SANKALCHAND PATEL UNIVERSITY

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FOR A BETTER TOMORROW

VOLUME : 01

Issue : 01

January - 2024

SANKALCHAND PATEL UNIVERSITY

JOURNAL OF SCIENCE, TECHNOLOGY AND MANAGEMENT RESEARCH

(SPU-JSTMR)

RESEARCH JOURNAL

Sankalchand Patel University Journal of Science, Technology and Management Research (SPU-JSTMR)

Peer–Reviewed Journal

Volume- I, ISSUE-01, January-2024

Chief Editor(s)

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Date: 30.01.2024

FOREWORD

Sankalchand Patel University has my gratitude and pleasure to release the first volume of the journal, "**SPU Journal of Science, Technology, and Management Research**". I take great pride in this journal's services, which particularly benefit students, researchers, and educators in the fields of science, technology, and management. This magazine publishes articles with theoretical frameworks and application scopes that meet the cutting-edge requirements of science, technology, management, fashion design, and commerce fields.

This journal stands as a testament to the relentless pursuit of knowledge, the dedication of our scholars, and the commitment to excellence that defines our institution. The articles within this first volume represent a diverse array of groundbreaking research, innovative ideas, and thought-provoking insights that showcase the intellectual vitality of our academic community. I encourage each member of our community to engage with the contents of this journal, fostering dialogue, collaboration, and further exploration of the ideas presented. The SPU Journal is a platform for the exchange of knowledge and the cultivation of a vibrant scholarly community, and I am eager to witness the impact it will undoubtedly have on our academic landscape.

I commend the editorial team for their meticulous work in bringing together this collection of scholarly works. I feel proud of the journal published by Sankalchand Patel University. I congratulate the Editorial team of the journal "**SPU Journal of Science, Technology and Management Research**" for making this volume-I, Issue-01 successful.

Wish you all the best for your future endeavors.

Shri Prakashbhai Patel
President

Research/Review Papers on Science, Technology and Management Research

Volume- I, ISSUE-01, January-2024

Peer –Reviewed Journal

Published by : Sankalchand Patel University, Visnagar 384315, India

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Editor, SPU-JSTMR, Sankalchand Patel University, Visangar 384315, India through
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EDITOR'S NOTE

The university is pleased to release the first volume of the journal, **"SPU Journal of Science, Technology and Management Research (SPU-JSTMR)**" which features research and review papers authored by students, professors and researchers from various Institutions. This journal brings research articles in Interdisciplinary fields and due focus is given to science, technology and management areas. The Sankalchand Patel University Journal of Science, Technology and Management Research (SPU-JSTMR) facilitates the rapid dissemination of original theoretical and applied research findings from a variety of disciplines, including Engineering, Science, Commerce, Management, Computer Applications and Fashion Design.

The papers may contain original research contributions such as state-of-the-art literature reviews, mathematical analyses, mathematical modeling and simulation analyses, design procedures, computer flowcharts and programs, real-world implementation, hardware realization in science and technology, and management case studies in all published articles and research papers in their entirety.

The present volume carries 09 articles written by research scholars and professors of Science, Technology and Management disciplines. We sincerely express our gratefulness to Honourable President Shri Prakashbhai Patel, Honourable Provost (I/C), Prof. (Dr.) Prafulkumar Udani for all their support in undertaking the publication of research articles and perfectly completing the task. We sincerely express our thanks to the Honourable Director, Prof. (Dr.) Hetalkumar Shah for unprecedented guidance from inception to the publication of this volume. We thank editorial board members and reviewers for providing fruitful comments for revising and improving the research paper's quality. We thank to scholars and professors for their valuable papers submitted for publication in the journal.

Dr. Rajesh P. Patel

Dr. Hitesh H. Mehta

CONTENTS

Advancements in Coordination Chemistry: A Comprehensive Review on the Synthesis and Characterization of Transition Metal Complexes with 4-Amino-5-pyridyl-4H-1, 2, 4-triazole-3-thiol Ligands

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Abstract: This review paper provides a comprehensive examination of recent developments in coordination chemistry, focusing on the synthesis and characterization of transition metal complexes incorporating 4-Amino-5-pyridyl-4H-1,2,4-triazole-3-thiol ligands. The investigation delves into the diverse methodologies employed for the synthesis of these complexes, encompassing various transition metals and reaction conditions. A detailed analysis of the structural features, spectroscopic properties, and potential applications of the synthesized complexes is presented. The paper aims to offer valuable insights into the design, synthesis, and understanding of the properties of these transition metal complexes, shedding light on their significance in the realm of coordination chemistry and their potential applications in catalysis, medicine, and materials science.

Keywords: Amino-5-(pyridyl)-4H-1, 2, 4-triazole-3-thiol Metal complexes, Spectral analysis, Nuclear Magnetic Resonance, Magnetic Susceptibility.

I. INTRODUCTION

Heterocyclic chemistry, a distinct field with a rich history, plays a crucial role in contemporary society and holds promising prospects for the future. Nitrogen, oxygen, and sulphur are recognized as key hetero atoms. Among heterocyclic compounds, triazoles, specifically 1,2,3-triazoles and 1,2,4-triazoles, are noteworthy due to their relevance in drugs and industrial studies. Triazoles, comprising five members with the molecular formula C2H3N3, have been extensively studied for their diverse applications. Notably, amine and thione-substituted triazoles exhibit anti-inflammatory and antimicrobial properties. Triazoles are esteemed as effective coordinating ligands, featuring both hard nitrogen and soft sulphur atoms. Their coordinating sites include the sulphur of thiol groups, nitrogen of primary amino groups, and two nitrogen atoms in the triazole ring system. This polydentate ligand forms stable five-membered rings through bidentate coordination to metal ions, leading to chelate complexes known for their enhanced stability.

The paper outlines the preparation and characterization of copper (II), nickel (II), zinc (II), cadmium (II), and tin (II) complexes with 4-amino-5-(pyridyl)-4H-1,2,4-triazole-3-thiol.

II. MATERIALS AND METHODS

All reagents, starting materials, and solvents were commercially purchased and used without additional purification. Melting points were determined using a Coslab melting point apparatus. Elemental analysis for carbon (C), hydrogen (H), nitrogen (N), and sulphur (S) was conducted with a Fison EA 1108 analyzer. Infrared (FTIR) spectra were recorded using an FTIR 8300 Shimadzu spectrophotometer with a CsI disc in the frequency range of 4000–200 cm^-1. UV–visible (UV–VIS) spectra were obtained with a Shimadzu UV–VIS 160 A-Ultra-violet spectrophotometer in the range of 200–1100 nm. Magnetic susceptibility values were measured at room temperature using a Magnetic Susceptibility Balance from Johnson Matthey. Conductivity measurements were performed using a WTW conductivity meter. Atomic absorption measurements were acquired with a Shimadzu 680 cc-flame instrument. 1H and 13C NMR spectra were recorded on a Bruker Ultrasheild 300 MHZ in Jordan, utilizing deuterated DMSO-d6 as the solvent and tetramethylsilane (TMS) as the internal standard.

A. Synthesis of 4-Amino-5-(pyridyl)-4H-1,2,4-triazole-3-thiol (ligand)

A mixture containing 1 gram of is nicotinic acid (0.0072 mol) and 0.44 grams (0.008 mol) of potassium hydroxide dissolved in 10 ml of ethanol. After complete dissolution, 2 ml (0.014 mol) of carbon disulphide was slowly added. The reaction mixture

was stirred for 10 hours. To this, 10 ml of dry ether was added, resulting in a yellow precipitate, which was filtered, washed with ether, and dried. The obtained salt was nearly quantitatively yielded and used for the subsequent step. The yellow precipitate (potassium salt) was combined with an excess of hydrazine hydride (20 ml) and refluxed with stirring until the evolution of hydrogen sulphide ceased, confirmed by lead acetate paper. After cooling, the reaction mixture was filtered, and Hydrochloric acid was added for acidification, yielding a white precipitate (Siddiqui et al., 2010). The overall yield was 62%, and the melting point was in the range of 210–212 °C.

B. Synthesis of Complexes

To synthesize complexes of this ligand, an ethanolic solution containing suitable metal salts [Copper (II) acetate, Tin (II) Chloride, Zinc (II) acetate dihydrate, Cadmium (II) acetate, and Nickel (II) acetate] was combined with an ethanolic solution of 4-amino-5-(pyridyl)-4H-1,2,4-triazole-3-thiol in a 1:2 (metal:ligand) molar ratio. The mixture was refluxed for two hours, resulting in the formation of crystalline-colored precipitates at room temperature. The obtained solids were washed with hot methanol, allowed to dry, and then recrystallized from ethanol (Majeed et al., 2004).

III. RESULTS AND DISCUSSION

A. Elements analysis

The melting points and physical properties of all the compounds under investigation are presented in Table 1. CHNS data were obtained using the flame atomic absorption technique, and the calculated values align well with the experimental results. The physical analytical data, including melting points and elemental analysis, for the ligand (L) and its complexes are summarized in Table 1.

TABLE I
PHYSICAL DATA OF PREPARED COMPLEXES

Complexes	Colour	M.P.	Elemental analysis theoretical (Experimental)				
			% C	% H	% N	% S	% M
L	White	212–214	45.91(46.23)	5.30(5.75)	33.47(33.82)	15.32(14.98)	--
Ni(L)2 1	Green	240–242	40.01(39.22)	5.25(4.11)	29.16(30.01)	13.35(13.73)	12.22(12.28)
Cu(L)2 2	Dark green	222–224	39.61(40.21)	5.19(5.89)	28.87(29.32)	13.22(13.58)	13.10(16.02)
Zn(L)2 3	Off white	178–180	39.46(40.05)	5.17(6.13)	28.76(29.30)	13.17(13.52)	13.43(17.28)
Cd(L)2 4	White	255–257	35.99(40.25)	4.72(5.25)	29.23(28.88)	12.01(12.52)	21.05(23.85)
Sn(L)2 5	Yellow	230–232	35.57(35.12)	4.66(4.85)	25.93(25.54)	21.97(21.55)	21.97(6.152)

B. Infrared Spectroscopy

The FTIR spectrum of the ligand (L) displayed characteristic stretching bands at 3250 and 3213 (NH2), 2736 (S-H), 1645 (C = N of triazole ring), and 673 (stretching of C-S bond). Similar bands were observed in complexes 1-5, as reported in various studies. The triazole structure may exist in a tautomeric form (see Figure 1). Deprotonation before complexation is indicated by the complete disappearance of the band related to ν(S-H) in complex spectra. After deprotonation, the ligand can bind with the metal ion either through N or S of the thioamide group. Bonding at S is favored, forming a stable five-membered chelate.

An exception is observed in the n(C = N) bands of complexes 1-5, which shift to a lower wavelength compared to the ligand (L), suggesting coordination via the nitrogen atom of the ligand. The NH2 bands also shift due to complexation. The disappearance of the S-H band and the shift of C-S and C = N bands indicate changes in bond orders and complexation through sulphate. New bands appear, supporting the frequencies of M-S, M-N bonds. The significant IR bands and their likely assignments are summarized in Table 2 (Flifel and Kadhim, 2012; Cheremisina et al., 1972; Qurban, 2011; Yousif et al., 2004)

TABLE II
KEY INFRARED DATA OF L AND COMPLEXES 1–5

Complexes	NH2	-S-H	C = N	C-S	M-N	M-S
L	3250, 3213	2736	1645	673	-	-
Ni(L)2 1	3280, 3228	-	1643	690	530	459
Cu(L)2 2	3321, 3286	-	1620	694	532	428
Zn(L)2 3	3329, 3286	-	1640	694	529	432
Cd(L)2 4	3440, 3391	-	1639	693	528	451
Sn(L)2 5	3200, 3165	-	1643	690	528	451

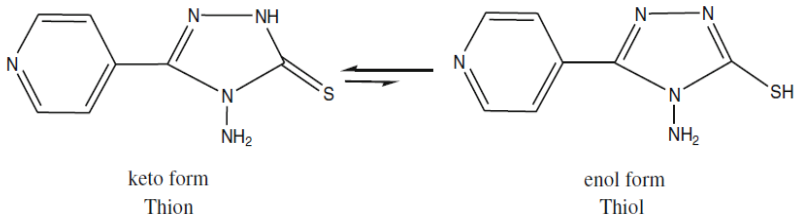

Fig.1. Tautomerism form in triazole

C. Nuclear Magnetic Resonance

The 1H NMR and 13C NMR data for 4-amino-5-(pyridyl)-4H-1,2,4-triazole-3-thiol and its complexes showed good solubility in DMSO. The proton nuclear magnetic resonance spectra provided additional confirmation of the complex compositions. The observed changes in the spectra indicate that complexation has occurred, as the chemical shift of a compound is strongly influenced by its electronic environment (Yousif et al., 2010; Ibraheem et al., 2010; Cos-kun, 2006).

i. Ligand

The 1H NMR data (ppm) for the ligand in DMSO-d6 at 300 MHz reveals signals at 5.301 (2H, s, NH2), 8.014, 8.025-8.744, 8.755 (4H, d, d, CH aromatic ring), and 10.189 (1H, s, SH). The 13C NMR shows chemical shifts at 121.564 (carbon a), 150.133 (carbon b), 132.891 (carbon c), 147.308 (carbon d), and 167.551 (carbon e) (See Figure 2).

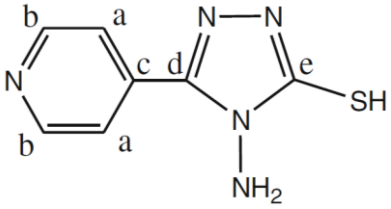

Fig.2. The structure of ligand

ii. Complex 1

The 1H NMR data (ppm) for Complex 1 in DMSO-d6 at 300 MHz reveals signals at 3.314 (2H, s, NH2) – this peak is shifted to a lower field due to its attachment to the zinc atom, 7.945, 8.014-8.739, 8.678 (4H, d, d, CH aromatic ring), and 11.099 (1H, s, NH). The 13C NMR shows chemical shifts at 125.001 (carbon a), 149.583 (carbon b), 134.991 (carbon c), 155.683 (carbon d), and 183.548 (carbon e) (See Figure 3)

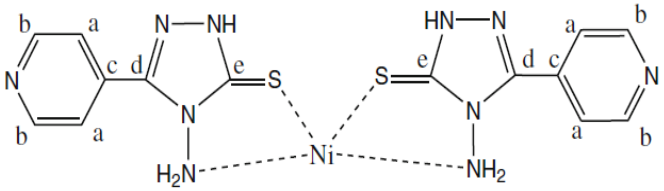

Fig.3. The structure of complex 1 Ni(L)2

TABLE III
1H NMR DATA OF L AND METAL COMPLEXES 1,3 AND 4 IN DMSO-D6COMPLEXES
(C-H AROMATIC, NH2, S-H N-H)

L	(8.014,8.025-8.744,8.755)d,d(5.301)s (10.189)s
Ni(L)2	(7.945,8.014-8.739,8.678)d,d(3.314)s -(11.099)s
Zn(L)2	(8.024-8.702)m (3.354)s- (10.012)s
Cd(L)2	(7.901,7.952-8,625,8.690)d,d(3.270)s- (11.101)s

iii. Complex 2

In the 1H NMR data (ppm) for Complex 3 in DMSO-d6 at 300 MHz, signals appear at 3.354 (2H, s, NH2) – this peak is shifted due to its attachment to the metal atom, 8.024-8.702 (4H, m, CH aromatic ring), and 10.012 (1H, s, NH). The 13C NMR shows

chemical shifts at 121.705 (carbon a), 149.322 (carbon b), 134.035 (carbon c), 158.297 (carbon d), and 180.114 (carbon e) (See Figure 4).

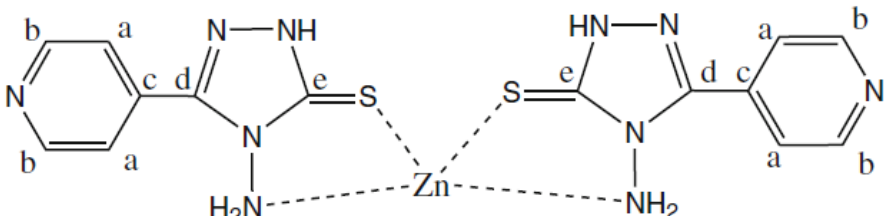

Fig. 4. The structure of complex 3 Zn(L)2

iv. Complex 3

In the 1H NMR data (ppm) for Complex 4 in DMSO-d6 at 300 MHz, signals are observed at 3.270 (2H, s, NH2) – for the reason mentioned above, 7.901, 7.952-8,625, 8.690 (4H, d, d, CH aromatic ring), and 11.101 (1H, s, NH). The 13C NMR shows chemical shifts at 120.992 (carbon a), 149.603 (carbon b), 134.036 (carbon c), 150.297 (carbon d), and 187.329 (carbon e) (See Figure 5).

Tables 3 and 4 provide the 1H NMR and 13C NMR data for L and metal complexes 1, 3, and 4 in DMSO-d6, including chemical shift, δ (ppm).

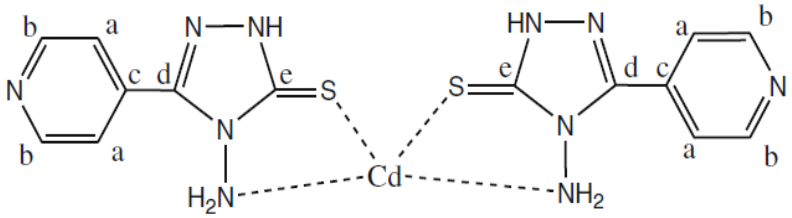

Fig.5. The structure of complex 4 Cd(L)2

TABLE IV

13C NMR DATA OF L AND METAL COMPLEXES 1, 3 AND 4 IN DMSO-D6 CHEMICAL SHIFT, D (PPM)

L	121.564 150.133 132.891 147.308 167.551
Ni(L)2	125.001 149.583 134.991 155.683 183.548
Zn(L)2	121.705 149.322 134.035 158.297 180.114
Cd(L)2	120.992 149.603 134.036 150.297 187.329

D. Ultraviolet-visible Spectroscopy

The absorption spectra of the ligand (L) and its complexes were recorded in DMSO solvent within the range of 250–900 nm. The electronic spectra of (L) and its complexes are summarized in Table 5. The ligand's electronic spectra display three bands at 263, 302, and 309, corresponding to intraligand transitions (π-π*), (π-π*), and (n-π*) electronic transitions, respectively. Complexes 1–5 also exhibit similar electronic transitions with shifts compared to the ligand (L).

For complexes 1 and 2, additional electronic transitions of metal d orbitals (d-d electronic transitions) were observed in the visible region for Ni(II) and Cu(II). In Ni(II), the d-d electronic transition appeared at 620 nm, assigned to the 3 T1(F) → 3 T1(P) and 3 T1(F) → 3A2(F) transitions. For Cu(II), bands at 280, 300, 312, and 451 nm were attributed to (π-π*), (n-π*), charge transfer, and 2 T2→2E2 transitions, respectively. However, complexes 4, 5, and 6 were diamagnetic, as expected for d10 ions, with no (d-d) transition expected in the visible region (Chohan, 2009).

TABLE V

ELECTRONIC SPECTRA OF PREPARED COMPOUNDS

Complexes	Absorption Transition
L	263, 302, 309 (π-π*), (π-π*), (n-π*)
Ni(L)2	262, , 610 (π-π*),3 T1(F) →3 T1(P)
Cu(L)2	280, 300, 312, 451(π-π*), (n-π*), L→Cu(CT), 2 T2→2E2
Zn(L)2	264, 300, 310 (π-π*), (π-π*), (n-π*)
Cd(L)2	262, 310 (π-π*), (n-π*)
Sn(L)2	265, 310 (π-π*), (n-π*)

Here (*) symbol means the excited states

E. Magnetic Susceptibility and Conductivity Measurements

Magnetic measurements are commonly used to study transition metal complexes, where the presence of unpaired electrons in the partially filled d-orbitals contributes to their magnetic properties. Complex 1 exhibited a magnetic moment value of 1.09 B.M., indicating paramagnetic. Complex 2, with a magnetic moment value of 0.7 B.M., is believed to have a copper (II) metal moiety with distorted square planar geometry (Win et al., 2011). Complexes 3–5 are diamagnetic, with no recorded magnetic moment in this study (Chohan, 2009).

Conductivity measurements were conducted on these complexes in ethanol solvent to determine if the solutions were electrolytes. Table 6 presents the molar conductivity measurements of complexes 1–5, revealing that all the prepared complexes are non-electrolytes (Majeed et al., 2010).

According to the spectral study, complexes 1–5 exhibit distorted tetrahedral geometry, except for complex 2, which has a distorted square planar structure (Foo et al., 2013). The proposed structures of complexes 1–5 are illustrated below (See Figure 6).

