3.3.2 Number of research papers in the Journals notified on UGC website during the last five years

Sr. No.	File Description	Page No.
1	List of Faculty	2
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3.3.2 **Number of research papers in the Journals notified on UGC website during the last five years**

Sr. No.	Activity Name
1	List of Teaching Faculty

THADOMAL SHAHANI ENGINEERING COLLEGE

TEACHING FACULTY DETAILS (A.Y 2020-21)

Sr. No	Faculty Name	Designation	Department
1	Dr. G.T. Thampi	Professor & Principal	Information Technology
2	Dr. Madhuri Rao	Professor	Information Technology
3	Ms. Archana Kale	Associate Professor	Information Technology
4	Dr. Arun Kulkarni	Associate Professor	Information Technology
5	Ms. Anjali Malviya	Associate Professor	Information Technology
6	Ms. Sampada S.Pinge	Associate Professor	Information Technology
7	Dr. Shanthi Therese	Assistant Professor	Information Technology
8	Dr. Gopal Pardesi	Associate Professor	Information Technology
9	Dr. Mukesh Israni	Assistant Professor	Information Technology
10	Ms. Kumkum Saxena	Assistant Professor	Information Technology
11	Ms. Geeta Karande	Assistant Professor	Information Technology
12	Ms. Nagveni Hebbar	Assistant Professor	Information Technology
13	Mr. Chetan Agarwal	Assistant Professor	Information Technology
14	Ms. Reshma Malik	Assistant Professor	Information Technology
15	Mr. Sanjay K.Pandey	Assistant Professor	Information Technology
16	Ms. Sunita D. Rathod	Assistant Professor	Information Technology
17	Mr. Nikhilesh Joshi	Assistant Professor	Information Technology
18	Dr. Shachi Natu	Assistant Professor	Information Technology
19	Dr. Bhushan Jadhav	Assistant Professor	Information Technology
20	Ms. Sanober Shaikh	Assistant Professor	Information Technology
21	Ms. Himani Deshpande	Assistant Professor	Information Technology
22	Ms. Monica Tolani	Assistant Professor	Information Technology
23	Ms.Vijal Jain	Assistant Professor	Information Technology

24	Dr. Darshan Ingle	Assistant Professor	Information Technology
25	Dr. Tanuja Sarode	Professor	Computer Engineering
26	Dr. Archana Patankar	Professor	Computer Engineering
27	Dr. Jayant Gadge	Associate Professor	Computer Engineering
28	Dr. Shilpa Verma	Associate Professor	Computer Engineering
29	Dr. Anil Chhangani	Associate Professor	Computer Engineering
30	Dr. Seema Kolkur	Assistant Professor	Computer Engineering
31	Ms. Tasneem Mirza	Assistant Professor	Computer Engineering
32	Ms. Sakshi Surve	Assistant Professor	Computer Engineering
33	Dr. Ujwala Bharambe	Assistant Professor	Computer Engineering
34	Ms. Anagha Durugkar	Assistant Professor	Computer Engineering
35	Ms. Sonal Shroff	Assistant Professor	Computer Engineering
36	Ms. Vaishali Suryawanshi	Assistant Professor	Computer Engineering
37	Ms. Ruhi Bajaj	Assistant Professor	Computer Engineering
38	Ms. Manisha Dumbre	Assistant Professor	Computer Engineering
39	Ms. Rupali Patil	Assistant Professor	Computer Engineering
40	Ms. Vijaya Padmadas	Assistant professor	Computer Engineering
41	Dr. Arti Deshpande	Assistant Professor	Computer Engineering
42	Ms. Urvi Kore	Assistant Professsor	Computer Engineering
43	Mr. Aejazul Khan	Assistant Professor	Computer Engineering
44	Ms. Nabanita Mandal	Assistant Professor	Computer Engineering
45	Ms. Darakhshan Khan	Assistant Professor	Computer Engineering
46	Ms. Juhi Ganwani	Assistant Professor	Computer Engineering
47	Mr. Vaibhav Ambhire	Assistant Professor	Computer Engineering
48	Ms. Shilpa Ingoley	Assistant Professor	Computer Engineering
49	Dr. Ashwini Kunte	Professor	Electronics & Telecommuniation

50	Dr. M. Mani Roja	Professor	Electronics & Telecommuniation
51	Ms. K. Anuradha Rao	Associate Professor	Electronics & Telecommuniation
52	Mr. K.Y. Rajput	Associate Professor	Electronics & Telecommuniation
53	Mr. K.K.Mathew	Associate Professor	Electronics & Telecommuniation
54	Ms. Anushree Gupta	Associate Professor	Electronics & Telecommuniation
55	Ms. Shrishti Bhatia	Assistant Professor	Electronics & Telecommuniation
56	Ms. Neeru Pathak	Assistant Professor	Electronics & Telecommuniation
57	Ms. Uttara Bhatt	Assistant Professor	Electronics & Telecommuniation
58	Ms. Jyoti Kashyap	Assistant Professor	Electronics & Telecommuniation
59	Mr. Amit Hatekar	Assistant Professor	Electronics & Telecommuniation
60	Ms. Sharmila Barve	Assistant Professor	Electronics & Telecommuniation
61	Mr. Manoj Kavedia	Assistant Professor	Electronics & Telecommuniation
62	Mr.Deepak Pawar	Assistant Professor	Electronics & Telecommuniation
63	Dr. Mita Bhowmick	Professor	Biomedical Engineering
64	Mrs. Bharati Jayesh Ingale	Assistant Professor	Biomedical Engineering
65	Mr.Dhananjay Kishore Theckedath	Assistant Professor	Biomedical Engineering
66	Dr. Gauri Mandar Shukla	Assistant Professor	Biomedical Engineering
67	Mrs. Anuradha Bharat Mistry	Assistant Professor	Biomedical Engineering
68	Mr.Rithesh Kini	Assistant Professor	Biomedical Engineering
69	Mr. Tanvir Munir Daphedar	Assistant Professor	Biomedical Engineering
70	Dr. Anita Kumari	Professor	Chemical Engineering
71	Dr. Sadhana Purohit	Professor	Chemical Engineering
72	Dr. Rajkumar Pathak	Professor	Chemical Engineering
73	Mrs. Nita Mehta	Associate Professor	Chemical Engineering
74	Mrs. Usha Nambiar	Associate Professor	Chemical Engineering
75	Dr. Elizabeth Joseph	Associate Professor	Chemical Engineering

76	Dr. Ramesh Bhande	Associate Professor	Chemical Engineering
77	Mr. Prasad Parulekar	Assistant Professor	Chemical Engineering
78	Mr. Ravindra Joshi	Assistant Professor	Chemical Engineering
79	Mrs. Sangita Gaikwad	Assistant Professor	Chemical Engineering
80	Dr. Trupti Dharmarao	Assistant Professor	Chemical Engineering
81	Mrs. Mannat Khanwani	Assistant Professor	Chemical Engineering
82	Dr. Nitin Pereira	Assistant Professor	Biotechnology
83	Mrs. Praseeda Nambisan	Assistant Professor	Biotechnology
84	Dr. Kajali Sharma	Associate Professor	First Year-Humanities
85	Dr.Chumki Biswas	Assistant Professor	First Year-Humanities
86	Dr.Rita Sharma	Assistant Professor	First Year-Humanities
87	Mr.Mahesh Rao	Associate Professor	First Year-Mechanics
88	Dr.Umesh Kulal	Associate Professor	First Year-Mechanics
89	Ms.Mudita Dixit	Assistant Professor	First Year-Mechanics
90	Mr.Sachit Nalaskar	Assistant Professor	First Year-Mechanics
91	Mr.Kiran Ghadyalji	Assistant Professor	First Year-Mechanics
92	Mr.Iqbal Hussain	Assistant Professor	First Year-Mechanics
93	Mr.Vinit Zaba Rane	Assistant Professor	First Year-Mechanics
94	Mr.Chandrashekhar Kulkarni	Associate Professor	First Year-Physics
95	Dr.Kumkum Sanyal	Assistant Professor	First Year-Physics
96	Dr.Anupama Sawant	Assistant Professor	First Year-Chemistry
97	Ms. Anjali Kirkire	Assistant Professor	First Year-Chemistry
98	Ms.Vandana Kadam	Assistant Professor	First Year-Chemistry
99	Dr.Mansha Kotwani	Assistant Professor	First Year-Mathematics
100	Mr.Saket Kumar	Assistant Professor	First Year-Mathematics

101	Dr.Poonam Soni	Assistant Professor	First Year-Mathematics
102	Mr.Gaurav Mittal	Assistant Professor	First Year-Mathematics
103	Mr. Indrajit Sircar	Assistant Professor	First Year-Mathematics
104	Mr.Sunil Gidwani	TPO & Associate Professor	TPO
105	Dr. Tushar Parulekar	Assistant Professor	First Year-Mathematics
106	Mr. Arvind Mishra	Assistant Professor	First Year-Mathematics
107	Ms.Sheetal Gondal	Assistant Professor	Information Technology
108	Ms.Poonam Jadhav	Assistant Professor	Computer Engineering
109	Ms. Parul Jain	Assistant Professor	Computer Engineering
110	Ms. Reshma VK	Assistant Professor	Biotechnology
111	Ms. Sruthi Menon	Assistant Professor	Biotechnology
112	Dr. Abha Jha	Assistant Professor	First Year-Humanities
113	Ms. Anchu Pillai	Assistant Professor	Electronics & Telecommuniation
114	Mr. D.D. Mulajkar	Assistant Professor	First Year-Physics
115	Ms. Meenu Bhatia	Assistant Professor	Artificial Intelligence & Data Sceince

3.3.2 Number of research papers in the Journals notified on UGC website during the last five years

Sr. No	Activity Name
1	Auto & Auto Component Industry in India-A Study Paper by G.T .Thampi
2	a) Effect of Temperature on Biodiesel Synthesis – An Experimental Study Paper by Ramesh Bhande b) Synthesis Silver Nano Particles From Azadirachta Indica Leaves

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Paper by Author – Dr G.T. Thampi

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PRINCIPAL
S.I.E.S. (NERUL) COLLEGE OF
ARTS, SCIENCE & COMMERCE

Dr. G. T. Thampi
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Bandra (W), Mumbai - 400 050.

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∽ CONTENTS OF PART - II ∾

Paper by Author Ramesh Bhande

Effect of Temperature on Biodiesel Synthesis – An Experimental Study

Subhash S Kadlag Ramesh S Bhande

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Abstract - The increasing awareness of the depletion of fossil fuel resources and the environmental benefits of biodiesel fuel has made it more attractive in recent times. The cost of biodiesel, however, is the major hurdle to its commercialization in comparison to petroleum-based diesel fuel. These finite reserves are highly concentrated in certain region of the world. Therefore, those countries not having these resources are facing a foreign exchange crisis, mainly due to the import of crude petroleum oil. In this perspective, considerable attention has been given towards the production of biodiesel as a diesel substitute that is produced from vegetables oils and animal fats. It consists of the monoalkyl esters formed by a catalyzed reaction of the triglycerides in the oil or fat with a simple monohydric alcohol. The reaction conditions generally involve a trade-off between reaction time and temperature as reaction completeness is the most crucial fuel quality parameter. The effect of temperature on various parameters has been studied for the production of Biodiesel. Much of the process complexity originates from contaminants in the feedstock's, such as methanol, free glycerol, and soap processes have been developed to produce biodiesel from high free fatty acid (FFA) feedstock's, such as recycled restaurant grease, animal fats, and soap stock.

Index Terms –Biodiesel, acid value, yield, catalyst, FFA

I. INTRODUCTION

Biodiesel is an alternative to petroleum-based diesel fuel made from renewable resources such as vegetable oils, animal fats,waste cooking oil or algae. It has very similar combustion properties to petroleum diesel, and can replace it in current uses. However, it is most often used as an additive to petroleum diesel, improving the low lubricity of pure ultra-low sulfur petro diesel fuel. It is one of the most realistic candidates to replace fossil fuels as the world's primary transportation energy source, because it is a renewable fuel that can replace petro diesel in current engines and can be transported and sold using today's infrastructure. A growing number of fuel stations are making biodiesel available to consumers, and a growing number of large transportation fleets use some proportion of biodiesel in their fuel.Efforts are under way in many countries, including India, to search for suitable alternative diesel fuels that are environment friendly.

Among the different possible sources, diesel fuels derived from triglycerides (vegetable oils/animal fats) present a promising alternative to substitute diesel fuels. Although triglycerides can fuel diesel engines, their high viscosities, low volatilities and poor cold flow properties have led to the investigation of various derivatives.

Fangrui et. al. have studied biodiesel, glycerol are derived through transesterification process. Experimental investigations have been carried out to examine properties, performance and emissions of different blends (B10, B20, B100 and B40)[1]. Some researchers reported the basic information regarding to the design of batch reactor, baffles, agitator, etc. the agitator section procedure, design parameters, design condition required for production in batch volume reactor describe very well[2].

Fatty Acid Methyl Esters, known as Biodiesel, derived from triglycerides by transesterification with methanol have received the most attention.Biodiesel production is a very modern and technological area for researchers due to the relevance that it is winning every day because of the increase in the petroleum price and the environmental advantages. Kim et al. studied the kinetics of transesterification of oil. Transesterification of oil with alcohol is estimated [3].Meher et.al studied the biodiesel production by transesterification for center for rural Development and technology [4].

It is an alternative fuel for diesel engines that is produced by chemical reaction of a vegetable oils or animal fats with an alcohol such as methanol. The product is called as Biodiesel or methyl ester, which is receiving high attention as an alternative, nontoxic, biodegradable and renewable diesel fuels. When methyl ester displaces petroleum diesel, it reduces global warming gas emission such as carbon dioxide. Biodiesel has no 6 aromatic, almost no sulphur and contains 11% oxygen by weight. These characteristics of Biodiesel reduce the emissions of carbon monoxide; hydrocarbon and particulate matter in the exhaust gas compare petroleum-based diesel fuels.The Jatropha plant bears fruits from 2nd year of its plantation & the economic yield stabilizes from 4th/5th year onwards. The plant has an average life with effective yield up to 50 years. Fangruiet. al. explains the effect of moisture,

Sythesis Silver Nano Particles From Azadirachta Indica Leaves

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Abstract — Green synthesis of nanoparticles is a novel way to synthesis nanoparticles by using biological sources. It is gaining attention due to its cost effective, eco-friendly and large scale production possibilities. In this present study Azadirachta indica was taken to investigate their potential for synthesizing silver nanoparticles. The silver nanoparticles synthesized were confirmed by change of colour to dark brown due to the phenomenon of surface plasmon resonance. The characterization studied was done by Scanning electron microscopy (SEM), Fourier Transmission infrared spectroscopy (FTIR). All the plants synthesized silver nanoparticles show good antimicrobial activity against clinically important pathogens Staphylococcus aureus, Klebsiella pneumoniae, Vibrio cholera and Escherichia coli.

Keywords — Green synthesis, SEM, FTIR

I. INTRODUCTION

In recent days nanotechnology has induced great scientific advancement in the field of research and technology. Nanotechnology is the application of science and technology to control matter at the molecular level. At the nanoscale level, the properties of matter are significantly different from their macroscopic bulk properties. Nanotechnology is also referred to the ability for designing, characterization, production and application of structures, devices and systems by controlling shape and size at the nanometer scale. Nanotechnology is the study and application of small object which can be used across all fields such as chemistry, biology, physics, material science and engineering. [1]

However, there is still need for economic commercially viable as well as environmentally clean synthesis route to synthesize the silver nanoparticles. Silver is well known for possessing an inhibitory effect toward many bacterial strains and microorganisms commonly present in medical and industrial processes. In medicines, silver and silver nanoparticles have a ample application including skin ointments and creams containing Silver to prevent infection of burns and open wounds, medical devices and implants prepared with silver-impregnated polymers. In textile industry, silver-embedded fabrics are now used in sporting equipment[6]. Nanoparticles can be synthesized using various approaches including chemical, physical, and biological. Although chemical method of synthesis requires short period of time for synthesis of large quantity of nanoparticles, this method requires capping agents for size stabilization of the nanoparticles.

II. MATERIALS AND METHODS

A. MATERIAL

Plant Sample of Azadirachta indica leaves, chemical regent such as Silver Nitrate (AgNO₃), Nutrient agar, Nutrient broth.

B. CHARATERIZATION TECHNIQUES i. Fourier Transmission Infrared Spectroscopy (FTIR):

FTIR is chemical analytical method which measures infrared intensity v/s wavelength or wave number of light. FTIR spectroscopy detects the vibration characterstics of chemical functional groups[4]. The silver nanoparticle synthesis FTIR data measures interaction between Ag salts and protein molecule. The characterizations of functional groups on the surface of AgNPs by plant extracts were invested[1].

ii. SEM Analysis:

Scanning electron microscope (SEM) analysis the employed to characterization of size, shape & morphologies of formed nanoparticles also gives high resolution images of the surface of a sample. The SEM works as same principle as an optical microscope, but it measures the electrons scattered from the sample rather than photons.The Morphological characterization of the samples was done using SEM analysis[4].

III. SYNTHESIS OF SILVER NANOPARTICLES

The following procedure is adpoed for preparation of plant extract. Initially healthy plant samples were collected from the locality of Ratnagiri, India and were cleaned properly in tap water. The samples were shade dried and homogenised to fine powder using a motor. 25 gram of powder is taken and mixed into the 100 ml of distilled water. Were the mixture boiled in a 500 ml Erlenmeyer flask were temperature is maintained 90°C up to 15 to 20 min. The solution was then kept at room temperature to cool down. The plant extract was then filtered out by using vacuum filtration[5].

