can be stated that convenient location of the branch office and visually appealing brochures and materials associated with service do not have much impact on the overall satisfaction of health insurance policyholders of general insurance companies of both the sectors. Further, it was found that empathy and responsiveness have the highest impact on the overall satisfaction of health insurance policyholders in the public and private sector general insurance companies, respectively.

Managerial Implication: This study has some practical implications. The management of general insurance companies providing health insurance services can use the results of this study to increase their understanding of the service quality dimensions. The insurance companies can work on these service quality dimensions for improving the quality of their services to satisfy the customers. The results of the study can also be used to increase their understanding of which service quality dimension has the highest

impact on the overall satisfaction of health insurance policyholders. Service quality dimensions reliability, empathy, access and responsiveness and overall satisfaction have a significant positive relationship with each other. To satisfy and retain a customer, the insurance companies should consider these service quality dimensions while preparing their business strategies. This will give them a competitive edge.

Limitations and Future Scope: Firstly, this study was carried out mainly in Greater Mumbai, therefore, the results obtained may not be significant to the country as a whole. The study can be extended to other states of India to have a better generalization of the findings. Secondly, in the current study, only five factors/dimensions of health insurance service quality are identified. There may be other factors that affect the health insurance service quality, and future research may focus on them. Moreover, the impact of service quality variables on customer satisfaction and customer loyalty has not been studied. In future, research can be undertaken to study the mediating effect of customer satisfaction on service quality and customer loyalty. ✪

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Appendix 1

Questionnaire

A Study on Customer Satisfaction of Health Insurance Policyholders

1. **Gender:**

   ☐ Male ☐ Female

2. **Age:**

   ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51 and Above

3. **Educational Qualification:**

   ☐ Up to SSC ☐ HSC ☐ Graduation ☐ Postgraduation

4. **Occupation:**

   ☐ Service ☐ Business ☐ Profession ☐ Others

5. **Family Monthly Income (₹):**

   ☐ Less than 50,000 ☐ 50,001-100,000

   ☐ 100,001-150,000 ☐ 150,001 and above

6. **Marital Status:**

   ☐ Married ☐ Unmarried

7. Name of your Health Insurance Company: _____

8. What is the type of your Insurance Company?

   ☐ Public Sector ☐ Private Sector

9. Please tick (√)) your response to each of the statement regarding your EXPECTATIONS (the level of service you expect to receive) and PERCEPTIONS (actual service performance received) of your insurance company (SD-Strongly Disagree, D-Disagree, N-Neither Agree nor Disagree, A-Agree and SA-Strongly Agree).

Expectation (E)						Statements	Perception (P)				
	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
						Tangibles (T)					
1.						Visually appealing materials (e.g., Brochures) (T1)					
2.						Materials associated with service, i.e., clarity of policy statements (T2)					
3.						Convenient location of the branch office (T3)					
						Reliability (R)					
4.						When the insurance company promises to do something by a certain time, they do so (R1)					
5.						Customers have a problem; excellent insurance company shows sincere interest in solving it (R2)					
6.						The services of the insurance company are performed correctly right at the first time (R3)					
7.						The insurance company delivers the serviceson time (timely settlement of claim) (R4)					
8.						The insurance company insists on error-free records (R5)					
						Responsiveness (RE)					
9.						Tells customers when exactly the services will be performed (RE1)					

Appendix 1 (Cont.)

Expectation (E)						Statements	Perception (P)				
	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
10.						Employees/agents of the insurance company give prompt service (RE2)					
11.						Your insurance company has got simplified formalities for transactions (RE3)					
12.						Willingness of employees/agents to help customers (RE4)					
13.						Employees/agents are never too busy to respond to customers' request (RE5)					
						Assurance (A)					
14.						Customers of the insurance company feel safe in all their transactions (A1)					
15.						Employees/agents have the knowledge to answer customers' question (A2)					
16.						Easy to approach the staff of the insurance company (A3)					
						Empathy (E)					
17.						Employees/agents of the insurance company give their customers personal attention (E1)					
18.						The insurance company has customers' best interest at heart (E2)					
19.						Employees/agents of the insurance company understand the specific needs of their customers (E3)					
20.						Easy online access (E4)					
21.						Easy telephone access (E5)					

10. How is your overall satisfaction with the services of your insurance company?

☐ Highly Satisfied ☐ Satisfied ☐ Neither

☐ Dissatisfied ☐ Highly Dissatisfied

Appendix 2

This appendix is aligned with the factors and items/statements as listed in the order they appear in Figure 1.

Short Form Used	Statement/Item	Factor
GR4	The insurance company delivers the services on time (timely settlement of claim)	Factor 1
GR1	When the insurance company promises to do something by a certain time, they do so	
GR3	The services of the insurance company are performed correctly right at the first time	
GR2	Customers have a problem; excellent insurance company shows sincere interest in solving it	
GR5	The insurance company insists on error-free records	
GA1	Customers of the insurance company feel safe in all their transactions	
GRE1	Tells customers when exactly the services will be performed	
GE1	Employees/agents of the insurance company give their customers personal attention	Factor 2
GE2	The insurance company has customers' best interest at heart	
GE3	Employees/agents of the insurance company understand the specific needs of their customers	
GA3	Easy to approach the staff of the insurance company	
GE4	Easy online access	Factor 3
GRE3	Your insurance company has got simplified formalities for transactions	
GE5	Easy telephone access	
GRE4	Willingness of employees/agents to help customers	Factor 4
GRE2	Employees/agent of the insurance company give prompt service	
GRE5	Employees/agents are never too busy to respond to customers' request	
GA2	Employees/agents have the knowledge to answer customers' questions	
GT3	Convenient location of the branch office	Factor 5
GT2	Materials associated with service, i.e., clarity of policy statements	
GT1	Visually appealing materials (e.g., Brochures)	

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Agree- Culture: Eventual Fate of Precision Agriculture in India Utilizing Machine Learning and Artificial Intelligence

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Abstract• The adjuslmenls in climate and atmosphere conditions have consistently innuenccd crop development, cultivating and creature reproducing. A measure set up in some cases comes up short. Data and intellectual advances arc inventive strategics that can be utilized to battle these progressions by applying "precision agricullurc". In this paper, convcrsalion is on eventual fate of precision 11gricuJturc which has been demonstrated to work in different nulions utilizing Al and computerized reasoning. The extent of use is engaged on medium and huge scope farmers with a plan to bring up the preferences and drawbacks of the procedures. Beforehand there has !>ten a moderate development in this part yet from the year 2016 onwards many new businesses have !>ten rising which are yielding high ventures. These intellectual innovations have been applied in cutting edge nations and have come about in expanded yield, development In GOP, low death rates and Improved expectations for everyday comforts. The equivalent can be applied locally to help creation in the rural segment.

Keywords: Agriculture, Machine Learning, Artificial lntelUgence, Al advancements

I. INTRODUCTION

Agriculture in India is the significant wellspring of employment for 66% of the whole populace India, Service and private part represem the rest. Fam1ing area involves roughly43% of India's topographical land spread. In the previous days, India was 10a great extent subordinate upon food impons however throughout the years through research, the nation has accomplished independence in grain and seed creation. Coordinated endeavors have been made to act natıra lly adequate in the food creaiion and this under1aking has lead to the amulgcmen1 of the Green Revolution. ·111rough the green upset the accompanying accomplishments have been acquired:

- Acquiring more land for cullivation-development.
- Expansion of wuter system plans.
- Adoption of cutting edge high-yielding seeds.
- Application of belier water board strategies.
- Plant insurance exercises through reasonable utilization of composts, pesticides and yield applications.

111e above accomplishments thusly have prompted a great ascend in wheat and rice creation. Thinking about the quantum rise, a national Pulse Development Program 1ha1 secured right around 13 states was set up in 1986 with the intend to present the improved advancements for farmers. Across the country Technology 1eam was divulged in 1986 after the accomplishment of National Pulse Development Program 10 improve the oil and seeds area in India's frugali1y. Pulses too went under this program. This pauem has proceeded tiJI date and enhancements have been seen ceaselessly. As per Precision cultivating or accuracy horticulture alludes to playing out the proper thing, in the correct way, in the ideal spot and at the perfect time. Exactness cultivating is implied to coordinate ruraJ practices according to agro-climatic conditions so as to build the exactness of utilization. Over the most recent 40 years cultivating land has contracted a little however the number of farmers had quite recently multiplied. According to Agricultural Registration of 20 I0-1 l, the all out number of

operational property (singular farmers) was assessed a,; 139.36 million and the all oul worked zone was 158.59 million hectare. The normal size of holding had been a.,;sessed to be 1.25 hectare. It essentially implied that one farmer was having 1.25 hectare of land to develop the yields. This implies there is a tremendous degree 10 make a harmony between 1he accessible ground,; versus the land under development To make this suitable, accuracy fanning offers an open door advenrure into this son ofcultivating for its supportability.

0.M.ETHODOLOGY

The methodology of research focuses on the recent 1echnologies that can be leveraged in order 10 provide reasonable option forcurren1 techniques in agricullure.

The study is isolated into 3 area,;

I] Area I arrangements with Al and accuracy agriculture:-

A) Al in1ellecrual innovation.

B) Effect of PrecisionAgricullure.

C) AJ advancemenL for exactnesscullivating.

2] Area 2 arrangements with results and end :-

A) Indian Agriculture and extension for artificial in.„ighl

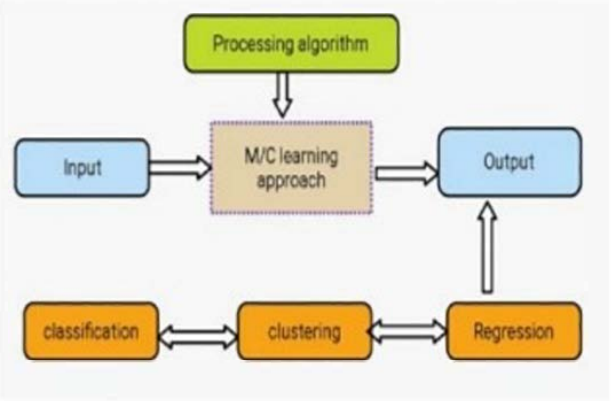
B) Difficultie. of Al inAgricullural Sector in India.

3] Area 3 arrangements with conclusion and fuiure scope.

1] Areal:Arrangements

A. AI intellectual innovation

Machine Learning is the part of coun1erfei1 knowledge and software engineering which manages the formation of calculation.,; that show self-learning propeny. With the guide of Artificial In1elligence, precise and productive frameworks equipped for a. sessing are created 10 illuminate the everyday errand,;. Researchers can utilize compmerized recreations 10 lead early yie.ld 1ests 10 a. sess how a specific assonmen1 may perform when confronted with various sub atmospheres, soil 1ypes. climate designs and different variables. This computerized 1es1ing doesn't supplant physical field preliminaries; however permits plant reproducers all the more precisely foresee the execution of yieJds.



Fi,:. 1 Machint! lurnin,:, approach proeusin,: ror dnlu

Data about the yield a.„sonmen1 10 be tried is utilized as input and gone through an AJ approach that di reeled or unaided, for example, convolution neural network (CNN), Baye.<;ian system, bolster vector machine and so on. The methodology investigations the contribution Loextricate the applicable highlight and data identified with the difficuh subject. In light of the factors and capacities *set,* the preparing calct ation playing out the information examination and gives a possible yield that is grouped, or relapsed.

B. Effect of Precision Agriculture

Applying psychological advancements in agribusiness could help in deciding the best yi.eld decision for various climatic conditions and more qualified 10 farmers' needs. This can be accomplished by investigating and looking al dala about seeds rypes, climate, kinds of soil, perva.„;ions in a certain territory, likelihood of maladies and information about what worked grea1es1, s1ep by step results, current market pauems, costs also, buyer needs. Farmers would then be able 10 senle on choices on s1ep by s1ep instructions 10 expand return on crops.

The pace at which theAJ innovation is getting created no doubt that the cultivating business is on the cusp of a mechanical upheaval under artificial knowledge as its main 1luus1.

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C. AI advancements for exactness cultivating

i. Automatons and unmanned ethereal vehicles

Unmanned ethereal vehicles (UAV) catch pictures and gather information about a specific scene. The utilization of UAV prompts low cost of activity and wide natural observing. Giving better approaches for expanding crop yields through in-profundity examination, significant distance crop showering and high-effectiveness will upgrade the degree of profitability. Advancements in drones are rapidly picking up trust among farmers. Pragmatic applications for drone innovation are continually progressing in this manner almost certainly, drone- fueled arrangements will be on the step throughout the following not many a long time.

ii. Talk bots for ranchers/farmers

Talk bots are conversational menial helper which mechanizes collaborations with end clients. In horticulture talk bots are utilized for correspondence between farmers, government partners, producers and markets. While still in its early days visit bots were utilized for the most part by retail, travel, media or on the other hand protection offices. Agribusiness could likewise use this developing innovation by helping farmers with answers to their inquiries, offering guidance and proposals on explicit homestead issues. The inventive mode will give opportune and intelligent checking of the harvests remotely.

iii. Driverless Tractors

Mechanical agribusiness is a foreseen future yet to be completely actualized in the following 10-15 years. Driverless tractors play out all the ranch rehearses self-rulingly. They are fixed with sensors that can play out the necessary practices, screen deterrents and comprehend where to apply the homestead inputs.

Driverless vehicle innovation has been the adjustment over a wide cluster of innovative firms. Farming is presently consolidating off-rack advancements, for example, Global Positioning System (GPS) frameworks, radars and sensors. This advancement in programming and apparatus are making new roads of venturesome cultivating and ranchers will lessen pressures on an AI.

2] Area 2 arrangements

A. Indian Agriculture and Extension for Artificial insight

The sole driver and advancement of AI and its psychological suggestions across enterprises, has not been simply to lessen manual exercises altogether, however dynamically and precisely foresee for future results. Agriculture in the decade ago has been constrained by entrance of innovation driven business, the beginning of AI has permitted a chance to illuminate difficulties like environmental change and a worldwide temperature alteration. This achievement has assisted with adapting up to the expanding measure of multifaceted nature in present day cultivating. Farm Analytics driven by the intellectual capacity of neural systems to run through huge datasets, has gotten one of the high drive for effectiveness and research driven applications.. While the improvement of AI calculations can be a difficult assignment in an agrarian setting, the approach of huge information and area explicit AI apparatuses identified with the area can increment farming yields. The eventual fate of AI in cultivating is progressively significant for a nation like India, where over 64% of everyone is as yet utilizing direct farming while near 75% despite everything depends on the division for their occupation. In contrast to the west, India's horticultural issues can't be managed simply progressed agritech arrangements like plant rearing and yield duplication as cultivating despite everything remains to a great extent dissipated and chaotic.

B. Difficulties of AI in Agricultural Sector in India

In spite of the fact that the utilization of AI is promising with regards to cultivating, the advancement of AI calculations can be testing in farming setting. The underlying and major square requires huge pieces of information, clean information to productively prepare the calculations with noteworthy measure of spatial information in agribusiness. A more prominent measure of adequate information is for the most part accessible during the developing season which is once, making research cycles constrained. For India specifically, non-accessibility of information from remote regions and

farmlands that don't meet least hectare measures during studies are regularly forgotten about, given the dominant part of our farmlands despite everything stay divided, a mass paper or on the other hand all encompassing information assortment might be very aspiring.

With the regularly changing climatic conditions, there are eccentric climate conditions in the dirt surface. The exceptional appearance of vermin and sicknesses remains obscure even with enough assurance gauges set up.

Farmers and cultivators may feel made sure about from all collect and get ready for a guard gather however the vulnerabilities of nature are consistently in pausing What may happen with a similar seed and compost in the US may not be relevant in India. A couple of variables that could influence the change would commonly incorporate the estimation of downpour per unit of a yield planted, soil types, examples of oil corruption, light hours, temperature and so forward. To address the issue of cultivators' interests; the issue is no two conditions will be actually similar, which makes the testing, approval and fruitful rollout of such advancements substantially more relentless than generally other enterprises.

III. CONCLUSION AND FUTURE SCOPE

Precision agriculture still remains a wishful concept in many developing countries. It is possible to achieve the above vision in India in order to improve the food security and per capita income of the farmers. The above mentioned challenges and promising solutions are prediction of future landscape of the Indian agriculture. Technological advancements and government initiatives to foster and promote precision agriculture through aids, reliefs, tax holidays and other incentives to farmers will greatly attract investment. This move will thus help deliberate efforts to protect the growth and sustainability of future generations yet to come.

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T TO E: A PATHWAY FROM INTERNET OF THINGS TO INTERNET OF EVERYTHING

Mr.Rajesh Yadav,
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ABSTRACT

The use of internet has great effect or we can say utmost impact in our lives.There is a huge dependency on it in such a way that little things we use in our daily lives now a days has become a broad part of communication and this led everyone to move into a new era of Internet of Things (IoT). In my paper , there is discussion about the transition phase from Internet of Things (IoT) to Internet of Everything (IoE). This transition is not an instant process there is a gradual change to achieve this. Also there is need of this transition to make human lives comfortable . But this can be made possible only by adaption of technologies. Now a days , IoT and IoE are the talk of the town in the interconnection networking community. Here in this paper I have made an attempt to show the progress from IoT and to IoE ,the need of IoE over IoT,similarities, the differences between both the technologies,pillars of IoT and IoE,Future of IoE,Examples.The aim of this paper is to present a complete overview of IoE in context to todays world.

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Contents

VICKS: A study on distributed Virtual Cloud Key Storage Technologies

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ABSTRACT

Cloud computing is the arising technology. Cloud computing gives simple access and high execution processing on the information .Another significant challenge that today programming organizations face is capacity of information at moderate expense and making it accessible constantly. This paper provides the study on prologue / introduction to distributed storage and virtual storage engineering.

Keywords: *Virtual Storage, Cloud, Technologies, Deployment Models.*

----------*****----------

1. INTRODUCTION:-

Every day, the utilization of information in the PC has been expanding from average person to association. The enquiry emerges where to store the significant information, how to share the information, how to access the information all around the world, how to deal with the information, how to make information accessible constantly, how will every one of these be accomplished with sensible expense? The response to this load of inquiries is cloud processing. NIST characterizes Cloud processing as a model for empowering omnipresent, helpful, on-request network admittance to a common pool of configurable processing assets that can be quickly provisioned and delivered with negligible/no administration exertion or specialist organization connection.

2. ADVANTAGES OF CLOUD COMPUTING:

The components that make more organizations to move cloud are

- Access to the application should be possible whenever, anyplace given that they ought to be associated with the web.
- Scalable.
- Improves Flexibility.
- Disaster Recovery.
- As the administrations depend on "Pay per use", capital consumption can be decreased.
- User Friendly Environment.
- Quick Deployment.
- Less Energy Consumption.
- Reduces the maintenance cost like no need of authorized software expense for every framework, the acquisition of new equipment and programming is decreased.

3. CLOUD AS A SERVICE

The services of the cloud can be arranged into the three classes in particular Software as a Service, Platform as a Service, and Infrastructure as a Service. Each of these services works on the basis of "Pay-per-use" model.

3.1. Software as a Service: In SaaS, an application is facilitated by a specialist organization and afterward access through the World Wide Web by the client. These are primarily intended for end clients. Clients need not introduce the application on the local system there by disposing of establishment and maintenance costs. The update of software is taken into consideration by the SaaS provider. A large portion of the SaaS solutions belong to the multitenant architecture. As the product is managed at a central area, clients can access the application at their own pace, the only thing required is access to the web. Google Apps, Microsoft Office live Business, Amazon, LinkedIn, Net suite are some SaaS providers. Utilization of SaaS is beneficial when there is a critical requirement for versatile or web access like huge exchange among association

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and outside world like email, applications like expense or billing software that are utilized once in a month.

3.2. Platform as a Service: With this kind of services initiatives and facilities provided, one can convey the application without installing the platform on the local framework that is software can be deployed in cloud framework. The principle advantage of using PaaS is that developers need not stress over the platform updates, capacity. These provisions are taken by PaaS providers. Some PaaS providers provide pre-built utilities with the goal that clients can avoid building everything from scratch. A few of the PaaS providers likewise give online communities where engineers can share best practices, get thoughts, and look for advice from others. The implementation of PaaS is not quite the same as one provider to another provider. Some of the PaaS providers are Amazon web services, Appscale, Google, Open Stack, Flexi scale.

3.3 Infrastructure as a Service: Unlike SaaS and PaaS, IaaS provides hardware resources as Services. The hardware incorporates memory, servers, processing power and networking devices. These are utilized in deployment of the application. Different clients can use infrastructure using virtual machines. To deal with these virtual machines, a governance system is required, which helps in keeping away from uncontrolled access to the clients sensitive data. Use of this service will help in decreasing the underlying interest in organization's equipment. The service depends on the "pay-per-use" model. Amazon Web Services EC2 and S3 are the best models for IaaS.

4. CLOUD DEPLOYMENT MODELS

The Cloud services can be deployed in any of the four deployment models relying upon the client needs.

Each model has its own benefits and disadvantages. Figure 1 shows the types of deployment model.

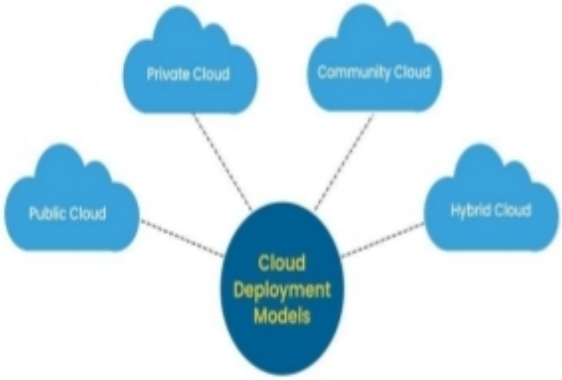


Fig 1.Cloud Deployment Models

4.1. Public Cloud: In this model, general people can get to the services, storage, application offered by the provider. Public clouds are managed and owned by third party assistance. Adaptability, flexible climate, opportunity of self assistance, pay-per-use, accessibility are some of the characteristics of public cloud. The primary disadvantage of this model is absence of high level security. Ex: Amazon Elastic Cloud Compute, Google Application Engine, Blue Cloud by IBM.

4.2. Private Cloud: This model gives access to the frameworks and services inside an organization. Information stored in a private cloud can be shared between the clients of an organization only. There are two kinds of private cloud specifically, On-Premise Private Cloud, Externally Hosted Private Cloud .The drawback of this model is , it is complex to deploy internationally. Virtual Private Cloud of Amazon and Microsoft are some of the examples of this model.

4.3. Community Cloud: Organizations with comparative interest and necessities share the cloud infrastructure. It gives better security when compared with public cloud. This might be managed by either inside organization or third parties.

4.4. Hybrid Cloud: It is the blend of both public and private cloud. Versatility, cost proficiency, Security, Flexibility are the features of Hybrid cloud.

5. CLOUD / DISTRIBUTED STORAGE

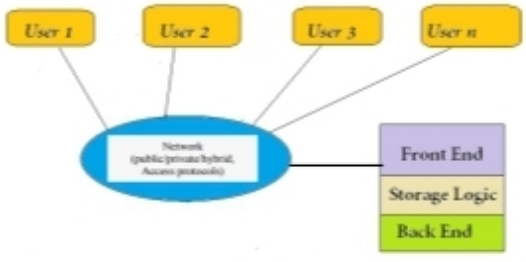
Distributed storage is a service that keeps up information, manages and backups and makes

information accessible to clients over the organization (through web). There are many organizations that provide cloud storage. Majorly providers give free space up to certain gigabytes. For ex: Dropbox gives free space upto 2GB, Google Drive, Box, Amazon, Apple Cloud give virtual storage to 5GB, Microsoft SkyDrive gives virtual storage to 7GB.Customer need to pay the amount as indicated in the plan if they cross the free space limit. Provisions like most extreme record size, auto backup, transfer speed, update for restricted space vary starting with one provider then onto the next provider like maximum file size in Drop Box is 300MB whereas most extreme document size in Google Drive is 1TB . By utilizing cloud storage services, clients need not contribute on storage devices, even specialized help isn't needed for support, the storage, backup, disaster recuperation/recovery. The idea of distributed storage is not worth it when the customer can store and deal with the information for minimal price when looking at using cloud .So, the cloud ought to be planned so that it is practical, autonomic, processable, multi-occupant, adaptable, accessible, controlled, and effective.

6. GENERAL CLOUD STORAGE ARCHITECTURE

General Cloud storage design comprises front end, middleware, and back end.

Below figure shows the general architecture:



i)The front end can be Web service frontend; document based front end, and surprisingly more conventional front closures.

ii) The middleware comprises storage logic which carries out different components like replication, data reduction, and data placements.

iii) The back end carries out the actual Storage for information.

The access methods for cloud are not the same as conventional storage as the cloud holds unique information of various clients.

7. VIRTUAL STORAGE ARCHITECTURE

A significant piece of the cloud model is the idea of a pool of assets that is drawn from upon the interest in little additions .The new development that has made this conceivable is virtualization. Distributed storage is basically the conveyance of virtualized stockpiling on request. This design depends on the Storage Virtualization Model.

It comprises of three layers in particular

1.Interface Layer,

2.Rule and Metadata Management,

3.Virtual Storage Management.

In Interface Layer, Administrator and clients are given the interface modes that might incorporate commands, customer internet browsers. The Rule and Metadata Management layer comprises 2 parts Upper layer and Under layer. The upper layer comprises an independent interface for customer and administrator. Both interface's have various rules. Rule is made from the Operating Transactions. In the customer interface, client demands are shipped off the Resource Based Services and Meta-Based Services. These services are available in the Under layer. Assets based assistance controls asset planning, whereas Meta-based Service deals with the Meta information. Actual device virtualization , information/document demand load adjusting is taken into consideration by the Virtual Storage Management layer.

Boundaries like transfer speed, turning speed and so on are kept up with by URM. Framework keeps a table holding these boundaries and furthermore a steering table. Subsequent to investigating all device hubs, the framework will assort in rational space and construct a worldwide space finally. In case there is

information/document compose demand, framework summons compose activity. Likewise, the Replica steering module is conjured when there is a need to adjust the heap. Copy module is carried out by utilizing Fair-Share Replication calculation. In light of the entrance load factor, this calculation will recognize the best applicant hubs for reproductions substitution.

CONCLUSION

This paper presents the key innovations and virtual storage architecture in the cloud. Cloud storage is more worthwhile than conventional storage in terms of its accessibility, adaptability, execution, versatility and its useful prerequisites. Implementation of virtualization in the distributed cloud storage works on the versatility, accessibility and yet giving security in the virtual climate is perplexing. So aside from virtualization, accentuation ought to be given in regards to security in virtual capacity.

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BIOGRAPHY

Mr. Rajesh Yadav is working as Assistant Professor in V.K.Krishna Menon College with an overall teaching experience of 6 + years. He has completed his M.Sc (Computer Science) along with NET and B.Ed. He has also completed his diploma in machine learning using R Studio and Diploma in Data analytics. He has participated in more than 150 seminars, webinars (at national and international level).He has successfully completed more than 60 Faculty development programmes and more than 12 certificate courses in online mode.He had published in 5 research papers in an international journal.His research areas of interest are Machine Learning, Data science,Cloud Computing, Automata, Internet of things.

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Contents

PYTHONIC - DATA SCIENCE

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ABSTRACT:
Python-an interpreted OO programming language is acquiring fame in data-science & analytics environment by designing non-easy Software(S/W) applications. It possesses extremely enormous standardized libraries' utilized for data visual-ization and analy-sis. Due to simplicity in structure & syntax, library pool, it's becoming a no-doubedtly a secure choice to work-in with big data. Here in my paper with details, I will work-view on tools utilized by python-programmers for strong data-analytics results & its' scope of comparison with different languages.

Keywords: ML, Data-Science, ML tools, Data-Analytics, Big-data.

---

1. INTRODUCTION

The quickly developing advanced data is moving fastly over web framework and the significant bit of which involves unstructured information for example pictures, video, sounds, online journals, tweets', facebook, Google-map etc. A customary methodology to deal with such mind boggling non-structured colossal measure of information is exceptionally way a-look for program-ming world. Applications such as big-data, data-science, investigation and statistical surveying, the programming experts utilize python which gave a non-static library-set in productive ML & data-analytics. In my paper there are six section. The various section are in following way:

Section1: Steps of data-analysis
Section2: Mining-Tools
Section3: Python Libraries in Data Analysis
Section4: Pythonic-Editors in Data Science
Section5:Data Science-Future scope
Section6: Conclusion
Section7: References

2. STEP OF DATA-ANALYSIS

Data-analytics - a technique of dissecting significant knowledge from information.

A) Understanding: Here we need to comprehend fundamental analytics initiatives that answers the detail of it's' need.

B) Collection: - Here wide assortment of information sources is recognized relying on the seriousness of an issue. More the information assets mean more-shots at discovering covered up connections and examples. Tools are utilized in capturing key-words, information & data from various non-homogenous information sources.

The captured organized & unstructured information should be put away in data-sets/data warehouses.

No-SQL data-sets are expected to accommodate Big-Data.

C) Cleansing: - Here we remove copies, corrupted, irrelevant data-objects of the collected information. Validation rules are applied based on business-case to confirm relevance of data extracted.

D) Analysis with Processing: - Here in-actual data mining & analy-sis are carried to enstand hidden-unique patterns for business decisions. Analytics techniques differ depending upon the scenarios.

E) Interpretation of Results:- Representing results into visual or graphical form makes analysis easy to understand.

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Fig 1. Gives a visual look of above steps:

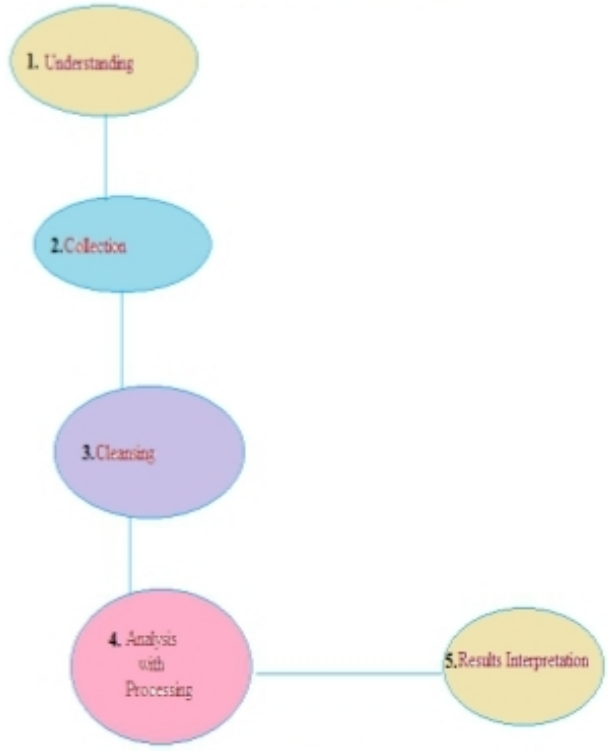

Fig.1.Data analysis Steps

3. MINING-TOOLS

Data must be cleansed & processed from their non-processed state.

Various mining tools are used do this processing as given in Fig.1.

An only limitation of these tools' is-non utilization with large datasets.

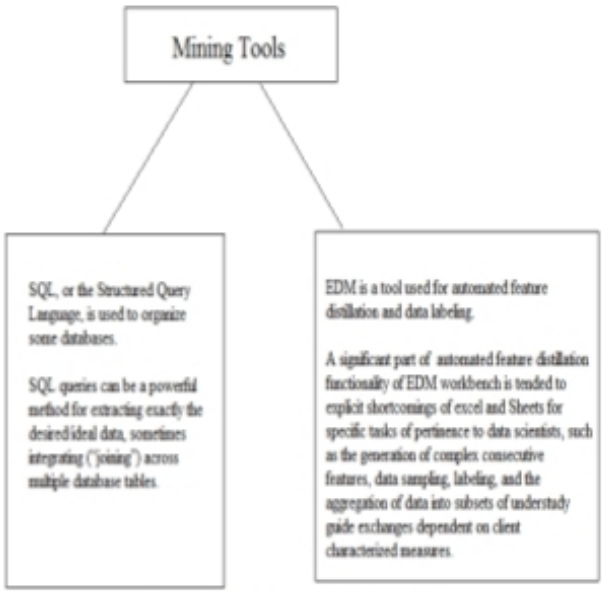

Fig.2. Data-Mining Tools

4. PYTHON LIBRARIES IN DATA ANALYSIS

Python as data-analysis is easy-to-learn, read-able, and scale-able, with library pool, different language integration, active-community & support-system.

Following is the table that overlook on python library and its functions.

Library	Function
Numpy, scipy	Scientific and technical computing
pandas	Data manipulation and aggregation
Mlpy ,scikit-learn	Machine Learning
Theano,tensorflow, keras	Deep learning stats models Statistical analysis
Nltk ,genism	Text processing network Network analysis and visualization
Bokeh,matplotlib, Seaborn ,plotly	Visualization
Beautifulsoup,scrapy	Web scraping

Table 1: Python Libraries & its function

5. PYTHONIC-IDE IN DATA SCIENCE

Python provide different editors for different applications. The following are some development-environment that are in recent trends.

