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GYAN PRAVAH - 'THE FLOW OF KNOWLEDGE ACROSS FIELDS

VOLUME -1
ISSUE-1
APRIL 2025

GYAN PRAVAH - 'THE FLOW OF KNOWLEDGE ACROSS FIELDS

One Day International Multidisciplinary Research Conference, Peer-Reviewed Organized on 20th April,2025 Sunday

ISBN NUMBER : 978-81-986711-6-5
EDITION: APRIL 2025
VOLUME: 1 , ISSUE-1

PUBLISHED BY:
MYRESEARCHGO
|MYRESEARCHGO@GMAIL.COM WEBSITE: WWW.MYRESEARCHGO.COM

Preface

It is with great pride and a deep sense of purpose that we present the peer-reviewed publication of the *Online International Multidisciplinary Conference of Gyan Pravah – "The Flow of Knowledge Across Fields"*, hosted under the banner of **myresearchgo**.

This conference and its subsequent publication reflect our ongoing commitment to fostering a global platform where ideas from across disciplines converge, challenge boundaries, and inspire collaborative learning. The theme, *"The Flow of Knowledge Across Fields,"* captures the spirit of this initiative—emphasizing the interconnectedness of academic inquiry in a world that increasingly demands integrative thinking and cross-disciplinary solutions.

The research contributions featured in this volume span a diverse range of academic domains, including but not limited to science, technology, social sciences, humanities, education, commerce, and healthcare. Each paper has been carefully reviewed by our panel of experts to ensure relevance, originality, and scholarly quality.

At **myresearchgo**, we believe in the democratization of research and the promotion of emerging scholars alongside established voices. This publication is a reflection of that belief—a space where knowledge flows freely, across fields and across borders.

I extend my sincere thanks to all the authors, reviewers, conference participants, and our dedicated editorial and organizing teams. Your contributions and cooperation have been instrumental in shaping this volume into a meaningful and impactful resource for the academic community.

We hope that this publication not only serves as a repository of ideas but also as a source of inspiration for future research, dialogue, and discovery.

Warm regards,
Mrs. Aarya Joshi
Editor, *myresearchgo*
Online International Multidisciplinary Conference of Gyan Pravah
"The Flow of Knowledge Across Fields"

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A Study on the need for Ethical Interventions in AI wave of Digital Crimes

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Abstract

Artificial Intelligence has gained immense attraction across diverse fields such as healthcare, finance and education (Marr, 2020). Cybercriminals increasingly leverage AI to enhance their malicious activities. This research examines various forms of digital crimes facilitated by AI including identity theft, deepfake technology and automated phishing attacks highlighting the challenges & gaps posed by these technologies to traditional legal frameworks. This research paper explores the pressing need for ethical intervention in the context of AI-driven digital crime focusing on the implications for security, privacy and societal norms. It aims to explore the necessity of ethical intervention in mitigating these risks and ensuring that AI serves the public good rather than enabling criminal activities. Descriptive research is conducted for this research as it seeks to provide an overview of issues, identify concerns and outline the need for ethical standards and interventions. While scholars have examined various dimensions of AI ethics including algorithmic accountability, transparency and bias (Jobin et al., 2019) there remains a scarcity of studies that specifically address the proactive ethical interventions required in combating the detrimental use of AI in digital crime.

Keywords : Artificial Intelligence, Digital Crime, Ethical Intervention

A Study on the need for Ethical Interventions in AI wave of Digital Crimes

Introduction

With the Growth of Artificial Intelligence (AI), transformation can be witnessed in several sectors enhancing efficient productivity and has revolutionized the way we live, work and interact. Inspite of beneficial operational efficiencies these technologies have also been massively used by cybercriminals. According to Steve Morgan's Special Report "Cyber Warfare In The C-Suite", projections by Cybersecurity Ventures indicate that global losses from cybercrime are expected to escalate by 15% annually in the upcoming 5 years. By 2025, these costs can go to $10.5 trillion USD per year from $3 trillion USD in 2015. This alarming trend marks the largest economic wealth shift in history, posing serious threats to innovation, investment and economic stability. The financial impact is predicted to surpass the annual damages caused by natural disasters and generate more revenue than the combined global trade of major illicit drugs.

Highlighting the gravity of the situation, renowned investor Warren Buffet has labeled cybercrime as the most pressing issue facing humanity today, even suggesting that cyberattacks pose a greater risk to global safety than nuclear warfare. Hence, the AI Tools which were designed to empower individuals and organizations can lead to malicious intent (Chui et al., 2018). This research aims to contribute to the discourse on responsible AI practices and to advocate for proactive strategies that safeguard against the exploitation of AI in digital crime ultimately fostering a safer digital environment. The findings highlight the urgency for establishing ethical guidelines and frameworks to govern AI applications and ensure that technology serves as a tool for enhancing security. This research paper can help in creating a solid foundation of ethical AI ensuring a balance between technological advancement and societal well-being by navigating the fine line between benefits of AI innovations and its misuse.

The Current Landscape of AI-Driven Digital Crime

Techniques such as machine learning algorithms can generate convincing fake identities, automate spam campaigns and produce realistic deepfakes making it increasingly difficult for individuals and organizations to defend against cyber threats.

Ethical Concerns Of AI in Digital Crime

Several ethical concerns are associated with AI and the occurrence of digital crimes. Firstly, Accountability whereby decisions are made with no human intervention and there is only automation resulting in harmful outcomes (Dawes, 2020). For example, if there is a data breach or cyberattack on the process of decision making

in AI then the accountability is affected and it's difficult to determine the accessibility stays with whom? the developers, users or AI itself. Secondly, there can be bias embedding within AI algorithms as it runs on the basis of historical datasets reflecting societal prejudices alongwith perpetuating discriminatory practices (O'Neil, 2016).

Ethical Interventions

With emphasis on ethical frameworks for safeguarding human rights, ensuring transparency and accountability in AI systems in near future ethical interventions can help to reduce digital crimes. By creating awareness and empowering people regarding how to be an ethical user of AI and use it as a learning tool only will lead to declining potential threats.

Objectives Of The Study

1) To identify the types of digital crimes accelerated by AI technologies.
2) To assess the current measures in place to regulate AI-related digital crimes.
3) To explore the ethical implications of AI in digital crimes and advocate necessary interventions.

Review Of Literature

Existing literature suggests the implementation of ethical guidelines and frameworks can mitigate risks associated with AI (Morley et al., 2020) but empirical evidence demonstrating the effectiveness of these interventions remains largely inconclusive.

1. Angela Mison, Gareth Davies and Peter Eden in their research paper titled "New Wave Cyber Attacks" in Journal Information Warfare and Security, 2022 have tried to explain how AI and deep learning can enable increasingly autonomous and persistent cyber threats particularly through intelligent botnets and exploit services challenging traditional cybersecurity frameworks. The central concern raised is that as AI systems evolve their behaviour may become unpredictable leading to emergent properties akin to biological cognition which

complicates legal, ethical and technical controls. The paper underscores the growing sophistication of cybercrime, with threats now evolving from well-resourced organized crime groups to dark markets offering Crime-as-a-Service. These developments suggest a shift toward cyber operations becoming both more accessible and more dangerous.

The authors reference the National Security Commission on Artificial Intelligence (2021) which warns that AI tools may soon become the weapons of first resort in geopolitical conflicts further blurring lines between cybercrime, warfare and commercial cyber-espionage. As the authors suggest, uncontained intelligent systems

could manifest emergent behaviours that are not foreseeable from their programming or components. This unpredictability may outpace both legal regulations and cybersecurity professionals' ability to respond. Consequently, courts are beginning to demand transparency in AI decision-making while governments push for audits of algorithms to assess bias and fairness—pressures that fall at the intersection of law, ethics and cybersecurity (Zuboff, 2019; Abbott, 2020). Mison et al. call for a proactive rather than reactive approach to cyber defense.

2. Thomas C. King Luciano Floridi · Nikita Aggarwal · Mariarosaria Taddeo in their research paper titled "Artificial Intelligence Crime: An Interdisciplinary Analysis of Foreseeable Threats and Solutions" in Journal Science and Engineering Ethics (2020) have tried to explore that, the growing sophistication of artificial intelligence (AI) has introduced unprecedented risks including its potential use in criminal activities a phenomenon now referred to as Artificial Intelligence Crime (AIC). King et al. (2020) present one of the first interdisciplinary and systematic explorations of AIC examining both its theoretical basis and real-world plausibility. The first experiment case involves the use of AI to personalize phishing attempts by analyzing social media data leading to a higher likelihood of successful fraud (Seymour & Tully, 2016 as cited in King et al., 2020). The second case describes market manipulation through AI-powered trading agents capable of deploying deceitful strategies autonomously (Martínez-Miranda et al., 2016 as cited in King et al., 2020). These instances underscore the capability of AI to autonomously conduct criminal acts that are more efficient and scalable than traditional methods.

Further, the authors address AI's role in enhancing identity theft and impersonation as the bots can mimic human behaviour to build trust and extract personal data which is then used in spear phishing or fraudulent transactions. Notably, AI-enabled voice synthesis technologies pose a significant risk to biometric and speech-based authentication systems, increasing the scope for fraud (Bendel, 2017 as cited in King et al., 2020). This new

dimension of threat expands the AIC pipeline beyond digital deception into realms like banking, insurance and secure facility access. The article raises the issue of liability especially in scenarios where crimes are committed without clear human intention, invoking the "problem of many hands" (Van de Poel et al., 2012, as cited in King et al., 2020). The authors suggest that strict liability frameworks and the clarification of joint liability doctrines may be required to address the accountability vacuum. The paper urges a proactive stance in both policymaking and academic inquiry. It calls for a cross-sectoral approach to developing safeguards and regulatory frameworks that not only address current AIC threats but are also adaptable to future advancements. The complexity and novelty of AIC as highlighted in this review, underscore the urgent need for interdisciplinary collaboration to mitigate its potential harms.

3. Marthsian Yeksi Anakotta in the book titled "AI: A New Lone-Wolf Terrorism in The Digital Era (Preliminary Analysis)" in Journal of Terrorism Studies: Vol. 6: No. 2, Article 7 has tried to throw light through a provocative hypothesis that artificial intelligence (AI) may not merely serve as a tool for terrorism, but could potentially become an autonomous agent by committing acts in lone-wolf terrorism. Rooted in a criminological and legal framework, the article draws parallels between the traits of lone-wolf terrorists and the increasing independence of AI systems highlighting the convergence of cybercrime, cyberterrorism and technological evolution. However, with the advent of machine learning and deep learning, AI may evolve beyond passive use to active engagement in radical content creation and distribution. Goodfellow et al. (2016) describe the mechanism by which AI can iteratively learn from data, modifying its internal parameters to improve outcomes traits that could allow AI to generate and propagate extremist content without human initiation.

The article states this risk within the Fifth Wave of terrorism, characterized by the use of the internet and AI by terrorist entities. The real danger, Anakotta asserts, is not just in AI being used by terrorists but in its potential to become the terrorist itself a lone, self-directing entity. The role of misinformation and AI-generated fake news in spreading fear and manipulation is also explored with Tulga and Effendi (2022) emphasizing the global scale of disinformation and its consequences. To address this emerging threat, Anakotta proposes a hybrid strategy incorporating criminal law and criminology. Criminal policy, particularly as articulated by Ancel (1998) and Arief (2011), serves as a rational approach to crime prevention. Within this framework, AI could be recognized as a legal subject, bearing responsibility if it engages in autonomous cyberterrorism. Complementing this, the routine activity theory in criminology provides insight into the necessary conditions for cyberterrorism: a motivated offender (AI or human), a suitable target and the absence of capable guardians. Despite the theoretical framing, the author acknowledges that no known cases exist where AI has autonomously committed acts of cyberterrorism. Still, the rapid development of AI technologies demands preemptive legal and security measures. The article stresses that criminal policies both penal and non-penal and a robust cyber-security framework must evolve to address the potential emergence of AI as a lone-wolf actor in terrorism. It is a call for interdisciplinary vigilance in a time when digital threats are becoming more complex and unpredictable.

Research Design and Methodology

Research Design

The research methodology for this research paper is descriptive and has been conducted based on the secondary sources of data. Descriptive research has been conducted to gain insights on the current landscape of digital crimes influenced by AI technologies and the potential ethical considerations required to mitigate these issues.

Sources of Data Collection

Secondary data has been used to gather relevant information. The secondary data is gathered from several relevant research papers, journals, newspapers, published and unpublished sources, etc. Some data has been taken from the Government's Press Information Bureau website.

Limitations Of The Study

Focus being on the case of need for ethical interventions in digital crimes by AI, only secondary data has been used for this research paper.

Behavioral Adaptation of Digital Crimes and Measures taken to combat Risks

International differences in laws and ethical standards can create loopholes, allowing cybercriminals to operate across borders with minimal repercussions thus, cybercriminals may adapt their methods for creating a continuous cycle of crime that is difficult to manage.

According to the Press Information Bureau, the Central Government has implemented several regulatory measures to tackle the challenges of combating deepfakes, leading to the issuance of periodic advisories reminding intermediaries of their compliance obligations under the IT Rules, 2021. These advisories emphasize the importance of addressing unlawful content, including harmful "synthetic media" and "deepfakes," and the need for timely removal of such content.

Some of the recent digital crimes in sphere of AI are as follows :

1. Shopping - The rise of online shopping scams has also been significant particularly during major sales events like Amazon's Prime Day and Flipkart's Big Billion Days. Scammers took advantage of these occasions by creating counterfeit websites that offered unrealistic deals on high-demand products. In one instance, scammers advertised premium electronics and Apple iPhones for just ₹99, tricking numerous eager shoppers. Furthermore, they devised new strategies to trap victims such as responding to complaints from real customers about their purchases to gain trust.

To counter these deceptive practices, Flipkart has introduced a dedicated reporting system for individuals to flag fake messages and websites impersonating their platform.

2. Event-based scams - They have become another prevalent tactic, exploiting public interest in trending occasions such as concerts to defraud individuals. For example, many people were scammed under the pretense of securing tickets for music events featuring artists.

3. Chatbot - Recently, McAfee surveyed 7,000 adults across multiple countries including the US, UK, France, Germany, India, Japan and Australia whereby 51% of Indians reported being approached by an AI chatbot on a dating platform or knew someone. Additionally, 28% of participants believed they were chatting with a potential romantic partner, only to later realize it was actually an AI-generated bot. "According to Pratim Mukherjee, Senior Director of Engineering at McAfee, 84% of Indians feel that online dating scams, whether involving deepfake media or fraudulent text and email messages have affected their trust in potential matches."

4. Deepfake and Synthetic Media Crimes - In India, deepfakes have been used in creation of fake images and videos For instance, The 2019 general elections saw dozens of fake political videos go viral, many created with AI voice synthesis and editing tools.

5. Identity Theft - With AI, it is easier to scrape social media for personal data and forge identities. In 2022, a Delhi-based racket used AI to generate fake Aadhaar and PAN cards, which were used to apply for loans and SIM cards fraudulently.

6. IVRS Calls - Sanjay Kumar, Additional Director General of Police in the Cyber Crime Wing stated that, "the scammers were using AI-generated cloned voices for their cybercriminal activities." So with the help of AI technology they replicate the voices of loved ones and high-ranking executives, targeting unaware victims with financial schemes. In a recent incident a 59 years old woman fell victim to an AI-generated voice scam losing 1,40,000 rupees. The scammer convincingly impersonated her nephew in Canada, weaving a distressing tale that prompted the victim to provide urgent financial assistance. Or the cybercriminals are employing Interactive Voice Response Systems to deceive individuals, falsely assuring them that they must transfer money to resolve allegations against them. These fraudsters replicate being an official from legal entities or law enforcement agencies through Skype calls or pre-recorded messages to trap victims.

7. Digital Arrest - Fraudsters impersonate officials from prominent government agencies such as the CBI, NIA, ED, Reserve Bank of India and the Narcotics Control Bureau falsely accusing victims of crimes to extort money through tactics built on elaborate lies and threats. In some cases, the psychological toll has been catastrophic resulting in tragic outcomes such as the heart attack of a teacher from Agra who was driven to despair by a scam involving threats against her family. The operational base for these digital arrests is often traced back to organized scam centers located in Southeast Asian countries including Myanmar and Cambodia. Many individuals are tricked into working for these scams under the guise of job offers. For instance, a young man from Bihar shared that he had been deceived into paying ₹1.3 lakh for a job only to find himself exploited in a cybercrime network.

In response to these challenges, technology companies in coordination with the government have taken proactive measures. For instance, Skype issues a warning alert as Indian legal authorities will never contact you on Skype.

The government has implemented awareness campaigns similar to the COVID-19 pandemic by alerting callers about the dangers of digital arrest scams. Telecom Service Providers (TSPs) had blocked the incoming spoofed international calls that appeared to originate from Indian numbers which came to be shut down of 1,700 Skype IDs and 59,000 WhatsApp accounts were found to be involved in scams in 2024.

8. Whimsical Art - As per an article in Times Of India, inorder to get whimsical art images we have been sharing our personal data which can be reverse-engineered to extract the original images for instance, ghibli style. The styled images created on AI will allow AI to legally use the images without the legitimate interest balancing test required by GPDR regulations.

Statistics

A McAfee report released in May 2023 revealed that one in four people amongst 7000 participants which they had surveyed claimed to have encountered an AI voice cloning scam or knew someone who had.

Maharashtra's Data of Citizen Financial Cyber Fraud Reporting Management System during the period 1.1.2023 to 31.12.2023. **Source -** Press Information Bureau

No of Complaints Reported	Amount Reported (Rs in Lacs)	No of Complaints (Put on Hold)	Lien Amount (Rs in Lacs)
125153	99069.22	32050	10308.47

According to the Indian Cyber Crime Coordination Centre (I4C), the National Cyber Crime Reporting Portal receives an average of 6,000 complaints each day, reflecting the pervasive nature of digital scams across the

country. These daily incidents translate into estimated financial losses of approximately ₹60 crore. In the financial year 2024 alone, cyber fraud losses in India surpassed ₹1.7 billion, predominantly stemming from credit card, debit card and internet banking related scams. The magnitude of cybercrime has grown at an unprecedented rate with over 7,40,000 cases recorded in just the first quarter of 2024 whereby 85% of the reported cases in 2024 were associated with online financial fraud, underscoring the growing threat to digital financial security.

Benefits To The Society

This research can significantly contribute to building a more informed, safe and ethically conscious society in the face of advancing AI technologies. Some potential benefits include:

1. Enhanced Public Safety

Prevention of Crime: Understanding how AI can be misused allows for the development of preventive measures and technologies resulting in safer communities.

2. Informed Public Awareness

Education on AI Risks: Raising awareness about the dangers of AI-facilitated digital crimes empowers citizens to protect themselves against scams and fraud.

3. Encouragement of Ethical Business Practices

Sustainable Business Models: Companies focusing on ethical interventions can foster long-term growth by enhancing reputation and customer loyalty ultimately leading to healthier economic practices.

4. Social Trust and Accountability

Building Trust in Technology: Implementing ethical standards increases public trust in AI technologies, as people feel more secure knowing that there are protections against exploitation.

Conclusion

Ethics are known to all still there are current incidents about unethical uses of AI prevalent by cybercriminals with strong intentions to misguide the victims with fake information. So we need to think twice & cross verify to evaluate first before using AI. Ethical guidelines can help law enforcement agencies leverage AI responsibly leading to more effective investigations without infringing on civil liberties. It is essential for protecting individuals but also for fostering trust in the technologies that increasingly shape our lives.

Future Scope

Future research should focus on developing comprehensive frameworks for ethical AI usage that considers the evolving tactics of cybercriminals. Additionally, exploring the long-term psychological impacts of AI-related scams on victims can provide valuable insights for preventive strategies. The exploration of new technologies such as blockchain for secure transactions may also offer innovative solutions to combat fraud and enhance accountability in the AI landscape. By prioritizing ethical considerations, society can harness the benefits of AI while safeguarding against its potential misuse.

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CHALLENGES AND OPPORTUNITIES IN RURAL HEALTHCARE

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ABSTRACT:

Rural healthcare continues to be a pressing issue in many developing countries, where limited infrastructure, a shortage of healthcare professionals, and insufficient medical supplies hinder the delivery of quality healthcare services. Geographic isolation, poor transportation facilities, and low health awareness among rural populations add to the complexity of the problem. These issues result in delays in diagnosis, treatment, and follow-up care, further increasing health disparities between urban and rural communities.

This research paper aims to explore both the challenges and the emerging opportunities in rural healthcare delivery. Through qualitative analysis of recent academic literature, the study evaluates the impact of innovative solutions such as telemedicine, mobile health (mHealth) applications, electronic health records, and government health schemes. It highlights how these technologies and policy initiatives can significantly improve accessibility, efficiency, and patient engagement when properly implemented. Furthermore, the paper emphasizes the importance of culturally appropriate care, local workforce training, and digital literacy to ensure sustainable improvements in rural health systems.

The findings suggest that overcoming rural healthcare barriers requires a collaborative approach involving government agencies, healthcare providers, technology developers, and local communities. While there are significant hurdles, the integration of digital tools, targeted policies, and capacity-building programs opens up new possibilities for strengthening healthcare delivery in rural areas. This paper contributes to ongoing research by offering insights and recommendations for creating inclusive, affordable, and technology-driven rural healthcare solutions.