Research Article

USE OF MEMBRANES IN PURIFICATION OF WATER

Ms. Radhika Bhadbhade, Mr. Aryan Musale and Dr. Ramesh Bhande

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ARTICLE INFO	ABSTRACT
	The threat of environmental contamination looms large on the earth today having a major impact on the groundwater resources. It no longer remains an individual or national concern, but is now a global problem, to be addressed internationally. Currently, the annual availability of fresh water is 1123 Billion Cubic Meters in India and the demand is around 750 Billion Cubic Meters. However, by 2050 the annual demand for water will be 1180 Billion Cubic Meters which will exceed the fresh water availability. The development of original technologies and studies have been accelerated to satisfy the water demands of the world. As an immediate measure, establishment of emission norms on bans of potentially harmful chemicals in industries and discharge of wastes only after proper treatment has been imposed. The current state of water filtration technology needs to be ameliorated in order to provide access to sufficient clean water. Scientific innovations corroborate the development of conventionally used membranes of variegated properties, materials in glorifying this process of filtration. The elementary postulation for the membranes is to limit the entry of particles through diverse sizes of pores in order to acquire purest form of water which has been studied in thorough detail in this review study. These are the heart and soul of effluent treatment plants in the industry. The present spotlight on water treatment has divulged the perks of use membrane technology in efficiently providing immaculate water.

INTRODUCTION

Water scarcity and availability of fresh water has produced a scathingly alarming situation across the globe. By 2050, at least 1 in 4 people will likely live in a country affected by chronic or recurring fresh-water shortages. Furthermore, by 2025, it is estimated that water-scarce countries will increase by more than 30% compared to 1995 and 653 million people in 2025 and subsequently, 2.43 billion in 2050 will suffer direct water shortages as stated by a report from the World Meteorological Organization (WMO) report. This whopping increase in the demand is due to the frivolity of the masses and has in-turn cumulated with rapid urbanization, population growth and climate disruption.

Our planet earth, on the flip side doesn't have "actual" water scarcity. The copious amount of water in the oceans and fresh water reservoirs has been substantially efficient in serving the needs. But nonetheless, the pivotal reason is the discharge of highly impure water by the industries in these fresh water resources. Besides being a Trojan to the water quality, it's also fatally captious to the marine life of utmost importance to the ecosystem. Hence in order to depreciate these causes in an economical manner, membranes were introduced. The detritus water before getting acquitted into these water resources gets treated in an Effluent Treatment Plant. The membranes are advantageous while purifying water at higher quality, considerable maintenance, minimize energy costs while operation, catering filtration at distinct levels (ultra, micro, nano filtration, reverse osmosis etc) to name a few. Also, in this separation process, there's no involvement of phase change of the liquid under operation.

This review paper specifically throws light on recent scientific, technological and innovative trends in membrane operations in a plant along with the controlling the size regime in different filtration processes through analysis of domestic and foreign patent information and publication of papers, technical trends and recent trends in the field of science and technology. Membrane fouling and materials used for construction are also stressed upon.

Membrane Operations

Microfiltration

Microfiltration is considered as one of the pre-treatment methods for other processes such as ultrafiltration whereas for a process like granular media filtration, it is a post-treatment method. The most common particle size which is filtered with efficacy in this process is about 1-0.1 μm. It filters

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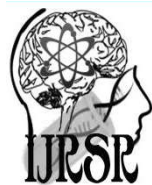
Review Article

ADVANCEMENTS IN SPACE FOOD PROCESSING TECHNOLOGIES

*Sharvari Raut, Sudiksha Hegde, Salil Modak and Dr Ramesh Bhande

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ABSTRACT

Space food is a spectrum of foods specially modified and processed to meet the nutritional requirements of space explorers. It must provide a balanced diet for the astronauts and should be convenient to prepare and handle in a microgravity environment. When it comes to the attributes and the quality of space food, traits like weight, shelf life, energy value, nutrient density play an important role. Gemini and Apollo were the two main periods during which different types of space food were developed. These developments were done by taking the important aspects into consideration like nutrient density, Vitamin density, Shelf life and Optimized packaging. Space scientists continue to expand space research with the motive of sending humans further into space. Such a mission may have many negative consequences on the product .The primary focus for advancement depends upon maintaining the aspects like nutrition, safety, palatability and reliability. Problems faced by the astronauts such as electrolyte imbalance, calcium loss, potassium loss need to be overcome. Although space food technology has improved over the years there is still need for this improvement to be compatible with long duration space missions. This paper summarizes the various aspects of space foods and the current research taking place like 3D food printing, space farming and food palatability research.

INTRODUCTION

When it comes to human space explorations the crucial component of the mission is the availability and requirement of the space food which has a high caliber to fulfill the need of the astronauts.

Space exploration as the term suggests is the utilization of space technology and astronomy to explore outer space. This is usually carried out by both unmanned robotic rovers/space probes and human space flights. The main reasons why these Space missions are usually carried out is:

- To find recent advancements in the field of space technology
- To develop relations between two countries
- To find and predict the possibility of human survival in bodies other than earth.
- To increase national security.

As the space technology has advanced, the duration of manned space flights have also consecutively increased. The main concern has been the preservation of food that would be consumed by the Astronauts. Although in 1960's when NASA successfully sent men to space, space food still wasn't developed as it took years to be perfected.

Space food is produced in such a way that it can sustain in a zero gravity environment. It needs to be light-weight, compact and easy to be consumed. The most important aspect of space food is its shelf life: That it can be preserved for a long amount of time in the same state without being spoiled. The packaging and design of space food also play a very important role as small crumbs of food could float around and prove lethal to the shuttle.

Improvement in space food design is important not only for the consumption of nutrients but also to build morale and improve the productivity of the mission. The food design has improved significantly since the 1960's when John Glenn became the first American astronaut to eat food on board which consisted of applesauce and xylose sugar tablets with water.

Today, food scientists are taking efforts to make the space food experience for astronauts as homely as possible by making continuous upgrades in the existing technologies and also inventing new technologies.

TYPES OF SPACE FOOD

There are eight categories of space food:

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SHORT TERM AND LONG TERM FORECASTING OF CLOUD COMPUTING USING MULTIPLE INDICATORS

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ABSTRACT

In recent times, the cloud computing model is strongly influencing IT world and enterprises. The increasing interest of enterprises, technology developers and Governments in cloud computing creates a need to investigate the potential direction and rate of technological change. This paper presents short term and long term forecasting of cloud computing with the workload, data traffic, revenue and number of service providers as an indicator. Genetic algorithms and particle swarm optimization (PSO) are designed for short term forecasting. The results are compared with double exponential smoothing method. Results of GA and PSO are close to the best but fine tuning is necessary. Cloud adoption curve and industry life cycle are identified using best-fitted growth curve from logistics, gompertz, log logistic and mono molecular. These growth curves are implemented using autoregressive regression that further improved using genetic algorithms. Logistic growth curve is best fitted to all datasets except PaaS providers. The results show that cloud computing technologies show "S shaped" growth pattern for all the selected indicators with very fast growth rate. Cloud computing technologies have crossed the inflection point in between the year 2011 and year 2014 for all selected datasets. Use of multiple methods and multiple indicators validates the growth pattern of cloud computing. Results show that the growth of Software as a Service cloud provider's revenue is very fast as compared to Infrastructure as a Service and Platform as a Service. The growth in the number of platform as a service cloud providers is very slow as compared to infrastructure as a service and software as a service.

Keywords: Cloud computing, technology life cycle, technology forecasting, growth curve, multiple indicators, evolutionary algorithms.

INTRODUCTION

Every product or technology follows a life cycle pattern from introduction to decline. The Product Life Cycle (PLC) concept was developed in the 1950s. Since then, it is important part of marketing theory [19]. One of the important purposes of the PLC concept is to identify the current stage of product in its life cycle pattern and accordingly select the best strategy for sales, cost, profit, competitor etc. [19]. Since the mid 1980's, several authors has noted that technological development follows certain patterns [31]. Life cycle pattern of technology consists of several distinct stages. Generally, the stages are introduction, growth, maturity and decline [5, 14, 24]. Sales, revenue, cost, competitors etc. shows different

Article

Region Filling with Super Resolution Algorithm

June 2021

Authors:

Darakhshan R. Khan

References (11)

Abstract

Region filling which has another name inpainting, is an approach to find the values of missing pixels from data available in the remaining portion of the image. The missing information must be recalculated in a distinctly convincing manner, such that, image look seamless. This research work has built a methodology for completely automating patch priority based region filling process. To reduce the computational time, low resolution image is constructed from input image. Based on texel of an image, patch size is determined. Several low resolution image with missing region filled is generated using region filling algorithm. Pixel information from these low resolution images is consolidated to produce single low resolution region filled image. Finally, super resolution algorithm is applied to enhance the quality of image and regain all specifics of image. This methodology of identifying patch size based on input fed has an advantage over filling algorithms which in true sense automate the process of region filling, to deal with sensitivity in region filling, algorithm different parameter settings are used and functioning with coarse version of image will notably reduce the computational time.

Classification of affect states from facial segments using transfer learning

Dhananjay Theckedath[a,*] and R.R. Sedamkar[b]
[a]*Biomedical Engineering Department, Thadomal Shahani Engineering College, Mumbai, India*
[b]*Computer Engineering Department, Thakur College of Engineering and Technology, Mumbai, India*

Abstract. Affect detection is a key component in developing Intelligent Human Computer Interface (IHCI) systems. State of the art affect detection systems assume the availability of full un-occluded face images. However image occlusion is a prominent problem which one comes across while dealing with such systems. The challenge is to identify affect states from portions of the face that are available. This paper proposes a novel method of assessing only a segment of the face instead of the whole face for affect detection. This paper aims at finding segments of the face which contain sufficient information to correctly classify the basic affect states. This work uses Convolutional Neural Networks (CNN) with transfer learning to detect 7 basic affect states viz. Angry, Contempt, Disgust, Fear, Happy, Sad and Surprise from a few prominent facial segments. Full face images are partitioned into separate segments viz. Right segment, Left segment, Lower segment and Upper segment. Modified VGG-16 and ResNet-50 networks were trained using each of the segments. Experiments were conducted using these facial segments and results obtained were compared with that of the full face. Using the VGG-16 network, we have been able to achieve validation accuracies of 96.8% for Full face, 97.3% for Right segment of the face, 97.3% for Left segment of the face, 96.6% for Lower segment of the face and 84.7% for Upper segment of the face. The validation accuracies are higher using the ResNet-50 network. Using the ResNet-50 network we have been able to achieve validation accuracies of 99.7% for Full face, 99.47% for Right segment of the face, 100% for Left segment of the face, 99.6% for Lower segment of the face and 90.8% for Upper segment of the face. Apart from accuracy, the other performance matrices used in this work are Precision, Recall and f1-score. Our evaluation, based on these performance matrices show that the results obtained for Right segment, Left segment and Lower segment of the face using both, VGG-16 as well as ResNet-50 networks, are comparable with that of the Full face. Experiments performed clearly indicate that Right segment, Left segment and Lower segment of the face contain sufficient information about the seven affect states and that CNN with transfer learning can be used to accurately classify them.

Keywords: Convolutional neural network, transfer learning, occlusion, affect states

1. Introduction

Affect describes the experience of feeling or emotion. The expression of emotion is achieved through a complex combination of information produced from the body and the brain. There have been several attempts to quantify the relationship between facial expressions and the mental state of a person. Effective affect analysis hugely depends upon the accurate identi-

fication of facial features. Image occlusion is a prominent problem while dealing with identifying the various affect states. One case where occlusions frequently occur is while capturing facial expressions of students during online learning. Affect detection plays a major part in developing educational interfaces which are capable of responding to the learning needs of students. Occlusions can arise due to posture of sitting, palms on the chin, glasses etc. Automatic expression recognition systems, which are tolerant to partial occlusion remain a challenging task.

A lot of ongoing research is being carried out in the area of Artificial Intelligence (AI) and Deep Learning (DL). AI aims to narrow the communicative gap be-

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Hand Gesture Recognition to Perform System Operations

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Abstract- *Hand gestures have been the mode of communication for humans before we learned to speak and communicate verbally. It is the most convenient form of communication for two individuals to interact with each other without the barrier of language. In this paper, we introduce a more efficient way of utilizing hand gestures for operating systems. The data model uses Deep learning, Convolutional Neural Networks and a dataset from Kaggle with more than 50,000 training and testing images. The program then uses an algorithm to recognise the background, segments the hand gesture and then recognises the gesture. This paper tries to analyse the performance of the program under different backgrounds and the accuracy of the trained model.*

Keywords: Deep Learning, Convolutional Neural Network, Python, PyAutoGUI, Problem-solving, Computer Science

1. INTRODUCTION

From the start of the 21st Century, we all have aspired to control any device with just a movement of our hand or wrist. Our hands have always played an important role in helping us learn and remember. Therefore, Hand Gesture Recognition is a perceptual computing user interface that allows devices to capture and interpret these gestures as commands. These devices can then execute commands based on these unique gestures.

Hand Gesture recognition works by providing real-time data to a computer and discards the need of traditional data input like typing or using a pointer. It only requires a standard input camera that feeds the image into a software running a data model. The data model can recognise meaningful gestures from a list of defined and trained gestures. To train the data model with the data images, Deep Learning with Convolutional Neural Networks has been used. Convolution Neural Networks extracts relevant features by analysing the images and is extremely fast and efficient. We use a data set of size 53,620 images, and therefore Deep learning is used to outperform other learning techniques. Finally, the model uses Adam to optimise our deep learning algorithm.

The primary issue faced in gesture recognition is to find a stable background so that the model can clearly find the Hand. We use an algorithm from OpenCV called accumulated Weighted () to find the running average over a frame sequence. This enables us to find the difference between the backgrounds and foreground so that the latter can be distinctly identified. This paper discusses implemented model of gesture recognition that recognises static gestures only.

2. RELATED WORK

In a model proposed by Shivendra Singh [1] uses Hue, Saturation and Intensity values of skin to detect the hand and pre-processing is applied to remove the non-hand region. The region in the image which represents hand is set to 0 and rest is set to 1. The image is converted to binary image format. City Block Distance transform method is used to detect the centre point of the palm. Finger tips are detected by dividing the image in two vertical halves and scanning each half from top to bottom to find the highest point which are the finger tips. Gesture classifier is then used to classify the gesture which is based on the number of finger tips detected and the angle between fingertips and the palm point. The performance of the proposed work in this paper is highly dependent on the environment where it is trained and tested as it requires a background which does not have HSI values similar to skin.

Simran Shah [2] proposed a model using Convolution Neural Network to classify gesture based on the training data. A CNN model was built with two convolution layers followed by a pooling layer with an output layer of 7 nodes as the model was trained to accurately identify between 7 gestures. The images were pre-processed with two modes Binary mode and SkinMask mode. In binary mode the images were converted to grayscale and Gaussian blur was applied to smoothen the image and remove noise. In SkinMask mode the image is converted to HSV format and HSV range for skin is applied to extract only the region with hand.

A model to recognise American Sign language was proposed by Rutuja J [3]. The CNN classifier takes input image and process it through its convolution layers to extract specific features and then is passed through a fully connected ANN to classify gestures based on the features extracted. It contains two parts, assign language to text converter and a text to Sign language converter.

3. PROPOSED MODEL

This model is can be divided into four sections – pre-processing, data model, real-time running of the model and recognition of the gesture.

A Qualitative Investigation of Existing Learning Organization Prototypes

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Abstract - *Knowledge and specialized expertise learned over the years by companies are essential for growth and change, thereby offering a competitive advantage. As the learning institution develops and reinvents itself in response to the external environment, this experience is preserved and disseminated within the institution. Individual learning is transformed into organizational learning through the use of shared mental models and effective experimentation facilitation. This paper draws together the ideas put forward by numerous researchers on Learning Organizations and attempts to explain their applicability and significance in a globalized environment where the globalization of educated people, access to business knowledge, and continuously evolving technologies define the rules of the game. In an unpredictable, unstable, dynamic, and contradictory world, companies are gearing up to cope with economic instability, contend with internal chaos created by a pool of capital, and continue to thrive in the face of volatility. A learning organization that survives in such circumstances would have a honeycomb system's strength, reflecting performance, allowing for the free flow of knowledge, is lean, and its devoted members are working toward a single shared vision.*

Key Words: Knowledge Management (KM), Learning Organization (LO), competitive advantage, Organizational Learning(OL).

1. INTRODUCTION

As early as 1959, strategists understood human capital's value in driving knowledge management when designing a business growth strategy. They Re-emphasized the connection between organizational capital, organizational learning, and competitive advantage twenty-five years later, in 1984. In the early 1990s and early twentieth century, there was a wave of academic papers and posts. The Learning organization concept started to gel and take shape in the early '90s by examining the dualistic relation between individual and organizational learning and what characteristics constitute a Learning organization.

Peter Senge introduced a systematic Learning Organization model in his book entitled The Fifth Discipline, in which he used -systems Thinking to integrate a Learning Organization's essential characteristics.[1]. Senge offered guidance to help organizations invest in learning, promote collaboration, exchange experiences, adjust to changing situations, and work toward a shared vision. In the last two decades, multiple models inspired by Senge have been proposed, each one adding to the established literature and exploring additional dimensions that makeup learning organizations.

Some previous research has taken a descriptive approach, relying on generalized principles to determine how organizations learn. Some have called for a more prescriptive approach, advising on "how does an organization learn?".

Organizational culture, structure, strategies, leadership, and vision affect successful learning organizations' development by scholars. The dynamic, unpredictable, complex, and ambiguous environment we now live and work in necessitates creativity, performance, and agility through personalized products and services. A leader must find new ways to communicate with their teams, clients, and stakeholders to satisfy this demand by developing external knowledge, reflection on experiences, the stimulation of transformational ideas, and the use of resources and technologies that are rapidly emerging. Levitt and March describe organizational learning as the collective learning of its representatives, proposals, practices, programs, and frameworks.