5.1) Spy-der: - A FOSS scientific environment written with Python designed to be utilized by scientists, engineers & developers. Spy-der has distinct combinative advance editing, debugging, profiling functionality features of a compre-hensive develop-ment tools.

5.2) Thonny: - An IDE for teaching-learning programming. Thon-ny is free IDE specially designed with the begin-ner Pythonis-ta in mind. An availability of pre-built debugger helps in bug's detection also helps to step-in expression-evaluation.

5.3) Py-Charm :- Jet-Brains developed Py-Charm as a cross plat-form I D E for Python. Py-Charm is also compatible with, Linux, Windows & MacOS. Features tools of Py-Charm helps programmer's to write varied software (s/w) applications quick-ly and efficient-ly.

5.4) Atom: - A FOSS editor for MacOS, Linux, Windows having support plug-ins written in

JavaScript, built using web-technologies and embedded Git-Control by GITHUB.. It is available in free license-version.

5.5) Jupyter-Notebook: A server-client app allows edit-ing & run-ning note-book document's through web browser. This can be executed on a local-desktop with no internet access or can be installed on a remote-server and accessed through the internet.

6. Data Science -Future Scope

Recently arising advances like Artificial Intelligence, Deep Learning, Machine Learning, IoT are all a vital part of Data Science.

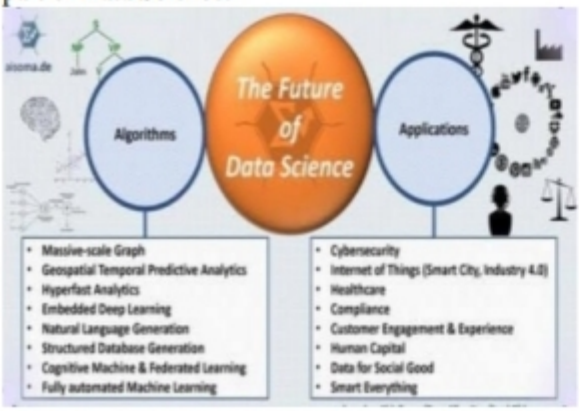

Fig.2. Future Algorithm and application of Data Science

The future extent of Data Science is by all accounts critical for each business today because of the accompanying reasons:

i)Organizations' work to deal with information

A giant measure of information is being unloaded into capacity consistently gathered from online exchanges, face to face buys, web-based media, and site cooperation's. Nonetheless, putting together and breaking down this gathered information is really difficult for some organizations. This is the place where the Data Science advancements come in to picture where the organized and unstructured information is concentrated to attract significant translations and help business development.

ii)Further developed Marketing Strategies

Client assistance and item promoting fields have gone through a significant change as far as approach. The Chatbot's, Virtual Reality (VR) and Augmented Reality (AR) are overshadowing the conventional practices.

iii)Reception of Blockchain innovation

Blockchain innovation is on the ascent where every one of the records and exchanges are recorded leaving no extension for altering. The stream which is restricted to the money area today is probably going to get taken advantage of in medical services, banking and protection areas.

iv)Changing face of Data Science

Digitally intelligent isn't further from reality any longer. Going ahead, all the applications, gadgets, and individuals will meet up to fill in as a unit.

7. CONCLUSION

A var-ied libraries & editors in python turned out productive for data science and AI research areas. One of the quickest developing language-Python is streamlining every investigations happening now-a-days. With above details, I would consciously conclude that python along with its tools-libraries have the wide scope of help for Data- Science research.

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BIOGRAPHY

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HIT- A BLENDING VIEW OF HUMAN RESOURCES MANAGEMENT, AND INFORMATION TECHNOLOGY

Mr. RAJESH YADAV
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Technical Abstract:

Indian Human-Culture has been transformed entirely by utilizing the web of the world i.e internet. Informa-tion Techno-logy offers schemes that are usable to individuals & companies via device components assuming a primary point in the growth(development) of HR. To-day, Information innovation be-came significant factor for the development of (HR)-human resources collection. This paper encases short outline of blend-view of Information Technology in the HRMS, definitive terms, techno-logical impacts.

Keywords: Innovations, HRM, Recruitments, Human-Resources-Development (HRD).

1). INTRODUCTION:

- Al-most, all organizations understand H-R is most prominent capi-tal for develop-ment of their companies. A period of improvement-development is of no importance without human resources.
- The foundations of H-R-D are presence of new-test data and data is judicious cycle i.e Information technology (IT) to assist with making-developing fortitude in HR.
- Changes by new data-innovation seen in principal factors of organizations & laborers.
- The present Information-Technology has shown a constant turn of events-Innovation & H-R-M scope effect one-another & accordingly H-R experts embraces advance-ments permitting redesigning of H-R activi-ties.
- "Information and Communication technology(ICT) - an umbrella term for technologies joined with the web, new media (web-based media), portable devices and PCs permit the companies to revamp their inner cycles, structures, center abilities and significant business sectors on a worldwide scale."

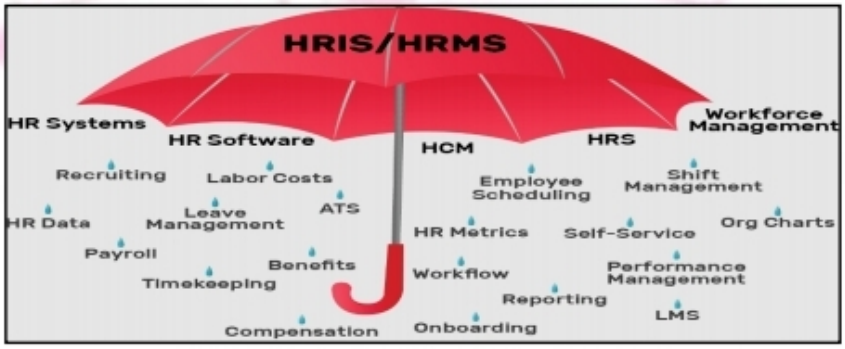

Fig.1 Umbrella view of HRIS/HRMS

- HRM focuses arounds the essential level headed Information-Technology methodo-logies'.

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2). CONCEPTUAL DEFINITIONS AND MEANING OF TERMS IN INFORMATION TECHNOLOGY AND HRM:

Technology	Information Technology	Human Resources Management	E-HRM
→The Concept "Technology is a group of cycles, procedures, strategy, hardware, tools, devices and abilities that an item or administrations are presented by them. →Technology is the use of science to industry, utilizing ordinary and directional practices and exploration".	→It is a group of tools which are made with the objective of renovative data frameworks and impediment of information technology are generally brought about by the unnecessary utilization of this framework, mistaken and deficient plan of data frameworks. →Unjustifiable utilization of the clients (originators and IT engineers) of these frameworks generally creates issues and problems.	→Human resource management is a systematic process of management of people employed in the organization. →It is managerial process of acquisition and engagement of the required workforce, who are appropriate for the job and related with development, maintenance and utilization of the workforce. **"HRM is concerned with the dimension of people" in management.** **--Decenzo and Robbins**	**IT + HRM= E-HRM** In simplified manner, "E-HRM is process of planning, implementation and application of IT for networking and supporting HR activities".

3). ROLE OF INFORM-ATION TECHNOLOGY IN HUMAN RESOURCE INFORMATION SYSTEM (HRIS):

- Human-Resource-Information-System (HRIS) is a coordinated frame-work of getting & keep-ing away information of interviews and tests , as per on choices and protocols in fields of H-R.
- INFORMATION TECHNO-LOGY (IT) makes the Human-Resource work straightforward and simpler.
- The H-R director currently stores' and recovers organization's records in elect-ronic configuration.
- H-R-I-S provides workers' infor-mation, work-attributes, business-application necessity, determination&staffing, businesses-strategies, expert & individual improvement, corporate-design, instructive-expenses, execution&evaluation, sorting out.
- Information Technology carries different enhancements to a companies such as diminishing managerial costs, increment usefulness, further developing the dynamic interaction and customer care.
- The company uti-lizes a wide innovation range for H-R, recruiting-board & choo-sing a person for a meeting, look-on workers, distinguis-hing their information ,etc,

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- Distinctive program-ming' and group of tools are utili-zed by companies group as-per-needs.

4). IMPACT OF IT ON HRM FUNCTIONS:

Following Tabular diagram describes blended descriptive-impacts:

IMPACT OF IT ON HRM FUNCTIONS		
Sr.No	**Function**	**Description**
1	**Training**	▪ HR supervisor prepares new staff in the association in a more effective way perhaps through data innovation. ▪ Trainers work straightforwardly with new staff through Information Technology and preparing programs.
2	**Performance Management**	▪ HR administrator utilizes Information Technology to get representative execution and furthermore evaluate worker criticism to be utilized to assist the association. ▪ Different equipment and programming applications are accessible to make it workable for the HR administrator to look at the representative presentation and set up the exhibition standard. ▪ HR director thinks about the real execution of the worker to standard execution and eliminate the distinctions and furthermore give extra preparation to their representative.
3	**Human Resources Development**	▪ Information Technology is additionally vital for HR advancement in the general public and association and it decides the improvement guideline of HR as indicated by the necessity of representatives and society. ▪ Information Technology (IT) helps in HRD by creating human abilities and quality on a non-stop premise. ▪ In Information Technology measure, data is constantly delivered, circulated, handled and overseen, so Information Technology will be the arrangement of issues when the preparation of workers and human abilities are consolidated and along these lines create and improve efficiency.
4	**Idea Management**	▪ Information Technology additionally assumes a significant part in thought the executives instrument by giving data in regards to the number of progress recommendations presented by the worker in the organizations and furthermore helps in creating a novel thought in the organizations. ▪ It can likewise give the expense and income data of the organizations and furthermore helps in execution of the new proposition in the organizations for future advantage. ▪ The primary point of the online data support in thought the executives is turning into the foundation of association solid and gives the chance to all representatives To introduce their thought in the organizations gatherings and dynamic cycles.

5). ADVANTAGES AND DISADVANTAGES OF IT IN CONTEXT TO HRM:

Information Technology conveys the accompanying benefits to HRM:

a. Economical & Time-saving.
b. Reduces execution-cost.
c. Efficient Recruit-ments.

DISADVANTAGES FOR WORKERS & COMPANIES:

a. Augmentation in Information-Technology contracts open positions in companies & countless workers become jobless.
b. On the off chance that the representatives don't know about the information technology, workers can-not find the idealistic position in organi-zations.

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c. Costly to assemble a new Information Technology frame-work in organization.
d. Unsafe consideration of security.

CONCLUSION:

- From all above analyses it is reasonable to state that Information Technology benefits the inside tasks of the organization. Utilization of computers, printers, fax-machines, mobile-phones for data'-rapid-development.
- Blending-Information technology, the HRM plan becomes compelling.
- Information-Technology is group of programming-tools' for representatives & companies assuming signi-ficant part in Human-Resource-Development.
- Information-Technology affects entire areas of H-R-Executives, enrollment, preparation , advancement & support capacities.

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A Comprehensive Review On Big Data Analytics

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Abstract:

In today's information period, a huge amount of information has opened up to decision makers. Enormous information alludes to datasets that are large, yet additionally high in volume and velocity, which makes them hard to deal with utilizing conventional devices and strategies. Because of the fast development of such information, arrangements should be examined and given to deal with and separate worth and information from these datasets. Besides, decision makers should have the option to acquire significant experiences from such shifted and quickly evolving information, going from day by day exchanges to client connections and interpersonal organization information. Such worth can be given utilizing large information-big data investigation, which is the use of cutting edge examination strategies on enormous information. This paper focuses on various aspects of big data strategies, techniques , processing and tools which can be applied to big data, just as the chances given by the use of big data analytics in different choice areas.

Keywords: Big Data, Analytics, Map reduce, HDFS.

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EDITORIAL NOTE

This book is a collection of selected contributions made by the Research scholars, Academicians, Industry Experts of colleges in various countries in the role of cutting edge technologies in National development. This book would not have been possible without the support, cooperation and encouragement of researchers and would like to acknowledge their contribution towards this assignment possible.

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In this conference more than 200 participants from various countries have attended. We have received more than 150 papers from the researchers. The selected research papers are published in this book. The papers are classified based on the theme of the conference. The researchers discussed on various issues in cutting edge technologies in Computing in National Development.

We strongly believe that the papers of this book attempts to address the critical research issues in Image processing, Machine & Deep Learning, Cloud Computing, Networking, Artificial Intelligence, Biometrics, Software Engineering, Big data and Neural networks.

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Prof. M.Praneesh

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Sri Ramakrishna college of Arts and science [formerly known as SNR Sons College) is one among the most renowned Arts and Science Educational Intuitions where excellence is tradition. It is affiliated to Bharathiar University and accredited by National Assessment and Academic Council with Grade "A+" in its 4th cycle. The college enjoys autonomous status since 2004. It is an ISO 9001:2015 certified college and the first Arts and Science College in the region to receive International Accreditation with "A" grade from the CIAC. The college is under STAR College scheme of the Department of Biotechnology (DBT), government of India since 2019. SRCAS holds a partnership with the institution innovation council some of our academic partners are Amity Global Institute-Singapore, Asia Pacific University- Malaysia, Cyber Jaya University – Malaysia, Sunway University- Malaysia, Lahti University of Applied Science- Finland, and Association of Chartered Certified Accountants.

ABOUT THE DEPARTMENT

The Department of Computer Science was established in the year 1987.The department offers following Programmes B.Sc CS, M.Sc CS, M.Phil (CS) & Ph.D (CS).The Department has signed MoU's with the leading Industries like IBM for course integration with specialization with artificial intelligence. The students are benefitted with international certification on AP Skills. The department has various other MoU's like Hackup Technologies and Robotic Process Automation. The department conducts various job oriented courses and value added courses on the currents trends and requirements of the industry. Various webinars seminar and workshops are conducted to enrich the knowledge of the students. The department has produced nearly 100 research scholars and has benefitted in the research activity like writing books, chapters, sponsored projects and proposals. The department has well experienced, qualified, committed faculty members who produce excellent results and good research publications. The Department is supported by well equipped air-conditioned computer Labs, with latest configuration systems and internet facilities. The Students are not only taught the curriculum but also interpersonal skills. They are also trained for their placements. Our students are motivated and trained to face the modern competitive technological environment to compete professionally. The department is equipped with quality resources for imparting need and carrier based education using contemporary teaching techniques by the motivated faculty team.

ABOUT THE CONFERENCE

International Conference on Research Practices of Cutting Edge Technologies in Computing (ICRCTC-2021**)** is a prestigious event organized with a motivation to provide an excellent international platform for the academicians, researchers, engineers, industrial participants and budding students around the world to Share their research findings with the global experts. ICRCTC 2021 will be held in Coimbatore, India on 11th and 12th November 2021. The key intention of ICRCTC - 2021 is to provide opportunity for the global participants to share their ideas and experience in virtual environment with their peers expected to join from different parts on the world. In addition this gathering will help the delegates to establish research or business relations as well as to find international linkage for future collaborations in their career path. We hope that ICRCTC - 2021 outcome will lead to significant contributions to the knowledge base in these up-to-date scientific fields in scope.

Dr. B.L.Shivakumar
Principal and Secretary

SRI RAMAKRISHNA COLLEGE OF ARTS & SCIENCE
Coimbatore-641 006
South India

PRINCIPAL MESSAGE

I am very happy that the PG & Research Department of Computer Science is organizing ICRPCETC 2021, an International Conference on "Research Practices of Cutting Edge Technologies in Computing". Information and Communication technologies play a critical role in the context of globalization and economic development. ICRPCETC Conference will address some of the key topics in the field and will serve as an excellent platform for exchange of scholarly views.

I am confident that the conference discussions and the publication of the conference proceeding will bring opportunities among the academicians, corporate delegates, research scholars and students to present their innovative ideas, most up-to-date findings, and technical proficiency in the various fields of Cutting edge technologies in computing.

On behalf of Sri Ramakrishna College of Arts & Science, I heartily welcome the Honorable Keynote Speaker, Eminent Academicians, Corporate delegates and all the paper presenters to ICRPCETC 2021. I wish to express my unfathomed wishes to the Convenor Dr. G. Maria Priscilla, Organizing Secretaries Dr.M.Hemalatha, Prof.M.Praneesh, Faculty members, Research Scholars and Students of the Department of Computer Science for their genuine interest, diligent efforts and dedicated services in the field of Computer Science.

Dr. B.L.Shivakumar

Dr.G.Maria Priscilla
Convenor

SRI RAMAKRISHNA COLLEGE OF ARTS & SCIENCE
Coimbatore-641 006
South India

CONVENOR MESSAGE

I am extremely pleased to act as a Convenor in the International Conference on "Research Practices of Cutting Edge Technologies in Computing". The ICRPCETC Committee has meticulously invited submissions from authors to contribute and present their research ideas in the conference. Research articles spanning various themes like Data Mining, IoT, Networks, Cloud Computing, Soft Computing, Big Data, Image Processing, Bio-Informatics, Deep and Machine learning, Software Engineering and Information Security are being dealt with in this conference. All these efforts undertaken by our department has led to an exciting, rich and a high quality technical conference program in Cutting Edge Technologies.

The goal of this conference is to bring together the researchers with expertise of cutting edge technologies in computing era. Additionally, this forum discusses theoretical and practical issues and suggests future research directions.

I learn that the conference has received an overwhelming response from academia, research organizations and industry alike, with over 150 technical papers, out which technical experts and reviewers have selected around 80 high-quality papers for presentations and publications during the conference. I express my deep hearted congratulations to the editorial board, for their untiring endeavor to get this conference proceeding successfully. I also wish the contributors for their novel, remarkable and enlightening research contributions. It's my pleasure to congratulate and place my appreciation to faculty members, staff, research scholars and students of computer science for their efforts in organizing this International Conference.

Dr. G. Maria Priscilla

Dr.M.Hemalatha
Organizing Secretary

SRI RAMAKRISHNA COLLEGE OF ARTS
& SCIENCE
Coimbatore-641 006
South India

ORGANIZING SECRETARY MESSAGE

I am privileged to organize the International Conference on "Research Practices of Cutting Edge Technologies in Computing. This is a golden age for our filed and in many important ways, the potential research is unprecedented. The ongoing revolution in the underlying electronics technology continues to create new opportunities for innovation.

The conference aims to cover a wide range of topics like Image Processing, Mobile communications, soft computing, Data Analytics, Artificial Intelligence etc. ICRPCETC-2021 is an excellent forum for exchanging information and discussion on research issues in the field of computing technology. ICRPCETC will bring together leading researchers and academicians in the domain of interest from all over India. This would provide a plat form to poster discussion and exchange ideas, experiences, challenges, solutions, and explorations of future research in the field of Computer Science.

Dr.M.Hemalatha

Prof.M.Praneesh
Organizing Secretary

SRI RAMAKRISHNA COLLEGE OF ARTS & SCIENCE
Coimbatore-641 006
South India

ORGANIZING SECRETARY MESSAGE

I am extremely pleased to act as an Organizing Secretary in the International Conference on "Research Practices of Cutting Edge Technologies in Computing". My heartfelt salutation to all the participants, delegates, National and International Speakers for ICRPCETC-2021. This international conference is one of the major events conducted by PG & Research Department of Computer Science of Sri Ramakrishna College of Arts & Science which is a place to do research; A Chance to upgrade. This International Conference has brought researchers , scientists, engineers and various other scholars in concert to exchange and share their new thoughts, experiences and the research outcome of all possible aspects of computing, communication, Image and Signal Processing, Software Engineering, Knowledge based Systems, Data Analytics, and much more . Today the title of this conference provides a wide scope for the research and researchers to publish their quality papers and prove their individuality.

I take an opportunity in this message to thank all the authors from various parts of the world who showed their interest in sharing their findings in ICRPCETC-2021. I extend my gratitude to our Management, Principal and Head of the department.

Prof.M.Praneesh

KEYNOTE SPEAKERS

Dr.Anand Bhojan
Senior Lecturer in Computing
National university of Singapore

Topic: Technology Trends in Fintech industries and Services

Dr. Reshmy Krishnan
Associate Professor & Head of Research Centre, Muscat

Topic: Role of Deep learning in teaching and learning

Dr. Murugananthan Velayutham
Data Scientist
Malaysia

Topic: Cloud Computing and Security

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CONTENTS

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A Comprehensive Overview on Edge Computing

Mr. Rajesh Ramnaresh Yadav,
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TechnicalAbstract : *We as a whole think about information existing in the cloud, yet have we at any point pondered where this information comes from? To be sure, we use this existing information in the cloud and cycle it with various programming which further aids in performance, yet we never thought often about the beginning of the information. Obviously, the information is established by people in our working surroundings while communicating, computing, or performing different errands. With time, everything redesigned including the data and its computing requests. The ascent of constant computing requests has constrained the technology drivers to reconsider cloud computing design and migrate it from unified to appropriated servers. Hence, the idea of Edge Computing came into light of focus.Here , with paper description I have focused on What is Edge Computing, its need , architectural and computational comparison of edge and cloud computing, its advantages and difficulties /challenges.*

Keywords:*Edge ,Computing, Internet of things, Distributed, Colocation ,5G Technology.*

I.Introduction

The computing that happens by putting workloads at the edge of corporate networks where the information is being made is known as Edge Computing. The "edge" is characterized as the position where the end devices can get access to the rest of the organization devices like workstations, telephones, work area, machines, switches, and sensors. This innovation is utilized to interface IoT devices so they can convey information effectively, get directions rapidly, and download programming refreshes from a cloud or a server center with no problem. Edge computing is another way to deal with network engineering where first in distributed computing keeps on assuming a significant part and besides the additional opportunities presented by IoT devices which are fit for preparing the information compels organizations to re-examine their way to deal with IT framework. Edge devices gather, sorts, and plays out the performance of the information and subsequent to preparing stores the information to its predetermined spot.

"Edge Computing is an open distributed computing model that guarantees quick calculation, handles information exercises, network activities and information storage . It carries the devices nearer to the spot thus working on the transfer time and saving data transfer capacity. It highlights decentralized preparation of power empowering versatile computing and Internet of Things."

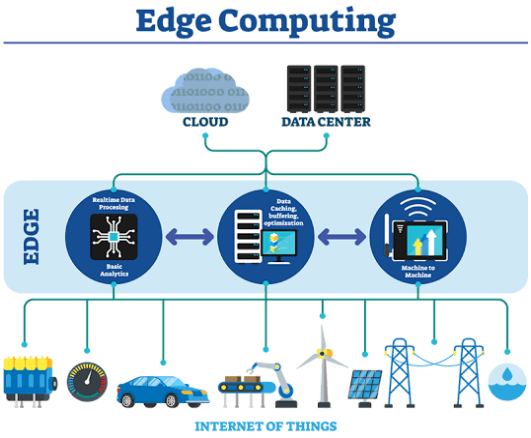

Fig.1.Edge Computing

The Edge Computing data is either handled by the actual devices or by a nearby PC or server instead of being straightforwardly communicated to a server. The data processing happens at the Edge of the devices or at the area where information is created. Consequently, it essentially works on the speed of information handling by decreasing the information going among gadgets and incorporating cloud server centres. This technology opens a stage for us to convey into the premises where the work is performed not normal for the storage retail area, store, banks, etc,.With the flare-up of the Internet of things or IoT gadgets, there is a greater part of information present in the midway found server center or cloud. Subsequently, it requires bigger and costly networks to keep up with the unmitigated volume of information. The work performed by these IoT gadgets makes a requirement for a lot quicker network between the server center or cloud and the gadgets.

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II.Need of Edge Computing

For longer than 10 years unified distributed computing was predictable and has upset a standard stage to pursue, compose, store, and bring information. It has a solid data driven design where asset putting away, and computational tasks were productive and adaptable. The cloud has turned into an imperative piece of data preparation and capacity. Yet, with technological innovation and the internet, the time saw huge development of data known as the 'Internet of Things'.

IoT produces deficient information, which further should be handled and replied in an exceptionally brief time frame. Coming about with an unexpected ascent continuously processing requests however with cloud computing the expense for creating the information likewise expanded dramatically. Nonetheless, the cloud has been halfway connected on a worldwide scale to deal with enormous information. Additionally, if the actual distance between the client and the cloud expands, it raises the transmission issues and builds the reaction time, accordingly worrying the client.

Additionally , clouds have just some restricted access. Organization union, web based recordings and web usages keeps on moving towards data transmission, disconnected admittance to projects and inactivity of delicate applications in an expanding interest for cloud administrations. The answer for these issues is to move the cloud computing and information storage to Edge Computing Platform.

The edge computing stage works by permitting applications preparing to be performed by a little edge server position between the cloud and the client. The organization edge brings down the information transport time and builds the accessibility. The goal of this technology is to register rationales and information to edge networks so the information won't get back to the focal server each time the capacity is executed by an IoT gadget.

This innovation permits a portion of the responsibilities to be offloaded from the cloud server and push it nearer to the client's device for handling. Hence, accelerating application's reaction time and keeping a low non-active reaction.

III. Cloud computing V/S Edge Computing

Edge computing is an expansion of the cloud computing model- thus giving a base to the optimized solution for decentralized infrastructure.

The primary difference between cloud and edge computing is in the context of infrastructure.

"Cloud is centralized in nature whereas Edge is decentralized."

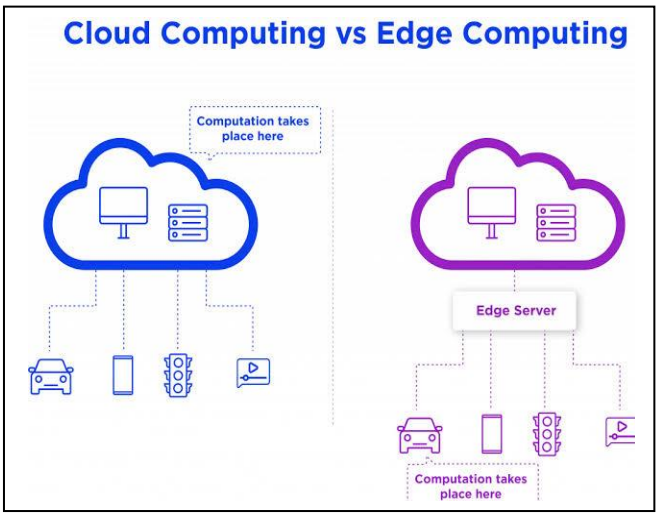

Fig.2.Computational Comparison of Cloud and Edge Computing

The following tabular figure gives a view on point of difference in terms of operations and benefits as parameters.

POINTS OF DIFFERENCE	Edge Computing	Cloud Computing
OPERATIONS	It happens on the device itself.	It happens on cloud platforms such as Google cloud, Amazon, EC2
BENEFITS	User can independently scale the network with each device you add to a system	User can store a massive amount of data on scalable hosting over the network and access it anytime.

IV.Advantages of Edge Computing

a.Continuous Data Processing: This is the center goal of edge computing. Since the data computing happens locally that can accomplish ongoing data handling, the efficient checking approach of ongoing handling forestall many concerns even earlier of their occurrence.

b.Fast and low idleness: The information isn't going each an ideal opportunity to cloud server organization can incredibly diminish idleness and can upgrade information handling execution.

At the point when data is associated nearer to the client, data can be shared rapidly, safely and without inactivity. Edge Computing is joined with 5G, thus decreasing the idleness to 1 millisecond.

c.Decreased Internet transfer speed use and related cost: Edge can fundamentally diminish internet data transmission utilization and cost. Data handling occurs at the edge network.The server devices are free more often than not and

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can be used in other cloud explicit tasks henceforth it can decrease server device use and its related cost.

d.Responsive and Robust Application Performance : Responsive and vigorous application execution can be accomplished by transferring the preparing rationale to nearby edge climate. In this manner, it further develops the business effectiveness and unwavering quality by doing basic tasks in the neighborhood environment.

V.Difficulties of Edge Computing

a.Colocation Cloud Data Centers:The strategy for private lodging servers and systems administration devices in an outsider server center is Colocation. To guarantee smooth edge computing tasks, the cloud provider would require setting up or teaming up with neighborhood server centers, which itself will get a ton of difficulties in terms of information virtualization and replication.

b.5G Technology: 5G remote technology guarantees the conveyance of rapid information, diminished inactivity, expanded dependability, accessibility, and immense organization limit.5g working is needed to speed up constant applications, for example, video creation, independent vehicles, AI knowledge, profound learning, and advanced mechanics. However, to be sure, it is a test for the designers to keep up with the 5g innovation and give every one of the components with no obstacle.

c.Solid Security Management: Strong information secret tools and approaches assume a significant part of data for Edge Computing. The trackdown could be a test and inconvenient, particularly when taken care of by various gadgets that probably won't be just about as secure as a unified cloud-based framework.

d.Nonstop Local equipment Maintenance: With edge computing, the quantity of edge devices increments and hence it requires non stop local equipment maintenance. Consequently, it includes huge ventures and more support costs.

e.Organization Connectivity and Electrical Power Management:Edge Computing requires continuous network availability and electrical force of the executives on the grounds that diverse edge devices for distinctive preparing force and organization network.

VI.Conclusion:

As IoT turns out to be more persuasive, edge computing will do likewise. The capacity to analyze information nearer to the source will limit latency, lessen the load on the web, further develop protection and security, and lower data management costs. The reception of cloud computing brought data operations to another level.The interconnectivity of the cloud empowered a more intensive way to deal with capturing and analyzing the information. With edge computing, things have become considerably more proficient. Thus, the nature of business tasks has become higher. Edge processing is a practical answer for data driven tasks that require lightning-fast response and a significant degree of adaptability, depending upon the present status of things.

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INDEX

Education 4.0

Track 2

 ISBN:978-93-5578-200-7

A CRISP VISION ON EDUCATION 4.0

Mr. Rajesh Yadav
Assistant Professor, Department of Computer Science
V.k.krishna Menon College, Mumbai, Maharashtra

ABSTRACT
Education is the powerful tool to bring any change and thereby growth in any field. However, this change can only be brought through the use of Advance technologies. Education system gets affected by any changes that happen around the world be it in the field of technology or arts or archaeology. The paper focuses on various aspect of changes in terms of version from 1.0 to 4.0, its characteristics, patterns to accomplish Education 4.0, benefits of Education 4.0 for teachers and students.

Keywords*: Education 4.0, Pattern, Outcomes, Versionified Description.*

1. INTRODUCTION

Change is evident and the foremost reality of life. Any type of growth is next to impossible without change. Change always comes from a way in classic to Recent trends. Here are Some classic definition of Education given by renowned personalities as presented in following diagram:

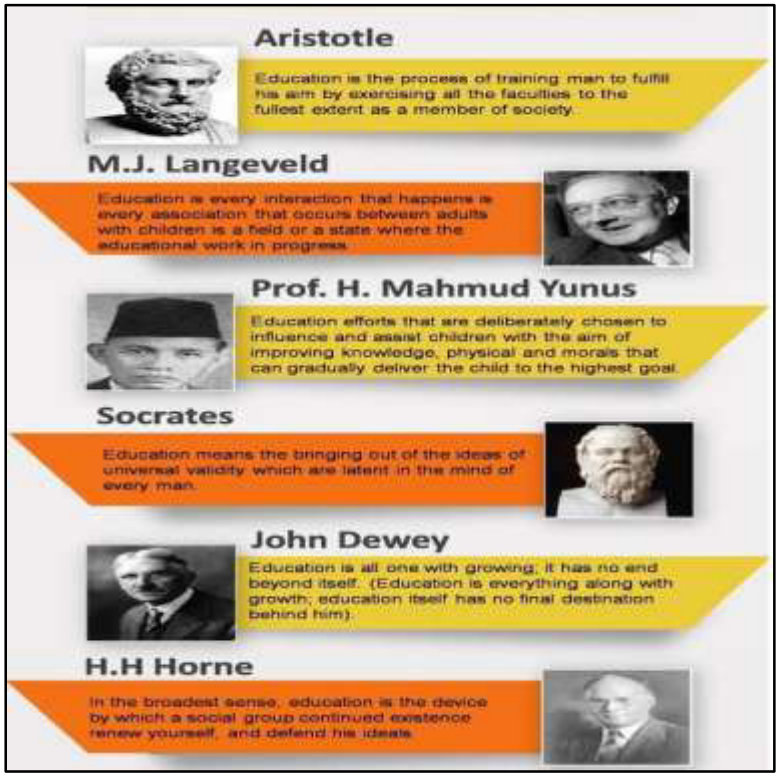

Fig.1.Definition of Education

From all above definitions it can be seen that education is elementary yet one of strongest tools that is bringing change to recent developments.

2. VERSIONIFIED DESCRIPTION OF EDUCATION

A) Short Meaning -Nature wise

Education 1.0: Dictated.
Education 2.0:Socially constructed, usually with help of Internet access.
Education 3.0: Contextually reinvented knowledge.
Education 4.0: Built through effective individual and team driven focused innovative practices.