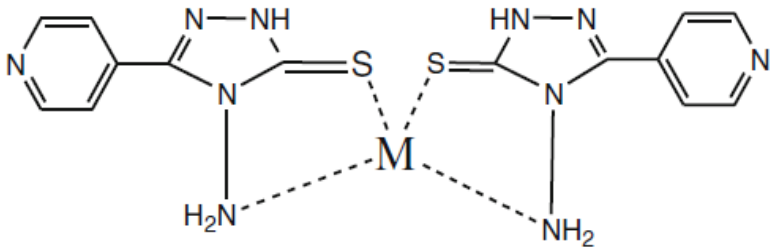

Fig. 6. The proposed structure of complexes 1–5

(Where M=Ni(II), Cu(II), Zn(II), Cd(II) and Sn(II))

TABLE VI

CONDUCTIVITY MEASUREMENT AND MAGNETIC MOMENT OF LAND ITS COMPLEXES

Complexes	Conductivity (μS/cm)	Magnetic moment
L	-	-
Ni(L)2	3	1.09
Cu(L)2	1	0.7
Zn(L)2	3	4.0
Cd(L)2	2	2.0
Sn(L)2	1	12.0

IV. CONCLUSION

The synthesis of the ligand 4-amino-5-(pyridyl)-4H-1,2,4-triazole-3-thiol was successful, and it was used to form complexes with various metal ions. The coordination of the ligand involved both amino and thiol groups, resulting in the creation of a five-membered ring chelate. The copper complex was suggested to have a square planar geometry, while the other complexes were proposed to exhibit a tetrahedral geometry.

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Exploring Financial Literacy Levels: Insights from College going Students of Gujarat State

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Abstract: Financial literacy is crucial for the advancement of financial inclusions and, ultimately, for ensuring financial stability in India. Financial literacy is a change agent for financial inclusion, according to the RBI's agenda. Increasing public awareness of financial products and services is RBI's aim. The daily financial market will grow increasingly complex since financial products and services are a concern. Which role do the pupils play? Do they have the requisite skills to make sound financial decisions? Can they anticipate their demands in terms of money? How do they take care of their money needs? Educating yourself on finances is one way to answer their questions. A researcher employing a simple random sample technique is looking into the level of financial literacy among college students of Gujarat. Students performed averagely in financial knowledge and, the researcher concluded that their level of financial literacy is average. Financial planners and friends have less of an influence on financial understanding than environmental factors like parents and life. Correlating with Students' average financial literacy with financial attitude and behavior, it shows a significant influence on their financial attitude and behavior.

Keywords: Financial Literacy, Financial Knowledge, Financial Behaviour, Financial Attitude.

I. INTRODUCTION

Financial Inclusion has turned out to be a subject of significant interest among policymakers & researchers. The RBI has developed adapted financial literacy content for five target groups' including Farmers, Which can be worn by the trainers in financial literacy programs.(RBI, RBI). For financial inclusion, Banking is one of the important pillars and Indian Banking systems consist of public/public/foreign/ RRBs/ cooperative (rural and urban) sector banks. When financial and banking systems grow continuously with digitization, also increase financial products and services, with a wide scope of employment generation. Hence it is important to know where the youth of the country stand in this era. In the entire where the youth of India stand, are they ready to enter in financial market or service? Are they aware of all financial products or services available in the market? Are they aware of current Banking and its relatedness with his life? To know the answer to all the above questions, the researchers would like to know the level of financial literacy among college students in Gujarat.

II. LITERATURE REVIEW

Financial literacy encompasses three key components: financial knowledge, financial behavior, and financial attitude. The word "financial knowledge" describes one's comprehension of financial terms, concepts, and principles. It entails understanding financial concepts such as financial planning, debt management, investing, saving, and budgeting. Strong financial knowledge increases a person's ability to comprehend the consequences of financial products, make wise financial decisions, and successfully handle challenging financial circumstances. This section concentrates on an individual's knowledge of finance, including knowledge of interest rates, risk diversification, tax consequences, and financial regulations.

The decisions and behaviors people take with relation to their finances are referred to as financial behavior. It covers how they handle debt, save, invest, and make spending decisions. Consistent saving, cautious investing, prudent spending, and debt management are examples of positive financial behaviors. Negative financial practices, on the other hand, can result in excessive debt, overspending, or insufficient savings. One's financial well-being can be greatly impacted by their financial conduct, which is an expression of how one applies their financial knowledge in real-world situations.

A person's views, feelings, and behaviors about money and financial matters are referred to as their financial attitude. It covers their entire financial thinking, risk tolerance, and financial ambitions. Having a healthy relationship with money, being proactive in financial planning, and setting clear financial goals are all components of positive financial attitudes. Financial risk aversion, financial planning avoidance, and hasty spending are examples of negative attitudes. A person's attitude toward money

greatly influences their financial conduct. People who have a positive outlook are more likely to strive for their financial objectives and make wise financial judgments.

In summary, financial literacy comprises a combination of knowledge, behavior, and attitude. To be financially literate, individuals should not only acquire financial knowledge but also apply it through responsible financial behavior and cultivate a positive financial attitude. This holistic approach to financial literacy can lead to improved financial well-being and better financial decision-making.

A survey conducted by ANZ of Adult Financial Literacy in Australia analyzed covered socio-demographic variables like gender, age, education, house condition, and financial knowledge/attitudes to possibly be used to enlighten differences in people's financial literacy level. They concluded factors like financial attitudes acknowledged as dealing with money is stressful, impulsivity, financial self-efficacy, and financial aspiration.(ANZ, 2015)

A low level of financial literacy would be unreasonable to expect individuals or households to manage various kinds of risks and be accountable uncompetitive financial market (OECD, 2009). It is particularly sensitive in developing nations such as India, where there is a considerable portion of the populace with limited exposure to the official financial system despite the country's expanding economic and financial development and availability of composite financial products.

Individuals with below-average financial literacy face long-term issues that can have a significant negative impact on their financial security. In the event of a financial emergency, the average Indian has no more savings than three months' worth. Over the past few years, there has been a decline in the overall domestic savings rate, primarily as a result of higher consumer expenditure (Nayak, 2012). Furthermore, taking credit has become more common, particularly when it comes to consumption. There is a greater reliance on unofficial sources of finance, and personal debt has always existed.

The Reserve Bank of India (RBI) has been actively working to increase public financial literacy in the country. Developing the skills and confidence of consumers to become more aware of financial dangers and opportunities, to make informed decisions, to know where to go for support, and to take other effective steps to improve their financial well-being is the OECD's stated purpose (OECD, 2005). RBI established Financial Literacy and Counseling Centers (FLCC) to provide people with the knowledge and resources they need to make better credit decisions. On the other hand, the RBI survey reveals that people are not very responsive to these centers. Additionally, the centers' teaching resources don't really go beyond the advertising materials specific banks provide (Nayak, 2012). Financial education programs should focus on areas where financial competence is poor, as indicated by data on existing levels of financial understanding. Therefore, the degree of financial literacy should be a top concern for nations looking to effectively impart financial education and assess its effects at the village level. Policymakers should be able to determine demand areas for different financial literacy features and prioritize which groups of individuals most require assistance by using a number of dimension exercises (Atkinson & Messy, 2012).

A person's seeming control over their financial choices and decisions is acknowledged by financial literacy. Individuals won't exhibit established financial behaviors unless they believe they are valuable, which exposes their mindset and gives them power over these behaviors. Therefore, one may claim that, despite having financial information, an individual's attitude—which serves as the study's foundation—will determine their actual financial conduct.

III. OBJECTIVE OF STUDY

This research is based on the following objectives:

- To ascertain the college students' degree of financial knowledge, attitude, and behavior.
- To ascertain the relationship between college students' financial behavior, attitude, and knowledge.
- To investigate how environmental influences affect students' financial literacy.

IV. RESEARCH METHODOLOGY

A. Research design

The exploratory research design is used to explore the level of financial literacy among college students of Gujarat.

B. Research Population and Sampling

The researcher population is the college students of Gujarat (India). The researchers used a convenient sampling method of non-probability sampling and collected 800 student respondents from various regions of Gujarat.

C. Data Collection Instrument and Measurement

A survey was created based on the Measuring Financial Literacy questionnaire developed by the OECD. The survey was divided into five sections. The demographic factors in the first section include parent's income, education, marital status, age, gender, and field of study. Ten questions about financial attitudes are included in the second section to assess the financial attitude variable using a Likert scale. Eight questions about financial behavior are included in the third section to assess financial behavior variables on a Likert scale. Ten financial knowledge items were introduced in the fourth section to assess the financial knowledge variable. Net worth, interest rate, checks, loan and leasing agreements, credit bureau, and time value of money are among the topics covered in the questions. Every question is graded according to its percentage corrected score, with 1 mark awarded for a correct response and 0 for incorrect answers, and the outcome was transformed into a percentage of the right response. The final section covers environmental elements that affect pupils' financial literacy or awareness.

D. Hypothesis of the study

A researcher is studying hypothesis as, H_{0x} as Null hypothesis for x variable and H_{1x} as an alternative hypothesis for x variable.

1 H_{o1}: There is no significant association between financial knowledge, financial attitude & financial behavior

H_{11}: There is a significant association between financial knowledge, financial attitude & financial behavior

3 H_{o2}: There is no significant association between financial knowledge & environmental factors.

H_{12}: There is a significant association between financial knowledge & environmental factors.

E. Technique of Data Analysis

For finding correlations among variables, various methods are used. In this case, variables are qualitative as well as quantitative hence Karl Pearson correlation coefficient and Spearman Rank correlation coefficient are used at 1% level of significance test.

V. DATA PRESENTATION AND ANALYSIS

The Researcher collected 800 respondents from various regions of Gujarat (India). Out of these 47 questionnaires were not filled. Hence only 753 questionnaires were used for analysis. The questionnaire includes 58% of male and 42% female students. The majority of students, 74.4% are from the 19^{th} – 22^{nd} years of age group. 64.1 % of students are from Commerce then 23.1 % of students are from the science stream. The majority, 92.3 % of students are unmarried. 38.5 % of students' parental income is less than Rs. 1,00,000, 51.2% of Students' parental income ranges from Rs. 100000 to Rs. 500000. Only 7.7% of students' Parental income is above Rs. 10,00,000. Hence most of the students are coming from lower-income groups.

Financial knowledge (FK), financial behavior (FB), financial attitude (FA) and impact of environment on financial literacy (IFL) results are in below table 1. The student's average financial behavior is 3.41 which is more than 2.5 with a standard deviation of 0.44. It is nearly the same as the average impact environment on financial knowledge or financial literacy (IFL) is 3.86 out of 5 with a standard deviation of 0.67. Students' average of financial attitude on a scale of 3.29 out of 5 with a standard deviation of 0.57. Student's financial knowledge result is an average of 54.97% with a standard deviation of 14.95%.

Correlation between various variables includes average financial behavior (FB_Avg), average influence on financial literacy (IFL_avg), Percentage of financial knowledge (FK_Percentage), and an average of financial attitude (FA_Avg). Correlation is calculated using the Karl Pearson and Spearman Rank correlation methods. The correlation between financial knowledge and financial behaviour is 0.315, Hence with a 1 % level of significance financial knowledge and behavior is associated with each other. Knowledge influences students' behavior, both variables are partially positively correlated. The correlation between financial behavior and financial attitude is 0.348, Hence with a 1 % level of significance financial behavior and attitude are associated with each other. A student's financial behavior influences his financial attitude. Both variables are partially positively correlated. Students' financial knowledge has a positive correlation on environmental factors that influence their financial knowledge. Table 2, there is a significant association between environmental factors and financial knowledge.

TABLE I

DESCRIPTIVE STATISTICS

		FB_Avg*	IFL_avg*	FK_Percentage*	FA_Avg*
N	Valid	753	753	753	753
	Missing Values	0	0	0	0
Mean		3.41	3.86	54.97	3.29
Std. Error of Mean		0.04	0.046	1.02	0.03
Std. Deviation		0.44	0.67	14.95	0.37

*Note: FB_Avg: Average Financial behavior,
IFL_avg: Average influence on financial literacy,
FK_Percentage: Percentage of financial knowledge,
FA_Avg: Average of financial attitude.

TABLE II

CORRELATIONS BETWEEN VARIABLES

		FA_Avg	FB_Avg	IFL_avg	FK_Percentage
FA_Avg	Correlation Coefficient	1	0.348**	0.202**	0.159**
	Significant (2-tailed)		0.000	0.001	0.008
	N	753	753	753	753
FB_Avg	Correlation Coefficient	0.348**	1	0.159**	0.315**
	Sig. (2-tailed)	0.000		0.008	0.000
	N	753	753	753	753
IFL_avg	Correlation Coefficient	0.202**	0.159**	1	0.246**
	Sig. (2-tailed)	0.001	0.008		0.000
	N	753	753	753	753
FK_Percentage	Correlation Coefficient	0.159**	0.315**	0.246**	1
	Sig. (2-tailed)	0.008	0.000	0.000	
	N	753	753	753	753

**. Correlation coefficient is significant at the 1% level (2-tailed).

Note: FB_avg: Average Financial behavior,
IFL_avg : Average influence on financial literacy,
FK_Percentage: Percentage of financial knowledge,
FA_Avg : Average of financial attitude.

The influence of different environmental elements on pupils, such as parents, friends, relatives, media, employment, life experience, and the internet, is depicted in Chart 1. Additionally, researchers find that the greatest influences on learning about financial literacy are parents and life experience; friends and financial planners or counselors have a less significant impact.

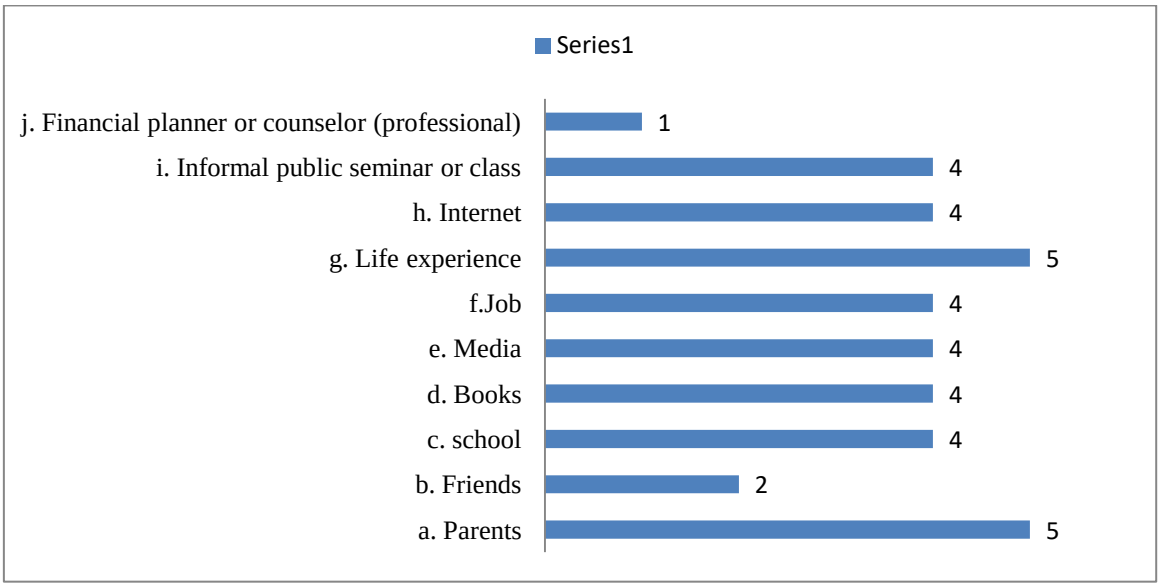

Fig. 1. Chart- Influence on financial knowledge

VI. LIMITATION OF THE STUDY

This study has the following limitations:

- It only covers Gujarat, which represents only one state of Indian college students.
- There are drawbacks to utilizing questionnaires to gather primary data for research.
- Qualitative traits including knowledge, attitude, and financial behavior are used by researchers. Quantifying the qualitative variable presents a challenge as well.
- The International Network on Financial Education of the OECD provided principles for measuring financial literacy, which were followed in creating the questionnaire used in this study. Every country or group has its own limitations.

VII. CONCLUSION

The study defined financial literacy as the culmination of the impacts of financial behavior, financial attitude, and financial knowledge. In general, students have mediocre financial behavior, knowledge, and attitude. Financial behavior influences attitude toward money in a good way, and financial behavior and knowledge are favorably correlated. Financial awareness is most influenced by environmental factors such as parents and life experience; friends and financial planners have less of an effect. The attitudes of students toward money and their spending habits are positively impacted by an average level of financial literacy.

VIII. THE IMPLICATIONS OF STUDENTS' FINANCIAL LITERACY FOR ACADEMIC AND MANAGERS

The academic and managerial implications of students' financial literacy are significant:

A. Academic Implications:

1. Improved Educational Outcomes: Students who are more financially literate may perform better academically because they may grasp personal finance concepts better and be able to apply them to practical scenarios.
2. Curriculum Enhancement: To guarantee that students gain the necessary financial abilities, educational institutions may need to improve their curricula by adding courses or modules on financial literacy.

3. Research Opportunities: Research on financial literacy can result in scholarly investigations that advance our understanding of the ways in which financial literacy affects several facets of students' lives.

B. Managerial Implications:

1. Employee Financial Wellness: Financially literate workers are more productive, make better financial decisions, and experience less financial stress—all of which are advantages for organizations.
2. Financial Literacy Programs: Employers can improve employee financial wellness by implementing financial literacy training, which can boost employee retention and job satisfaction.
3. Investment in Training: To increase financial literacy among employees and students, firms and educational institutions may need to make investments in resources and training.
4. Risk Mitigation: People who are financially literate are better able to handle their own finances and make wise decisions, which lowers the possibility that they may experience financial troubles that could impair their performance at school or at work.

In conclusion, raising students' financial literacy benefits businesses and educational institutions alike by producing better-educated people who know how to handle their money better.

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A Review of Studies Examining Machine Learning Techniques

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Abstract: This paper presents a comprehensive review of publications dealing with a master assessment of programming development using Machine Learning Techniques (MLT). In this new era, machine learning is demonstrating the assurance of producing consistently accurate assessments. An AI framework effectively "realizes" how to judge after preparing a collection of completed projects. The audit's main goal and commitment is to aid in master assessment, for instance, to make it easier for other scientists to contemplate using AI techniques for large master assessments. In order to test programming mastery, this paper offers the most widely used AI techniques, including neural networks, case-based reasoning, grouping and relapse trees, rule enlisting, hereditary computation, and genetic programming. Each time we conducted an analysis, we found the effects of various AI.

Keywords: Case-Based Reasoning, Genetic Programming, Neural Networks, Classification and Regression Trees, Genetic Algorithms, Rule Induction and Machine Learning Techniques.

I. INTRODUCTION

The assessment field has been completely overrun in the last ten years by the terrible presenting results produced by quantifiable assessment models. There has been more research using unconventional approaches like machine learning methods as a result of their inability to handle plainly presented information, adapt to missing information focuses, spread of information focuses, and lack of thinking abilities.

In actuality, AI is the study of computational methods for enhancing performance by automating information security [18]. Master execution necessitates a lot of space-explicit knowledge, and information design has produced a number of AI master frameworks that are widely used in business today. Deductive and inductive AI are the two broad categories of AI.

Deductive learning uses knowledge that already exists to infer new information from previously known information. By sifting through vast informational resources and eliminating rules and examples, inductive AI techniques create computer programs. Instead of starting with pre-existing knowledge, inductive learning uses models and summaries one important subclass of inductive knowledge is concept learning.

The organization of this paper is as follows: Area 2 of our investigation looks at neural networks' use of AI. The introduction of CBR with application region 3. Another successful learning method shown in size 4 is the CART. In segment 5, there is another recruitment of a worldview rule. The impact of hereditary computation and programming in zone 6. Room 7 hosts the discussion on various AI tactics, goals, and implications for area 8.

The poor performance results produced by statistical estimation models have flooded the estimation area over the last decade. Their inability to handle categorical data, cope with missing data points, spread of data points, and most importantly lack of reasoning capabilities has triggered an increase in the number of studies using non-traditional methods like machine learning techniques.