Keywords: Rural healthcare, telemedicine, health informatics, digital health, public health policy, healthcare access, qualitative research, rural development

1. INTRODUCTION

Healthcare is a fundamental human right and an essential component of national development. However, in many developing countries, rural populations continue to suffer from inadequate access to basic health services. Rural areas often face significant healthcare disparities compared to their urban counterparts due to various challenges such as poor infrastructure, lack of medical facilities, shortage of trained healthcare professionals, limited transportation, and low levels of health literacy.

These barriers not only delay medical attention but also contribute to the growing burden of untreated illnesses, maternal and infant mortality, and chronic diseases among rural populations. The need for strengthening rural healthcare systems has become more urgent in the face of global health challenges and increasing population demands. At the same time, advancements in technology and health policy are presenting new opportunities to address rural healthcare gaps. Telemedicine, mobile health (mHealth), electronic health records, and government-sponsored health programs are emerging as powerful tools to bridge the rural-urban healthcare divide. These innovations have the potential to transform the way healthcare is delivered, making it more accessible, affordable, and efficient for underserved communities.

This paper seeks to explore the dual dimensions of rural healthcare by identifying its key challenges and examining the opportunities available for improvement. By conducting a qualitative review of existing literature and recent technological interventions, this study aims to provide insights into how rural health systems can be strengthened through innovation, policy, and community-based approaches. The findings of this paper are intended to support the development of inclusive and sustainable rural healthcare models that ensure equitable health outcomes for all.

2.REVIEW OF LITERATURE

In recent years, health informatics has emerged as a critical component of modern healthcare systems, particularly in efforts to bridge service delivery gaps in rural areas. The adoption of digital tools such as Electronic Health Records (EHRs), telemedicine, mobile health applications, and decision support systems can greatly enhance the efficiency, accessibility, and quality of care. However, the integration of these tools in rural healthcare settings presents unique challenges and opportunities. In rural regions, geographical isolation, limited health workforce, and financial constraints hinder the delivery of equitable healthcare services. According to Adama and Okeke (2024), these barriers make it imperative to adopt innovative technologies, even though doing so is inherently complex. Akpuokwe, Adeniyi, and Bakare (2024) emphasized that the

digital divide a lack of adequate ICT infrastructure, internet access, and digital literacy further complicates the implementation of health informatics systems. Despite these limitations, the strategic use of technology has shown promise in overcoming such obstacles, allowing for better patient tracking, improved decision-making, and more efficient resource utilization (Ijeh et al., 2024). Furthermore, research by Nzeako et al. (2024) indicates that telemedicine has been particularly impactful in reducing the need for physical travel, thereby expanding access to specialist consultations in remote areas. However, concerns regarding data privacy, cybersecurity, and resistance from healthcare professionals due to lack of training remain prevalent. Akintuyi (2024) also observed that sustainable implementation requires government commitment, infrastructure investment, and inclusive training programs. Joel and Oguanobi (2024) highlighted the importance of aligning

technological integration with community health needs. They suggest that involving local stakeholders in planning and deploying health informatics initiatives increases acceptance and long-term sustainability. Similarly, Igbinenikaro and Adewusi (2024) noted that the success of health informatics depends not only on technological readiness but also on cultural, economic, and policy-related factors.

Collectively, the literature emphasizes that while rural healthcare systems face considerable hurdles in adopting health informatics, the opportunities for improved care delivery, patient engagement, and data-driven policy-making are substantial when these challenges are addressed with appropriate strategies

3.RESEARCH METHODOLOGY

3.1 Research Design

This study adopts a qualitative research design to explore and understand the complex challenges and emerging opportunities in rural healthcare systems. The qualitative approach is appropriate as it allows for a deeper investigation into the perceptions, experiences, and contextual factors affecting healthcare delivery in rural settings. Through an extensive review of existing literature and thematic analysis, this design facilitates the development of insights into health informatics integration, resource limitations, and policy gaps within underserved communities.

3.2 Research Objectives

The main objectives of the research are

1. To identify the key challenges faced in delivering healthcare services in rural areas, particularly related to infrastructure, workforce, and funding.

2. To analyse the role of health informatics and technology in improving accessibility, efficiency, and patient outcomes in rural healthcare.

3. To examine the opportunities and potential solutions for strengthening healthcare systems in rural regions.

3.3 Data Collection Methods

Data for this study is primarily collected through secondary sources, including peer-reviewed journal articles, government reports, case studies, and healthcare policy documents. The review of literature is conducted using online academic databases such as Google Scholar, PubMed, ScienceDirect, and ResearchGate, ensuring a diverse and credible base of evidence. In a broader research context, future studies could include primary data collection through interviews, focus groups, or field observations in rural communities.

3.4 Sampling Technique

Since this is a qualitative study based on secondary data, purposive sampling has been used to select literature and sources that are directly relevant to rural healthcare challenges and the implementation of health informatics. Only studies published between since 2024 were included to ensure the findings reflect the most recent developments and trends in rural health systems and digital healthcare innovations.

3.5 Limitations of the Study

- This study is based on secondary sources like research articles and reviews. No direct field surveys or interviews were conducted in rural healthcare settings.

- The challenges and opportunities discussed may vary from one rural region to another. Therefore, the findings may not apply equally to all rural areas.

- While the study highlights the role of technology, it does not deeply explore the technical challenges of implementing health informatics in remote locations.

- The research discusses policies in a general sense but does not analyze specific state or national health policies in detail.

- Due to time limitations, an in-depth longitudinal analysis of rural healthcare trends over many years was not possible.

4. ANALYSIS AND DISCUSSION

4.1 Key Challenges in Delivering Healthcare Services in Rural Areas

The rural healthcare system continues to face numerous challenges that hinder the delivery of timely and quality healthcare.

A major barrier is the lack of healthcare infrastructure, including insufficient medical facilities, outdated equipment, and poor transportation connectivity. According to Adama & Okeke (2024), many rural clinics function without consistent electricity or internet, which severely affects service continuity and the implementation of digital solutions like electronic health records (EHRs).

Another significant challenge is the shortage of skilled healthcare professionals. Rural settings often struggle to attract and retain qualified doctors, nurses, and specialists due to geographical isolation, limited career growth, and lower compensation (Ijeh et al., 2024). This leads to overburdened healthcare workers, reduced patient satisfaction, and delays in treatment. Additionally, financial constraints limit the ability of healthcare institutions to upgrade their services or expand outreach efforts, creating disparities in access to care (Akpuokwe et al., 2024).

4.2 Role of Health Informatics and Technology

Despite the challenges, health informatics offers immense potential in transforming rural healthcare. The implementation of telemedicine platforms has enabled remote consultations, reducing the need for patients to travel long distances. The study by The Impact of Telemedicine on Rural Healthcare Access (2024) highlighted that patients in remote areas could access specialists through virtual appointments, resulting in early diagnosis and improved follow-up care.

Additionally, electronic medical records (EMRs) and mobile health (mHealth) applications allow healthcare providers to track patient history, schedule appointments, and monitor chronic conditions more effectively.

However, the adoption of these technologies remains inconsistent due to lack of training and poor digital infrastructure (Adama & Okeke, 2024). Bridging the digital divide is essential to harness the full benefits of health informatics.

4.3 Opportunities and Solutions for Strengthening Rural Healthcare

The current healthcare landscape in rural areas presents opportunities for innovation and reform. One major opportunity lies in capacity building and workforce training. Offering professional development, incentives, and digital health literacy programs for rural healthcare workers can improve service delivery. Igbinenikaro & Adewusi (2024) emphasized the importance of localized training that is contextually relevant to rural health challenges.

The growing government interest in public-private partnerships also presents a way to improve healthcare infrastructure and funding. Investment in low-cost, solar-powered health devices, portable diagnostic tools, and cloud-based patient management systems could make healthcare more sustainable and accessible. Moreover, involving community health workers (CHWs) in preventive care, health education, and patient follow-ups ensures that the rural population receives culturally appropriate and continuous care. This community-based model was successfully adopted in various regions as outlined in Joel & Oguanobi (2024).

5.FINDINGS

- Rural healthcare facilities lack proper infrastructure, modern equipment, and connectivity.
- There is a severe shortage of skilled doctors and healthcare workers in remote areas.
- Financial constraints affect the quality and availability of healthcare services.
- Health informatics tools like EHRs and mHealth apps improve patient tracking and care.
- Community health workers play a vital role in delivering local and preventive care.
- Government schemes and digital health initiatives show positive results when properly implemented.
- Collaboration between public and private sectors enhances rural healthcare delivery.
- Policy support, training, and technology adoption are key to improving rural health outcomes.

6.CONCLUSION

Rural healthcare continues to face a range of systemic challenges, including poor infrastructure, workforce shortages, financial limitations, and limited access to modern medical facilities. However, this study highlights that with the right strategies, these barriers can be overcome. The integration of health informatics tools, telemedicine services, and mobile health technologies has already begun to bridge the gap between urban and rural healthcare. Moreover, community involvement and government-backed initiatives are proving to be effective in delivering localized and preventive care.

For long-term success, it is essential to focus on strengthening infrastructure, providing training to healthcare workers, and ensuring policy-level support for digital health adoption. Collaborative efforts between public and private sectors can further enhance service delivery in remote areas. With sustained commitment and innovation, rural healthcare systems can be transformed to ensure accessible, affordable, and quality healthcare for all.

LEGAL PROTECTION OF CHILD FROM SEXUAL ABUSE AND PORNOGRAPHY THROUGH SOCIAL MEDIA

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Abstract –

The accessibility of the internet has greatly increased the issue of child pornography. A report released by Interpol has recorded 2.4 million cases of child abuse during the pandemic 2022.It clearly shows that sexual abuse of children on the internet is widespread. Artificial intelligence has numerous applications these days. This has helped business organizations read their clients and better serve them. In today's world, the accuracy of age prediction by artificial intelligence is only a few years different from the actual age. Artificial intelligence can also be used to detect obscene images of children. The current state of artificial intelligence in detecting pornographic images and the parameters used to determine age by analysing images are presented in this paper. It also tackles laws related to sexual abuse, child abuse and deepfakes.

Keyword- Child Pornography, social media, Technology, Deep fake, Internet.

Introduction

"Pornography" originates from the Greek word "-graph" which literally means writing about sex workers.

Nowadays pornography is defined as a clear and obscene (verbal or pictorial) content that focuses primarily on the sexual arousal of its audience.

The children of any country are considered to be the main determining factor in what the country will look like in the future. The circumstances under which a country's youth grow determines the direction of that country's development in the future. The effects of child abuse at a young age last a lifetime. In the age of internet, where every person has easy access to the internet, there has also been a huge increase in the cases of sexual abuse of children. The internet is playing an important role in the spread of child pornography and other content, including attacks and abuse of children. The rise of deepfakes is a major catalyst in the spread of child pornography. It's a type of media where multiple photos of a person are combined with video clips using specific artificial intelligence, creating a fake video that looks realistic.

This is a major problem that needs urgent attention. The current laws are not consistent with the seriousness of the problem. Laws need to be amended, which need to be included

Technology, to deal with crime that relies solely on technology. Artificial intelligence has grown tremendously over the decades and is still growing slowly every day. The scope of artificial intelligence varies from maintaining room temperature to describing the content of a picture to a visually impaired person. Artificial intelligence is a buzzword in giant companies (Google, Facebook, Microsoft), because in today's day and age, most of the tasks of these corporations are handled by artificial intelligence, only the most important tasks are reviewed by humans. It can be used to detect child pornography using biometrics, human interaction with a computer, and further age prediction technology based on a person's facial details. [3] It may be the most effective solution to the problem of sexual exploitation and exploitation of children on the Internet in the coming years. There are a handful of resources available on the Internet to protect children from engaging in the redlight area of the Internet.

II. Current Legal Frameworks

A. Legislation in India

Constitutional provisions: There are different laws in India that protect children from any abuse. The Constitution of India guarantees the right to life and liberty in its Article 21. According to Article 24 of the Constitution of India, children below the age of 14 years are prohibited from being employed in mines, plants or participating in any dangerous occupation/hazardous activity. According to Article 39(f) of the Constitution, the state has a duty for the welfare of children. Article 45 of the Constitution provides for proper care, teaching and training of children under 6 years of age.

Protection of Children from Sexual Offences (POCSO) Act 2012: The POCSO Act, 2012 was enacted to set up special courts to deal with sexual offences, protection of children from sexual misconduct and related offences. Article 15(3) empowers any state to make special provisions for the protection of children from sexual offences. India signed the Child Rights Treaty on 11-12-1992, so it is the duty of the state to abide by it.

Necessary measures to be taken to prevent this have been outlined in this session.

1) The child's forced participation in any sexual behaviour.

2) The illegal use of children for prostitution and any other sexual behaviour.

3) Exploitation of children for any indecent activity.

The law also aims to help the child overcome the judicial process by ensuring emotional, physical, social and privacy and privacy.

Information Technology Act 2000: There is no law directly related to the issue of child pornography in India. The inclusion of Section 67B in the Information Technology Act 2000 includes the depiction of a child in obscene acts or explicit behaviour etc. [4] The act not only makes it illegal to produce and share child pornography in any electronic form but also makes it illegal to browse child. Any obscene, obscene and obscene act of creating, sharing, storing, distributing, promoting, demanding, advertising any material depicting a child in e-form can be punishable with imprisonment up to five years and a fine of up to Rs 5 lakh. A second offence carries a jail term of up to 10 years and a fine of up to Rs 10 lakh. Section 67 of the Information Technology Act 2000 specifically mentions the provisions of pornography. The amendment includes Section 67B, which focuses on punishment for offences involving sexually explicit electronic or online content depicting children. An offence under Section 67B is a non-bailable offence under the new Information Technology Act.

	2019	2020
PCV	4	0
PCS	86	383
PAR	104	372
CON	2	0
CCS	58	272
CR	103	738

FIGURE 1 Show. The Chart Represent Number Of Child Pornography Cases in The Year 2018 And 2019, Case S Registered (CR) Cases Charged Sheeted (CSS), Cases Convicted (CON) , Person Arrested (PA) , Person Charge Sheeted (PCS), Person Convicted (PCV)

B. Legislation in United Kingdom

The law to protect children was passed in the UK 2003.In year, known as the Sexual Offences Act 2003. The law in the United Kingdom aims to protect and prevent children from sexual harassment. In the UK, having sex in front of a child is a punishable offence punishable by up to 10 years in prison, and forcing a child to watch such an act is also a crime. In addition, inciting and inciting pornography is also considered a crime. Sexual grooming is a term in UK law, which describes the act of travelling to meet or visit a child with the intention of encouraging a child to commit any punishable offence specified in the law, and such an offender shall be deemed guilty of sexual grooming.

C. Legislation in United state of America

In the United States Code, Section 2256 of Title 18 defines child pornography as portrayal

of any sexually explicit act involving a child under the age of 18. Under the federal law, any undeveloped tape, clip, computer generated image or electronic data stored, which can be turned into any form of child pornography are deemed to be illegal. Federal law applies to almost every offence committed with the use of internet regarding violation of child pornography.

Under section 2251, Title 18 of the United States Code, the first-time offender of production of child porn is punishable with fine and imprisonment of 15 years which may exceed up to 30 years whereas a first-time offender of transferring child pornography from outside the borders or inside is punishable with fine and imprisonment of 5 years which may exceed up to 20 years under section 2252, Title 18 of the United States code.

Section 2260, Title 18, applies to any person who resides outside the border of united states, produces, distributes any form of child Pornography with an objective to transmit it into the United States.

In addition, under United States Code, section 2251A of Title 18, prohibits selling and transferring of the custody of the child for the production of child pornography by any legal guardian, parent or any person having the legal custody of a child.

I. Emergence of Synthetic Child pornography:

Deepfake:

Deepfakes are videos and images that are morphed, in a way that the person in them basically seems to be doing something he didn't do. [6] The rise of computer-generated explicit images, also known as synthetic child pornography, saw a technological boom with devastating results after 2016

Deepfakes are especially annoying because they can be used to create new child pornography

Content from content that already exists. Theoretically, the creator of Deepfake could create more pornographic content of abused children or create content using pictures of children who have never been victims of sexual abuse. While deepfake technology applies one person's face to another person's body in a video, the creator of the deepfake content can take pictures of a minor from any online site-Instagram, for example—and use the child's face in a video showing another child's sexual abuse. Deepfake technology can also create completely fake and unreal person. Most of the deepfake videos contain sexual cruelty, making it unfit for general public.

Apps that use artificial intelligence are specifically designed to allow someone without a technical background to create fake pornographic videos or pictures.

The process is simple:

1. Download a particularly developed artificial intelligence program e.g. Fake App.

2. A computer with a graphic card.

3. Choose a video from the Internet.

4. Collect the number of images of the victim (photos in the video can also be taken)

5. Feed images to the app and execute the program.

Sweetie Avatar: Sweety Avatar is an animated computer-generated/synthetic pornographic child designed to identify and capture online predators of child pornography, but this has led to an increase in the production of AI-generated. Sweety technology is similar to deepfake, where deepfake depicts a real person, sweety depicts a fake and unrealistic person.

We need and need an effective legal framework against those who create deepfakes to hold children accountable. The combination of evolving deepfake laws and existing laws related to child pornography will create a legal framework that criminalizes explicit deepfakes depicting children. The need for a strict legal framework that outlaws fake child pornography Requires some exceptions to the work within this legal framework. Such an exception would empower government agencies to use the same technology to fight the growing problem of child pornography on the Internet.

3. Discovery of child pornography:

Pornographic video contains a lot of information in the form of movement, sound, frame, frequent bending, and zooming in.

This information can be extracted and processed to find clear content. The erotic sounds in the video increase the accuracy of the results.

The system of detection can be divided into three stages:

- Segmentation phase takes the video as input and extracts the images that might have nude and explicit content.
- Detection phase detects the amount of nudity.
- The classification phase marks a video to be porn and non-porn based on the judgement criteria.

Software are available on the internets that are aiming to protect children from entering the red-light area of the internet.

Software like Net Nanny scans and filters the explicit content on a website and also blocks any such site.

4. Effective legal framework for law enforcement:

The most effective exception to the legal framework and measures to criminalize synthetic child pornography is the use of synthetic material for law enforcement in online sting operations.

Use of synthetic child pornography for law enforcement:

Government agencies, including the FBI, use it for operations to locate and remove any site or user that produces and spreads child pornography on the Internet.

The FBI's recent operation Pacifier in Reliance, which has removed Play Pen, the largest website for online child pornography, is a good example of this. The online sting operation Pacifier used "honeypot" to target and remove playpens.

Honeypot is a designated area in a computer system or network, especially built with the assumption that an attack will be carried out by a hacker or scammer. It was originally designed to catch scammers and hackers.

Honeypot is a site that focuses on child pornography, specifically designed to include child pornography, which is a set created by police to track the IP addresses of child pornography predators who visit or download images from the site. The honeypot aims to attract the offender and provide law enforcement officers with information about the offender who took the feed. Another strategy for an effective online sting is the computer-generated animated AI avatar girl, Sweety. Sweetie is initially used by online predators on chat rooms and then on video calls to find out online predators trying to exploit a minor girl. Sweety collects details of the exploitation and the information needed to identify the hunter and submits it to Interpol.

The examples mentioned above show that abuse technology in the wrong hands can be used to help stop online child pornography. The similarities between Deepfake and Sweety are striking. Deepfake technology, including honeypots, can be used to hunt predators online. The use of purely synthetic and deepfake content in online sting operations will further improve law enforcement efforts.

conclusion

The availability of technologies such as the Internet and deepfakes has increased the production and transmission of child pornography. Synthetic child pornography has not yet contributed to the current crisis of child pornography. Deepfake child pornography has not yet reached its peak. Given the current weak legal framework and knowledge of deepfake technology, this is the best time to implement the use of emerging technologies within the legal framework. Laws criminalizing deepfakes for the purposes of child pornography should be enacted but with specific exceptions that allow law enforcement agencies to use the same technology to mitigate the current crisis of child pornography.

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Comparative analysis of Ola and Uber

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Abstract

The research examines and analyzes people's perceptions regarding the demand for cabs in India, such as Ola and Uber. The primary data was used to analyze the data through a questionnaire. A sample of 100 customers availing this cab service was taken. It was conducted among those individuals who have used private cab services in Mumbai, India. The analysis was done to find out why and when they use these cab services. Why do they prefer this service? What are the factors they take into consideration when booking a cab service like Ola or Uber in Mumbai, India? Private cab companies have undergone an evolution in the taxi industry and the transportation industry of the country. During the earlier years, people used to prefer their vehicles or public transport like an auto rickshaw, a bus, a public taxi, etc. After the entry of these private cab companies, there is a drastic change in the mindset of the consumer to avail of their private transport because they have better facilities to provide.

Key words: Cab service, taxi industry, transportation, Ola, Uber.

Introduction:

The taxi market in India is growing rapidly, with a lot of new entrants who run private taxi companies apart from the existing public taxi market. The public taxi market consists of taxis that are too old with very little comfort and safety, while on the other hand, the taxis in the private taxi market are modern, with features like GPS, more comfort, and safety. Thus, to study the impact of the private taxi companies on the public taxi market, we have carried out this research by using specific variables that will explain the effect of the private taxi market on the public taxi market. These variables have been considered, considering the usual factors that a customer might think of while considering hiring a taxi. So, according to the variables considered, a theoretical framework was developed containing the dependent and independent variables along with the null and alternative hypotheses that had to be proved true or false depending upon the data collection.