2. ORGANIZATIONAL LEARNING AND LEARNING ORGANIZATIONS

Organizations do not necessarily react the same way as people do, and they are not limited to collaborative learning between individuals and their stakeholders. However, personal conceptual development happens whether or not an entity is a learning organization is determined by archiving and leveraging at the organizational level. It brings us the new definition that defines a learning organization into a sharper focus. The term "learning" was coined by Tsoukas to describe the process of information transfer from the source domain (individual) to the target domain (organization).[3]

Since individual learning is challenging in itself, researchers warn against using comparisons. Understanding, belief formulation, and mindset are included in the psychological construct of knowledge. Simultaneously, the behavioral dimension examines the impact of learning on progress and the ability to adapt to new environments. So, how else would Organizational Learning and Learning Organizations relate to one another? The procedure and technique by which organizations eventually become learning organizations are known as organizational learning. Thus, it is the mechanism by which a company develops its expertise and management

A New Dictionary Learning Approach Using SVD with Kmeans and its appliance as regularization method for Image Deblurring using Non-Locally Centralized Sparse Representation

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Abstract

Image deblurring is the process to remove blur from image and get back the original image. Basically, it is the inverse problem, but the blurring operator is generally not directly invertible so no direct solution is available. Many approximate solutions are proposed by using different regularization methods. This paper proposed a new dictionary learning method using Kmeans and SVD and used it as regularization method to solve image deblurring inverse problem using non-locally centralized sparse representation. In this method SVD is used to improve quality of dictionary. It is observed that this new method gives better average PSNR for colour as well as gray images while SSIM is same as that of NCSR-PCA technique for gray and colour images. Results are tested for 7 colour and 10 gray images affected by Gaussian blur. This can be used as alternate better method to Non-Locally Centralized Sparse Representation (NCSR).

Keywords

Dictionary Learning; Kmeans, SVD, NCSR, Sparsity; Image deblurring; NCSR-PCA; Regularization

INTRODUCTION

Image deblurring is the process of getting back original image from its blurred version. The observed image can be represented as y = H * x + n, where x is original image, n is noise and H is blurring function [1]. We cannot find x simply as x = H^{-1} y, because H may not be invertible or even if invertible, it is possible that it increases the error. There is no exact reverse function which can achieve this. Means, image deblurring is an ill posed inverse problem [2]. There is no one exact solution applies there are many approximate solutions. The job is finding the most appropriate one. The solutions vary depending on the assumptions made such as prior information or regularization [3]. The solution to above problem can be found by minimizing the error between y and x. Mean square error formula is used to minimize this difference, given as below.

$\|y-Hx\|_2$: it calculates sum of squares.

The second term of formula is regularization term which depends on what is desirable behaviour of x. For example, x is smooth or x is sparse [4]. If we concentrate on x is sparse that means x has few non-zero components then regularization can

be defined as number of non-zero elements (l_0 norm). But l_0 norm is considered as NP hard so l_1 norms are used as regularization term for sparse solutions. Hence the final solution to estimate x from y is to minimize the function

$$\|y-Hx\|_2 + \lambda \|x\|_1$$

Where λ is regularization parameter.

Many methods are developed to solve the above problem in literature the very basic method is Iterated Soft Thresholding Algorithm (ISTA) [5]. Other advance techniques used are Fast Iterative Shrinkage Thresholding algorithm (FISTA) [6] [7], Two step Iterative Shrinkage Thresholding algorithm (TwIST) [8], Total Variation based method [9], etc.

 The proposed method develops a sparse dictionary using Singular Value Decomposition (SVD) [10] and Kmeans [11] which will choose non-zero elements and serve as regularization parameter. Dictionaries can be represented as y=Dx.

Where y is observed image, D is dictionary and x is to be calculated. Quality of restored image depends upon how much sparse representation the dictionary can provide. Various sparsity-based methods in literature are KSVD [11] [12], Learned Simultaneous Sparse Coding (LSSC) [13], and Clustering-based Sparse Representation (CSR) [14], Non-locally Centralized Sparse Representation (NCSR) [1] [3], Clustering-based Denoising with locally learned dictionaries (KLLD) [15] [16], etc. All these methods try to find the sparsest possible solution. So, building good quality dictionary is very important step in image restoration based on sparsity [17] [18] [19]. Here in this paper work is concentrated on improving dictionary quality by using SVD. The most efficient algorithm for image restoration developed in literature is Non-Locally Centralized Sparse Representation (NCSR) [1]. It is combination of almost all methods studied for image restoration. So we use this model for our work. The basic steps of algorithm are summarized below.

The NCSR [1] Algorithm
1) The given image is divided into overlapping patches. Each patch is then sparsely represented.

2) In sparse representation model [11][12][13][17][18][19] original image x is estimated by Φα, Where Φ is over complete dictionary and α has maximum entries zero or close

Drying of Turmeric Rhizomes and Extraction of Curcumin from Turmeric

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Abstract:
Turmeric is widely used in food, textiles and pharmaceuticals. In this work, different methods for drying of turmeric and extraction of curcumin were evaluated. Drying of turmeric rhizomes using Air dryer and Solar conduction dryer was reviewed. The extraction of curcumin with Solvent extraction and Supercritical fluid extraction and Pressurised liquid extraction was studied.
Keywords*: Turmeric; curcumin; drying; extraction.*

I.   Introduction

Turmeric is obtained from the root of the *Curcuma longa* plant which belongs to the ginger family. The most useful part of this plant is the root containing rhizome. The rhizome has a tough brown skin and deep orange flesh. Traditionally, turmeric has been used as a condiment, textile dye and medicinal purposes.

Turmeric is well-known for its antioxidant properties. The antioxidant properties of turmeric can be attributed to Curcumin. Curcumin is the main colouring substance in Curcuma longa and the two related compounds demethoxycurcumin (DMC) and bisdemethoxycurcumin (BDMC), are altogether known as curcuminoids [1]. Along with curcuminoids, turmeric also contains turmerones i.e. ar-turmerones, α-turmerones and β-turmerones which are responsible for the flavour of turmeric[2].

Fig. 1 gives the structures of Curcumin, DMC and BDMC.
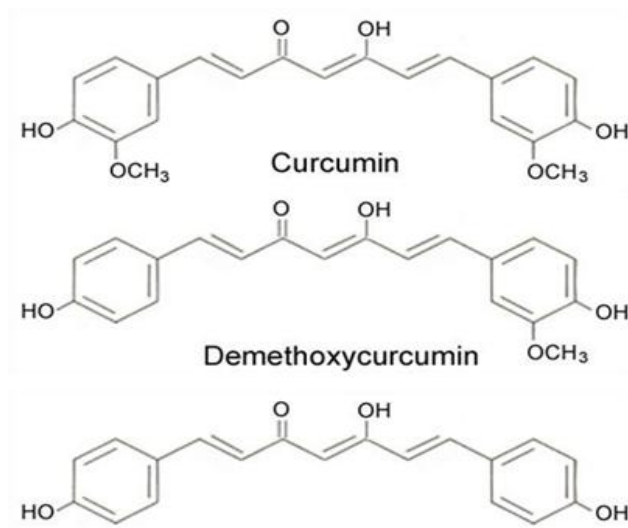
Figure 1: Structure of Curcumin, DMC, BDMC

Curcumin is used as a dietary supplement because of its anti-mutagenic, anti-inflammatory and anti-arthritic properties. It is also used as a food colourant. To meet the ever-increasing demand for curcumin, synthetic curcumin is used. Synthetic curcumin, which is produced from petroleum-based products, is not proved to be as beneficial as natural curcumin.

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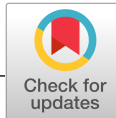
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Kinetics of CO_2 absorption by aqueous mixtures of *N,N′*-diethylethanolamine and polyamines

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Abstract

Aqueous solutions of *N,N′*-diethylethanolamine (DEEA) are prospective high-capacity CO_2-capturing solvents. Their reactivity can be enhanced by promotion with absorption activators. Two polyamines were chosen as activators in this work, viz. (methylamino)propylamine (MAPA) and diethylene triamine (DETA). In a stirred cell reactor, kinetics of CO_2 absorption into aqueous DEEA/MAPA and DEEA/DETA mixtures was studied at 303 K. The molarity of DEEA was varied in the 2–2.5 M range, whereas the polyamine concentration was changed between 0.1 and 0.5 M. Pseudo–first-order rate constants were reported. Second-order rate constants for the CO_2 reactions with MAPA and DETA were determined too. DETA reacts faster than MAPA.

KEYWORDS

carbon dioxide, kinetics, polyamine

1 | INTRODUCTION

Since carbon dioxide (CO_2) is an unwanted and harmful constituent of industrial gases, its effective capture is essential. Absorption, adsorption, and membrane separation processes are some candidate options for CO_2 removal. Today, chemical absorption into aqueous solutions of alkanolamines is the most prevalent CO_2-capturing method in many industries, e.g., coal gasifiers, natural gas processing units, power stations, ammonia and ethylene oxide production plants, etc. Commonly, a closed-loop absorption–desorption cycle is employed. This cycle comprises CO_2 absorption in an amine scrubber, desorption of the CO_2-rich amine in a stripper, and recycle of the lean-regenerated amine to the scrubber. The most popular amines, viz. the primary amine monoethanolamine (MEA) and the secondary amine diethanolamine, are highly reactive; however, they are limited by high regeneration cost and low CO_2 removal capacity (0.5 mol CO_2/mol amine).[1] Therefore, the search for alternative solvents is now focused, among others, on further amines, e.g., tertiary amines. These high-capacity solvents (1 mol CO_2/mol amine) are more easily regenerated than primary and secondary amines. Today, the use of the tertiary amine *N*-methyldiethanolamine (MDEA) is widespread. Typical of tertiary alkanolamines, MDEA has low reactivity with CO_2. Often, the CO_2 reactivity of aqueous solutions of MDEA is improved by adding promoters such as MEA or piperazine (PZ).[2] Apart from the traditional amines, sterically hindered amines, alkaline amino acid salts, and carbonate-bicarbonate buffers are also used for CO_2 removal.

Recently, we contributed to several works[3–8] on a further tertiary amine, *N,N′*-diethyl ethanolamine (DEEA). In this amine, two ethyl groups substitute the hydrogen atoms of the amino group in MEA. Past works on the kinetics of CO_2 absorption by aqueous DEEA solutions were analyzed by Monteiro et al.[9] The reaction between CO_2 and DEEA is of the first order with respect to both CO_2 and DEEA,[4] and thus, second order on the whole (rate constant = 173 M^{-1} s^{-1} at T = 303 K). DEEA is producible from renewable ethanol,[3] reacts faster with CO_2 than MDEA,[4,10] and readily works in tandem with many other amines such as piperazine,[4,6,7] *N*-ethylethanolamine,[3,5] hexamethylene diamine, *N*-(2-aminoethyl)ethanolamine,[7] and ethylene diamine.[8] Especially, the DEEA/PZ blend has superior kinetic and equilibrium features than DEEA,[6,7] because the very

reactive PZ complements the high loading DEEA. Thus, using DEEA together with promoters is encouraging.

In this work, we selected DEEA-based solutions promoted with two new polyamines, (methylamino)propylamine (MAPA) and diethylene triamine (DETA). We investigated the performance of these solvents in a stirred cell reactor and reported rate constants for the chosen solvents at 303 K. Both MAPA ($C_4H_{12}N_2$) and DETA ($C_4H_{13}N_3$) have multiple amine functionalities. Especially, the highly reactive DETA has attracted much interest, and its absorption kinetics,[11,12] mass transfer characteristics,[13] and desorption features[14] are now known. At T = 303 K, DETA reacts with a second-order rate constant equal to 21,480 M^{-1} s^{-1}.[12] DETA is more easily regenerable than MEA.[14] There are a few works on the absorption kinetics of DEEA/MAPA mixtures.[15,16] However, these studies were performed in highly concentrated solutions (molarity of amine > 5 M). Thus far, there is no information on the kinetic aspects at low amine concentrations (2–3 M); besides, the kinetics of the DEEA/DETA system is hitherto unknown. In this work, we are trying to fill this gap.

2 | THEORY

Past reviews have described pathways for the reactions between CO_2 and alkanolamines.[2,17,18] DEEA catalyzes CO_2 hydrolysis in aqueous medium; this is in line with the traits of other tertiary amines:[19]

$$RR'_2N + H_2O + CO_2 \xrightarrow{k_{RR'_2N}} RR'_2N^+H + HCO_3^- \quad (1)$$
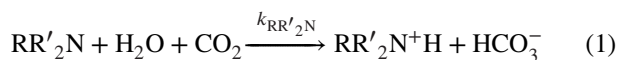
In Equation 1, DEEA is denoted by RR'_2N (such that R = $-CH_2CH_2OH$ and R' = $-C_2H_5$). Besides, the following two reactions also occur in amine/water mixtures:

$$CO_2 + OH^- \xrightarrow{k_{OH^-}} HCO_3^- \quad (2)$$

$$CO_2 + H_2O \xrightarrow{k_{H_2O}} HCO_3^- + H^+ \quad (3)$$
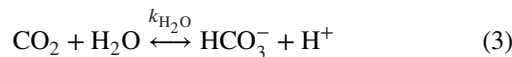
where k_{OH^-} and k_{H_2O} denote the individual reaction rate constants. The strength of OH^- ions in solution determines whether the reaction represented by Equation 2 contributes to the overall rate of reaction. If the pK_a value of amine is high, then the value of the hydroxyl ion concentration (OH^-) is high. At T = 308 K, DEEA has a pK_a value of 9.56.[20] The reaction between CO_2 and H_2O (i.e., Equation 3) does not have any effect on the overall rate.

Both promoters MAPA and DETA (denoted by AmH) react with CO_2 according to the zwitterion mechanism[21,22]:

$$CO_2 + AmH \xrightarrow{k_2, k_{-1}} AmH^+COO^- \quad (4)$$

$$AmH^+COO^- + B \xrightarrow{\hat{k}_B} AmCOO^- + BH^+ \quad (5)$$
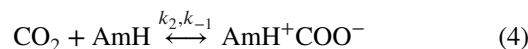
If the steady-state rule is applied to the zwitterion species AmH^+COO^-, it can be shown that the rate of the CO_2-AmH reaction is given by

$$R_{CO_2} = \frac{k_2 (CO_2)(AmH)}{1 + \dfrac{k_{-1}}{\hat{k}_B (B)}} \quad (6)$$

In Equation 6, the kinetic constant $\hat{k}_B(B)$ accounts for deprotonation of the zwitterion either by one single base among H_2O, OH^-, or AmH, or by all of them together.

On the whole, the rates of CO_2 reactions with the DEEA/MAPA and DEEA/DETA blends are denoted by Equations 7 and 8:

$$R_{CO_2} = \frac{k_{2,MAPA}(CO_2)(MAPA)}{1 + \dfrac{k_{-1}}{\hat{k}_{MAPA}(MAPA) + \hat{k}_{DEEA}(DEEA) + \hat{k}_{H_2O}(H_2O) + \hat{k}_{OH^-}(OH^-)}} \\ + k_{DEEA}(CO_2)(DEEA) + k_{H_2O}(CO_2)(H_2O) + k_{OH^-}(CO_2)(OH^-) \quad (7)$$

$$R_{CO_2} = \frac{k_{2,DETA}(CO_2)(DETA)}{1 + \dfrac{k_{-1}}{\hat{k}_{DETA}(DETA) + \hat{k}_{DEEA}(DEEA) + \hat{k}_{H_2O}(H_2O) + \hat{k}_{OH^-}(OH^-)}} \\ + k_{DEEA}(CO_2)(DEEA) + k_{H_2O}(CO_2)(H_2O) + k_{OH^-}(CO_2)(OH^-) \quad (8)$$

From Equations 7 and 8, it can be shown that the value of k_{obs}, i.e. the observed reaction rate constant is represented by

$$k_{obs} = \cfrac{k_{2,MAPA}\,(MAPA)}{1 + \cfrac{k_{-1}}{\hat{k}_{MAPA}\,(MAPA) + \hat{k}_{DEEA}\,(DEEA) + \hat{k}_{H_2O}\,(H_2O) + \hat{k}_{OH^-}\,(OH^-)} + k_{DEEA}\,(DEEA) + k_{H_2O}\,(H_2O) + k_{OH^-}\,(OH^-)} \tag{9}$$

$$k_{obs} = \cfrac{k_{2,DETA}\,(DETA)}{1 + \cfrac{k_{-1}}{\hat{k}_{DETA}\,(DETA) + \hat{k}_{DEEA}\,(DEEA) + \hat{k}_{H_2O}\,(H_2O) + \hat{k}_{OH^-}\,(OH^-)} + k_{DEEA}\,(DEEA) + k_{H_2O}\,(H_2O) + k_{OH^-}\,(OH^-)} \tag{10}$$

3 | EXPERIMENTAL

3.1 | Chemicals

Cylinders containing 99.5% pure CO_2, nitrogen (N_2), and nitrous oxide (N_2O) were purchased from Inox Air Products (Mumbai, India). Spectrochem (Mumbai, India) provided us with 98% pure DEEA. The two promoters DETA (purity 97%) and MAPA (purity 98%) were purchased from S. D. Fine Chemicals (Mumbai, India) and Sigma Aldrich (Bengaluru, India).