B) What is the technology aspect of each Education?

Education 1.0: conducted at classroom doors.
Education 2.0: Cautiously adopted as open access.
Education 3.0: utilized everywhere for ubiquitous construction and transmission of knowledge.
Education 4.0: Always changes with the direct input of learners who acts as a major source of tech evolution in the innovation service production.

C) How is teaching done in each version of Education?

Education 1.0: involves teaching from teachers to students
Education 2.0: involves teaching from teachers to students and students to students.
Education 3.0: involves teaching from teachers to students, students to students, students to teachers, people - technology-people.
Education 4.0: amplifies teaching by positive innovative feedback loops, creatively and ubiquitously in all phases of living, working and learning.

D) Where does each version of Education localize?

Education 1.0: in a building
Education 2.0: in a building or online
Education 3.0: everywhere in the "creative society".
Education 4.0: in the globally networked human body.

3. EDUCATION 4.0 AND ITS CHARACTERISTICS

Education 4.0 is the required strategy for learning that adjusts itself with the trending fourth industrial revolution. In general, Education 4.0 is a belief that fosters intelligent thinking among its stakeholders. It assists education in different patterns, by the consumption of tools and resources that are technologically best. In other words, it means that instead of old classrooms patterns of chalk and talk students will enroll themselves through courses available on various moods portal

which in turn makes them self-reliable, independent and professional in terms of skills and ethics. There is no boundary in learning things.

Characteristics of Education 4.0 as follows:

1) It is scalable in nature.
2) It is transdisciplinary.
3) It provides experiential and Hands on training.
4) It is just in time information based rather than pre-requisite based
5) Here teachers act as mentors and coach.
6) It focuses on acquiring skills rather than on knowledge.
7) The assessment skill is formative and provides student with great ability to learn
8) Education 4.0 is a flexible source of knowledge/information and promotes personalized learning.

4. PATTERNS TO BE FOLLOWED TO ACCOMPLISH EDUCATION 4.0

1. Speed up Remote Learning: It will empower learning whenever, anyplace as the eLearning tools will change the general idea and will infer remote learning.

2. Customized Learning: It will bring the students customized with groups relying upon the abilities and explicit gifts. This implies that there will be an individual learning measure for every student aiding them in what they possess interest.

3. Project-based Learning: With project-based learning the students will figure out how to keep a hold and clean their abilities and figure out how to apply them over various circumstances.

4. Field specific Experience: With techno-logical progression, the training educational plan will add countless abilities centering human information and individual connection. This will give or guarantee more field experience information with the current courses.

5. Data analysis: Education 4.0 will assist the students to utilize their insight and think to inspect continuous and past examples or patterns.

6. Change in exam pattern and assessment: The current situation of theory based learning solely focuses on memorizing or doing rote learning programs and composing those in tests won't be the pattern any longer. It is fundamental to comprehend that the customary Q&A design and abstract sort questions just won't help later on. It implies the above exclusively won't stamp an individual, other than this more pragmatic stuff and exploratory information like tasks and field works will be added.

5. EDUCATION 4.0's BENEFITS FOR TEACHERS

Teachers symbolize makers of personality and change. Education-4.0 is an intelligence based digital revolution that benefits many stakeholders, teachers and educators. It is beneficial to teachers because they can convey information and fulfill the required needs of students. Teachers can indirectly teach students. They can promote digitalized personal learning goals through the

utilization of tools and techniques thus provides interesting learning outcomes for students and better educational outcomes. It facilitates educators with needs by providing the best methodology to facilitate work. It aims to improve performance by promoting teacher-skills and thus improve student -learning outcomes.

6. EDUCATION 4.0's BENEFITS FOR STUDENTS

For any organizational network, Students are the one who brings change to learning by properly gaining experience and knowledge provided by educators. It behaves students as beneficiaries. Students can connect with various stakeholders, teachers and management with the use of technology. Learning outcomes of students are directly related to the implementation level of Education 4.0. It is truly a game changer and improves student-learning outcomes.

7. CONCLUSION

From all the above points discussed it can be concluded that Education 4.0 is a reformary tool that has capability of bringing change and thus can help in overall development of teachers, students and country.

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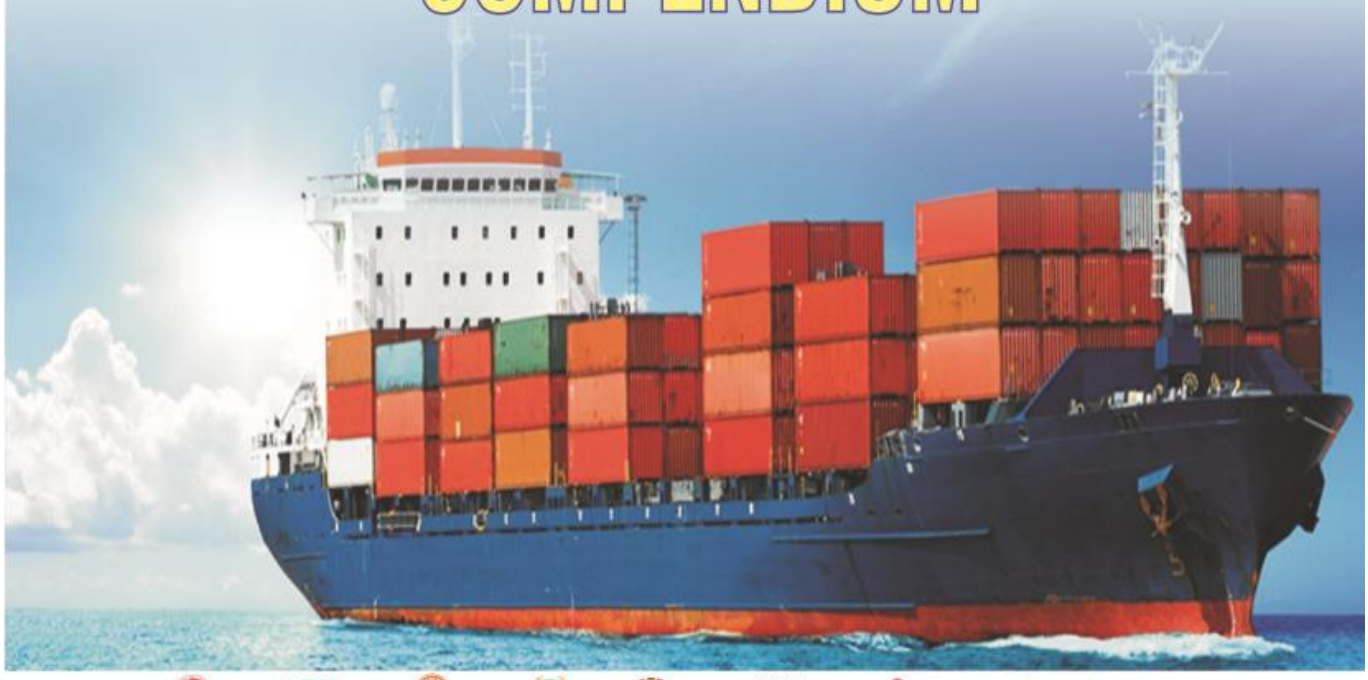

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PREFACE

Proceedings of the International Conference on Artificial Intelligence - A Game Changer for Maritime Business

We are very happy to bring you the Compendium of the Proceedings of the 5th International Conference on Artificial Intelligence - A Game Changer for Maritime Business 18th and 19th March2022. A major goal and feature of this International Conference is to bring academician, research scholars and students together to exchange and share their experiences and research results about most aspects of maritime and Business research, and communicate the practical challenges encountered and the solutions adopted. This volume contains the papers submitted to the International Conference Delivering impact in higher education learning and teaching.

We hope that you will have a technically rewarding understanding of the various research issues raised by the researchers across the country on the topic of conference.

We would like to thank the organization staff, the members of the program committees and reviewers. The Compendium aims to provide a platform for discussing the issues, challenges, opportunities and findings of research on applications of Artificial Intelligence, digital technology and practice. Hopefully, it will also spark innovative ideas, foster further research and also aid researchers to identify relations or partnership between the various institutions based on the compiled research work presented herewith.

SEMANTIC VISUALIZE SYSTEM OF INTELLIGENCE EXTRACTION USING PYTHON LIBRARIES

MR RAJESH YADAV

Asst. Professor, Department of Computer Science, V.K.Krishna Menon College, Mumbai.

ABSTRACT

Intelligence Extraction, also known as IE, is a technique for systematically organising unstructured information or data using a machine learning algorithm. Structure information is collected data that can be easily understood and classified by the human brain. As the name implies, unstructured data is a data format that contains dynamic information that neither machines nor humans can understand. As a result, extracting meaningful information from them is a difficult task. Here I have tried to give a visual view on various Extraction obtained through libraries available in a Machine Learning environment.

KEYWORDS: Machine Extraction, Intelligence Structured Data, Webpage, Unstructured Data.

1. INTRODUCTION

Millions of documents are uploaded to the cloud every day. We process a large amount of data every day, so processing and analysing this unstructured data is complicated. To manage that data, we need a simple system to use, reliable, efficient, and user-friendly, and through which we can obtain structured data.

The World Wide Web is a central location where data is stored and managed, so this organisation contains a large amount of information in pdf, images, text, numbers, videos, etc. From this large amount of data, the user wants only relevant data. Various extraction methodology is discussed below in Section 3, which will provide the visual flow of intelligence extraction.

2. RELATED STUDY

[1] Studied various approaches to extract structured data from web pages. She also discussed web data extraction techniques, some techniques extracting flat records and others trying to pull nested documents. Some of these techniques are either inaccurate or make many strong assumptions.

[2] Proposed a solution - automatic Extraction of entity relation employing Information Extraction (IE) technique divided into two steps of Named Entity Recognition (NER) and Relation Extraction (RE) process. The author utilised a supervised machine learning approach combined with a rule-based system.

Significant findings: It determines which features and algorithms of machine learning are sufficient to gain the best-known result and which rules are the most suitable for novel characteristics.

[3] The authors proposed a new approach to extract structured data from Web pages in this paper. Although several researchers have studied the problem, existing techniques are inaccurate or make many strong assumptions. Their method does not make these assumptions. They proposed an enhanced method and novel partial tree alignment technique based on visual information, significantly improving the algorithm's accuracy. Their empirical results using many Web pages showed the accurate Extraction of data.

3. EXTRACTION OF INTELLIGENCE

Intelligence Extraction is nothing more than the Extraction of structured data. Intelligence Extraction includes Web Page Extraction, Csv Extraction, Video Extraction, Image Extraction, and Pdf Extraction, among other things. These modules extract data and store it in a file format such as.csv, .txt, etc.

The proposed system includes the following modules:

1. CSV Extraction
2. Webpage Extraction
3. Extraction of Video
4. Extraction of Images
5. Extraction of PDF
   - •Text Extraction
   - •Image Extraction
   - •Extracting E-Mail Addresses
   - •Extraction of URLs
   - •Extraction of Tables

3.1 Extraction of CSV

This module extracts CSV data from a specific column by using a unique character known as a delimiter. Delimiters are those special characters that separate data.

This module makes use of two libraries:

a) Pandas: prime role in data analysis by allowing & importing data from various file formats such as CSV, SQL database tables or queries, JSON and Excel.

b) CSV: read and write tab-ular data in CSV format.

In this module, the user must provide the file's name with the extension to the programme. The module then reads the file and asks the user which column they want to extract. After providing the column name, the user must give the delimiter between the data in that column.

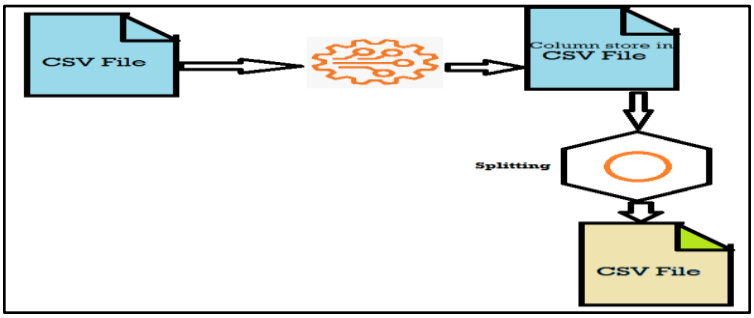

Figure 1: CSV Extraction Process

3.2 Extracting Web Pages

Web Extraction extracts the contents of a webpage and saves it to a file.

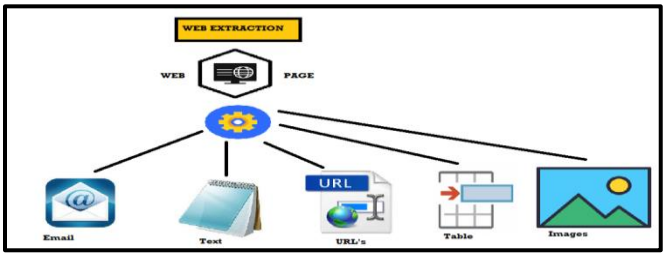

Figure 2: Web Extraction Method

This module is divided into several types, including:

3.2.1 Web-page Text Extraction

Text data will be extracted from a static website using this method. The above method makes use of three libraries:

a) Request: Send HTTP requests.

b) Sys: Access to interact strongly with the interpreter.

c) Beautiful Soup: To pull data out of HTML and XML files.

3.2.2 Web-page Image Extraction

This module is a subset of Email Extraction; however, it will extract images from a given URL. There are four libraries in use:

a) Request b) Urllib: This library primarily fetches Uniform Resource Locators aka URL'S.

c) Beautiful Soup d) Req: to check whether a given string matches with a given regular expression.

3.2.3 Email Extraction from a Website

The Email Extraction module is used to extract an email address from a website that the user has provided. We used three libraries in this case:

a) Reb) Beautiful Soup c) Request

3.2.4 Web-page URL Extraction

This module focuses on obtaining the linked URL of a specific Website. The user will provide this module with a URL, and it will read the website and return a linked URL from it. There are two libraries used in this case: a) Reb) Sys

3.2.5 Web-page Table Extraction

This module extracts tables from web pages and saves them in CSV format.

4. Extraction of Video

Video frame extraction will extract each video frame and save it in a file; the structure will be image format. This module made use of two libraries:

a) CV2: to read video

b) Os: provides the most straightforward functions facilitating user interaction and operating system information.

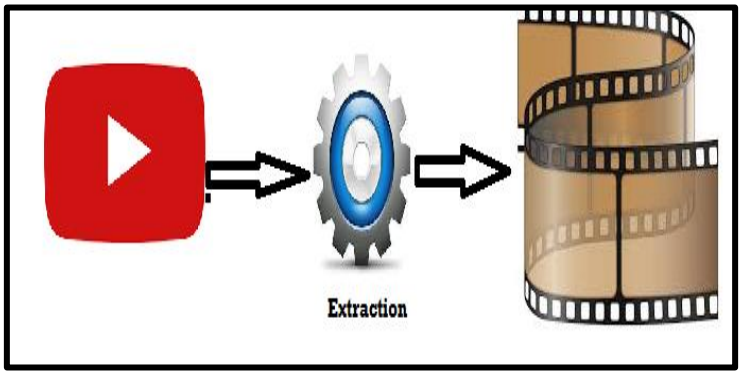

Figure 3: Video Extraction Process

5. Image Extraction

This module is used for text extraction from an image as a source. This makes use of two libraries:

a) Pytesseract: Optical character recognition (OCR) tool for python, which recognises and "read" the text embedded in images.

b) PIL: facilitates image processing capabilities to Python interpreter. It also provides extensive file format support.

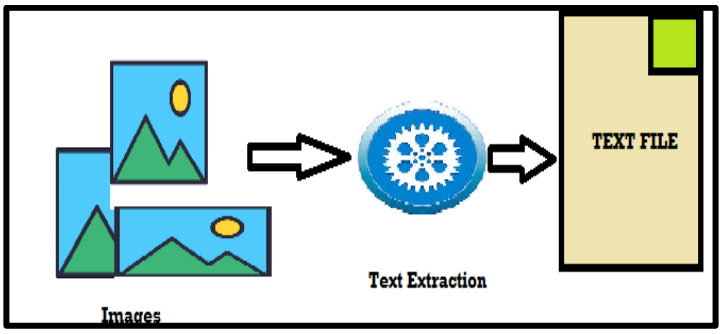

Figure 4: Image Extraction Method

6. Extraction of PDFs

It will extract text from a pdf file. We only used one library in this case, PyPDF2, which is used for performing major tasks on PDF files such as extracting the document-specific information, merging the PDF files, splitting the pages of a PDF file, adding watermarks to a file, encrypting and decrypting the PDF files, etc.

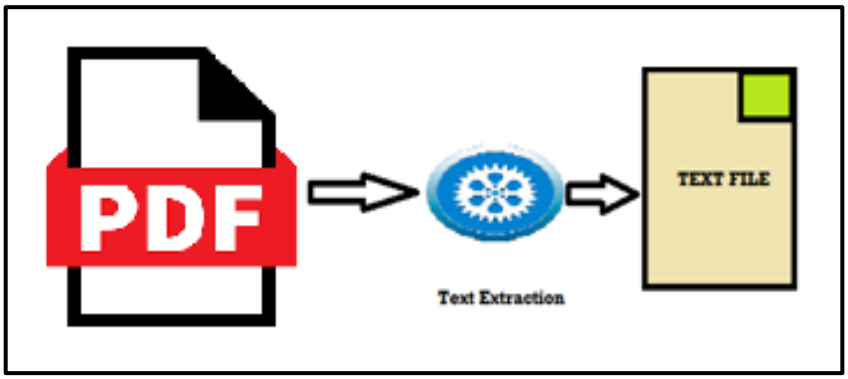

Figure 5. PDF Extraction Method

Articulation of Proposed System

This system is based on data gathered from various sources, such as company and organisational data. Because the user wants only relevant data, the proposed system categorises that data as easily accessible. It will extract and classify data into graph format as output files using various machine learning python libraries.

The complete visual is provided below figure to understand more simply.

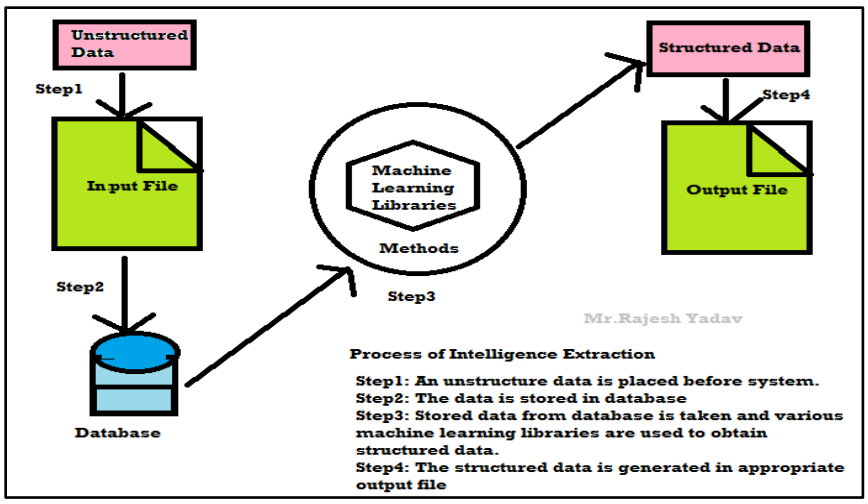

Figure 6: The Process of Intelligence Extraction

CONCLUSIONS

Here I tried implementing a visual system in which Extraction is based on the different machine learning algorithms that sort unstructured data into a structured format to be user-friendly for the user.

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INDEX

"Shield"
An AI-Powered Framework for Smart Waste Management (In Reference to Navi Mumbai)

Mr Rajesh Yadav
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Technical Abstract:

In the Indian setting, smart urban areas are a somewhat new idea. Current urban areas quickly adjust particular advancements to address developments, environments, morphology, and comparative viewpoints. This arising pattern empowers the joining and advancement of man-made brainpower, mechanical technology, touchy sensors, and huge information by means of the web of things. There are even a few increased and computer generated reality variations for savvy urbanization plan. This section centers around fostering a model in view of innovative perspective changes that endure brilliant urban communities' wording. Punsari, India's smart town in Gujarat, as of now exists as a model. This section additionally researches the writing on inexhaustible and environmentally friendly power energy, observing the climate, air quality, and water quality. Because of exploration holes, this study will in general use man-made consciousness to zero in on metropolitan possibilities. It is an experimental review/exploratory examination in light of quantitative and quantitative information. It proposes a system/model for Navi Mumbai as a feature of Mumbai's keen urban communities. These would bring about coordination. Thus, this instructive system would be educational for Researchers, scholastics, enterprises, and government offices. Information researchers and conspicuous information examiners are standing out for them in creating tech-based urban areas. Human insight joined with man-made reasoning would have social, financial, and natural results manageability.

Keywords: *Navi Mumbai, Smart-cities, Punsari, Artificial intelligence, urbanism, Smart Waste-Management.*

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1. INTRODUCTION:-

As indicated by United Nation, the total populace will develop by 9.7 billion by 2050. It is assessed that urban communities would house around 80% of the metropolitan populace at that point, with every city lodging around 10 million individuals. There would be a huge populace increment, bringing about a shortage of assets and energy. The following significant test would be the organization and the board of numerous exercises connected with disinfection, gridlock relief, and traffic the executives framework. Overseeing such circumstances is generally a troublesome assignment. My exploration endeavors to distinguish the job of AI in such worries. Man-made consciousness examination can drive all disciplines referenced over that can be extensively classified as mental science, then again, actually the AI people group is continuously endeavoring groundbreaking thoughts zeroed in on programming, exploring and approving human cognizance speculations or planning a framework to play out a particular errand. A PC is a machine that permits us to do things present and control images expressly and verifiably. We accept that we are

the drivers for thoughts and ideas. Numerous clever specialists would be expected to drive in the contemplations. The specialist should identify it's general surroundings, think about its choices, and act on the planet overall. Assuming projects are keen, we call them so. This universe is the thing it is, and we endeavor to describe its way of behaving. Researcher ask how it affects an animal categories deliberately. An actual framework should be dynamic to be alive. Be that as it may, a significant number of these issues are sensible on account of applying AI-empowered Internet of Things utilizing mechanical headway to make the new conceivable and generate the idea of savvy urban communities. A smart-city uses Information and Technology to work on civil administrations' quality and execution (like energy and transportation). Subsequently, it diminishes the utilization of assets. Inventive innovation decidedly affects the occupants. Urban communities are among the most complicated substances and metropolitan improvement with different conveniences worries about structures, streets, wellbeing, security, and so on Various administrations are accessible, for example, traffic light and stopping the executives, squander the board, open spaces, and so on Whenever we allude to it as a savvy city, we talk about utilizing sensors, advanced mechanics, and AI supports gathering and putting away in numerous ways.

2. LITERATURE REVIEW:-

Authors': R.Begun, M. Arebey, M. Hannan, and H. Basri[2011].
Discoveries/Suggestion: To foster the canister and truck savvy observing framework, they proposed a framework outfitted with data frameworks and trend setting innovations like RFID, Global Positioning System (GPS), General Packet Radio Service (GPRS), and Geographic Information System (GIS), as well as camera innovation.

Authors': M. Arebey, M. A. Hannan, R. A. Begum H. Basri,[2010]
Discoveries/Suggestion: Another framework portrayed in [2] would screen and deal with the whole assortment process. It gives on-time strong waste assortment, vehicle following by means of a GIS data set, and continuous receptacle status. Notwithstanding, one disservice of this work is that it requires the gathering truck moving toward the waste canister to send information to the server.

Authors': I.von Poser and A. Awad.
Discoveries/Suggestion: According to them, the assortment interaction represents 85% of the absolute expense of the strong waste framework. Be that as it may, in light of the fact that they saw distance as an uneven interaction, their answer was restricted to bidirectional ways. Thus, they decide the best course for gathering strong waste in urban areas, with Irbid City in Jordan filling in for instance. As a for example, this examination made a strategy in light of an exact hereditary calculation.

3. PUNSARI – A SMART VILLAGE ROLE MODEL

The innovative implication of artificial intelligence is commonly seen in urban cities; however, seeing the impact of intelligent technologies in villages is quite surprising. In India, this surprise is by a small Village in Gujarat and can compete with any smart city. Taking the motivation the other village small town in countries needs to ahead their footstep not only to make a particular area or state as competent but also to make a whole as "SMART INDIA" and be a role model for

other countries in the world. Because of its incredible contribution, Punsari has been named "ADARSH GRAM".

The contributory detail is as below.

Location: Himmatnagar, Gujarat

Population: Approximately 6000

Credibility due to Village Sarpanch, Himanshu Patel

Facilities:

- It offers Wi-Fi connectivity; primary schools are equipped with air-conditioning facilities and CCTV cameras.
- All streets in the village have concrete roads; the roads are clean and litter-free.
- Speakers are installed at every corner of villages to pass on information to citizens.
- People get chilled mineral water for drinking through the RO water plant, and there is an independent public transport system.

Figure.1- Smart Classroom

Figure.2- Improvised Waste Collection

Figure.3- CCTV enabled Streets in Punsari

4. OBJECTIVES BEHIND

→To investigate ways of planning a shrewd city with AI prompting savvy administration.
→To consolidate AI-based brilliant framework regarding waste administration for the arising city of Navi Mumbai.

5. MAN-MADE CONSCIOUSNESS IN BUILDING SMART CITIES

There are not many instruments accessible to exhibit how AI and man-made brainpower can assist with building savvy cities.AI additionally has gifted independent advances that control a few explicit situations in urban communities. Since Regulatory and Compliance highlights are fulfilled for security, this will turn into a huge element in how city travel courses are planned and made due. These apparatuses and innovations assume a fundamental part in the enormous scope improvement of keen city the executives. These are incredible examples of design impressions for critical scale advancements. In the cosmopolitical and metropolitan urban areas, squander the board has been persistent development and in this manner, imaginative administration to handle such a situation is required. There is a requirement for shrewd administration in India for significant urban areas like Delhi, Mumbai, Kolkata, and so on Up until this point, we can prove that main explicit regions have squander the executives that needs greater headway. All things considered, there is an incredible interest for such innovations to make the public authority more straightforward.

6.SMART WASTE MANAGE-MENT IN NAVI MUMBAI

Computerized reasoning and IOT can execute savvy squander the board answers for guarantee that occupants of a shrewd city get a protected and sound climate. Squander-Waste assortments and their legitimate administration and removal are fundamental city administrations. This expansion in the metropolitan populace requires imaginative strategies for squander the executives. Taking on Artificial Intelligence for savvy reusing and squander the executives can give a maintainable waste administration framework. One such model could be Barcelona's waste administration framework, outfitted with Sensors and gadgets fitted on squander canisters that tells the specialists to dispatch the waste assortment trucks when they fill. They additionally keep up with independent containers for paper, plastic, glass, and waste food things in each territory. Sewage/wastewater removal frameworks in urban communities are turning out to be more productive with the utilization of man-made consciousness to anticipate the quantity of synthetics used to tidy up the water pursue off your grimy business, given different potential situations, for example, brief populace increments because of occasions, getting ready for expected populace development, precipitation levels and so forth.

Various stages of intelligence are applied to improve waste management

Stage 1: Instructions was given to Individuals to separate garbage as dry and wet. Door to Door Waste Collector visits the society of a particular area and dispose of them as per the type of garbage.

Stage 2: In addition to Stage 1, Sensors were installed in the trashbin to check the fill-up level.

Current Progress of Existing System:

Vighnaharta-A-3-S introduced its first Smart-Bin at Navi Mumbai. The Smart container incorporates three areas. A savvy level sensor is associated with each segment. These sensors send the level of the trash to the cloud utilizing GPRS 2G. Cloud App tells the Solid Waste Management group of NMMC to get once the trash level compasses 80% (The unit can set levels).

Figure.4- Smart Bin, Navi Mumbai

In this way, I propose an enhancement strategy that could uphold, make due, diminish, and control squander exercises in Navi Mumbai.

7. FRAMEWORK-ARCHITECTURE

I anticipate proposing a framework that exhibits a substance to propel the current brilliant waste administration framework. Figure 9 exhibits the model of the proposed approach.

With the use of IoT, AI will turn into the standard way we plan most things. The current waste administration frameworks can't proficiently manage the huge loads of trash produced consistently. The city of Navi Mumbai is thickly populated and delivers huge loads of waste. The city creates around 700 Metric Tonnes(MT) of waste/day. Navi Mumbai stowed the third situation in the yearly study of neatness, Swachh Survekshan 2020[MIDC]. NMMC-Navi Mumbai-Municipal Corporation got the primary position in the Cleanest Big City in the 10 to 40 lakh populace class. It dropped to the fourth situation in the yearly overview of neatness, Swachh Survekshan 2021 [MIDC].

Figure. 5- Swachh Survekshan 2020[MIDC]

Figure. 6- Swachh Survekshan 2021[MIDC]

Figure.7- Swachh City Award#1,2021

7.1. SHIELD – AN AI-POWERED AUTOMATED FRAMEWORK OF WASTE MANAGEMENT

Mechanizing the trash arranging and removal processes by changing to Artificial Intelligence for Smart Recycling and waste administration is relied upon to raise better and more proficient removal strategies to reuse reasonably. Radio Frequency Identifications [RFID] tag is a new innovation embraced for squander the executives. Numerous western countries vigorously utilize such changes for the trash the board interaction. In like manner, the essential server that stores this information decides a proper technique to discard the all out waste produced. Computer based intelligence programs and IoT sensors are other progressive ideas in squander the board. The sensors on these garbage bins measure the waste levels of the trash tossed inside them and send this information through moderate servers to the essential removal frameworks for handling.

The framework sorts the information into the kind of trash, the amount of each sort of trash, and the separate garbage removal strategy.

Mechanized canny machines are supplanting the conventional waste arranging techniques. The planned smart receptacles could think for themselves while arranging and sending trash. Over the long run, this framework can likewise refine itself by concentrating on chronicled records to work on its productivity.

Each of an individual requires is to keep the trash in the receptacle.It then, at that point, utilizes its sensors to study and look at the rubbish recuperated through the past garbage records and afterward chooses the should be finished with the waste.

Contingent upon the idea of the choice, the actual canister sends the trash to a fitting removal framework, whether it is an unloading ground or a reusing plant.It will move far in keeping up with the environmental equilibrium for a superior and more maintainable future.

An AI-Powered behaviour of the framework

Consider the above framework flow; the question arises: Where is the artificial intelligence in the proposed framework?

The answer lies here: The concept of AI comes in the frame when primary servers receive data through a sensor and compares it with previous records. Based on nature, it decides what to do next. The above behaviour is an exact behaviour of the model-based agent in artificial intelligence.

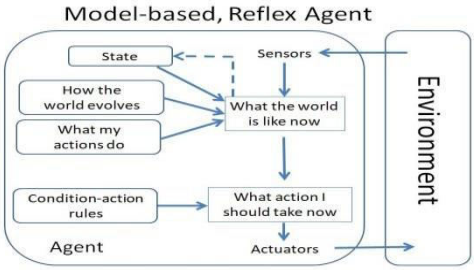

Figure.8-Model Based Agent

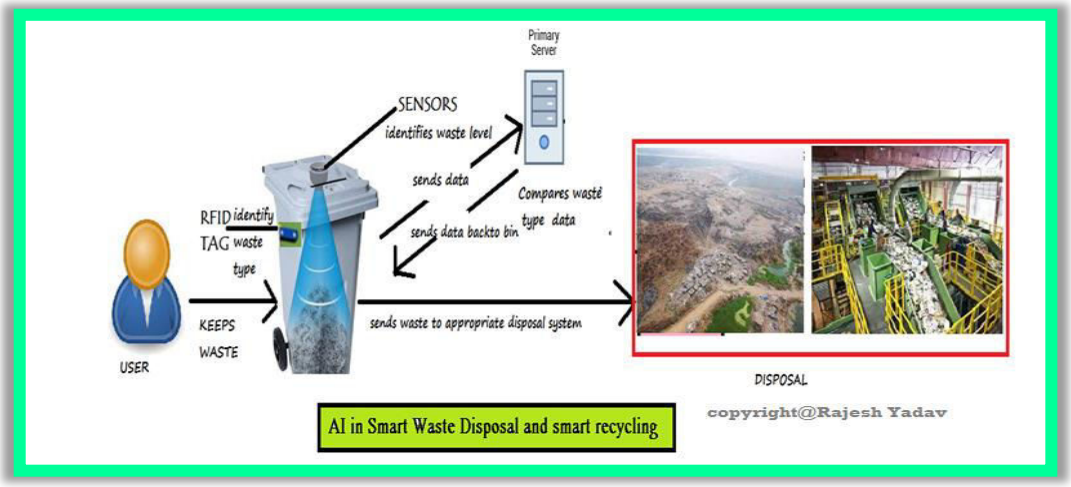

Figure.9-Proposed Framework Prototype

The name shield is given to the proposed framework to indicate an automated process without an in-between actual Human intervention.