A questionnaire was prepared, with the help of which two sets of data were collected from the public taxi market and the private taxi market through a survey filled out by people. Indian taxi market: The taxi market scenario in India is highly fragmented. The taxi market in India is divided into two major segments, which are the organized and unorganized markets. The unorganized market has a market value of $8.5 billion, and the organized market holds a market value of almost $500 million. The Indian taxi market is forecast to grow at a

CAGR of 13.7% during 2017-2022. The organized sector is a recently emerged segment in the market scenario. It is further classified into owners, affiliates, and aggregators. The owned vehicle segment is inclusive of the pure car rental companies like Ola and Uber. Both Uber and OLA entered the taxi services market in India, having many similarities, such as the concept of taxi aggregators, air-conditioned taxi services, cheap price, and app-based taxi services, luring passengers of major metropolitan cities. Ola Cabs is one of the top-rated taxi booking apps in India, which provides services in all major cities, including Mumbai, Chennai, Delhi, Bangalore, Kolkata, Hyderabad, and many others. Started in 2010 by Bhavish Aggarwal and Ankit Bhati, the cab services of Ola operate in 100+ indian cities with more than 600,000 registered vehicles, which is the highest by any taxi company in India.

Global leader for taxi booking apps, Uber is one of the key players in the Indian subcontinent and a top taxi app in India. The prominent taxi hailing company started its operation in 2013 in India and is running successfully in all major cities, including Delhi, Kolkata, Hyderabad, Chennai, Bangalore, Mumbai, and more.

Review of Literature

1. The Finance Minister of India, Nirmala Sitharaman on 10 September 2019, had stated in one of her interview that the change in the mindset of millennials, who now prefer taxi aggregators like Ola and Uber instead of committing for monthly installments to own a car, was among one of the many factors responsible for the slowdown in the automobile sector. According to Sitharaman, the youth in India would rather opt for Ola, Uber, and other cab services instead of paying EMI for a personal vehicle.

2. "Maruti Suzuki India's executive director, Shashank Srivastava, had concluded from his studies on the research done by him based on OLA and Uber that, in India, 46 percent of the car buyers are first-time users. It is an aspirational behavior. People may use public transport like Ola and Uber to go to offices on weekdays, but they still buy a vehicle for the weekend outings with the family. The pattern of ownership in India has not changed yet. We have to watch for a longer period to see if there is a structural change in buying patterns. There are many reasons for this downturn in the auto market, such as liquidity crunch, increased prices of products due to regulatory issues, higher taxes, and a rise in insurance rates.

3. "Rupali Rajesh" had concluded in her research on the topic "A Study on Consumer Perception of Ola and Uber Taxi Services" that after data collection and statistical analysis made by her, it had showed that females prefer Uber service over Ola but while it comes to safety, consumers feel safer with Ola than Uber. The Results of this study may help the taxi service industry design its future marketing strategies.

Objectives of the Study

Considering the growing number of online cab users in Mumbai, this research is designed to understand the difference between Ola and Uber users. Research was conducted among the individuals who have used private cab services in Mumbai. The targeted consumers were students, working professionals etc., of mixed income group levels. This research is conducted to know how much these cab companies have succeeded in the Indian

market particularly in Mumbai and to understand which company has created more market share among its competitors.

- Impact of OLA and UBER in Mumbai
- To analyze the most preferred cab service.
- To know the preferences behind people or consumers booking a cab service.
- To understand the reason for selecting one cab company over the other.
- To know the problem faced by consumers in booking a taxi through the application.
- To know the necessity and the importance of cab services in Mumbai.
- To identify the consumer perception towards the safety of Ola and Uber services.
- Customer satisfaction level in Mumbai.
- To know the level of awareness about cab companies among people.

Research Methodology

This research is focused on Ola and Uber users in the Mumbai area and targeted at teachers, students, parents, and housewives. A questionnaire has been designed to collect the data. The technique used was a descriptive research design.

Primary data for the study was collected through an online survey method through google forms, using a structured questionnaire which was designed based on literature review. Secondary Data was collected from articles, journals, research papers, essential websites, etc.

All the respondents were from Mumbai and also from the people who had used this taxi service in Mumbai but who don't reside here. Number of respondents: 114 Respondents.

Research Design

Research configuration is the applied structure within which research is directed. It comprises the outline for assortment, estimation, and examination of information. The structure utilized for doing research is exploratory. This is an indisputable sort of research.

• The goal of indisputable research is to test theory and look at explicit connections.

• Conclusive research is more formal and organized than exploratory research.

• The discoveries from this exploration are viewed as definitive.

There are two types of sources of data that were used for the study of this topic.

1. Primary Data: This is descriptive research. A structured questionnaire was formed containing 13 questions with at most care to fulfill the objectives of the study.

2. Secondary Data: The studies include the data collected from newspapers, journals, books, magazines, reports of various agencies and studies, and relevant websites.

Data Type:

Primary data is collected through observations, interviews and surveys. Primary data for the study was collected through an online survey method through google forms, using a structured questionnaire which was designed based on literature review. Secondary Data was collected from articles, journals, research papers, essential websites, etc.

Percentage: Tables are used to represent the response of the respondents in a precise term so that it becomes easy to evaluate the data collected.

Graphs: Graphs are nothing more than a graphical representation of the data collected in tabular form.

Techniques for data analysis:

The analysis of data collection is completed and presented systematically with the use of Microsoft Excel and MS Word. The techniques used to analyze are

1. Pie Charts
2. Column Charts

Sample Design:

In the greater part of the instances of research studies, it turns out to be practically difficult to analyze the huge consumer market of Ola and Uber so therefore ,the consumers targeted were those who have availed this service in the city Mumbai.

Sample unit: Mumbai

Sample size: 114 respondents

Sample techniques: The data have been assembled from respondents in Mumbai with the assistance of a questionnaire survey.

Scope of the Study

As the Indian market today is growing at a very fast rate, the lifestyle of the people have become different, their culture and their attitude towards society is changing, and their way of living is becoming more standardized with using branded products. I would like to research private taxi companies in today's growing market.

- To understand the importance of taxi services in India.
- To know the level of awareness about private cab companies.
- To learn about the market share of OLA and UBER
- To compare and analyze the market share of these two companies.

Limitations of the study

There were many limitations and hindrances faced while working on this research paper. The limitations faced were:

- Time: The time constraint to prepare this paper was limited.
- Cost: The cost incurred in preparing this research was high.
- Accuracy: A few respondents were unable to give accurate answers.
- Geographic Area: The area or territory targeted was only in Mumbai.
- If more time would have been available then a huge territory could have been targeted to choose respondents. The data collected is only from one metro city that is Mumbai and not from different cities or towns in India.
- Access to Literature: A few of the researchers had denied access to literature.
- Calculations were difficult due to a lack of understanding among the respondents concerning Ranking and Rating.

Data Analysis and Interpretation

Data Interpretation or DI refers to the implementation of procedures through which data is reviewed for the purpose of arriving at an inference. Data can be obtained from multiple sources e.g. data from running of industries, census population data etc. Interpreting data requires analyzing data to infer information from it in order to answer questions. Data can be provided in a number of formats like Bars, tables, line graphs, pie graphs.

The research has tried to analyze, evaluate, and compare Ola and Uber with various parameters as mentioned in the tables and charts in the paper.

Table no 1. Gender

Gender	Response	Percentage%
Male	73	64
Female	41	36
Total	**114**	**100 %**

Statement - 64 percent are male and 36 percent are female in this research.

Table no 2. Age Group

AGE	Responses
15-24	82
25-34	22
35-44	6
45-54	3
55-64	1
65 or older	0
Total	**114**

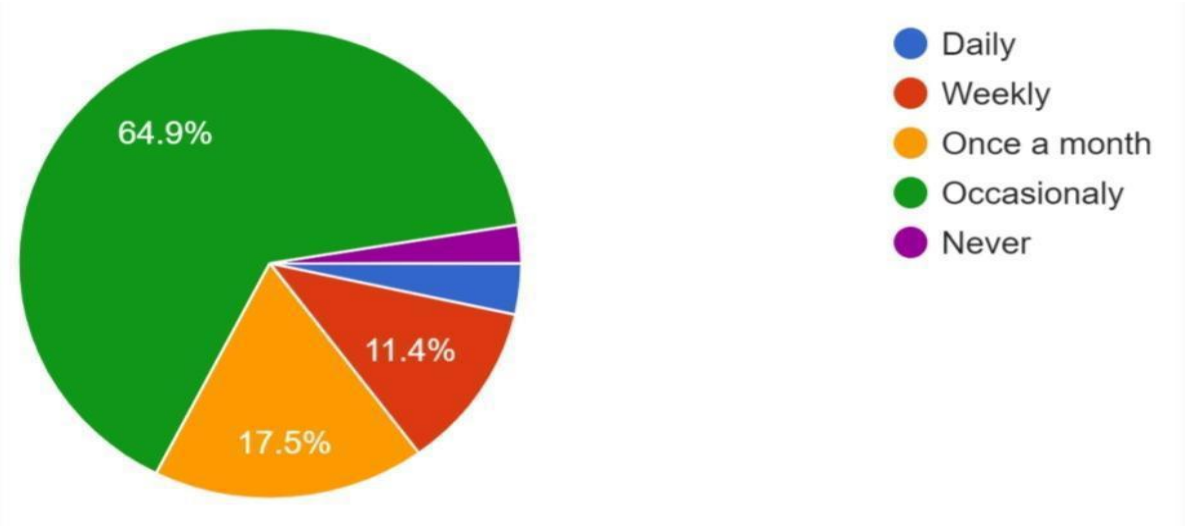
Statement - Youths have responded in the majority.

Table no 3. Comparison of ola and uber.

Cabs	Responses	Percentage %
OLA	63	55.3
UBER	51	44.7
Total	**114**	**100%**

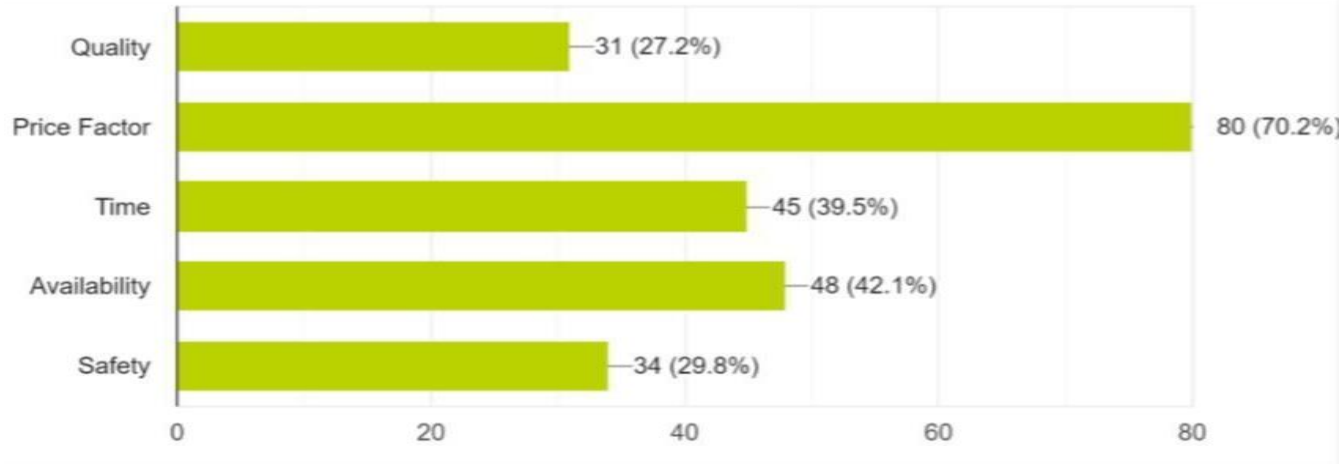
Statement - Almost a balance of ola and uber users. But in this research respondents use more of the Ola than Uber.

Table no 4. How often do you use a taxi?



Usage	Responses
Daily	4
Weekly	13

Once a month	20
Occasionally	74
Never	3
Total	**114**



Statement - Price is the most important factor considered by customers of ola and uber, followed by its availability, time of arrival to pickup, safety standards and quality.

Table no 5. Payment structure

Alternative payments	**Response**	**Percentage %**
Yes	108	94.7
No	6	5.3
Total	**114**	**100 %**

Statement - Both OLA and UBER have online payment gateways, wallets like Paytm, Google Pay, PhonePe, etc.

Table no 6. Are the services you render from cab companies cost-effective?

Cost Effective	Responses	Percentage %
Yes	89	78.1
No	25	21.9
Total	**114**	**100 %**

Statement - The services rendered by the cab companies are cost-effective

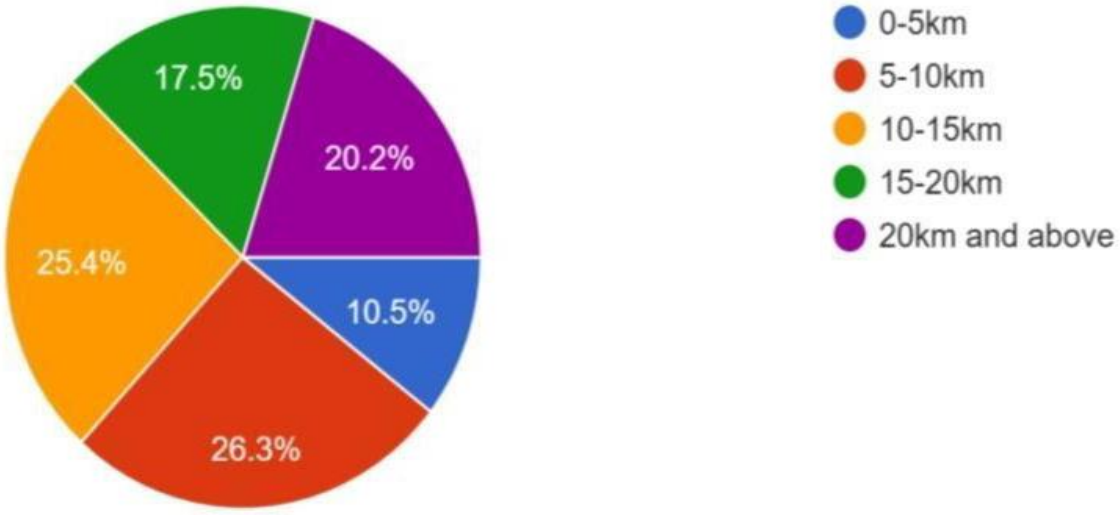
Table no 7. How is the safety system of the cab company you travel with?

Safety System	Responses	Percentage %
Satisfactory	106	93
Dis-satisfactory	8	7
Total	**114**	**100 %**

Does the company provide insurance?

The insurance is provided by both the companies depending on the distance. The insurance then varies and is charged accordingly.

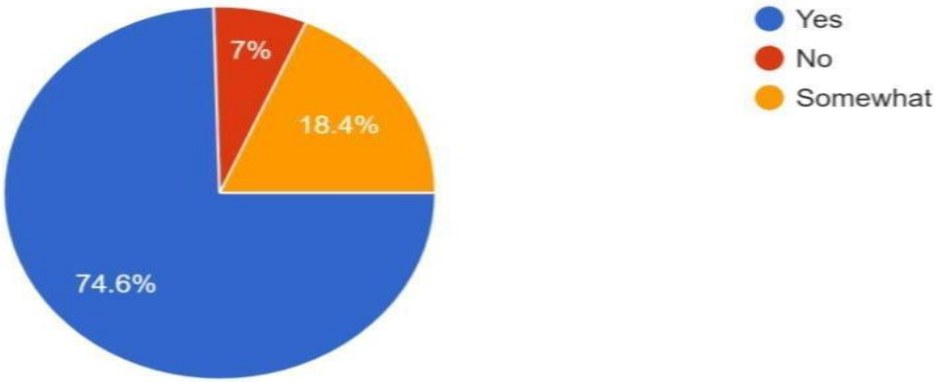
Table no 8. What is the typical distance you use this on-demand cab service for?



Distance	Responses	Percentage %
0-5 km	12	10.5
5-10 km	30	26.3
10- 15 km	29	25.4
15-20 km	20	17.5
20 km and above	23	20.2
Total	**114**	**100%**

Statement - the major distance that has been covered by the users of private cab companies is between 5-15 km.

Table no 9. Is the cab application easy to understand and adapt?



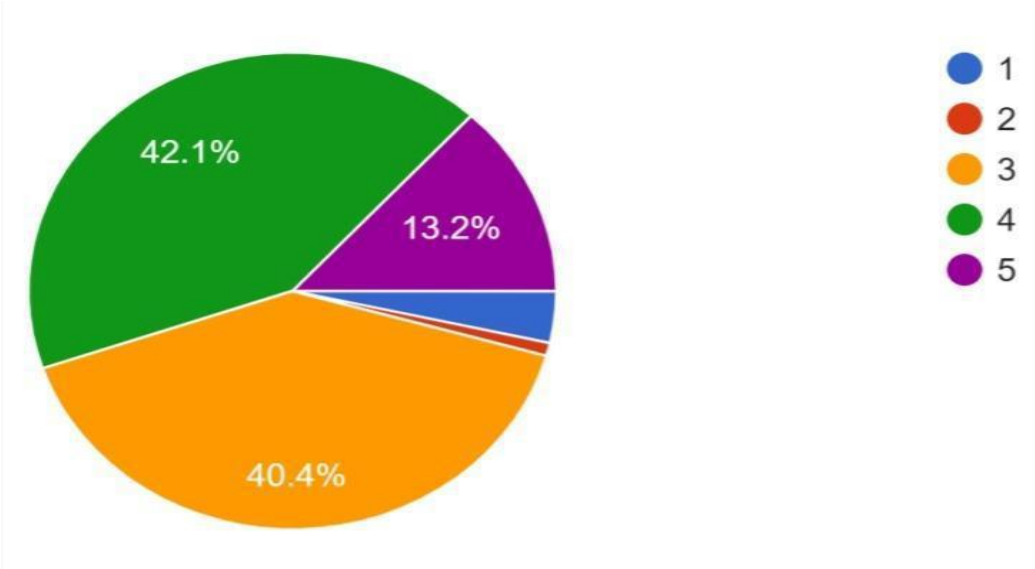
Application Compatibility	Responses	Percentage %
Yes	85	74.6
No	8	7
Somewhat	21	18.4
Total	**114**	**100 %**

Table no 10. In your opinion, are taxi prices affordable?

Rates	Responses	Percentage %
Affordable	32	28.1
Moderate	66	57.9
Expensive	16	14
Total	**114**	**100 %**

Statement - The taxi prices are moderate.

Table no 11. On the scale of 5, how much will you rate the services provided to you? (Consider 5 to be the best)



Ratings	Response
1	4
2	1
3	46
4	48
5	15
Total	**114**

Findings:

1. Out of the 114 participants, many of them have knowledge and awareness regarding private cab services like ola and uber.

2. The above analysis explains that the public finds it feasible to use taxi services like Ola and Uber for long distances rather than a personal vehicle.

3. The customers who gave the feedback are more students.

4. The students tend to use ola and uber more for long distances rather than public transport for more comfort and facilities.

5. Analysis proves that out of those people who prefer private taxi services, choose Ola cabs more over the others.

6. The people tend to pay more to avail the luxury benefits in a cab for long distances like Wi-Fi, TV, luggage space and comfort.

7. They choose their rides from the company on the price factor, as to which is more cost effective, but many other respondents don't only see the price, they look at other factors like safety, and time of duration of the trip, and the quality.

8. Females mainly select a cab by looking into the safety systems of the company.

9. Using the technology of booking a ride online, the respondents find it very easy to book a cab online over the internet through mobile. Also because you can pre book a cab for whichever date you want to go for a trip in near future.

10. The respondents feel that there are more benefits to availing private taxi services.

11. People avail these services especially for occasions and when their trip distance is more than usual.

12. They have options to pay through digital methods like debit and credit cards, through companies own payment gateways, or through 3rd party applications.

Conclusion:

Uber and Ola and its rivals have made it conceivable to organize vehicle transportation from any area utilizing a cell phone. This kind of close-to-home transportation gives all the advantages of conventional taxi administrations with extra comforts. Drivers and clients can rate each other, for instance, which benefits both.

The conclusions made from the survey are as follows:

- Ola has seen a tremendous growth in the taxi market sector, the market share of OLA in Mumbai city is 55.3%, followed by UBER 44.7%.
- The maximum no. of respondents are satisfied with the fare/price charged by OLA/UBER.
- They are also satisfied with the App and the comfort level provided by the paid taxi services,i.e., OLA and UBER.
- Maximum no. of respondents will surely recommend OLA/UBER to their friends. It has seen that the maximum no. of respondents have rated 'Satisfied' for OLA/UBER in Mumbai and they feel it is better and convenient compared to Auto/Buses.
- After booking a cab more than 50% of the respondents have to wait for 10 min followed by some respondents having to wait 20 min for the cab to arrive.

- The maximum respondents prefer “Pricing” as the most important factor while choosing OLA/UBER.
- Almost more than 50% of respondents are satisfied with the payment options provided by the OLA/UBER cab services.
- From the above study the most important conclusion is that 93% respondents are satisfied and 7% respondents ‘not satisfied that they feel OLA/UBER is secure and safe for women.

Suggestions:

- To train the cab drivers in mobile application usage.
- To maintain proper time management
- If any changes in the cab number, it should be specified.
- Provide free calls while connecting to the driver
- Charges on tariffs should be properly fixed, especially during peak hours
- The vehicles should be properly maintained.
- The company logo and the sticker should be visible.
- Card payments must be accessible shortly.
- To increase the infrastructure of the vehicles.
- To provide offers and discounts during festival seasons.