II. NEURAL NETWORK

Neural organizations are designed to be a powerful tool for design characterization and grouping (8, 15). There are two broad categories of neural learning: ‘Calculations, especially directed and solo, are best suited for unaided neural measures to group designs based on their intrinsic properties. There are three important methods for solo learning:

(a) Competitive Learning
(b) Self-Organizing Highlight Maps
(c) Artistic Networks

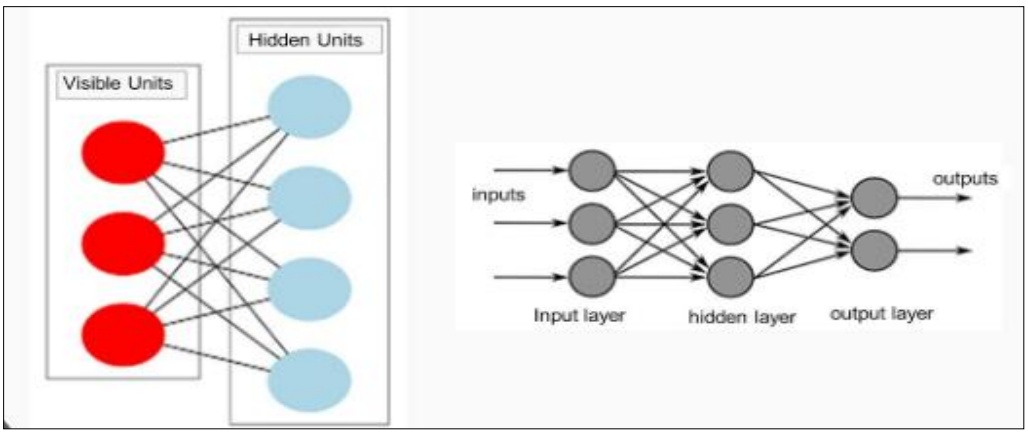

Fig.1. The Architecture of Neural Network

The second worldview is the "managed learning" worldview. These networks are designed to be generic approximations of fixed/interruptible capacities. Therefore, they are suitable for use where we have some information about the input-yield guide that we need to approximate. A lot of input-output data is used to prepare the organization. Once the organization has been prepared, it can receive any input (from the guide's information space) and provide a yield, which is the expected result from the planning that we have approximated.

The action work that is used is the Log-Sigmoid capacity as described in [9]. This can be expressed as:

$$\Phi(a) = \frac{1}{1 - e^{-a}}$$

Where

$$a = \sum_{i=1}^{N} WX$$

W's are synaptic weights, and x's are past layer yields. x's for the hidden layer refers to the organization's contribution, while x's compare to the result of the hidden layer. The organization is ready to go using the calculation of blunderback proliferation [9]. The weight update rule according to [9] could be expressed as:

$$\Delta W_{ji}(n) = \alpha \Delta W_{ji}(n-1) + \eta \delta_j(n) y_i(n)$$

where 'E' is usually a positive number, 'k' is learning rate, 'w' is corrected synaptic weight, 'i' is the yield associated with neuron j at focus n, 'j' is neighborhood angle, 'y' is capacity signal at focus n. From test results, we presume that neural organization can be utilized as a test prophet, exertion assessment, cost assessment, size assessment, and other application regions of programming [1,7,12, 13]. Anyway, the rate of mistakes that can be endured will rely upon the particular application for which the experiment is planned. The design and preparation calculation will depend on the space traversed by the experiment boundaries. There are some different frameworks like complicated recreation in the mechanical program, climate and financial estimating, and topographical investigation to tackle unsolved issues utilizing neural organization. There is no insightful arrangement.

III. CASE-BASED REASONING

Case-based reasoning is a process by which we solve new problems by adapting the arrangements from previously solved problems. We take the occurrence of performances from previously solved problems and try to solve the unique problems in those cases. Any such arrangement available to us is called a case.

A. *CBR Process*

A CBR measure includes the four cycles listed below.

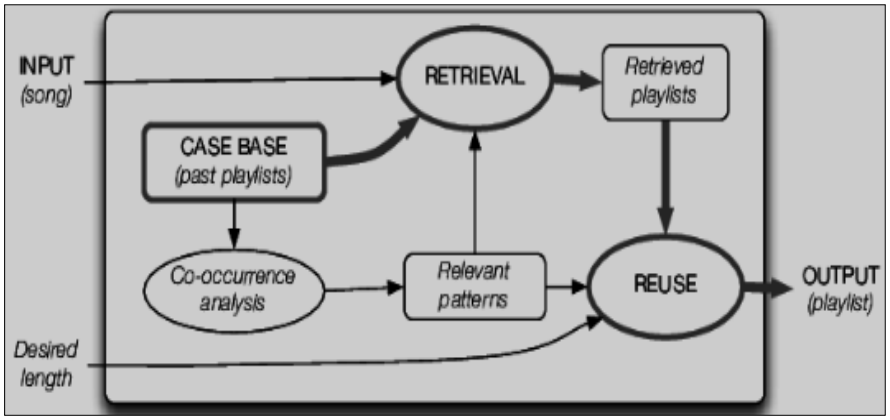

Fig. 3. The General CBR Process

The initial description of any problem characterizes another problem. This new problem is recovered from a bunch of previous problems. This recovered problem is then joined to the most recent problem through reuse into another problem to be solved. This problem to be solved is just a proposed solution for the problem it describes. When this structure is recognized, it is applied basically to this current problem to test it. This test cycle is called an "amendment of the problem". At this point comes the "pause" where we hold valuable experience for future reuse and refresh the case base by another scientific case or by changing some existing issues is a 4-step process:

- Recover
- Reuse
- Reconsider
- Hold

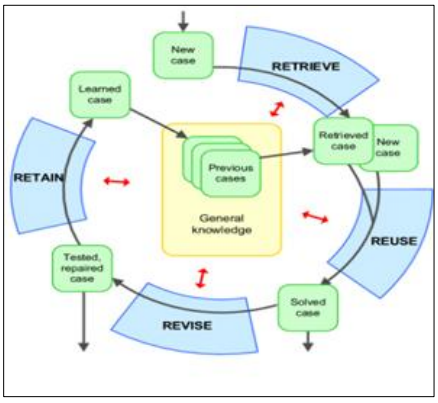

Fig. 4. Give a Brief illustration of the CBR Cycle

The figure shows that general information is important in CBR and supports all of the CBR measurements. Here, the available information suggests subliminal space information rather than explicit information as shown by the cases. For instance, when diagnosing a person by recovering and repeating a previous patient, the overall information used by the CBR framework may be determined by a model of the life structures and the easygoing relationships among neurotic states.

B. *Fundamentals of Case-Based Reasoning*

1) *Case Retrieval*

The subtasks for this particular advance include distinguishing highlights, coordinating, searching, and selecting the fitting ones to be executed in a specific order. A recognizable proof undertaking will find many relevant issue descriptors. At that point, coordinating performance will restore the cases that are similar to the new case, and the determination task will select the best match. Some common case recovery techniques include:

A. ***Nearest neighbor (NN):*** The NN approach involves comparing the similitude of put-away cases with the new information case because of the coordination of the weighted number of highlighted cases.
B. ***Induction:*** The induction process involves constructing a selection tree structure to group the cases together by identifying the highlights that do the best work in separate cases.
C. ***Knowledge:*** Guided Acceptance: We apply the information to an enlistment cycle based on a physically specific case including known or thought-influencing the crucial point. Because informative information is not always readily available for large case bases, this methodology is often used in conjunction with other procedures.
D. ***Restores:*** All cases that fit within specific rules are regularly used before using other methods, such as the closest neighbor, to limit the pursuit space to a subset of the entire case base.

2) *Case Reuse*

Case Reuse is the process of retrieving the tackled case from the recovered point. It analyzes the differences between the new case and the previous cases and then determines what portion of the recovered case is transferable to the new case. CBR is based on the concept of a relationship, where we define a response for the new topics[5].

3) *Copy*

In the little reuse cases, we replicate the structure of the previous cases and turn it into a solution for the new opportunities. As it happens, many frameworks think about the differences between these two points and use the transform cycle to plan the next arrangement based on those differences.

4) *Adaptation*

The transformation cycle can be divided into primary transformation and derivative transformation. Primary transformation rules are applied directly to the arrangement that is put away in the case.

For example, reuse previous case arrangements. Derivative transformation We reuse the strategy that came up with the solution for a previous problem. We don't use the previous format directly in the primary variation, but instead apply some change limits to build the new case solution. This type of transformation is also referred to as breakthrough transformation. We use the previous technique or calculation to solve the previous problem [17].

5) *Case Revision*

After using the previous cases to solve the new problem, we should test the structure. We should test or attempt to test if the structure is correct. If the testing proves successful, we should schedule the meeting. Otherwise, we should revise the case arrangement using explicit space information.

6) *Case Retainment -Learning (CRL)*

The structure of the new issue after being tried and fixed may be stored as explicit information in the current area. This cycle is known as Case Retainment Learning (CRL).

I have data that includes:

- Choosing what data to store
- Choosing what structure to store it in
- Choosing how to store the case for recovery from comparative issues
- Choosing how the new topic will be incorporated into the memory structure

7) *Case-Based Learning*

Case-based thinking is also recognized as a sub-field of AI. Thus, case-based thinking does not just refer to a particular thinking technique, no matter how the cases are acquired; it also refers to an AI worldview that supports learning by updating

the case base after a problem is resolved. Learning happens as an expected consequence of critical thinking in CBR. Once a problem is successfully solved, the experience is stored to solve similar problems in the future.

IV. CLASSIFICATION AND REGRESSION TREES (CART)

1) *CART Introduction*

CART is one of the most efficient AI strategies. The key difference between CART and other AI strategies is that it doesn't require nearly any expert input. This is in contrast to other processes where extensive expert input, the analysis of interval results and the change in technique are required.

Before we dive into CART's nuances, let's first define the three classes of factors and two types of factors that are important while describing grouping and relapse problems:

A. Target variable

The "target variable" is the one whose quality is to be evaluated and predicted by various factors. It's similar to the dependent variable in a straight relapse.

B. Predictor variable

A "predictor variable" is a quality that will be used to predict the objective variable's estimation. It's similar to the free variable in a straightforward relapse.

C. Indicator variable

There should be only one indicator variable for the choice tree examination, but there may be many indicator factors. You can specify a "weight variable". In the unlikely event that you display a weight variable, it must be a numerical (stable) variable whose quality is greater than or equal to zero. The estimation of a weight variable will determine the weight of a column in your dataset. There are two main types of constant factors:

Continuous factors

A constant variable has numerical qualities, e.g., "1," "2", "3.14," or "5," etc. The general range of the values is important (for example, an estimate of 2 shows twice the size of "1"). Examples of persistent factors include circulatory strain and height, weight and pay, age and disease likelihood, etc. Some projects use constant factors as requested or "monotonic" characteristics.

Types of categorical factors

All-out elements have values that act as marks, rather than numbers. Some projects refer to straight-out factors as "ostensible" factors. For example, an "unmitigated variable" for sexual orientation might use values such as "1 for male" and "2 for female. CART is a parametric measurable approach developed for the analysis of grouping issues from both all-out and continuous ward factors (24, 25). If the dependent variable is continuous, CART produces an ordered tree. When the dependent variable is constant, CART produces a relapse tree.

2) *Binary Recursive Partitioning*

For example, consider the question of selecting the best size and type of cutting-edge laryngoscope for pediatric patients undergoing intubation (CART). The result variable is the best cutting edge for each patient (controlled by a trained pediatric aviation route professional) with three possible qualities (Miller 0, Wis-Hipple 1, and Mac 2). The two indicator factors are estimates of neck length and pharyngeal height. The smallest patient is best brooded with a Miller 0, the medium estimated patients with a Wis-Highipple 1, and the largest patients with a Mac 2.

CART is essentially used to avoid the disadvantage of relapse methods. A CART investigation can be thought of as a twofold recurrence of recurrence. For example, the expression "twofold" implies that every corner of a choice tree can belong to two gatherings. In this case, the first hub is called the parent hub.

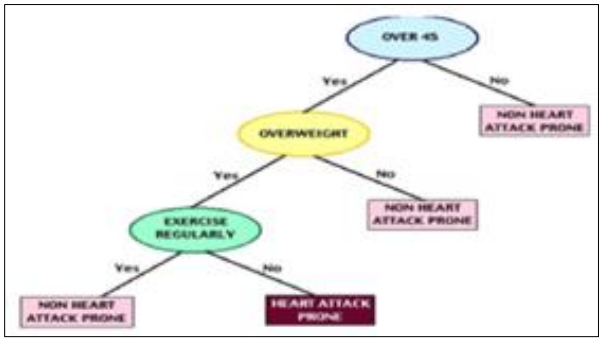

Fig. 5. The Cart Analysis Tree

3) *CART Analysis*

CART investigation is not a traditional information examination technique. It is suitable for the era of clinical choice guidelines

Truck Analysis consists of four main steps:

1. Tree working, where a tree is assembled using a recursive parsing of hubs, each coming about hub being relegated to an expected class, because the appropriation of courses is happening in that hub and in the choice cost grid
2. Halt the tree-building measure, where a "maximal" tree has been created that is likely extraordinarily overfitting the data contained in the learning dataset
3. Tree "pruning", where the cutting off of progressively significant hubs leads to the formation of an arrangement of simpler and less complicated trees
4. Ideal tree determination, where the tree that matches the data is selected from the arrangement of the pruned trees.

V. RULE INDUCTION

Another powerful AI technique is Rule Induction. It is easier because the standard inductive rules are much easier to understand than a recurrence model or a well-prepared neural network. This worldview uses condition-activity practice, choice tree or comparative information structure. Here, the exhibition component sorts examples down the branches of the choice tree or finds the main rule whose conditions coordinate the case, often using an all or no coordinate cycle. Data about class or expectation is stored in the tree leaves' activity sides. Learning calculation in the standard inductive structure naturally brings out an eager search through the area of a choice tree or rule set, usually using a fact-evaluation capacity to select ascribes for fusion into the information structure. The majority of techniques group the preparation information together into disjointed sets, trying to sum up every group as a set of legitimate conditions.

A. Rule learning measure

When given a set of preparing models, such as instances for which grouping is implemented, we find a set of characterization rules used to predict new problems that haven't been presented to the student yet. When identifying these cases, the tendency forced by dialects, for example, constraints imposed while presenting information, should be noted. We should also take into account the language used to convey the set of incited rules. A similar characterization issue would be ordering occasions into classes of positive and negative.

B. Propositional Rule Learning

Propositional rules learning frameworks are useful for problems where there is no strong relationship between the estimates of the different credits. A number of examples with well-known arrangements where each occurrence is represented by estimates of a set of fixed characteristics. The credits can either have a fixed understanding of qualities or accept real numbers as qualities. For these examples, at this point, we develop a set of IF-THIN guidelines. The return on learning is speculation talked about by a set of rules. Once the principles are characterized, we decide the accuracy of such procedures and apply them to functional problems to analyze their quality.

In propositional learning, accessible information has a normal structure with lines as singular records or then preparing models and sections as properties or characteristics to represent the data.

C. Social Rule Learning/Inductive Rationale Programming (ILP)

When information is stored in multiple tables, it contains a social information database structure. In such cases, the data needs to be changed to a single table to use standard information mining techniques. The most common information change

method is to choose a single table as the main table to learn from and to sum up the content of the different tables by summarizing the data in a few rundown credits in a principal table. However, with such single table changes, some data may be lost and the synopsis may also contain old rarities that may lead to inappropriate information mining outcomes. Therefore, it is best to leave information relatively unchanged and use information mining tools that can manage multiple social information.

ILP is therefore to be used for information mining purposes in multiple-social information missions with information stored in social information bureaus and with abundant master information on the social nature.

D. A guide to show Rule Induction

Case Study (Making Credit Decisions)

Credit organizations typically use polls to collect data about people applying for credit that they at that time used to decide whether to advance credit. This cycle had been incompletely roboticized for some time. However, records showed that the specialists were almost 50% accurate in predicting whether those marginal candidates would lose their credits. This perception drove American Express UK's efforts to try techniques from AI for improving the pick cycle. Starting with 1014 prep cases and 18 interesting ascribes (e.g., age and years of experience with a business) Michie's team used an enlistment methodology to deliver a pick tree with about 20 hubs and 10 of the initial highlights that made the correct forecasts for 70% of these marginal candidates.

Even though the guidelines improved accuracy, American Express UK found the guidelines attractive because they could explain candidates' reasoning behind their choices. American Express UK was so impressed that it put the information base into use minus additional events.

VI. GENETIC ALGORITHM AND GENETIC PROGRAMMING

The hereditary approach to AI is a relatively new concept. Both hospitable calculations and genetic programming (GP) a forms of transformative processing, which is an umbrella term for critical thinking techniques that are dependent on organic standards of progress, such as a common decision. Heritable calculations employ a jargon derived from common hereditary characteristics in that they refer to rates (or bits), chromosomes (or people or spot strings), and people (of people).

The genetic calculation approach is based on three main cycles: hybridization, change, and, what's more, people's choice. Initially, many individual arrangements are put together to form a randomly selected population. Heritable calculations rely on Darwin's hypothesis of "The natural selection" to future humans. When a decision is made, new humans must be defined. These new humans are formed either through hybridization or through change. During hybridization, consolidation of two arrangement newcomers (delivery of a child from two guardians) creates new humans. In evolution, we modify a few humans, which means that some randomly selected parts of genetic information are altered to get another human. The cycle of age does not end until one of these conditions (e.g., least measures) is met, or the ideal level of health is achieved, or again a predetermined number of ages is reached, or a combination of the above.

In 1992, John Koza proposed a balance of genetic algorithm (GP). GP focuses on improving PC programs rather than working boundaries. In GP, calculations are designed based on characteristic choice. We call these calculations "capacity trees". In GP, "the fitter people" are held and allowed to be created while others are discarded. contingent on the work of the ideal arrangements chosen from a pool of people.GP works in a similar way to heritable calculation. It also follows normal development criteria to provide an answer that increases (or decreases) some wellness work. GP differs from GA in that GP will find the order of a given problem by talking to it as a bunch of whole numbers whereas a GP cycle aims to provide a PC program to solve the streamlining problem that is within reach. The GP cycle works like any developmental cycle. The new people are created; thetried-and-true ones are chosen to make their youngsters. The unfit people are removed from the population. Figure 6 describes how the GP cycle works.

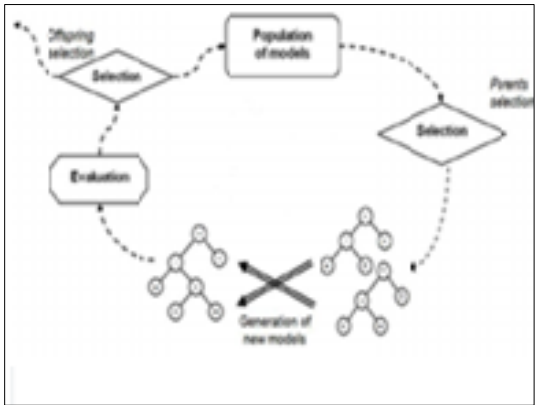

Fig. 6. Genetics Promming (GP)Cycle

TABLE I

THEME, OPPORTUNITIES AND LIMITATIONS

Theme	Opportunities	Limitations
Access and Availability of Information.	Research Real-world problem	Distraction Undeveloped information literacy.
Sharing And Collaboration	Collaborative learning and group work	No ownership of Technology /Shared resources.
Novelty	New learning tool dynamic learning environment	Lack of Training Rapidly" outdated orientation to technology distracts from traditional learning time
Learning Style and Technology Design	Design elements include more learning styles (Kinesthetic, Visual, Auditory)	Design elements negatively Impact learning (Keyboard, Size, app, Availability)
Convenience And Usability	Ease of use Intuitive design variety of apps.	Connectivity troubles Paralyze learning. Unstable /unreliable applications impact learning.

Describe Various Mobile Learning

GA and GP, for example, turn out to be valuable in the realm of logical analysis, including natural growth. Rule-based processes and the CART investigation may be useful in many monetary applications. CBR is also being developed for help-desk systems, a relatively new application. NN may be used for risk management or sales forecasting.

VII. CONCLUSION AND FUTURE DIRECTION

The primary objective of this audit is to analyze the various Machine-Learning techniques used in exertion measurement, cost measurement, size measurement, and other areas of Software Design. The paper also provides an in-depth analysis of the plethora of techniques depending on their application, user preferences, and limitations. After reviewing this relative group of techniques, we can't say that anyone's technique is the best. Each technique has its own application region and is useful in different areas depending on the focal points. Therefore, keeping each of these strategies in mind along with the prime center's limitations improves execution and efficiency Our analysis also confirms that no single strategy can be described as the optimal machine learning approach. There is a critical need for a better comprehension of the legitimacy and simplification of many of the systems studied. In particular, we plan to continue our research on -

When to use machine learning strategies and assessment models

Step-by-step guidance on how to select and combine many experiments for efficient assessment procedures and enhance

results? We should use the technique that best suits a particular application.