8. FUTURE SCOPE

The proposed model could be developed further and implemented in our cities. There would be a lot of technology and management assimilation in the processes mentioned above. AI and sensor networks and recent technological trends would be a boon to these rapidly developing cities. When these smart systems become a reality, they will face numerous challenges, but their adoption will always be a boon to humanity.

The following study has a few limitations, including a pilot run, government compliance, and the costs associated with such a project.

9. CONCLUSION

AI implementation would change the way cities operate, deliver, and manage public amenities such as traffic system management, parking management, and waste management. However, the proper selection of technologies is critical for smooth operation.

Due to the challenges, it will take a long time for cities to become fully AI-operated. Among the significant concerns are the growing population, the digital divide, and existing gaps in digital literacy. Retrofitted solutions could thus provide a way for ideas.

Another critical aspect to consider when implementing AI is collaboration. A shift in mindset is required for cities to benefit from the potential of smart cities truly. The authorities should coordinate their efforts across multiple departments. Though budget is an important consideration, the successful implementation of smart city components worldwide demonstrates that smart cities are relatively inexpensive if appropriately implemented. The transition to smart cities creates jobs while also helping to save the environment, reduce energy expenditure, and generate more revenue.

This study aims to investigate how to design smart waste management using AI, which will lead to smart governance. I proposed a way to deal with showing the reception of shrewd AI-based advancements and endeavored to extend my point of view on fusing AI-based brilliant foundation concerning waste administration for Navi Mumbai, an arising city.

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INDEX

A Theoretical View on the DARQ as future Cutting-Edge Technology

Mr Rajesh Yadav

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TECHNICAL ABSTRACT:

"World of today is the technology of Future."

OR

This quoted sentence indicates that whatever and how we live today will reflect the aspects of tomorrow, and it will be in terms of technology. Hence, in this paper, I'll try to elaborate on one of the cutting edge technology of the future called DARQ.DARQ stands for Distributed Ledger Technology (DLT), Artificial Intelligence (AI), Extended Reality, and Quantum Computing. You may be familiar with these technologies, which have the most potential in the future. For the theoretical view in this paper, I will discuss the technologies mentioned, how this technology (DARQ) works, how DARQ technology can improve our future, and finally, my thoughts on DARK (Conclusion).

Keywords: *DARQ Technology, Distributed Ledger Technology, Artificial Intelligence, Extended Reality, Quantum Computing are some keywords.*

1. FORMAL INTRODUCTION

We live in the technological age. We cannot claim to be on the cutting edge of technology, but we will be in the future**.** Because the more we think about the problems in the world, the more solutions we find. The answer, in this case, is nothing more than the technology we develop to solve the problem. Even so, there may be some limitations to that technology. What should we do next? We modernize the technology. This cycle repeats itself, and as a result, we evolve. This so-called technological evolution intends to make our lives easier.

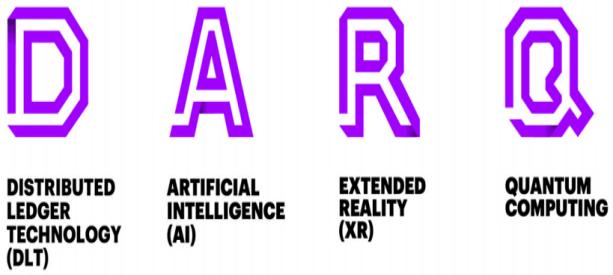
We are constantly upgrading to live happily and have a better future. While we cannot predict the future because we have not progressed that far, we can speculate on the evolution of technology. We constantly watch emerging media and the latest technological trends to predict which technologies will have a brighter future.

Here are a few technologies that will shape the future.

- Machine learning Deep learning and artificial intelligence
- Extending Reality with Blockchain
- Quantum computing.

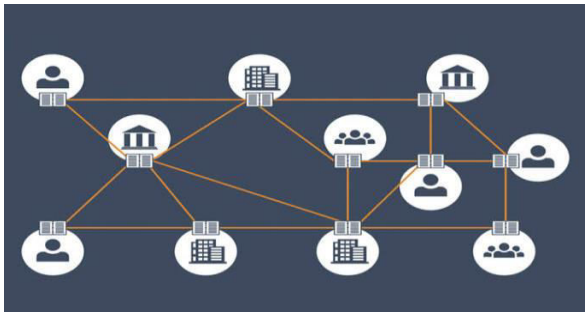
A newly emerging technology that combines the technologies mentioned earlier shows the most promise for the future. The DARQ technology will be used in the four significant technologies discussed below.

2. DARQ technologies



2. A Distributed Ledger Technology (DLT)

DLT ("Distributed Ledger Technology") is a technique of sharing and storing data across multiple data stores known as "ledgers". The ledgers' job is to maintain and control the distributed network of computer servers (nodes). The data records in each ledger are the same.



Changes to the single ledger reflect throughout the entire distributed network, and in any specific case, all network members have an exact, identical dupe of the ledger as the whole.

2.A.1 DLT TYPES

Permissioned distributed ledgers and permissionless distributed ledgers are the two types of distributed ledgers.

The permissioned distributed ledger involves the demand for authorization from central entities for nodes to enter the network and change the ledger. Identity verification is part of this.

Every node in the network has a complete and up-to-date dupe of the entire ledger in permission-less distributed ledgers. All proposed original ledger additions by network actors are communicated to all nodes throughout the network.

2.A.2 Blockchain technology

Blockchain is a type of DLT that employs cryptographic and algorithmic approaches to create and validate a continuously expanding, append-only data structure that gradually transforms into a chain of transaction blocks that serve as a ledger. It is currently the most widely used DLT variant in the world.

The nodes begin new additions to the database by creating a new data 'block' containing the records of various transactions or deals. In addition, information about the latest data 'block' is distributed throughout the network in translated data. As a result, Blockchains ensure that sale details are not made public.

Furthermore, all nodes in the network estimate the data block and confirm its validity using the predefined algorithmic confirmation method. The Blockchain consensus mechanism is another name for the predefined algorithmic confirmation system. When a data block is verified, all nodes can add it to their ledgers, forming a 'chain of blocks' known as The Blockchain.

Bitcoin, Ethereum, and other blockchain examples are the best. Different DLT variants include Hash graph, DAG, Holochain, and Tempo.

2. B. Artificial Intelligence

Artificial intelligence is nothing more than a machine's intelligence provided by a developer. Giving intelligence to the device ensures that the machine can make its own decisions based on the situation. In simple essence, artificial intelligence (AI) is simply lines of code written by the developer. However, AI is more than just code. AI is referred to as a "power-up" because it transforms a machine when added to it.
We are still using AI today. The best examples of AI are personal assistants such as Siri, Google, Bixby, and Alexa. Also, movie recommendations on Netflix, Prime, ZEE 5, Hotstar, etc. As a result, AI is now a part of our daily lives.
As these technology advances, we will be able to create wonders. AI subtopics include machine learning, deep learning, neural networks, etc.

AI requires data to perform tasks. This data is frequently collected, extracted, and mined as part of a process to understand better how we use technology. Patterns are built using data, which AI then uses to generate predictions and simulations.

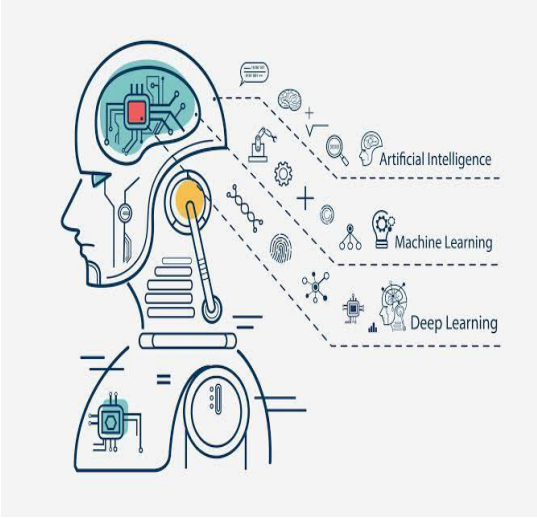


Fig.1.INTELLECT VISUAL OF AI, ML and DL

2.B.1 MACHINE LEARNING

Machine learning is creating machines that can collect data, apply algorithms to it, and then orient themselves to derive meaningful insights from the information.

The primary distinction between ML and AI is that ML does not rely on the code of its creator. ML is primarily used to detect faces, voice commands, and objects and translate languages and chatbots. In contrast, ML systems start with computer code and then load data, information, and inputs to evaluate. This connection to big data binds machine learning and the Internet of Things together.

2.B.2 Deep Learning

Deep learning advances AI by using artificial neural networks to mimic how the human brain works. Each neuron in an artificial neural network has the task of providing a binary response to fundamental questions about a piece of data. Extending thousands or millions of these artificial neural networks allows a Deep Learning machine to provide exact outputs without changing the coding.

2. C. Extended Reality

Augmented Reality (AR), virtual reality (VR), and Mixed Reality (XR) are examples of extended reality (XR) technologies (MR). These technologies broaden our perception of Reality by combining the virtual and real worlds or creating a fully immersive experience. We can find them in video games and apps that allow you to fantasize about a different reality while using your device.

XR enhances the human visual experience and spectacularly immerses people.

Extended Reality can be thought of as a link between the real and virtual worlds. Because of advancements in the semiconductor and photonics industries, the demand for augmented, virtual, and mixed reality technologies has grown over the years.

2.C.1. Technologies in Extended Reality

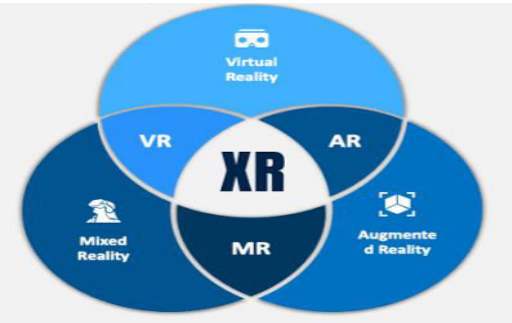


Fig.2.Technologies in Extended Reality

2.C.1.1. Augmented Reality (AR):

AR combines digital elements such as visual overlays (objects with no background) and haptic feedback over a real-world environment. In comparison to VR and MR, this technology is more easily accessible. All we need is a camera to capture the real world, and the AR app will overlay virtual objects on top of it, allowing us to see them on our phones.

Smart glasses or headsets can also be used to experience augmented reality. For the time being, augmented Reality is primarily used for navigation. AR glasses do not alter our surroundings

but rather add digital objects to real space. The digital data is projected directly in front of the user's eyes in this case.

2.C.1.2. Virtual Reality (VR):

Virtual reality headsets create or display the virtual reality environment around us, which is nothing more than a 3D simulation. They generate a computer-generated artificial environment. VR is currently used for entertainment, gaming, and healthcare, among other things.

There are two kinds of VR headsets:

A.PC-connected headsets are linked to a computer or a gaming console, resulting in high-quality virtual experiences. Computers and consoles today are capable of producing natural and convincing digital worlds.

B.Headsets that stand alone: The standalone headsets do not need to be connected to a computer or console. The majority of standalone VR headsets provide the VR experience through a smartphone screen which is more affordable, but they are also simpler to use.

2.C.1.3. Mixed Reality (MR):

MR enables users to see and interact with a completely virtual environment superimposed on the natural world around them. This hybrid Reality leans more toward VR than AR.

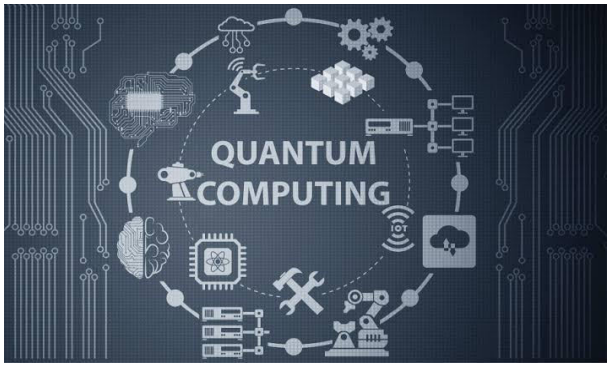
The two primary MR devices are as follows.

Holographic devices - These headsets have translucent glasses that allow the user to see the real-world surroundings while creating virtual experiences with holograms.

Immersive headsets - These headsets have a non-translucent display that blocks out the real world and uses cameras to track its surroundings.

2.D Quantum Computing

Quantum computing is the final technology in DARQ and the world's most experimental technology. I believe it is the most powerful technology in DARQ. It is a type of computing that is based on quantum mechanics. Quantum computers were created to solve problems that supercomputers were unable to solve. The development of powerful quantum computers for the future is still in its early stages.



2.D.1Process of quantum computing

Quantum computers use quantum mechanics laws to accelerate computation processes. Quantum computing has the capacity to change the course of history. It can also be used to lead scientific advances, industries, and so on, even when humans are at the beginning of our journey.

Quantum computers encrypt information as 0s, 1s, or both at the same time using quantum bits or qubits. Because of this superposition of states and other quantum mechanical phenomena such as quantum entanglement and tunnelling, quantum computers can simultaneously manipulate massive combinations of conditions.

2.D.2. Classical Computing VS Quantum Computing

Classical vs Quantum Computing Terms

Source: Caltech Entrepreneurs Forum, Feb 23, 2019

	Classical	Quantum
Basic Unit	Binary Bit (1 or 0)	**Qbit** (vector)
Computing	Logical Operation	**Unitary** Operation
Description	Truth Table (True/False)	**Unitary** Matrix
Direction	Most Gates Run Forward	Gates are Reversible
Copying	Easy	Impossible
Noise	Minimal w/Error Correction	**Quantum Error Correction** (Very Difficult)
Storage	n-bit storage holds 1 value. from 0 to 2**n - 1	n-qbits storage holds 2**n values
Computation	n-bit processor = 1 operation	n-qbit processor = 2**n operations

Table.1.Comparison of Classical and Quantum Computing

3. How does DARQ technology work?

DARQ technology, as the acronym suggests, is a combination of four powerful technologies: artificial intelligence, extended reality, quantum computing, and distributed ledger technology. Let us first discuss artificial intelligence. Artificial intelligence refers to the brightness of a machine (a device or an application) based on code written by the developer and learns from situations it encounters. DLT connects a group of computer servers to form a chain-like distributed network so that they can share and store information in the most secure way possible. Extended Reality assists us in visualizing things and recreates our surroundings in unimaginable ways. Quantum computing enables us to compute tasks that will last a lifetime.

We will combine the technologies as mentioned earlier in the DARQ technology. Assume we were able to provide AI to the nodes in the DLT network while also dealing with Extended Reality. Normal computation may not be efficient when dealing with complex problems and situations using the three big technologies. As a result, we will employ quantum computers as network nodes or, at the very least, as a central entity.

Note that the above assumption could take 50 to 100 years to come true.

4. Prospective Scope

SCENARIO OF FLYING VEHICLES: Let us imagine a future in which we finally have flying vehicles, but managing traffic in the air (3D space) is difficult because we are not moving on the roads (surface). As a result, we will employ DARQ technology. Every vehicle now has a quantum processor, and each vehicle is linked to another nearby car via a DLT network to receive positional information. The AI in the vehicle drives itself based on that information. As a result, the flying vehicles will move like a swarm of ants (as ants communicate with each other). Accidents and traffic jams can thus be avoided. With the assistance of ER, the passenger can view the journey details inside the vehicle.

Fig.4. Visualizing DARQ through Flying Cars

VIRUS DETECTION AND ACTIONABLE SCOPE: Assume that nanobots exist in our bodies. If they detect a new virus, they will send the information to the appropriate alert station and kill the virus before it spreads. It is possible thanks to DARQ technology. The nanobots use AI to make decisions, and a DLT network links them. Through ER, the individual can view their health statistics.

Fig.5.Nanobots in Virus prediction

- Other ways in which this technology can improve our future include:
- A UNI operating system for all of your devices, with UI, floats in mid-air.
- Encyclopaedia based on the emergency room.
- Adaptable Nanotechnology or artificial matter – matter that reshapes itself in response to user thoughts.
- Drones periodically repair the ozone layer.
- Spaceships that can travel at light speed (with the help of quantum computing).
- Drones and bots that can terraform Mars.
- To deconstruct every cell in our body in one location and reconstruct the same cell in another location

5. CONCLUSION

Numerous issues arise daily. We must be adaptable to change and embrace cutting-edge technology to address them. As we all know, each technology has its own set of limitations. If the technologies come together, the potential is enormous. As we all know, Artificial Intelligence, Extended Reality, Distributed Ledger Technology, and Quantum Computing are game-changers if they are combined.

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One Day International E – Conference On
Covid-19 Pandemic: Challenges, Opportunities & Solutions in Front of Higher Education
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PANDEMIC TECHNO-VISION OF ICT IN EDUCATION

ABSTRACT

The entire world is confronting pandemic circumstance. To be out of the present circumstance, we as a whole are battling. All fields are influenced because of Covid 19. And furthermore teaching field is influenced. However, ICT is very much accommodating to instructors and students. Due to this ICT version of change, teaching learning measure becomes easier. In training, ICT assume indispensable parts in working with instructing and learning. They have changed study hall specialized techniques and adjusted guidance systems. Too, ICTs have made educating and learning intelligent and community rather than the customary educator talking and students listening approach. The improvement of ICT is viewed as a superior method of educating and learning a specific language contrasted with the current strategies. In schooling, imaginative learning, particularly learning should be possible by utilizing the Internet to produce gadget based learning ICT. In this computerized period, ICT use in the study hall is significant for offering students chances to learn and apply the necessary 21st century abilities. In the advanced world, where everything is taken under Internet and new mechanical developments, it is hard to subvert their commitment to unknown dialect instructing. ICT shows up as a 'connect' to break the distance and 'endure' the learning. If there should be an occurrence of distance, instructors can utilize ICT through video meeting to empower them educate or screen the students learning measure.

The reason for this paper is to perceive how we can utilize ICT for getting teaching-learning measure more viable in the present circumstance .We can utilize ICT devices for advanced education students. ICT will be helpful for upgrading abilities as tuning in, talking, perusing and composing.

This paper centers on utilization of ICT apparatuses for powerful showing learning in pandemic circumstance.

KEYWORDS *Covid-19, pandemic, ICT, ICT Tools, Internet , Social media, Online facilities.*

1. INTRODUCTION:-

Covid disease 2019 (COVID-19) is an infections because of SARS-CoV-2. It was first recognized in December 2019 in China's city Wuhan. The principal case might be followed back to 17 November 2019. Corona virus is an illness brought about by another strain of Covid.Earlier, this infection was alluded to as '2019 novel Covid's or '2019-nCoV.' This illness spreads all around the world and made lockdown everywhere. Because of this pandemic circumstance, all fields get influenced. Any one of them is schooling. It likewise make changes in showing learning measure. Because of this lockdown, all schools, universities got shut and showing learning measure halted. Yet, ICT devices came to help educators and Students. Online classes begin and indeed training framework got sponsor. These days there are diverse applications through which instructors and students are coming to one-another and finishing their work. Diverse applications utilized like zoom, Google meet, WebEx, Microsoft and numerous others. There are various stages through which educator are coming to their teaching through web based instructing. Furthermore, students are likewise learning.

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2. EFFECTS OF COVID PANDEMIC ON TEACHING LEARNING PROCESS:

***i. Online training*:** Because of Covid-19, there is no alternative without online schooling. As lockdown don't permits to open schools, universities, so online training is just a single choice through which training can be initiated.

ii. Utilization of apps: Different applications these days are utilized for online schooling. These applications are useful for students and educators to reach. Such sort of applications is additionally utilized for gatherings/meets, internet trended learning process. Example: Zoom, Google meet, WebEx and so on.

iii. Stages/Platforms for online training:

There are various platforms accessible for online training. Through these platforms, online classes can be taken, user views can be presented, and recordings can be transferred. So these platforms are useful to the students just as instructors.

Example: Swayam, WebEx, Impartus and so on.

iv. Utilization of various e-content and digital libraries:

Because of online training there is no time limit just as spot limitation for learning. Anybody can gain from any spot and whenever, hence many kind of courses-anyone can take. What's more, unique e-content are additionally ready for students on various digital platform. Universities'/Colleges can enclose towards the development of an online resources bank where students can choose to access books, notes, documents and study material whenever they are in urge to. This would enable students to engage with resources and maintain a self-study schedule and are useful for them to improve their insight.

V.Virtual placement drives:

Universities/Colleges can further the process of digitalization by organizing virtual placement drives for under-graduate & post graduate students. This way, even the specificability of placement would not be compromised because of the non-accessibility of the physical university space.

3. ICT AND IT'S SCOPE:

1. World Wide Web (WWW) is refreshing the information libraries for students, educators, researcher because of huge advancement of ICT. An individual from Village additionally, can allude the most recent data and exploration every day. Open universities and distance schooling through ICT are new openings for working individuals to gain, information to learn at home moreover.
2. Television broadcast is outstanding amongst other correspondence media to instruct the students, farmers, athlete with most recent data with video clips. The exorbitant and troublesome tests progressed a medical procedure for clinical students and so forth can be seen.
3. The curriculum data about reading material, reference books and references are accessible on Internet. Even one can finish a course of unfamiliar college by utilizing Internet, which is exceptionally financially savvy.
4. Audiocassettes, video tapes, sound and video CDs, video mixed media intelligent CDs are accessible on the lookout for a wide range of student. Even educators can foster the content CDs utilizing PCs.
5. Rather than overhead projectors no LCD projectors can be utilized for successful learning for huge number of students.
6. The human mix-ups can be stayed away from by online assessment. It keeps up with objectivity of examination.

The three words Information, Communication and Technology have their own different vitality. Be that as it may, the importance of the three words altogether, ICT is turning into a vital part of person. ICT is exceptionally valuable in practically all spaces of human existence.

4. ICT TECHNO-TOOLS:

Data and correspondence innovations have become typical entities on the whole parts of life. Across the previous twenty years the utilization of ICT has generally changed the practices and methods of virtually all types of attempt inside business and administration. Teaching is a socially arranged movement and quality schooling has generally been related with solid instructors having high levels of individual contact with students. The utilization of ICT in teaching fits more understudy focused learning settings. However, with the world moving quickly into advanced media and data, the job of ICT in training is turning out to be increasingly significant and this significance will proceed to develop a lot in the 21st century.

Portions of the ICT Tools which are utilized for showing learning measure are as below:

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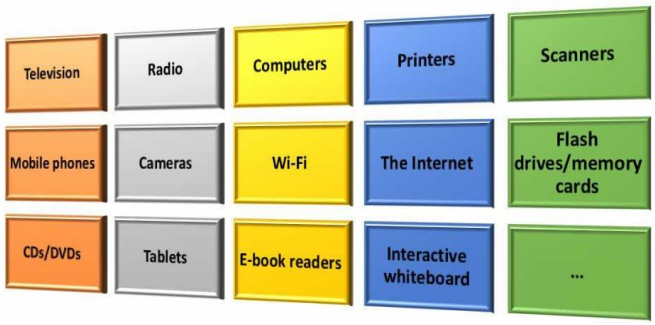

Fig 1: ICT TOOLS

These instruments assist students with gaining abilities needed for smooth correspondence. These devices are accommodating to instructors just as students.

5. ICT IN TEACHING LEARNING:

ICT can be valuable for an educator in the accompanying manners:

1) It is useful in the expert advancement of the educators. An instructor can learn different language abilities with the assistance of ICT. He can do different certificate programs run by the well known instructive organizations like Cambridge University, British Council, Great Learning and so forth. These projects help in upgrading his ability to show his subject substance simple, monetary and more justifiable.

2) An educator can build his area of information with the assistance of e-diaries, e-magazines and e-library that can be accomplished distinctly using ICT. He can likewise partake in conversations and gatherings with the specialists of his subject instructing to work on his insight and abilities through sound and video conferencing.

3) ICT assists an instructor with learning imaginative strategies for educating. He can work with the students on different venture and tasks. It likewise helps him in giving educating contents, home works and so forth

4) He might indulge in different in-administration preparing programs and studios which are fundamental for his expert improvement with the assistance of ICT.

5) ICT assists an educator with directing his students about the learning materials accessible on web, digital books ,e-diaries ,e-magazines and social locales like connected – in which are supportive in better acquiring of subject abilities.

6) ICT likewise helps him outlining educational plan of subjects. He can contemplate educational programs of various nations to examine their advantages and disadvantages, challenges just as sociological and psychological issues related to learners.

All these things help him in framing a curriculum that leads to achieve the aims and objectives of subject of teaching.

ICT can be useful for a student in the following ways:

1. Student learn and grasp concept through online resources.
2. Students comfortably learn at their own pace and time.
3. Students possibly meet teachers online and get required knowledge about the subject.

In this way there are different tech-views through which teaching learning process is becoming easier. These apps help both mentor-mentee to communicate with each other and get knowledge of particular contents. Teachers are making them more tech-savvy through use of different tech-apps. In this context, ICT tools are helping teachers as well as students in this pandemic situation.

Conclusion: In hand-use of ICT in today's pandemic scenario is very much beneficial. To overcome the teaching learning problem in part of education, these tools are very much efficient and relatable. Through these tools one may be in touch and continue their learning at their own pace.

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has actively Participated in Inter-Disciplinary International E-Conference on "Covid-19 Pandemic: Challenges, Opportunities & Solutions Infront of Higher Education" organized by Shankarlal Khandelwal Arts, Science & Commerce College, Akola & Arts and Science College, Kurha, Amravati & Saraswati Kala Mahavidyalaya, Dahihanda, Akola in Collaboration with Physical Education Foundation of India, New Delhi on 21st August 2021.

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INTERNET OF BEHAVIORS: A PERSPECTIVE MODEL OF BEHAVIOURAL PSYCHOLOGY

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ABSTRACT
The world is an eye witness of overall growth happening all over.Right from use of technology, to its advancement and benefits everything is growing rapidly.We as a user are much dependent on machines and technologies.People todays are using devices based on internet of things ,internet of Everything.It ,thus became a need to collect and observe the behaviour of customer their preferential interest etc.To achieve this an emerging extension of Internet of things is put into force preferably to observe the behaviour and is termed as "Internet of Behaviour".Here in my paper , an introduction, its visionary contribution,various fundamental aspects,the benefits will explain the behavioural psychology which will be showcase at end part through case studies.

Keywords: WWW, psychology, Behaviour, IoB,SxO.

INTRODUCTION & MOTIVE BEHIND
An interconnected network of physical objects to collaborate and share meaningful data over the internet is termed as "Internet of Things (IoT)".The IoT complexity is expanding and emerging constantly , complexity as the way in which devices are inter-linked, the processing of computations by these objects on their own.

Collection of Data gives insight of important information about behaviours of customers, their interest and preference, and the world of technology refer this as Internet of Behaviour- IoB. An Internet of Behaviour tries to introspect the collected data from online activity of various users through their perspective model of behavioural psychology. It addresses the following question: how to understand the data, how to apply the perceived understanding to create and market new products, baselining human psychology perspectives.

According to Gartner- " IoB collects the digital patterns of people's lives from varied Sources and these patterns can be used by private and public organisations to study people's behaviour".[8]

An IOT's conversion of data to information, and the IoB's conversion of knowledge into wisdom, can be seen in the pyramid (Fig. 1).

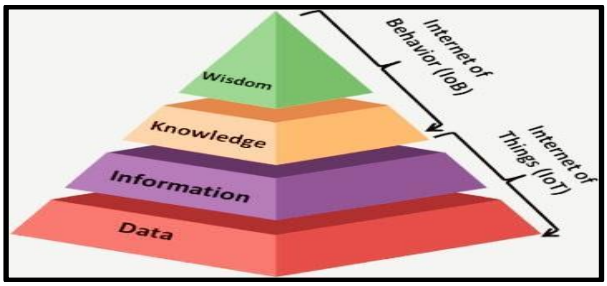

Fig.1. Conversion Pyramid From Iot To Iob

Thus IoB refers to a phenomena through which user-controlled information is analyzed by means of a behavioural-psychology perspective. The analyzed result of IoB put lights on recent yet new ways of designing a User-EXperience(UEX), Search EXperience Optimization(SeXO) and companies offering marketing products or services. Consequently, if we observe from the front view it is technically simple, to conduct IoB for a company but psychologically complex. The prerequisite of IoB is to conduct statistical studies that map daily habits and behaviours of consumers without fully disclosing their privacy for ethical and legal reasons.

In extended use, IoB combines existing technologies and is an amalgamation of three fields: Technology, Data Analytics and Behavioural Psychology.

IoB is viewed as one of the top tech patterns for the year 2021. The COVID-19 pandemic is chiefly answerable for IoB turning into this pattern since it has changed how purchasers associate with brands, making organizations reevaluate how they speak with clients. From a human psychology research viewpoint, the IoB plans to accurately investigate information and use that understanding to plan and sell new products. From a conduct behavioural psychology stance, the IoB attempts to decipher the information gained from clients' online exercises. It plans to answer how to decipher information and how to utilize that information to create and promote new merchandise, all according to the viewpoint of human brain science. This recent fad influences the

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Quality Infrastructure once in a while on the grounds that different organizations can Increase their availability, prompting higher client assumptions.[[1][2][3]]

VISIONARY CONTRIBUTION

The rationale of the IoB is to (CAUR):- catch, analyze, comprehend and react to all characterized kinds of human practices in an example that permits track-following and in this way deciphering those individuals' practices with the utilization of arising machine learning and AI algorithms[10].Behaviours of people are monitored and incentives/disincentives are configured to influence them so that they perform towards a desired set of operational parameters. What is really uni-quality about IoB is that it's not only descriptive in nature (analysing behaviour), but has a proactive nature (detecting which psychological variables to influence to bring about a certain outcome)[11].

The IoB focuses on consumer choice, and re-designs the value chain. However some users are worried about providing their data, whereas others are happy-go-lucky to do so when they believe it adds value to data and makes a final data-driven value. For industries or businesses, this indicates the ability to change their image, market products or improve the Customer-Experience (CuX) of a product/service. In a hypothetical term, information can be gathered on all facts of a user's life, with the golden goal of improving efficiency and quality.

The fundamental aspects required in company to make use of IoB in its marketing department is as follow:

Aspect 1: The foremost is to imagine the user's interaction patterns before the creation of the application and touch all those imaginary points.Include these in the creation process, understand the needs, keep the application experience cohesively unified , make navigation in the application simple and meaningful.Once the application is built and run, convey its purpose, make a user guide and reward by gamifying the CuX in the application.In overall aspect, Strong user engagement is required.

Aspect 2: Solid multi-format supported platform tools are required that can connect to any API, and can upload data to the cloud.Multi-channel personalisation should be allowed by these platforms.Besides these platform should replicate centralised updates , send unique notifications that turn users into contributors and thus facilitate in personalisation of the application.

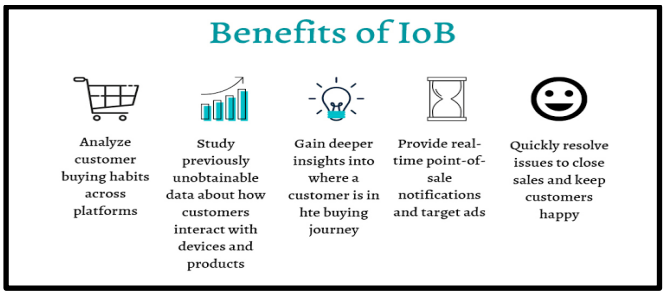
Aspect 3: This is the final stage where data is captured through the applicant that features user behaviour to a model. This data is nothing but And actionable data that can be transferred in the form of pop-ups and notifications to the customer in order to encourage and adhere to a desired behaviour.

Ethical usage of IoB

With Big Data, multiple points of contact information can be accessed. This facilitates exploration of the CuX from initial to end, to find where the customer's interest in a product begins, their journey to purchase and the methodology used to make the purchase. This thus provides the ability to invest in more touch points to positively engage with the consumer. The efficiency of a service is keyed by this personalisation.Highly efficient a service is, the higher the chance of user continuation to interact and modify their behaviour as an outcome[11].

Benefits of IoB

Following pictorial diagram shows benefits of IoB as an insight view.



CASE STUDIES

It is easy for organizations to interface a cell phone with a PC, with a voice associate, with a smart home or with their vehicle. Promoting research from Google, Facebook or Amazon is turning out to be increasingly far reaching. The calculations of these organizations are designed so they can expect client wants and practices. The B2B area is growing quicker than B2C in IoB yet it is inevitable before it becomes omnipresent.

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For instance, programming organization BMC has fostered a wellbeing application for cell phones that tracks diet, rest designs, pulse or glucose levels. The application can make aware of unfriendly circumstances in the client's wellbeing and recommend social alterations towards a more sure result. Wellbeing Passport (with applications like Aarogya Setu in India, and The Health Code in China) and Social Distancing Technologies are accomplices in this arising wellbeing innovation.

Corresponding to transportation, Uber, for instance, utilizes IoT information on drivers, traveler areas and inclinations to reexamine CuX. Likewise, enormous organizations, like Ford, have joined other new businesses, like Argo AI, to plan independent vehicles that fluctuate their conduct in every city dependent on vehicle traffic, walkers etc.