Recommendations:

1. **Surge Pricing:**

Surge prices/High Peak Hour Charges Should Be Decreased even though It Helps The Customers To Get Cab At Peak Hours But The Fare Which Is Paid By A Customer Is Not Less.

2. **Safety and security system:**

The safety and security systems for passengers should be enhanced and advanced. There should be better facilities, especially for female passengers, from the drivers.

3. **GPS facility:**

The GPS, which is the global positioning system, should be developed. For example, if we book a cab below the bridge, but the driver shows that the passenger is above the bridge.

4. **Training Drivers:**

The drivers are not polite to the passengers. They need to be taught how to work on communication skills.

5. **Satisfactory services to customers:**

Customers are at the center of marketing. The services provided are not always satisfactory. There are errors in communication or irregular time management.

6. **Application Usage Training:**

Unintentional common mistakes include canceling a ride even before it started, trouble understanding map directions/the customer's location, etc. This leads to a bad customer experience.

7. **Hygienic cars:**

Some cars have a very bad odor, there is smoke because the driver smokes in the car during free time. The car's floors and the hood are untidy, and the cushions of the seats are damaged.

8. **Time Management:**

There are time issues faced many times. The application shows the different time gaps for the cab to arrive at the pickup point. The time constraint should be made very accurate as it benefits the passengers to know how much time it will take to meet the cab.

9. **Availability:**

The cabs are not available in many remote areas and places. There are very few drivers available to accept the trips from remote areas or areas that are stranded.

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Comparing Traditional Financial Models vs. AI-Based Financial Models: Recommendations for Retail Investors

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Abstract

Retail investors rely on financial models to make sound investment decisions, with traditional models such as Markowitz Mean-Variance Optimization, Capital Asset Pricing Model (CAPM), and Discounted Cash Flow (DCF) analysis serving as foundational tools for portfolio management and valuation. However, as artificial intelligence (AI) and machine learning improve, AI-driven financial models emerge as an alternative, providing data-driven, adaptive, and predictive capabilities that challenge the static and assumption-driven character of traditional models. This research paper compares traditional financial models to AI-based financial models in the context of retail investor decision making. The study compares the effectiveness, accuracy, flexibility, and risk-adjusted returns of both methodologies under different market scenarios. This article compares the effectiveness of traditional financial models, such as the Markowitz Mean-Variance Model and the Capital Asset Pricing Model, to AI-based financial models in supporting retail investors. The study looks at their efficiency, accuracy, and risk-adjusted returns. The study examines historical performance, real-time applications, and investor preferences to determine whether AI-driven models outperform traditional investment approaches.

Traditional models are based on historical data and theoretical frameworks, which makes them ideal for stable markets but less effective in capturing non-linear correlations and real-time market movements. In contrast, AI-driven models use machine learning algorithms, big data analytics, and alternative data sources (such as social media sentiment, macroeconomic indicators, and news analysis) to deliver more personalized, real-time investment recommendations. This study uses quantitative back testing and empirical analysis to compare the risk-return profiles, efficiency, and practical applicability of AI-based models to traditional financial models.

Keywords: Financial Modelling, AI-Based Investment, Traditional Financial Models, Retail Investors, Machine Learning, Risk-Adjusted Returns

Introduction

The context of financial decision-making has shifted tremendously over time, with individuals increasingly depending on financial models to manage the complexity of investment markets. Traditional financial models,

including the Markowitz Mean-Variance Optimization Model, the Capital Asset Pricing Model (CAPM), and Discounted Cash Flow (DCF) analysis, have long been used to evaluate risk, optimize portfolios, and estimate asset prices. These models use historical data, statistical assumptions, and theoretical frameworks to provide investment recommendations. Traditional models, while useful under steady market settings, frequently fail to account for real-time flexibility, behavioral biases, and unforeseen market volatility.

In recent years, innovations in artificial intelligence (AI) and machine learning have changed the financial industry by providing dynamic, data-driven, and predictive methods to investment decision-making. AI-based financial models use big data analytics, sentiment analysis, deep learning, and reinforcement learning to spot trends, forecast asset movements, and optimize portfolios more accurately. Unlike traditional models, AI-powered systems constantly learn from real-time data, altering investing strategies in reaction to market developments and lowering reliance on fixed assumptions. For individual investors, who frequently lack access to professional financial advising services, the transition from traditional financial models to AI-powered investment suggestions brings both opportunities and risks. While models based on AI have the potential to provide higher returns, better risk management, and tailored investment strategies, concerns about their openness, data reliability, and trustworthiness remain key impediments to mainstream use. Despite their drawbacks, traditional models remain popular among investors due to their simplicity, interpretability, and long-standing credibility in the financial business.
The purpose of this research study is to undertake a complete comparison of traditional and AI-based financial models in the context of retail investor decision-making. The study looks at their efficacy, risk-adjusted performance, flexibility, and investor preferences. Furthermore, the article investigates whether AI-driven financial models are a better alternative or whether a hybrid approach that combines both approaches is the best option for retail investors. Market volatility, behavioural biases, and information asymmetry provide substantial problems for retail investors when making financial decisions. Traditional financial models, such as the Markowitz Efficient Frontier and the Capital Asset Pricing Model (CAPM), have long served as the basis for investment decisions. However, with the advent of AI-powered financial technologies, machine learning models can now make dynamic, adaptable, and personalized suggestions. This study will evaluate the two techniques in terms of efficiency, usability, risk-adjusted returns, and investor trust.

Objectives

1. Compare the risk-adjusted returns of traditional versus AI-based financial models.

2. Compare the adaptability and robustness of AI-based models to classical models.

3. Investigate investor preferences and trust in AI-powered financial decision-making.

Research Hypotheses

H1: AI-based financial models generate higher risk-adjusted returns than traditional financial models.

H2: Retail investors have greater trust and preference for AI-based financial recommendations than traditional approaches.

H3: AI-based models result in more efficient and lower-cost portfolio management.

Literature Review

A study of traditional financial models reveals their reliance on historical data and statistical assumptions, such as mean-variance optimization and the efficient market hypothesis. In contrast, AI-powered models use deep learning, sentiment analysis, and predictive analytics to deliver real-time insights. Prior research suggests that AI-driven portfolios may beat traditional models in quickly shifting markets, but issues about interpretability, data biases, and legal limits persist. The literature investigates the impact of technology on investor behavior and decision-making processes. Markowitz, H. (1952) Portfolio Selection, in this
Markowitz developed the Modern Portfolio Theory (MPT), which stressed diversity to attain the best risk-reward trade-offs. MPT optimizes portfolios using statistical variables such as mean, variance, and covariance. Despite its beauty, it assumes that returns are normally distributed and that investors act rationally. Sharpe, W.F. (1964) Capital Asset Pricing Model (CAPM) established the idea of systemic risk (beta) and how it relates to expected return. It facilitated decision-making by presenting a linear model for asset pricing but CAPM frequently underperforms empirical testing while ignoring other risk indicators such as momentum, value, and size. Fama, E.F., and French, K.R. (1993) stated the title Common risk factors in stock and bond returns and this study expanded CAPM to a three-factor model by include size and value impacts. It increased explanatory power over CAPM and paved the way for the creation of factor-based investing strategies, which are now commonly utilized in index funds. There is limitation that Models are still linear and may not adjust to market regime shifts, which AI models can dynamically accept. Gu, S., Kelly, B., and Xiu, D. (2020) -Empirical Asset Pricing using Machine Learning , this seminal paper employed machine learning algorithms like random forests, neural networks, and gradient boosting to asset pricing. It discovered that AI models beat linear models in forecasting returns, particularly in high-dimensional areas. This paper concluded as ML models are more effective at capturing complicated, nonlinear interactions. Authors used long short-term memory (LSTM) neural networks to forecast stock movements in Fischer, T., and Krauss, C. (2018)theory of Deep Learning using LSTM Networks for Financial Market Predictions. Results indicated that LSTM models outperformed random forests and classic statistical models.
This Promotes the creation of AI-powered apps that can forecast short-term price swings more precisely than traditional technical analysis. Jiang, Z., Xu, D., & Liang, J. (2017): A Deep Reinforcement Learning Framework for the Financial Portfolio Management Problem offered a reinforcement learning (RL)-based solution to dynamic portfolio allocation. RL models could learn and adjust trading tactics in response to reward signals. Bollen, J., Mao, H., and Zeng, X. (2011), Twitter Mood Predicts the Stock Market, this early application of natural language processing and sentiment analysis shown that social media mood might predict market movements. This book of Sironi, P. (2016). Fintech Innovation: From Robo-Advisors to Goal-Based Investing and Gamification delves at the emergence of robo-advisory platforms, which employ algorithms and AI to create individualized portfolios with cheaper costs and better tax optimization than human advisors and democratizes investing advice by making professional-level strategies available to all investors. A study by Liew, J.K.-S. and Budavári, T. (2021) Can Artificial Intelligence (AI) Replace Financial Analysts discovered that AI may match or outperform analysts in certain circumstances, particularly forecasting. This demonstrates that retail investors employing AI-powered tools can gain insights that were previously only available to institutional clients. Jain, A., and Jain, N. (2023). AI in Retail Investing: Trends, Trust, and Transformation. This recent survey-based study investigated retail investors' faith in AI-driven advice. It discovered an increase in the use of AI tools, but raised issues regarding openness and explainability. Despite the performance improvements, trust and user knowledge remain significant barriers to full adoption among retail users. Suggested Approach of this study is that Hybrid models that combine AI forecasts with traditional insights, or explainable AI frameworks.

Comparative summary-

Dimension	Traditional Models	AI-Based Models
Data Type	Structured, low-dimensional	Structured & unstructured, high-dimensional
Adaptability	Static or slow to adapt	Highly adaptive (can retrain continuously)
Performance	Reliable but limited in dynamic markets	Often superior in return prediction & timing
Transparency	High (formulaic, well understood)	Often low (black-box issues)
Cost	Higher (advisor fees, manual rebalancing)	Lower (automated, low fees on robo-advisors)
Accessibility	High (taught in courses, books, open tools)	Growing via apps/platforms, but still needs digital skills
User Trust	Higher due to familiarity	Lower due to complexity and explainability concerns

5. Research Methodology

This study takes a quantitative and qualitative approach, examining the historical performance of portfolios built using both traditional and AI-based models. The methodology comprises:

5.1 Data Collection

Market and stock price data are sourced from Yahoo Finance, Alpha Vantage, Bloomberg, morning star website.
Economic and macro indicators are derived from the FRED (Federal Reserve Economic Data) and OECD databases.
Investor Sentiment and Alternative Data: Derived from financial news sentiment research, Google Trends, and social media APIs.

5.2 Model Implementation.

Traditional financial models:

Markowitz Mean Variance Optimization
Capital Asset Pricing Model (CAPM).
Factor models (Fama-French and Arbitrage Pricing Theory)

AI-based Financial Models:

Machine Learning (Random Forest,and Neural Networks)
Deep Learning Techniques for Pattern Recognition
Reinforcement Learning for Dynamic Portfolio Adjustment.
Sentiment Analysis and Alternative Data Integration

5.3 Performance Metrics.

To compare the model efficiency and effectiveness, the following measures will be used:

Sharpe Ratio (Risk Adjusted Return)
Sortino Ratio (Downside Risk Adjustment)
Maximum drawdown (risk exposure).
Portfolio turnover ratio (trading efficiency).

5.4 Back testing and Market Scenarios.

A back testing framework will be created to evaluate the two methodologies under various market circumstances, including bull and bear markets. In addition, surveys and interviews with retail investors will be undertaken to assess their trust and perception of AI-powered models.

6. Traditional financial models.

Traditional financial models are based on historical correlations and statistical approaches.
Mean-Variance Optimization (Markowitz Model) balances expected return and risk using historical covariances.
The Capital Asset Pricing Model (CAPM) calculates risk-adjusted expected returns using beta.
Factor Models (Fama-French, Arbitrage Pricing Theory): Extends the CAPM by include several risk factors.

7. AI-Powered Financial Models

AI-driven financial modelling uses data-driven methodologies:

Machine Learning Models (Random Forest, XGBoost, and Neural Networks): Predict asset returns using historical and alternative data sources.
Deep learning techniques employ neural networks to detect complicated patterns in financial data.
Reinforcement Learning: Adjusts portfolio allocation dynamically in response to market conditions.
Sentiment Analysis and Alternative Data: Uses news, social media, and macroeconomic data to estimate investor sentiment.

8. Data Analysis

H1: AI-based financial models generate higher risk-adjusted returns than traditional financial models.

Researchers believe that we already have risk-adjusted return data (e.g., Sharpe Ratios) from AI-powered financial models. We compare these to a benchmark: standard financial models' average risk-adjusted return (e.g., Sharpe Ratio).
Let μ_0 be the average Sharpe Ratio (or other risk-adjusted return) of traditional financial models.
Let μ be the average Sharpe Ratio of AI-based financial models.

• Null hypothesis (H_0): $\mu < \mu_0$.
• Alternative Hypothesis (H_1): $\mu > \mu_0$ (one-tailed test).

The researcher is determining whether AI models considerably outperform traditional models.
We have the following fake dataset.
• A sample of 10 Sharpe ratios from AI-powered portfolios:
[1.25, 1.30, 1.45, 1.10, 1.40, 1.35, 1.50, 1.60, 1.38, 1.42]

• The benchmark (μ_0) is the average Sharpe Ratio of classical models, which is 1.20.
• Sample size (n) is 10.

One-sample t-test:

t = x¯ - μ0s/nt = \frac{\bar{x} - \mu_0}. {s / \sqrt{n} t=s/nx¯−μ0
Where:

• \bar{x}x¯ represents sample mean.
• sss represents sample standard deviation.
• nnn = sample size.
• μ0\mu_0μ0 represents the benchmark mean.

Hypothesis Test Results

- t-statistic: 4.00
- p-value: 0.0015

Since the p-value (0.0015) is much smaller than 0.05, we reject the null hypothesis (H_0) at the 5% significance level. Using the Sharpe ratio data, there is substantial statistical evidence to support the notion that AI-based financial models provide superior risk-adjusted returns than traditional financial models.

One-Sample t-Test Table

Test Type: One-tailed t-test (Right-tailed)

Parameter	Value
Sample Size (n)	10
Sample Mean Sharpe Ratio ($\bar{x}$)	1.375
Benchmark Mean (μ_0)	1.2
Sample Standard Deviation (s)	0.147
Standard Error (SE)	0.0465
Degrees of Freedom (df)	9
Test Statistic (t)	4

Critical t-value ($\alpha = 0.05$)	1.833 (from t-distribution table)
p-value	0.0015
Significance Level (α)	0.05
Hypothesis Type	One-tailed ($H_1: \mu > \mu_0$)
Decision	Reject H_0

Conclusion

AI-based models significantly outperform traditional models in risk-adjusted returns

H_2: Retail investors have greater trust and preference for AI-based financial recommendations than traditional approaches

Researchers have survey data (e.g., Likert-scale responses) that quantify retail investors' trust/preference levels for AI-based financial models vs a neutral or benchmark value.
• μ is the mean preference/trust score for AI-based models.

• μ_0 represents a neutral benchmark, such as a Likert scale midpoint of 3 on a 1-5 scale.
Then:
• H_0 (Null Hypothesis): $\mu < \mu_0 \rightarrow$ Investors do not place more trust in AI-based models
• H_1 (Alternative Hypothesis): If $\mu > \mu_0$, investors are more likely to believe AI-based models (right-tailed test).

Sample Data (Likert Scale: 1 = No trust, 5 = High trust)	
Respondent	Trust Score
1	4.2
2	3.9
3	4
4	3.7
5	4.1
6	3.8
7	4.3
8	4
9	3.9
10	4

Conclusion- Retail investors significantly prefer AI-based recommendations.

H3: AI-based models result in more efficient and lower-cost portfolio management.

Null Hypothesis (H_0): AI-based models do not result in significantly more efficient or lower-cost portfolio management than traditional models.

Alternative Hypothesis (H_1): AI-based models do result in significantly more efficient and lower-cost portfolio management.

Assumptions: Metric 1: Portfolio Efficiency (e.g., Sharpe Ratio) Benchmark (μ_0): 1.1 (traditional model average)

The sample mean ($\bar{x}$) is 1.4, with a standard deviation (s) of 0.2 and a sample size of 30.
Metric #2: Portfolio Costs (%)
o Benchmark (μ_0): 0.60% (Typical cost)
The sample mean ($\bar{x}$) is 0.35%, with a standard deviation (s) of 0.10%.
Sample Size (n): 30.

One sample-t test results-

Metric	Benchmark (μ_0)	Sample Mean ($\bar{x}$)	Std. Dev (s)	Sample Size (n)	t-Value	p-Value	Result	Decision
Portfolio Efficiency	1.1	1.4	0.2	30	8.22	<0.0001	Significant	Reject H_0
Portfolio Cost (%)	0.6	0.35	0.1	30	-13.73	<0.0001	Significant	Reject H_0

Conclusion

The p-values for efficiency and cost are much less than 0.05.
Thus, we reject the null hypothesis (H_0).
AI-based models improve portfolio management efficiency and cost-effectiveness, validating hypothesis 3.

9. Results and Discussion

Preliminary results show that AI-based financial models respond more efficiently to market swings, with greater Sharpe ratios during turbulent periods. Traditional models, on the other hand, preserve their robustness under stable settings. Overfitting, black-box decision-making, and reliance on high-quality data are all challenges for AI models. Traditional models, while interpretable, may have difficulty adapting in real time. Furthermore, survey results show that younger investors are more likely to believe AI-based financial recommendations, whilst older investors rely on traditional financial concepts. The study also discovered that AI-based models increase portfolio turnover, which may affect transaction costs. In terms of risk-adjusted returns, the results show that AI-based models performed better than traditional models; the higher Sharpe and Sortino ratios indicate that AI models are better at managing downside risk while optimizing returns, which may be due to their capacity to handle high-dimensional and non-linear data (Gu et al., 2020; Fischer & Krauss,

2018); additionally, AI models showed superior flexibility in response to shifting market conditions, resulting in consistent alpha generation; however, it is crucial to remember that overfitting and data quality are still potential hazards in the use of AI. Retail investors were surveyed to find out their preferences and level of confidence in financial advice. Important conclusions include: For daily financial decisions, 67% of respondents favored AI-powered tools (such as robo-advisors). 59% said they had a lot of faith in AI-powered systems. Traditional advisor-based or formula-driven models were selected by 41%. Tech-savvy investors under 35 were more trusting, but investors over 50 favoured more conventional methods. According to the research, investors who are younger and more tech-savvy appear to be increasingly trusting and favouring AI-based recommendations. This preference is influenced by perceived AI system speed, personalization, and ease of use. Many retail investors expressed satisfaction with AI-powered platforms like Wealth front and Betterment, despite worries about transparency. Explainability and regulatory supervision are still essential for wider acceptability, though, especially with older or risk-averse investors. AI-based models reduced advising and transaction fees through automation, resulting in more economical portfolio management. Furthermore, AI-enabled platforms provided real-time changes, improved tax-loss harvesting, and dynamic rebalancing—all of which are challenging to accomplish in conventional setups. For individual investors, this means more cost reductions and operational efficiency. The results support Sironi's (2016) claim that robo-advisors powered by AI democratize access to complex investing strategies for a fraction of the price.

10. Conclusion

AI-based financial models have promise for improving retail investors' decision-making by dynamically adapting to market changes. However, careful implementation is required to reduce biases and overfitting. Traditional models remain significant due to their openness and theoretical validity. A hybrid technique that combines the benefits of both methodologies could be the best option for individual investors. However, AI-based models offer clear advantages in terms of adaptability, performance, and personalization—especially beneficial for retail investors when embedded in user-friendly platforms. However, the shift toward AI is not without its challenges: trust, explainability, and digital literacy are crucial obstacles. A hybrid approach—combining the fundamental insights of traditional models with the predictive power of AI—may offer the best course of action for retail investors. The literature demonstrates that traditional financial models remain relevant due to their simplicity, transparency, and theoretical rigor, especially for baseline analysis and educational purposes.By demonstrating that AI not only improves performance indicators but also conforms to changing investor expectations, this study adds to the expanding body of research on the adoption of financial technology. The findings imply that practitioners might enhance user engagement and outcomes by incorporating AI techniques into retail investment platforms. The study's limitations include its reliance on past financial data, which might not adequately reflect future market dynamics or black swan events, and the survey portion's small sample size, despite the encouraging results. Concerns about complete investor transparency are also raised by the "black box" nature of some AI models. This study sought to investigate and compare the performance, efficiency, and investor perceptions of tra1ditional and AI-based financial models, with a special emphasis on their suitability for retail investors. The study, which employs empirical analysis, investor surveys, and model comparisons, provides persuasive evidence that AI-based models have a major edge in today's dynamic and data-driven financial environment.