3.2 | Experimental methodology

Since the setup and procedure were described in detail in a past work,[12] just a brief narrative is given here: A stirred cell reactor (inner diameter 97 mm, volume 1210 cm^3) was used in the batch mode. It was equipped with a 45° pitched blade turbine impeller (blades 6, impeller size 40 mm). Initially, the reactor was rinsed out with N_2 to ensure a passive atmosphere. Using a vacuum pump, the reactor was then evacuated, and 400 cm^3 of the absorbent was introduced. We changed the molarity of DEEA between 2 and 2.5 M. The polyamine was used in the low concentration range (0.1–0.5 M). The impeller speeds in the gas and liquid were 1000 and 60 rpm. This ensured that mixing in the gas phase was intense, whereas the liquid level was horizontal and undisturbed and the geometric area ($\hat{a}$) was definite. After reaching the chosen temperature (303 K), pure CO_2 was allowed inside and the reactor pressure was recorded for 0.5 min. using a digital indicator (accuracy 1 mbar). The slope of P_{CO_2} versus t curve was found. Knowing val-

ues of V_G and V_L, i.e. volume of gas and liquid phase, the absorption rate was found (error < 3%) using the following relation:

$$R_{CO_2}\,\hat{a} = -\left[\frac{V_G}{V_L\,\hat{R}T}\frac{dP_{CO_2}}{dt}\right] \tag{11}$$

Jiru and co-workers[23] proved that the resistance to mass transfer on the gas side is unimportant when the pressure of inert gas is low and the gas phase is vigorously stirred. Since we used pure CO_2 in all experiments and stirred the gas phase at 1000 rpm, we disregarded the gas side resistance. Furthermore, we found that the impeller speed in the liquid phase did not influence the rate of absorption in the 40–100 rpm range. Thus, the chosen system belonged to the fast reaction regime systems and the fast pseudo–first-order rate constant (k_{obs}) could be determined from the measured rate. In a separate experiment, we investigated the reaction between CO_2 and MEA at 303 K to get the second-order rate constant. We found that $k_{2,MEA} = 7311$ M^{-1} s^{-1} at $T = 303$ K; earlier, Hikita et al.[24] reported a value (7721 M^{-1} s^{-1}) that was not too far. Thus, our experimental technique was upheld.

3.3 | Measurement of transfer coefficient and solution properties

To find k_L, i.e. the liquid side mass transfer coefficient, we used the method of Littel et al.[25] We found a value ($k_L = 0.0033$ cm s^{-1}) that was in the usual range of values reported for stirred cell reactors. In Table 1, we reported the solution density and viscosity; these were measured using densitometer and capillary viscometer. Since CO_2 reacts with amines, it cannot be directly used for measuring diffusivity and solubility in the liquid phase. Another gas, N_2O, has electronic structure, molecular configuration, and molecular volume similar to those of CO_2. Besides, N_2O does not react with

TABLE 1 Physical properties of the aqueous solutions at 303 K

Solvent	Concentration (M)	Density ρ (kg m^{-3})	Viscosity μ (mPa s)	$D_{CO_2} \times 10^9$ (m^2 s^{-1})	$H_{CO_2} \times 10^4$ (M kPa^{-1})
DEEA + MAPA	2 + 0.5	989.3	0.91	2.03	2.43
	2.5 + 0.1	989.2	0.76	2.36	2.62
	2.5 + 0.3	988.3	0.76	2.36	2.54
	2.5 + 0.5	972.3	0.86	2.14	2.19
DEEA + DETA	2 + 0.5	990	0.85	2.15	1.74
	2.5 + 0.1	990	0.85	2.15	1.77
	2.5 + 0.3	987	0.86	2.14	1.75
	2.5 + 0.5	984	0.88	2.10	1.73

amines, unlike CO_2. Therefore, N_2O is an ideal choice for diffusivity and solubility measurements. This is referred to as the N_2O analogy method. The diffusion coefficients (D) of N_2O and CO_2 in water, viz. 2.03×10^{-9} and 2.15×10^{-9} m^2/s at 303 K, were earlier reported by Versteeg and van Swaaij.[26] From our viscosity measurements, the value of N_2O diffusivity in the amine solutions was estimated using the modified Stokes–Einstein relation:

$$\left(D_{N_2O} \mu^{0.8}\right)_{amine} = \left(D_{N_2O} \mu^{0.8}\right)_{water} \quad (12)$$

The diffusivity of CO_2 in amine was then found using the following relation:

$$\left[\frac{D_{CO_2}}{D_{N_2O}}\right]_{water} = \left[\frac{D_{CO_2}}{D_{N_2O}}\right]_{amine} \quad (13)$$

The stirred cell reactor was also used to measure the solubility (H) of N_2O in the amine solutions. From the reported values of solubility of N_2O and CO_2 in water,[26] and from our measurements of N_2O solubility in the amine, the solubility of CO_2 in amine was found as follows:

$$\left[\frac{H_{CO_2}}{H_{N_2O}}\right]_{water} = \left[\frac{H_{CO_2}}{H_{N_2O}}\right]_{amine} \quad (14)$$

The estimated values of CO_2 diffusivity (D_{CO_2}) and solubility (H_{CO_2}) in the amine mixtures are represented in Table 1.

4 | RESULTS AND DISCUSSION

4.1 | Bronsted relation for DEEA

According to Versteeg and van Swaaij,[27] the second-order rate constant $k_{1,1}$ for a tertiary alkanolamine and the dissociation constant K_a observe the Bronsted relation:

$$\ln k_{1,1} = -\frac{8171}{T} + 1.47 pK_a + 9.8 \quad (15)$$

Using the reported pK_a value for DEEA from Rayer et al.[20] and applying Equations 15, the calculated value for $k_{1,1}$ at 303

TABLE 2 CO_2 absorption rates into aqueous solutions of activated DEEA at 303 K

Amine	Concentration (M)	P_{CO_2} (kPa)	$R_{CO_2} \times 10^6$ (kmol m^{-2} s^{-1})
MAPA	0.5	5.6	5.6
DETA	0.5	6.1	6.9
DEEA + MAPA	2.5 + 0.1	11	4.6
	2.5 + 0.3	6	4.8
	2.5 + 0.5	8.2	7
DEEA + DETA	2.5 + 0.1	5	1.6
	2.5 + 0.3	12.8	6.1
	2.5 + 0.5	9.4	8.2

K is 50 M^{-1} s^{-1}. This is much lower than the experimental value reported in our past work,[4] viz. 173 M^{-1} s^{-1} at $T = 303$ K.

4.2 | Comparison of additive performance

At first, no DEEA was used and the absorption rates in aqueous MAPA and DETA solutions (0.5 M) were measured at $T = 303$ K. The results are shown in Table 2. It is evident that DETA reacts faster with CO_2 than MAPA. When 2.5 M DEEA was added to these solutions, the rates were higher and CO_2 absorption process was improved. Next, the effect of promoter concentration was studied. Three additive concentrations were chosen (0.1, 0.3, and 0.5 M). The strength of DEEA was 2.5 M. The positive influence on the rates was most noticeable at the highest additive concentration. The results are shown in Table 2. Clearly, the chosen blends DEEA/MAPA and DEEA/DETA are attractive and merit further investigation.

4.3 | Evaluation of the reactivity of chosen blends

Absorption rates in the selected amine blends were measured at 303 K in the 5–21 kPa CO_2 pressure range. The concentration of the tertiary amine in solution was 2.5 M, whereas the additive concentration was 0.5 M. The results are represented
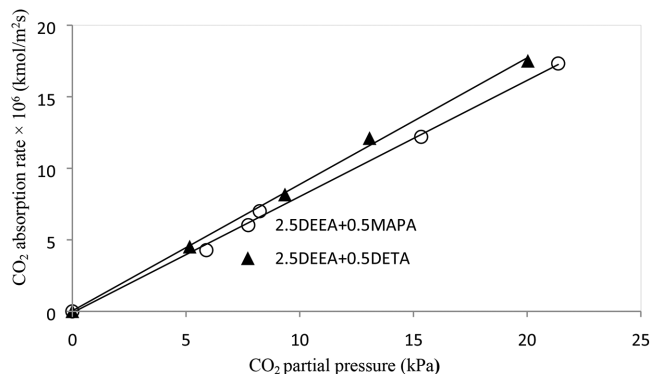
FIGURE 1 Dependence of absorption rates in blends on CO_2 partial pressure at 303 K

in Figure 1. As expected, the rate increased linearly with CO_2 pressure. Also, the rates were higher in the DEEA/DETA blend.

4.4 | Study of reaction kinetics in blends

In aqueous blends, the rate of absorption of CO_2 can be represented as

$$R_{CO_2} = k_L (CO_2) E \qquad (16)$$

Here, (CO_2) and E denote the interfacial concentration of CO_2 and the enhancement factor, which highlights the accelerating effect of chemical reactions on mass transfer. Equations 16 holds when two criteria are met: First, the gas-side mass transfer resistance is absent, and, second, the CO_2 concentration in the bulk liquid is insignificant.[28] If the reaction belongs to the fast pseudo–first-order reaction regime systems, E equals Hatta number (or Ha), defined by

$$Ha^2 = \frac{D_{CO_2} k_{obs}}{k_L^2} \qquad (17)$$

If the reaction system fits in the fast reaction regime, the inequality $10 < Ha \ll (E_i - 1)$ is satisfied. Here, E_i denotes

the enhancement factor for an instantaneous reaction and is represented as[28,29]

$$E_i = 1 + \left[\frac{(Amine)}{z (CO_2)} \frac{D_{amine}}{D_{CO_2}} \right] \qquad (18)$$

where z and D_{amine} denote the stoichiometric coefficient and the diffusivity of amine in liquid. Equations 18 is valid if the film theory of mass transfer across a gas–liquid boundary is applied. From Equations 16 and 17, it follows that

$$R_{CO_2} = (CO_2) \sqrt{D_{CO_2} k_{obs}} \qquad (19)$$

Knowing the values of D_{CO_2} and H_{CO_2}, the values of k_{obs} for the selected blends DEEA/DETA and DEEA/MAPA were found. These values are listed in Table 3. It is clear that the k_{obs} values for the DEEA/DETA blend are greater. For the 2.5 + 0.5 M blend, k_{obs} was equal to 12,108 s^{-1} at $T = 303$ K. The values of Ha and E_i are given in Table 3. The inequality $10 < Ha \ll (E_i - 1)$ is satisfied, thereby confirming that these systems belong to the fast reaction regime.

4.5 | Estimation of rate constants for DETA and MAPA

On the whole, two reactions ensued in parallel: one, between CO_2 and DEEA, and the other, between CO_2 and DETA (or MAPA). If the impact of the CO_2 reactions with OH^- and H_2O to the overall rate is overlooked and it is anticipated that, owing to the high reactivity of DETA and MAPA, zwitterion deprotonation is fast as compared to the reverse reaction between CO_2 and the additive, i.e. $k_{-1} \ll [\hat{k}_{DETA}(DETA) + \hat{k}_{DEEA}(DEEA) + \hat{k}_{H_2O}(H_2O) + \hat{k}_{OH^-}(OH^-)]$ and $k_{-1} \ll [\hat{k}_{MAPA}(MAPA) + \hat{k}_{DEEA}(DEEA) + \hat{k}_{H_2O}(H_2O) + \hat{k}_{OH^-}(OH^-)]$, the fast pseudo–first-order rate constant k_{obs} is given by

$$k_{obs} = k_{2,DETA} (DETA) + k_{DEEA} (DEEA) \qquad (20)$$

$$k_{obs} = k_{2,MAPA} (MAPA) + k_{DEEA} (DEEA) \qquad (21)$$

TABLE 3 Kinetic characteristics of the selected blends at 303 K

Solvent	Concentration. (M)	P_{CO_2} (kPa)	$R_{CO_2} \times 10^6$ (kmol m^{-2} s^{-1})	k_{obs} (s^{-1})	$E = Ha$	E_i
DEEA + MAPA	2 + 0.5	5.2	3.6	3998	59	1983
	2.5 + 0.1	11	4.6	1080	31	903
	2.5 + 0.3	6	4.8	4203	60	1837
	2.5 + 0.5	8.2	7.0	7100	78	1660
DEEA + DETA	2 + 0.5	10.8	7.3	7019	79	1338
	2.5 + 0.1	5	1.6	1520	36	2951
	2.5 + 0.3	12.8	6.1	3465	53	1259
	2.5 + 0.5	9.4	8.2	12,108	102	1860

Equations 19 can be simplified to the following forms:

$$R_{CO_2}$$
$$= P_{CO_2} H_{CO_2} \sqrt{D_{CO_2} \left[k_{2,DETA} (DETA) + k_{DEEA} (DEEA) \right]}$$
(22)

$$R_{CO_2}$$
$$= P_{CO_2} H_{CO_2} \sqrt{D_{CO_2} \left[k_{2,MAPA} (MAPA) + k_{DEEA} (DEEA) \right]}$$
(23)

From Equations 22 and 23, and from the knowledge of k_{DEEA} at 303 K from our past work,[4] viz. 173 M^{-1} s^{-1}, the value of the rate constant for the CO_2–DETA and CO_2–MAPA system at 303 K was evaluated from the absorption rate measurements in blends (2.5/0.5 M) and found to be 23,350 and 13,335 M^{-1} s^{-1}. The rate constant for DETA is closer to that reported by Salvi et al.,[12] who reported a value of 21,480 M^{-1} s^{-1} at T = 303 K. In Equations 20 and 21, the contribution of the tertiary amine–related term to k_{obs} is low (viz. 3.6 and 6.1% for DEEA/DETA and DEEA/MAPA, respectively) due to the low value of k_{DEEA}. Finally, we found that the measured rate in DEEA/DETA (2.5/0.5 M) blend at 303 K (viz. 8.2×10^{-6} kmol m^{-2} s^{-1}) was in good agreement with the rate according to the parallel reactions[4,12] (viz. 7.9×10^{-6} kmol m^{-2} s^{-1}).

4.6 | Some general remarks

Recently, Du Preez et al.[30] used an in situ Fourier-transform infrared method for studying CO_2-MEA reaction kinetics in alcoholic solvent outside the pseudo–first-order conditions. Under these conditions, the assumption that the zwitterion concentration is at steady state is invalid. Therefore, these researchers included the zwitterion concentration in the rate expression. Contrarily, we employed the stirred-cell method here, which necessitates data analysis at pseudo–first-order reaction conditions with respect to CO_2. The stirred cell enables measurements of the absorption rate using a liquid with a single, known composition. However, it is not possible to quantify the concentration of the zwitterion intermediate using this method. Thus, the stationary steady-state hypothesis, which presumes the net reaction rate of the zwitterion as zero, is used to derive the rate expression. Since the amine concentration in the liquid is in much excess in our experiments, it can be assumed to be constant so that the pseudo–steady-state assumption holds.

Finally, the advantage of using the straightforward fall-in-pressure method to determine the kinetic parameters in a stirred cell is evident: in this way, the analysis of the liquid phase and quantification of the concentrations of amines and ionic products can be avoided.

5 | CONCLUSIONS

Polyamines, DETA, and MAPA act as excellent activators when added to tertiary amine DEEA. This study on DEEA/DETA and DEEA/MAPA was conducted in a stirred cell reactor in the pseudo–first-order fast regime. Using 2 and 2.5 M DEEA solutions, the kinetic characteristics were investigated in the activator concentration range of 0.1–0.5 M at 303 K. DETA was found to be more reactive than MAPA. As expected, the observed kinetic constant was found to increase with temperature and activator concentration.

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Implementation of Disease Prediction Chatbot and Report Analyzer using the Concepts of NLP, Machine Learning and OCR

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Abstract - *In recent times, healthcare is becoming more accessible to a wider group of people through the medium of technology. The concepts of artificial intelligence, machine learning and neural networks have provided substantial assistance in the field of healthcare. In today's fast-paced world, people tend to neglect their health which may result in a critical problem. Such a problem can be avoided by using the symptoms driven disease prediction application. Our project focuses on providing the users immediate and accurate prediction of the diseases based on their symptoms along with a detailed analysis of their pathology reports. The disease prediction chatbot is developed using natural language processing and machine learning algorithms. For the prediction of diseases, we have used two classification algorithms namely, Decision tree and KNN (k-nearest neighbors). The performance of these techniques are compared and based on their accuracy, the best model is selected. As per our results, the accuracy of Decision Tree and KNN are 92.6% and 95.74% respectively. This project also looks forward to providing medical consultation on the predicted disease. The pathology report analysis is performed using the concept of Optical Character Recognition (OCR). Tesseract is an open-source recognition engine to perform OCR. The text extracted from the report is used for interpreting the results in an easier way and to provide a graphical analysis of the test results.*

Key Words: Disease Prediction, Machine Learning, Decision tree, K-nearest Neighbors, Natural Language Processing, Chatbot, WordNet, Python, Optical Character Recognition, Tesseract

1. INTRODUCTION

Since the past few decades, humans have been tirelessly working day in and day out that they fail to prioritize their health on a regular basis. In the longer run, this problem leads to jeopardizing the quality of life. Nevertheless, with the aid of Artificial Intelligence, we can now provide health care services to individuals at their convenience at reasonable prices. One of the biggest blessings we possess is a healthy body. A healthy body and enhanced quality of life is something each one of us looks up to. The primary focus of this paper is to provide these services to fulfill the above mentioned purpose. It is difficult to imagine our lives without high tech gadgets because they have become an essential part of our lives. Therefore the field of Artificial Intelligence is prospering due to the various applications of it in the research field. Disease prediction is one of the main goals of the researchers based on the facts of big data analysis which in turn improves the accuracy of risk classification based on the data of a large volume. [1]

E-healthcare facilities in general, are a vital resource to developing countries but are often difficult to establish because of the lack of awareness and development of infrastructure. A number of internet users depend on the internet for clearing their healthcare based queries. We have designed a platform for providing online medical services to patients with a goal to provide assistance to healthcare professionals. The user can also seek medical guidance in an easier way and get exposure to various diseases and diagnosis available for it. In order to make communication more effective, we have implemented a chatbot for disease prediction.

Chatbots are the human version of software that is based on AI and uses Natural language processing (NLP) to interpret and accordingly respond to the user. This study proposes the disease prediction chatbot using the concepts of NLP and machine learning algorithms. The prediction is carried out using KNN and Decision tree algorithms. KNN and Decision tree are a few of the most used classification algorithms that are frequently used in disease prediction. It is assisted with the NLP driven chatbot. [2] The wordnet and tokenization concepts of NLP are used. The use of tokenization is to split the given text into a list of words whereas WordNet is a lexical database of dictionary designed for natural language processing. The study also focuses on the use of the Optical Character Recognition tool named Tesseract which is used to extract text from the patient's scanned pathology report. The generated text helps in translating the report in an easier manner by providing a graphical analysis of the test result.