One more programming organization, GBKSOFT, has completed a venture that likewise executes the IoB idea. The pith of the venture was to assist golf players with further developing their playing abilities with the assistance of a versatile application and following of wearable gadgets, to be specific adjusting existing ball striking strategy and learning new methods. Utilizing a handheld device associated with the cell phone, each hit on the golf ball is recorded in the application and dissected (stroke power, direction, point, and so forth) Accordingly, the player can see their missteps and get visual proposals on the most proficient method to further develop their swing and stroke.

CONCLUSIONS

Without a doubt, A/B testing, SWOT examination and numerous different methods have helped organizations for a really long time to fabricate their item and showcasing techniques to make and advance that clients would need to purchase. The IoB will take this pattern to a higher level, and is set to produce extensive energy in the improvement of the business. As per Gatner, the innovation might in any case be in its initial days, yet before the finish of 2025, over half of the total populace will be presented to no less than one IoB program, either from the public authority or a privately owned business. It will be the environment that characterizes human conduct in an inexorably computerized world.

Hence, it will be crucial for find some kind of harmony between customized contributions and nosiness to stay away from unfavorable purchaser response. Any organization that decides to embrace an IoB way to deal with its systems should guarantee that it has hearty network safety set up to secure all that delicate information.

IoT-reaped information utilized with IoB innovation can be utilized to sell, yet it's not all designated promoting. Associations will actually want to test, for instance, the proficiency of their missions, both business and non-benefit. Likewise, medical care suppliers can quantify patient initiation and commitment endeavors. All in all, its inventory of uses is as of now broad, yet it will keep on growing as it becomes set up in the public arena.

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PRIVACY: IS IT A THREAT TO CYBER SECURITY?

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ABSTRACT
In trending digital world, every individual is much concern about their online activity and thereby the privacy related to it.Privacy is considered as one of the important factor when it comes a talk of security. The following survey paper aims to understand and highlight the importance of privacy in cyber security. It gives a compelling argument for both ends and tries to find a balanced view between the two. To achieve the objective we have conducted a survey that showcases major view of people on privacy.

Keywords: Privacy, online, anonymity, cyber, security, information, data.

I. INTRODUCTION

As the dawn of the new era dominated by the internet approaches us, no matter how hard we try it is impossible to not have an online presence. From our passports, and various other government documents to simple transactions or for using any of the messaging services, digitization is leading the way. However, in recent times people are getting more and more concerned about information leaks and data manipulation. The term "Privacy Threat" has gained a lot of prevalence in the world around us. Getting tracked on the internet is something that has been a major cause of concern for many, which has led to a global need for anonymity on the internet. While anonymity can be a boon for some, it comes with its risks. The following paper aims to highlight those risks and tries to assess if there is a way to provide both privacy as well as security to the user or an organization.

II. PERSPECTIVE VIEW OF PRIVACY

Privacy is one of the most difficult to define human rights as it cannot be restricted to one particular definition. The definition may vary according to the context and environment. Privacy has often been used along with Data Protection, which relates privacy with the management of personal information. In simple terms, it can be said that privacy protection is to what extent society or others can intrude into a person's individual affairs [1]. In the context of the internet and Cyber World Privacy can refer to information privacy and privacy of communications.

TYPES OF PRIVACY:

Information Privacy: Privacy protection for personal data such as credit information, medical records, social security numbers, contact numbers, etc. [1]

Privacy of Communications: Security and privacy of our conversations, mail, email, phone calls, etc. [1].

III. Being anonymous online or online anonymity

In colloquial terms, online anonymity applies to any interaction a user has on the internet that protects his or her identity from being shared with another user or third party. Anonymity can have different levels as well [3].

Cyber Security: Cyber Security is the use of technology to protect systems, networks, programs, and the user from cyber-attacks. Cyber Security may also include protection from Cybercrime such as extortion, harassment, fraud, defamation, etc. [4].

Privacy and Online Anonymity

Privacy and Anonymity are terms that are often co-related. These terms differ in terms of actual application and are used interchangeably. Anonymity means that your identity is not revealed however, your activity is visible to everyone. Privacy means to keep your identity public but your activity is kept a secret [5]. To understand this better let’s consider an example.

Imagine a class of a certain number of students. Each student has been given a code secretly and the results of their examination are sent using that code. The teacher herself is not aware of which code belongs to which student nor have the students informed each other about their respective codes. When the results arrive, the teacher sees that 10 codes have got an F or they have failed the examination and the results are put up on the notice board. Since the notice is publicly posted everyone knows 10 students have failed. However, no one knows who those 10 students are. This is anonymity.

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Now let's say that a student named M is very popular in his class. He sees the results and realizes that he has failed the examination. M wants to avoid getting punished and does not want to reveal to anyone his results out of shame. Everyone knows M but no one is aware that he has failed. This is privacy.

The government and various organizations that have been set up by them for protecting us from people like M. To achieve this, they use various methods such as wiretapping, tracking, monitoring our online activity, monitoring our social profiles, and private searches (legally or illegally). Some people might say, "I have nothing to hide as I am not committing any crime or act of treason." Others might think that these people don't realize the actual implication and extent of this and how it may take away some of their civil rights [5]. However, even if you have nothing to hide internet privacy is crucial especially in the times, we are living in. Let us explore further for the reason.

IV. NEED OF CRUCIALITY IN INTERNET PRIVACY

Let's go back to our dear friend M again. M has been having some trouble with one of his professors. The professor is constantly abusive, unprofessional towards the entire class. One of the students of the class wants to file a complaint against the professor. Now when you want to report this to the higher authorities of the school administration you would not want your identity to be revealed. Because the professor if he has not been removed, might fail you in your terms or give you a bad report.

Applying this concept to an entire country and its government. Is there any way to assess whether they are using their powers correctly? If we want to protest, report an injustice, use social media to spread awareness about our problem, raise our voices when they abuse their powers can we do it without being labeled as anti-national [5]?

Considering all these factors helps us to conclude. If we are being constantly monitored and any organization can peep into our lives as per their will and wish. We may lose our freedom of speech. Sensitive information of our businesses, our private conversations might also come under constant surveillance.

The companies which provide a majority of the online services like search engines, emails, social media sites, chat applications are available for free. These services use user data, search history, transaction history, keywords in chats, etc. to present the user with advertisements to make money. Understandably, they make use of these advertisements to support their infrastructure. The problem is that they don't provide the user an alternative to keep their data at all. Which is a cause of concern as many users would be willing to pay to keep their data secure and untouched by any third person.

V. DANGERS OF ONLINE ANONYMITY AND PRIVACY

While it is true that online privacy is crucial it comes with its own set of dangers as well. One of the main dangers is that it can lead to online abuse [6]. For anyone who uses social media extensively knows what can happen if people can completely hide their identity. The ones who may not be able to criticize you in person will use this to post harsh comments on your profile and make abusive and negative comments under their anonymous identity. It can lead to online fraud. Impostors and conmen will abuse this privilege to commit fraudulent acts and businesses could end up trading illegal goods such as alcohol, weapons, drugs, etc. [6]. A good example of this is the Silk Road [8]. Which was an online black market on the darknet. After a lot of investigation and findings, the authorities were able to arrest the operators of the Silk Road in 2013. Another problem is that there will be fewer consequences to the people who make rape threats or otherwise act illegally online in comparison to what would happen if they did those things in person or the real world as we call it [6].

VI. SURVEY

We conducted a survey in which over 75 individuals took part. The main goal of this survey was to know what people think about privacy and data sharing. The survey was shared amongst students of multiple fields including computer science students, professors, IT professionals, and engineers as well as professionals of other fields. To maintain a unique response criterion, the email ids were used as the primary key.

Survey Graphs

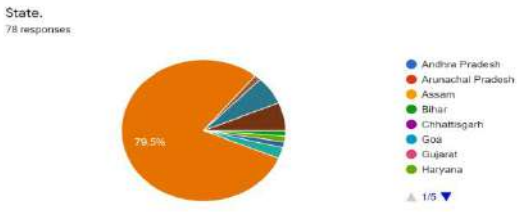

Figure 6.A: Survey question about the state they belong to.

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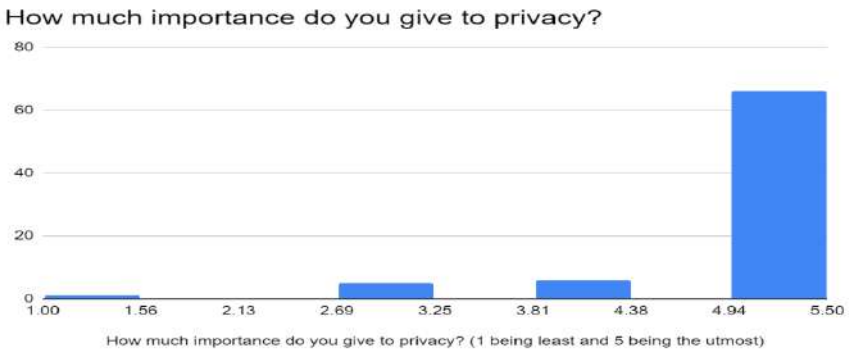

Figure 6.B: Importance to Privacy

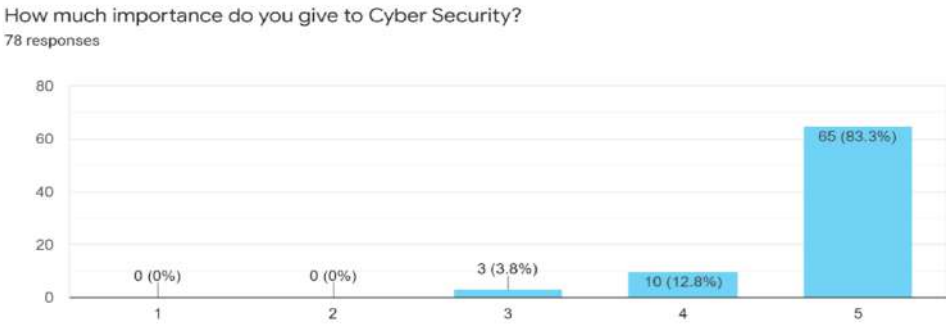

Figure 6.C: Importance to Cyber Security

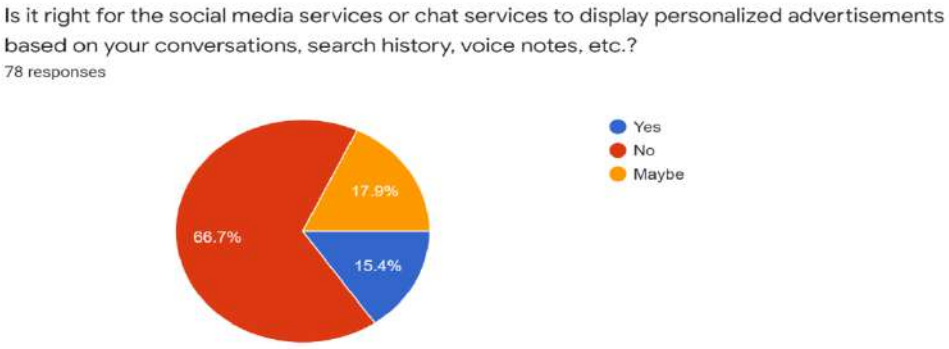

Figure 6.D: Organizations monitoring data for advertisements.

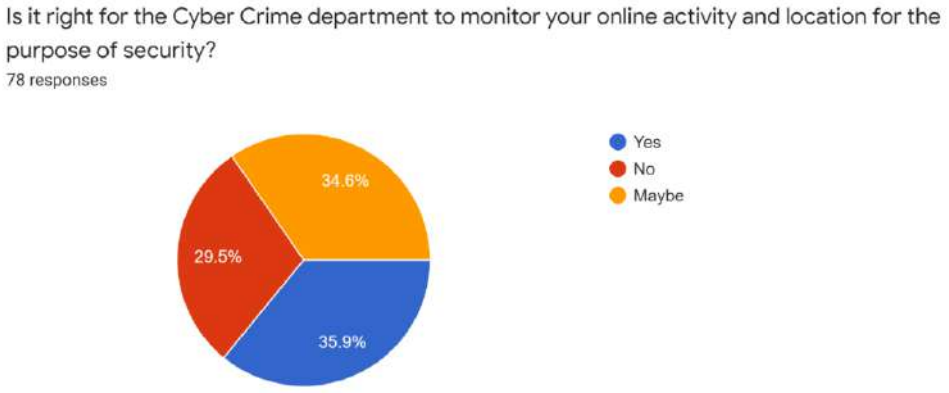

Figure 6.E: Monitoring by the Cyber Crime Department

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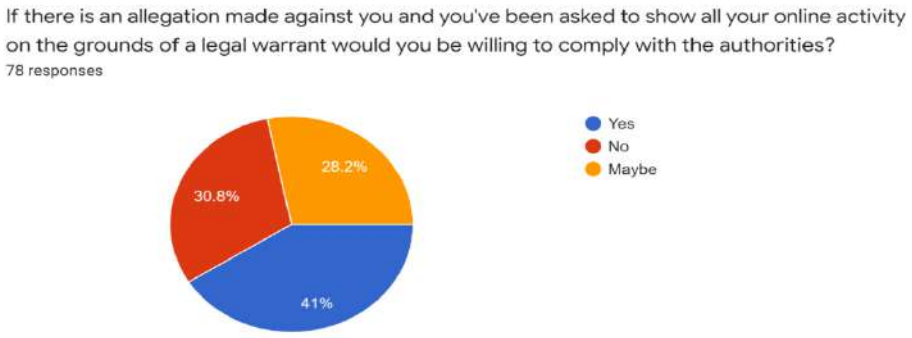

Figure 6.F: On being asked to share their activity for an investigation.

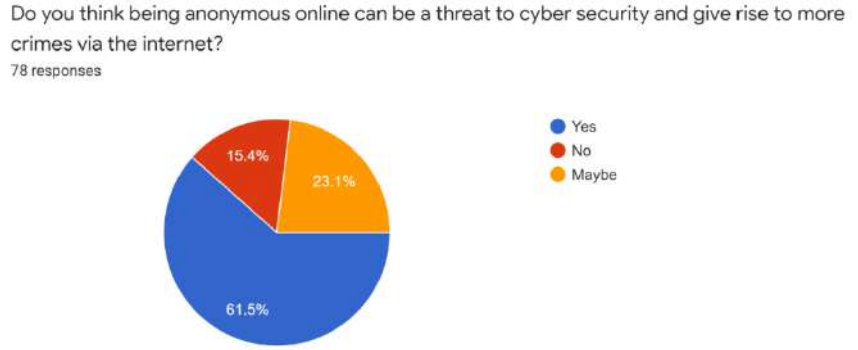

Figure 6.G: Anonymity can be a threat

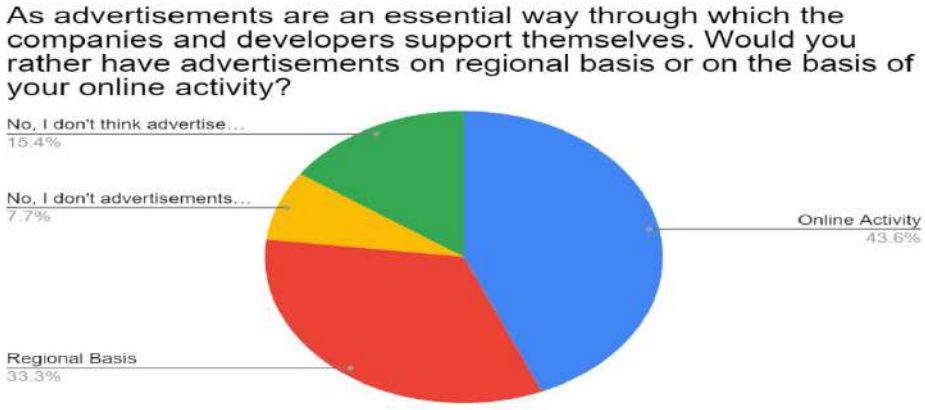

Figure 6.H: View on Advertisements and online activity.

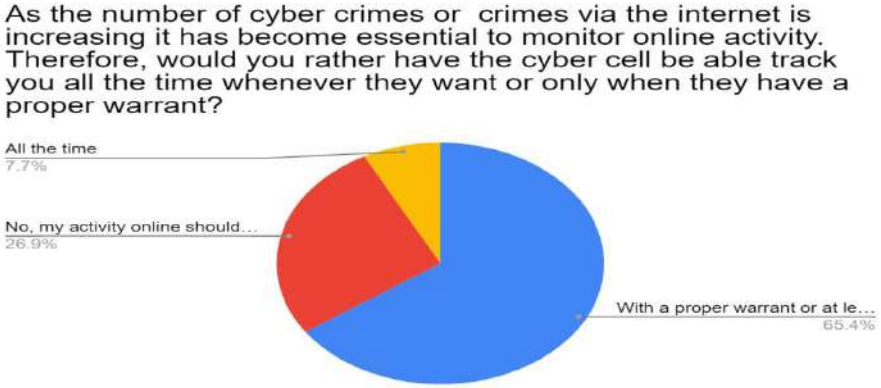

Figure 6.I: Being monitored by law enforcement.

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(These were the options given 1. All the time 2. With a proper warrant or at least through prior intimidation 3. No, my activity online should only be accessible by me)

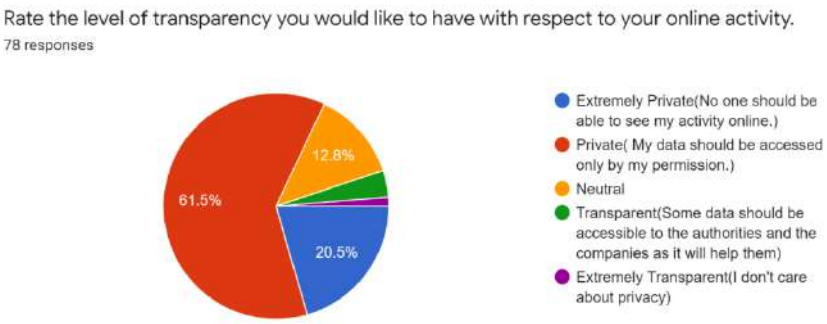

Figure 6.J: Level of transparency concerning their data. (3.8% percent said transparent and 1.3% said extremely transparent.)

Comments made by the participants of the survey:
A few selective comments made by the participants have been given below.

A. Privacy to data is important for everyone. Some people don't want to compromise their privacy on online media as there are cyber threats and scams. We should be well aware of what we are doing in the digital world.

B. As per me, cyber security is quite important but talking about being our online activity accessed continuously without intimidating before or something like that you strongly disagree**.**

C. Accessing other's online data or online activities should only be done with the respective user's consent and should not be used for any other negative activities, apart from what is mentioned in the terms and conditions.

D. Privacy does not exist in cyberspace. The various websites that offer varied services to their consumers fail to protect their data time and again.

E. People's phones should only be breached to collect info when required & necessary by the respective intelligence or law enforcers protecting their land & mass.

RESULTS
As it is evident from the various arguments presented above and the survey conducted privacy is extremely important for many but even more important than that is cyber security (figures 6.B and 6.C). The survey also showed the same. According to the Article 12 of the Universal Declaration of Human Rights Act, 1948, which state as follows: "No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attack upon his honor and reputation." right to privacy is a basic human right [11].

From figure 6.D and 6.H we can argue that the people are less likely or do not want to share their data with major corporates or organization which is providing them the service. This goes to show that these organizations should work on a more privacy-oriented model which will cater to the privacy need of the users. At the very least they should have a premium service option that will not record or steal user data. We can safely assume that people are willing to cooperate with law enforcement and the cybercrime department if they are under any investigation. The maximum number of participants of the survey are willing to share their online activity provided they permit it or they are given a prior intimation before they are marked for surveillance.

From figure 6.G most of the people who took the survey believe that being anonymous online can prove to be a threat to cyber security.

DISCUSSION
It would not wrong to say that privacy comes under a very gray area of study when spoken by keeping cyber security in mind. There is compelling evidence that dictates that law enforcement and cyber cell agencies are often able to stop crime before it takes place because they search for keywords in emails, monitor your social profiles, and keep an eye on your searches [7]. To some extent, this is where even people in our survey are ready to compromise. However, there needs to be a limit and that limit has to be defined. In the name of security, if everything we do online is scrutinized constantly, we may lose our freedom of speech, our chats might be leaked and sensitive data of business could be compromised. Whereas when it comes to the service providers or organizations which provide you with web services, search engines, chat applications, social sites,

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etc. They must provide an alternative to the user which keeps the user data to the user itself and no one else can access it. They must implement security systems to avoid data leaks and data breaches. Even as users we must be aware of what we post online. We must learn to control how much access we give to others about our data. To do this, there are simple steps that we can do to ensure our privacy at our level. Read the terms and conditions of an app or service before accepting it. Do not give unnecessary access to applications that may not need that access, like giving location access to social sites. These apps can function without accessing your location. So, there is no harm in not permitting them to access. Do not register on unknown sites or sites that seem to be dangerous or unauthorized. Make your transaction only through secured payment gateways. These are the basic steps. Do not save your credit card, debit card, UPI details on your browser, or any application for future use. There are many other ways we can control our privacy on our end.

CONCLUSION

In this paper, an elaborative argument was made considering both the good and bad aspects of online privacy. As mentioned in this paper, it's difficult to draw a decisive line between user privacy and security. The key is to find the balance and only monitor what is extremely essential. It is difficult to set the standards, yet it is essential to do so to protect human rights. We need to do whatever is in our power to stop our data from being compromised. As the new age is dawning, we can hope for better rules and better services that ensure that our data is not leaked.

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One Day International Interdisciplinary E-Conference On
BENEFITS OF LIFE VALUES IN CONTEMPORARY SOCIAL SYSTEM
On 30th September, 2021 @
K.M. MALKAPUR, D.M & P.H.S. P. COLLEGE, BALAPUR, &V. S. S., BRANCH AKOLA

CSR AND SOCIAL ETHICS OF BUSINESS IN INDIA

Abstract:
Now-a-days, the term of Corporate Social Responsibility (CSR) becomes progressively significant. The developing pattern of CSR turns into an intrigued challenge for organizations and their administration. There is a mix of uplifting outlooks, rehearses, or programs into organization's business technique at the top administration level. For organizations and their administration, know whether CSR exercises lead to monetary and non-monetary benefits. The paper focuses on the CSR categories, definitions, benefits, examples and the connection.

KEYWORDS: *CSR, Economic, Philanthropic, categories, administration, Business*

1. INTRODUCTION:-

Corporate Social Responsibilities (CSR) refers to techniques that organizations set in motion as a component of corporate administration that are intended to guarantee the organization's activities are moral and advantageous for society. Another named used for CSR are sustainable business, ,corporate sustainability, corporate conscience, conscious capitalism, corporate citizenship or responsible business.

2. CSR CATEGORIES :-

Corporate Social Responsibility (CSR) is an exceptionally wide idea that is perceived and executed contrastingly by each firm, the fundamental thought of CSR is to work in a financially, socially, and ecologically in manageable way.For the most part, corporate social responsibility drives are sorted as follows:

A. **Environmental: -**
Ecological/Environmental responsibility drives target diminishing pollution/contamination and ozone depleting substance gases(emanations), and the practical or sustainable use of natural-resources.

B. **Human rights: -**
Common freedoms responsibilities drives include giving reasonable work rehearses (e.g., equivalent compensation for equivalent work) and reasonable exchange rehearses, and denying child labor/work.

C. **Philanthropic: -**
Charitable responsibility can incorporate things like financing instructive projects, supporting wellbeing drives, giving to causes, and supporting local area beautification projects.

D. **Economic:-**
Monetary responsibility drives include further developing the association's business activity while taking part in manageable practices – for instance, utilizing another assembling interaction to limit wastage.

3. CORPORATE RESPONSIBILITY AND ITS DRIVER

The following diagram show the three phases of corporate responsibilities namely Profit Maximization, Trusteeship and Quality-of-life. The role of drivers and corporate responsibility clearly states that an organization can grow in business only when its goes in practical through all these phases.

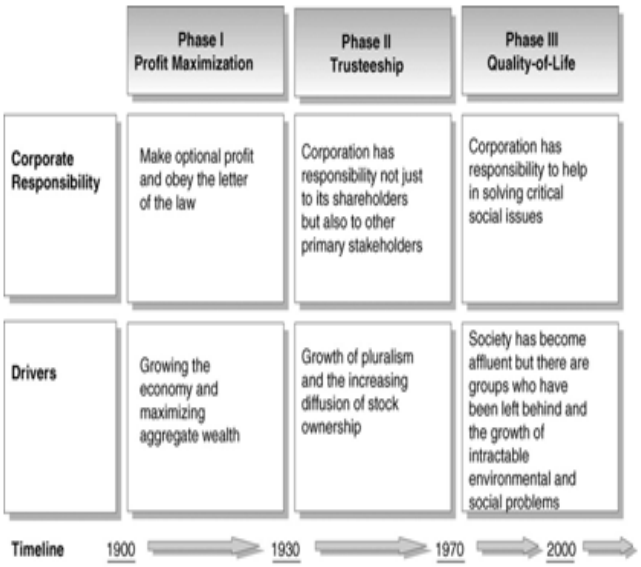

Fig.1 CSR drivers and its phases

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4. Basic Benefits of CSR

As it were, corporate social responsibility can be viewed as an advertising exertion. Nonetheless, it goes past that, as corporate social responsibilities can likewise help a company's business seriousness.

The business benefits of CSR inculcate the following exposures:

- **Stronger brand picture, acknowledgment , and notoriety:**
  - CSR enhances firms by setting up and keeping a decent corporate standing as well as brand value.
- **Increased client unwaveringness and deals:**

Firms Clients that follow CSR feels that they are helping the firm for great purposes.

- **Operational expense investment funds:**

Putting resources into functional efficiencies brings about functional expense investment funds just as diminished natural effect.

- **Retaining key and skilled representatives:**

People acting as representatives regularly stay-longer and are more dedicated to their firm realizing that they are working for a business that rehearses CSR.

- **Easier admittance to financing :**

Numerous financial backers are more able to help a business that rehearses CSR.

- **Reduced administrative load:**

Solid associations with administrative bodies can assist with lessening a company's administrative load.

5. CSR benefits in companies

CSR, is the possibility that an organization ought to be socially engaged with the climate around itself. This can go from taking part in not-for-profit causes, to bettering the local area, or making more grounded associations between workers. Eventually, an organization's CSR is set up to build generally worker arrangements with its qualities and mission. It is made to make representatives, and businesses, feel more associated with society. In any case, not everything organizations can adopt a similar strategy at CSR. Industries should know their specialty and what their representatives need.

6. CSR example in real-life

The following are 5 distinct organizations that show incredible instances of CSR in real life.

1) BMW :

BMW holds its pride in being perhaps the most socially dependable organization in its industry. BMW has set the bar high with an objective of aiding more than 1,000,000 individuals by 2020. They intend to do this by making projects, for example, "The Schools Environmental Education Development Project" to assist with bringing issues to light of social and natural issues. BMW's vital to CSR achievement has consistently been arrangement. They're an incredible illustration of corporate social obligation due to their harmony between a decent plan of action and aiding social causes.

2) LEVI STRAUSS and CO.

Levi's is another organization that focuses on its endeavors on CSR. Levi's methodology is to diminish their natural impression by acting on common liberties and ecological causes. Very much like BMW's program, Levi's has a "Laborer Well-Being Initiative" that is expected to assist with working on the existence of their representatives. Levi's has additionally reserved their "Water-Less" crusade by utilizing less water when fabricating their items. They have saved more than one billion liters of water and desire to all the more likely further develop their assembling cycle by 2020.

3) Survey-Monkey

Survey-Monkey, most popular for their overview creation programming, has made an offering back program to all the more likely work on their social obligations. They have done this by taking part in an imaginative manner to offer in return. Rather than giving out prizes to overview takers, Survey-Monkey gives 50 pennies for each study finished. This gift goes to the review takers good cause of decision. The organization has given more than 1,000,000 dollars to associations like Boys and Girls Club of America and the Humane Society. Survey-Monkey's illustration of corporate social responsibility extends a long ways past commitment. They center on bettering society overall, in this way giving the organization a decent standing.

4) Starbucks Coffee

Since the start of its reality in 1971, Starbucks Coffee has consistently centered around moral and social obligations. Starbucks targets making an item that isn't simply gainful to its clients, yet in addition to the climate. With the beginning of the C.A.F.E. program, Starbucks has set rules to expand item quality, social and financial obligation, and natural administration. Collaborating with Ethos Water, Starbucks is carrying clean water to more than one billion individuals who don't approach it. Which isolates Starbucks from its rivals is that they center around society before themselves. Rewarding the local area is an incredible factor to why the brand is so notable. It demonstrates that organizations with incredible giving projects are esteemed in excess of ones that don't.

5) Ben and Jerry's

Originators of Ben and Jerry's, Ben Cohen and Jerry Greenfield, have consistently been centered around offering back in any capacity conceivable. Simultaneously they have hushed up about obvious the benefit of associating the organization with its representatives. To achieve different CSR objectives, Ben and Jerry's made the "Ben and Jerry's Foundation." The organization has set the bar high by giving 7.5% of its pretax benefits to beneficent associations all throughout the planet. Ben and Jerry's endeavors "to recognize people" if they work for the organization. They have given more than 2,000,000 dollars to different associations it the desires to decidedly affect society.

CONCLUSION:

From all above details, it can be concluded that CSR has a great impact on business growth and an organization's success.

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Research Papers

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MIDC: MUTUAL IOT DEPENDENCY AND CLOUD COMPUTING

Mr. Rajesh Yadav
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TECHNICAL ABSTRACT

The cloud is a tremendous, interconnected network of amazing servers that performs administrations for organizations and individuals. The Internet of Things (IoT) is a placement of inter-related processing gadgets or devices, mechanical and computerized machines, items, individuals that are given special identifiers and the capacity to move information over an organization without expecting human-to-human or human-to-PC communication. IOT Cloud Service makes unreasonable correspondence between cheap sensors in the IoT which means a much more prominent network. IoT creates a group of information while then again, cloud distributed computing provides the way for this information to move and work . In this paper I have attempted to focus on mutual dependency of IOT and cloud, cloud based IoT architecture, cloud based iot applications, cloud needs for iot, futuristic information of cloud computing and IOT.

Keywords : Cloud computing, IoT,blend,virtual machine

I. INTRODUCTION

The IoT is producing an extraordinary measure of information, which thus puts a gigantic strain/pressure on the Internet framework. Thus, organizations are attempting to discover approaches to lighten that pressing factor and tackle the information issue. Distributed computing will be a significant piece of that, particularly by making the entirety of the connected devices to cooperate. However, there are some critical contrasts between distributed computing and the Internet of Things that will work out in the coming a very long time as we create increasingly more data.

Utilizing the cloud is significant for collecting information and drawing experiences from that information. Without the cloud, looking at information across more extensive areas is significantly more difficult. Utilizing the cloud additionally considers high versatility. At the point when you have hundreds, thousands, or even a huge number of sensors, putting a lot of computational force on every sensor would be amazingly costly and energy escalated. All things that are considered, information can be passed to the cloud from this load of sensors and prepared there in total.

The Internet of Things is getting helpful to us in everyday life. For example, Take brilliant homing. Individuals can start their air conditioning device distantly through their cell phones. This used to be received through a SMS, however today the world of web has made it simpler. Along with giving more brilliant solutions for homes and lodging networks, IoT has additionally been utilized as devices in business conditions across different industries. In any case, with the measure of large information that is created by IoT, a ton of strain is put on the web foundation. This has made organizations and network search for a choice that would decrease this heap. It empowers associations to devour a figure asset, similar to a virtual machine (VM) rather than building a registering foundation on premise.

Today, distributed computing has pretty much infiltrated standard IT and its foundation. Numerous tech big deals, for example, Amazon, Alibaba, Google and Oracle are building AI tools with the assistance of cloud innovation to offer a wide scope of answers for organizations around the world.

This paper tries to advise reader regarding the job of distributed computing in IoT and why IoT and distributed computing are indivisible.

II. MUTUAL DEPENDENCY OF CLOUD COMPUTING AND IOT

- Cloud computing and IoT are expanding the proficiency of regular errands and both have a mutual relationship.
- IoT creates loads of information while then again, distributed/cloud computing gives a way for this information to transfer.
- There are many cloud providers who exploit this to give a pay-as-you-use model where clients pay for the particular assets utilized.
- Likewise, cloud facilitating as an assistance increases the value of IoT new businesses by giving economies of scale to diminish their general expense structure.

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- Distributed computing likewise empowers better joint effort for designers, which is the thing to address in the IoT region.
- By working on designers to store just as access information distantly, the cloud permits engineers to execute projects immediately.
- Additionally, by putting away information in the cloud, IoT organizations can get to a tremendous measure of Big Data.
- When a business uses a huge number of sensors for data collection , every one of those sensors is stacked with a lot of computational power. This requests a tremendous measure of energy and is exorbitant simultaneously.
- In the present circumstance, information can be passed to the cloud from these sensors and prepared there in total.