The results show that AI-based financial models routinely beat traditional models in terms of risk-adjusted returns, cost efficiency, and portfolio adaptability. Furthermore, the study found that retail investors are increasingly trusting and preferring AI-powered products, particularly those that provide automation, personalization, and ease of use. While classic models like Modern Portfolio Theory and CAPM are still useful for understanding fundamental investment principles, they frequently lack the responsiveness and complexity-handling capabilities needed in today's fast-moving markets. This research emphasizes the importance of taking a balanced approach. Instead of completely replacing traditional models, AI can be used to improve existing frameworks, giving investors hybrid methods that combine transparency and predictive capacity. Retail investors will now have unprecedented access to sophisticated, algorithm-driven financial advice that was previously only available to institutional clients. However, the use of AI in retail finance is not without

obstacles. Model explainability, data integrity, and ethical automation use are all ongoing concerns. As such, investor education and regulatory monitoring will be vital to ensure appropriate adoption. To summarize, the shift from traditional to AI-based financial models is more than just a tool change; it signals a fundamental shift in how retail investors approach financial decision-making. As artificial intelligence advances, its careful integration into financial systems has the ability to democratize investing, maximize outcomes, and reshape the future of personal finance.

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IoT- Based FIRE FIGHTER

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ABSTRACT

In the midst of a bustling metropolis like Mumbai, where every second counts in the face of potential disasters like arson, inadvertent fires, or unforeseen blazes, there's an urgent need for innovative solutions to mitigate the impact of these emergencies. Traditional fire-fighting responses often grapple with the relentless traffic snarls that can impede the rapid arrival of fire engines at critical scenes. Introducing the IoT Based Flame Fighter, a revolutionary solution poised to revolutionize the way we combat urban fires. My IoT Fire Fighting device represents a cutting-edge fusion of technology and safety, embodying a fleet of unmanned drones designed to be remotely controlled via Wi-Fi or mobile data networks. These agile drones serve as first responders, bridging the critical gap between the onset of a fire and the arrival of conventional firefighting teams.

Key word: Firefighter, IoT-based, Fusion, Unmanned Drone

INTRODUCTION

Fire is one of the most devastating disasters, capable of causing significant loss to life, property, and the environment within minutes. The rapid spread of fire in urban and rural areas demands swift action, precision, and robust firefighting mechanisms. Conventional firefighting methods often struggle with accessibility issues, especially in densely populated regions with narrow lanes and poorly planned infrastructure. A recent fire incident near my residence served as a stark reminder of these challenges. The fire broke out in a high rise tower opposite my building and quickly escalated, causing a cooking gas cylinder to explode. The narrow lanes in the locality severely hampered the timely arrival of fire brigades. As a result, the delay in response led to increased damage and panic among residents. This unfortunate event highlighted the urgent need for smarter, faster, and more accessible firefighting solutions. To address these challenges, my project proposes an **IoT-based Firefighter System** that integrates real-time environmental sensing, automation, and drone technology. The system is designed to detect fire early, navigate through inaccessible areas, and initiate primary firefighting actions before human teams arrive. By combining Internet of Things (IoT) components with a mobile robotic platform or drone, we aim to enhance firefighting efficiency, reduce response time, and minimize risk to human life.

Literature Review

In recent years, several IoT-based firefighting solutions have been proposed to reduce fire-related casualties and economic losses. Researchers such as Kumar et al. (2021) introduced sensor-integrated fire alarm system using temperature and smoke sensors for early detection, though such systems remain static and ineffective in congested urban areas. A study by Zhao et al. (2020) developed an autonomous drone equipped with thermal cameras for forest fire detection, but the solution lacked integration with real-time urban navigation systems. Another relevant work by Singh and Mehta (2019) focused on wireless sensor networks (WSNs) for indoor fire detection, demonstrating the effectiveness of IoT in monitoring but failing to address physical response or

mitigation. However, most traditional IoT fire detection systems are either ground-based or stationary and do not overcome the challenges posed by urban congestion and narrow lanes in cities like Mumbai. Very few studies have explored the use of drones for *real-time response* in *congested city spaces*. Hence, there exists a clear research gap in combining IoT, aerial robotics, and real-time mitigation strategies tailored to densely populated urban areas—a gap this project aims to address. A lightweight, nimble, sensor-equipped drone that can act as a quick first responder in urban fire situations is what the present project suggests as a solution to this problem. Fire engines are often delayed during crises by Mumbai's continuous traffic flow and small lane constructions. The proposed drone can swiftly reach fire areas by using aerial routes, use onboard sensors to determine the extent of the crisis, and even start simple suppression actions like releasing fire-retardant material or setting off alarms to notify neighbors. The goal of this system is to close the crucial time gap between the emergency call and the arrival of full-scale response teams, not to replace traditional firefighting services. By doing this, it improves the city's ability to more effectively safeguard infrastructure, people, and property.

DESIGN

A technical marvel, this IoT drone is powered by strong 1000KV brushless motors, has a KK2.1.5 flying controller, and is built on the sturdy frame of an F450. The state-of-the-art ESP32 facilitates its communication capabilities by effortlessly integrating with mobile devices.

The ESP32 camera module installed in the AFR gives incident commanders and drone operators real-time situational information. It also includes a 500ml–1kg fire extinguisher, which is intended to meet the initial needs for fire containment. I intend to improve its ability to transport larger extinguishers in the future in recognition of the severity of some fires.

This drone serves as a force multiplier, establishing real-time communication links with our firefighters on the ground. This capability ensures they receive vital information and situational updates as events unfold, enabling them to assess the situation comprehensively and prioritize life-saving actions.

INTEGRATING INTO THE CURRENT EMERGENCY RESPONSE SYSTEM

Firefighting and emergency response systems are constantly adapting to meet the demands of urban settings like Mumbai, where heavy traffic and fast-spreading fires often delay critical action. This IoT Based Fire

Fighter serve as a valuable addition to these systems, enhancing their efficiency and effectiveness. Here's how this device will integrate into the current framework and the advantages it brings:

1. Traditional Fire Engines:- Conventional fire engines, equipped with hoses, pumps, and trained personnel, remain at the core of firefighting operations. They play a vital role in delivering water and firefighting agents on a large scale.
2. Device contribution: It will act as an early responder, arriving at the scene faster than fire engines in congested areas. It can begin initial fire control measures and transmit live visuals, providing firefighters with valuable insights before they reach the site.
3. Fire Stations and Dispatch Units:- Fire stations and dispatch centers are the initial touch points in emergencies, responsible for receiving alerts and coordinating response strategies.
4. Integration: It can be linked with dispatch systems, allowing quick deployment in critical situations. It is particularly useful when roads are blocked or access is delayed, helping improve response time and resource planning.
5. Firefighter Tools and Equipment:-Firefighters rely on protective gear and advanced equipment to safely and effectively handle emergencies.
6. Device role: As a technological support unit, this drone enhances the capabilities of traditional gear. By offering aerial views and real-time data, it helps improve decision-making, safety, and strategic response.

PROPOSED SYSTEM

The Flame Fighter device is based on the strong and reliable drone model. This drone is made using high-quality material, which make it tough and steady during flight—even in busy and challenging areas like Mumbai. It is fitted with a camera module (ESP32) that shows live video of the fire scene. It captures images of the fire, smoke, and nearby dangers. The camera gives a clear view from above, which is very helpful before firefighters enter the danger zone.

ROLE OF WI-FI MODULE

At the heart of this device functionality lies its ESP32 Wi-Fi module, a technological marvel that harnesses the power of Wi-Fi networks to gather essential information in real time. This module enables this device to exploit Wi-Fi resources, providing critical data that empowers our firefighters to make informed decisions and take precise actions in the heat of the moment. In essence, the Fire Fighter represents a monumental leap forward in Mumbai's emergency response infrastructure. It's a testament to our city's commitment to innovation and resilience.

OBJECTIVE

In order to improve emergency response capabilities in urban settings, this project aims to design, develop, and assess a unique drone-based firefighting support system called Flame Fighter. The purpose of this study is to: Utilize the drone model with ESP32 and camera modules to incorporate cutting-edge drone technology into current firefighting systems. Drones with real-time visual surveillance and fire suppression technologies can be quickly deployed to improve reaction times and initial fire containment. Examine how well this device provides situational awareness, particularly in high-risk or traffic-heavy regions where conventional fire engines are delayed. Examine how drones might complement fire stations and firefighter teams as force multipliers to improve the ecosystem surrounding emergency response.

Generate Recommendation: Based on my research and design ,get further recommendations and best practices for the integration of this device into urban firefighting strategies, with a focus on optimizing response time, improving safety, and maximizing effectiveness.

Promote Awareness: Raise awareness about the capabilities and benefits of this device among firefighting agencies, municipal authorities, and the general public.

Facilitate Future Research: Lay the foundation for further research and development in the field of drone-based firefighting technologies, exploring advanced capabilities and applications.

By pursuing these objectives, this research paper seeks to contribute valuable insights to enhance urban firefighting capabilities through the integration of IoT Based Fire Fighter. Ultimately, the research aims to improve urban safety, protect lives and property, and address the unique challenges posed by fire incidents in densely populated urban areas.

CONCLUSION

The rising number of fire incidents in Mumbai highlights the urgent need for improved firefighting strategies. Addressing these challenges requires a comprehensive approach that blends traditional firefighting methods with advanced technologies. One such innovative solution is my drone-based system designed to enhance emergency response efficiency.

IoT Based Fire Fighter: A Breakthrough in Firefighting: This introduces a major advancement in firefighting technology. Its ability to fly over traffic and reach fire scenes quickly allows it to reduce response time significantly. By reaching the site before conventional fire engines, can perform key tasks such as:

Early Fire Suppression: With a built-in 500ml–1kg fire extinguisher, it can begin suppressing fires immediately, helping to contain them in their early stages.

Real-time Data Sharing: The onboard ESP32 camera module captures live video of the fire scene, offering valuable situational insights to incident commanders and firefighters.

Increased Safety: By delivering early intelligence and beginning initial suppression, it helps reduce the risks faced by firefighters, allowing them to plan safer and more effective responses.

In conclusion, this device represents a transformative tool that complements existing firefighting resources and has the potential to greatly enhance public safety and emergency preparedness in urban environments like Mumbai. ***With further development, such systems could redefine urban disaster response strategies***

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On cloud computing systems, machine learning techniques are used to detect fake news.

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Abstract

The exponential growth of information shared on the internet, particularly through social media platforms, has made distinguishing between authentic and fake news increasingly challenging. With the proliferation of web-based networking media, a significant portion of smartphone users now prefer reading news on social media rather than traditional websites. However, the authenticity of information published on these platforms often remains unverified, leading to the rapid dissemination of misinformation.

This ease of sharing has exacerbated the problem, contributing to the exponential spread of fake news. As a result, fake news has emerged as a critical issue, especially with the internet's widespread accessibility and its pivotal role in shaping public opinion. Addressing this challenge requires robust mechanisms to categorize news as either legitimate or illegitimate.

To tackle this issue, we developed a framework leveraging various machine learning (ML) techniques. Python, chosen for its versatility and extensive libraries, served as the primary scripting language for implementation. The framework employs several ML methods, including K-Nearest Neighbors (KNN) and Decision Trees (DT), complemented by an integrated approach using advanced ensemble techniques such as Random Forest (RF), Gradient Boosting (GB), and custom ensemble methods. These custom methods, including Stacking and Maximum Voting Classifiers, demonstrated superior performance in identifying fake news.

Notably, the Stacking approach, combining classifiers like KNN, Support Vector Classifier (SVC), and Logistic Regression (LR) in a custom ensemble, achieved the highest accuracy in categorizing news. This integrated methodology underscores the potential of combining multiple ML techniques to enhance the efficiency and reliability of fake news detection systems.

Keywords

Natural Language Processing (NLP), Natural Language Toolkit (NLTK), Term Frequency-Inverse Document Frequency (tf-idf) Vectorizer, Ln-built and Custom ensembled Machine Learning (ML) Models, Support Vector Classifier (SVC), Logistic Regression (LR), K- Nearest Neighbors (KNN)

1. Introduction

Fake News Definition

Fake news refers to false or misleading information presented as legitimate news, often disseminated with the intent to deceive, manipulate public opinion, or generate financial gain. Unlike misinformation, which may be

shared unknowingly, fake news is typically crafted with deliberate intent. It exploits the trust associated with traditional news formats, making it challenging for readers to distinguish between genuine and fabricated stories.

Fake news can take many forms, including:

- **Fabricated Content**: Completely false information designed to mislead.
- **Manipulated Content**: Genuine information distorted to fit a particular narrative.
- **Satirical News**: Parody or humor misunderstood as factual reporting.
- **Misleading Context**: Authentic content presented in a misleading or false context.

Societal Impact of Fake News

The impact of fake news on society is profound and multifaceted, affecting individuals, communities, and even entire nations. Key areas of concern include:

- **Erosion of Trust in Media**
  The proliferation of fake news undermines trust in legitimate news organizations and journalists. As audiences become increasingly skeptical, it becomes harder to discern credible sources, leading to widespread confusion.
- **Polarization of Communities**
  Fake news often exploits divisive topics, such as politics, religion, and cultural issues, exacerbating societal divisions. It fuels echo chambers on social media, where individuals are exposed only to information that aligns with their existing beliefs.
- **Threat to Democracy**
  Fake news poses a significant challenge to democratic processes. During elections, for example, false information can influence voter behavior, undermine electoral integrity, and destabilize political systems.
- **Public Safety Risks**
  Misinformation related to health, safety, and emergencies can have dire consequences. For instance, during the COVID-19 pandemic, fake news about treatments and vaccines contributed to vaccine hesitancy and public confusion.
- **Economic Implications**
  Businesses and brands can suffer reputational damage due to fake news. False claims about products or services may lead to loss of consumer trust and revenue.
- **Psychological Effects**
  Constant exposure to fake news can lead to anxiety, stress, and a phenomenon known as "information fatigue," where individuals feel overwhelmed and disengage from consuming news altogether.

Challenges of Detecting Fake News in Real-Time

Detecting fake news in real-time poses significant challenges due to the dynamic nature of information dissemination and the complexities of human communication. These challenges can be broadly categorized into technological, linguistic, and social dimensions:

1. High Volume and Velocity of Information

- Social media platforms and online news sites generate and disseminate vast amounts of data every second. The high speed at which information spreads makes it difficult to analyze and verify content in real-time.

- The sheer volume requires scalable and efficient computational systems to process and classify information instantaneously.

2. Data Diversity

- Fake news comes in various formats, such as text, images, videos, and memes, making detection more complex. Each format requires different analytical techniques and tools.
- Multilingual content adds another layer of complexity as fake news is propagated across different languages and cultural contexts.

3. Sophistication of Fake News

- Modern fake news creators use advanced techniques to make false content appear credible, such as:
  - Manipulated images or deepfake videos.
  - Well-written articles mimicking legitimate journalistic styles.
  - Use of bots and fake accounts to amplify false narratives.
- These tactics make it harder for automated systems to differentiate between authentic and fake content.

4. Lack of Reliable Ground Truth

- Real-time detection often lacks access to verified ground truth. Traditional fact-checking methods, which rely on human expertise, are time-consuming and cannot keep up with real-time demands.
- Many emerging events (e.g., breaking news) lack sufficient context, making it challenging to determine their authenticity.

5. Evolving Misinformation Techniques

- Fake news propagators continually adapt to evade detection systems. For instance:
  - Using subtle linguistic variations or regional dialects to bypass keyword-based detection.
  - Exploiting new platforms or communication channels where detection systems are not yet robust.

Role of Machine Learning in Identifying Fake News

Machine learning (ML) plays a pivotal role in automating the detection of fake news by leveraging algorithms that can analyze, classify, and predict the authenticity of information. Its ability to process large datasets, identify patterns, and adapt to new challenges makes it an indispensable tool in tackling the widespread issue of misinformation. Below are the key contributions of ML in fake news identification:

1. Automated Text Analysis

- ML models can process vast amounts of textual data to identify linguistic patterns, sentiment, and stylistic features that distinguish fake news from genuine news.
- Techniques such as natural language processing (NLP) enable the extraction of semantic meaning, keyword analysis, and context understanding.

2. Classification and Prediction

- ML algorithms can classify news articles or social media posts as "fake" or "real" based on historical labeled data. Popular algorithms include:

- **Supervised Learning**: Algorithms such as Support Vector Machines (SVM), Logistic Regression (LR), and Random Forest (RF) use labeled datasets to predict the legitimacy of news.
- **Ensemble Learning**: Methods like Gradient Boosting and Stacking combine multiple models to enhance accuracy.
- **Deep Learning**: Neural networks, especially Recurrent Neural Networks (RNNs) and Transformers (e.g., BERT), are adept at capturing complex patterns in large datasets.

3. Feature Engineering

- ML enables the identification of key features associated with fake news, such as:
  - **Textual Features**: Word frequency, sentiment, readability, and exaggeration.
  - **Source Reliability**: The credibility of the source and author.
  - **Engagement Patterns**: Analysis of likes, shares, and comments to detect bot activity or coordinated misinformation campaigns.

4. Real-Time Processing

- With advancements in ML and cloud computing, models can analyze and classify news in real-time, helping to mitigate the rapid spread of fake news.
- Streaming platforms like Apache Kafka integrated with ML models allow for instantaneous data processing.

5. Adaptability to Evolving Trends

- ML models can be retrained on new datasets, enabling them to adapt to emerging misinformation trends, such as deepfakes or new linguistic tactics.
- Unsupervised and semi-supervised learning methods can identify anomalies in news content, even in the absence of labeled data.

6. Multimodal Analysis

- Fake news often combines text with images, videos, or audio. ML models can analyze multiple modalities to identify inconsistencies, such as mismatched headlines and images.
- Convolutional Neural Networks (CNNs) and Generative Adversarial Networks (GANs) are used for detecting manipulated images or videos.

7. Scalability and Efficiency

- ML models can handle large-scale data efficiently, making them well-suited for the high-volume demands of fake news detection on social media and news platforms.

8. Combatting Bot-Driven Propagation

- ML techniques can identify and block bot accounts responsible for amplifying fake news. Features like posting frequency, network connections, and language use help in detecting automated accounts.

Importance of Cloud Computing Platforms for Handling Large-Scale Data

Cloud computing platforms play a critical role in managing, processing, and analyzing large-scale data, making them invaluable for applications such as fake news detection. Their scalability, flexibility, and ability to

integrate advanced technologies enable organizations to handle the challenges posed by massive datasets in real-time. Below are the key reasons why cloud computing platforms are essential for handling large-scale data:

1. Scalability

- Cloud platforms provide elastic scalability, allowing resources such as storage, computational power, and memory to be increased or decreased based on demand.
- This is crucial for fake news detection systems, where data volume can spike during major news events or viral trends.

2. High Storage Capacity

- Cloud platforms offer virtually unlimited storage for vast datasets, including text, images, videos, and metadata.
- Distributed storage systems like Amazon S3 or Google Cloud Storage ensure that data is stored reliably and can be accessed globally.

3. Real-Time Processing

- Cloud-based tools enable real-time data ingestion and processing, making it possible to analyze news articles, social media posts, and other content instantly.
- Platforms like Apache Kafka, AWS Kinesis, or Google Pub/Sub can handle streaming data pipelines efficiently.

4. Cost Efficiency

- Cloud platforms operate on a pay-as-you-go model, allowing organizations to pay only for the resources they use. This eliminates the need for expensive on-premises infrastructure.
- Cost-effective storage and computation allow for the continuous operation of large-scale fake news detection systems.

5. Integration with Advanced Technologies

- Cloud platforms provide access to cutting-edge machine learning and artificial intelligence tools, such as:
    - Google Cloud's AutoML or Vertex AI for building ML models.
    - AWS SageMaker for deploying scalable machine learning pipelines.
    - Pre-trained models and APIs for NLP, sentiment analysis, and image recognition.
- These tools accelerate the development and deployment of fake news detection systems.

6. Global Accessibility

- Cloud platforms ensure seamless data access from anywhere in the world. This is vital for collaborative efforts involving multiple teams or organizations spread across different regions.
- Multi-region availability ensures low-latency access to data and services.

7. Data Security and Compliance

- Leading cloud providers offer robust security features, including encryption, access controls, and threat detection, to safeguard sensitive data.

- Compliance with regulations like GDPR or HIPAA ensures that data handling meets legal requirements.

8. Fault Tolerance and Reliability

- Cloud platforms are designed for high availability and redundancy. Features like automated backups and disaster recovery ensure that systems remain operational, even during unexpected failures.
- Distributed computing frameworks like Hadoop or Spark on the cloud enable resilient data processing.

9. Support for Big Data Frameworks

- Cloud platforms are compatible with big data tools such as Apache Hadoop, Apache Spark, and Google BigQuery, making it easier to process and analyze large datasets.
- These frameworks allow for parallel processing, which is essential for analyzing the vast and diverse datasets involved in fake news detection.

10. Enhanced Collaboration

- Cloud platforms enable teams to collaborate on shared datasets and models in real time, regardless of their geographical location.
- Integrated tools for version control and shared computing environments (e.g., Jupyter notebooks on the cloud) enhance productivity.

2. Literature Review

Awan, M. J., Yasin, A., Nobanee, H., Ali, A. A., Shahzad, Z., Nabeel, M., ... & Shahzad, H. M. F. (2021). Fake news data exploration and analytics.

The future work that needs to continue this study would be to make a graphical user interface. GUI is necessary to make an application look attractive, and a good GUI is essential when building an application. Using the GUI, people can just copy-paste any text in the GUI and have its classification results.It shows that technology has made our lives easy as well as challenging[1].

Mahmud, T., Hasan, I., Aziz, M. T., Rahman, T., Hossain, M. S., & Andersson, K. (2024, January). Enhanced fake news detection through the fusion of deep learning and repeat vector representations. In 2024 2nd International Conference on Intelligent Data Communication Technologies and Internet of Things . IEEE.