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A Systematic Review of Transfer Learning Methods for Identifying Lung Disease Sounds

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Abstract: Lung disorders are now the leading cause of death throughout the globe. Despite this, most occurrences of lung illness are only identified at a late stage, when treatment options may be more limited. Technological advances are crucial to today's healthcare delivery system. This state-of-the-art medical research focuses on the value of analyzing lung sounds for the purpose of identifying lung diseases. The capacity to learn new material and use it in novel situations is crucial for patients to make their way through the healthcare system. Several Transfer learning techniques, like ALEXNET, VGGNET, and RESNET, are presented in this paper for classifying lung sounds. In addition to these methods, we will classify lung sound waves using a Transfer learning model that combines a Modified RESNET and a Mel spectrogram. Excellent performance in categorizing lung sounds by these transfer learning models suggests they may one day be employed in the diagnosis of respiratory disorders. In this evaluation, we will look at several Transfer Learning Techniques and talk about their pros and cons. And not even the worst part. To recognize four kinds of breathing noises. In addition, please provide suggestions about how the identification of lung sounds might be improved.

Keywords: Naive Bayes, Decision Tree, Support Vector Machine, Random Forest, Naive Bayes, Artificial Neural Network, AlexNet, VGGNet, RESNET.

I. INTRODUCTION

Lung disease is the third leading killer after heart disease and cancer throughout the world. The World Health Organization (WHO) reports that three million individuals each year lose their lives due to breathing problems. Over 200 million individuals across the world have COPD, and another 235 million have asthma [1,4]. Each year, 8.7 million people are diagnosed with tuberculosis. Pulmonary sound characteristics are reliable predictors of respiratory infections and diseases in this setting. [9.12]. Chronic obstructive pulmonary disease (COPD) and asthma are two of the world's leading killers. While 384 million people have chronic obstructive pulmonary disease (COPD), only 235 million people have asthma. During the duration of an asthma episode, symptoms including wheezing, chest tightness, trouble breathing, and coughing may fluctuate [15]. There are two types of lung sounds, normal and diseased. Two distinct types of breath sounds exist. A person with healthy lungs will make the same noises at each stage of the breathing cycle. It is possible that if you are having breathing problems, you will be able to pick up on more sounds than usual. A secondary respiratory sound is one that is generated in addition to the primary one by the lungs. As an example, apart from the constant sounds of breathing, there is another auditory phenomenon that happens [13].

Each of the topics mentioned below will be explored at further length in the sections that follow. Here, we will examine some of the most recent and noteworthy advances in speech recognition technology. In Section III, we discuss in detail the many techniques that were used to build this structure. In Section IV, we conduct in-depth analyses of many different subjects and draw parallels between them. Finally, the authors draw some firm conclusions from their research and provide suggestions for further research.

II. LITERATURE STUDY

In [1], Fatih Demir and colleagues present a study that delves into the categorization of lung sounds using a Convolutional Neural Network (CNN) model employing a Parallel Polling Structure. Their investigation primarily centers on harnessing deep learning methodologies to precisely classify lung sounds, a development with significant implications for the identification of respiratory conditions. In [2], Valentyn Vaityshyn explores the utility of pre-trained Convolutional Neural Networks (CNNs) in the classification of lung sounds. They are examining the potential of transfer learning to enhance the accuracy and efficiency of lung sound categorization. In [3], Zeenat Tariq presents an approach rooted in deep learning for the classification

of lung diseases utilizing a Deep Convolutional Neural Network (DCNN). Their research is primarily directed towards the development of an effective system for automated lung disease diagnosis. In [4], Md. Ariful Islam and their team concentrate on the classification of individuals with normal, asthma, and COPD conditions based on multichannel lung sound signals. Their study underscores the significance of accurately distinguishing between different lung conditions to facilitate precise medical diagnosis. In [5], Joel Than Chia Ming examines the classification of lung diseases using diverse deep learning architectures and Principal Component Analysis (PCA). Their work explores various methodologies aimed at enhancing the accuracy of lung sound classification.

In [6], Anuradha D. Gunasingle places their focus on the early prediction of lung diseases. Their research seeks to develop a system capable of detecting lung conditions at an early stage, potentially enabling timely interventions. In [7], Syed Zohaib Hassan Naqvi proposes an intelligent system for the classification of pulmonary diseases based on lung sounds. Their study explores the application of intelligent systems to enhance the precision of pulmonary disease diagnosis. In [8], D. Jayaraj introduces a classification model for predicting lung cancer using Random Forests applied to computer tomography images. Their research centers on the utilization of machine learning techniques for predicting lung cancer. In [9], Funda Cinyol delves into the classification of lung sounds utilizing Convolutional Neural Networks. Their work underscores the adoption of deep learning models for categorizing lung sounds. In [10], Shreyasi Dutta presents an automated approach for analyzing lung sounds to detect pulmonary abnormalities. Their study investigates the implementation of automated analysis techniques for early detection of pulmonary issues.

In [11], Ramizraja Shethwala explores the classification of lung sounds, specifically wheezes and crackles, through the aid of transfer learning. Their research seeks to leverage transfer learning for improved classification accuracy. In [12], Truc Nguyen and Franz Pernkopf center their research on lung sound classification using a snapshot ensemble of Convolutional Neural Networks. Their study investigates ensemble learning techniques to enhance the classification of lung sounds. In [13], R. X. Adhi Pramono evaluates features relevant to the classification of wheezes and normal respiratory sounds. Their research offers insights into the selection of features that promote precise lung sound classification. In [15], Abdulkadir Sengu and Varun Bajaj present an efficient strategy for classifying lung diseases using Convolutional Neural Networks (CNNs). Their work is dedicated to improving the efficiency of systems for classifying lung diseases. In [16], Adnan Hassal Falah and Jondri propose a method for lung sound classification employing stacked Autoencoders and Support Vector Machines. Their research explores the application of deep learning techniques in conjunction with support vector machines to enhance the precision of lung sound classification. In [17], Gorkem Serbes develops an automated system for preprocessing and classifying lung sounds based on spectral analysis. Their study highlights the importance of effective preprocessing techniques in the analysis of lung sounds. In [19], H. Kamble conducts a frequency response analysis of respiratory sounds and carries out a comparative study on windowing techniques. This research primarily focuses on signal processing and the analysis of respiratory sounds to improve our understanding of the characteristics of lung sounds.

III. THE IDENTIFICATION OF RESPIRATORY SOUNDS

A. Gathering Dataset

The ICBHI 2017 database has 920 annotated audio recordings from 126 people, as stated on Kaggle [1,3,9]. Different stethoscopes were used to capture the sounds in this collection. You may choose the length of the recording from 10 seconds to 90 seconds, and the sample rate from 4000 Hz to 44,100 Hz. Each recording includes a set number of breaths, some introductory and concluding commentary, and the ability to identify crackles and/or wheezes. Here, we use database annotations to separate out individual breaths in audio recordings. The average time for a complete cycle is 2.7 seconds, however, it may range from 0.2 seconds to 16 seconds. The database has a total of 6898 breathing cycles, 3642 of which are regular, 1864 of which include crackles, 886 of which have wheezes, and 506 of which include both.

B. Processing Sound in the Lungs

The purpose of a noise reduction method is to either completely remove or significantly reduce the amount of noise present in an image [2,4,6]. Noise reduction techniques work by smoothing the picture generally while leaving the areas at the contrast limits alone. In contrast, these strategies may obfuscate little elements that have a low contrast. Cut and paste [8,9]: Before a full picture can be shown, it must be resized and maybe translated, and it must also be recognized as to what portion of the image can really be seen. It might be challenging to do this. Parts of the picture are obscured while others are not. Removed are just partly occluded lines and things. Clipping is the process of selecting which parts of a picture will be shown and which will be omitted. Clipping separates an item into visible pieces and those that are not. The scope of what can be seen now has been reduced. When something cannot be seen, it is written off as irrelevant.

C. Tools for Extracting Features from Audio

Waveform analysis in the form of a spectrogram [1,2,11-14] provides a visual representation of the intensity or sound of a signal over time by plotting the signal's amplitude against its frequency. The graph also displays the varying energy levels over time. Our proposed inside-outside model may be informed by spectrograms of our lung sounds, which can be generated via a top-down modeling approach. To create these spectrogram pictures, we utilized the excellent Virdis Color Map, whose colors span the spectrum from blue to green to yellow. The Mel Octave According to the Cestrum Coefficients [3,6,9,12], Mel Frequency is a certain pitch in music. For this assignment, we analyzed audio files by computing Cestrum Coefficients. MFCCs are crucial to the success of speech recognition systems in recognizing human speech. It has also been widely used in previous work on the detection of fake respiration sounds because it provides a measure of the short-term power spectrum of time domain data. Recognizing the many accidental noises that may arise in a single recording at various times and for varying lengths of time requires considering both the frequency and temporal content of the sounds. MFCC is helpful because it captures the evolving frequency content of a signal. The Mel scale is a subjective, nonlinear frequency scale that is used in the field of acoustics. Frequencies are assigned to octaves in the Mel scale according to a formula. MFCC generates a two-dimensional (time and frequency) feature vector that is converted to a one-dimensional array. Convolutional Neural Network [8,9,10,11]: Using this neural network classification approach, images are sorted into classes 24-28. This apparatus is known as a Convolutional Neural Network (CNN). In contrast to conventional neural networks, which assign separate weights to each input feature, CNNs use a shared parameter space for all features. This might help the network get insight into its local environment. Since CNN would pick up on the most vital characteristics without any human intervention, feature extraction is superfluous. CNN-based architectures employ data-driven convolutional kernels to construct a deep layered structure for extracting complicated features. CNN also uses very little processing power. Using convolution and pooling, we may distribute parameters and speed up calculations. When dealing with many frequency bands, as is the situation in most communication networks, it is helpful to convert from the time domain to the frequency domain using the Fourier transform (FFT) [2,18,19]. Furthermore, it has the potential to convert discrete data into continuous data that may be retrieved at varying rates.

D. Machine Learning Methods

Data might be linear or non-linear for use in Support Vector Machine (SVM) classification [2, 6]. Several different kernels are available to the user of an SVM Classifier. To classify new data points according to the values of the closest existing ones, we may use a technique called K-Nearest Neighbor [1-3], which is based on the idea that similar observations in a data collection are the ones that are physically nearest to a given data point. The user may adjust how many nearby observations the algorithm uses by changing a parameter K. Navier the Naive Bayes classifier uses Bayes theorem for statistical inference [2,4,7]. The probability of each category being accurate in the training data is calculated. Inverse probability is used to classify the test data. Consequently, it is possible to utilize the mean and variance to accurately forecast outcomes across a population. The key advantage of this classifier is that it can produce an accurate estimate of the mean and variance using just a small fraction of the training data. Naive Bayes classifiers are a collection of easy-to-understand probabilistic classifiers used in machine learning. They are based on Bayes theorem, which is itself based on the premise of feature independence. This classifier is very scalable since the number of parameters grows linearly with the number of predictors/features in the learning problem. As an ensemble classifier, Random Forests [9,11,19] generates decision trees at random. Bagging and a random sampling of variables are used to build the trees in a random forest. Each tree then votes for a class to which the instances should be allocated after the forest has been built. The winning category is the one that received the most votes. Several characteristics of this classifier make it well-suited for the task of classifying enzyme functions: a) It can be utilized successfully on large datasets without the necessity for pre-existing data normalization. The blanks in (b) pose no problem for it. Sequential Analysis [11,12,15]: To build a model for classification or regression, statisticians employ a tree-like structure called a decision tree. The dataset was further divided into subsets. Similarly, the decision tree associated with this issue is being built incrementally. The result is a structure that looks like a tree with branching-off points and terminal branches.

E. Transfer Learning Methods

The Alex-Net [1,5] findings show that a large, recurrent neural network (RNN may achieve outstanding performance on an extremely challenging data set using just supervised learning techniques. A year after AlexNet's debut, the ImageNet competition began, and all the entrants employed Convolutional Neural Networks. AlexNet was the first CNN, ushering in a new era of research. Despite the proliferation of deep learning frameworks, setting up AlexNet is still a breeze. Res-Net [2,10]: It is a dormant piece of infrastructure with a bypass connection that allows data to flow unhindered through the building. It takes in signal x and generates a signal F using a series of activation curve layers as intermediates (x). A skipped connection is analogous to this modification. In this configuration, the input signal x is compared to the reference signal F, and the differences between the two are described by the residual unit (x). Since the network will have already approximated the output function that creates data at that layer, the optimizer may reduce the weight of the remaining blocks at higher levels virtually to zero, enabling the signal to pass unaltered over the gap. This architecture, named VGG (Visual Geometry Group), is a multi-layer deep convolutional neural network [1,5,10] is a description of the Vgg-Net (DCNN). The difference between

VGG-16 and VGG-19 lies in the overall number of layers, which is 16. A cutting-edge model for object recognition has been built on top of the VGG framework.

IV.DIFFERENTIAL ANALYSIS

TABLE I
DIFFERENTIAL ANALYSIS OF FEATURES

Method	Advantage	Limitation
Mel Frequency Cestrum Coefficients [3,6,9,12]	To mimic the response of the human nervous system more closely, MFCCs frequency bands are arranged logarithmically.	When there is additive noise present, the MFCC results are not especially robust.
Fast Fourier transform [2,18,19]	Compression at low bit rates and compression of continuous tones benefit from this improvement.	Compression times and computation costs may increase.

TABLE II
DIFFERENTIAL ANALYSIS OF MODELS

Method	Advantage	Limitation/Disadvantages
Support Vector Machine [1-4,11,19]	Useful in situations involving several dimensions. is still useful even if there are more dimensions than data points to analyze them in. The decision function is memory-friendly since it uses just a subset of the available training data (the support vectors).	When the number of features exceeds the number of samples, it is more crucial than ever to choose the appropriate Kernel function and regularisation term to avoid over-fitting. SVMs need expensive five-fold cross-validation to assess accuracy instead of supplying probability estimates up front (for more on this, see Scores and probabilities).
K-nearest neighbor [2-8,12,18]	With KNN, a distance formula may be used since the only metric that has to be computed is the distance between two points based on data of various qualities. The model does not need a training period, so new information may be added whenever it is most practical.	Susceptibility to background noise and a lack of required data This approach fails when dealing with a large dataset since calculating distances between each data item is exceedingly time-consuming.
Naive Bayes [1,9-12,21]	Very easy to use and implement. It is easy to calculate the probability of an event occurring under a given set of conditions. A quick calculation of the chances is possible right away. This kind of training is efficient and quick. Possibly favorable if the hypothesis of conditional independence is correct.	Prerequisites for complete autonomy it is risky to draw broad conclusions. There are a lot of interdependent features. If a word is not part of the training data but appears in the test data for a particular class, the model may not assign it any class probability.
Decision Tree [14,17,19]	When compared to other techniques, pre-processing data for use in decision trees is simpler. A decision tree does not need data standardization to be used.	It is possible that decision tree computations will be far more complicated than those of any other approach. Given the time and effort involved, training a decision tree might end up being rather costly. It usually takes more time to train a model that uses a decision tree.

RF (Random Forest) [3-9,13,16,18]	When comparing the random forest technique to the decision tree approach, the latter falls short of the random forests forecast accuracy. With large data sets, it performs well. When it comes to machine learning, the rain forest algorithm is one of the most flexible and straightforward options available.	Compared to a decision tree method, this one takes much longer to complete.
Alex-Net [3,4,6,13]	In contrast to convolutional layers, which only depend on local spatial coherence and a narrow receiving field, fully connected layers may learn features from all conceivable combinations of the attributes of the layer below them.	Layer construction with many interconnections is computationally intensive.
Res-Net [1,2,11]	If you do not want to, you do not have to form any associations at all. It uses batch normalization, which boosts efficiency without compromising accuracy.	Implementation takes a considerable amount of time.
Inception-V3 [11,13,16]	Permits the use of any layer arrangement.	The training budget must be increased. The time spent calculating is seldom worth it.
Vgg-Net [5,10,11,12, 16]	Unfortunately, only 80% of the available parameters are accounted for.	The degree of precision is deteriorating with time.

V. CONCLUSION

The ability to recognize the distinctive characteristics of lung sounds is essential for their accurate diagnosis and categorization. When working with a huge dataset, however, it might be difficult to isolate individual patterns in attributes. The non-linear nature of environmental data makes standard techniques for discovering patterns and creating mathematical models worthless. In this study, we compare and analyze several aspects of noisy conditions. When MFCC fails, time wave late features may be able to restore functioning. However, unlike deep learning approaches, machine learning-based techniques are inefficient when dealing with huge datasets since they are slower and less accurate. Prospects: What We Can Count on Completely connected and soft max layers outperform conventional hard max layers when it comes to the disease-based classification of lung respiratory adventitious sounds using either the RESNET or ALEXNET transfer learning method.

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Different Types of Methods to Recover Regenerative Energy Replacing Conventional Dynamic Braking of Variable Frequency Drive

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Abstract: The Variable Frequency Drive (VFD) is the most used drive nowadays in industries. However, the conventional VFD has some energy loss as dynamic braking is used in it. There are some different types of methods in how to use and convert the regenerate energy when the motor acts as a generator and this energy can be saved rather than dissipating as heat in the dynamic braking. Some methods are shown in this paper.

Keywords: Variable Frequency Drive (VFD), Dynamic Braking (DB), Hertz (Hz)

I. INTRODUCTION

The drive is a general term responsible for controlled motion with specific start/stop and matched torque properties as required by the process, keeping input energy to level at most minimum level while keeping efficiency the best one; in other words minimizing the losses. The drive could be alone or a combination of mechanical, hydraulic, pneumatic, and electrical motors combined with control elements like gearbox, belts and pulley drives, chain drives, throttle valves, pressure regulators, and electronic systems with analog/digital controls. Almost 80% of industrial motions are achieved by asynchronous induction motors. Thereby there is an increasing population of AC digital to drives replacing DC drives and simplifying mechanical drives [1].

A Variable Frequency Drive (VFD) is simply a motor controller that drives an electric motor, generally a three-phase squirrel cage induction motor, by varying the frequency and voltage supplied to the electric motor. VFD are also called different types of names such as variable speed drive, adjustable speed drive, adjustable frequency drive, AC drive, micro-drive,and inverter. The VFD is controlled by the frequency (Hz) which is proportional to the speed of the motor. As the frequency is increased the speed of the motor increases and vice-versa. The Variable Frequency Drive (VFD) industry is growing rapidly and it is now more important than ever for technicians and maintenance personnel to keep VFD installations running smoothly. VariableFrequency Drives (VFD) change the speed of a motor by changing the voltage and frequency of the power supplied to the motor. In order to maintain proper power factor and reduce excessive heating of the motor, the name plate volts/hertz ratio must be maintained [4].

The main tasks of variable frequency Drive are:

1. The VFD is used to steeples speed control of squirrel cage induction motors mostly used in process plants due to its ruggedness and maintenance-free long life.
2. VFD controls the speed of a motor by varying output voltage and frequency through a sophisticated microprocessor-controlled electronics device.
3. VFD consists of Rectifier and inverter units. A rectifier converts AC into DC voltage and an inverter converts DCvoltage back into AC voltage.

II. OPERATION OF VFD AND THE BRAKING

The three-phase ac supply is given to the rectifier section where ac is converted to DC and this DC voltage is generally about 650V. The DC voltage is then filtered out and the harmonics re removed. The DC voltage is converter to ac voltage through the three-phase inverter and an induction motor is connected to it which runs. The controlling section is in the inverter where the frequencyis changed and the speed changes.

The reasons why the motor works as a generator:

1. Quickly decelerating a high inertia load (flywheel, mechanical arm)
2. Controlling the speed of a load moving vertically downward (hoist, declining conveyor)
3. A sudden drop in load torque occurs (machining/drilling operation or an industrial saw)
4. The process requires repetitive acceleration and deceleration to a stop (indexing)
5. Controlling the speed (tension control) of an unwind application
6. Running motors can be brought to a halt quickly without any mechanical tear. After the supply has been cut-off

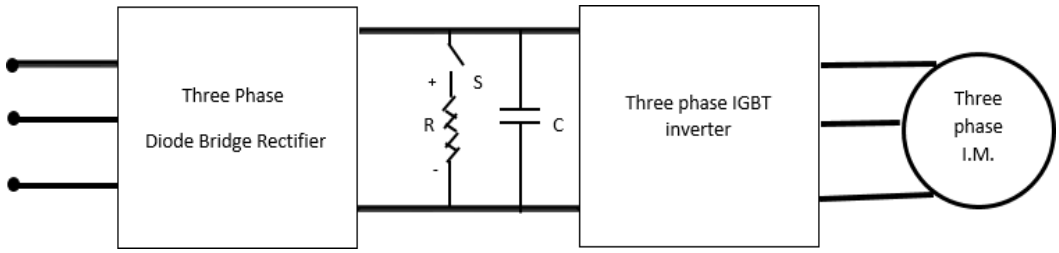

Fig. 1. The Variable Frequency Drive (VFD)

When the motor works as a generator, the energy from the stator flows back to the DC bus through the inverter section. In the DC bus, if the voltage rises above some level of the voltage, the braking chopper turns ON and the resistor is connected to the braking chopper in series, where the excess energy gets dissipated in the form of heat. Hence the motor stops slowly. This method is called dynamic braking of VFD. This method is generally used in the current period in industries. Fig 1 shows the conventional dynamic braking of VFD. Dynamic braking (DB) is typically used for applications that require frequent or rapid braking, especially of heavy (high inertia) loads. However, many such applications could also be candidates for regenerative converters.