A Qualitative Investigation of Existing Learning Organization Prototypes

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Abstract - *Knowledge and specialized expertise learned over the years by companies are essential for growth and change, thereby offering a competitive advantage. As the learning institution develops and reinvents itself in response to the external environment, this experience is preserved and disseminated within the institution. Individual learning is transformed into organizational learning through the use of shared mental models and effective experimentation facilitation. This paper draws together the ideas put forward by numerous researchers on Learning Organizations and attempts to explain their applicability and significance in a globalized environment where the globalization of educated people, access to business knowledge, and continuously evolving technologies define the rules of the game. In an unpredictable, unstable, dynamic, and contradictory world, companies are gearing up to cope with economic instability, contend with internal chaos created by a pool of capital, and continue to thrive in the face of volatility. A learning organization that survives in such circumstances would have a honeycomb system's strength, reflecting performance, allowing for the free flow of knowledge, is lean, and its devoted members are working toward a single shared vision.*

Key Words: Knowledge Management (KM), Learning Organization (LO), competitive advantage, Organizational Learning(OL).

1. INTRODUCTION

As early as 1959, strategists understood human capital's value in driving knowledge management when designing a business growth strategy. They Re-emphasized the connection between organizational capital, organizational learning, and competitive advantage twenty-five years later, in 1984. In the early 1990s and early twentieth century, there was a wave of academic papers and posts. The Learning organization concept started to gel and take shape in the early '90s by examining the dualistic relation between individual and organizational learning and what characteristics constitute a Learning organization.

Peter Senge introduced a systematic Learning Organization model in his book entitled The Fifth Discipline, in which he used -systems Thinking to integrate a Learning Organization's essential characteristics.[1]. Senge offered guidance to help organizations invest in learning, promote collaboration, exchange experiences, adjust to changing situations, and work toward a shared vision. In the last two decades, multiple models inspired by Senge have been proposed, each one adding to the established literature and exploring additional dimensions that makeup learning organizations.

Some previous research has taken a descriptive approach, relying on generalized principles to determine how organizations learn. Some have called for a more prescriptive approach, advising on "how does an organization learn?".

Organizational culture, structure, strategies, leadership, and vision affect successful learning organizations' development by scholars. The dynamic, unpredictable, complex, and ambiguous environment we now live and work in necessitates creativity, performance, and agility through personalized products and services. A leader must find new ways to communicate with their teams, clients, and stakeholders to satisfy this demand by developing external knowledge, reflection on experiences, the stimulation of transformational ideas, and the use of resources and technologies that are rapidly emerging. Levitt and March describe organizational learning as the collective learning of its representatives, proposals, practices, programs, and frameworks.

2. ORGANIZATIONAL LEARNING AND LEARNING ORGANIZATIONS

Organizations do not necessarily react the same way as people do, and they are not limited to collaborative learning between individuals and their stakeholders. However, personal conceptual development happens whether or not an entity is a learning organization is determined by archiving and leveraging at the organizational level. It brings us the new definition that defines a learning organization into a sharper focus. The term "learning" was coined by Tsoukas to describe the process of information transfer from the source domain (individual) to the target domain (organization).[3]

Since individual learning is challenging in itself, researchers warn against using comparisons. Understanding, belief formulation, and mindset are included in the psychological construct of knowledge. Simultaneously, the behavioral dimension examines the impact of learning on progress and the ability to adapt to new environments. So, how else would Organizational Learning and Learning Organizations relate to one another? The procedure and technique by which organizations eventually become learning organizations are known as organizational learning. Thus, it is the mechanism by which a company develops its expertise and management

Customer Support Chatbot Leveraging Machine Learning

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Abstract – *Customer support plays an important role in an organization's ability to generate revenue and income. Support staff spend a lot of time answering questions via telephone to make sure that the customers are satisfied with their business. Customer support through telephone is time consuming, exasperating and possibly leaves the customer with unresolved issues. In this paper we introduce more efficient way to resolve customer queries. Today's customers have high expectations and want convenience, quick and accurate responses, complete and robust resolution, service that is available anywhere and anytime. All of these can be addressed with well-designed chatbots. The entire experience is conversational and chat is the most appropriate medium as it is quick and accurate. The aim is to implement a chatbot which can resolve customer queries, search the knowledgebase for resolution and give the solution. The chatbot will handle the queries; ultimately reducing the human effort.*

Key Words: **Rasa framework, Natural Language Processing, Rasa Natural language Understanding (NLU), Rasa Core, Artificial Intelligence, Machine Learning, Flask, Webhooks**

1. INTRODUCTION

Customer support and service is difficult to achieve. Customers buy products online, make payments, has queries related to products as a result they want good customer service for solving their queries. Traditionally, people use telephones to contact to the customer executive. This process is very time consuming as the customers need to wait on the line for a lot of time before their request is processed. The customers get frustrated when they ask the same question again and again, lodge complaints and they don't receive a response for days. Also, the cost of phone interaction between the customer as well as executive is also more. So, to solve this issue we introduce chatbots which is a computer program that we can talk to via text, chat or voice. Using Artificial Intelligence (AI) Powered chatbots, enterprises can be closer to achieving efficient and automated customer service which can lead to better engagement and understanding [1].

A chatbot is a computer program through which you can talk to, through messaging applications. The chatbot replies through the same messaging application, creating a back and forth conversation between the customer and the bot. The chatbot has the ability to respond immediately as they serve as round the clock agent which is available 24/7, 365 days. Chatbots reduces human error as well personalizes the customer service. Chatbots, are a major innovation in the field of AI.

Chatbots are highly responsive, interactive which resembles human conversations using AI tools and techniques and resolves customer queries or needs anytime with the ease of chat. A customer can put a question or query and the chatbot replies with the right response. Based on the situation, the chatbots can learn from the utterances in the conversation and further personalize the responses and learn from the past connections [1]. Chatbots have a lots benefits including a 24/7 customer service, timely responses and effective inquiry handling, reduced cost of customer service and best customer satisfaction. They outperform humans in terms of speed and accuracy.

2. LITERATURE SURVEY

Conversional assistants are becoming integral part of daily life. Rasa Core and Rasa Natural Language understanding (NLU) are easy to use tools for building conversational systems [2]. Rasa is an essential set of tools for building more advanced and efficient AI assistants/chatbots. The benefit of rasa is the infrastructure and tools which provides the user with high performance, resilient and proprietary intelligent chatbots that work. Rasa helps all developers create better text and voice-based chatbots. Rasa's NLU helps the developers with the technology and the tools necessary for capturing and understanding user input, determining the intent and entities. Rasa supports multiple languages, single and multiple intent, and both pre-trained and custom entities [3].

Rasa is an opensource framework for building AI bots. Rasa open source framework consists of two components: - Rasa NLU and Rasa core. Rasa recommends using both Rasa NLU and core, but they can be used independently of each other. Rasa core is the component which handles the dialogue engine for the framework and helps in creating more complex chatbots with customization. Rasa provides an opportunity for interactive learning. Chatbots can be enhanced because of the flexibility options provided by the Rasa framework. The chatbot can be easily deployed, integrated and connected to websites and applications [3].

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AI in Diagnostics

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Abstract - *In the field of medicine, predictions are of great significance. In recent times, intelligent systems play an important role. The techniques of the user interface are built on the ever-increasing and progressing areas such as Artificial Intelligence (AI) and Artificial Neural Networks (ANN). The mechanism of artificial intelligence provides substantial assistance in healthcare. Considering these optimistic aspects, a combination of accuracy of mathematics and the potentiality of automation results in a robust system. In this paper, our aim is to develop a healthcare interface web application that will aid the user and enable them to issue their symptoms of common diseases or issues faced by the user to generate a prognosis. The primary objective is to develop a machine learning system that utilizes AI and deep learning to help people to keep a check on their health with the ease of a web application. Artificial intelligence (AI) aims to bring a revolutionary change to the healthcare sector, reinforced by the increasing availability of healthcare from hospitals which acts as a catalyst to the rapid progress of analytics techniques.*

Key Words: prediction, user interaction, artificial intelligence, artificial neural networks, Prognosis, machine learning.

1. INTRODUCTION

Artificial intelligence is a cohesion of multiple technologies grouped together. Medical diagnostic applications utilize the AI approach to diagnose disease. These technologies have a vast variety of immediate relevance to the field of healthcare and nutrition, but the specific ways in which they process may vary widely. Today, the swift evolution and innovation of applied science have altered the perspective and the way information is preceded. Artificial Intelligence has the capability to predict results and diagnose illness at a rate which is higher than most medical professionals. and A healthcare decision-making interface can make use of technology and enhance the diagnosis process.

An AI-powered medical diagnosis system can rapidly store an immense amount of data and can make intricate connections between them. Medical diagnosis applications incorporate different mechanisms from the large domain of artificial intelligence, highlighting the vast amount of benefits they have been able to achieve to the field of medical decision making and also these mechanisms come with their own drawbacks which has been discussed as it is essential to emphasize them to decide a favorable AI method for a specific task. Some of these features (pros and cons) are present in the literature survey of the domain which act as a strong evidence by the decisional systems presented. Some others have been noticed once these systems were developed [5].

This paper proposes a system that is used for the prognosis of the users experiencing symptoms which may cause discomfort to the user but can be quickly analyzed with the help of a self-service web application to diagnose the issue and if severe, contact a medical professional. The system is trained and tested using machine learning based on a dataset of symptoms faced by the users from the UCI Machine Learning Repository [6].

The paper is constructed as follows: Section II discusses the survey which was conducted, Section III and Section IV talks about the proposed system and Section V concludes the paper.

2. LITERATURE SURVEY

The purpose of carrying out a *Literature Survey* is to demonstrate and develop our familiarity with the existing work relevant to the focus of our study.

A. Prediction Techniques

Machine learning algorithms are used to analyze data again and again to produce the most effective results. It can be used for the analysis of medical data and it is helpful in medical diagnosis for sensing different diagnostic problems.

iSeeBetter: Spatio-temporal video super-resolution using recurrent generative back-projection networks

Aman Chadha[1] (✉), John Britto[2], and M. Mani Roja[3]

Abstract Recently, learning-based models have enhanced the performance of single-image super-resolution (SISR). However, applying SISR successively to each video frame leads to a lack of temporal coherency. Convolutional neural networks (CNNs) outperform traditional approaches in terms of image quality metrics such as peak signal to noise ratio (PSNR) and structural similarity (SSIM). On the other hand, generative adversarial networks (GANs) offer a competitive advantage by being able to mitigate the issue of a lack of finer texture details, usually seen with CNNs when super-resolving at large upscaling factors. We present iSeeBetter, a novel GAN-based spatio-temporal approach to video super-resolution (VSR) that renders temporally consistent super-resolution videos. iSeeBetter extracts spatial and temporal information from the current and neighboring frames using the concept of recurrent back-projection networks as its generator. Furthermore, to improve the "naturality" of the super-resolved output while eliminating artifacts seen with traditional algorithms, we utilize the discriminator from super-resolution generative adversarial network. Although mean squared error (MSE) as a primary loss-minimization objective improves PSNR/SSIM, these metrics may not capture fine details in the image resulting in misrepresentation of perceptual quality. To address this, we use a four-fold (MSE, perceptual, adversarial, and total-variation loss function. Our results

demonstrate that iSeeBetter offers superior VSR fidelity and surpasses state-of-the-art performance.

1 Introduction

The goal of super-resolution (SR) is to enhance a low resolution (LR) image to a higher resolution (HR) image by filling in missing fine-grained details in the LR image. The domain of SR research can be divided into three main areas: single image SR (SISR) [1–4], multi image SR (MISR) [5, 6], and video SR (VSR) [7–11].

Consider an LR video source which consists of a sequence of LR video frames LR_{t-n}, ..., LR_t, ..., LR_{t+n}, where we super-resolve a target frame LR_t. The idea behind SISR is to super-resolve LR_t by utilizing spatial information inherent in the frame, independently of other frames in the video sequence. However, this technique fails to exploit the temporal details inherent in a video sequence resulting in temporal incoherence. MISR seeks to address just that—it utilizes the missing details available from the neighboring frames LR_{t-n}, ..., LR_t, ..., LR_{t+n} and fuses them for super-resolving LR_t. After spatially aligning frames, missing details are extracted by separating differences between the aligned frames from missing details observed only in one or some of the frames. However, in MISR, the alignment of the frames is done without any concern for temporal smoothness, which is in stark contrast to VSR where the frames are typically aligned in temporal smooth order.

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Smart Milk Adulteration Detection

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Abstract- Adulteration is extremely basic today and the most normally adulterated nourishment item is milk. The most widely recognized explanation behind adulteration is the utilization by producers of undeclared materials that are less expensive than the right and pronounced ones. Adulteration brings down the nature of nourishment and now and then, harmful synthetic substances are likewise added which can be dangerous to health. Adulteration of products either in liquid or solid form can harm or pose serious health risk issues to the consumer. The present investigation was arranged with the primary goal of recognizing purchasing practices of homemakers and their degree of awareness identified with chosen food items. Being considerate of the health & betterment of the society we have planned a project which will allow the customer to know about the level of purity of product which they are buying and being aware of it in future.

I. INTRODUCTION

Liquid adulteration is one of the most common issues with the quality of food. Apart from being a moral violation it also affects health in a big way. Some of them are renal and skin disease, eye, and heart problems and may also lead to cancer. Reliable testing of food items is required for assessing the value and to preventing the customers of being defrauded both economically and in terms of health. So, in our project, we have focused on milk adulteration detection. In most cases adulteration is being done intentionally so as to increase profits while in some cases it might be due to the non-availability of proper technology to detect adulterants and unawareness of adulterants in case of industrial workers.[1]

Sometimes milk items are adulterated with cheap liquids like water and whey and are referred to as "economic adulteration". Diluted food item contains reduced nutritional values and the water that may have been used for adulteration might have been contaminated which poses dangerous health issues. Addition of water results in the change of specific gravity which also results in discoloration of milk. Based on the above principle lactometer which works on the principle of changes in specific gravity is used for detecting adulteration in milk. But to compensate for the changes in specific gravity sugar is added. And to compensate for the changes in colour a small amount of food is also added. Maltodextrin is used in dairy foods to add flavor and reduce the cost of the products. One more commonly used adulterant is the addition of milk whey (the by-product obtained after making cottage cheese from the milk).[2]

Whey is also created by chemicals which further affect health. Now, this artificially created whey also causes many medical issues. Cold press oils are adulterated by refined oils. During the refining process, fatty acids are created which causes further harm. Trans fatty acids are not required by the body and affect one's health.

Hydrogenated oils are much more harmful than refined oils which causes trouble if used. Milk and natural product juices have principal significance in the human diet. Increasing demand of these milk foods has made them vulnerable to economic adulteration during processing and in the supply chain. Removal of the cream or selling of skimmed or partially skimmed milk as whole milk is additionally one type of milk adulteration. Compound adulterants are utilized for various purposes. The most commonly used adulterants are formalin, chlorine, ammonium sulphate, starch, sodium carbonate, formalin, and hydrated lime.

To meet the deficit of milk, the synthetic milk is prepared by mixing urea, caustic soda, refined oil and common detergents which has a poisonous effect. Widespread use of chemical preservatives to preserve milk in warm weather is a great concern in the food industry. Worries about food safety and guideline have guaranteed the improvement of different procedures like physical, biochemical/immunological and molecular systems, for adulterant detection in food. Molecular strategies are progressively ideal with regards to detection of natural adulterants in food, albeit physical and biochemical procedures are best for the detection of different adulterants in nourishment. Potential advantages and disadvantages of different systems, for example, physicochemical techniques, chromatography, immunoassays, sub-atomic, electrical, spectroscopy with chemometrics, electronic nose, and biosensors have been found. For detection of chemical adulterants sophisticated instrument is required. With the progression of innovation, more up to date procedures have been designed to recognize various types of fluid adulterants, however in a similar pace, the mind-bogglingstrategies for milk adulteration have been developed.

II. LITERATURE SURVEY

Various Past electrical methods to detect milk adulterants are as follows -
Potentiometric Sensors- Potentiometric allows the determination of a wide spectrum of ions and inexpensive, portable equipment that can be developed. Trivedi et al. have reported a potentiometric biosensor3 to detect urea adulteration in milk. It uses an NH+4 ion-sensitive electrode as the transducer.[3]

Biometric Identification using Human Ear

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Abstract: Biometrics refers to the metrics of the human characteristics which has gained much popularity in recent times. It is a form of identification and access control. Widely used forms of biometrics are facial recognition, finger print recognition, iris recognition, etc. but the drawback is that most of these features change over time. The human ear is a cogent source of data to classify biometrically since its attributes do not change substantially as time progresses. This paper explores the field of ear biometric wherein the database images are re-sized to 128 x 256 pixels and then converted to grayscale image. Various transforms viz. Discrete Cosine Transform, Discrete Fourier Transform, Discrete Wavelet Transform are then applied to extract the features. The coefficients of the test image are compared with the coefficients of the registered database image. On comparison, Euclidean distance classifier is used to recognize the test image from the database. The database used consists of 25 subjects with 6 images per person out of which the initial 4 images are used to train the model, and the remaining 2 for testing. The outputs of various transforms were compared and the best accuracy obtained is 86% using Discrete Wavelet Transform.

Keywords: Discrete Cosine Transform, Discrete Fourier Transform, Discrete Wavelet Transform, Ear Recognition, Person Identification

I. INTRODUCTION

Personal identification is more relevant than it was before in different sectors and hence biometrics has been receiving a lot of attention lately as it deals with the identification of individuals based on various characteristics. It is conventionally perceived that biometric has become a essential element of the identification technology. Biometrics can be bifurcated into two categories, namely physiological and behavioural. The physiological class is based on external physical characteristic measurements, such as height, body shape, face shape, hand shape, ear shape, odour, retina, iris, deoxyribonucleic acid, fingerprint etc. The behavioural class measures the learned behaviours such as body posture, speech, handwriting, heartbeat, eye blinking pattern, etc. However, in due course of time the identifying factors tend to change and cause hindrances in the identification process. Hence, all the commercially used techniques have their shortcomings.