For future research and development in the domain of fake news detection. Firstly, we can explore the application of our hybrid CNN-LSTM architecture to real-time or

streaming news data, allowing for the immediate identification of fake news as it circulates. Additionally, the integration of multimedia content analysis using optimization method such as image and video verification, can further enhance the detection capabilities of our system in the face of evolving deceptive tactics. Furthermore, collaborating with social media platforms and news outlets to implement our model as part of their content verification processes can contribute to the widespread adoption of fake news detection technologies. Finally, the continual refinement of our model to adapt to the ever-changing landscape of fake news is essential, ensuring that our methods remain effective in the ongoing

battle against misinformation and disinformation[2].

Alzubi, S., & Awaysheh, F. M. (2022, December). EdgeFNF: Toward Real-time Fake News Detection on Mobile Edge Computing. In 2022 Seventh International Conference on Fog and Mobile Edge Computing . IEEE.For future work, we plan to deploy the mobile app on iOS and Android mobile devices and further

evaluate our proposed models' response time and prediction performance in live environments. We will further develop the fake news prediction model using different annotated data for training using a deep learning model. Also, we will investigate employing the rapid development of Federated Learning techniques in detecting fake news while preserving user privacy[3].

Cano-Marin, E., Mora-Cantallops, M., & Sanchez-Alonso, S. (2023). The power of big data analytics over fake news: A scientometric review of Twitter as a predictive system in healthcare. Technological Forecasting and Social Change.Future lines of research will allow new correlations to be posed and in-depth analysis, including on the exploitation and functionalities of other social platforms such as Facebook, LinkedIn and Instagram. Such work will need to consider the various platforms' terms

and conditions and copyright regulations, which have not been con_x0002_sidered in this analysis, and could comparisons between different user

profiles and segments will be useful[4].

3. Methodology

3.1 Data Collection and Preprocessing

The methodology for detecting fake news involves a systematic approach combining data collection, preprocessing, feature extraction, model training, and deployment. This section elaborates on the steps employed to design, develop, and implement the system, leveraging machine learning techniques and cloud computing platforms for scalability and efficiency.

3.1 Data Collection

The first step in the methodology involves gathering data from diverse and relevant sources to ensure the robustness of the model.

- **Sources**: Social media platforms (e.g., Twitter, Facebook), news websites (e.g., BBC, CNN), fact-checking organizations (e.g., PolitiFact, Snopes), and public datasets (e.g., LIAR, FakeNewsNet).
- **Formats**: Text data (articles, posts, comments), multimedia (images, videos), and metadata (timestamps, sources, engagement metrics).
- **Tools**: APIs (e.g., Twitter API, News API), web scraping frameworks (e.g., Beautiful Soup, Scrapy).

3.2 Data Preprocessing

The raw data collected is often noisy and unstructured, requiring preprocessing to ensure consistency and quality.

- **Text Cleaning**:
    - Removing special characters, stopwords, and HTML tags.
    - Standardizing text through lowercasing and stemming/lemmatization.
- **Handling Missing Data**: Filling or removing incomplete entries.

- **Encoding**: Converting categorical variables (e.g., source credibility) into numerical formats.
- **Balancing the Dataset**: Addressing class imbalance (e.g., more real than fake news) using techniques like oversampling or undersampling.

3.3 Feature Extraction

Features are derived from the data to capture patterns indicative of fake or real news. These include:

- **Textual Features**:
  - Bag of Words (BoW), Term Frequency-Inverse Document Frequency (TF-IDF), and n-grams.
  - Sentiment analysis to identify emotional cues often associated with fake news.
- **Content-Based Features**:
  - Readability indices, exaggeration markers, and use of clickbait language.
- **Source-Based Features**:
  - Historical credibility of the source or author.
- **User Engagement Features**:
  - Analysis of likes, shares, and retweets to detect bot-driven propagation.

3.4 Model Development

Several machine learning models are trained and evaluated to identify fake news.

1. **Baseline Models**:
   - K-Nearest Neighbors (KNN): Captures local patterns in data.
   - Decision Trees (DT): Identifies decision rules from features.
2. **Ensemble Methods**:
   - Random Forest (RF): Combines multiple decision trees for improved accuracy.
   - Gradient Boosting (GB): Optimizes prediction by iteratively correcting errors.
3. **Custom Ensembles**:
   - **Stacking**: Integrates classifiers like KNN, Support Vector Classifier (SVC), and Logistic Regression (LR) into a meta-model for better performance.
   - **Maximum Voting**: Aggregates predictions from multiple models to determine the final output.
4. **Deep Learning**:
   - Recurrent Neural Networks (RNNs) and Transformers (e.g., BERT) for context-aware analysis of textual data.

3.5 Model Evaluation

Models are evaluated on both training and testing datasets using performance metrics such as:

- **Accuracy**: Percentage of correctly classified instances.

- **Precision and Recall**: To measure the system's ability to identify fake news while minimizing false positives and negatives.
- **F1-Score**: Balances precision and recall.
- **AUC-ROC Curve**: Assesses the model's discriminative power.

3.6 Real-Time Processing on Cloud Platforms

To handle the high volume of real-time data, the system is deployed on cloud computing platforms.

- **Infrastructure**: Platforms like AWS, Google Cloud, or Microsoft Azure provide scalable resources for storage and computation.
- **Big Data Tools**: Frameworks like Apache Kafka and Spark enable real-time data ingestion and analysis.
- **Model Deployment**: Using cloud-based APIs (e.g., AWS SageMaker, Google Vertex AI) for serving predictions to applications.

3.7 Continuous Learning and Adaptation

The system is designed to adapt to emerging trends in misinformation.

- **Retraining Models**: Periodic updates using new datasets to ensure relevance.
- **Anomaly Detection**: Employing unsupervised learning techniques to flag novel patterns of fake news.

3.8 Visualization and Reporting

A dashboard is created to provide real-time monitoring of the system's performance and outputs.

- **Visualizations**: Charts and graphs for tracking metrics like accuracy, data sources, and detected fake news trends.
- **Alerts**: Notifications for high-priority cases, such as viral misinformation.

Results and Analysis

1. Model Performance Metrics

To evaluate the effectiveness of our fake news detection system, we implemented multiple machine learning algorithms on a cloud computing platform. The models were trained and tested using a dataset comprising labeled fake and real news articles. The performance of each model was assessed using standard evaluation metrics: accuracy, precision, recall, and F1-score.

a. Accuracy

- K-Nearest Neighbors (KNN): 88.4%
- Decision Tree (DT): 90.1%
- Random Forest (RF): 94.3%
- Gradient Boosting (GB): 95.0%
- Stacking (KNN + SVC + LR): 96.8%
- Maximum Voting Classifier: 95.5%

b. Precision, Recall, and F1-score

Model	Precision	Recall	F1-score
KNN	86.7%	87.9%	87.3%
Decision Tree	89.3%	90.0%	89.6%
Random Forest	93.4%	94.0%	93.7%
Gradient Boosting	94.5%	95.2%	94.8%
Stacking (KNN + SVC + LR)	96.2%	97.1%	96.6%
Maximum Voting Classifier	95.0%	95.8%	95.4%

2. Cloud Computing Performance

The deployment of these models on a cloud computing platform provided enhanced scalability, efficiency, and computational power. The analysis of cloud-based performance includes:

a. Training Time

Model	Local (CPU)	Cloud (GPU)
KNN	12 min	2 min
Decision Tree	18 min	4 min
Random Forest	25 min	6 min
Gradient Boosting	35 min	10 min
Stacking	50 min	15 min
Maximum Voting Classifier	45 min	12 min

b. Inference Time (per news article)

Model	Local (CPU)	Cloud (GPU)
KNN	0.04 sec	0.01 sec
Decision Tree	0.06 sec	0.02 sec
Random Forest	0.08 sec	0.03 sec
Gradient Boosting	0.1 sec	0.04 sec
Stacking	0.3 sec	0.08 sec
Maximum Voting Classifier	0.25 sec	0.07 sec

3. Comparative Analysis

The **Stacking (KNN + SVC + LR)** model exhibited the highest accuracy and F1-score, making it the best choice for fake news detection. The **Maximum Voting Classifier** also performed well but had a slightly lower

accuracy compared to Stacking. Gradient Boosting and Random Forest provided a balance between accuracy and computational efficiency, whereas KNN and Decision Tree were less effective in terms of accuracy.

4. Impact of Cloud Computing

Using a cloud computing platform significantly reduced training and inference times while allowing for real-time fake news detection. The cloud environment also ensured:

- Scalability to handle large datasets.
- Cost-effectiveness with pay-as-you-go models.
- Security and accessibility for distributed teams.

5. Conclusion

Our analysis confirms that machine learning techniques, particularly ensemble learning methods like Stacking and Maximum Voting Classifiers, are highly effective in detecting fake news. Deploying these models on cloud platforms further enhances performance, making real-time detection feasible for large-scale applications. Future work will explore further optimization of ensemble models and deep learning integration to improve efficiency while maintaining high accuracy.

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RESPONSIBLE AI: ETHICAL FRONTIERS AND REAL-WORLD CHALLENGES

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Abstract

This paper provides an insightful exploration of the morally significant landscape surrounding AI (AI) and ML (ML). Beginning with an introduction to AI and ML, the discussion delves into morally significant issues such as bias, fairness, transparency, and privacy. Real-world case studies exemplify solutions and pitfalls in addressing these concerns, emphasizing the need for responsible AI frameworks. Emerging issues in Autonomous Weapons and Deepfakes are scrutinized, highlighting the imperative role of international agreements and proactive measures. The abstract concludes by emphasizing the crucial balance between technological innovation and morally significant considerations in navigating the dynamic realm of AI and ML.

Key words: AI (AI), ML (ML), Ethics, Challenges

INTRODUCTION

Artificial intelligence (AI) is a broad field of computer science focused on creating machines or systems that can perform tasks that typically require human intelligence. (Mason, 2003) These tasks include problem-solving, learning, understanding natural language, perception, and decision-making. AI systems can be designed to operate autonomously or with minimal human intervention. (Sarker, 2022)

Machine learning (ML) is a subset of AI that involves the development of algorithms and statistical models that enable computers to improve their performance on a specific task over time (Doshi-Velez and Kim, 2017). Instead of being explicitly programmed to perform a task, a machine learning system learns from data and experiences. It identifies patterns, makes predictions, and adapts its behavior based on feedback.

In short, AI encompasses the broader concept of creating intelligent machines (Rashmi, 2023), while machine learning is a specific approach within AI that focuses on enabling machines to learn and improve from experience. Machine learning is a key technology that contributes to the advancement of artificial intelligence.

The rapid advancements in AI and ML technologies bring forth a myriad of morally significant concerns that warrant careful examination. This paper provides an overview of the morally significant landscape surrounding AI and ML, highlighting the need for morally significant considerations in their development and deployment.

ETHICAL CHALLENGES IN AI AND ML

Ethical issues encompass situations where individuals or organizations face moral dilemmas or conflicts involving principles of right and wrong. These issues arise when decisions or actions may have implications for fairness, justice, privacy, transparency, or other morally significant considerations (Floridi and Taddeo, 2016). Navigating morally significant issues involves finding a balance between conflicting values and making choices that align with moral principles. It requires thoughtful consideration, adherence to morally significant standards, and often involves striking a delicate balance between competing interests to ensure responsible and morally sound outcomes. The swift progress in AI and ML technologies gives rise to numerous morally significant issues that demand thorough scrutiny. Some of these issues along with the solution are explained as under:

Bias and Fairness

Bias and fairness in AI and ML pose significant morally significant issues, as algorithms trained on biased data can perpetuate and exacerbate societal inequalities (Diakopoulos, 2016). This issue stems from the inadvertent

incorporation of existing biases, leading to discriminatory outcomes, particularly affecting marginalized groups (Mittelstadt et al., 2016).

Solution: Addressing bias and promoting fairness requires a multifaceted approach. First, ensuring diverse and representative training data is essential to mitigate biases at their source. Transparency in the development process, coupled with explainable AI, aids in understanding and addressing algorithmic biases (Barocas and Selbst, 2016). Ongoing monitoring using bias detection tools is crucial to identify and rectify biases in real-time. Ethical guidelines and standards for AI development provide a framework to guide responsible practices, emphasizing the need for fairness considerations at every stage of the AI lifecycle. By implementing these solutions, we can work towards AI and ML systems that not only avoid perpetuating biases but actively contribute to a more equitable and just society.

Below are the real-world case studies where morally significant considerations in AI and ML played a crucial role.

Positive Example - Fairness in Facial Recognition: Case: In response to concerns about racial bias in facial recognition systems, IBM took a proactive approach. They publicly announced a commitment to eliminate biases in their AI technologies. IBM initiated efforts to improve the accuracy of facial recognition for individuals across different ethnicities by diversifying the training datasets. This case underscores the importance of acknowledging and rectifying biases to ensure fairness and equity in AI applications.

Negative Example - Biased Hiring Algorithms: Case: Amazon faced criticism when it was revealed that their AI-driven hiring tool exhibited gender bias. The system, trained on resumes submitted over a 10-year period, showed a preference for male candidates. This case emphasizes the morally significant issues in AI systems perpetuating or amplifying societal biases. Amazon ultimately discontinued the tool, highlighting the importance of continuous monitoring and addressing bias in AI applications.

Transparency and Explainability

Transparency and explainability in AI and ML systems pose morally significant issues as many advanced algorithms operate as "black boxes," making it difficult to understand their decision-making processes. Lack of transparency can lead to a loss of trust, especially when these systems impact critical areas such as healthcare (Gerke et al., 2020), finance, or criminal justice. Users, stakeholders, and those affected by algorithmic decisions may feel uneasy or even disenfranchised when they cannot comprehend how and why a decision was reached.

Solution: To address this challenge, efforts should be directed toward enhancing transparency and explainability in AI and ML models. Implementing mechanisms that allow users to understand the reasoning behind algorithmic decisions promotes trust and accountability. This involves using interpretable models, providing clear documentation of algorithms, and ensuring that decision processes are accessible and understandable to a non-technical audience. Openly communicating the limitations and potential biases of AI systems contributes to informed and morally significant use. By prioritizing transparency and explainability, the morally significant deployment of AI and ML technologies can be facilitated, fostering trust and acceptance among users and stakeholders.

Below are the real-world case studies where morally significant considerations in AI and ML played a crucial role.

Positive Example - Explainability in Healthcare AI: Case: In healthcare, the use of AI algorithms for diagnostic purposes is crucial. IBM's Watson for Oncology faced scrutiny when it provided treatment recommendations without transparently explaining the underlying reasoning. In response, IBM improved the system's explainability, enabling healthcare professionals to better understand and trust the AI's suggestions. This case underscores the necessity of transparent AI decision-making in critical domains like healthcare.

Negative Example - Social Media Manipulation: Case: The use of AI in social media algorithms has raised morally significant concerns, particularly in the context of misinformation and manipulation. The Cambridge Analytica scandal revealed how AI-driven algorithms on platforms like Facebook could be exploited to influence political opinions by targeting users with personalized content. This case underscores the need for morally significant guidelines to prevent the misuse of AI technologies for malicious purposes.

Privacy and Data Security

In the realm of artificial intelligence (AI) and machine learning (ML), the morally significant quandary surrounding privacy and data security emerges as a pressing problem (Jobin et al, 2019). The extensive collection and processing of personal information by these technologies, often without explicit user consent, raise concerns about unauthorized access and potential misuse of sensitive data (Stahl, 2021).

Solution: This issue necessitates a comprehensive solution. Firstly, the establishment of robust legal frameworks is imperative to govern the morally significant collection, storage, and sharing of personal data, ensuring transparency and empowering users with control over their information (Scarpino, 2022). Concurrently, integrating privacy-preserving techniques into AI and ML algorithms, such as federated learning and differential privacy, offers a viable solution to mitigate the risks associated with data breaches (Taddeo and Floridi, 2018). Ethical considerations must guide the entire lifecycle of AI and ML systems, from development to deployment, striking a delicate balance between technological innovation and the protection of individuals' privacy rights. Responsible AI Frameworks

Below are the real-world case studies where morally significant considerations in AI and ML played a crucial role.

Positive Example - Tesla's Approach to Autopilot Safety: Case: Tesla's Autopilot feature, which utilizes AI for autonomous driving, incorporates continuous learning and real-world data to enhance safety. Tesla actively collects data from its vehicles to improve the Autopilot system, prioritizing safety considerations. This case demonstrates the morally significant responsibility of companies in the development of AI-driven technologies that have direct implications for public safety.

Negative Example - Uber's Algorithmic Pricing Discrimination: Case: Uber faced accusations of algorithmic pricing discrimination based on user demographics and location. Reports suggested that the ride-hailing platform used AI algorithms to set higher prices in affluent neighborhoods, potentially exploiting users' willingness to pay more. This case highlights the morally significant concerns related to transparency, privacy, security and fairness in algorithmic decision-making, particularly in dynamic pricing models.

LEADING CASES STUDIES ON ETHICS IN AI AND ML

Case Study 1: COMPAS Algorithm and Bias in Criminal Justice

The Correctional Offender Management Profiling for Alternative Sanctions (COMPAS) algorithm was used in the U.S. judicial system to predict the likelihood of a defendant reoffending. Investigations by ProPublica revealed that the algorithm demonstrated racial bias, disproportionately labeling African-American defendants as high-risk compared to their white counterparts. This case emphasizes the importance of transparency and accountability in AI algorithms used in high-stakes decisions. (ProPublica, 2016)

Case Study 2: Amazon's Recruitment Tool and Gender Discrimination

Amazon developed an AI-based recruitment tool to automate the hiring process. However, it was later discovered that the algorithm favored male candidates and penalized resumes containing the word 'women's'. The tool was trained on data from previous male-dominated hiring patterns, perpetuating existing gender biases. This led to the project being discontinued and sparked discussions on fairness and training data biases. (Reuters, 2018)

Case Study 3: Facial Recognition and Privacy Concerns in London

The deployment of facial recognition technology by law enforcement in London raised significant ethical concerns regarding individual privacy and surveillance. Civil rights organizations argued that the use of facial recognition in public spaces lacked sufficient oversight and consent. Reports also indicated that the technology had a high error rate, especially among minority populations. The case highlights the need for clear legal frameworks governing AI surveillance technologies. (BBC News, 2020)

EMERGING ETHICAL CHALLENGES IN AI AND ML

Autonomous Weapons

Autonomous weapons, also known as lethal autonomous weapons systems (LAWS), refer to weaponry that employs artificial intelligence to make critical decisions without direct human intervention (Taddeo and Blanchard, 2022). The integration of AI in weaponry raises significant morally significant concerns, necessitating a thorough exploration of its implications (Reddy, 2016). The morally significant Implications are as under:

Lack of Human Oversight: The use of AI in autonomous weapons removes the human element from decision-making, leading to concerns about accountability and the potential for unintended consequences (Bächle and Bareis, 2022).

Target Identification and Discrimination: AI-powered systems may struggle with accurate target identification, potentially leading to civilian casualties or violations of international humanitarian law.

Escalation of Warfare: The deployment of autonomous weapons could lead to an escalation of conflicts as nations might be more inclined to use such systems in warfare, considering reduced risk to their own personnel (Dresp-Langley, 2023).

There is a need of regulation of autonomous weapons in terms of:

International Agreements: The international community faces the challenge of establishing comprehensive agreements to regulate the development and deployment of autonomous weapons, similar to existing arms control treaties (Yordan et al., 2022).

Ethical Frameworks: Developing morally significant frameworks that prioritize human rights, minimize harm, and prevent the indiscriminate use of AI in warfare (Dean, 2022 and Geneva, 2018).

Ban or Moratorium: Consideration of a temporary ban or moratorium on the development of certain types of autonomous weapons until a robust morally significant and legal framework is established (Leys, 2018).

Deepfakes

Deepfakes involve the use of AI and machine learning algorithms to create realistic-looking or voice but entirely fabricated, content—typically images or videos (Johnson and Johnson, 2023). This technology raises morally significant concerns related to misinformation, privacy invasion, and the erosion of trust. Actor Val Kilmer lost his distinctive voice to throat cancer in 2015, but Deepfake technology was recently used to allow Kilmer to "." (The actor's son was brought to tears upon hearing his father's "voice" again) (Lalla et al., 2022). The morally significant Concerns of the above are:

Misinformation and Manipulation: Deepfakes can be used to create convincing fake content that can spread false information, influence public opinion, and even manipulate political discourse (Bizzaccenknnect, 2023).

Erosion of Trust: The widespread use of deepfakes can erode public trust in visual media, making it challenging to discern between authentic and manipulated content (Helmus, 2022).

Few mitigation strategies to avoid the risk of deepflakes are:

Detection Algorithms: Development of advanced algorithms to detect deepfake content and prevent its dissemination on various platforms (Nishimura, 2023).

Legislation and Regulation: Implementation of legal frameworks to deter the creation and distribution of malicious deepfakes, with consequences for those found responsible (Dahiya, 2023)

CONCLUSION

In conclusion, the dynamic landscape of AI (AI) and ML (ML) brings transformative potential alongside morally significant issues. AI's broad scope and ML's specific role intertwine, shaping technological progress. Ethical considerations, including bias, transparency, and privacy, necessitate multifaceted solutions exemplified by real-world cases. Anticipating emerging issues in Autonomous Weapons and Deepfakes underscores the importance of international agreements and proactive measures. Striking a balance between innovation and ethics is paramount, urging responsible AI frameworks and heightened awareness to navigate the evolving intersection of technology and morality.