It can be said that the cloud is 'the cerebrum' for a significant part of the IoT, as most gathered information is after being completely handled and broken down in the cloud.

III. CLOUD BASED IOT ARCHITECTURE

It is a way of communicating to the different modules of each organization's system used for cloud computing and data processing.

According to some previous studies, typically an IoT architecture is divided into 3 different layers: application, sensing and network layer.

1) **Network layer :** It is the Cloud layer where all clouds rely. The main objective of the network layer is to transfer the collected data to the Internet/Cloud.
2) **Sensing layer :**This layer identifies objects and gathers data, collected from the nearby environment.
3) **Application layer:** This layer provides the interface to various services.

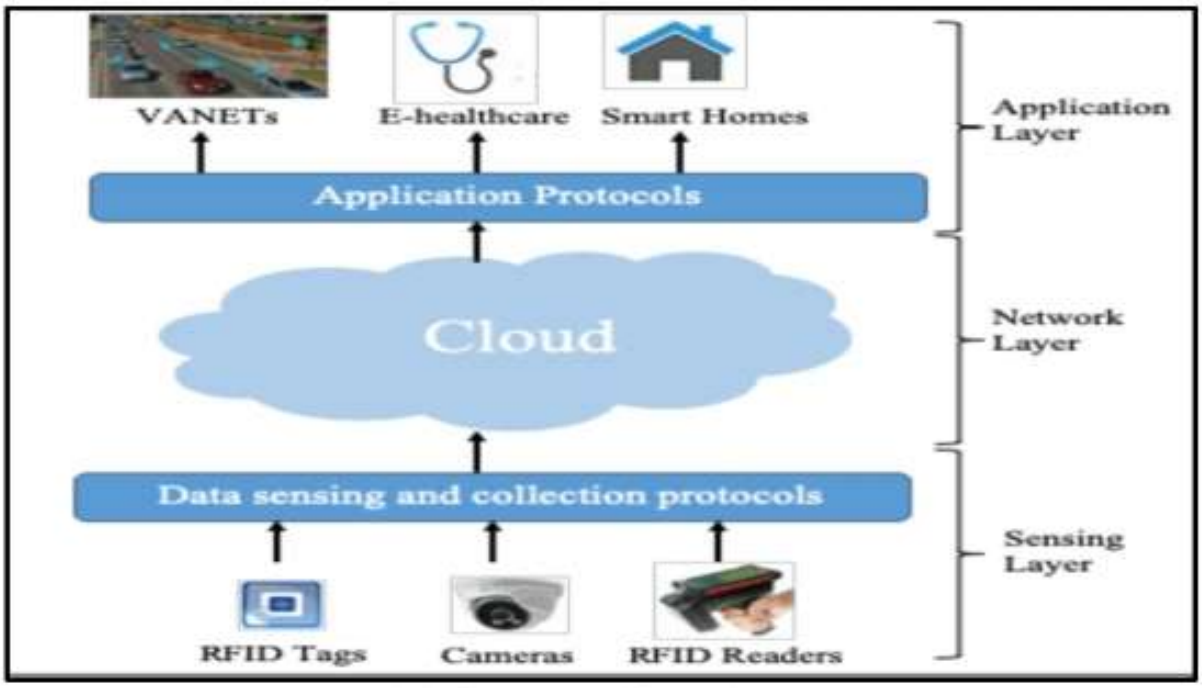

Fig. 1.Cloud based IOT architecture

IV. CLOUD BASED IOT APPLICATIONS

The Cloud-based IoT model has introduced a large number of applications and smart roles, which have influenced end users' daily lives.

Below table presents a brief overview of various applications-Cloud-based IoT paradigm.

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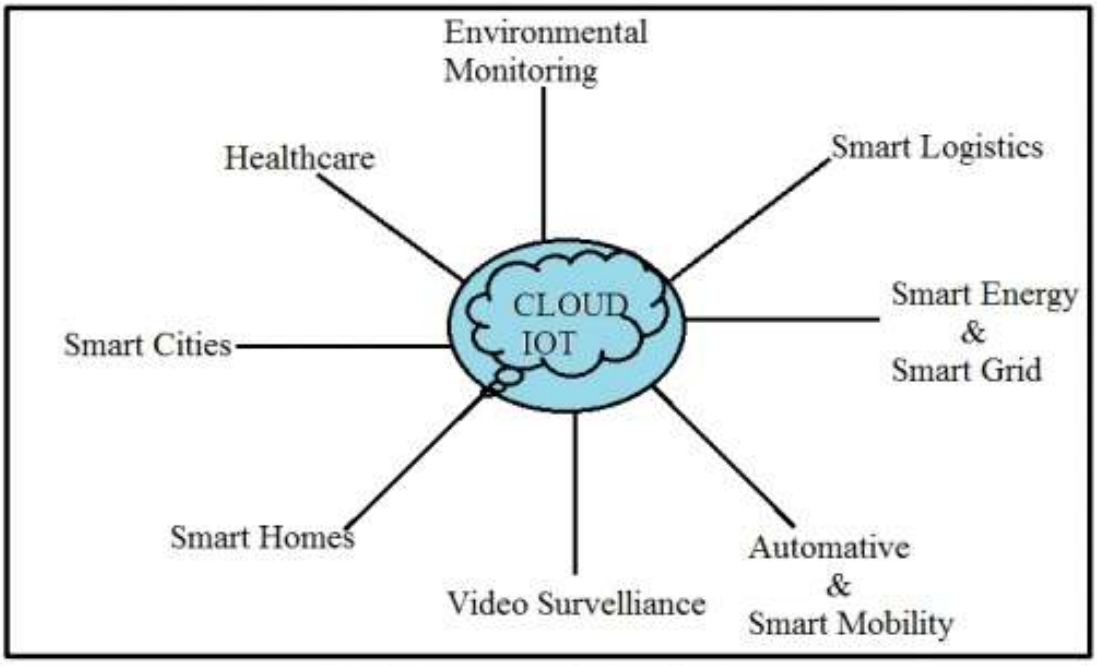

Fig.2. Cloud Based IOT Applications

The following tabular diagram describes the applications details in more precise manners::-

Health care: Cloud based IOT has provided many benefits and opportunities to field of healthcare.
Example: intelligent drug/medicine control,hospital management

Smart Cities: Cloud based IOT can provide a middleware infrastructure to future smart cities by attaining data from sensing infrastructure,IOT technologies and placing information in a consistent manner.
Example: smart streetlights,Bigbelly etc.

Smart Homes: Cloud based IOT applications have enabled the automata of home activities by adoption of various embedded system.
Example: Home security control,smart metering, energy saving etc

Video Surveillance: Using cloud based IOT, intelligent video surveillance will make it possible to store ,manage,and process video content from video sensors easily and efficiently
Example:Wireless CCTV cameras, Movement detection System

Automative and Smart Mobility: It indicates the integration of cloud computing into the GPS and other transpaortation technique to solvemany of existing challenges
Examples: Traffic state prediction ,remote vehicles

Smart energy and grid: Both technology can work together to provide consumers or clients with smart management of enegy consumption.
Example: smart meters,renewable energy sources

Smart Logistics: It allows the automated management of goods ,flows between resources and consumers,along with tracking of goods in transit
Example: logistics industry, tracking shipments

Environmental monitoring: Both technology when integrated can monitor wide area environment and sensors that have been properly deployed in the area.
Example: pollution source monitoring,air quality monitoring etc.

Fig.3.Description of Cloud Based IOT applications

V . CLOUD NEEDS FOR IOT

A) **Sensor networks:**

- Cloud gives an opportunity to organizations in gathering sensor information which it additionally thwarts the advancement as a result of safety and security issues.
- Sensor networks have increased the advantages of IoT.
- These organizations have permitted clients to gauge, induce and comprehend sensitive markers from the environment.
- Be that as it may, opportune preparation of a lot of this sensor information has been a significant test.

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B) **Empowers devices correspondence:**

- Cloud memories are empowered by cloud interchanges,permitting simple connection to cell phones. This facilitates devices to converse with one another and not simply us, which basically is the precept of IoT. It is thus a reason to say that the indulgence of cloud can speed up the development of IoT. However, conveying cloud innovation has certain difficulties and deficiencies.
- Not on the grounds that the cloud is imperfect as an innovation however the blend of IoT cloud can trouble clients for certain deterrents.
- In the other scenario, if we at any point proceed with an IoT cloud network, it is better in the event that you know the sort of difficulties you might face in advance.
- Far off handling power Provider Cloud innovation permits IoT to move past standard apparatuses, for example, climate control systems, fridges etc. This is on the grounds that the cloud has such a tremendous storage that it removes conditions on premise framework.
- With the ascent of scaling down and change of 4G to higher web speeds, the cloud will permit designers to offload quick figuring measures.

C) **Systems administration and correspondence conventions:**

- Cloud and IoT permits machine-to-machine interchanges among a wide range of sorts of gadgets having different conventions.
- Dealing with this sort of a variety could be intense since a larger part of use regions don't include portability.
- As of now Wi-Fi and Bluetooth are utilized as a makeshift answer for work with portability somewhat.

VI. COMPARISON OF IOT WITH CLOUD COMPUTING

The following table gives comparative view on iot and cloud computing with respect to different items ::-

TABLE I. COMPARISON OF THE IOT WITH CLOUD COMPUTING

Items	IoT	Cloud
Characteristics	IoT is pervasive (things are everywhere). These are real world objects.	Cloud is ubiquitous (resources are available from everywhere). These are virtual resources.
Processing Capabilities	Limited computational capabilities.	Virtually unlimited computational capabilities.
Storage Capabilities	Limited storage or no storage capabilities.	Unlimited storage capabilities.
Connectivity	It uses the Internet as a point of convergence.	It uses the Internet for service delivery.
Big Data	It is a source of big data	It is a means by which to manage big data.

VII. FUTURE OF IOT AND CLOUD COMPUTING

- Soon, the blend of IoT and Cloud Computing will definitely support the development of the IoT frameworks and cloud-based administrations.
- The vast majority of the businesses have perceived and acknowledged the significance of arranging powerful cloud services as the backend to numerous IoT projects.
- Additionally, the majority of these companies have effectively fired up the two advancements and are profiting from it. IoT and distributed computing have a correlative relationship.
- While IoT produces a lot of information, many cloud suppliers permit information to move through the web, which implies it works with an approach to explore the information.
- In a cloud framework, you can send applications to measure and dissect information rapidly and settle on choices as quickly as time permits.

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- IoT gadgets which use normal APIs and back-end framework can get significant security refreshes in a split second through Cloud when any security break occurs in the foundation. This IoT and Cloud processing joined component is an imperative boundary for client security and protection.
- Distributed computing assists with working together in IoT improvement. Utilizing the Cloud stage, IoT designers can store the information distantly and access it easily.
- IoT in cloud offers public cloud administrations can undoubtedly help the IoT region, by giving outsider admittance to the infrastructure.
- Thus, the combination can help IoT data or computational segments working over IoT gadgets. Following Features can elaborate on this futuristic aspect in more precise manner : -
- **Expanded Scalability:** IoT gadgets need a great deal of capacity to share data for significant purposes. IoT in cloud, similar to the Cloud Connect to Microsoft Azure can give clients more prominent space which can increment according to the client request. Assisting with settling the capacity needs of clients.
- **Expanded Performance**: A lot of information created by IoT gadgets need outrageous execution to interface and associate with each other. Iot in cloud gives the network which is important to divide data among the gadgets and make significance from it at a quick pace.
- **Pay-more only as costs arise:** Internet Cloud Computing foundations assist IoT with offering significance to the more prominent measure of information produced. Clients have no concern of purchasing more prominent or less storage. They can pay without much of a stretch on the capacity.

VIII . CONCLUSION

The Internet of Things is a wide field and incorporates an unbelievable assortment of uses. The cloud framework is a decent structural fit for IoT. IoT can profit from the limitless abilities and assets of distributed computing, as cloud has the adaptable limits. There is no one size-fits-all arrangement so IoT organizations need to consider their particular application when choosing whether the cloud works well for them. In addition, the cloud foundation can be perceived to whenever and anyplace, and thus has lower capital use and functional use. At last it can be concluded that the Internet of things, huge information or big data and distributed computing influence another skyline of choice supportive network. And further more the blend of the IoT, and cloud distributed computing can give independence among applications in all the sectors.

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TECH-LOGIC VIEW OF CSR

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ABSTRACT:
Until reasonably as of late, most huge organizations were driven solely considering a solitary objective: benefit. To expand benefits was at the core of every activity shown or drive pursued. In the beyond couple of many years, nonetheless, more business pioneers have perceived that they have a responsibility to accomplish more than essentially boost benefits for investors and leaders. Maybe, they possess a social responsibility to do what can be best for their organizations, along with individuals, the planet, and society at priority. This has prompted the rise of organizations that are recognized as socially responsible and dependable.

Keywords:
CSR, ecological, philanthropic, moral, ethical, benefits.

1) INTRODUCTION:

IDEA OF CSR: "A business possesses responsibility to the existing society around it" according to the online course Sustainable Business Strategy."An idea about CSR has both ethical and philosophical dimensions particularly in India where there is a wide gap between income and standard of living among different sections of society.

Companies that willingly accept corporate social responsibility are usually organized in a way that facilitates them to act in a socially culpable way. A type of self-guideline can be communicated in drives or techniques, contingent upon an association's objectives. Precisely what "socially responsible" signifies changes from one organization to another. Firms are regularly directed by an idea known as the triple primary concern, which directs that a business ought to be focused on estimating its social and ecological effect, alongside its benefits. The aphorism "benefit, individuals, planet" is frequently used to sum up the main thrust behind the triple primary concern. Effective CSR gives a company the power to stand out in today's saturated market and connect with customers on a level that ensures long term loyalty and potentially even brand advocacy.

Fig1. CSR AREAS OF RESPONSIBILITY

2)KINDS OF CORPORATE SOCIAL RESPONSIBILITY:

Corporate social responsibility is generally broken into four classes: ecological, charitable, moral, and financial obligation.

1. Ecological Responsibility

- It provides an assurance to the conviction that organizations act in a harmless way to the ecosystem.
- Some organizations utilize a term "ecological stewardship" to obligate to drives for harmless impact.
- Organizations that look to accept ecological responsibility can do as such in more than one way: Lessening contamination, ozone depleting substance outflows, the utilization of single-use plastics, water usage, and general waste
- Expanding dependence on environmentally friendly power, maintainable assets, and reused or to some extent reused materials
- Counterbalancing negative ecological effect; for instance, by establishing trees, financing examination, and giving to related causes.

2. Moral Responsibility

- Moral Responsibility is concerned about guaranteeing an organization is working in a reasonable and moral way. Organizations that embrace moral obligation plan to accomplish reasonable treatment, all things considered, including administration, financial backers, workers, providers, and clients.
- Firms can accept moral obligation in various ways. For instance, a business may set its own, higher the lowest pay permitted by law if the

one commanded by the state or national government doesn't establish a "decent pay."

- Likewise, a business may necessitate that items, fixings, materials, or parts be sourced by deregulation norms. In such a manner, many firms have cycles to guarantee they're not buying items coming about because of bondage or youngster work.

3.PHILANTHROPIC/CHARITABLE RESPONSIBILITY

- Charitable Responsibility alludes to a business' intent to effectively make the world and society a superior spot.
- As well as going about as morally and harmlessly to the ecosystem as could be expected, organizations driven by philanthropic responsibility regularly commit a piece of their income.
- While many firms give to noble cause and not-for-profits that line up with their directing missions, others give to admirable motivation that don't straightforwardly identify with their business.

4. Financial Responsibility

- Monetary Responsibility is the act of a firm moving the entirety of its monetary choices in its obligation to do great in the spaces recorded previously.
- The ultimate objective isn't to just augment benefits, yet emphatically sway the climate, individuals, and society.

3) KEY ASPECT FOR EFFECTIVE CSR FRAMEWORK:

To make a viable CSR structure, organizations should zero in on the accompanying key aspects:

1. Recognizing a social plan that lines up with the ethos of the organisation.
2. Characterizing wanted results across the recognized social plan.
3. Planning an arrangement of activities and characterizing boundaries like topographies, scale, length, and so on.
4. Recognizing best-fit execution accomplices; corporates need to make long haul responsibilities to accomplish a quantifiable effect and work to construct the abilities of execution accomplices.
5. Connecting with their own labor force to additionally enhance the effect, just as underlining and upgrading the feeling of offering back among the general labor force.

4) TECHNOLOGICAL VIEW OF CSR

1. A ground-breaking capacity of IT can improve on the most intricate of business cycles and constructions by interfacing them consistently with the assistance of instruments that deal with the inflow and outpouring of data being made across the organisation.
2. Technology, thus, is an instrument that can resolve the underlying issues in the social area and CSR area, and assist social responsibility with creating and upgrading their abilities.
3. More current endeavors are arising in the market that is doing this by empowering NGOs and corporates to conquer difficulties and build up better hierarchical and administrative capacities with the assistance of technologies that spotlights on tackling explicit issues.
4. The basic parts of an organization's CSR venture are a vital aspect to know before we perceive how information and innovation can be instrumental in conveying sway at speed and scale.
5. A Strategic CSR plan can assist organizations with breaking the endless loop. These plans and methodology have the reasoning for picking the causes to help, recipients and areas to zero in on and modalities of checking and revealing dependent on their past learning and information investigation.
6. A powerful arrangement with a productive program execution is smooth, with few or no unexpected and undesirable astonishments
7. The bigger program objectives ought to be made keeping all partners adjusted in a straightforward way. This can be accomplished by following revealing prescribed procedures by on ground accomplices and planning of complete checking structures.
8. Organizations can draw significant and noteworthy bits of knowledge from the program information. This can be accomplished by keeping up with solid cycles and adjusted partners.

5) ADVANTAGES-CORPORATE SOCIAL RESPONSIBILITY

Most firms are headed to accept corporate social responsibilities because of moral feelings, and doing as such can bring a few advantages.

a) Corporate social responsibility drives can, for instance, be an incredible advertising apparatus, helping an organization position itself well according to purchasers, financial backers, and controllers.
b) CSR drives can likewise further develop worker commitment and fulfillment—key estimates that drive maintenance. Such drives can even draw in potential representatives who

convey solid individual feelings that match those of the association.

c) At last, corporate social responsibility drives, by their tendency, to power business pioneers to inspect rehearses identified with how they enlist and oversee representatives, source items or parts, and convey worth to clients.
d) This reflection can regularly prompt inventive and momentous arrangements that help an organization act in an all the more socially capable way and increment benefits.
e) Reconceptualizing the assembling system so an organization burns-through less energy and delivers less waste, for instance, permits it to turn out to be all the more harmless to the ecosystem while lessening its energy and materials costs—esteem that can be recovered and imparted to the two providers and clients.

6) CONCLUSION:

In one all, CSR indicates that the business organization must follow its basic protocols in the society. If observed, part of the actions of business within CSR are utilized in the daily activities of business companies. The increasing dependence on IT for information requirements is leading us to a path of no-return. Without a doubt, advanced technology is emerging as a lifeline to new business opportunities. As the access to information is increased, more powerful rights go in the hands of parties who are appropriate for the different governance mechanisms of companies. But with power comes responsibility. No doubt, advances in IT will continue to alter the significance of information both as a business tool and as an asset. It is therefore necessary that business parties acquaint themselves with IT applications in the potential way in their respective corporate governance roles and legal issues and problems that are likely to arise.

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Ear: An Overview on Essence of Analytics & R Programming

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ABSTRACT

R, an open-source programming language and much in use due to it simplicity. R is extremely well known language that are used by many organizations' to en-vision and analyse information. Data-analysis is path toward investigating the piece of measurements information for learning purposes. Libraries/Packages are rolling significant part in R-programming. It has constitute set of different measurable algos and ML ideas which empower user to make reproducible research and make enlightening products.

Keywords : Data Analytics, R, R-Libraries, R-Scope, Big-Data

I. INTRODUCTION

A re-designated version of S-tool, was made by Ross-Ihaka and Robert-Gentleman at the Bell Labs Auckland University, New-Zealand. R thus get name using credit of initial of two authors .S was made by John Chambers. It is at present evolved by the R core group of development, in which John Chambers act as member-part. The project was consider in the year-1992, where the initial variant released in 1995 and the beta variant in 2000. In my paper there are six section. The various sections are in following way:

- Section1- About R, its Advantages and Disadvantages
- Section2- Environment
- Section3- Libraries
- Section4-Comparisons of R with other languages
- Section5- Scope of R
- Section6-Conclusion
- Section7- References used.

II. R

A free-open source which utilizes IDE as R-Studio.
Features:

- Easy-to-learn and most powerful data-analytic programming language.
- Create the unique & beautiful data visualizations.
- Compiles code & runs on Unix-platforms & similar platforms like Window's & Mac-OS.
- Uses Console where scripts get in implementation stage.

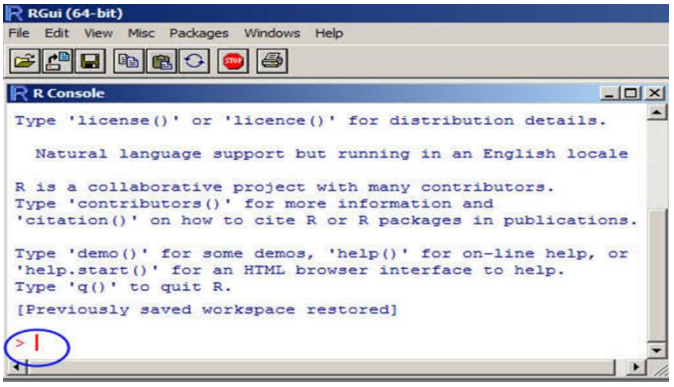


Fig 1.R-GUI

III. ADVANTAGES

- Available for anyone to use.
- Does not have any license-restrictions, hence can be run at any of software platform.
- Import tools from various unique software's.
- Around 4800 packages are available from multiple repositories.
- Active user-groups where queries is answered in a short-span of time.
- It produces visuals in pdf, png, jpg and svg formats.

IV. DISADVANTAGES

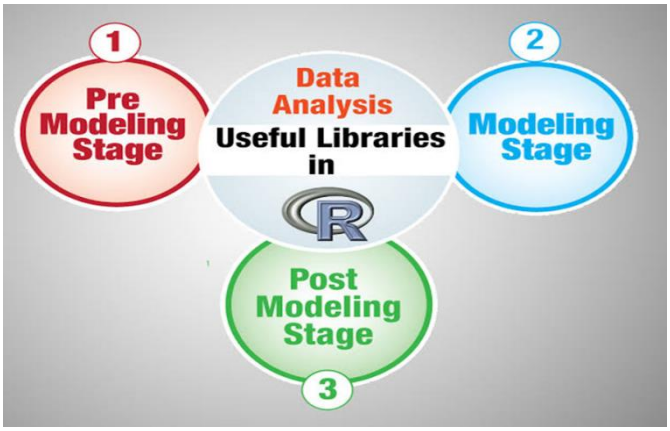
- Very less visuals on memory management. Almost utilizes full of disk space.
- Best suited for people with data-oriented problems only.
- Cannot be used as back-end server for computations.
- Less-Secure.

V. AS AN ENVIRONMENT

R- Environment is suited for computing statistical data & Computer Visual-graphics. A set of software facilities having Manipulative data, computation of data & data-in visual-graphical format.
An environment of R is area where we can ware objects, variables, functions.

- **Basics:** It includes essential properties of an environment where we can establish our own current circumstance.
- **Names-Values Binding:** It depicts the principles that names ought to follow just as shows a few minor departures from restricting a name-value.
- **Explicit-Environment:** Conditions have reference semantics due to this, they are likewise helpful information structures by their own doing.

VI. LIBRARIES



A) Pre-Modeling Stage:

- ggplot2: model to make exquisite Data Visualizations Using the Grammar of Graphics. In vision of ''The Grammar of Graphics'' as per our information 'ggplot2' map factors to feel and it deals with the subtleties.
- RRF: RRF means "Regularized Random Forest". This library depends on Random Forest bundle which is utilized for Feature- determination.
- Plyr: models data change to perform a few tasks like information Split-ting, Applying and consolidating of information.

B) Modeling Stage:

- Car: package used in Continuous-Regression, as companion to Applied-Regression.
- Carat: utilized for grouping and Regression-training.
- Forecast: Functions are utilized for Time Series and Linear-Models.

C) Post-Modeling Stage:

- Comparison: utilized for computing and assessing proportions from multivariate ceaseless perceptions.
- ACD: utilized for Categorical-information investigation with complete or in-missing reactions.
- PROC: utilized to envision & break down ROC bends in R & S+. Also used to think about recipient working trademark.

D) Other Libraries:

RCPP: Assists with further developing execution. It gives consistent incorporation in the mid-of R & C++ by offering R works just like C++ classes.

VII. COMPARISON WITH OTHER LANGUAGES

R Programming	Python	Java
•It was stably released in 2014.	•It was stably released in 1996.	•It was stably released in 1995.
•It has more functions and packages.	•It has less functions and packages.	•It has large number of inbuilt functions and packages.
•It is an interpreter base language	•It is an interpreter base language	•It is interpreter and compiled based language.
•It is statistical design and graphics programming language.	•It is general purpose language.	•It is general purpose programming language designed for web applications .
•It is difficult to learn and understand.	•It is easy to understand.	•It is easy to learn and understand.

Fig2: R Comparison with other languages

VIII. SCOPE OF R WITH LIST OF ATTRIBUTES

1. **Cost/Availability:** Being R as an open-source tool, it can be freely downloaded anywhere.
2. **Ease-of-learning:** R has quite a ease of learning curve. Codes can be implemented with ease of structure /syntax which facilitate easy learning in users.
3. **Data Handling:** R has power to compute everything and has good data-handling capabilities & options for parallel -computations.
4. **Graphical tendencies:** possess advanced graphical tendency when it is in considerate purely to statistical-tools. Large amount of packages are available to facilitate advanced graphical-capabilities.

IX. BIG DATA-ANALYTICS

Huge information includes the right portrayal and capacity of huge volumes of information in organized and unstructured structure on a solitary Personal Computer. This information helps in maintaining the everyday business activity. It holds the tremendous measure of information as well as keeps the associations' information unblemished for helpful business matters. It is worried about an advancing term of portraying any measure of voluminous organized, semi-organized and un-organized information that can be done in for valuable data handling. An organization profit value is not designated by the data that is stored which is true for old/traditional databases, warehouses, and new technologies like big data -Hadoop. Data once stored in appropriate manner can be analyze to create immense value in it.

X. R SCOPE IN DATA ANALYTICS

R act as an open source software platform for statistical computing and analysis. On a large scale due to its open-source nature, R is speedily adopted by statistics departments in universities around the world, attracted by its extensible nature as a platform for academic research. It's available free of cost. R builds this process very easily and anyone can produce an R package to CRAN that stands for Comprehensive R Archive Network and make it available to everyone. An extensive open-source interactive ide has been created by R Studio for the R language, further boosting the productivity of R users everywhere.

XI. CONCLUSION

R-is one of popular language, easy in terms of learning which avails visual-graphics & statistics developments. Libraries play as main actor in R-Studio & environment. CRAN let users to browse packages with respect to topics which they want & it also offers tools sets where package of interest can be installed in an auto-mode. Due to miscellaneous features of R, it has multiple applications & used in almost every-field.

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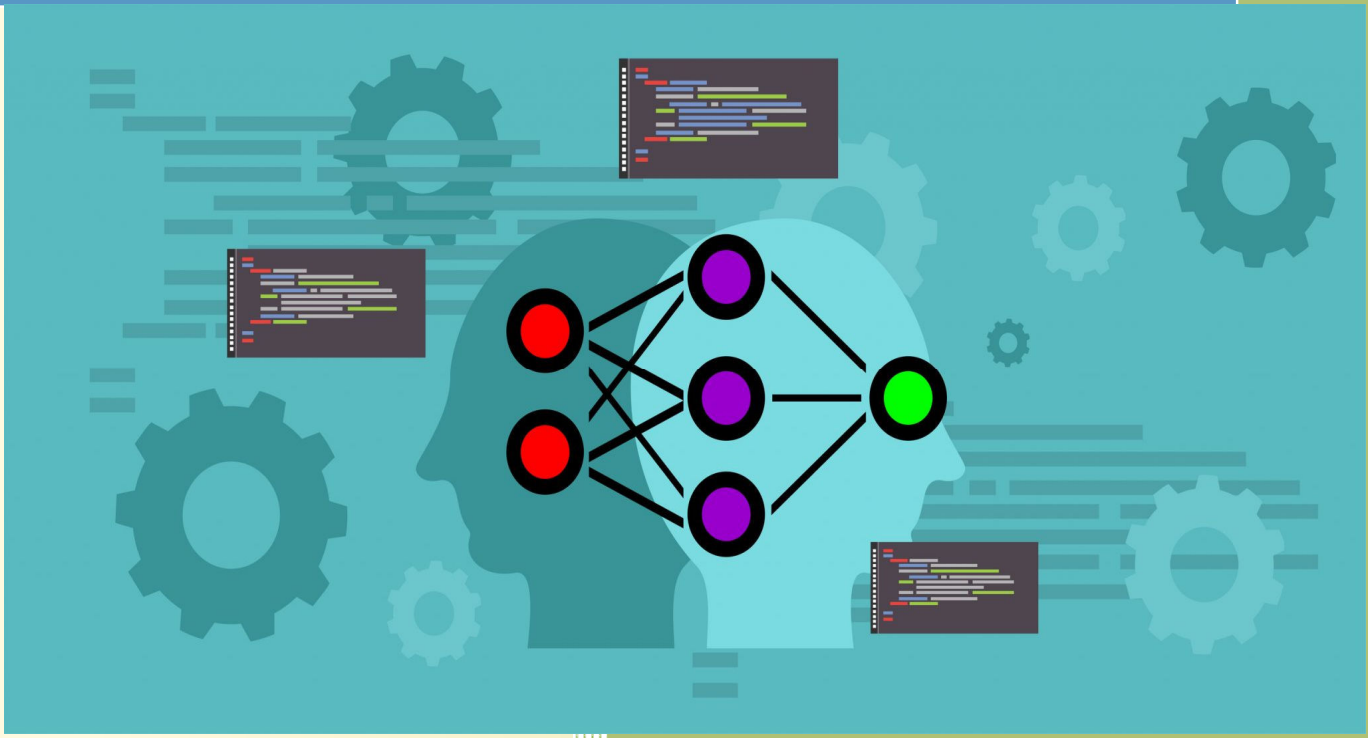

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Fundamentals of Algorithm

By ...

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Fundamentals of Algorithm

By Prof. Rajesh Yadav

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Preface

This book is intended to survey the most important computer algorithms in use today, and to teach fundamental techniques to the growing number of people in need of knowing them.

It is intended for use as a textbook for a second year course in computer science, after students have acquired basic programming skills and familiarity with computer systems.

The book also may be useful for self-study or as a reference for people engaged in the development of computer systems or applications programs, since it contains implementations of useful algorithms.

The broad perspective taken makes the book an appropriate introduction to the field.

~Prof. Rajesh Yadav

Acknowledgement

I would like to express my gratitude to the many people who saw me through this book; to all those who provided support, talked things over, read, wrote, offered comments, allowed me to quote their remarks and assisted in the editing, proofreading and design.

I would like to thank my Colleagues of V.K.K Menon College for enabling me to publish this book. Above all I want to thank of my family, who supported and encouraged me in spite of all the time it took me away from them. It was a long and difficult journey for them.

I would like to thanks Sarada madam, Chairman, V. K. Krishna Menon College who encouraged me and provided me an ample time to complete this book.

Last and not least: I beg forgiveness of all those who have been with me over the course of the years and whose names I have failed to mention."

~Prof. Rajesh Yadav

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Mr. Rajesh Yadav is currently working as Assistant Professor in V. K. Krishna Menon College, Mumbai with an educational qualification of M.Sc (Computer Science), NET, B.ED, and UP-TET. He has been teaching computer science students for more than 6 years. He has also completed diplomas' in Machine learning using R Studio, Data Analytics with Python and Advanced Diploma in Introduction to Internet of Things. He has completed more than 12 certificate courses. He has published 5 papers in international journals. He has presented research papers in conferences at National & International level. He has attended more than 250 inclusive seminars, workshops, symposiums, talks, and faculty development programmes. His areas of interest are Machine Learning, Automata, Data Science, Big Data Analytics, Internet of Things and Statistical Computation.

Contents

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Chapter 1

Introduction to Algorithm

An algorithm is a step by step method of solving a problem.