The waste heat generated by DB often creates the need for additional cooling and air-conditioning. A regenerative unit will save the customer energy and money by eliminating that waste heat and returning that energy back to the AC line. Implementinga regenerative unit in the system will allow for a smaller cooling system (HVAC), offsetting the up-front cost of the regenerative unit, and reducing the demand on the cooling system. One regenerative unit can feed several drives connected to a common DC bus and optimize energy consumption by recovering excess regenerative energy not used by the drives.

III. METHODS TO RECOVER REGENERATIVE ENERGY

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There are mainly three different types of methods to recover the regenerative energy of the VFD when it works as a generator:

A. Snubber resistor braking
B. Line regeneration control
C. Synchronous rectifier control

A. Snubber Resistor control

Snubber Resistor Braking kits use a transistor and circuitry that "turns on" at a predetermined DC bus voltage, which is set below the AC drive's trip point. At this voltage level, the energy is transferred to a resistor (or group of resistors) where the energyis burned off as heat. Some AC drives already include a built-in braking transistor and only require the addition of a resistor kit. Snubber resistor braking kits are a lower-cost solution compared to line regeneration controls or synchronous rectifier controls. Snubber braking resistors, however, require cool-down time, which makes them less suitable for highly cyclical operations such as frequent, repetitive starts and stops. Line regeneration controls or synchronous rectifier controls are more suitable for these applications.

B. Line Regeneration control

Line Regeneration Controls use a set of transistors, which pulse "on" at a predetermined DC bus voltage set below the AC drive's trip point. At this voltage level, the energy is transferred directly back to the AC power source. Line regeneration controls can operate in a continuous mode up to the transistor current rating[3]. Their ability to regenerate power back to the power source also makes them an energy-saving device. Over time this energy savings can offset the higher cost of these controls. As shown in Fig 2. the regenerative module converts the excess energy from the DC bus to three-phase AC power and passes it to the source back thus saving the energy.
If we go back to the three-phase bridges mentioned earlier, we get some insight into how a Regenerative Brake works. The IGBT bridge inside the regenerative Converter is connected in parallel with the diode bridge of the drive. When one of the diodes in the drive's diode bridge is forward-biased, the diode in the same relative position in the IGBT Bridge is also forward-biased. Remember that the two bridges are basically connected by the DC bus and the AC line terminals [6].

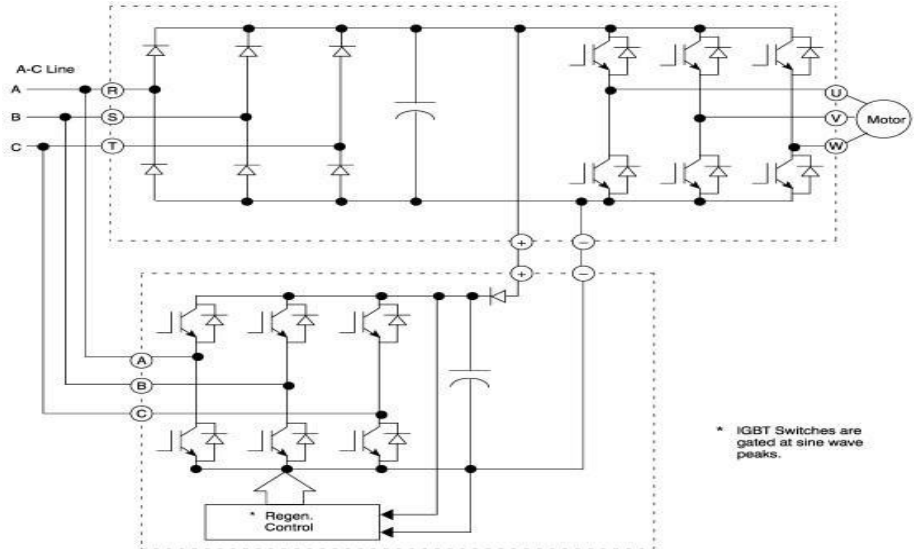

Fig. 2. Line Regeneration Control

3.3 Synchronous rectifier control

Synchronous Rectifier Controls can be used either as line regeneration controls or as AC line voltage to DC voltage converters for powering the DC bus of an AC drive. This is the newest technology which can be the ultimate solution of a regenerative drive. The circuit consists of two IGBT bridges with both of them controlled by PWM as shown in Fig 3. The converter bridge gating is synchronized to the A-C line. The resulting input currents are nearly sinusoidal with 5^{th} and 7^{th} harmonics removed which we see in the diode bridge converter [3].

In the motoring mode, the IGBT converter bridge works with a resonant-tuned input line reactor and DC bus capacitor as a boost converter to create DC bus voltage. This intermediate voltage is higher than that created by a conventional diode bridge rectifier. In the regenerative mode, the IGBT bridge feeds width-controlled pulses of the excess C bus voltage maximizing the input power factor. The synchronous PWM rectifier may be tuned to create a leading power factor, compensating for other lagging loads in the system [3].

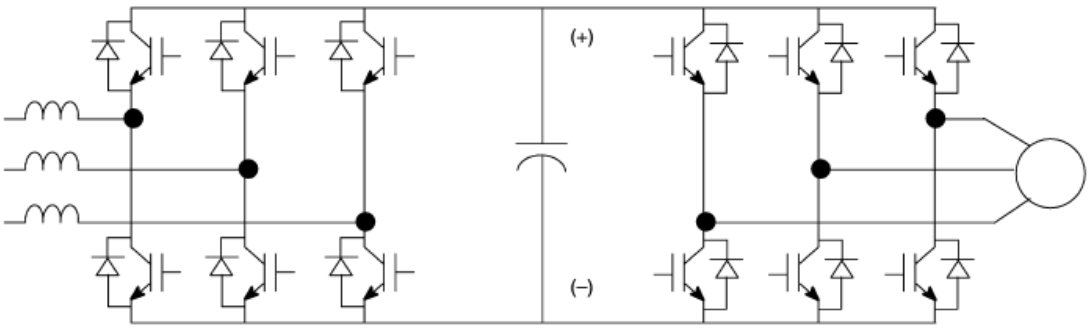

Fig. 3. Synchronous Rectifier Control

IV. APPLICATIONS OF REGENERATIVE AC DRIVE

- Overhauling loads
- High inertia loads
- Machine requiring fast deceleration
- Flywheels
- Vacuum pumps
- Locomotives
- Cranes and hoists
- Elevators
- Drums/ kilns
- Injection molding machines, etc

V. CONCLUSION

The above discussion states that the conventional braking of VFD can be replaced by different methods to recover the regenerative energy of the motor. Of all the three methods, the synchronous rectifier control method is best as it has lower cost and high efficiency. Also, the cost of the energy losing can be reduced with this implementation.

ACKNOWLEDGMENT

Obstacles are what we see when we take out eyes off the goals" Adversity is often one of the best teachers. Even the people that somehow gripped our meanest imagination, violated us in some way, even those people are due their honor for what they have taught us. We wish to acknowledge all for their role in our lives. We are also grateful to our beloved principal, whose dynamic and single-handed efforts have inspired us to do something in the time to come. We also thank our teaching & Non-teaching staff for their kind help in bringing out this project within a stipulated time. Finally, we thank our Parents and Friends for their unconditional support throughout the project.

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IoT-Based Dustbin Monitoring System

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Abstract: The overflowing trash cans in most cities produce an unclean atmosphere. This will also cause various kinds of unidentified diseases to develop. Many types of dustbins, such as swing lid trash cans, pedal trash cans, mesh trash cans and open trash cans are used to dispose of rubbish or garbage these days. The problem with open and mesh garbage cans is that they can harbor a deadly stench for several days if the rubbish is left undisturbed, and children can easily unravel the waste and scatter it everywhere. Another disadvantage for people with children is how difficult it is to keep an eye on them and keep them away from trash cans. These trash cans are frequently used in streets, workplaces, hospitals, and residences. The economical use of dustbins is discussed in this article. The presented work aims to reduce human efforts and to automate the task of ash-bin.

Keywords: Internet of Things (IoT), Waste management, Arduino, GSM/GPRS module, Ultrasonic Sensor

I. INTRODUCTION

An extremely creative technology today that will aid in maintaining clean cities is the IOT-based dustbin monitoring system. This system continues to keep an eye on the trash cans and uses a web page to notify users about the amount of trash that has been collected. To do this, the system compares the depth of the garbage bins with the garbage level using ultrasonic sensors that are positioned over the bins. The Arduino UNO, GPRS module, buzzer, and data transmission are utilized by the system. The Ministry of Urban Wellbeing, Housing, and Local Government claims that these wastes are causing severe air and land pollution, health issues for local populations, and obstacles to economic growth. When combined, Malaysia's inadequate waste management practices represent one of the country's most pressing problems to date. The project's goals are to create a working prototype of an Internet-of-Things (IoT) garbage monitoring system and notify garbage collectors when the bin is full by determining the garbage level based on the bin's depth. Cleaning all of the dustbins as soon as they are filled is crucial. [1]

II. PROBLEM DEFINITION

Solid waste management is a major issue in urban areas. In a traditional waste management system, the person in charge of collecting garbage is unaware of how much waste is in the dustbin. When the dustbins fill up, the garbage spills out and overflows, creating an unsanitary environment in urban areas. Garbage is dumped into the already overflowing dustbin. Untidy trash cans can occasionally give off an unpleasant odor in addition to producing toxic and unsanitary gases, which contributes to air pollution and the spread of some dangerous diseases. The city has a really poor appearance. Using a traditional system leads to an ineffective system that costs money and takes time to use. [2]

In this article, the issue of overflowing solid waste bins that contaminate the environment is addressed. The ultrasonic distance measuring sensor determines how much garbage is in each bin. The microcontroller in each garbage bin sends an alert message to the e-monitoring station when the level of garbage inside surpasses a predetermined threshold. The workstation then arranges for the closest garbage collection truck to pick up the trash from the bins that have sent the alert. The sanitation experts can work more productively and save money by using this information, which indicates when the container is full and needs to be emptied.

III. METHODOLOGY

A system based on the Internet of Things (IoT) will automatically alert and properly dispose of such waste. Every person on the planet disposes of their waste in a dustbin, which they then empty once it is full. This is how a typical dustbin is used in its most basic capacity—all manual operations, no coding, and no use of components. When the waste from the bin overflows the lid, the bin is not being properly maintained. Using dustbins with distinct segregations, such as green and blue bins placed together or a dustbin designated solely for recyclable waste, is the second method. The third method uses Arduino, ultrasonic sensor, GSM module, and servomotor to do the same result and it is not cost-efficient.

A. Hardware

- Arduino UNO
- HC-SR04 ultrasonic sensor
- Connecting wires
- GSM/GPRS module

B. Block Diagram

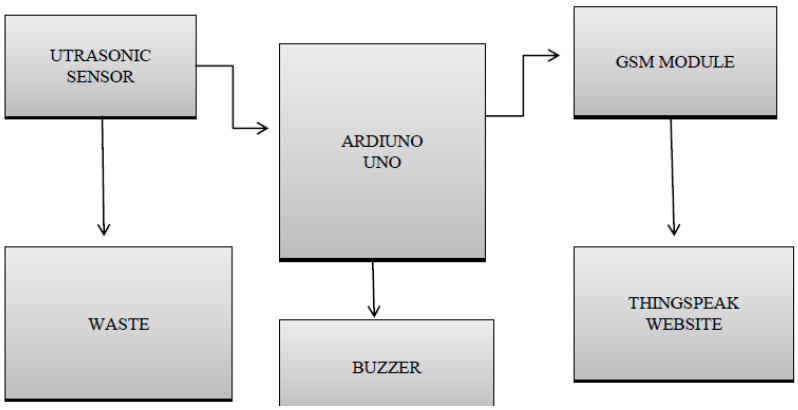

Fig.1. Block diagram of process system

The device that is being shown uses an ultrasonic sensor as an input, which is positioned at the waste can's highest level. An ultrasonic sensor is used to measure the garbage level and an Arduino for system control makes up the system. Everything will be connected to ThingSpeak. The user will be able to see the amount of waste in the dustbin without having to open it at the same time thanks to the level of garbage display. Based on the depth of each bin, the four ultrasonic sensors connected to Arduino determine the garbage level in each one. In order to ensure that data transfers and displays on ThingSpeak, these four ultrasonic sensors are connected to the GSM module simultaneously. Based on the type of waste, the system will attempt to monitor the rubbish's depth in this work. The home garbage should not wait for the bin to be completely full since the longer it is in the bin, the longer it will rot and cause an unpleasant environment.

C. Circuit Diagram

Figure 2 illustrates the circuit and how each component is connected to the others. Here, a logic level converter is used to connect ultrasonic sensors to the Arduino UNO and GSM module. The purpose of the logic level converter is to lower the ultrasonic sensor's 5V voltage to 3.3V. This is a result of the GSM module's PINs only accepting 12 V. In this setup, in order to create data and connect to the GSM module, the ultrasonic sensor requires a minimum of 5V. After being gathered, the data was uploaded to ThingSpeak for analysis and visualization.

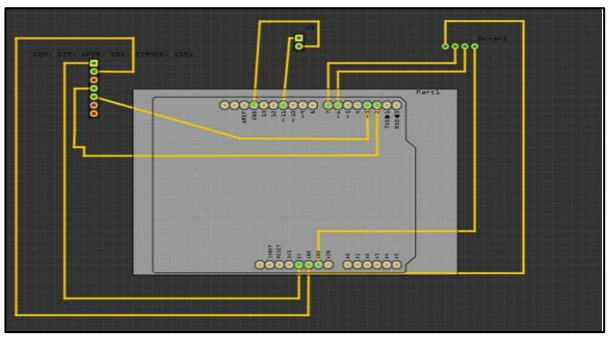

Fig.2. Circuit connection

D. Working Process

The Arduino will read the ultrasonic sensor after the account is created and then send a signal at the speed of sound. Once it hits the object, it reverses direction and travel time is stored. Consequently, the object's distance is computed. The garbage level can be classified as low or high based on distance. To denote the need for the cleaning procedure, we used the term "Overflow."

E. Result

The testing methodologies are referred to as test cases, as Table I illustrates. The operation and assessment results of the IOT-based dustbin monitoring system are displayed in Table I.

TABLE I
SMART GARBAGE BIN STATUS IDENTIFICATION AND EVALUATION RESULTS

TESTCASE DESCRIPTION	TESTCASE NOTATION	INPUT	REQUIREMENTS	TESTCASE STATUS	BUZZER
The garbage bin was found to be “EMPTY”	T1	Null	The Garbage bin should not have waste in it	Pass	NO
The garbage bin was found to be “MEDIUM”	T2	Garbage filling	The Garbage bin should be filled to its intermediated level	Pass	NO
The garbage bin was found to be “NEARLY FULL”	T3	Garbage filling	The garbage bin should be filled to an above intermediate level	Pass	YES
The garbage bin was found to be “FULL”	T4	Filled	The garbage bin should be filled to its maximum level	Pass	YES
The garbage bin was found to be “THRESHOLD CROSSED”	T5	Spillover	The garbage bin should be filled to a level that crosses the threshold limit	Pass	YES

Fig. 3. Hardware components

Testing the rubbish bin's fullness and emptiness serves as an evaluation of the system. The resulting level of garbage will display as empty if the trash can is empty. The buzzer will turn on based on how full the trash can is. Simultaneously, ThingSpeak will receive data from the sensor via the GSM module. As seen in Fig. 4, the data will be displayed in real-time by the ThingSpeak. Thus, waste management is able to keep an eye on the amount of junk that is buried inside the dustbin.

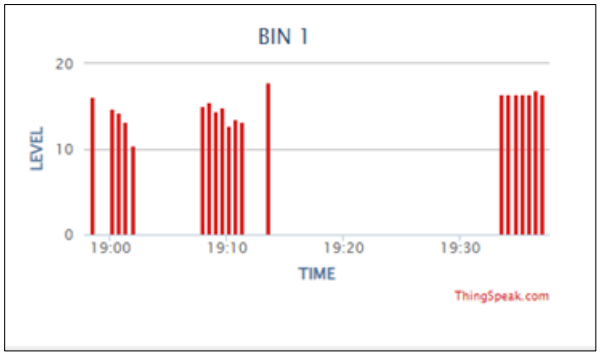

Fig.4. The data on ThingSpeak for bin

F. Advantages

- Quite a basic circuit.
- Helps monitor garbage levels.
- Makes little use of electricity.
- In the end, facilitates improved garbage pickup scheduling.
- It may decrease the amount of overflowing bins.
- Cuts down on travels to locations where the bins still have a lot of capacity.

G. Disadvantages

- The city gets a bad image of being dirty.
- The system requires a larger number of garbage bins for different waste collection according to the population in the city.
- This results in high initial cost owing to the expensive smart dustbin comparison to other methods.
- The dustbin's sensor mode has a small memory capacity.

H. Applications

- The "SMART CITY" can also make use of this initiative.
- The government's "SWACHH BHARAT ABHIYAN" project benefits from this project as well.

IV. CONCLUSION

This article presents a workable system for monitoring the level of garbage. The presented work uses sensors to measure the amount of waste in the dustbin in real time to implement a real-time waste management system. This system allows users to access the dustbin's information at any time and from any location. This system will assist in providing real-time information on each trash can's status. Therefore, when the dustbin is full, waste management can dispatch the garbage collector to pick up the trash. The ultrasonic sensor's detection range is 2cm to 400 cm, and it has a working buzzer. This sensor will display the amount of trash in the dustbin by comparing its depth. At the same time, the sensor will send data to ThingSpeak via the GSM module. Real-time data visualization is possible with ThingSpeak's data. As a result, garbage management is watchable.

V. FUTURE SCOPE

This system helps keep our neighborhood, house, or even the environment clean and green, which leads to a better way for us to live in a hygienic environment. It also provides real-time waste monitoring. The amount of waste containers in the dustbins is tracked using an ultrasonic sensor.

ACKNOWLEDGMENT

We would like to say thanks to our Institute’s Management, Director, and Principal for the kind support and constant encouragement to do such kind of work.

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Predictive Modeling for ATME-TOX Properties of Drug Using Machine Learning: A Review

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Abstract: This survey paper comprehensively explores the landscape of predictive modeling for Absorption, Distribution, Metabolism, Excretion, and Toxicity (ADMET) properties of drugs through the lens of machine learning (ML) techniques. The review encompasses an extensive analysis of methodologies, data sets, advancements in ML algorithms, and their applications in drug discovery and development. Beginning with an overview of the significance of ADMET properties in drug development, the survey delves into various datasets utilized for modeling, encompassing chemical descriptors, biological activities, physicochemical properties, and toxicity endpoints. It scrutinizes the intricacies of feature engineering, emphasizing the importance of selecting informative features for accurate predictions. The survey critically evaluates an array of ML algorithms employed in predictive modeling, ranging from traditional methods to state-of-the-art deep learning architectures. It highlights the strengths, limitations, and applications of these algorithms in predicting ADMET properties, emphasizing the need for robust experimental design and validation protocols. Challenges such as interpretability, data quality, and integration of domain knowledge are addressed, underscoring the significance of standardized frameworks for ensuring reproducibility and generalizing ability of predictive models. Furthermore, the survey showcases successful applications of ML-based predictive modeling in optimizing drug candidate selection, mitigating toxicity risks, and expediting the drug discovery process.

Keywords: Health care, Machine Learning, Deep Learning, ADMET Properties

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I. INTRODUCTION

In recent years, the application of ML techniques in predicting ADMET properties of drug candidates has emerged as a pivotal area in pharmaceutical sciences. The introduction provides an overview of the significance of ADMET properties in drug development, emphasizing the necessity of efficient prediction models to assess these properties early in the drug discovery process. It discusses the complexities and challenges associated with traditional experimental methods in assessing ADMET properties, underscoring the need for computational approaches that expedite the identification of potential drug candidates while reducing costs and laboratory efforts. Predictive modeling for ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) properties of drugs using machine learning (ML) involves employing computational techniques to forecast how a drug candidate might interact within a biological system. This approach has become integral in pharmaceutical research and development, aiding in the identification and optimization of potential drug candidates while minimizing risks associated with toxicity and inefficacy.