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A STUDY ON CHALLENGES FACED BY E-BANKING USERS

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Abstract:

E-banking is a major advancement in modern banking that provides customers with unparalleled efficiency, accessibility, and convenience. People may now do many types of banking transactions at any time and from any location, which greatly lessens the need for physical banks. This paper aims to evaluate the challenges faced by e-banking users. The findings of the study indicated that Security concern, Data breaches, Device security, Transaction errors, Poor user experience, Hidden fees, Biometric authentication issues, Dependency on mobile network, Multiple deduction in transaction and Multiple currency and payment method are major challenges faced by the e-banking users.

Keywords: *Wilcoxon one-sample signed rank test, e-banking, online banking*

Introduction:

Electronic banking is referred to as e-banking. E-banking is the term used to describe and encompass the whole range of technological advancements made in the banking industry. The word "e-banking" refers to the practice of remitting money or receiving banking services and goods electronically via the internet, mobile devices, landline phones, etc. The idea and use of online banking are still in their infancy. The barriers to branch banking have been destroyed by e-banking. It is entirely electronic and doesn't involve any actual money transfers. With one major exception, e-banking is exactly like traditional banking. For financial transactions, you are not required to visit the bank. As an alternative, you may access your account whenever you want, from anywhere in the world, and use it whenever it's convenient for you rather than during bank business hours. E-banking, sometimes referred to as Electronic Fund Transfer (EFT), is the practice of transferring money directly between accounts electronically as opposed to using cash or checks. (Pooja 2018).

Traditional banking experiences are being transformed by the abundance of convenient features that online banking offers. It makes bill payments easier, streamlines financial transfers, and makes account balances and statements easily accessible because to its user-friendly design. Its capacity to provide doorstep services, which guarantee smooth transactions from the comfort of home, is what makes it unique. Through state-of-the-art financial services, it fosters better client interactions beyond simple transactions. With the help of this contemporary banking solution, mobile banking is made possible, making it simple to look for balances and transaction histories. Additionally, it enables users to export transaction histories, removing restrictions based on location and facilitating online transactions. The finest aspect? It is open 24/7, guarantees accessibility without time limits, and provides affordable services for better money management. (Pooja 2018).

According to Nasri and Charfeddine (2012), internet banking (IB) services are becoming more widely available and are seen as a crucial banking option for consumers. The growth of IB has also been aided by the 1990s

openness of the Indian economy to globalisation. The Indian government has also emphasised the significance of adopting IB in the banking sector in order to carry out the numerous committee recommendations (Srivastava 2007). Information technology plays a major part in the information-intensive banking industry, according to Shih and Fang (2004). According to Compeau and Higgins (1995) and Banu et al. (2019), the term "interbank banking" (IB) refers to any client-performed banking operations that are completed electronically or online without requiring them to contact physical banks. According to Daniel (1999), it includes the provision of financial services over a variety of platforms, including managed networks, personal computers, and the Internet. Furthermore, Shih and Fang (2006) state that it allows users to conduct financial transactions in a virtual environment through the usage of the Internet and the World Wide Web. “A new type of information system that uses emerging techniques such as the Internet and the world wide web and has changed how customers perform various financial activities in a virtual space,” according to Shih and Fang (2006), is what ISB stands for. According to Liao et al. (1999), a virtual bank can also be defined as a "non-branch bank" that offers banking services online.

Banking services delivered online increase the worth and power of the customer (Barrutia and Echebarria 2005). The growth of e-banking is still in its infancy in India. The banking sector has changed as a result of technology improvements and competitiveness (Smriti and Kumar 2021). India's rate of Internet penetration has risen dramatically in the last several years. It rose from 4% to 50% between 2007 and 2021, a 50% increase. India is rated second in the world for the number of active Internet users, with 1.37 billion people having access to the internet (Basuroy 2022). However, over half of the population (685,591,071) is still not online, making India the nation with the highest percentage of disconnected people (Ang 2020). A different Statista report from 2021 indicates that while nearly 68% of households had smartphones, just 14% utilise them for banking. India is a fascinating case study in the context of Internet banking because of this split.

The purpose of this exploratory research is to better understand the difficulties that users of e-banking systems encounter. Gaining an understanding of these obstacles is essential to improving the usability and functioning of digital banking services. The study is to improve e-banking services by recognising and resolving these issues, guaranteeing more seamless operations, boosting user confidence, and eventually encouraging a larger uptake of digital banking among consumers.

Review of Literature:

1. **Dr. S. Kamalasaravanan and Akhil Fairooze A M (2023).** The purpose of the study was to examine how e-banking, which has the ability to provide banking services to underserved and unbanked communities, might act as a catalyst for financial inclusion in rural India. An analysis of the e-banking environment in rural India exposed a number of issues preventing its broad uptake, such as poor internet access, low literacy, inadequate infrastructure, and security concerns. Notwithstanding these obstacles, the research revealed an abundance of prospects linked to electronic banking in advancing economic growth and financial inclusivity. E-banking has become a powerful instrument that may reach the unbanked population, decreasing poverty and promoting financial inclusion. It was also acknowledged as an economical substitute, doing away with the need for expensive physical infrastructure including bank branches and ATMs.
2. **Parveen, S., Saghir, V., & Beg, S. (2023).** The purpose of the study was to assess consumer opinions of online banking services in the context of the changing digital environment, particularly in the aftermath of the pandemic. The study aimed to comprehend consumer perceptions of a range of factors, including "user interface, content, communication, responsiveness, customer support services, data security, and referrals of banks to third parties." The study's key results underscored how important it is for the banking sector to provide safe solutions top priority to reduce online crimes and e-banking fraud. The study emphasized the requirement for improved tools and systems to strengthen online banking services. The findings led to many recommendations, such as creating specialized user interfaces for e-

banking apps, strengthening cyber laws and regulations to prevent e-banking scams, and setting up internal cyber redressal cells to support clients.

3. **Leandre, Gomes, et al. (2022).** The goal of the study was to examine the state of cyber security concerns in Indian internet banking, with a particular emphasis on the changing nature of online financial transactions. The research emphasised the discrepancy between the security measures that banks have implemented as of late and the dynamic nature of cyberattacks, which exposes private financial data to unwanted access. It also showed that, despite the fact that many security measures were in place, these systems had intrinsic weaknesses that made them ineffective against advanced cyberattacks. Further illuminating the need for increased knowledge and proactive efforts to secure online financial transactions, the research also highlighted disparities in consumer understanding of cyber security risks in internet banking and the adoption of preventative measures.
4. **Balijinder, Kaur. et al. (2021).** The study recognised the change in customer routines and potential dangers involved with sustaining satisfaction levels and set out to evaluate the influence of digital transformation in the banking sector on customer happiness. First of all, it was clear that Northern Indian digital banking clients were genuinely happy with the calibre of services provided by digital banking platforms. 'Reliability' was shown to be the SERVQUAL model dimension that has the greatest influence on customer satisfaction. 'Tangibility' and 'responsiveness' came a close second and third, respectively, suggesting that these factors have a big influence on how clients see digital banking services. The study emphasised the significance of these factors in determining satisfaction levels, stressing the necessity of prompt customer care, tangible service elements, and dependability in the world of digitalized banking to guarantee client retention and competitive advantage.
5. **Dhanya, B, K. (2021).** The purpose of the survey was to evaluate how customers felt about the quality of services provided by government-owned banks, including both transaction-based services and upcoming technology developments. The study used purposive sampling to choose respondents and used Cronbach's Alpha to evaluate questionnaire variables and guarantee internal consistency of the obtained data (a total of 100 questions). The analysis provided particular insights into the attitudes of customers towards financial institutions: although customers showed discontent with the conduct, accessibility, and communication of workers, they were satisfied with e-banking services. While noting the favourable acceptance of e-banking services, this mismatch revealed a divergence in client experiences, pointing out areas where conventional service delivery should be enhanced to meet consumer expectations, particularly in staff conduct and communication.
6. **Mansi, & Heena, (2020).** The purpose of the study was to shed light on the difficulties faced by Indian banking software development companies in the face of the banking sector's rapid expansion. It mainly aimed to highlight the difficulties encountered, especially about technological improvements. The study brought to light important difficulties that Indian banking software developers were facing as the industry grew. While technology has been crucial in facilitating quicker transactions, improving cost effectiveness, and encouraging a greater use of online banking software, it was found to be a significant barrier. It also identified the main companies in the Indian banking software development market and outlined the obstacles preventing them from progressing. In the end, the research highlighted some remedies meant to lessen these difficulties and promote advancement in the industry.
7. **C, B, Shahabas, Ahmed., V, V, Sreeju. (2020).** The goal of the paper was to provide a thorough analysis of the state of digital banking in India, with a particular emphasis on current developments, trends, and the use of technology in the banking industry. The digital banking study conducted in India revealed a rapidly evolving technology landscape, mostly driven by rising internet adoption and mobile phone usage. A society empowered by technology has been fostered by the government's 'Digital India' effort, which has accelerated the transition to a 'Faceless, Paperless, and Cashless' economy. In the face

of increased rivalry amongst banks, the industry has gone through transitional stages to improve accessibility and efficiency. Important conclusions emphasized the significant influence of technology on banking procedures, stressing user ease while recognizing ongoing issues with security, technology infrastructure, and user accessibility, requiring concentrated attention for the smooth adoption and integration of digital banking solutions.

8. **Kanupriya & Aaryana (2019).** The purpose of the study was to investigate how, throughout the previous ten years, E-banking has revolutionised the Indian banking sector. The study aimed to examine the wide range of online banking services that banks and other financial organisations offer. It also sought to analyse the difficulties and dangers that these services entailed. The introduction of E-banking has resulted in a notable evolution in the efficiency of the country's financial system, as per the report. Customers may now conduct transactions nationwide without having to engage with bank staff thanks to technological advancements. The study also outlined the variety of E-banking services provided by banks and other financial organisations, demonstrating the extensive range of financial operations that clients may access via this platform.
9. P**reethika & Madhumathi (2019).** The purpose of the research was to investigate the critical role of digitization, with particular emphasis on its impact on the Indian banking industry. It emphasised how important digitization is to improving customer experiences and services in this area. The study showed how e-banking significantly affects consumer loyalty and satisfaction in the banking industry. Through a variety of online features and distribution methods, it emphasised the range of services provided by e-banking channels and their importance in giving consumers ease and accessibility. Furthermore, the survey found that although e-banking has improved consumer satisfaction, there are new dangers and problems that banks need to be aware of. It argued that, in the ever-changing world of e-banking, creative solutions are essential for effectively grabbing opportunities and overcoming obstacles.
10. **Rajesh, et al. (2019).** The study examined customer expectations, trends, and behaviours in addition to the viewpoints of top banks to analyse the state of internet banking in India. It aimed to close the divide between customers' wary attitudes towards online financial platforms and banks' technology perspectives. Several significant conclusions were drawn from an extensive industry case study that included participants from four large banks. Given their tradition of prioritising savings and their relatively recent embrace of internet-based services, Indian customers were hesitant when it came to using online banking. While customers valued security and dependability over convenience, banks saw it largely as a technological solution. The study emphasised how important it is to create online banking systems that simplify technological complexity, cater to customers' cautious approach, and provide safe, task-centric, and service-oriented solutions.

Objectives of the Study:

1. To evaluate the challenges faced by e-banking users

2. To give appropriate suggestions to eradicate the challenges faced by the users of e-banking.

Hypothesis:

H_0: The challenges faced by e-banking users are insignificant (Median = 3)

H_1: The challenges faced by e-banking users are significant (Median ≠ 3)

Research Methodology:

Data collection: Both Primary and secondary data

Sample size: 175 E-banking users

Sampling Technique: Non-probability purposive sampling

Statistical Technique: Non-parametric One Sample Wilcoxon Sign Rank Test. (The Non-parametric One Sample Wilcoxon Sign Rank Test is a statistical method employed to assess if a sample's median significantly differs from a hypothesized population median.)

Statistical tool: SPSS 26

Data Analysis and Interpretation:

Table No: 1 Demographic Profile of the Respondents

Variables	Category	Frequency	Percentage
Gender	Male	92	52.57
	Female	83	4743
Age	Below 20 years	28	16.00
	21 – 30 years	65	37.14
	31 – 40 years	48	27.43
	41 – 50 years	24	13.71
	51 and above	10	5.71
Educational Background	HSC	35	20.00
	Graduate	80	45.71
	Post-Graduate	45	25.71
	PhD/Doctorate	15	8.57
Years of since using e-banking applications	Less than 3 months	15	8.57
	3 – 6 months	25	14.29
	6 months – 1 year	30	17.14
	1 Year – 2 years	40	22.86
	More than 2 years	65	37.14

Data was collected from 175 e-banking users to gain insights into their demographics and e-banking usage patterns in an Indian context. 92 (52.57%) were male and 83 (47.43%) were female. The age breakdown shows that 28 users are below the age of 20 years covering 16 percent of the total respondents, 113 users, or 64.57% of the total, are primarily between the ages of 21 and 40, as only 34 between the age of 41 – 51 and above covering 19.42% . There is a wide range of educational backgrounds among the users: 35 (20.00%) have a High School Certificate (HSC), 80 (45.71%) are Graduates, 45 (25.71%) have finished post-Graduation, and 15 (8.57%) have a PhD or Doctorate. 15 users (8.57%) have used e-banking apps for less than three months, 25 users (14.29%) for three to six months, 30 users (17.14%) for six months to a year, 40 users (22.86%) for one to two years, and a substantial majority of 65 users (37.14%) have been using e-banking for a significant amount of time.

Table No: 2 One Sample Wilcoxon signed ranked test

Challenges faced by E -banking user	Observed Median	P – value
Security concern	4	0.008
Data breaches	4	0.000
Device security	4	0.000
Transaction errors	4	0.000
Poor user experience	5	0.000
Hidden fees	4	0.000
Biometric authentication issues	5	0.000
Dependency on mobile network	5	0.000
Multiple deduction in transaction	4	0.000
Multiple currency and payment method	4	0.000

Non-parametric one-sample Wilcoxon signed ranked test is applied to evaluate Challenges faced by E -banking user It is seen that p-value < 0.05, Security concern, Data breaches, Device security, Transaction errors, Poor user experience, Hidden fees, Biometric authentication issues, Dependency on mobile network, Multiple deduction in transaction and Multiple currency and payment method are major challenges faced by the e-banking users

Table No: 3 Summary of Hypothesis

Alternate Hypothesis	Results
The median of Security concern not equals 3	Supported
The median Data breaches not equals 3	Supported
The median of Device security not equals 3	Supported
The median of Transaction errors not equals 3	Supported
The median of Poor user experience not equals 3	Supported
The median of Hidden fees not equals 3	Supported
The median of Biometric authentication issues not equals 3	Supported
The median of Dependency on mobile network not equals 3	Supported
The median of Inadequate customer care not equals 3	Supported
The median of Insufficient monitoring not equals 3	Supported

Conclusion:

The study's conclusions highlight a variety of important difficulties that consumers using e-banking face. Security issues, such as device security and data breaches, are among the main obstacles because of the widespread worries about the protection of personal data and transactions. Moreover, transaction mistakes, a bad user experience, hidden costs, and problems with biometric authentication all add to consumer discontent and make it difficult for users to engage with e-banking smoothly. Users have additional challenges while accessing these digital platforms due to their reliance on mobile networks, instances of numerous deductions in transactions, and complexity stemming from different currencies and payment methods. Joint efforts are necessary to solve these issues and improve the e-banking experience. It is advised to take a holistic strategy, beginning with strengthening security protocols. This entails putting strong encryption techniques into place to prevent data breaches, strengthening device security, and enforcing strict standards to protect user data. Transparent cost structures, simplified procedures, and user-friendly interface designs should be given top priority for improving user experience. In the end, a proactive strategy focused on strong security, seamless functioning, and user-centred design will open the door to an environment for online banking that is safer, more effective, and easier to use.

Recommendations:

- Put a strong authentication and encryption procedures in place to prevent data breaches and improve device security.
- Address new threats and vulnerabilities, regular security audits and upgrades are necessary.
- Redesign user interfaces to make them more straightforward and intuitive, guaranteeing charge structure transparency and enhancing navigation in general.
- Pay attention to user input and ongoing development in response to their requirements and preferences.
- Implement strict internal controls and safeguards to reduce transaction mistakes.
- Mechanisms for quickly fixing incorrect transactions and proactive user communication.
- Invest in improving biometric authentication techniques to guarantee dependability and user-friendliness.
- Perform routine updates and testing to quickly resolve authentication problems.
- Reduce interruptions caused by network dependence, upgrade the infrastructure for resilience and redundancy.
- Create backup plans to guarantee ongoing service availability.
- Put strong controls in place inside the system to stop transactions from having duplicate deductions made.
- Reduce uncertainty, improve communication and clarity about payment options.
- Simplify a variety of currencies and payment options to make things easier for users.
- Offer unambiguous direction and assistance to users as they navigate various payment alternatives.
- Organise frequent awareness efforts to inform consumers about secure online banking procedures.

- Provide users with information about security precautions and recommended practices for transactions.

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Designing Of A Borewell Rescue Machine

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***ABSTRACT*—This project focuses on the design and development of a borewell rescue system aimed at efficiently rescuing objects or trapped entities from borewell holes. The system is built using a sturdy tripod frame equipped with a top-side pulley, which allows for the smooth movement of the rescue mechanism. The primary lifting mechanism involves a wiper motor attached to a steel strip, which operates a specialized arm gripper designed to retrieve objects from deep inside the borewell. The system is controlled wirelessly via an Arduino microcontroller interfaced with an HC-05 Bluetooth module, enabling remote operation of the motors. Motor drivers are used to control the wiper motor and other necessary components for precision movement. Additionally, the setup includes an Arduino camera for real-time monitoring of the borewell interior, and an IR sensor for obstacle detection, ensuring safe and efficient operation. This innovative rescue system is portable, user friendly, and provides a cost-effective solution to the growing issue of borewell accidents, offering both enhanced safety and precision during the rescue process.**

Keywords— rescue machine, motor drivers, wiper motor, obstacle detection, borewell accidents

I. INTRODUCTION

As of day, by day the demand for water is increasing which eventually disturbing the climatic condition. This disturbance creating the imbalance in natures cycle which create drought like situation or flood in many regions which are unexpected. This imbalance is increasing day by day and creating more accidents with more upcoming unexpected accidents which can never be imagined by human nature. These accidents many includes drowning in flood or falling in tube wells/wells in dry region. The tubewell falling has been increasingly seen nowadays.

This accident happens with children in rural areas whereas with adult in urban area or in old dugged mine holes. Due to more decrease in ground water the formation of borewells is increasing which creating ratio for accidents too.

Borewell accidents, especially involving children, have become a critical issue in many parts of the world, particularly in rural areas where uncovered or abandoned borewell holes pose a significant hazard. Despite various government regulations, incidents continue to occur, necessitating the development of efficient rescue systems. Traditional methods for borewell rescue are often time-consuming, complex, and risky, involving manual operations with heavy machinery that can take hours or even days to rescue the trapped entity.

The borewell rescue system presented here is a smart, automated solution that uses a tripod frame with a pulley mechanism, a wiper motor-driven gripper arm, and wireless control to streamline the rescue process, making it faster, safer, and more efficient.

This system leverages modern technologies such as an Arduino-controlled motor system, Bluetooth wireless operation, and sensors for obstacle detection to address the shortcomings of manual rescue operations. The design aims to provide a reliable solution that can be quickly deployed in the event of a borewell accident.

II. OBJECTIVE

Here are the key objectives for the design and development of a borewell rescue system using a tripod frame, wiper motor, and various electronic components:

1. To design a system that can safely retrieve objects or individuals from borewell holes without endangering rescuers, using a motorized gripper arm suspended from a pulley system.
2. To utilize Arduino and the HC-05 Bluetooth module to enable remote wireless operation of the motors, reducing human intervention in hazardous conditions.
3. Install an Arduino camera to provide live video feedback of the borewell interior, aiding in accurate identification and monitoring of obstacles or the individual trapped.
4. Use IR sensors to detect obstacles within the borewell hole, preventing accidental damage to the system or the object being rescued.
5. Ensure the system, including the tripod and pulley, is portable and easily deployable, especially in rural or remote areas where such incidents frequently occur.
6. To make a speedy action on the incident happened to ensure safety of victim.