Prior research reveals that human ear is one of the

representative human biometrics with uniqueness and stability since the deformation of ears due to ageing and weight is very little over a long period of time. According to documented history, French Criminologist Alphonse Bertillon in 1890 was the first to use the ear for identification. The most widely cited methods used for ear biometrics was presented by Burge and Burger in 1997 [1]. Several feature extraction and matching schemes have been proposed by researchers since then. These vary from simple appearance-based methods such as principal component analysis (PCA) to more complex methods based on scale-invariant feature transforms (SIFT), local binary patterns, wavelet transforms and force fields.

Burge and Burger devised the first well known technique for ear detection. Using deformable contours, they positioned the ear on a Gaussian pyramid representing the gradient of the side profile. However, this technique requires user interaction for contour initialization. Ansari and Gupta (2007) [2] had a similar approach where they detected the ear from the edges of outer helices. They achieved an accuracy of about 93.34% with this approach. Moreno et al (1999) [3] were one of the firsts to introduce an automated system for recognition of ears. They extracted features by a compression network, and included them in their feature vector along with outer ear points, ear shape, and wrinkles. Tariq et al (2011) [4] extracted the features of a ear using the Haar wavelet, and matched them using fast normalized cross correlation (NCC). They achieved a recognition rate as high as 98.33%; however it goes to 95.2% with a database with more subjects. Feng and Mu (2009) [5] combined wavelet transform and local binary pattern operators, resulting in an accuracy of 96.86% using chi-squared distance. Wang et al (2008) [6] also used a similar approach; they decomposed ear images using Haar wavelet transform, followed by applying uniform local binary patterns. The resulting recognition rate was as high as 100%, but deteriorated to around 42.41% with change in angles. Karuna et al (2015) [7] used Gabor filter (GF) for feature extraction, and further used discrete wavelet transform (DWT) to filter the Gabor feature matrix of its redundancies, achieving a recognition rate of 90%. Abate et al (2006) [8] extracted features using rotation invariant descriptors viz. Generic Fourier Descriptors. They got an accuracy of 96%. Taertutulakarn et al (2016) [9] used the geometric features on 3D ear surface for a 2D ear image, further used PCA for feature extraction and attained a recognition rate of 92% of 50 volunteers. Zhang et al (2013) [10] used Gabor filters for feature extraction.

Speaker Diarization

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Abstract — Speaker Diarization is the task of determining 'who spoke when?'.Speaker Diarization uses unsupervised as well as supervised approaches to detect the change of speaker in the temporal dimension. This paper primarily describes the implementation of Speaker Diarization using Neural Networks (a supervised method). First a summary of the clustering algorithms is given. Then the three approaches using neural networks is specified. They are Speaker Diarization using Artificial Neural Networks, Recurrent Neural Networks and Adaptive Long Short Term Memory or Multiple LSTMs. Finally the accuracy is calculated and the results are compared.

Keywords — Artificial Neural Network, Recurrent Neural Networks, LSTM, MFCC

I. INTRODUCTION

Speaker Diarization is the task of determining 'who spoke when?'. Speaker diarization is the process of partitioning an input audio stream into homogeneous segments according to the speaker identity. It can enhance the readability of an automatic speech transcription by structuring the audio stream into speaker turns and, when used together with speaker recognition systems, by providing the speaker's true identity.[1] With the rise of voice biometrics and speech recognition systems, the ability to process audio of multiple speakers is crucial. In many applications, we will want to identify multiple speakers in a conversation, for example when writing a protocol of a meeting. For such occasions, identifying the different speakers and connect different sentences under the same speaker is a critical task.[2]

Speaker diarization has utility in a majority of applications related to audio and/or video document processing, such as information retrieval for example. Indeed, it is often the case that audio and/or video recordings contain more than one active speaker. This is the case for telephone conversations (for example stemming from call centers), broadcast news, debates, shows, movies, meetings, domain-specific videos (such as surgery operations for instance) or even lecture or conference recordings including multiple speakers or questions/answers sessions.[2]

Speaker diarization is one of the tasks in the NIST Rich Transcription (RT) Meeting Recognition Evaluation. It is to automatically find the segments of time within a meeting in which each meeting participant is talking, a task to detect Who Spoke This requires for marking the start and end times of every speech segment with a speaker identity, from a continuous audio recording of a meeting. In recent years, there has been extensive research on the speaker diarization systems[3]

Audio diarization is defined as the task of marking and categorizing the different audio sources within an unmarked audio sequence. On the flip side, owing to its lack of search ability, working on audio data is a tedious task. [4]

II. THE PREVIOUS APPROACHES

The goal of a speaker diarization system is to analyse an audio stream and output a set of labels defining the moments when each individual speaker speaks. This can be cast as a classification task, if all the speakers along with their identities are known beforehand.[6] Speaker diarization is the process of detecting the turns in speech because of the changing of speaker and clustering the speech from the same speaker together, and thus provides useful information for the structuring and indexing of the audio document.[7] The first step in any automatic speech recognition system is to extract features i.e. identify the components of the audio signal that are good for identifying the linguistic content and discarding all the other stuff which carries information like background noise, emotion etc.[5] Most of present state-of-the-art speaker diarization systems fit into one of two categories: the bottom-up and the top-down approaches, as illustrated in Fig 1[2]
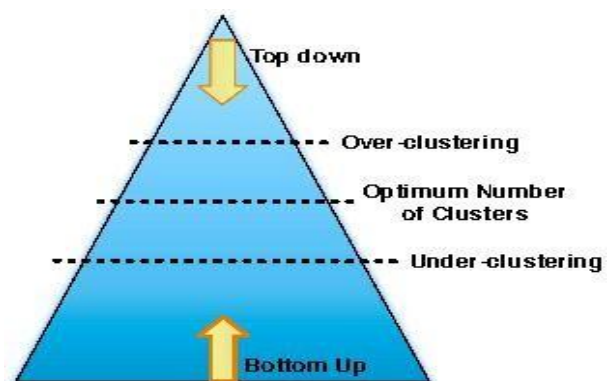

Fig. 1 Top down and bottom up Approach

A. The bottom-up Approach

The bottom-up approach is by far the most common in the literature. Also known as agglomerative hierarchical clustering (AHC or AGHC), the bottom-up approach trains a number of clusters or models and aims at successively merging and reducing the number of clusters until only one remains for each speaker. Clusters are generally modeled with a GMM and, upon merging, a single new GMM is trained on the data that was previously assigned to the two individual clusters.

This simple approach generally leads to good performance. In all cases the audio stream is initially over-segmented into a number of segments which exceeds the anticipated maximum number of speakers.

Exhaustive Appraisal of Adaptive Hybrid LTE-A Downlink Scheduling Algorithm

Shrishti Bhatia, Ashwini Kunte

Abstract:Long Term Evolution- Advanced (LTE-A) networks have been introduced in Third Generation Partnership Project (3GPP) release – 10 specifications, with an objective of obtaining a high data rate for the cell edge users, higher spectral efficiency and high Quality of service for multimedia services at the cell edge/Indoor areas. A Heterogeneous network (HetNet) in a LTE-A is a network consisting of high power macro-nodes and low power micro-nodes of different cell coverage capabilities. Due to this, non-desired signals acting as interference exist between the micro and macro nodes and their users. Interference is broadly classified as cross-tier and co-tier interference. The cross tier interference can be reduced by controlling the base station transmit power while the co-tier interference can be reduced by proper resource allocation among the users. Scheduling is the process of optimal allocation of resources to the users. For proper resource allocation, scheduling is done at the Main Base station (enodeB). Some LTE-A downlink scheduling algorithms are based on transmission channel quality feedback given by user equipment in uplink transmission. Various scheduling algorithms are being developed and evaluated using a network simulator. This paper presents the performance evaluation of the Adaptive Hybrid LTE-A Downlink scheduling algorithm. The evaluation is done in terms of parameters like user's throughput (Peak, Average, and Edge), Average User's spectral efficiency and Fairness Index. The evaluated results of the proposed algorithm is compared with the existing downlink scheduling algorithms such as Round Robin, Proportional Fair, Best Channel Quality Indicator (CQI) using a network simulator. The comparison results show the effectiveness of the proposed adaptive Hybrid Algorithm in improving the cell Edge user's throughput as well the Fairness Index.

Keywords: Long Term Evolution (LTE), Long Term Evolution- Advanced (LTE-A), Scheduling algorithms, Channel Quality Indicator (CQI), Throughput, Fairness Index.

I. INTRODUCTION

The growth in data traffic usage has increased by 109% in the year 2018. The average data usage grew 69% in 2018 with a 10GB data traffic usage per user per month in December 2018 as studied by the Nokia's annual Mobile Broadband India Traffic (MbiT) index [1]. This study also discusses the increase in the number of people using broadband on mobile which is led by the growing popularity of video streaming and video content in local languages on the various over the top (OTT) applications, online gaming on gaming apps, media apps educationrelated apps etc. This surge in data traffic usage creates challenges for the network operators. The network operators now have to cope with the increasing demands of data usage in outdoor as well indoor environments.

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The increasing data traffic also creates a burden on the macro-cellular network. Wireless communications have evolved from the first generation(1G) analog communications followed by the introduction of digital cellular technology in second generation(2G) and through the deployment of third generation (3G) systems providing high speed data, thereby improving coverage by using heterogeneous networks in the fourth generation (4G) networks being deployed today . The evolution of LTE to LTE-A –LTE Release 10 was mainly to provide higher bitrates in a cost efficient way and to fulfil the requirements set by ITU for IMT Advanced and its subsequent Long Term Evolution (LTE-A) [2]. For indoor coverage with higher capacity along with high quality of service, advanced wireless heterogeneous networks support deployment of medium and low power nodes viz. small cells and femto cells. A Femtocell is a low power base station which can be installed indoors to cover an indoor area not covered by the Macro Base Station (MBS) network [3], [4]. The Femtocellalso offloads heavy data traffic from the macro cellular network to the femto cellular network. Thus, the quality of service as well the capacity of the user in terms of user throughput can be improved.

The deployment of a femtocell in the macro cell has its own drawback. The undesired signal from the MBS to the Femto user and from Femto base station to the nearest macro user is called interfering signal. This leads to Interference which is broadly classified into two categories viz.: cross-tier and co-tier interference. Cross tier interference is caused by the high power undesired signal of different frequency received by Femtouser from the MBS or vice versa.

This paper explores the performances of LTE-A network for different scheduling algorithms such as Round Robin, Best CQI, and Proportional Fair [5] with Adaptive Hybrid Scheduling algorithm which was proposed in our previous paper [6] using simulations in Vienna LTE simulator. Adaptive Hybrid Scheduling algorithm is tested and evaluated by varying number of users in the cell, change in bandwidth such as 20MHz and 100MHz, for various frequencies such as 2.4GHz, 5.2 GHz and 10 GHz and finally with and without Fractional Frequency Reuse in the cell. Wireless network parameters such as throughput, Fairness Index and spectral efficiency are used to evaluate the performance of the Adaptive hybrid scheduling algorithm. The simulation results are compared with the existing LTE-A downlink Scheduling algorithm.The remainder of this paper is structured as follows: section II presents an overview of LTE-A system, various LTE-A downlink Scheduling algorithms followed by simulation parameters set up for the simulation in Section III, Section IV presents the simulation results and comparative study of the adaptive hybrid scheduling algorithm with the Round Robin , Best CQI and Proportional Fair scheduling algorithms, also comparative study of these algorithms with and without FFR and finally

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A Study of various Geographical Ecosystems with High Performing Digital Technology Business sector to replicate in Indian setting with varying Business Matrix

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Abstract - *India as a technology market place is hugely failing to offer at least one world class product or process getting reckoned in the global setting. India as a country offers value proposition to developed countries and to domestic market in the realm of IT services and also some in the IT product space. Countries are demonstrating more and more nationalist aspirations and are trying to maximize market share to optimize their fortunes. Therefore, the business enterprises are expected to create cost and quality arbitrage in the marketplace to survive and thrive in the competitive business setting. This paper therefore investigates the overall rank of India with respect to leading 10 developed countries in the realm of IT Enterprises enlisting various factors like political and business environment, infrastructure, skills etc.*

Key Words: **Global IT Enterprises, Indian IT Enterprises, Ranking of Countries based on various factors.**

1.INTRODUCTION

It is a known fact that for so many years Indian state and its people are denied with a matter of pride of offering a world class product or process and the longing for at least one is getting prolonged. This is the underlying emotion which provoked us to think aloud and zeroed in on Information Technology market place to find the reasons for years of failure. The inability to create build one world class product is obviously not because of lack of deep pockets.

This paper undertakes to find the inexcusable reasons for the continued failure and suggests ways and means of Indian IT majors to evolve as world leaders in the time to come.

We started with exhaustive survey of literature to find the cultural / historic / social / financial / educational / technological reasons for the stated non-performance of even the cash rich Indian behemoths.

In this paper, the overall ranking of India is compared to 10 leading IT giants of the world, so as to understand the factors required to replicate the same in the Indian setting and evolve the Indian IT enterprises as total solution providers.

As per The Global Information Technology Report by "The world economic forum and INSEAD"[1], the success of IT enterprises in a country are based on the 10 pillars :

Political and Regulatory Environment, Business and Innovation Environment, Infrastructure, Affordability, Skills, Individual Usage, Business Usage, Government Usage, Economic Impacts, Social Impacts[1].

These factors are used to formulate tables and determine the overall rank of India with respect to other leading countries involved in IT business.

2. Analysis of Leading Countries in IT Business

Tables / Matrix were formulated based on the various aspects of the above factors which show the ranking of 10 leading countries of the world out of total 139 countries on various factors listed above and the overall rank of India was compared with them in various factors[1].

2.1 Political and Regulatory Environment

FACTORS	USA	UK	CHINA	GERMANY	KOREA	JAPAN	ISRAEL	CANADA	SINGAPORE	INDIA
Effectiveness of law-making Bodies	49	5	40	17	99	10	62	13	1	50
Laws relating to ICT	11	6	49	26	21	27	31	13	5	53
Judicial independence	28	10	67	17	69	12	18	11	23	64
Efficiency of legal framework in setting disputes	25	6	50	16	57	13	44	17	1	42
Efficiency of legal framework in challenging regulations	19	9	66	11	74	24	34	14	10	39
Intellectual property protection	15	7	63	20	52	6	29	12	4	50
Software piracy rate	1	9	73	9	25	2	17	14	18	53
Number of procedures to enforce a contract	41	14	69	22	27	27	48	58	2	128
Time required to enforce a contract	33	41	44	38	4	14	124	75	1	137
OVERALL RANK	**25**	**12**	**58**	**20**	**48**	**15**	**45**	**25**	**7**	**68**

Table 1: Ranking based on political and regulatory environment

TRANSFER LEARNING APPROACH FOR SPLICING AND COPY-MOVE IMAGE TAMPERING DETECTION

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Abstract

Image authentication before using in any security critical applications has become necessary as the image editing tools are increasing and are handy to use in today's world. Images could be tampered in different ways, but a universal method is required to detect it. Deep learning has gained its importance because of its promising performance in many applications. In this paper a new framework for image tampering detection using Error Level Analysis (ELA) and Convolutional Neural Network (CNN) with transfer learning approach is proposed. In this method, the images are pre-processed using ELA to highlight the tampered region and are used to fine tune the entire model. Six different pre-trained models are used in the proposed framework to compare the performance in classifying the tampered and authentic images. The complexity and processing time of the proposed method is low with respect to most of the existing methods as the images are not divided into patches. The performance of the model obtained is also considerably good with an accuracy of 97.58% with Residual Network 50(ResNet50).

Keywords:

Tampering Detection, Transfer Learning, Copy-Move, Splicing

1. INTRODUCTION

In this digital era, the images have become one of the most important ways of information exchange in different applications like social media, medical, television and many other applications over the internet. With the increase in different type of image editing tools and software that are available in handy devices like mobile and laptops, it has become possible to modify the images easily for different purposes. The images could be modified for some good intention but if the images are modified with some bad intent, then it is called a forgery. The image forgery could be done to conceal some meaningful information like hiding some person or object in the image. The manipulated images are used as false evidence in court, to make money by getting more viewers on social media, getting popularity or publicity, etc. There is a necessity to verify the integrity of the images to prevent spreading or promoting of false information and also to avoid trusting and considering the edited images as evidence in the court of law.

There are different image manipulation types and among them Copy-move and Splicing are the major types as shown in Fig.1. Copy-move forgery [2]-[7] is done by copying a small region of an image and pasting in the same image to change the information conveyed by the image. Splicing forgery [10]-[12] is done by replacing a portion of an image by a part of a different image to manipulate the information conveyed. The tampering is done in such a way that the changes are not easily identified by the naked eyes. During the process, the forged region may be made to undergo some transformations [2] [3] like rotation, scaling, blurring, etc. to match it to the surroundings and to hide from detection. Sometimes the forged images are made to undergo post-processing operation like smoothing to remove the traces

that arise at the edges during manipulation of images. Hence, it is a big challenge to detect the forged images as it could be used for unethical purposes.