II. METHODOLOGY AND APPROACH

A. Objective: The primary goal is to predict and assess various crucial properties of a drug candidate:

1. **Absorption:** How the drug is absorbed into the body's blood stream from its administration route.
2. **Distribution:** How the drug spreads throughout t the body's tissues and organs.
3. **Metabolism:** How the drug is chemically altered within the body.
4. **Excretion:** How the drug and its metabolites are eliminated from the body.
5. **Toxicity:** Assessing potential adverse effects the drug might induce.

B. Data Acquisition: Gathering comprehensive data from various sources (e.g., biological assays, chemical databases, research publications) that detail the properties and behaviors of different drug molecules.

1. ***Data Preprocessing:*** Cleaning the data by handling missing values, normalizing features, and structuring it for analysis. This step ensures that the data is suitable for ML algorithms.
2. ***Feature Engineering*:** Identifying relevant features or properties that impact ADMET behaviors. This may involve transforming existing features or creating new ones that enhance predictive power.
3. ***Model Selection*:** Choosing suitable ML algorithms (e.g., Random Forests, Gradient Boosting, and Neural Networks) based on the nature of the data and the prediction task.
4. ***Model Training:*** Training the selected models on a portion of the dataset to learn patterns and relationships between drug features and ADMET properties.
5. ***Model Evaluation*:** Assessing model performance using metrics like accuracy, precision, recall, or area under the curve (AUC) for classification tasks, and metrics like RMSE or R-squared for regression tasks.
6. ***Model Validation and Interpretation:*** Ensuring the model generalizes well to new, unseen data. Analyzing feature importance can provide insights into which factors significantly influence the predictions.
7. ***Deployment and Monitoring:*** Deploying the model to predict ADMET properties of new drug candidates. Continuous monitoring and potential model updates as new data becomes available or as performance changes are essential.

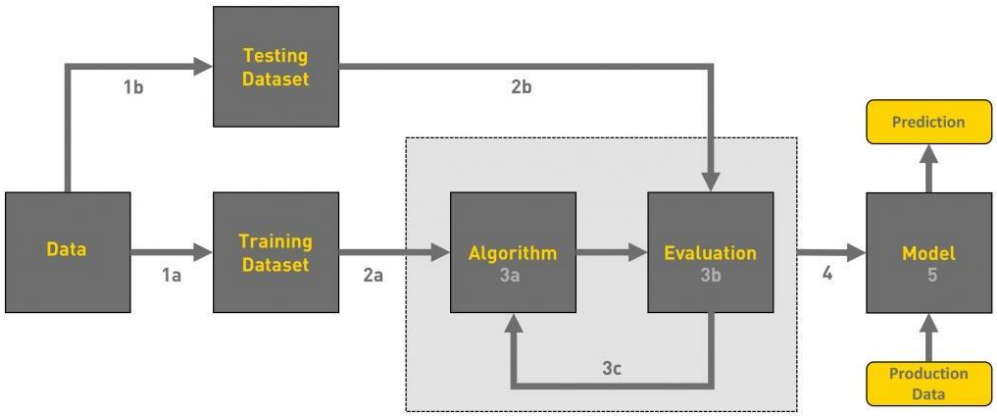

Fig. 1. Work flow of Machine Learning

C. Scope of the Survey:

The survey aims to comprehensively review and analyze various aspects of predictive modeling for ADMET properties using ML techniques. It delves into:

1. ***Data Sources and Preprocessing*:** Discuss the diverse sources of data used for modeling ADMET properties, data quality challenges, and preprocessing techniques required for ML algorithms.
2. ***Feature Engineering and Selection:*** Highlighting strategies for identifying essential features and engineering approaches to enhance predictive power.
3. ***Machine Learning Models:*** Reviewing a spectrum of ML algorithms (e.g., Random Forests, Neural Networks, and Support Vector Machines) employed in predictive modeling and their applications to specific ADMET properties.
4. ***Model Evaluation and Validation:*** Discussing metrics and techniques used to assess model performance and ensure generalizability and reliability.
5. ***Challenges and Future Directions:*** Addressing challenges such as interpretability, domain knowledge integration, and the need for more comprehensive datasets. Additionally, discussing emerging trends and future directions in the field.

D. Significance:

The introduction emphasizes the significance of this survey in consolidating current knowledge, providing a comprehensive understanding of methodologies, and identifying gaps and opportunities for future research in predictive modeling for ADMET properties using ML. It highlights the potential impact of these models in expediting drug discovery, optimizing candidate selection, and minimizing risks associated with toxicity and inefficacy.

By offering a comprehensive review of existing literature, methodologies, challenges, and potential advancements, this survey aims to serve as a roadmap for researchers, practitioners, and stakeholders in the pharmaceutical industry, fostering advancements in predictive modeling for ADMET properties using ML techniques.

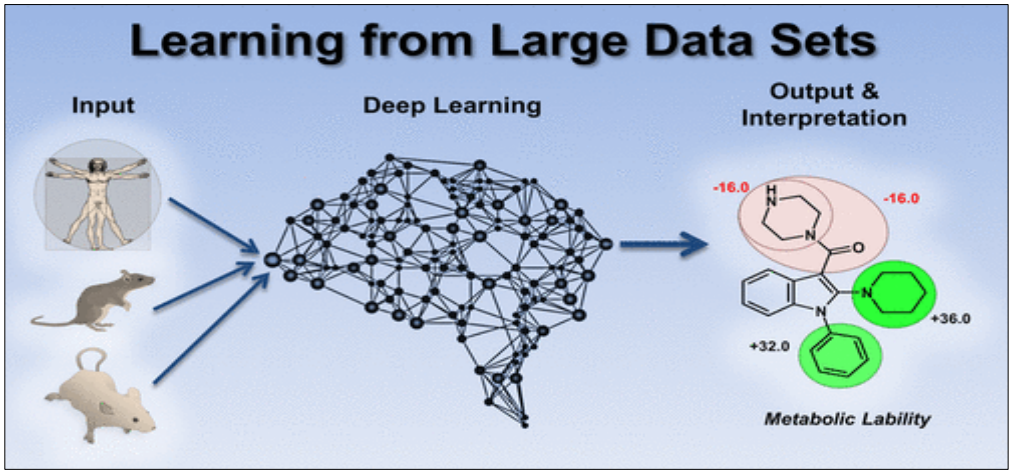

Fig. 2. Predictive Multitask Deep Neural Network Models for ADME-Tox Properties

III. LITERATURE SURVEY

A. Identifying Protein Features and Pathways Responsible for Toxicity Using Machine Learning and Tox21: Implications for Predictive Toxicology [13]

This represents the inaugural computational pipeline leveraging protein descriptors to extract crucial features from twelve toxicity endpoints within the Tox21 dataset for evaluating compound toxicity. Our approach encompasses a fusion of protocols integrated into the CANDO drug discovery platform. These protocols involve generating compound-proteome interaction signatures, balancing data, selecting features, and conducting enrichment analysis. This concerted effort aims to comprehend compound toxicity patterns at the protein pathway level. We anticipate that this innovative computational pipeline will offer a fresh perspective on assessing environmental compounds. Moreover, it presents an opportunity for researchers and the pharmaceutical industry to delve into the underlying proteomic mechanisms responsible for inducing toxicity while potentially aiding in the development of novel therapeutics targeting toxicity-related pathways.

B. Machine learning in drug design: Use of artificial intelligence to explore the chemical structure–biological activity relationship [14]

The paper presents a comprehensive overview of the use of artificial intelligence (AI) systems in drug design. Neural networks, which are one of the systems employed in AI, are used to identify chemical structures that can have medical relevance. The 2019 Nature Machine Intelligence article highlighted the resurgence and lasting impact of AI in medicine. It confirmed the growing role of computer advancements and computational algorithms in supporting drug design. The review emphasized that while various neural network architectures, from basic to complex ones like CNN, capsule, or GAN, are applied in drug design; no single network stands out definitively as the best tool. However, deep learning (DL) solutions are gaining popularity due to their ability to emulate intricate human thinking patterns and autonomously derive characteristics from observed datasets, aiding drug design significantly.

C. A review on machine learning approaches and trends in drug discovery [15]

A collaborative effort is imperative to seek and implement standardized frameworks. This effort stands as a crucial factor in swiftly transitioning academic findings into industrial applications. Lack of standardization in processes and methodologies poses

a challenge, preventing the extension of research outcomes to practical clinical tasks. Hence, when employing machine learning techniques, it becomes essential to design experiments robustly to ensure reproducibility across diverse researchers. Throughout this review, inconsistencies in this aspect were evident across various articles analyzed. To arrive at definitive conclusions, addressing this issue deserves significant attention. Nonetheless, the potential and benefits offered by machine learning techniques remain vast, particularly within the realms of precision medicine and drug discovery.

IV. DATASET

Several datasets are available for predictive modeling of ADMET properties using machine learning in drug discovery. Some popular datasets include:

1. ***Tox21Dataset:*** This data set, developed by the National Institutes of Health (NIH), contains results from high-throughput screening assays measuring toxicity-related properties for thousands of chemical compounds.
2. ***Drug Bank:*** Drug Bank is a comprehensive database that includes information on drugs, their targets, chemical structures, and ADMET properties. It's a valuable resource for predictive modeling in drug discovery.
3. ***ChEMBL:*** ChEMBL is a large database that provides bioactivity data, including ADMET properties, for a wide range of compounds. It's frequently used in drug discovery research.
4. ***PDBbind:*** This dataset focuses on protein-ligand binding affinity and contains information about protein structures, ligands, and their binding affinities, which can be relevant for drug design and ADMET prediction.
5. ***PubChem BioAssay Database:*** PubChem offers an adverse collection of bioassay data, including ADMET-related assays, which can be used for modeling toxicity properties.
6. ***TCRD (Therapeutic Target Database*)**: TCRD provides information on drug targets, including protein interactions, pathways, and associations with diseases, which can be used in predictive modeling.

When using these datasets for predictive modeling, it's crucial to preprocess the data, handle missing values, perform feature engineering, and split the dataset into training and testing sets for model development and validation.

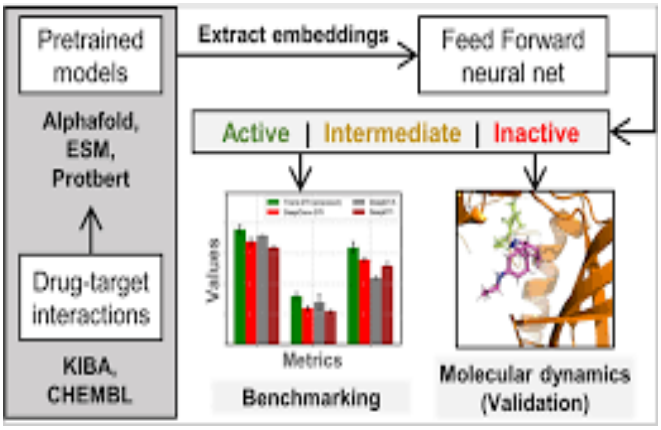

Fig.3. Transformer-Based Language Models for Estimating DTI and Building a Drug Recommendation Workflow [16]

***A. Attributes of Dataset*:** Attributes in a dataset for predictive modeling of ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) properties of drugs using machine learning typically include various features describing chemical compounds and their biological properties. Here are common attributes or features found in such datasets:

1. ***Chemical Descriptors:*** Molecular descriptors representing structural features of compounds, such as molecular weight, chemical formulas, atom counts, bond types, etc.
2. ***Biological Activity:*** Information about the interaction of compounds with biological targets, including binding affinity, enzymatic activity, or cellular responses.
3. ***Physicochemical Properties:*** Properties like solubility, lipophilicity, polar surface area, and hydrogen bonding capacity influence a compound's behavior in biological systems.
4. ***Toxicity Endpoints:*** Measurements or predictions of toxicity-related properties, including cytotoxicity, mutagenicity, genotoxicity, carcinogenicity, hepatotoxicity, cardiotoxicity, etc.

5. ***ADMET Parameters*:** Attributes describing the Absorption, Distribution, Metabolism, Excretion, and Transport properties of compounds, such as bioavailability, permeability, metabolic stability, plasma protein binding, etc.
6. ***Biological Pathways/Targets:*** Information about biological pathways affected by the compounds, target proteins, gene expression changes, and pathway interactions.
7. ***Experimental Conditions:*** Conditions under which the data was collected, including concentrations, assay types, cell lines, organisms, and experimental protocols.
8. ***Metadata:*** Additional information like compound IDs, assay IDs, sources of data, assay descriptions, and any other relevant contextual information.
9. ***Outcome/Label:*** The target variable representing the toxicity or ADMET property being predicted or classified.

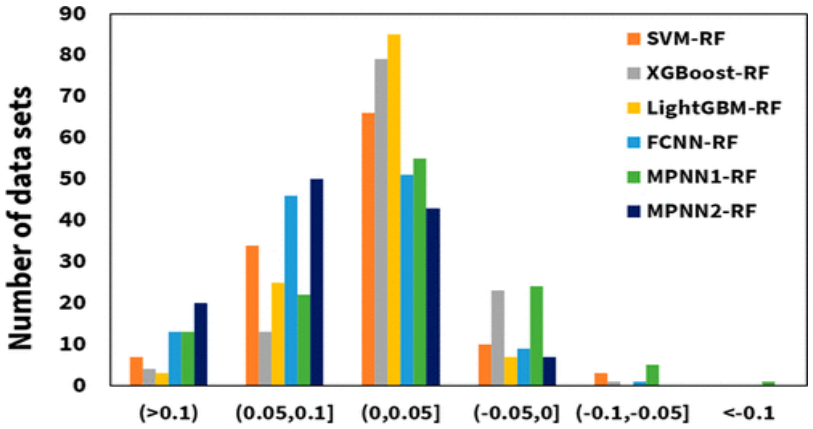

Fig. 4. Prospective Validation of Machine Learning Algorithms for Absorption, Distribution, Metabolism, and Excretion[17]

These attributes collectively provide a comprehensive profile of compounds and their behaviors, facilitating the development of predictive models to estimate ADMET properties and predict the potential toxicity or efficacy of drug candidates. The choice and relevance of attributes often depend on the specific research question, the nature of the compounds, and the goals of the predictive modeling task.

V. CONCLUSION

This survey comprehensively explores the landscape of predictive modeling for Absorption, Distribution, Metabolism, Excretion, and Toxicity (ADMET) properties of drugs using machine learning (ML) techniques. The review underscores the transformative potential of ML in revolutionizing drug discovery and development processes. Through an in-depth analysis of various datasets, methodologies, and advancements in ML algorithms, it is evident that predictive modeling holds promise in efficiently evaluating ADMET properties, aiding in the identification of drug candidates while mitigating risks associated with toxicity and inefficacy. The review highlights the significance of interdisciplinary collaboration, emphasizing the need for standardized frameworks and robust experimental designs to ensure the reproducibility and generalizability of predictive models. Challenges such as interpretability, data quality, and the integration of domain knowledge remain crucial areas for further exploration and refinement. Moreover, the versatility of ML algorithms, coupled with their ability to decipher complex biological interactions, opens avenues for precision medicine and targeted drug design. However, it's imperative to acknowledge that while ML techniques offer tremendous potential, they complement rather than replace human expertise in the decision-making process.

The future of predictive modeling in ADMET properties using ML appears promising, paving the way for accelerated drug discovery, enhanced drug safety, and personalized therapeutics. As this field continues to evolve, it is crucial to foster collaborative research efforts, leverage emerging technologies, and address existing challenges to realize the full potential of predictive modeling in optimizing drug development."This conclusion serves to summarize the key takeaways from the survey paper, emphasizing the opportunities, challenges, and future prospects in the realm of predictive modeling for ADMET properties using machine learning techniques.

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[13] https://www.mdpi.com/1420-3049/27/9/3021

[14] https://wires.onlinelibrary.wiley.com/doi/epdf/10.1002/wcms.1568

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Improving Voice Assistant User Experience throughContext Awareness and Personalization

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Abstract: Context awareness, the system's ability to comprehend and adapt to the user's surroundings, is harnessed through cutting-edge natural language processing, environmental sensing, and machine learning algorithms. To achieve context-awareness, the proposed system employs advanced natural language processing and machine learning algorithms.

The incorporation of context-aware features allows voice assistants to grasp the situational nuances of a conversation. This involves considering the user's prior commands, inquiries, and the broader context of the dialogue. Such awareness enables the voice assistant to provide more relevant and coherent responses,creating a seamless and natural conversation flow.

Personalization plays a crucial role in making voice assistants not only responsive but also adaptive to theunique needs and preferences of each user. Through the analysis of user behavior, preferences, and historical interactions, voice assistants can learn and evolve over time, delivering a more personalized and user-centric experience. This tailored approach not only enhances user satisfaction but also fosters a senseof connection between the user and the voice assistant.

In conclusion, the convergence of context-aware features and personalized responses represents a paradigm shift in voice assistant design. This approach holds the potential to elevate user satisfaction, foster more natural and intuitive conversations, and redefine the future landscape of voice interaction technology.

Keywords: customer satisfaction, expectations confirmation theory, digital assistants, privacy concerns,artificial intelligence.

I. INTRODUCTION

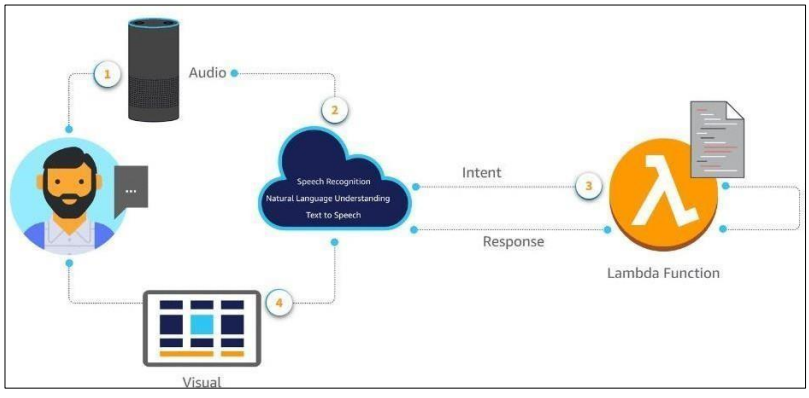


Fig. 1. Alexa Flow Chart

- To enhance the user experience of a voice assistant by leveraging context awareness andpersonalization.
- This project seeks to improve user interaction with a voice assistant by making it context-awareThey are often discussed in terms of the "5W" framework, which stands for Who,
  What, When, Where, and Why.

TABLE I

PROPOSED METHOD

5W of ETL		
No	Condition statisfied	Required
1	1234	0
2	234	1
3	123	0
4	124	3
5	134	0
6	12	3
7	13	0
8	14	3
9	24	13
10	23	1
11	1	3
12	2	13
13	3	1
14	4	123

1	what(Sales,production)
2	who(material)
3	when(date,period)
4	which(arithmatic)
5	where(location)

- The objective of the project is to create an AI, the total elastic application that can capture userspoken/written queries and respond to them accordingly related to sales data.
- This is our proposed 5W structure which fills the gap of fulfilment and satisfies the whole query.
- With this system, we can capture anything in order to create dynamic AI.

II. ALGORITHM

A. Named Entity Recognition

Another significant technique for analyzing natural language space is called entity recognition. It's in charge of classifying and categorizing persons in unstructured text into a set of predetermined groups. This includes individuals, groups, dates, amounts of money, and so on.

B. Text Summarization

As the name implies, NLP approaches can assist in the summarization of big volumes of text. Text summarization is commonly utilized in situations such as news headlines and research studies.

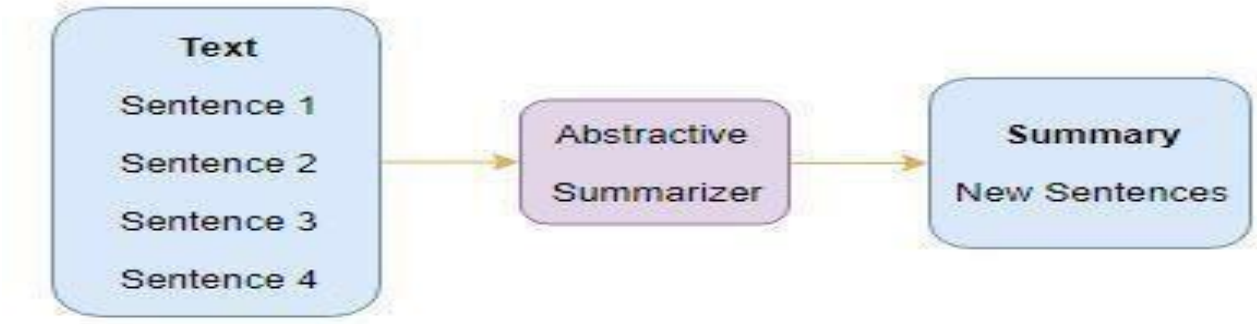


Fig 2. Text summarization

C. Bag of Words

This paradigm represents a text as a bag (multiset) of words, neglecting syntax and even word order whilekeeping multiplicity. In essence, the bag of words paradigm generates a matrix of incidence. These word frequencies or instances are then employed as features in the training of a classifier.