- "It is commonly used for data processing, calculation and other related computer and mathematical operations.
- An algorithm is also used to manipulate data in various ways, such as inserting a new data item, searching for a particular item or sorting an item.
- An algorithm is a detailed series of instructions for carrying out an operation or solving a problem.
- Technically, computers use algorithms to list the detailed instructions for carrying out an operation. For example, to compute an employee's pay check, the computer uses an algorithm.
- To accomplish this task, appropriate data must be entered into the system.
- In terms of efficiency, various algorithms are able to accomplish operations or problem solving easily and quickly.

1.1 Why Analyze an Algorithm

- The most straightforward reason for analyzing an algorithm is to discover its characteristics in order to evaluate its suitability for various applications or compare it with other algorithms for the same application.
- Moreover, the analysis of an algorithm can help us understand it better, and can suggest informed improvements.
- Algorithms tend to become shorter, simpler, and more elegant during the analysis process.

A. Computational Complexity

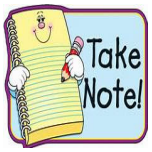
"The branch of theoretical computer science where the goal is to classify algorithms according to their efficiency and computational problems according to their inherent difficulty is known as *computational complexity*."

Paradoxically, such classifications are typically not useful for predicting performance or for comparing algorithms in practical applications because they focus on order-of-growth worst-case performance.

1.2 Running Time Analysis

- It is the process of determining how processing time increases as the size of the problem (input size) increases.
- Input size is the number of elements in the input, and depending on the problem type, the input may be of different types.
- The following are the common types of inputs.
    - Size of an array
    - Polynomial degree
    - Number of elements in a matrix
    - Number of bits in the binary representation of the input
    - Vertices and edges in a graph.
- A complete analysis of the running time of an algorithm involves the following steps:
    - Implement the algorithm completely.
    - Determine the time required for each basic operation.
    - Identify unknown quantities that can be used to describe the frequency of execution of the basic operations.
    - Develop a realistic model for the input to the program.
    - Analyze the unknown quantities, assuming the modelled input.
    - Calculate the total running time by multiplying the time by the frequency for each operation, then adding all the products.
- The running time of a program depends on factors such as:
    1. The input to the program.
    2. The quality of code generated by the compiler used to create the object program.

3. The nature and speed of the instructions on the machine used to execute the program, and
4. The time complexity of the algorithm underlying the program.



The running time depends not on the exact input but only the size of the input.

1.3 How to Compare Algorithms

To compare algorithms, it is necessary to define few objective measures:

1. **Execution times:** It is not a good measure as execution times are specific to a particular computer.
2. **Number of statements executed:**It is not a good measure since the number of statements varies with the programming language as well as the style of the individual programmer.
3. **Ideal solution:** Let us assume that we express the running time of a given algorithm as a function of the input size n (i.e., f(n)) and compare these different functions corresponding to running times. This kind of comparison is independent of machine time, programming style, etc.

To compare algorithms, we use a set of parameters or set of elements like memory required by that algorithm, execution speed of that algorithm, easy to understand, easy to implement, etc.

1.4 Rate of growth

"The rate at which the running time increases as a function of input is called as Rate of Growth."

In other words, the rate of growth for an algorithm is the rate at which the cost of the algorithm grows as the size of its input grows.

1.5 Types of Growth Rates OR Commonly Used Rates of Growth

1. Linear Growth Rate

- A growth rate of cn (for c any positive constant) is often referred to as a *linear growth rate* or running time.
- This means that as the value of n grows, the running time of the algorithm grows in the same proportion.
- Doubling the value of n roughly doubles the running time.
- A linear growth rate is a growth rate where the resource needs and the amount of data is directly proportional to each other.
- That is the growth rate can be described as a straight line that is not horizontal.

2. **Quadratic Growth Rate**

- An algorithm whose running-time equation has a highest-order term containing a factor of n^2 is said to have a *quadratic growth rate*.

3. Constant Growth Rate

- A constant resource need is one where the resource need does not grow.
- That is processing 1 piece of data takes the same amount of resource as processing 1 million pieces of data.
- The graph of such a growth rate looks like a horizontal line.

4. Log Linear

- A log linear growth rate is a slightly curved line. the curve is more pronounced for lower values than higher ones

5. Logarithmic Growth Rate

- A logarithmic growth rate is a growth rate where the resource needs grows by one unit each time the data is doubled.
- This effectively means that as the amount of data gets bigger, the curve describing the growth rate gets flatter (closer to horizontal but never reaching it).

1.6 Analysis of Algorithm

- The term "analysis of algorithms" was coined by Donald Knuth.
- Analysis of algorithm is the process of analyzing the problem-solving capability of the algorithm in terms of the time and size required (the size of memory for storage while implementation).
- However, the main concern of analysis of algorithms is the required time or performance.
- To analyze the given algorithm, we need to know with which inputs the algorithm takes less time (performing well) and with which inputs the algorithm takes a long time.
- Algorithm analysis helps us to determine which algorithm is most efficient in terms of time and space consumed.

There are three types of analysis:

1. Worst Case

- Defines the input for which the algorithm takes a long time (slowest time to complete).
- Input is the one for which the algorithm runs the slowest.

2. Best Case

- Defines the input for which the algorithm takes the least time (fastest time to complete).
- Input is the one for which the algorithm runs the fastest.

3. Average Case

- Provides a prediction about the running time of the algorithm.
- Run the algorithm many times, using many different inputs that come from some distribution that generates these inputs, compute the total running time (by adding the individual times), and divide by the number of trials.
- Assumes that the input is random.

Lower Bound <= Average Time <= Upper Bound

- For a given algorithm, we can represent the best, worst and average cases in the form of expressions.
- As an example, let f(n) be the function which represents the given algorithm. Similarly for the average case.

f(n)=n2+500,for worst case

f(n)=n2+100n+500,for best case

The expression defines the inputs with which the algorithm takes the average running time (or memory).

1.7 Asymptotic Notation

Introduction

- Whenever we want to perform analysis of an algorithm, we need to calculate the complexity of that algorithm.
- But when we calculate complexity of an algorithm it does not provide exact amount of resource required.
- So instead of taking exact amount of resource we represent that complexity in a general form (Notation) which produces the basic nature of that algorithm.
- We use that general form (Notation) for analysis process.

Asymptotic notation of an algorithm is a mathematical representation of its complexity.

In asymptotic notation, when we want to represent the complexity of an algorithm, we use only the most significant terms in the complexity of that algorithm and ignore least significant terms in the complexity of that algorithm (Here complexity may be Space Complexity or Time Complexity)

Algorithm 1 : 5n2 + 2n + 1

Algorithm 2 : 10n2 + 8n + 3

- Generally, when we analyze an algorithm, we consider the time complexity for larger values of input data (i.e. 'n' value).
- In above two time complexities, for larger value of 'n' the term in algorithm 1 '2n + 1' has least significance than the term '$5n^2$', and the term in algorithm 2 '8n + 3' has least significance than the term '$10n^2$'.
- Here for larger value of 'n' the value of most significant terms ($5n^2$ and $10n^2$) is very larger than the value of least significant terms (2n + 1 and 8n + 3).
- So for larger value of 'n' we ignore the least significant terms to represent overall time required by an algorithm.

- In asymptotic notation, we use only the most significant terms to represent the time complexity of an algorithm.

Majorly, we use THREE types of Asymptotic Notations and those are as follows...

1. Big - Oh (O)

2. Big - Omega (Ω)

3. Big - Theta (Θ)

1.8 Big –Oh(O) Notation

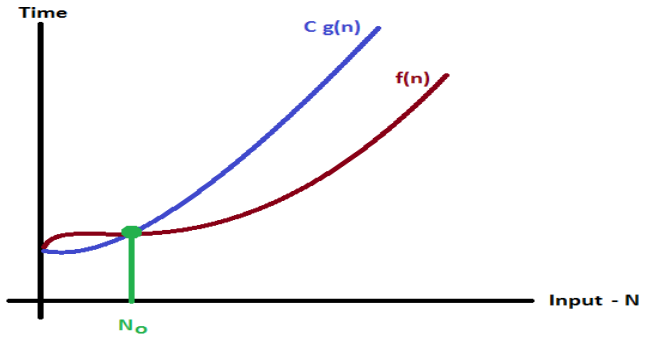
- Big - Oh notation is used to define the upper bound of an algorithm in terms of Time Complexity.
- That means Big - Oh notation always indicates the maximum time required by an algorithm for all input values.
- That means Big - Oh notation describes the worst case of an algorithm time complexity.

Big - Oh Notation can be defined as follows:

Consider function f(n) the time complexity of an algorithm and g(n) is the most significant term.

- ✓ If f(n) <= C g(n) for all n >= n0, C > 0 and n0 >= 1.Then we can represent f(n) as O(g(n)).

Consider the following graph drawn for the values of f(n) and C g(n) for input (n) value on X-Axis and time required is on Y-Axis.



In above graph after a particular input value n0, always C g (n) is greater than f (n) which indicates the algorithm's upper bound.

Example

Consider the following f(n) and g(n)...

f(n) = 3n + 2

g(n) = n

Solution: If we want to represent f(n) as O(g(n)) then it must satisfy f(n) <= C x g(n) for all values of C > 0 and n0>= 1

f(n) <= C g(n)

⇒3n + 2 <= C n

Above condition is always TRUE for all values of C = 4 and n >= 2.

By using Big - Oh notation we can represent the time complexity as follows...

3n + 2 = O(n)

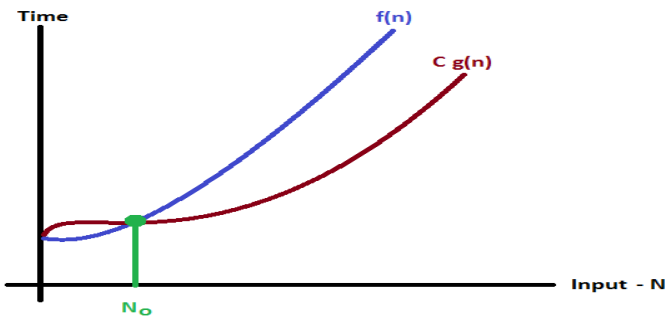
1.9 Big - Omega (Ω) Notation

- Big - Omega notation is used to define the lower bound of an algorithm in terms of Time Complexity.
- That means Big - Omega notation always indicates the minimum time required by an algorithm for all input values. That means Big - Omega notation describes the best case of an algorithm time complexity.
- Big - Omega Notation can be defined as follows...

Consider function f(n) the time complexity of an algorithm and g(n) is the most significant term.

- ✓ If f(n) >= C x g(n) for all n >= n0, C > 0 and n0 >= 1. Then we can represent f(n) as Ω(g(n)).

Consider the following graph drawn for the values of f(n) and C g(n) for input (n) value on X-Axis and time required is on Y-Axis.



In above graph after a particular input value n0, always C x g(n) is less than f(n) which indicates the algorithm's lower bound.

Example

Consider the following f(n) and g(n)...

f(n) = 3n + 2

g(n) = n

Solution: If we want to represent f(n) as Ω(g(n)) then it must satisfy f(n) >= C g(n) for all values of C > 0 and n0>= 1

f(n) >= C g(n)

⇒3n + 2 <= C n

Above condition is always TRUE for all values of C = 1 and n >= 1.

By using Big - Omega notation we can represent the time complexity as follows...

3n + 2 = Ω(n)

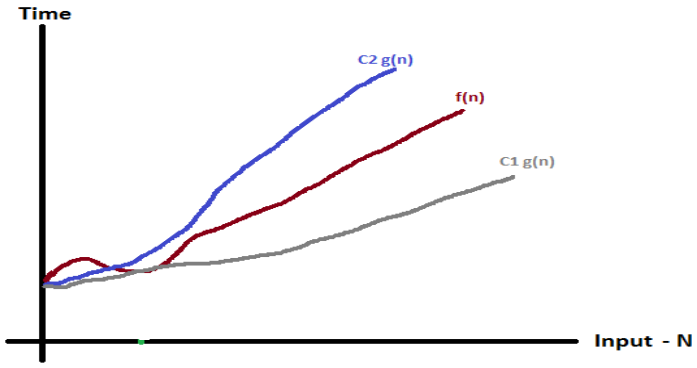
1.10. Big - Theta Notation (Θ)

- Big - Theta notation is used to define the average bound of an algorithm in terms of Time Complexity.
- That means Big - Theta notation always indicates the average time required by an algorithm for all input values. That means Big - Theta notation describes the average case of an algorithm time complexity.
- Big - Theta Notation can be defined as follows...

Consider function f(n) the time complexity of an algorithm and g(n) is the most significant term.

- ✓ If C1 g(n) <= f(n) >= C2 g(n) for all n >= n0, C1, C2 > 0 and n0 >= 1. Then we can represent f(n) as Θ(g(n)).

Consider the following graph drawn for the values of f(n) and C g(n) for input (n) value on X-Axis and time required is on Y-Axis.



In above graph after a particular input value n0, always C1 g(n) is less than f(n) and C2 g(n) is greater than f(n) which indicates the algorithm's average bound.

Example

Consider the following f(n) and g(n)...

f(n) = 3n + 2

g(n) = n

Solution:

If we want to represent f(n) as Θ(g(n)) then it must satisfy C1 g(n) <= f(n) >= C2 g(n) for all values of C1, C2 > 0 and n0>= 1

C1 g(n) <= f(n) >= ⇒C2 g(n)

C1 n <= 3n + 2 >= C2 n

Above condition is always TRUE for all values of C1 = 1, C2 = 4 and n >= 1.

By using Big - Theta notation we can represent the time compexity as follows...

3n + 2 = Θ(n)

1.11 Asymptotic Analysis

One naive way of doing this is – implement both the algorithms and run the two programs on your computer for different inputs and see which one takes less time. There are many problems with this approach for analysis of algorithms.

1. It might be possible that for some inputs, first algorithm performs better than the second. And for some inputs second performs better.
2. It might also be possible that for some inputs, first algorithm perform better on one machine and the second works better on other machine for some other inputs.

Solution to above problem **is Asymptotic analysis.**

- Asymptotic analysis of an algorithm refers to defining the mathematical boundation/framing of its run-time performance.
- Using asymptotic analysis, we can very well conclude the best case, average case, and worst case scenario of an algorithm.
- Asymptotic analysis is input bound i.e., if there's no input to the algorithm, it is concluded to work in a constant time. Other than the "input" all other factors are considered constant.
- Asymptotic analysis refers to computing the running time of any operation in mathematical units of computation.
- For example, the running time of one operation is computed as $f(n)$ and may be for another operation it is computed as $g(n^2)$.
- This means the first operation running time will increase linearly with the increase in **n** and the running time of the second operation will increase exponentially when **n** increases.
- Similarly, the running time of both operations will be nearly the same if **n** is significantly small.

1.12 Properties of Notations

Following are the properties of asymptotic notations:-

1. Transitive

- If $f(n) = \Theta(g(n))$ and $g(n) = \Theta(h(n))$, then $f(n) = \Theta(h(n))$
- If $f(n) = O(g(n))$ and $g(n) = O(h(n))$, then $f(n) = O(h(n))$
- If $f(n) = o(g(n))$ and $g(n) = o(h(n))$, then $f(n) = o(h(n))$
- If $f(n) = \Omega(g(n))$ and $g(n) = \Omega(h(n))$, then $f(n) = \Omega(h(n))$
- If $f(n) = \omega(g(n))$ and $g(n) = \omega(h(n))$, then $f(n) = \omega(h(n))$

2. Reflexivity

- $f(n) = \Theta(f(n))$
- $f(n) = O(f(n))$
- $f(n) = \Omega(f(n))$

3. Symmetry

- f(n) = Θ(g(n)) if and only if g(n) = Θ(f(n))

4. Transpose Symmetry

- f(n) = O(g(n)) if and only if g(n) = Ω(f(n))
- f(n) = o(g(n)) if and only if g(n) = ω(f(n))

5. Some other properties of asymptotic notations are as follows:

- If f (n) is O(h(n)) and g(n) is O(h(n)), then f (n) + g(n) is O(h(n)).
- The function $\log_a n$ is $O(\log_b n)$ for any positive numbers a and $b \neq 1$.
- $\log_a n$ is O(lg n) for any positive $a \neq 1$, where $\lg n = \log_2 n$.

1.13 Commonly used Algorithms and Summation

1. Logarithms

$$\log x^y = y \log x \qquad \log n = \log_{10}^n$$
$$\log xy = \log x + \log y \qquad \log^k n = (\log n)^k$$
$$\log \log n = \log(\log n) \qquad \log \frac{x}{y} = \log x - \log y$$
$$a^{\log_b^x} = x^{\log_b^a} \qquad \log_b^x = \frac{\log_a^x}{\log_a^b}$$

2. Arithmetic Series

$$\sum_{K=1}^{n} k = 1 + 2 + \cdots + n = \frac{n(n+1)}{2}$$

3. Geometric Series

$$\sum_{k=0}^{n} x^k = 1 + x + x^2 \ldots + x^n = \frac{x^{n+1} - 1}{x - 1} (x \neq 1)$$

4. Harmonic Series

$$\sum_{k=1}^{n} \frac{1}{k} = 1 + \frac{1}{2} + \ldots + \frac{1}{n} \approx \log n$$

5. Other Important Formulae

$$\sum_{k=1}^{n} log\, k \approx nlogn$$

$$\sum_{k=1}^{n} k^p = 1^p + 2^p + \cdots + n^p \approx \frac{1}{p+1} n^{p+1}$$

1.14 Performance Characteristics of Algorithm

Introduction

- If we want to go from city "A" to city "B", there can be many ways of doing this. We can go by flight, by bus, by train and also by bicycle.
- Depending on the availability and convenience, we choose the one which suits us.
- Similarly, in computer science there are multiple algorithms to solve a problem.
- When we have more than one algorithm to solve a problem, we need to select the best one.
- Performance analysis helps us to select the best algorithm from multiple algorithms to solve a problem.
- When there are multiple alternative algorithms to solve a problem, we analyse them and pick the one which is best suitable for our requirements.

Formal definition is as follows…

"Performance of an algorithm is a process of making evaluative judgement about algorithms."

"Performance of an algorithm means predicting the resources which are required to an algorithm to perform its task."

That means when we have multiple algorithms to solve a problem, we need to select a suitable algorithm to solve that problem.

Generally, the performance of an algorithm depends on the following elements:--

1. Whether that algorithm is providing the exact solution for the problem?
2. Whether it is easy to understand?
3. Whether it is easy to implement?
4. How much space (memory) it requires to solve the problem?
5. How much time it takes to solve the problem? etc.,

Based on this information, performance analysis of an algorithm can also be defined as follows:-

- Performance analysis of an algorithm is the process of calculating space required by that algorithm and time required by that algorithm.
- Performance analysis of an algorithm is performed by using the following measures of Complexity

The complexity of an algorithm describes the efficiency of the algorithm in terms of the amount of the memory required to process the data and the processing time.

Complexity of an algorithm is analysed in two perspectives: **Time and Space**

1. Time Complexity

- It's a function describing the amount of time required to run an algorithm in terms of the size of the input.
- "Time" can mean the number of memory accesses performed, the number of comparisons between integers, the number of times some inner loop is executed, or some other natural unit related to the amount of real time the algorithm will take.

2. Space Complexity

- It's a function describing the amount of memory an algorithm takes in terms of the size of input to the algorithm.
- We often speak of "extra" memory needed, not counting the memory needed to store the input itself. Again, we use natural (but fixed-length) units to measure this.
- Space complexity is sometimes ignored because the space used is minimal and/or obvious, however sometimes it becomes as important an issue as time.
- When we calculate the complexity of an algorithm we often get a complex polynomial.
- For simplify this complex polynomial we use some notation to represent the complexity of an algorithm call Asymptotic Notation.

For every algorithm corresponding to efficiency analysis, we have three basic cases :--

- Best Case
- Average Case
- Worst Case

"Execution time of an algorithm depends on the instruction set, processor speed, disk I/O speed, etc. Hence, we estimate the efficiency of an algorithm asymptotically."

Time function of an algorithm is represented by T(n), where n is the input size.

1.15 Master theorem for Divide and Conquer

- All divide and conquer algorithms divide the problem into sub-problems, each of which is part of the original problem, and then perform some additional work to compute the final answer.
- The following theorem can be used to determine the running time of divide and conquer algorithms.
- For a given program (algorithm), first we try to find the recurrence relation for the
- Problem.
- If the recurrence is of the below form then we can directly give the answer without fully solving it.
- If the recurrence is of the form $T(n) = aT(\frac{n}{b}) + \Theta(n^k log^p n)$, where a ≥ 1
- b > 1,k ≥ 0 and p is a real number, then:

1) If a > b^k, then $T(n) = \Theta\left(n^{log_b^a}\right)$
2) If a= b^k
   a. If $p > -1$, then $T(n) = \Theta\left(n^{log_b^a} log^{p+1} n\right)$
   b. If $p = -1$, then $T(n) = \Theta\left(n^{log_b^a} loglogn\right)$
   c. If $p < -1$, then $T(n) = \Theta\left(n^{log_b^a}\right)$
3) If $a < b^k$
   a. If $p \geq 0$, then $T(n) = \Theta(n^k log^p n)$
   b. If $p < 0$, then $T(n) = O(n^k)$

1.16 Divide and Conquer Master Theorem Problems & Solutions

For each of the following recurrences, give an expression for the runtime T(n) if the recurrence can be solved with the Master Theorem. Otherwise, indicate that the Master Theorem does not apply

Problem-1: $T(n) = 3T(n/2) + n^2$

Solution: $T(n) = 3T(n/2) + n^2 \Rightarrow T(n) = \Theta(n^2)$ (Master Theorem Case 3.a)

Problem-2: $T(n) = 4T(n/2) + n^2$

Solution: $T(n) = 4T(n/2) + n^2 \Rightarrow T(n) = \Theta(n^2 \log n)$(Master Theorem Case 2.a)

Problem-3: $T(n) = T(n/2) + n^2$

Solution: $T(n) = T(n/2) + n^2 \Rightarrow \Theta(n^2)$ (Master Theorem Case 3.a)

Problem-4: $T(n) = 2^n T(n/2) + n^n$

Solution: $T(n) = 2^n T(n/2) + n^n$ => Does not apply (a is not constant)

Problem-5: $T(n) = 16T(n/4) + n$

Solution: $T(n) = 16T(n/4) + n \Rightarrow T(n) = \Theta(n^2)$ (Master Theorem Case 1)

Problem-6: $T(n) = 2T(n/2) + n\log n$

Solution: $T(n) = 2T(n/2) + n\log n \Rightarrow T(n) = \Theta(n\log 2n)$(Master Theorem Case 2.a)

Problem-7: $T(n) = 2T(n/2) + n/\log n$

Solution: $T(n) = 2T(n/2) + n/\log n \Rightarrow T(n) = \Theta(n\log\log n)$ (Master Theorem Case 2. b)

Problem-8: $T(n) = 2T(n/4) + n^{0.51}$

Solution: $T(n) = 2T(n/4) + n^{0.51} \Rightarrow T(n) = \Theta(n^{0.51})$ (Master Theorem Case 3.b)

1.17 Master Theorem For Subtract and Conquer Recurrences

Master theorem is used to determine the Big – O upper bound on functions which possess recurrence, i.e which can be broken into sub problems.

Master Theorem For Subtract and Conquer Recurrences:

Let T(n) be a function defined on positive n as shown below:

$$T(n) \leq \begin{cases} c, & \text{if } n \leq 1, \\ aT(n-b) + f(n), & n > 1, \end{cases},$$

For some constants c, a>0, b>0, k>=0 and function f(n). If f(n) is $O(n^k)$, then

1. If a<1 then $T(n) = O(n^k)$
2. If a=1 then $T(n) = O(n^{k+1})$
3. if a>1 then $T(n) = O(n^k a^{n/b})$

Proof of above theorem (By substitution method):

From above function, we have:

$T(n) = aT(n-b) + f(n)$

$T(n-b) = aT(n-2b) + f(n-b)$

$T(n-2b) = aT(n-3b) + f(n-2b)$

Now,

$T(n-b) = a^2T(n-3b) + af(n-2b) + f(n-b)$

$T(n) = a^3T(n-3b) + a^2f(n-2b) + af(n-b) + f(n)$

$T(n) = \Sigma^{i=0 \text{ to } n} a^i f(n-ib) + \text{constant}$, where $f(n-ib)$ is $O(n-ib)$

$T(n) = O(n^k \Sigma^{i=0 \text{ to } n/b} a^i)$

Where, If $a<1$ then $\Sigma^{i=0 \text{ to } n/b} a^i = O(1)$, $T(n) = O(n^k)$

If $a=1$ then $\Sigma^{i=0 \text{ to } n/b} a^i = O(n)$, $T(n) = O(n^{k+1})$

If $a>1$ then $\Sigma^{i=0 \text{ to } n/b} a^i = O(a^{n/b})$, $T(n) = O(n^k a^{n/b})$

1.18 Method of Guessing and Confirming

- Let us discuss about a method which can be used to solve any recurrence. The basic idea behind this method is, guess the answer; and then prove it correct by induction.
- In other words, it addresses the question:
  - What if the given recurrence doesn't seem to match with any of these (master theorems) methods?
  - If we guess a solution and then try to verify our guess inductively, usually either the proof will succeed (in which case we are done), or the proof will fail (in which case the failure will help us refine our guess).

As an example, consider the recurrence $T(n) = \sqrt{n}\, T(\sqrt{n}) + n$. This doesn't fit into the form required by the Master Theorems.

Carefully observing the recurrence gives us the impression that it is similar to divide and conquer method (diving the problem into $\sqrt{n}$ sub problems each with size $\sqrt{n}$). As we can see, the size of the sub problems at the first level of recursion is n.

So, let us guess that $T(n) = O(n\log n)$, and then try to prove that our guess is correct.

Let's start by trying to prove an upper bound $T(n) \leq cn\log n$:

$T(n) = \sqrt{n}\, T(\sqrt{n}) + n$

$\leq \sqrt{n}.\ c\sqrt{n}\ \log\sqrt{n} + n$

$= n.\ c \log\sqrt{n} + n$

$= n.c.1/2.\log n + n$

$\leq cn\log n$

The last inequality assumes only that $1 \leq c.1/2.\log n$. This is correct if n is sufficiently large and for any constant c, no matter how small. From the above proof, we can see that our guess is correct for upper bound. Now, let us prove the lower bound for this recurrence.

$T(n) = \sqrt{n}\ T(\sqrt{n}) + n$

$\geq \sqrt{n}.\ k\ \sqrt{n}\ \log\sqrt{n} + n$

$= n.\ k \log\sqrt{n} + n$

$= n.k.1/2.\log n + n$

$\geq kn\log n$

The last inequality assumes only that $1 \geq k.1/2.\log n$. This is incorrect if n is sufficiently large and for any constant k. From the above proof, we can see that our guess is incorrect for lower bound.

From the above discussion, we understood that $\Theta(n\log n)$ is too big. How about $\Theta(n)$? The lower bound is easy to prove directly:

$T(n) = \sqrt{n}\ T(\sqrt{n}) + n \geq n$

Now, let us prove the upper bound for this $\Theta(n)$.

$T(n) = \sqrt{n}\ T(\sqrt{n}) + n$

$\leq \sqrt{n}.c.\sqrt{n} + n$

$= n.\ c + n$

$= n\ (c + 1)$

$\not\leq cn$

From the above induction, we understood that $\Theta(n)$ is too small and $\Theta(n\log n)$ is too big. So, we need something bigger than n and smaller than $n\log n$? How about $n\sqrt{\log n}$?

Proving upper bound for $n\sqrt{\log n}$:

$T(n) = \sqrt{n}\ T(\sqrt{n}) + n$

$\leq \sqrt{n}.c.\sqrt{n}\ \sqrt{(\log\sqrt{n})} + n$

$= n.\ c.1/\sqrt{2}\ \log\sqrt{n} + n$

$\leq cn\log\sqrt{n}$

Proving lower bound for $n\sqrt{\log n}$:

$T(n) = \sqrt{n}\, T(\sqrt{n}) + n$

$\geq \sqrt{n}.k.\sqrt{n}\, \sqrt{(\log\sqrt{n})} + n$

$= n.\ k.1/\sqrt{2}\ \log\sqrt{n} + n$

$\not\geq k n \log\sqrt{n}$

The last step doesn't work. So, $\Theta(n\sqrt{\log n})$ doesn't work. What else is between n and nlogn? How about nloglogn?

Proving upper bound for nloglogn:

$T(n) = \sqrt{n}\, T(\sqrt{n}) + n$

$\leq \sqrt{n}.c.\sqrt{n}\ \log\log\sqrt{n} + n$

$= n.\ c.\log\log n - c.n + n$

$\leq c n \log\log n$, if $c \geq 1$

Proving lower bound for nloglogn:

$T(n) = \sqrt{n}\, T(\sqrt{n}) + n$

$\geq \sqrt{n}.k.\sqrt{n}\ \log\log\sqrt{n} + n$

$= n.\ k.\log\log n - k.n + n$

$\geq k n \log\log n$, if $k \leq 1$

From the above proofs, we can see that $T(n) \leq c n \log\log n$, if $c \geq 1$ and $T(n) \geq k n \log\log n$, if $k \leq 1$. Technically, we're still missing the base cases in both proofs, but we can be fairly confident at this point that $T(n) = \Theta(n \log\log n)$.

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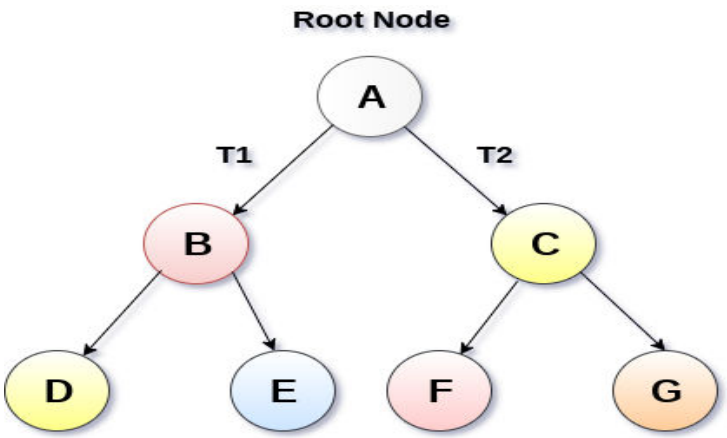


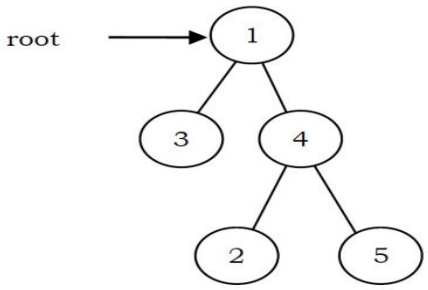
Commonly-Used Terminologies

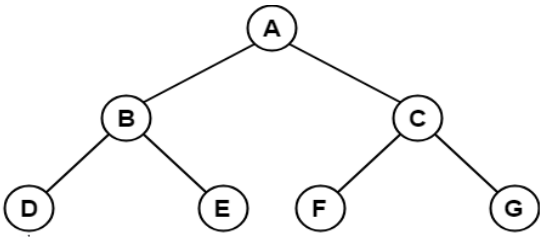
- **Root**: Top node in a tree.
- **Child**: Nodes that are next to each other and connected downwards.
- **Parent**: Converse notion of child.
- **Siblings**: Nodes with the same parent.
- **Descendant**: Node reachable by repeated proceeding from parent to child.
- **Ancestor**: Node reachable by repeated proceeding from child to parent.
- **Leaf**: Node with no children.
- **Internal node**: Node with at least one child.
- **External node**: Node with no children.

2.3 Types of Binary Trees

Strict Binary Tree:

- A binary tree is called strict binary tree if each node has exactly two children or no children.
- A strictly binary tree with n leaves, will have (2n - 1) nodes.



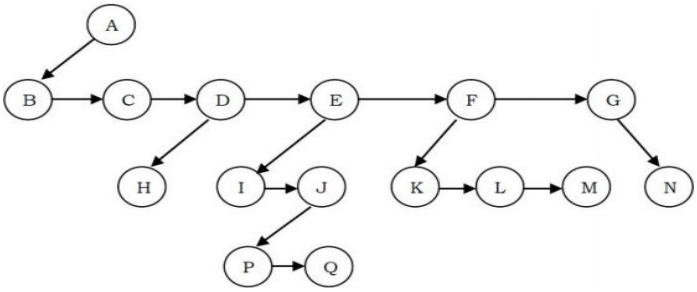


Postorder Traversal : D , E , B , F , G , C , A

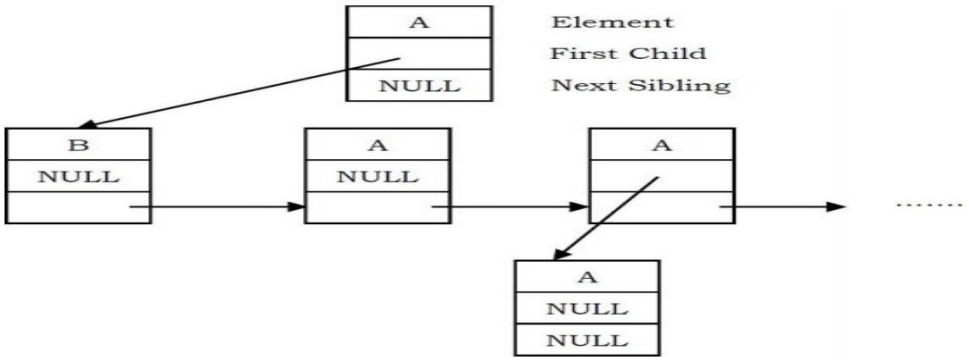
2.6 Representation of Generic Trees (N-ary Trees)

Since our objective is to reach all nodes of the tree, a possible solution to this is as follows:

- At each node link children of same parent (siblings) from left to right.
- Remove the links from parent to all children except the first child.