Many tampering detection methods were proposed to detect either copy-move or splicing detection. Then the researchers thought of universal methods to detect both the forgery types and hence there were several approaches emerged with DCT [13], SURF [14] and LBP [15] features with SVM classification. When CNN emerged in several applications and proved its importance, it was also used in detecting tampered images [16]-[18]. With the advancement in the processing capacity using GPU, the deeper architectures also emerged [24] [25] to detect tampering in images.

| Original image | Spliced image | Forged region mask |

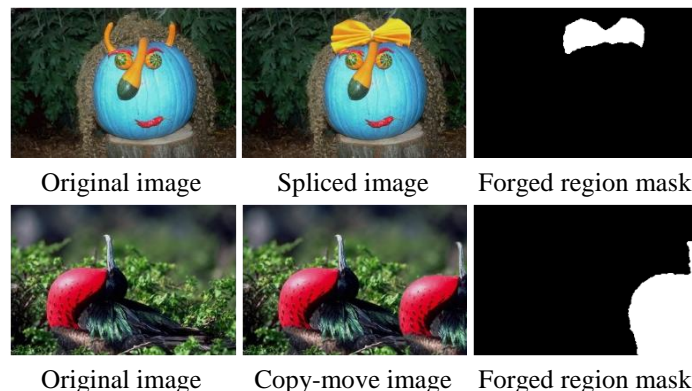| Original image | Copy-move image | Forged region mask |

Fig.1. Image tampering types

All the above research work motivated me to propose a new framework for forged image classification problems. As the images are mostly compressed to store and transfer efficiently, ELA [32] is used to highlight the tampered part. As we need a huge dataset to train deep CNN architecture for better accuracy, the transfer learning approach is used in this work to overcome this problem. Transfer learning uses already trained weights in one application over a huge dataset to initialize the network in another application, which considerably reduces the training time and gives better accuracy with smaller datasets. Some existing methods [11] [20] convert images into patches to get better accuracy which increases the complexity and time of training and testing, but the proposed method trains the complete images without creating patches which reduces the complexity and processing time. In the proposed architecture, instead of flattening all the feature maps we used a GAP [31] layer to get an average feature vector. It helps us in reducing a lot of trainable parameters, which further helps to reduce the training time and to avoid overfitting problem.

Further, in this paper the contents are organized as follows. Related work gives the overview of existing techniques in this area. The methodology section explains about the proposed approach in detail step by step. The following section to

BIOMETRIC BASED ELECTRONIC VOTING SYSTEM

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Abstract - *This paper aims to present a new voting system employing biometrics in order to avoid rigging and to enhance the accuracy and speed of the process. The system uses a biometric method for voters identification. The major two parts of the system are: enrolling and voting. All the voting machines are connected to a central database network, through which data transfer takes place to the local database. The result is instantaneous and is done finally at the main host itself. The overall cost for conducting elections gets reduced and so does the maintenance cost of the systems.*

Keywords: EVM, Fingerprint, Central Database (CBD), Local Database (LDB).

1. INTRODUCTION

In the present day, democracy has become an important part of people's lives, and to achieve democracy one must meet several conditions. The heart of democracy is voting where as the heart of voting is trust that each vote is recorded and tallied with accuracy and impartiality. All earlier elections be it state elections or central elections a voter used to vote his/her favourite candidate by putting the stamp against his/her name and then folding the ballot paper as per a prescribed method before putting it in the Ballot Box. This is a long, time-consuming process and very much prone to errors. This situation continued till the election scene was completely changed by the electronic voting machine. No more ballot paper, ballot boxes, stamping, etc. all this condensed into a simple box called ballot unit of the electronic voting machine. Currently India uses EVM for elections, which is prone to fraud and it is tedious to handle the voting machines. EVMs which are used in India do not provide any mechanism by which the voter can verify their identity before casting votes. EVMs can be tampered during manufacturing, in such cases it can manipulate the actual voting. After elections the

government has to maintain records which is again a tedious process for the government. [1][2][3]

To overcome these disadvantages of the previous system, our project focuses on Biometric verification and digital record maintenance, because biometrics is becoming an essential component of personal identification solutions. Since biometric identifiers cannot be shared or misplaced, and they represent an individual's identity. In detail it is discussed in further sections.

2. LITERATURE REVIEW

From 1948 onwards, India has conducted the election process at a time interval of 5 years. The following methods are used to elect an appropriate candidate:

   A.   Paper ballot system
   B.   Electronic voting machine

A. PAPER BALLOT VOTING SYSTEM

Paper Ballots were used in India before 1997 for conducting the public elections. Votes captured in ballots can be stored for a very short period as the ink used in voting may discharge or ballot paper may lose its quality. Proper care has to be taken in maintaining these ballots to protect them from humidity, sunlight and other factors, which affect the ballot papers. Once the ballot is corrupted, we cannot recover the original data. After the election process, it takes more time and effort for counting the votes manually by checking each ballot paper. Paper is an Inflammable material accidentally it may catch fire in case all records will be lost and cannot be recovered and hence the government has to spend extra money for conducting reelections. Bogus ballots can be made and in-numerous fake votes can be casted. Physically disabled people were facing difficulties in casting their votes, in those cases they needed others' help, but privacy while casting votes was vomited.[4]

PATIENT HEALTH MONITORING SYSTEM USING IOT

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Abstract - *In this project we have planned to design a compact wireless Patient Health Monitoring System. The idea is to use a Raspberry Pi 3, Arduino Uno, Heartbeat sensor, monitoring circuit, temperature sensor to directly get the data on the Doctor's computer. These components play a vital role in monitoring the patient health status. Since time plays a key role in saving a person's life, the device aims at saving time required by the doctor to monitor each and every patient. The process starts by monitoring of physical parameters like heart beat and temperature readings sending the measured data directly to a Doctor's computer through a server database. The devices used in this project are very cheap and cost effective and can be widely used for wireless communication within indoor management. It is very easy to assemble and very less errors are introduced.*

Key Words: **IOT, Health monitoring, Blood Pressure, Heart rate, Sensor, Temperature.**

1. INTRODUCTION

A Patient Health Monitoring System is an extension of a hospital medical system where a patient's vital body state can be monitored remotely. Traditionally the detection systems were only found in hospitals and were characterized by huge and complex circuitry which required high power consumption. Continuous advances in the semiconductor technology industry have led to sensors and microcontrollers that are smaller in size, faster in operation, low in power consumption and affordable in cost. According to research, we found that approximately 2000 people died monthly due to the only carelessness of their health.

This is because they don"t have time for themselves and forget about their health management due to a heavy workload. The reason behind to make this project is the growing world of technology and people forget their health checkup which is needed to be done monthly or quarterly. As we all know that internet of things made our life easier. So, we have decided to make an internet of things based healthcare project for people who provide them all the personal information about their health on their mobile and they can check their all historical health data.

The best part of this project is that it can be used by everyone and make our health management easier than available systems. It provides a solution for measurement of body parameters like, Temperature Sensor and Heartbeat,

Blood Pressure. It also detects the body condition and location of the patients. This system also generates an alert when it required that means at the time of any critical conditions and notifications about the medicines, location change, conditions etc.

2. LITERATURE REVIEW

1.) Patient-Monitoring Systems, Reed M. Gardner & M. Michael Shabot , Year 2014 To meet the increasing demands for more acute and intensive care required by patients with complex disorders, new organizational units—the ICUs— were established in hospitals beginning in the 1950s. The earliest units were simply postoperative recovery rooms used for prolonged stays after open-heart surgery. Intensive-care units proliferated rapidly during the late 1960s and 1970s. The types of units include burn, coronary, general surgery, open-heart surgery, pediatric, neonatal, respiratory, and multipurpose medical-surgical units. Today there are an estimated 75,000 adult, pediatric, and neonatal intensive care beds in the United States.

2.) IoT-Based Health Monitoring System for Active and Assisted Living, Ahmed

Abdelgawad, School of Engineering and Technology, Central Michigan University, Mt. Pleasant, MI 48859, USA , Year 2017. The Internet of Things (IoT) platform offers a promising technology to achieve the aforementioned healthcare services, and can further improve the medical service systems [1]. IoT wearable platforms can be used to collect the needed information of the user and its ambient environment and communicate such information wirelessly, where it is processed or stored for tracking the history of the user [2]. Such a connectivity with external devices and services will allow for taking preventive measure (e.g., upon foreseeing an upcoming heart stroke) or providing immediate care (e.g., when a user falls down and needs help). Recently, several IoT systems have been developed for IoT healthcare and assisted living applications.

3.) IOT based health monitoring systems, Nayna Gupta & Sujata Pandey, Year 2012.

In this fast placed world, managing work and health simultaneously have become a matter of concern for most people. Long waiting hours at the hospitals or ambulatory patient monitoring are well known issues. The issues demand for a health monitoring system which can monitor

Cloud-Based smart parking system with ALPR algorithm and APP integration

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Abstract - *This paper is to describe a model for Smart parking system that is hassle free, human labor free and meets the requirements of modern-day customer. We propose a system based on machine-learning and image processing technology integrated with cloud data storage and Android app and payment system functionality for smart parking. A number of attempts have been proposed in recent years, but lack important components like automatic payment system, security mechanisms etc. We present a cost efficient and easily implementable fully automatic system consisting of booking-identification-pay per use model of smart parking. Customer books a slot for the vehicle beforehand through android app. Dynamic display of available slots. The vehicle when arrives at the parking lot is identified. Customer is charged as per the parking time through the app when the vehicle leaves the building.*

Key Words: Machine learning, image processing, smart parking, pay-per-use payment, customer-friendly system

1.INTRODUCTION

A lot of research has been done in the areas of recognition using machine learning and deep learning. Smart parking System uses the advantages of these technologies to overcome the problems of traditional parking system. Typical traditional parking system involves a third-party owner of the parking area managing the parking space and responsible for the payment.

There are various problems associated with the existing parking system. The customer does not know whether the parking space is empty or not until he reaches the parking lot. The people managing the parking lots sometimes give a hard time to customers by overcharging them. Physical record has to be maintained on who has parked the vehicle. There is no way to check whether the vehicle is legitimate or not. There is high chance of vehicles getting stolen, damaged due to more than capacity parking. The hiring of human labor to maintain the parking lot is costly. If the management staff is unavailable at some point in time, the parking lot is rendered useless. The payment and parking process is time consuming as everything needs to be handled physically with the involvement of customer and management staff. At some places pay per use model isn't implemented rendering the vehicle insecure if not taken back by the customer in time.

To tackle these problems, we propose a smart system which makes use of Android App to book the slot for parking from anyplace. When the registered vehicle arrives at the parking slot it is identified using deep learning technology. Camera sensor and ALPR (automatic license plate recognition) algorithm consisting of models SSD mobile net version 1 for number plate detection and CNN character-digit classifier for vehicle number recognition are used which is then compared with the cloud database and vehicle is identified. Instructions on the app are displayed to guide the user to the parking slot. The user can pay for the parking time through our app interface. The exit gate again makes the use of ALPR which detects whether or not the user has made the payment.

Thus, this system is capable of implementing a fully automatic car parking. It is customer friendly and implements pay per use model. Security measures are taken into consideration using cameras and secure payment Gateway. Since machine learning tools are used for vehicle identification, there is low chance of impersonators entering the slots in any unethical manner.

2. RELATED WORK

In the model proposed by Juhi Seth [1], their system was built on Arduino UNO along with the IR sensors. They have used RFID for verifying the entry of the user. Cloud based services are used for checking the accessibility of the parking areas. The user is updated about the parking details through SMS. A GSM module is used for providing this service. The proposed system involves lot of hardware equipment's which can be easily cut down. The proposed system does not talk about the payment process and also about the time for which the vehicle would be parked.

In the model proposed by J. Cynthia [2] they have used google maps for location of parking slots, IOT and cloud for the storage and the execution of the project. RFID tags are used for the validation and payment procedure. The data is stored in MYSQL format. The main issue in this project was the security. RFID cards are vulnerable and can be stolen or

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  by Vikas Swarnakar, A.R. Singh, Anil Kr Tiwari

  Abstract: Healthcare organisations have struggled with service quality problems to achieve operational excellence. Redundant waiting of patients is scathing to throughput and sustain organisations in a competitive environment. This study utilised a structured Lean Six Sigma DMAIC approach to reduce patient waiting time and improve service quality through systematic analysis of the problem of gynecology and obstetrics department of a multinational hospital. The structured implementation of the LSS framework was observed significant improvement in different aspects. The outcomes of the study revealed that 117% improvement in

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Machine Learning Approaches to Multi-Class Human Skin Disease Detection

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Abstract

Skin is the largest organ of human body. Due to different environmental and personal factors a lot people are suffering from skin diseases. Many skin diseases need screening by expert dermatologist. Due to lack of medical facilities available, the patients may need to wait which in turn may increase chances of increasing severity and/or spreading the infections. To avoid this, early detection of these diseases is important. We developed a system which identifies the disease based on input symptoms. We have acquired symptoms data of 10 skin diseases with the help of expert doctor in the field. Different classifiers were trained on the symptom's data. We got 90% above accuracy.

Keywords: Machine learning, Classification, Neural Networks

1. INTRODUCTION

In India, skin diseases are increasing at a very fast rate. Different factors contributing to this growth are developing economy, differences in climate, illiteracy, personal hygiene issues, lack of awareness, social backwardness, dearth of primary health

Identification of Trustworthy Sellers and Buyers in E-commerce

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ABSTRACT:Shopping through e-commerce websites has become an integral part of our routine and it is all but impossible to imagine a world without this. The success of these marketplaces is attributed not only to the ease that the buyers can have number of options available on a single click, but also to the fact of lesser time consumption. In spite of its cost effectiveness, e-commerce lacks the personal contact with the vendor. Hence for many people this rise of ecommerce was a surprise. How is it that strangers, who may be thousands of miles apart, are willing to trust each other? So the trust is undeniably the most critical factor when customers try to select proper e-commerce sellers for performing transactions online. At the same time Trustworthiness evaluation can't be assessed directly using some pre-defined metrics. It has to be perceived from various parameters including past history, reputation, website quality, and seller's response and customer support. However, these decisions are mainly dependent on the reviews that are posted by the post purchase user. In this paper, we have an approach for evaluating the feedbacks that can act as a decision support system, which can aid users to measure the trustworthiness of the user's opinion about a product or a service. In fact, the main part of the architecture lies in an intelligent layer that proposes three point questions from a collection of prefabricated feedbacks about the targeted product to each user who wants to provide his/her opinion. As a result of the user's selection, the proposed reputation algorithm generates better trust degree of the user, trust score of the feedback, global reputation score of the product and trustworthiness of the sellers.

KEYWORDS: Trustworthiness evaluation, reputation, trust degree, global reputation score.

I.INTRODUCTION

Internet nowadays has become the part and parcel of everyone's life, thanks to the invention of the 4G technology. The number of internet users is still increasing at a rapid rate every day. The online buying and selling has become a buzz word in today's world where a user can find anything, right from a small thing like pencil to the expensive product of cars and planes just on the press of the tip of finger. However, in this era of rapid growth of e-commerce, direct interaction between buyer and seller does not exist resulting in lack of mutual trust. But, users need to feel secure while purchasing a product or a service for the continuous development of e-commerce. Although cryptography and digital signatures and certificates assist users to make their transaction secure, they lack in the construction of a trustful reputation about a specific product or a service [1]. Hence, in order to perceive a trust for the product or service, additional information will be required to build a trust [2].

The trend observed today in e-commerce is that the buyers provide feedbacks and ratings to the products purchased online in lots of discussion forums. It's a very common practice that the users still wish to learn from other user's experiences and comments about a targeted product before buying it. Therefore ratings, feedbacks, recommendations and any other information given by users are very significant for the evaluation of trustworthiness. However, the honesty of this information needs to be verified before it is visible to the consumers. Here lies the significance of feedback evaluation system (TRS); so the analysis of trustworthiness of such feedbacks is the main topic of concern because while some factors like security or quality of services are subject to the direct metrics whereas the trustworthiness of the product in e-commerce cannot be measured easily by evaluating such direct parameters. Currently, the e-commerce jumbos like Amazon and flip kart have their own feedback evaluation systems but they don't provide the specifics about the trust score of feedback given by consumers and hence are less advantageous for buyers to make a buying decision. Therefore, we need a system, which can work as a tool that can help in recognizing

Precision forecasting for intraday and daily stock prices with neural networks and fuzzy models.

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Abstract: Precision financial market forecasting plays an important role in financial prediction and investing. There are various global, local and psychological factors that affect financial market forecasting making it a non-trivial, complex problem. Numerous soft computing techniques based on application of Artificial Neural Network (ANN), Fuzzy Systems (FS) and hybrid models, employing a combination of varied models have been applied by various researchers for forecasting stock prices, with modest results. In the present work, the time-series data, from ICICI Bank Ltd, obtained from the National Stock Exchange (NSE), India is considered as a reference data to demonstrate precise prediction on application of varied ANN and fuzzy algorithms. A thorough and detailed comparison of these algorithms under the ANN & Fuzzy domains, on widely varying time scales - daily price forecasting on one-year data and minute to minute forecasting on intraday data, has been attempted. Forecasting accuracies on the optimized methods has resulted in better than 99% accuracy.

IndexTerms - **Stock Market, Forecasting, Efficacy Parameters, ANN, ANFIS.**

I. INTRODUCTION

Artificial Intelligence methods are being increasingly applied in various fields of science and engineering. In the last few decades, artificial intelligence (AI) methods have especially found favour in various forecasting problems. Rather than just applying the conventional backpropagation ANN methods, researchers are now studying other optimization methods in the AI domain to select the most optimized method for the problem in hand. In the present work we have undertaken an in-depth study for the stock market forecasting using ANN, and hybrid of ANN and fuzzy methods. Share price of a stock depends on several factors like the financial performance of the respective company, confidence level of the shareholders in brand management and its demand/supply at any given time. Forecasting of share price movements in stock exchanges has historically been a challenging problem mainly due to their nonlinear, volatile and heteroscedastic nature in time, more so in developing economies than in developed ones. This has been a subject of intense research in recent past, though there is some progress in forecasting accuracies since the days of efficient market hypothesis and random walk hypothesis which postulated against accurate forecast of share prices. Researchers, who did not believe in the above hypotheses, however continued with their efforts of prediction employing both classical statistical methods and modern techniques like the AI methods obtaining increasingly better forecasts. AI techniques such as artificial neural networks (ANN), fuzzy systems (FS) and their hybrids such as the adaptive neuro fuzzy inference systems (ANFIS) are being increasingly used to make more accurate forecasts. The reason apparently being their superiority in capturing non-linearity, volatility and heteroscedasticity of the price data as compared to earlier methods. Hybrid methods such as ANFIS combine advantages both of ANN, the ability to adjust structurally to the given data and of FS, the ability to handle uncertainty of the data well. Higher degree of accuracy attained in forecasting is critically important in the selection of the methods. In the present study both the approaches of ANN and ANFIS have been applied to the time series data from ICICI Bank listed in NSE. The choice of the stock data being rather arbitrary, the main consideration was to choose a highly liquid and volatile stock so that capability of the ANN & FS methods employed can be put to test rather rigorously. Though there is significant literature on ANN applications on financial data, however, for the first time, we report highly accurate and precise predictions for an Indian stock.