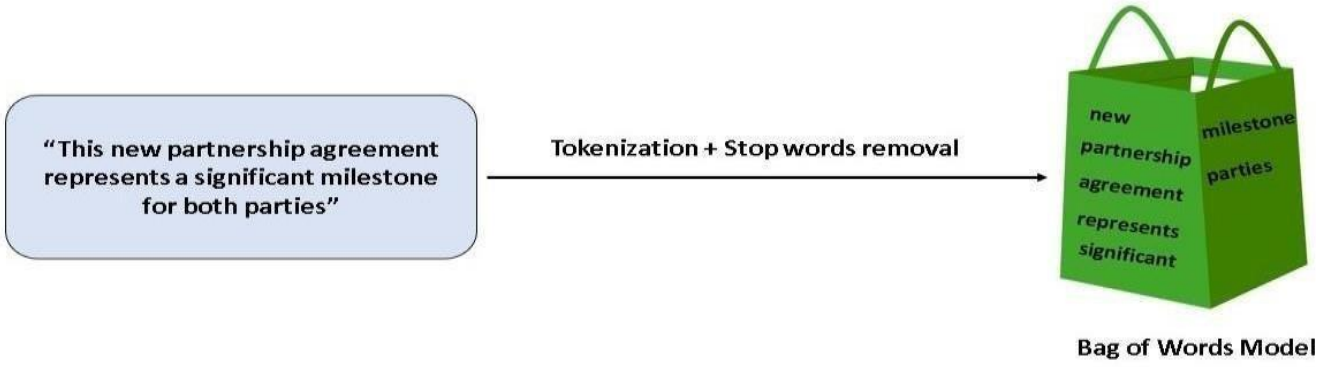


Fig 3. Bag of words

D. Keyword Extraction

Keyword extraction is one of the most important tasks in Natural Language Processing, and it is responsible for determining various methods for extracting a significant number of words and phrases from a collection of texts. All of this is done to summarize and assist in the relevant and well-organized organization, storage, search, and retrieval of content.

III. EXISTING FRAMEWORK ARCHITECTURE

A. Alexa Skills Kit (ASK):

- Framework: ASK is Amazon's official framework for building Alexa skills. It serves as the foundation for developing voice interactions and applications for Alexa-enabled devices.

B. AWS Lambda

- Serverless Backend: AWS Lambda is a key component of Alexa skill development. It allows you to run code in response to voice requests from Alexa. Most Alexa skills use AWS Lambda as theirbackend service.

C. Alexa Developer Console

- Development Environment: The Alexa Developer Console is an online platform where you design, build, test, and manage your Alexa skills. It provides a graphical interface for configuring your skill and testing it with simulated voice interactions.

D. Interaction Model

- Architecture: The interaction model defines how Alexa understands and responds to user input. It includes intents, slots, and sample utterances. You design and configure this model in the Alexa Developer Console.

- Process: After developing and testing your skill, you can submit it for certification through the Alexa Developer

Console. Amazon's certification process ensures that your skill meets its guidelines and quality standards.

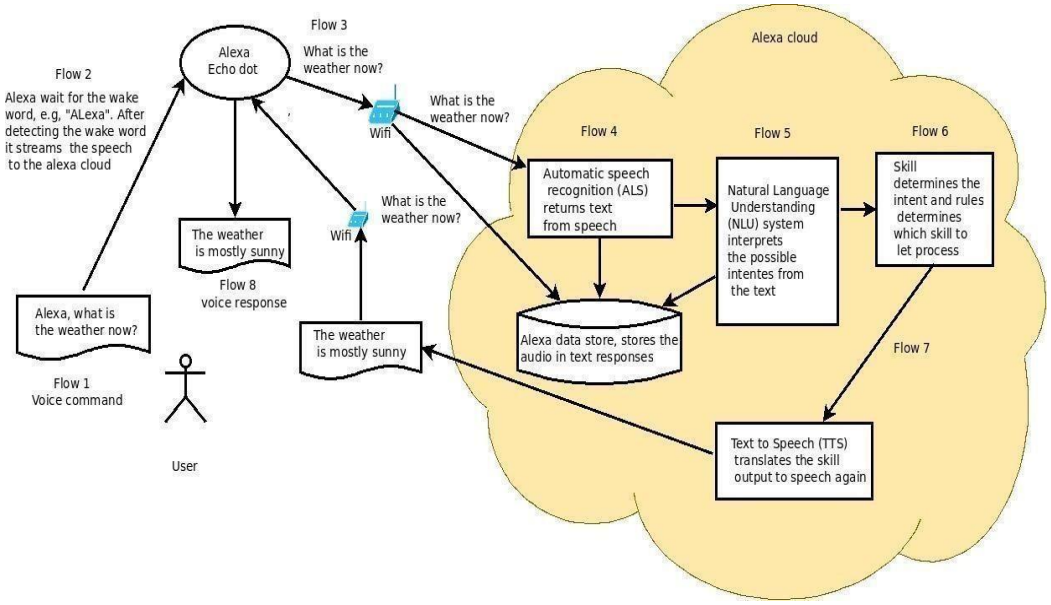


Fig. 4. Architecture of Alexa

E. Motivation

The underlying drive of this research is to offer valuable insights and actionable solutions to real-world challenges. By tackling genuine problems, we seek to make meaningful contributions that address pressingissues and generate practical outcomes. This motivation propels our efforts to drive positive change and provide tangible benefits to individuals, communities, and society at large.

IV. LITERATURE REVIEW

Sr. No	Authors and references	Paper Title/Journal	Main ideas	Simulation	Advantages	Limitations
1	Tom Brill Laura Muno z	Siri, Alexa,and Other Digital assistant: A Study of customer satisfaction with artificial intelligent applications	Siri, Alexa, andother digital assistants are rapidly being embraced by consumers and businesses. Digital assistants arespeech-enabled integrated artificial intelligence (AI) technologies (generally referenced as conversation-enabled applications).		This study affirmsthe role of the expectations confirmation processin customer satisfaction evaluation. Further, it provides insights that allow managers to understand the drivers and the degree of customer satisfaction with digital assistants. This study also	Customer satisfaction is not the sole goal inthe evolving landscape of digital assistants. Future research should explore diverse user dimensions, preferences, and generational differences to understand the full scope of Opportunities and challengesin

					provides recommendations as to where management should focus its priorities in order to assist users in gaining greater value with digital assistants.	this Rapidly advancing field.
2	Langzhou Chen,Volker Leutnant	AcousticModel Bootstrapping Using Semi-Supervised Learning	Speech recognition, semi-supervised training	Alexa Skill Set	It uses semi-supervised speech recognition.	Limitedlabeled datain semi-supervised acoustic model bootstrappingg can lead tosuboptimal performance, impacting accuracy and robustness. time- sensitive.
3	Che-Wei Huan g, Rol and Maas, Sri Harish Malli di, Björn Hoff meist er	A Study for Improving Device-Directed Speech Detection toward Frictionless Human-Machine Interaction	This paper is an update of prior work on detecting device-directed speech, or identifying utterances intended for Alexa.		The task can be phrased as a binary utterance-level classification problem that we approach with a DNN-LSTM model using acoustic features and features from the automatic speech recognition (ASR) decoder as input	Effectively integrating diverse acoustic and ASR decoder features for binary utterance-level classification using a DNN-LSTM model, which may pose challenges and impact overall classification accuracy.
4	AbdalGhani Abujabal Judith Gaspers	Neural Named Entity Recognition from Sub word Units	Named Entity Recognition (NER) is an important task in spoken language technology applications, such as voice-controlled smart assistants like the Amazon Echo or Google Home		To evaluate our models, we use the CoNLL script [3] to compute precision, recall, and F1 scores on a per-token basis. We report the average F1 score	Limitation in neural named entity recognition from sub-word units couldbe a reduced ability to capture nuanced semantic relationships due to the model's reliance on sub word represent at ions, potentially leading to less accurate identificationn of named

						entities in complex contexts.
5	Jaime Lorenzo Trueba, Thomas	Towards achieving robust universal neural vocoding	Statistical parametric speechsynthesis (SPSS) has seen a paradigm change recently, mainly thanks to the introduction of several Autoregressive models [1, 2, 3, 4,5, 6], turning into what can be termed statistical speech waveform synthesis (SSWS)[5].		This evaluation considered 2 female and 1 male speaker (the ones used to trainthe 3Spk vocoder).	Resultssuggest thatthe proposed vocoder, trained on varied materials (74 speakers and 17 languages, all recorded in studio conditions) can significantly outperform speaker dependent vocoders in clean unseen scenarios (relative MUSHRA score of 98%).
6	ChiehChi Kao,Ming Sun, Yixin Gao	Sub-band Convolutional Neural Networks for Small-footprint Spoken Term Classific action	With the rapid development of publicly available datasets (e.g. spoken term classification [1],speaker identification [2,3], acoustic event classification/detectio n [4, 5], etc.),state-of-the-art models for various acoustic applications can be trained with alarge amount of annotated data. CNN-based architectures have achieved state-of-the-art performance in keyword spotting [6], speech recognition [7, 8] speaker identification [2, 3], acoustic event classification [9]	Alexa SkillSet	They proposed a sub-band CNN architecture and explored it for spoken term classification.	effectively capturing nuanced acoustic features for small-footprint spokenterm classification using sub-band Convolutional Neural Networks, potentially impacting accuracy in diverse acoustic environments.

V. PROPOSED FRAMEWORK

A. Problem Statement

Alexa's personalization and context-awareness could involve addressing the need for improved adaptive capabilities. This may include developing mechanisms to enhance Alexa's understanding of individual user preferences and refining its ability to dynamically adapt responses based on real-time context. Challenges may include optimizing the balance between personalization and privacy, as well as ensuring seamless integration of context-aware features for a more natural and effective voice-assistant interaction.

B. Technology

- Alexa Developer Consol
- AWS Lambda

C. Alexa Developer Consol and AWS Lambda

The Alexa Developer Console and AWS Lambda form a crucial duo in the development and deployment of Alexa Skills. The Alexa Developer Console, as a web-based platform, serves as the central hub for skill creation, management, and testing. Developers utilize its features to design voice user interfaces, define interaction models, and simulate user interactions for testing. Moreover, the console facilitates the certification process, ensuring that developed skills meet the necessary standards before publication. On the other hand, AWS Lambda, a serverless computing service, plays a pivotal role in executing the code associated with Alexa Skills. Developers commonly use Lambda as the endpoint for their skills, where code for handling Alexa requests and generating responses is hosted. The serverless nature of Lambda allows for automatic scaling based on usage, providing scalability and cost-effectiveness. Additionally, AWS Lambda enables seamless integration with other AWS services, offering a robust infrastructure for Alexa Skill execution. Together, the Alexa Developer Console and AWS Lambda empower developers to create, refine, and deploy sophisticated voice-enabled applications with ease.

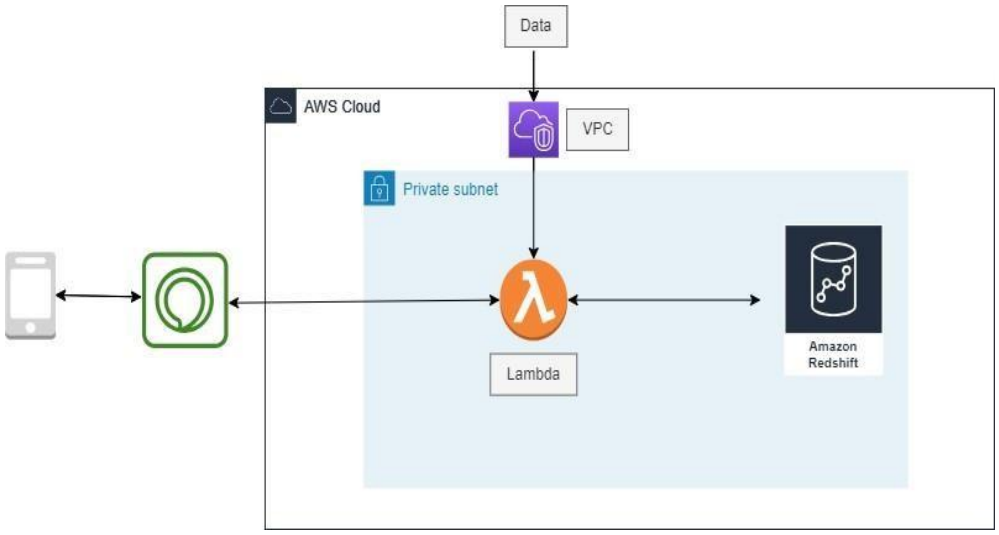


Fig 5. Architecture of Voice Assistant User Experience through Context-Awareness and Personalization

D. Project Planning and Design

- Define the objectives and scope of your Alexa skill. Determine the key functionalities and userinteractions.

E. *Skill Configuration*

- Access the Alexa Developer Console and create a new skill project.
  Configure the basic settings of your skill, including the skill's name, language, and region.

F. ***Lambda Function Integration***

- Create an AWS Lambda function to serve as the backend for your skill.
- Configure the Alexa Developer Console to link your skill to the Lambda function.

G. ***Code Development***

- Write the backend code for your skill's logic in the programming language supported by AWSLambda (e.g., Node.js, Python, Java).

H. Certification and Publishing

- Submit your skill for certification through the Alexa Developer Console.

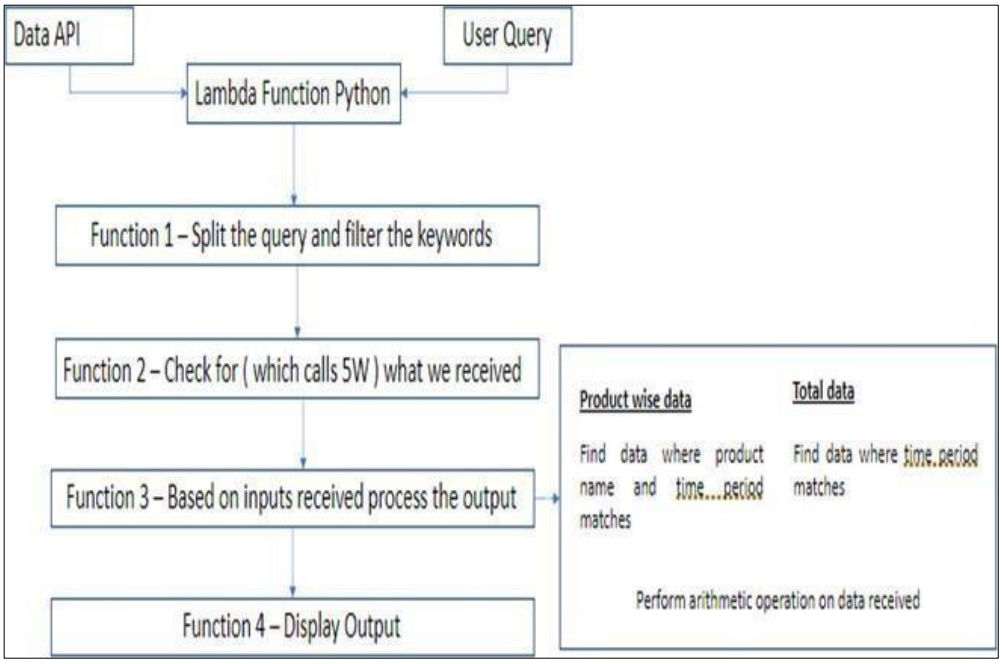


Fig. 6. Flow of Improving Voice Assistant User Experience through Context-Awareness and Personalization

Privacy and Security: Using a Virtual Private Cloud (VPC) is a crucial aspect of enhancing security in a cloud environment. VPC provides a private and isolated network space within the cloud, allowing you to control and secure your resources effectively. Here's how VPC contributes to security:

Network Isolation*:* VPC enables you to create isolated network environments, ensuring thatyour resources are not directly accessible from the internet. This isolation adds an extra layer of security by preventing unauthorized access.

Controlled Access: With VPC, you can define and configure security groups and network access control lists (ACLs) to control inbound and outbound traffic. This allows you to specify which IP addresses or ranges can access your resources, reducing the attack surface.

Subnet Segmentation: You can further enhance security by dividing your VPC into subnets.This segmentation enables you to organize and control traffic flow, creating zones with different security requirements for various components of your infrastructure.

VPN and Direct Connect*:* VPC allows you to establish secure connections between your on- premises infrastructure and your cloud resources using Virtual Private Network (VPN) or AWS Direct Connect. This

ensures secure communication and data transfer.

Encryption: Implementing encryption for data in transit and at rest is crucial for security. VPC provides options for encrypting communication between instances within the VPC and offers integration with other AWS services that support encryption.

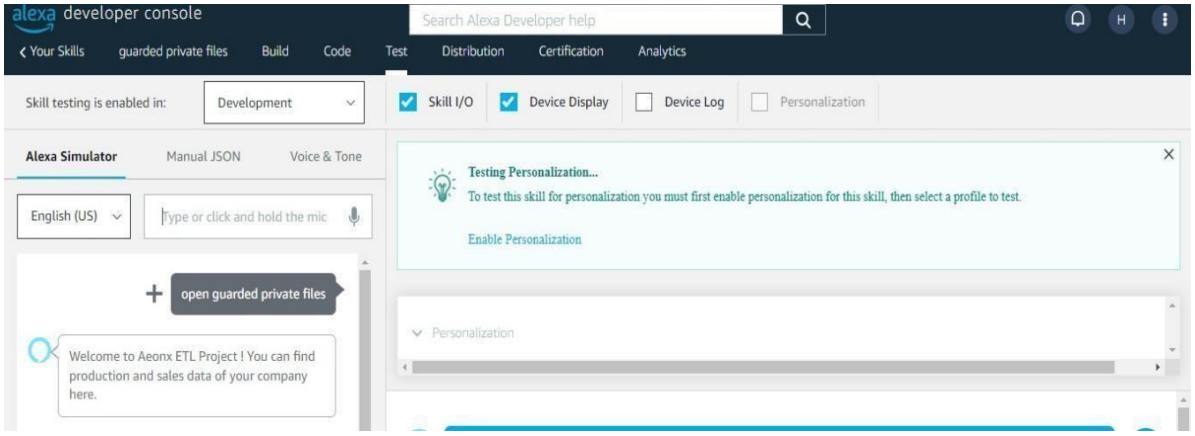


Fig. 7. Wake word

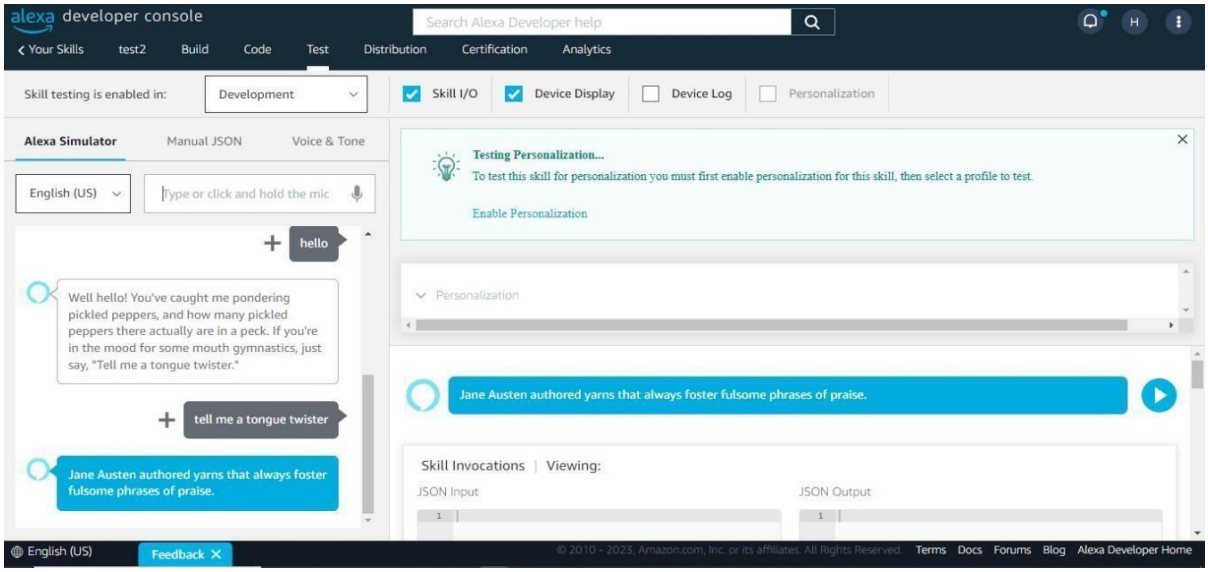
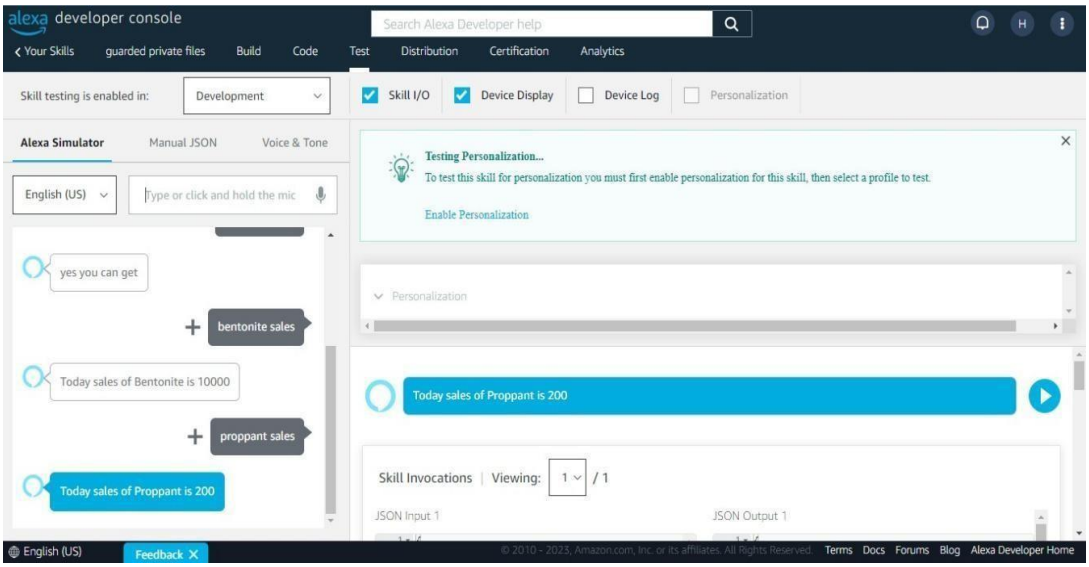


Fig. 8. Custom questioning



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Encryption: Implementing encryption for data in transit and at rest is crucial for security. VPC provides options for encrypting communication between instances within the VPC and offers integration with other AWS services that support encryption.