- The above statements say is if we have a link between children then we do not need extra links from parent to all children.
- This is because we can traverse all the elements by starting at the first child of the parent.
- So if we have a link between parent and first child and also links between all children of same parent then it solves our problem.
- This representation is sometimes called first child/next sibling representation.
- First child/next sibling representation of the generic tree is shown above.
- The actual representation for this tree is:

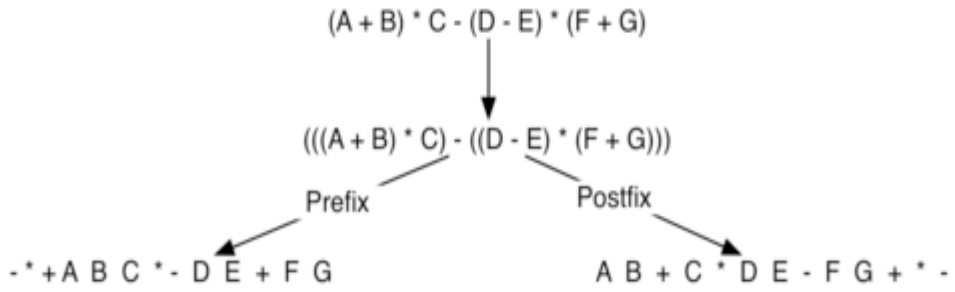


Examples

1: Convert the following infix Expression into postfix and prefix Expression.

(A + B) * C - (D - E) * (F + G)

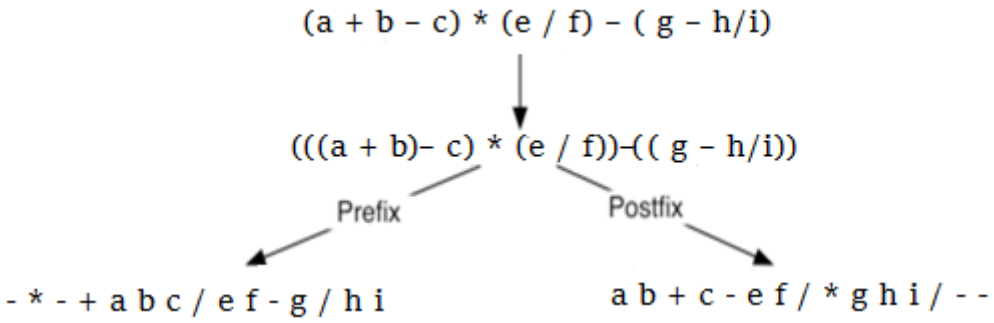
Solution:



2: Convert the following infix Expression into postfix and prefix Expression.

(a + b – c) * (e / f) – (g – h/i)

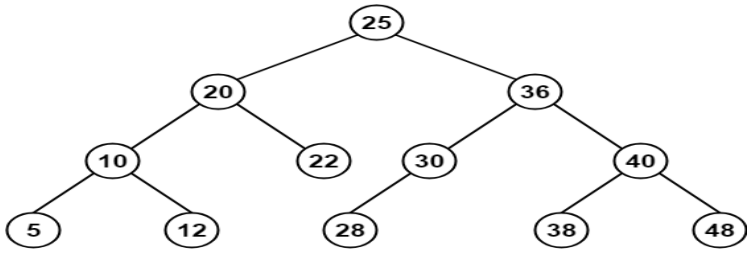
Solution:



2.9 Binary Search Tree

Binary Search Tree (BST) is a special kind of **Binary Tree** in which every node contains only smaller values in its left sub tree and only larger values in its right sub tree.

Example-

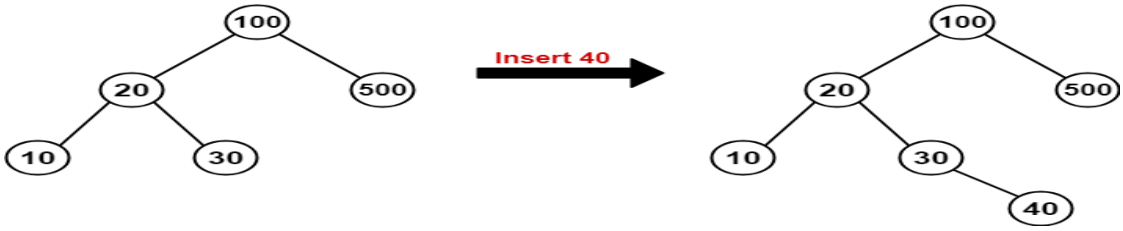


Binary Search Tree

Steps:

- The insertion of a new key always takes place as the child of some leaf node.
- For finding out the suitable leaf node, we start searching the key to be inserted from the root node till we reach at some leaf node.
- Once we reach at some leaf node, the new node is inserted as a child of that leaf node.

Example:



Step-01: We start our search for value 40 from the root node 100. As 40 < 100, so we search in 100's left sub tree.

Step-02: As 40 > 20, so we search in 20's right sub tree.

Step-03: As 40 > 30 (leaf node), so we add 40 to 30's right sub tree.

C. Deletion Operation

Deletion Operation is performed when we want to delete some particular element from the Binary Search Tree. When it comes to deleting a node from the Binary Search Tree, following three cases are possible

Case-1: Deletion of a node having no child (leaf node)

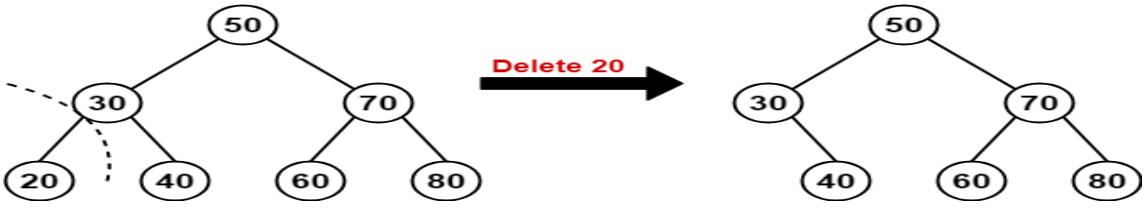
Case-2: Deletion of a node having only one child

Case-3: Deletion of a node having exactly two children

Case-01: Deletion of a node having no child (leaf node)-

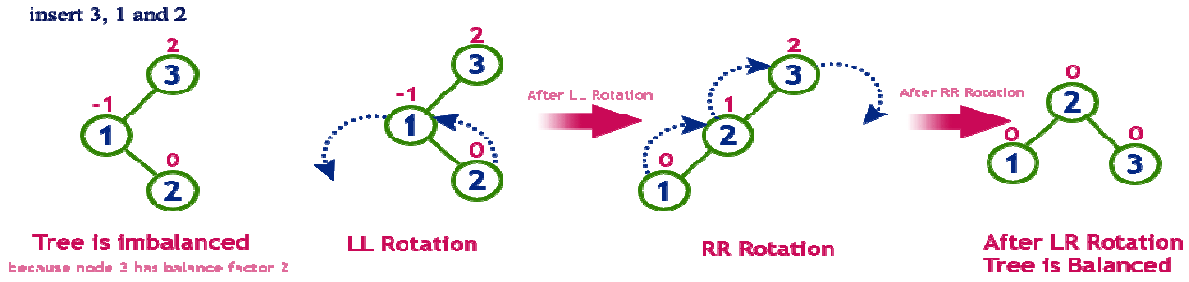
It is very simple. Just remove / disconnect the leaf node that you want to delete from the tree.

Example:



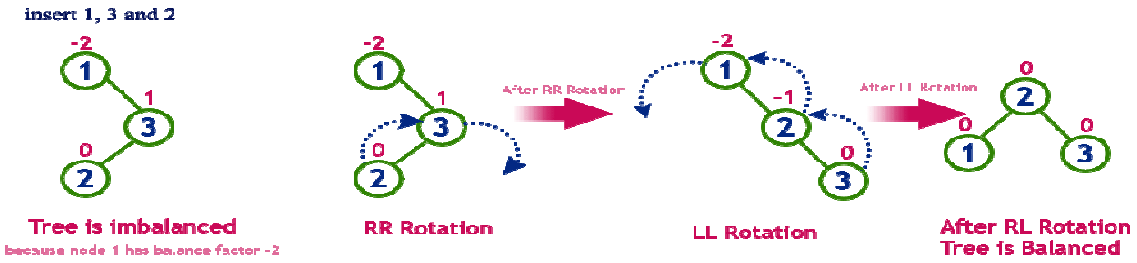
3. Left Right Rotation (LR Rotation)

The LR Rotation is combination of single left rotation followed by single right rotation. In LR Rotation, first every node moves one position to left then one position to right from the current position. To understand LR Rotation, let us consider following insertion operations into an AVL Tree...



4. Right Left Rotation (RL Rotation)

The RL Rotation is combination of single right rotation followed by single left rotation. In RL Rotation, first every node moves one position to right then one position to left from the current position. To understand RL Rotation, let us consider following insertion perations into an AVL Tree.



The following operations are performed on an AVL tree...

1. **Search**
2. **Insertion**
3. **Deletion**

1. Search Operation in AVL Tree

- In an AVL tree, the search operation is performed with **O(log n)** time complexity.
- The search operation is performed similar to Binary search tree search operation.

Following are the steps to search an element in AVL tree:

- **Simple Path:** If all the nodes of the graph are distinct with an exception V0=VN, then such path P is called as closed simple path.
- **Cycle:** A cycle can be defined as the path which has no repeated edges or vertices except the first and last vertices.
- **Connected Graph:** A connected graph is the one in which some path exists between every two vertices (u, v) in V. There are no isolated nodes in connected graph.
- **Complete Graph:** A complete graph is the one in which every node is connected with all other nodes. A complete graph contain n (n-1)/2 edges where n is the number of nodes in the graph.
- **Weighted Graph:** In a weighted graph, each edge is assigned with some data such as length or weight. The weight of an edge e can be given as w (e) which must be a positive (+) value indicating the cost of traversing the edge.
- **Digraph:** A digraph is a directed graph in which each edge of the graph is associated with some direction and the traversing can be done only in the specified direction.
- **Loop:** An edge that is associated with the similar end points can be called as Loop.
- **Adjacent Nodes:** If two nodes u and v are connected via an edge e, then the nodes u and v are called as neighbours or adjacent nodes.
- **Degree of the Node:** A degree of a node is the number of edges that are connected with that node. A node with degree 0 is called as isolated node.

2.12 Applications of Graphs

- Representing relationships between components in electronic circuits.
- Transportation networks: Highway network, Flight network.
- Computer networks: Local area network, Internet, Web.
- Databases: For representing ER (Entity Relationship) diagrams in databases, for representing dependency of tables in databases.

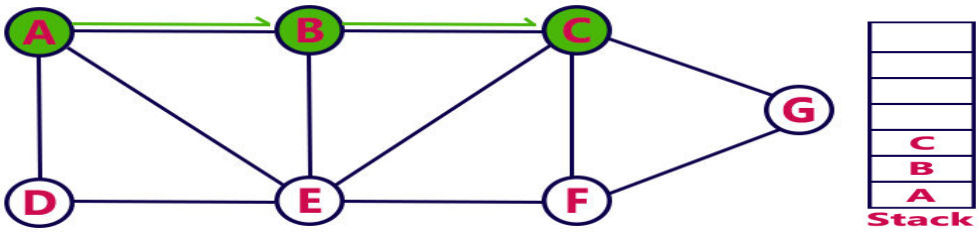
2.13 Graph Representation

By Graph representation, we simply mean the technique which is to be used in order to store some graph into the computer's memory.

- Adjacency Matrix

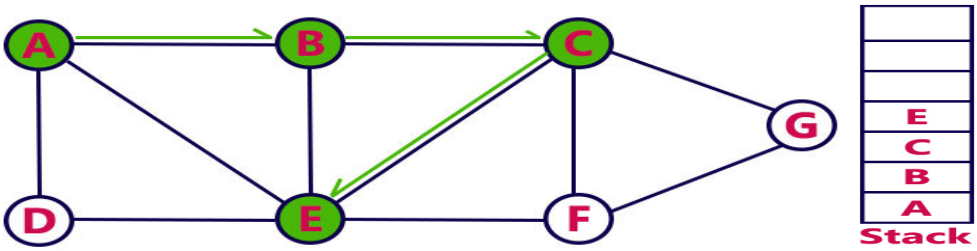
Step 3:

- Visit any adjacent vertex of B which is not visited (C) .
- Push C on the Stack



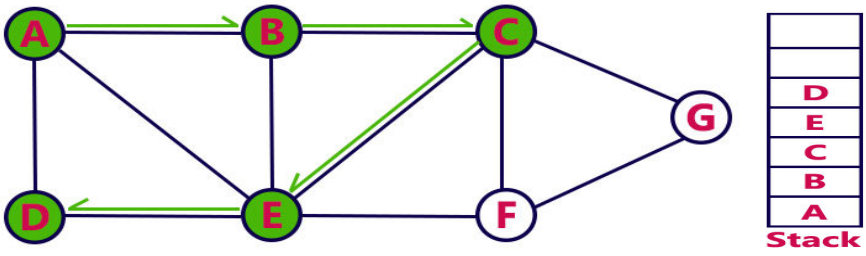
Step 4:

- Visit any adjacent vertex of C which is not visited (E).
- Push E on to the Stack.

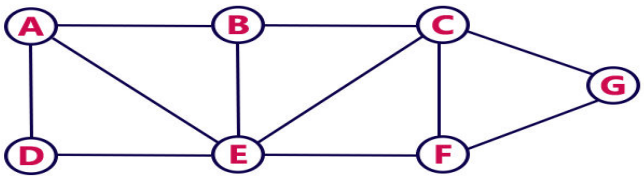


Step 5:

- Visit any adjacent vertex of E whichis not visited (D).
- Push D on to the stack.



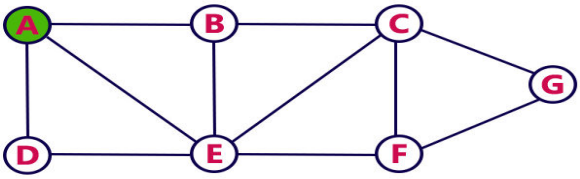
Example: Perform the BFS Traversal on the following Graph



Solution:

Step 1:

- Select the vertex **A** as starting point (visit **A**).
- Insert **A** into the Queue.

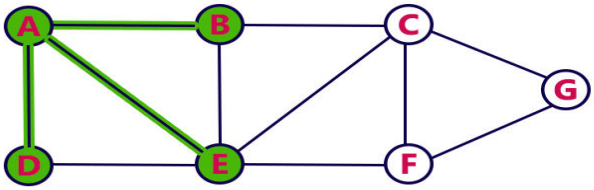


Queue

A						

Step 2:

- Visit all adjacent vertices of **A** which are not visited (**D**, **E**, **B**).
- Insert newly visited vertices into the Queue and delete A from the Queue..

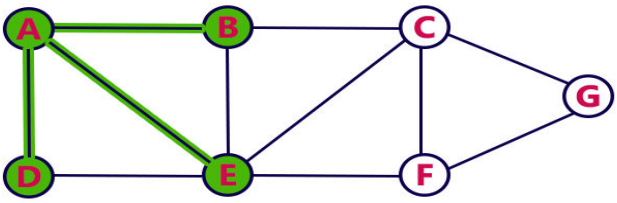


Queue

	D	E	B			

Step 3:

- Visit all adjacent vertices of **D** which are not visited (there is no vertex).
- Delete D from the Queue.

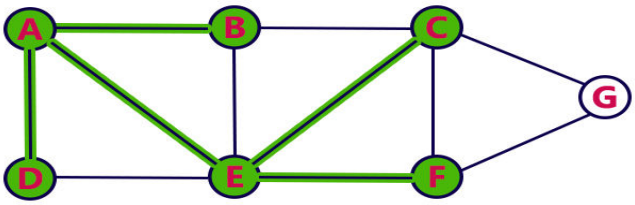


Queue

		E	B			

Step 4:

- Visit all adjacent vertices of **E** which are not visited (**C**, **F**).
- Insert newly visited vertices into the Queue and delete E from the Queue.



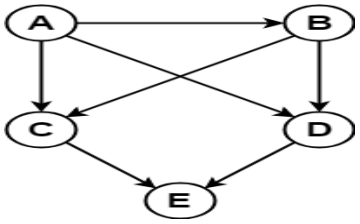
Queue

			B	C	F	

D. Applications of Topological Sort

- Scheduling jobs from the given dependencies among jobs.
- Instruction Scheduling
- Determining the order of compilation tasks to perform in makefiles.
- Data Serialization

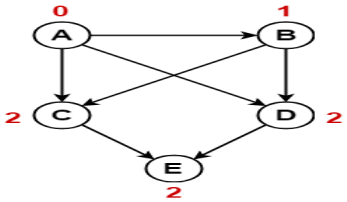
Example: The number of different topological orderings for the graph shown is _____?



Solution:

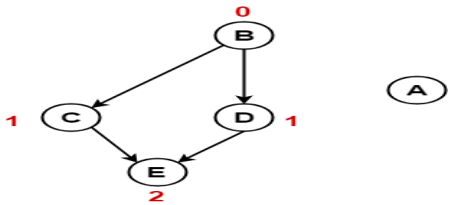
Step-01:

Write in-degree of each vertex-



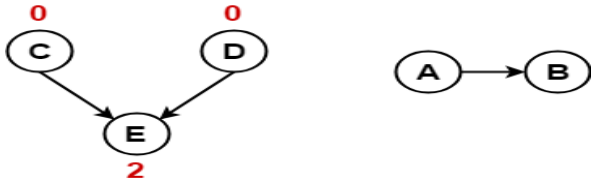
Step-02:

Now, since vertex-A has least in-degree, so remove vertex-A and its associated edges and update in-degree of other vertices.



Step-03:

Now, since vertex-B has least in-degree, so remove vertex-B and its associated edges and update in-degree of other vertices.



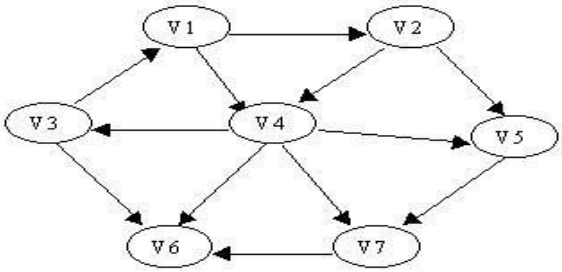
B. Data Structures Needed:

a. A distance table with rows for each vertex **w** and two columns:

1. Distance from source vertex
2. Path - contains the name of the vertex that precedes **w** in the path from **s** to **w**.

b. A queue used to implement breadth-first search. It contains vertices whose distance from the source node has been computed and their adjacent vertices are to be examined.

Example



Adjacency lists:

V1: V2, V4

V2: V4, V5

V3: V1, V6

V4: V3, V5, V6, V7

V5: V7

V6: -

V7:V6

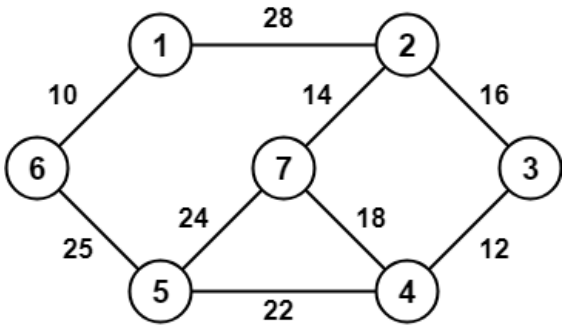
Let s = V3. The distance from V3 to V3 is 0.

Initially the distances to all other nodes are not computed, and we initialize the first column in the distance table for all vertices (except V3) with -1.

V1	-1	-
V2	-1	-
V3	0	-
V4	-1	-
V5	-1	-
V6	-1	-
V7	-1	-

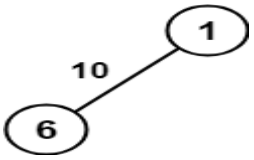
Examples:

1. Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm

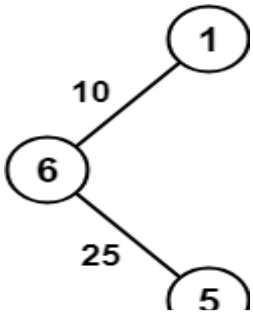


Solution:

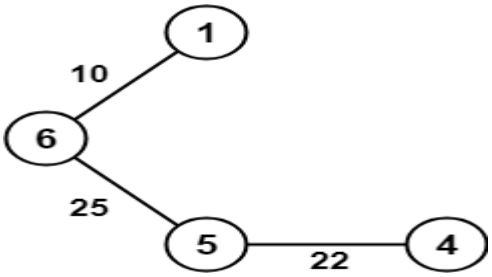
Step-01:



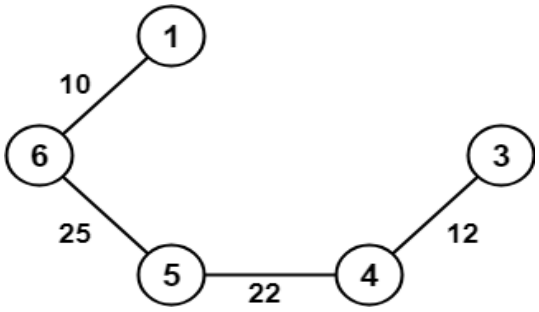
Step-02:



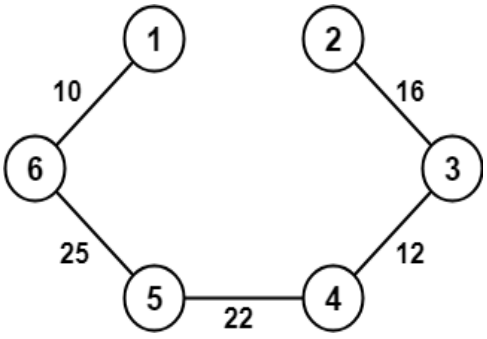
Step-03:



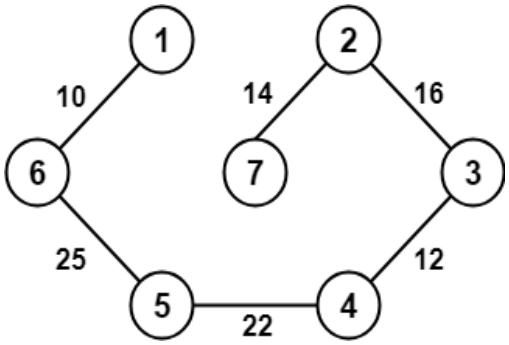
Step-04:



Step-05:



Step-06:



Since all the vertices have been included in the MST,

2.18 Selection Algorithm

Selection algorithm is an algorithm for finding the k th smallest/largest number in a list (also called as k^{th} order statistic). This includes finding the minimum, maximum, and median elements.

2.19 Selection by Sorting

- A selection problem can be converted to a sorting problem.
- In this method, we first sort the input elements and then get the desired element.
- It is efficient if we want to perform many selections. For example, let us say we want to get the minimum element.
- After sorting the input elements we can simply return the first element (assuming the array is sorted in ascending order).
- Now, if we want to find the second smallest element, we can simply return the second element from the sorted list. That means, for the second smallest element we are not performing the sorting again.
- The same is also the case with subsequent queries.
- Even if we want to get k th smallest element, just one scan of the sorted list is enough to find the element (or we can return the k th -indexed value if the elements are in the array).
- From the above discussion it can be stated that, with the initial sorting it can answer any query in one scan, O(n).
- In general, this method requires O(nlogn) time (for sorting), where n is the length of the input list.
- Suppose we are performing n queries, then the average cost per operation is just $\frac{n\,logn}{n} \approx O(logn)$.
- This kind of analysis is called Amortized Analysis.

2.20 Partition-Based Selection Algorithm

- Linear performance can be achieved by a partition-based selection algorithm, most basically quickselect.

- The difference between dynamic programming and recursion is in the memorization of recursive calls.
- When sub problems are independent and if there is no repetition, memorization does not help, hence dynamic programming is not a solution for allproblems.
- By using memorization [maintaining table of sub problems already solved], dynamic programming reduces the complexity from exponential to polynomial.

C. The Greedy Algorithm

- Greedy algorithms work in stages. In each stage, a decision is made that is good at that point, without bothering about the future consequences.
- Generally, this means that some local best is chosen.
- It assumes that the local best selection also makes for the global optimal solution.

D. Linear Programming

- In linear programming, there are inequalities in terms of inputs and maximizing (or minimizing) some linear function of the inputs.
- Many problems (example: maximum flow for directed graphs) can be discussed Using linear programming.

Other Classifications

A. Classification By Research Area

In computer science each field has its own problems and needs efficient algorithms. Examples: search algorithms, sorting algorithms, merge algorithms, numerical algorithms, graph algorithms, string algorithms, geometric algorithms, combinatorial algorithms, machine learning, cryptography, parallel algorithms,data compression algorithms, parsing techniques ,and more.

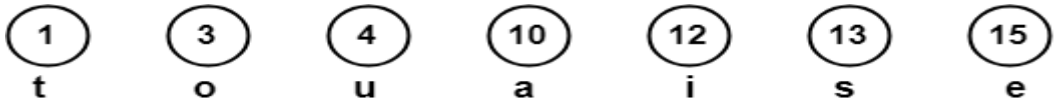
B. Classification By Complexity

- In this classification, algorithms are classified by the time they take to find a solution based on their input size.
- Some algorithms take linear time complexity (O (n)) and others take exponential time, and some never halt.

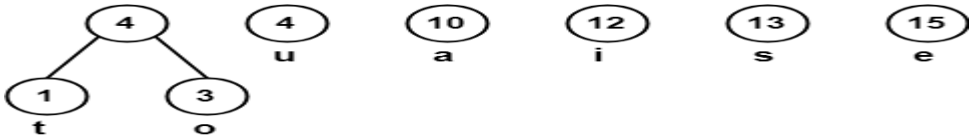
Solution:

First let us construct the Huffman tree using the steps we have learnt above-

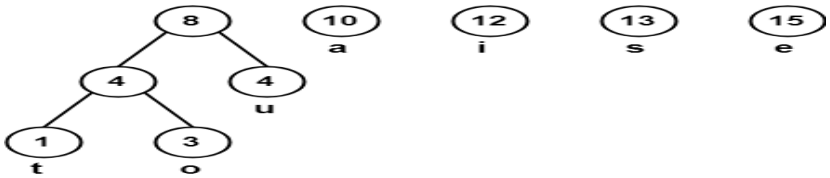
Step-01:



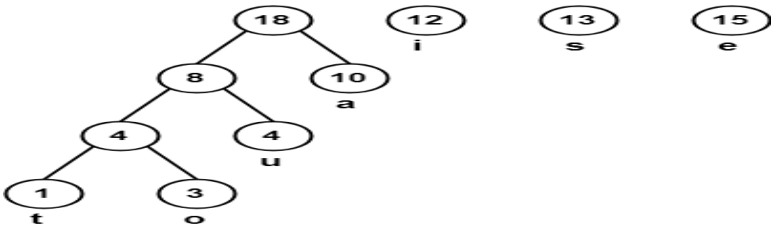
Step-02:



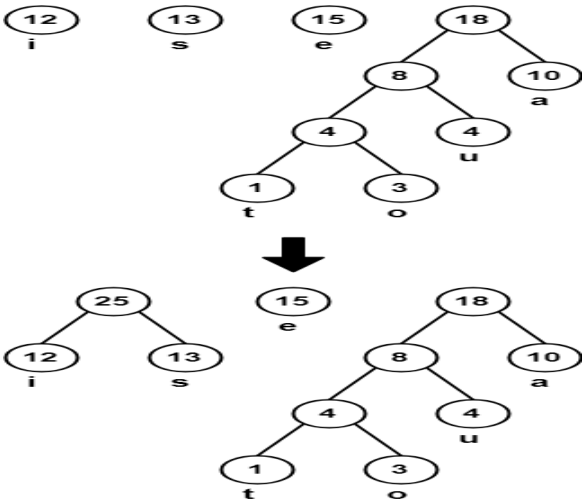
Step-03:



Step-04:



Step-05:



3.13 Master Theorem

Theorem: If $f(n) \in \Theta(n^d)$ with $d \geq 0$ in recurrence equation

$$T(n) = aT(n/b) + f(n),$$

then

$$T(n) = \begin{cases} \Theta(n^d) & \text{if } a < b^d \\ \Theta(n^d \log n) & \text{if } a = b^d \\ \Theta(n^{\log_b a}) & \text{if } a > b^d \end{cases}$$

Example:

Let $T(n) = 2T(n/2) + 1$, solve using master theorem.

Solution:

Here: $a = 2$
$b = 2$
$f(n) = \Theta(1)$
$d = 0$

Therefore:

$a > b^d$ i.e., $2 > 2^0$

Case 3 of master theorem holds good. Therefore:

$T(n) \in \Theta(n^{\log_b a})$
$\in \Theta(n^{\log_2 2})$
$\in \Theta(n)$

3.14 Dynamic Programming

Strategy of Dynamic Programming:

- Dynamic programming and memoization work together.
- The main difference between dynamic programming and divide and conquer is that in the case of the latter, sub problems are independent, whereas in DP there can be an overlap of sub problems.
- By using memoization [maintaining a table of sub problems already solved], dynamic programming reduces the exponential complexity to polynomial complexity(O(n2), O(n3),etc.) for many problems.

The major components of DP are:

- Recursion: Solves sub problems recursively.
- Memoization: Stores already computed values in table (Memoization means caching).

Thus ,

Dynamic Programming = Recursion + Memoization

Q) Find the optimal solution for the 0/1 knapsack problem making use of dynamic programming approach. Consider n = 4,w = 5 kg, (w1, w2, w3, w4) = (2, 3, 4, 5), (b1, b2, b3, b4) = (3, 4, 5, 6)

OR

Q) A thief enters a house for robbing it. He can carry a maximal weight of 5 kg into his bag. There are 4 items in the house with the following weights and values.

What items should thief take if he either takes the item completely or leaves it completely?

Item	Weight (kg)	Value ($)
Mirror	2	3
Silver nugget	3	4
Painting	4	5
Vase	5	6

Solution:

Given-

- Knapsack capacity (w) = 5 kg
- Number of items (n) = 4

Step-01:

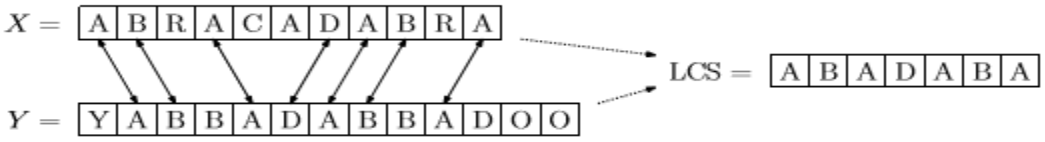
- Draw a table say 'T' with (n+1) = 4 + 1 = 5 number of rows and (w+1) = 5 + 1 = 6 number of columns.
- Fill all the boxes of 0^{th} row and 0^{th} column with 0.

	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0					
2	0					
3	0					
4	0					

T-Table

Step-02:

Start filling the table row wise top to bottom from left to right using the formula-



Longest Common Subsequence(LCS): ABADABA , Length: 7

Various Solution to Longest Common Subsequence

A. Brute Force Approach

- One simple idea is to check every subsequence of X[1.. m](m is the length of sequence X) to see if it is also a subsequence of Y[1..n] (n is the length of sequence Y).
- Checking takes O(n) time, and there are 2^m subsequences of X.
- The running time thus is exponential O(n. 2^m) and is not good for large sequences.

B. Recursive Solution

Below is simple observations about the LCS problem.

- If we have two strings, say "ABCBDAB" and "BDCABA", and if we draw lines from the letters in the first string to the corresponding letters in the second, no two lines cross:

- From the above observation, we can see that the current characters of X and Y may or may not match. That means, suppose that the two first characters differ. Then it is not possible for both of them to be part of a common subsequence -one or the other (or maybe both) will have to be removed.
- Finally, observe that once we have decided what to do with the first characters of the strings, the remaining sub problem is again a LCS problem, on two shorter strings. Therefore we can solve it recursively.
- The solution to LCS should find two sequences in X and Y and let us say the starting index of sequence in X is i and the starting index of sequence in Y is j.