AI techniques have been applied in numerous fields. A few of those are mentioned here. E. A. Mlybari et al. employed support vector machines (SVM) to predict daily tidal levels along the Jeddah Coast, Saudi Arabia [1]. Hossein Mombeini et al. employed an ANN model to forecast gold prices [2]. V.K. Dhar et al. have done an inter-comparison of several ANN algorithms on benchmark and function approximation problems [3]. In another AI application time series forecasting of daily network traffic, Haviluddin et al. used Radial Basis Function Neural Network (RBFNN) achieving acceptable accuracy [4]. Hyunjung Shin et al. employed a semi-supervised learning algorithm (SSL) to forecast direction of movement in crude oil prices [5]. In yet another work an ANN model was developed by Deepak Singhal et al. to predict one-day ahead energy market-clearing prices [6].

II. PARAMETERS FOR EVALUATING EFFICACY

We denote actual stock prices and the forecasted stock prices by y_d and y respectively. The error in the forecasted price is then defined by "$e = (y_d - y)$". Let n denote the total number of input-output data sets constructed from the stock prices, and let "y_{mean}" denote the mean of all the actual stock prices i.e. the desired output values. The parameters listed below are considered in the present work to investigate efficacy of the employed AI methods in stock prices forecasting.

Human face gender identification using Thepade's sorted N-ary block truncation coding and machine learning classifiers

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Abstract: Human face gender identification is increasingly gaining popularity because of exponential interest in ubiquitous and pervasive computing. The computing embedded in environment can feel the person's presence and as per person being male or female, may induce certain decisions with help of ubiquitous computing devices to make environment suited to person. The challenge of detecting a face is male or female is very trivial due to similarity of features. This work presents use of Thepade's Sorted Block Truncation Coding N-ary (TSBTC N-ary) for face feature extraction and further deploys machine learning classifiers to identify face as male or female. In proposed face gender identification, TSBTC N-ary is explored with six combinations (from two-ary to seven-ary) for face feature extraction with fourteen machine learning classifiers giving 96 variations; tested using Faces94-dataset. Classification accuracy is used as performance measure. Overall Random Forest gives best performance and TSBTC-7ary outperforms other feature extraction variations.

Keywords: gender identification; machine learning classifier; Thepade's sorted BTC N-ary; TSBTC N-ary.

Image Hashing Using DWT-CSLBP

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Abstract: Center Symmetric Local Binary Pattern (CSLBP) is widely used in texture and object detection, but its utilization in image hashing is still limited. Image hashing is a powerful technique to identify whether image content is changed or preserved. Two main issues in image hashing are its compact length and its robust discrimination power. To deal with these issues, a robust image hashing method is proposed by combining features of CSLBP and Discrete Wavelet Transform(DWT). CSLBP is applied on LL band of DWT for compact length hash. Discrimination power of hashing is enhanced by weigh factor which comprises information from all sub bands of 1-Level DWT. All sub-band images of 1-Level DWT is combined to form secondary image. Local statistical features like Standard Deviation and Magnitude Average are calculated to obtain local weight factor MASD (Magnitude Average and Standard Deviation). Weighted LL-CSLBP histogram is constructed using this weight factor. Experimental results are demonstrated with Receiver Operating Characteristics (ROC) and Normalized Hamming Distance (NHD). The results shows that, the proposed scheme is robust against content preserving operations and sensitive to malicious operations.

Key words: Authentication, image hashing, discrete wavelet transform (DWT), center symmetric local binary pattern (CSLBP), double bit quantization (DBQ).

1. Introduction

With the prevalent use of internet, data protection has become an important issue. Malicious data manipulation has serious consequences in various sensitive fields like legal matters, scientific research, forensic investigations and government documents [1], [2].

After capturing multimedia data like image and video, post processing operations on multimedia data are common. These operations are generally subject oriented like gamma correction, contrast change or JPEG compression etc. to improve the quality of the image. The purpose behind post processing is twofold, unintentional and intentional. Unintentional operations preserve information content, only allows change in appearance. Intentional lead to malicious operations which results in original content change. The idea behind image hashing is to identify content preservation. Image hashing is convenient for multimedia data. For text data authentication, Cryptographic hashing is suitable option which plays important role in applications like data integrity, password authentication etc [3]. Multimedia data is generally prone to changes. Image hashing allows free changes to content preserving and confines to original content change.

Image hashing algorithm should satisfy the following important properties: (i) Perceptual sensitivity/robustness: Hash algorithm should be robust to content preservation (visually akin) and sensitive to content change. (ii) Discerning competence: Similar images have similar hash value and vice

COMPOSITION OF WEB SERVICES USING ANT COLONY ALGORITHM

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Abstract— Automatic composition of Web services by demand is one of troublesome issues in the field of Web services. We explore Web services and Ant Colony (AC) algorithm and propose a technique for composition of Web services (ACAC) , that depends on Ant Colony Algorithm. We achieve web service discovery and integration by using keyword matching between particular interactions and web service descriptions. The web services are discovered based on the input query from the user, which are then sorted, and a graph of input and output of Web services utilizing this technique is created. Then ant colony algorithm is applied on this graph. After that the composition of Web services is executed by finding a satisfying best path in the graph. It builds simulation model based on services composition, and sets multiple pheromones and pheromone weights to denote the preference of a service. So AC algorithm is used for efficient composition of Web services and optimal solution is been executed. Finally, ACAC is tested with a test set and the outcomes will demonstrate that the algorithm can effectively compose the Web services and is likewise ready to guarantee the quality and productivity of composition.

Keywords— Ant Colony Algorithm, Pheromones, Web Service, Web Service Composition

I. INTRODUCTION

These days many enterprises publish their application functionalities on the internet. These new generations of applications are more efficient and are available for business. In reality, more and more applications make different functionalities available. However, there are many services around the web having a limited utility individually.

The basic web services communications are done through simple interactions between a client and a web service. If the implementation of a web service's business logic involves the use of other web services, it is necessary to combine the functionality of several web services. This is known as a composite service. Service Composition is the method of developing a composite service. Service composition can be either performed by composing simple or composite services. For example, if a user wants to travel, it is not adequate to book only a flight but also other services like hotel booking, car rentals, and entertainment are essential. The user needs to execute all these services manually and these tasks are time and effort consuming [9]. Hence, the need of composite services arises, to be used as a collection of services combined to achieve a particular goal. Thus different web services are combined together to provide a simple user-friendly interface.

Before initiation of the composition mechanism, the essential web services that address the given query need to be identified. In today's age, there are many functionally similar services accessible on the internet which will be retrieved by the discovery mechanism wherein actually only one of them will be used in the composition. After discovery stage, a set of candidate services are found. From the vast number of discovered web services, the most appropriate service to complete the user's requirement needs to be selected. This process of selection of the elements of a compound web service needs to be an adaptive process. There may be a contrast in the optimization results of the services based on different features, so we are involved with a multi-objective optimization. As there are a large number of web services involved, each composed of different multiple criteria and there is no preference weight given to them, more than one tradeoff solution can be found. This issue can be resolved by using a multi-objective approach.

During the process of composition of web services, the business logic of the client can be implemented by several services. This allows the definition of more and more complex applications by increasingly combining components at higher levels of abstraction. A client invoking a composite service can itself be exposed as a web service.

II. PROBLEM DEFINITION

The proposed approach is illustrated by using Internet Protocol (IP) address locator system as an application example. This scenario illustrates typical web services composition problems.

There are totally nine web services. The IP address service is developed using two atomic services (which are not composed) each executing a task independently. A city to zip code finder, currency information service, latitude-longitude converter, Google map service, is the other services used for composition. A task can be described as an activity that applies to a specific domain. In this work, activity and task are considered as the same things. There are five tasks that will be executed by nine services.

A planner determines the execution order of these nine tasks depending upon the request received. There are many services discovered in the discovery process that can execute a given task. After the composition of tasks from the candidate web services, optimization takes place using ant colony algorithm. Optimization is required to find out the shortest path in the tree created from the feature extraction model. And only those web services constituting the shortest and optimal solution would be executed.

CrossMark

Improved design of CELC meta-resonators for bandwidth improvement and miniaturization of patch antenna

Bhavna Thakur[1] · Ashwini Kunte[1]

Abstract

For metamaterial resonators, the essential figure of merit is its effective medium ratio (EMR), which is defined as the ratio of the resonant wavelength and lattice constant. In this paper, an altered topology of the electric-inductive–capacitive (ELC) metamaterial with an improved EMR is proposed. The proposed structure shrinks the electrical footprint of the conventional ELC resonator by accommodating additional inductance by meandering the arms of the resonator and fitting interdigital capacitors in the capacitive gap. The metamaterial properties of the proposed structure are investigated by parameter extraction, and analytical formulations are carried out for finding its resonant frequency. The proposed metamaterial structure is employed for performance enhancement and miniaturization of a standard patch antenna. A 3×4 array of the modified complementary resonators is etched in the ground plane of a patch antenna. A significant 293% improvement in bandwidth, with a miniaturization factor (unloaded frequency/loaded frequency) of 1.33 is achieved. The entire antenna resides in a small area of 37.5 mm $\times$ 37.5 mm. The design is substantiated both by simulation and experimental results, which complement each other. The presented design can be used for Mobile WiMAX (2.5–2.69 GHz) applications.

1 Introduction

Metamaterials are man-made materials created by sub-wavelength sized, typically periodically arranged unit cells called 'meta' atoms. The arrangement of these unit cells influences the material properties, rather than its chemical constituent atoms. These artificial materials exhibit uncommon and fascinating properties such as negative permittivity and permeability, negative refractive index and have extensive applications in directive emission [1], invisibility cloaks [2], filters [3], absorbers [4] and super lenses [5]. Electrically small metamaterial resonators like split ring resonators (SRR) and complementary split ring resonators (CSRRs) have been employed extensively for performance improvement and miniaturization of antennas [6, 7]. The SRR and CSRR are bianisotropic elements, having complex electromagnetic behaviour due to coupled electric and magnetic responses. Besides, the SRR or CSRR can couple only to

the magnetic and electric field perpendicular to its plane, restricting their use for specific orientations. On the other hand, the electric-inductive–capacitive (ELC) resonator and its complementary magnetic structure, the complementary electric-LC (CELC) are more suitable for designing electrically small antennas (ESAs), as they are highly symmetric structures and do not exhibit any magneto-electric coupling. Further, these can couple to both orthogonal and parallel fields. The ELC has a primary resonance which is electric, due to the two conducting loops in its structure which disallow magnetic resonance.

Metamaterials can work as 'real' materials, if they are effectively homogeneous, that is, the guided wavelength is much greater than the average lattice constant. The ratio of the operating wavelength λ_0 to the unit cell dimension a of a resonator (EMR) is a significant parameter for the proper functioning of the meta-resonators. In the effective medium regime, the parasitic diffraction losses that are unavoidably present in these structures can be avoided if the EMR is greater than 4 [8]. Novel structures with improved EMR and homogeneity have been designed. Schurig et al. [9] proposed an electrically coupled LC resonator with a ε-negative (ENG) response, which had λ_0/a of 5.7 using inductor loading. The EMR was further improved to a value of 10.2 by replacing the capacitive gap in the ELC resonator

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Tri-Stepped Rectangular Antenna (TSRA) for Efficient RF Energy Harvesting

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Abstract—**Although the worldwide demand for energy is increasing rapidly, the availability of current traditional resources (such as atomic and thermal power) is insufficient. Hence, artificial (man-made) energy sources are required. Advancements in wireless technology have raised the radio frequency (RF) levels in the environment. These RF waves are available at all times, unlike natural resources such as solar, hydro, and wind energy. The energy requirement and consumption of electronic devices have also been reduced over last decade. Hence, harvesting energy from RF waves and driving low-power devices are the simplest solutions. In the current work, a simplified monopole antenna, called a tri-stepped rectangular antenna for RF harvesting, is proposed. Here, the regular rectangular structure is modified to a step-like structure to achieve impedance matching and maximize the omni-directional gain at all mobile frequencies. This antenna functions with the LTE B5 (850), GSM900, GSM1800, 3G, 4G, and ISM (2.4 GHz) systems. We have also demonstrated a proof-of-concept of energy harvesting using RF waves generated by mobile towers and Wi-Fi devices. The system can generate up to 12 mV (14.4 mW) and could charge a battery of rating 3.7 V, 500 mAh. We anticipate this harvested energy to be used in driving the WSN node, Bluetooth devices, and mobile charging.**

Keywords—**RF harvesting, multiband antenna, tri-stepped rectangular antenna**

I. INTRODUCTION

The antenna is the most important part in a radio frequency (RF) energy module. It converts the received electromagnetic signal to AC sinusoids. These AC sine waves are further processed by a rectifier circuit to obtain DC power. The harvesting antenna must have considerable aperture, high gain, high efficiency, and omnidirectional radiation pattern over a wide bandwidth. A good antenna design improves the overall system performance. Among the proposed RF energy harvesting antennas such as a dipole[1], monopole[2], and helix[3], the printed microstrip antenna provides miniaturization and is thus preferred.

Mobile signal is available at all times. In an urban area, the received signal strength is approximately −20 dBm to −40 dBm (10 μW to 0.1 μW) at a distance of 25∼100 m[4]. As our focus is on energy harvesting in India, we have considered the mobile frequency bands used in India. In India, cell towers transmit in the frequency ranges of LTE B5 (850), 935∼960 MHz in GSM 900, 1 810∼1 880 MHz in GSM 1800, and both 2 100 MHz and 2 300 MHz in 4G bands[5,6]. There are more than 400 000 mobile towers in India[7]. Approximately four service providers are available on a single tower and generally three to four carriers exist per service provider. Each carrier transmits 10 W to 20 W; therefore, the total transmitted power from a cell tower crosses 0.5 kW. The histogram in Fig. 1 shows that the frequencies used by the telecommunication companies in India are 850 MHz, 900 MHz, 1 800 MHz, 2 100 MHz, and 2 300 MHz. Fig. 1(a) shows that most service providers use the 1 800 MHz frequency. Therefore, we designed an antenna with 1 800 MHz as the center frequency.

In this study, we have designed a novel tri-stepped rectangular antenna, which is useful for RF energy harvesting.

II. METHODOLOGY

A. Consumables, Equipment, and Chemicals

A double-sided printed circuit board (PCB) of FR4 glass epoxy of size 200 mm × 200 mm × 1.59 mm and ceramic capacitors (3.3 nF, 1.5 nF, 820 pF, and 390 pF) were obtained from Vegakit in Mumbai, India. $FeCl_3$ (157740-5G) was obtained from Sigma-Aldrich (MeRCK), India. The HSMS 2822 diode was obtained from Mouser electronics, Bangalore. A 3.7 V 500 mAh battery (KP 631938P) and LEDs were bought locally. All the frequencies were measured with a spectrum analyzer (3 GHz) acquired from GW Instek, Taiwan, China.

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Fabric Defect Detection Adopting Combined GLCM, Gabor Wavelet Features and Random Decision Forest

Nilesh Tejram Deotale · Tanuja K. Sarode

Abstract   In image analysis and pattern recognition activity, one of the most salient characteristics is texture. The global region of images in spatial domain has an enhanced processing effect with the help of co-occurrence matrix and in the frequency domain for the admirable performance such as multi-scale, multi-direction local information is obtained from Gabor wavelet. The consolidation of gray-level co-occurrence matrix and Gabor wavelet is utilized to fabric image feature texture eradication. In classification phase, random decision forest (RDFs) Classifier is applied to classify the input fabric image into defective or non-defective. RDFs are a novel and outfit machine learning strategy which fuses the element choice. Nevertheless, RDFs exhibit a lot of advantages when compared with other modeling approaches within the category. The main advantages are, RDFs can handle both the continuous and discrete variables, RDFs does not overfit as a classifier, and run quick and productively when taking care of expansive datasets.

Graphical Abstract   In this paper the consolidation of gray-level co-occurrence matrix (GLCM) and Gabor wavelet is utilized to fabric image feature texture eradication. In classification phase, random decision forest (RDFs) classifier is applied to classify the input fabric image into defective or non-defective.

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RESEARCH ARTICLE

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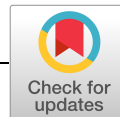
Some results on the Ryser design conjecture

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Abstract

A Ryser design has equally many points as blocks with the provision that every two blocks intersect in a fixed number of points λ. An improper Ryser design has only one replication number and is thus symmetric design. A proper Ryser design has two replication numbers. The only known construction of a Ryser design is the complementation of a symmetric design. Such a Ryser design is called a Ryser design of type 1. Let $\mathcal{D}$ denote a Ryser design of order v, index λ and replication numbers r_1, r_2. Let e_i denote the number of points of $\mathcal{D}$ with replication number r_i (with $i = 1, 2$). Call a block A small (respectively large) if $|A| < 2\lambda$ (respectively $|A| > 2\lambda$) and average if $|A| = 2\lambda$. Let D denote the integer $e_1 - r_2$ and let $\rho > 1$ denote the rational number $\frac{r_1 - 1}{r_2 - 1}$. Main results of the present article are the following. For every block A, $r_1 \geq |A| \geq r_2$ (this improves an earlier known inequality $|A| \geq r_2$). If there is no small block (respectively no large block) in $\mathcal{D}$, then $D \leq -1$ (respectively $D \geq 0$). With an extra assumption $e_2 > e_1$ an earlier known upper bound on v is improved from a cubic to a quadratic in λ. It is also proved that if $v \leq \lambda^2 + \lambda + 1$ and if ρ equals λ or $\lambda - 1$, then $\mathcal{D}$ is of type 1. Finally, a Ryser design with $2^n + 1$ points is shown to be of type 1.

KEYWORDS
Ryser design

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05B05; 51E05; 62K10