VI. CONCLUSION

Personalization takes context awareness a step further by tailoring responses and recommendations based on the user's individual preferences, historical data, and behavior patterns. By learning from past interactions, the voice assistant can adapt its responses to align with the user's unique preferences, creating a more personalized and human-like experience.

Customer satisfaction has long been a focal point of extant marketing and information technology literature. This study advances our understanding of the theoretical foundations for customer satisfaction as related to a new AI technology platform involving digital assistants.

Given the relative infancy of current digital assistant adoption and utilization, there is limited empirical work directly related to the consumer experience and customer satisfaction. This study affirmed the role of the expectations confirmation process in the customer satisfaction evaluation. Further, it provides insights that allow managers to understand the drivers and the degree of customer satisfaction with digital assistants. These elements can influence customer satisfaction evaluations.

VII. FUTURE SCOPE

In the future, improving the Voice Assistant User Experience through context awareness and Personalization holds promising prospects. Advanced context-aware features could encompass real-time environmental data and emotional cues, contributing to a more adaptive user experience. The integration of multimodal interactions, combining voice with gestures or facial expressions,

could offer a comprehensive and intuitive interface. Future systems might focus on continuous learning algorithms to dynamically adapt to evolving user preferences, ensuring a personalized and evolving interaction over time. Privacy-preserving personalization will be crucial, addressing concerns about data security as personalization becomes more intricate. Tailoring voice assistants to specific domains, fostering collaboration with third-party services, and prioritizing accessibility for diverse user groups are avenues for development. Additionally, recognizing and adapting to global cultural nuances and integrating with emerging technologies like augmented reality could further enhance the inclusivity and capabilities of voice assistants. In summary, the future holds potential for more sophisticated, adaptive, and culturally aware voice assistant interactions, transforming the landscape of human-computer interaction.

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A Survey of Intrusion Detection System in Wireless Sensor Networks

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Abstract: Remote sensor networks is more valuable where we can't lay out the conventional organization. The remote sensor network comprises of sensor hub, which has detecting parts, on-board handling, conveying and stockpiling capacities. Sensor hubs have less memory and less figuring power. Due to the large number of sensor nodes used in a variety of applications, there may not be a global identification number for sensor nodes. Every sensor hub detects the data and through information collection sends this data to a baser station. Remote sensor networks are open in nature and there are no cryptographic systems or security for sensor hubs to shield from outside Assaults. So we required the interruption recognition framework should be presented. Sensor hubs have restricted assets so we require Interruption distinguish frameworks such as lightweight and productive. Interruption identification conspires in a remote sensor network to distinguish the pernicious hub or gatecrasher. This paper presents a review of Interruption Discovery Frameworks in Remote Sensor Organizations. Out of a few identification methods, this paper centers on signature-based, Oddity based and half, and half-based procedures.

Keywords: intrusion detection, Sensor security, wireless sensor network, sensor node, malicious node, attacks

I. INTRODUCTION

Detecting is an interaction to gather the various sorts of data. Sensitive data can be gathered using numerous wireless sensor networks. Because they work with restricted assets and are left unattended, sensor nodes are more vulnerable to malicious intrusion and attacks. An intrusion can easily spy on sensor transmissions thanks to advanced remote communications [1]. In a wireless sensor network, sensor nodes are deployed densely to collect information. Sensor hub gather data as well as act in-network examination, relationship and combination of its own data and data or information from other sensor hubs. Sensor nodes don't just talk to each other; they also talk to the base station, allowing them to share information with other handling, visualization, and capacity frameworks [1].

In numerous sensor network applications, Sensor hubs work in distant regions and brutal climates, without infrastructural support or without fix and upkeep. Sensor hub having low energy, specially appointed sending, unattended activity makes him helpless.

In Rest of the Paper, Talk about the Security issues connected with Remote Sensor Organization (WSN), Security Objectives, Outline of Interruption Location Framework, and Related Work to Interruption Discovery.

II. SECURITY ISSUES OF WSN

In Remote sensor Organizations, The Sensor hubs are defenseless against various kinds of assault that endeavor to think twice about the organization and take data from hubs. There are various sorts of assaults, for example, inside/Outside, Dynamic/Latent, Host, and Organization. This Assault Can be named underneath at various layers to Relating Convention.

1. The Physical Layer: Sticking Assault, Physical Catching, altering.
2. Information interface Layer: Crash Assault, Weariness Assault.
3. Network Layer: Flooding Assault, Dark opening Assault, Dim opening Assault, Sybil Assault, Wormhole Assault, Surging Assault, Particular Sending, and Replay Assault.
4. Transport Layer: De-synchronization Assault, Meeting Commandeering Assault.
5. Application Layer: Misleading Information Sifting Assault, Traffic Investigation, and Bundle Following.

Security has a fundamental Concentration for Energy and Asset Obliged WSN Because of Different Basic Security Applications. Secure Correspondence is expected for hubs and Organizations. In numerous Applications, For example, front line Observation and evaluation, target following, Checking and noticing Catastrophe zones, any encroachment of Safety, splitting the difference of data or Deceiving Data can make an Intense Difference.

In Sensor Organization, Sensor hubs are asset Imperatives, for the most part, utilized in the far-off region and unattended activity makes them Defenseless against Security Assaults. So Security Objectives are Set for WSN and attempts to safeguard them. The four security goals for sensor frameworks are chosen as Secrecy, Respectability, Confirmation, and Accessibility (CIAA).

A. Confidentiality

Secrecy implies anticipation of unapproved admittance to data. In sensor organization, sensor hubs gather information and generally send this information to the base station through multi-bounce. In such a climate framework, we should keep up with the mystery of data.

A sensor organization shouldn't truly transmit its information to its encompassing organization. For instance, the interloper places a malignant hub in an organization for acquiring data. Encrypting data with a secret key to provide a Secure Communication Channel in WSN allows for the concealment of sensitive data.

B. Integrity

Information respectability guarantees that information can't be adjusted or changed during transmission. Therefore, another network should not be able to alter or change the data in the sensor network. The gatecrasher embeds a pernicious hub into the organization and attempts to embed fake information or tempestuous circumstances because of a remote channel that causes harm or loss of information. Information trustworthiness can be guaranteed by utilizing hash capabilities and message validation codes.

C. Authentication

The process of confirming the sensor node's identity is known as authentication. Confirmation guarantees the beneficiary hub that the information is from the hub that it professes to be from. The enemy can embed counterfeit information to arrange through a pernicious hub. So the Getting Hub can be ready to affirm the character of the hub from which it's gotten the information.

Information verification can be accomplished through symmetric or awry systems. That shares a secret key between the sender and the receiver to compute the MAC. Source Ascertains Macintosh Utilizing secret key, message information and attach to Information. The Getting hub ascertains the Macintosh and confirms the shipper.

Because of the Asset Limitation of Sensor Organization, it is hard to carry out such a Complex Cryptographic system.

D. Availability

When a network and its application are considered to be available, they can carry out any task without being hampered in any way. The Sensor hub stays accessible for working after some piece of the disappointment of the organization. Complex security systems are expected to keep the accessibility of the organization. Compromised base stations or cluster heads pose a threat to the sensor network. The most crucial aspect of the network's continuous operation is availability.

Remote Sensor Organization Security has been tested. The Sensor Network has various special difficulties like asset imperatives, Absence of focal control, distant area, and mistaken inclined Correspondence. So Sensor network requires different Security Innovations, Key administration, Counteraction procedures, and interruption Location Frameworks.

The answer for security assaults against the organization includes primary three parts [2]:

- Avoidance: In this given component stop the assault before it hurts the organization.
- Observation: Anticipation is the primary line of safeguard in the organization. In the event that the gatecrasher sidesteps the guard, a framework is coming up short against the assault. So the recognition instrument requires tracking down a pernicious hub or compromise hub.
- Moderation: After Location, the reaction module disconnects the noxious or compromise hub from the organization.

III. INTRODUCTION TO INTRUSION DETECTION

Interruption is the cycle wherein an unapproved substance penetrates the privacy, information honesty, and accessibility of the sensor network effectively or latently. Interruption identification is the system to recognize those who abuse the organization without approval and, furthermore, those who erroneously mishandle their honors.

An Interruption Recognition Framework (IDS) is a method that screens hub exercises and organizational conduct at various

layers. In most WSN applications, WSN is a multi-jump-appropriated activity, which makes it more troublesome in terms of assault location and avoidance. Because of the low-registering working state of WSNs, the vast majority of safety innovation utilized for wired or customary organizations is not applied to WSNs. Assuming that interruption happens, the trade-off hub alleviates the secret data like secure keys, information, and so forth. IDSs attempt to detect an attack and serve as a second line of defense. It sounds an alarm when it detects any illegal activity. The reaction module disengages the pernicious hubs from the organization.

There are three fundamental interruption location strategies:

A. ***Abnormality Discovery:***

The aim of the anomaly detection method is to locate abnormal activities. In this the identification, when it discovered some deviation from ordinary way of behaving is hailed as an abnormality and creates the admonition message for the framework. The Impediment of this framework is that network exercises quickly change, so the framework produces a high bogus alarm message.

B. ***Abuse-based Location***:

This Identification procedure is otherwise called mark or information-based strategy. In this procedure, Information on past distinguished assaults and shortcomings of the framework is utilized as a reference to identify future assaults. For instance, there are different times login fizzled, it identifies as savage power secret key assault. This method productively and precisely distinguishes the known assault with less bogus positive caution. The Weakness of this framework is that it isn't ready to identify another sort of assault whose mark or rules not accessible.

C. ***Particular rule-based Discovery*:**

An Anomaly detection strategy is somewhat comparable to this method. In this procedure, the regular Profile of the organization is described physically, so it gives less mistaken up-sides rate. This procedure tries to divide best between signature-based and abnormality location-based disclosure approaches by endeavoring to explain deviations from average social plans that are made not either by the planning data or by the AI system. The improvement of attack or show detail is finished physically. So it requires greater investment. Therefore, this will be a disadvantage of this strategy.

IV. RELATED WORK

In this segment, we have talked about existing techniques that are utilized for interruption location.

A. Using the Weighted trust technique

In this approach [3], The Trust values are allocated to every hub in the organization. The Group head keeps up with the trust worth of its associated hubs. The trust incentive for every hub shifts from 0 to 1. Higher trust esteem, sensor hub is more trust commendable. The Trust esteem is refreshed by bunch head in light of information obtained from sensor hubs. The malignant hub decides, assuming the hub has a lower weighted limit esteem than the base edge esteem. The accuracy of this method is very high if the number of malicious nodes is less than. Be that as it may, assuming malevolent hubs are high its exactness turns out to be extremely low, and pernicious hubs are detached from the legitimate hub. The principal Supposition in this approach is that the base station is secure and non-wrong. The adversary gains control of the entire network if the base station makes a concession.

B. Neighbor based approach

The Neighbor together methodology [4] is based with respect to the foremost that sensor hubs are thickly sent so near one another and have a similar sort of conduct. The Hub is recognized as pernicious in the event that its exercises are essentially not the same as its neighbors. The Creator has laid out the IDS for a network that utilizes the parcel conveyance proportion, got signal strength, Bundle dropping proportion, and got to send apportion to recognize the sticking, particular sending, and hi flood assaults. When neighbors work together, this neighbor-based detection method has high accuracy.

C. Mobile Agent-Based Approach

In this Approach [5], the Detection Mechanism is based on the mobile agent, which employs classification algorithms to

locate WSN intrusion detection. This order calculation is rule-based and uses an information mining design. They use information mining, a design matching method involving measurable information for recognizing malevolent hubs. They utilize K-implies to guileless.

Bayes and SVM Calculation. The reenactment results show that a portable specialist-based approach is better.

D. Cluster-based half and half-discovery

In this exploration [6], an Interruption Discovery Framework made in the group head is proposed. The half-and-half interruption discovery Instrument contains three modules. The Main peculiarity Location Module is used to check whether the bundle is typical or unusual. Second Module misuse detection, which determines type detection by analyzing abnormal packets.

The Consequence of two identification modules is coordinated with a dynamic module to track down the interruption and the sort of interruption. The Dynamic module gets back to trough to follow-up treatment. The detection rate and accuracy of the proposed system are satisfactory.

E. Knowledge-based Approach

In this Approach [7], the sensor network is separated into various bunches and each group has a Group head (CH). The Bunch's head screens all its part hub conduct and store information as occasions. The CH sends this occasion's information to the base station. The knowledge base is created and some functions are carried out on events data by the base station.

This information base is utilized by the CH utilizing a deduction motor to track down malignance. When the Cluster head detects any illegal activity, it initiates events to identify the attack thanks to continuous monitoring. The base station gives a status of occasion to CH. The CH closes any malignancy of a hub, it detaches the malevolent hub and broadcasts this data to different Groups.

F. Data mining Approach

In this Approach [8], the Interruption Recognition Framework contains two phases (a) Profiling and (b) abuse discovery. In the profiling stage, the data or conduct of the sensor hub is gathered by the Focal specialist and becomes mindful of the organization's geography. The local agent that monitors nodes is chosen by the central agent. Neighborhood specialist keeps up with the ordinary profile of sensor hubs. All data gathered is changed over into design acknowledgment.

Each local agent uses the normal profile created in the previous section for anomaly-based intrusion detection in the second phase. A nearby alarm is created when the hub acts uniquely in relation to the ordinary profile. The focal specialist performs abuse location and approves the neighborhood alert for the entire sensor organization. The Motivation behind ready approval is to lessen the misleading positive rate.

G. Hierarchical Energy productive methodology

In this Approach [9], every sensor hub sends a control bundle to the base station toward the finish of the transmission stage. Each control bundle having the hub id and N number of parcels ships off the bunch head. Sensor hub can straightforwardly send them control parcel to the base station, however, it very well may be energy wasteful and add additional above to the organization. So Second batch head (SCH) is chosen to communicate control bundles to the base station. The Choice of SCH depends on hub energy savings.

The Base station thinks about the complete bundles from the group head to the amount of N number of parcels from every hub to the bunch head. In the event that the base station finds a dark assault, it sends a caution message to its all sensor hubs. A Sensor hub keeps up with its dark opening table to prohibit distinguished CH from the next CH and SCH Political decision. This Proposed Approach is Energy-proficient and great discovery rate.

H. A Random Neural Network-Based Approach

In this paper [10], the author uses Random Neural Networks (RNN) to implement an intelligent security architecture and create an intrusion detection mechanism. Perceiving anomaly in view of conduct examination includes the learning of the normal activity of the framework and Recognition of any occasion that veers off from the recently scholarly model. Along these lines, obscure security assaults can likewise be distinguished which are routinely left undetected by the mark-based procedures.

In This Approach, a Sharp Regulator is used to take care of data and find Variety from the standard. This Approach Actually perceives the presence of any dubious sensor hub and peculiar action in the base station with high exactness and insignificant irrelevant execution above.

I. Game-Based Complex Methodology

The proposed framework [11] occupations a mix of detail rules and a lightweight brain coordinate-based irregularity location module to find the vindictive hub. Besides, the framework models the collaboration between the IDS and the sensor hub as a two-player non-helpful Bayesian game. This allows the IDS to embrace probabilistic noticing methodology in view of the Bayesian Nash Equilibrium of the entertainment and as such, decline the volume of IDS traffic introduced into the sensor organization. The proposed framework achieves higher accuracy and revelation rate over an extensive variety of assaults, while simultaneously limiting energy utilization.

V. CONCLUSION

In this paper, it is expected to prepare an outline of the interruption location framework in remote sensor organizations. We have primarily discussed WSN-specific security concerns and objectives. As a result of the asset limitation qualities of WSNs from wired frameworks, the Interruption Discovery Framework in WSN needs different methodologies, and these methodologies are portrayed as definite. Inconsistencies of WSNs are depicted, and the identification method of oddity, abuse (signature-based), and determination rule has been brought up for a couple of late years.

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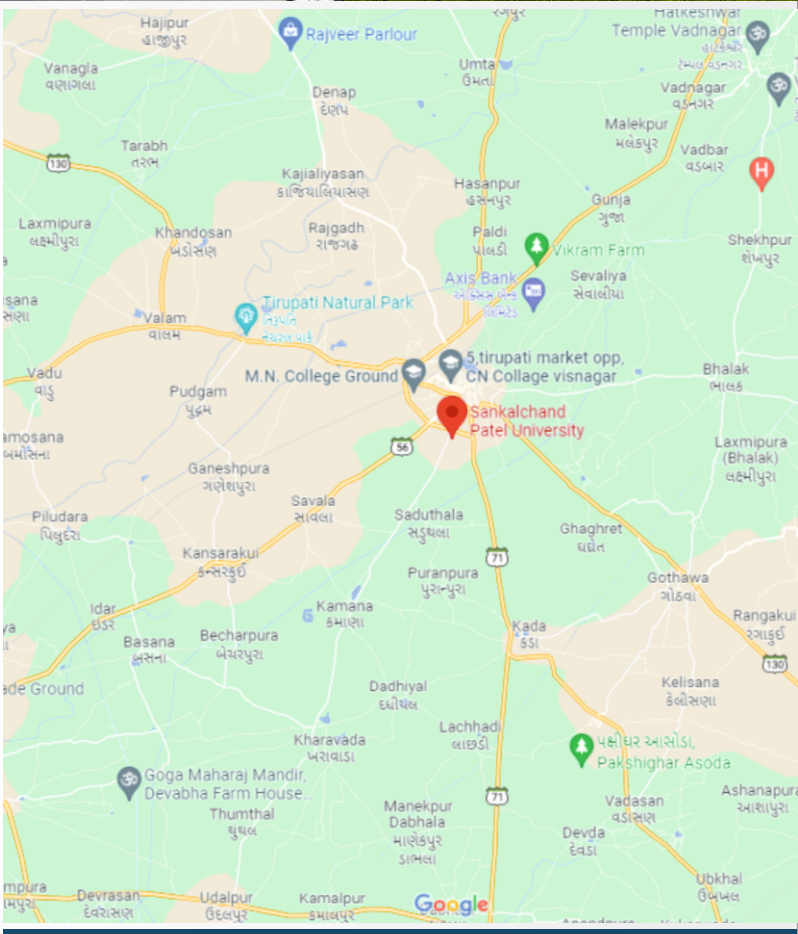

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