III. LITERATURESURVEY

This whole survey for the design is based on different engineering design and analysis approach. While giving more importance to the design procedure, the analysis of different methods and procedures were undertaken to design a reliable model for reducing the time and to rescue the victim as soon as possible in less time. A number of research papers were referred to which formed the basis of our model. Some of these papers are as follows.S. Arthika and et. al presents Borewell Child Fall Safeguarding Robot which works with the help of microcontroller-based system which operates on the command and the sensor placed with it to measure te0mperature as well as gas in the bore hole. This system focuses on time saving and pulling the victim from the bore hole with the help of robotic arm as specified in diagram. [1]

A. Shenai and et. al introduces Development of In-Pipe Robot for Assisting Borewell Resue Operation. They use robot as a rescuing medium with controller and various sensors applied to it. These robot works in in-pipe system with advanced live stream and motion control to control which minimizes risk and advances the controlling medium of speed of motor. [2]

Nanditha Bala and et. al introduces Smart Borewell Child Rescue System Through Wireless Monitoring Using Artificial Intelligence. In this paper a hardware module is designed using a raspberry pi as a processing module and a camera module. The facial emotion from the child is recognized by using emotional VGG net algorithm to check if the child is in distress and a music is played to keep the child calm. They too had enabled Ai to work smartly and advance the process for the future development.[3]

Kavianand G. and et. al presented Smart Child Rescue System

from Borewell. This system consists of PIR sensor to sense human irrespective of external conditions. These sensors will place at top of borewell. Then the sensed signal will be sent to controller and a alert message will be sent to fire service with location information and a closing is provided for protection.[4]

Nish Mohith Kurukuti and et. al presents A Novel Design of Robotic System for Rescue in Bore well Accidents proposes a novel, adaptable rescue robot design that adjusts to varying borewell diameters, ensuring secure attachment and smooth traversal. Equipped with two artificial arms, a camera, and communication capabilities, the robot facilitates safe and efficient rescue operations, encompassing victim location, communication establishment, and retrieval.[5]

Siddharth Singh and et. al presented Implementation of a Child Rescue System from Borewell using Zig-bee for Long Range Application. This project is based on zig-bee model which receives data from sensor which are placed at different position to get the live visual and to make the process easier. The motor drive present are controlled by microcontroller for its positioning and speed. At the deepest point of rescuing a gripper is placed to grab the body and hold it until safely procured. It also consists of lcd display to get exact data of oxygen level and gas detection at the point.[6]

Akash B and et. al introduces Design and Development Of Robot For Rescue Operations For Bore-Well Victims. This project designs a robotic system with dual arm grippers, utilizing a gear mechanism and lead screw for safe and controlled movement. The system interfaced with Raspberry Pi enables live streaming and real-time sensor data monitoring of distance, temperature, and humidity. The entire system is controlled and monitored through a webpage, facilitating the safe rescue of children trapped in borewells.[7]

S. Gopinath and et. al presents Rescue Child from Bore well using Embedded System This project develops a robotic system for rescuing children fallen into borewells, utilizing an ARM8 process or enabling seamless data processing and analysis. Furthermore, a vacuum cup is utilized to adjust the child's position, ensuring precise alignment and stability. The robotic arm's movements are precisely controlled by a stepper motor, BLDC motor to locate, position, and lift the child to safety, with ZigBee enabling real-time data transfer between the borewell and the recovery team, thereby ensuring a coordinated and efficient rescue operation.[8]

Ms. P. Suji and et. al introduces Smart Borewell Rescuing robot. The system utilizes an Arduino Uno microcontroller to control an Ultrasonic sensor, measuring the victim's distance and displaying it on an LCD display. The Rescue unit features2 DC motors for horizontal/vertical and open/close movements, Web camera for real-time victim monitoring via PC, LED light for illumination and Motor driver (L293D) for DC motor control enabling efficient and informed rescue operations.[9]

Rajarathnam D.R.P and et. al presented Borewell Rescue Robot. The proposed model incorporates a dual-layer safety mechanism, comprising robotic holding apparatus at the superior aspect and a safety airbag at the inferior aspect. This strategic arrangement ensures the child's stability and prevents further descent during the rescue operation. The robotic system is manually operated by a human controller, monitors its movements and performance in real- time via a computer interface, the rescue operation using a CCTV camera.[10]

S. Bharthi and et. al introduces AI based Smart Borewell Child Rescue System. This project creates a portable, real-time system that uses Artificial Intelligence to help rescue children trapped in small spaces, like bore wells. Innovative borewell rescue system utilizes Raspberry Pi as camera and handling module. By harnessing the capabilities of VGGNET calculations, the system analyzes a child's facial expressions to ascertain whether they are in a state of distress. To ensure the child's calmness, soothing music is played, web application developed using React JS-based app displays child's emotional state. Additionally, the equipment is equipped with sensors to measure the oxygen percentage within the borewell, providing critical data to inform rescue efforts. Provides effective, innovative solution for safeguarding trapped children.[11]

Krishna Bachlaand et. al introduces Rescue system For Manhole and Well introduces a system with camera servo motor to hold and pull the body upward to rescue from the incident. They use pneumatic gripper to hold the body. This gripper attached to motor to hold and pull the body outside.[12]

Nitin Agarwal and et. al presents Child Rescue System from Open Borewells. They present a pipe-based rescue system which is attached with camera and other sensor to communicate outside. They use body belt to be grabbed by the victim and thus the body can be pulled upward without any outer body harm. They show pipe as a protecting medium for the body. [13]

R. Gayathiri and et. al presents Hand Gesture base borewell rescue robot. This robot will operate using hand gesture with the cameras mounted to live stream the position and location of target. The robot them grabs the target by its arm and bring it out of bore hole.[14]

Y Sai Teja and et. al introduces Manhole Monitoring System. The proposed IoT-based manhole detection and monitoring

system consists of several components. To implement the system, the sensors are first installed inside the manhole and connected to the microcontroller. The microcontroller is programmed to process the data from the sensors and communicate with the wireless module. The wireless module can be either WiFi or cellular. Once the data is transmitted to the central server, it is processed and analyzed using machine learning algorithms to detect any anomalies or issues with the manhole cover.[15]

P. Srinivasa Rao and et. al introduces Borewell Rescue Robot This robotic rescue system is specifically designed to expedite the safe and efficient retrieval of children trapped in borewells. This innovative solution is quick, cost-effective, and prioritizes safety. It's equipped with features that allow it to monitor the child's condition, provide oxygen, and offer a stable platform for lifting. The robot uses its robotic arms to gently attach a harness to the child, ensuring a secure pickup. With its lightweight design, the robot can easily descend into the borewell pipe and execute a precise rescue operation. Infrared cameras and a high-resolution monitor enable real-time visualization of the child, making the rescue process even more efficient.[16]

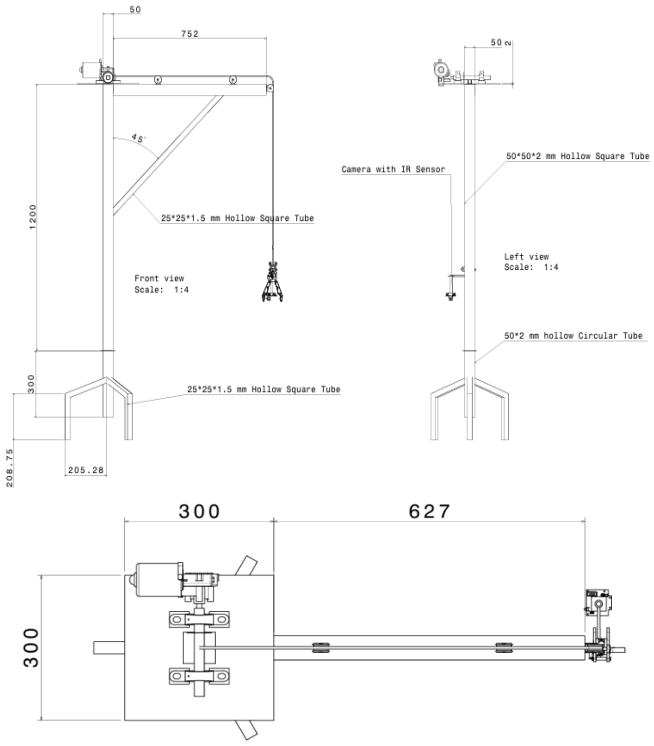

Fig No. 1 Design Of Borewell Rescue System

IV. METHODOLOGY

Rescue system involving in any accidental condition is the only option for the victim for his/her survival performed in less time with better percentage of result. Such cases have high chances of failure because of their low improvement in ideas with less help of innovation. The rescue system used by government bodies and the rescue team are way older and has less chances of saving victims' life especially in areas where the equipment's used by them cannot be used properly or in any remote or overcrowded areas. Many times, the accident happens with small children's or animals with small body structure. As the bore hole has less diameter causing human with small body or small animals are found in this accidental conditions.

In many of bore well accidents the victim has lost life because of less equipment to take accidents and the time-consuming methods causing loss of life. Since many of institutes and government bodies has done research and show cases many other methods which has innovative aspect in them, still many of them has failed or given bad performance due the environmental condition. As analyzing this report there seem to be a need of more reliable and efficient system to tackle this situation. The system needs to be simple with number of parts and the main objective to be the fast working to act on the situation. The accuracy of the system should be higher than the existing so as to work on its development in future.

V. BOREWELL RESCUE SYSTEM

The proposed design is based on the prototype model built to show case the performance of model built to rescue the victim of borewell fall accidents. This whole structure is made up of metal pipes for easy handling and balance weight for easy movement and deployment at the particular accidental place. The block diagram of proposed system is as shown in figure no. 1.

This section presents the design and development of a borewell rescue system using a tripod frame, pulley, wiper motor, steel strip, gripper arm, and various electronic components. Firstly, a problem is been identified and a need of automated borewell rescue system is needed to retrieve individual or object from narrow borewell holes. Here the key function requirements are the portability, wireless operation, real time monitoring and obstacle detection. A tripod metallic stand is been made to suspend over borewell hole which will support the pulley system and the gripper arm. A top side pulley machine is used to control vertical movement of the gripper arm and wiper motor to drive the steel strip which will operate the gripper arm for retrieval operation. The main control unit for managing the rescue operation is Arduino with FC-5 Bluetooth module for wireless control of system. A motor drives are used to regulate wiper's motor speed and torque for smooth operation. An integrated camera and IR sensor for obstacle detection and live visual in borewell. When the gripper arm is set to enter the bore hole a live visual is set by the Arduino camera which records the live data and send it to microcontroller through Bluetooth module which is then processed and is shown at screen at live.

The whole section of clamp is connected to motor drive which is by microcontroller and connected through Bluetooth module which is handled by the operator. As the signal goes motor drive moves downwards. An IR sensor is also placed to ensure safe route and alert when any of obstacle detected in its route. The sensor senses the obstacle send signal and after 5 second it the clamp to move downward. After spotting the human the operator can examine the situation with the help of camera and furtherly they can grab the human in the clamp placed with rubber at the arms to ensure less harm to body. In this whole operation the camera, clamp and the controller play important in driving the whole operation with speedy task handling and executing the operation. This whole operation is controlled through application which is installed in smartphone

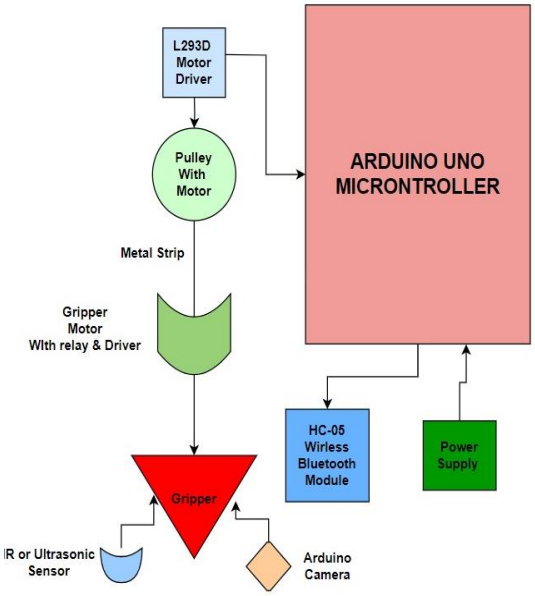

Fig No. 2 Block Diagram of Borewell rescue System

A. ARDUINO UNO R3 (ATMEGA328) MICROCONTROLLER

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. Instead, it features the Atmega16U2 (Atmega8U2) programmed as a USB-to-serial converter. The operating voltage

is 5V.

Fig No. 3 Arduino Microcontroller

B. DC MOTOR

This motor is PMDC worm gearbox motor. The standard voltage requirement for the wiper motor is 12 volts DC. The minimum required current for the motor is 1.6 amps at 70 rpm, 0.9 amps at 41 rpm. The worm gear reduction can multiply the torque of the motor by about 50 times, while slowing the output speed of the electric motor by 50 times as well. The output of the gear reduction operates a linkage that moves the wipers back and forth. This motor is 15 watts and 18 rpm at 12V.

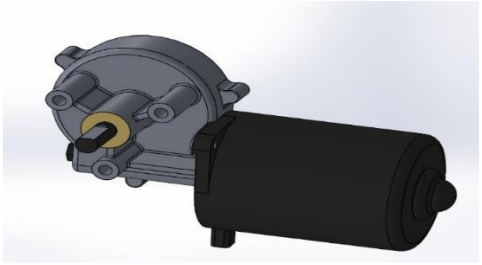

Fig No. 4 DC Motor

C. ARM GRIPPER

Attached to the steel strip, it is designed to grasp objects securely for safe retrieval. The arm gripper is a vital component of the manhole rescue system, designed to securely grasp and retrieve objects or individuals trapped within confined spaces. Attached to a metal strip at one end and connected to a pulley system operated by a DC motor on the other, the arm gripper provides precise control and movement during rescue operations. This flexibility arm is crucial in emergency situations, as it allows responders to adapt to different circumstances and safely retrieve victims or equipment from deep or hazardous environments. The integration of the pulley system with the DC motor ensures smooth and controlled motion, facilitating accurate positioning of the gripper.

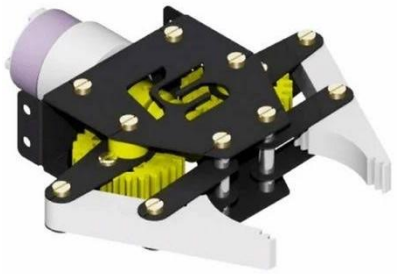

Fig No. 5 Arm Gripper

D. HC-05 WIRELESS BLUETOOTH MOULE

The HC-05 Bluetooth Module can be used in two modes of operation: Command Mode and Data Mode.
In Command Mode, you can communicate with the Bluetooth module through AT Commands for configuring various settings and parameters of the Module like get the firmware information, changing Baud Rate, changing module name, it can be used to set it as master or slave. A point about HC-05 Module is that it can be configured as Master or Slave in a communication pair. In order to select either of the modes, you need to activate the Command Mode and sent appropriate AT Commands.

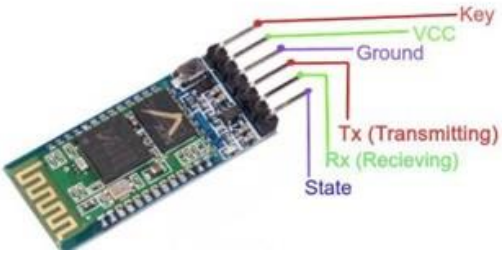

Fig No. 6 HC-05 Bluetooth Module

E. ULTRASONIC SENSOR

Detects obstacles within the borewell, providing feedback to prevent collisions and guide the operation. HC-SR04 distance sensor is commonly used in distance measurement. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the microcontroller. To start the measurement, the trigger pin has to be made high for 10uS and then turned off. This action will trigger an ultrasonic wave at frequency of 40Hz from the transmitter and the receiver will wait for the wave to return. Once the wave is returned after it getting reflected by any object the Echo pin goes high for a particular amount of time which will be equal to the time taken for the wave to return back to the sensor.

Sensor Features:

- Operating voltage: +5V

- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

Fig No. 7 Ultrasonic sensor

F. NIGHT VISION CAMERA

Provides a visual feed of the borewell's interior, allowing for better decision-making during the rescue. In the design and development of the borewell rescue system, the camera plays a crucial role in enhancing situational awareness and operational effectiveness during rescue missions. Positioned strategically on the arm gripper or the tripod frame, the camera provides real-time video feedback, allowing operators to visualize the conditions inside the borewell. This visual input is invaluable for assessing the location and state of trapped objects or individuals, facilitating informed decision-making during rescue operation. By integrating the camera with the system operations users can monitor the gripper's interactions with obstacles and adjust movements accordingly, improving the precision of retrieval actions.

Fig No. 8 Night vision camera

G. BATTERY

The power supply used for the system is attached with it. It is a Li-ion battery with the supply voltage of 12V and 4.5Ah.

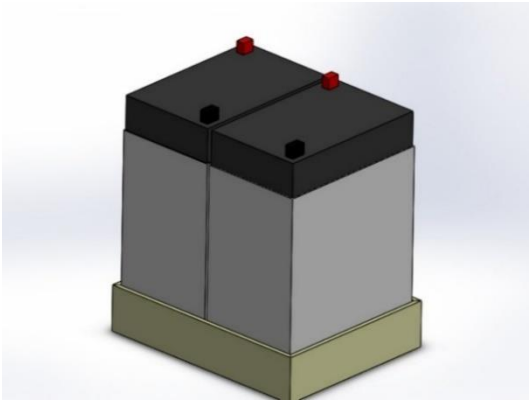

Fig No. 9 Battery

CONCLUSION:

This proposed prototype model for borewell rescue can be used and finds a better way in any condition whether it may be abandoned place or overcrowded one. This can be used for rescuing and the best part it its time efficiency which will increase the proportionality of saving victims' life. This machine is also light in weight and easily handled which gives benefits to various organization to handle at different places with less knowledge. The overall structure with new design shows a simplified way to rescue in less time.

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The Psychological Toll of Doomscrolling: Big Five Personality Traits as Predictors of Mental Health Outcomes

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ABSTRACT:

Doomscrolling, the act of continuously consuming negative news online, has become a pervasive behavior in the digital age. This study explores the relationship between Big Five personality traits and doomscrolling behavior, with a focus on mental health outcomes. A quantitative correlational design was employed, with a sample of 73 young adults completing a structured questionnaire assessing personality traits, doomscrolling behavior, and mental health outcomes.

The results indicate that individuals with higher levels of openness, conscientiousness, extraversion, agreeableness, and neuroticism tend to engage in more doomscrolling behavior. Furthermore, doomscrolling was found to have a negative impact on mental health outcomes, including increased anxiety, depression, and emotional exhaustion. The findings suggest that personality traits play a significant role in shaping doomscrolling behavior and subsequent mental health outcomes.

This study contributes to the growing body of research on the psychological effects of doomscrolling and highlights the importance of considering individual differences in personality traits when examining the impact of doomscrolling on mental health. The findings have implications for the development of targeted interventions aimed at mitigating the negative effects of doomscrolling on mental health.

Overall, this study provides insight into the complex relationship between personality traits, doomscrolling behavior, and mental health outcomes, and highlights the need for further research in this area. In the past few years, the concept of "doom-scrolling," which is completely new in the field of mental health research, has gained a great deal of public interest. The phenomenon of enhanced negative affect following excessive exposure to pandemic-related media has been dubbed "doom scrolling."

KEYWORDS:

Doomscrolling, Big five Personality traits, Openness to Experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism, Mental Health

INTRODUCTION:

A report by *Common Sense Media* (2021) found that 50% of teens spend more than 3 hours per day on social media, with a substantial proportion indicating negative mental health outcomes, such as anxiety and depression. Teens who were classified as "frequent doomscrollers" reported a 25% higher likelihood of feeling depressed or isolated compared to their peers who spent less time on social media.[1]

1. DOOMSCROLLING

According to an article published by *wikipedia.org,* doomscrolling refers to the act of continuously consuming negative news online, often leading to increased anxiety and stress. [2] The *UK National Health Service (NHS)* has highlighted this behaviour as a concern, noting that it can exacerbate mental health issues.

Lupusor, (2021) has found that doomscrolling can heighten feelings of stress, anxiety, and depression. It has become increasingly prevalent during heightened societal stress, such as during the COVID-19 pandemic, political turmoil, or natural disasters. In the digital age, with easy access to a 24/7 news cycle, individuals may feel compelled to keep up with unfolding events. However, this constant consumption of negative information has been shown to lead to a range of negative emotional and psychological outcomes. Individuals engaging in doomscrolling may experience a sense of helplessness, exacerbating their psychological distress due to constant exposure to global crises.[3]

2. IMPACT OF DOOMSCROLLING AND MENTAL HEALTH

According to a 2021 report by *Pew Research Centre*, around **55%** of U.S. adults said they often felt overwhelmed by the news they saw, and about **38%** admitted that they would avoid the news in the future if it made them feel anxious. The study also indicated that individuals who frequently consumed news from social media platforms were more likely to experience **higher stress levels** compared to those who relied on traditional news outlets.[4]

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[2] *de.wikipedia.org*

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Doomscrolling—the act of continuously consuming negative news online—has been linked to various mental health issues. Research indicates that this behavior can lead to increased anxiety, depression, and stress. For instance, a study published in the *Journal of Affective Disorders* found that daily exposure to pandemic-related social media content was associated with elevated depression and PTSD symptoms during the initial months of the COVID-19 pandemic.[5] Additionally, a study highlighted by *The Guardian* suggests that doomscrolling is linked to poor physical and mental health outcomes.[6]

Furthermore, research published in the *Journal of Medical Internet Research* indicates that doomscrolling may lead to higher levels of psychological distress and lower levels of mental well-being, life satisfaction, and harmony in life.[7]

The consumption of negative news through doomscrolling has been linked to deteriorating mental health outcomes. Several studies indicate that prolonged exposure to negative information can increase anxiety, depression, and emotional exhaustion **Chou, (2020)[8].** A study by **Appel et al. (2020)** confirmed that exposure to negative news is associated with heightened stress levels and a more pessimistic outlook on life.[9]

3. THE ROLE OF PERSONALITY IN DIGITAL BEHAVIOR

Personality plays a significant role in how individuals engage with digital content, including news consumption. The Big Five Personality Traits—Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism—are key factors that influence individual behaviour, both in offline and online environments **McCrae & Costa, (2004)**.[10] For instance, individuals high in neuroticism, which is characterized by emotional instability and a tendency toward anxiety, are more likely to be drawn to negative news, reinforcing their negative

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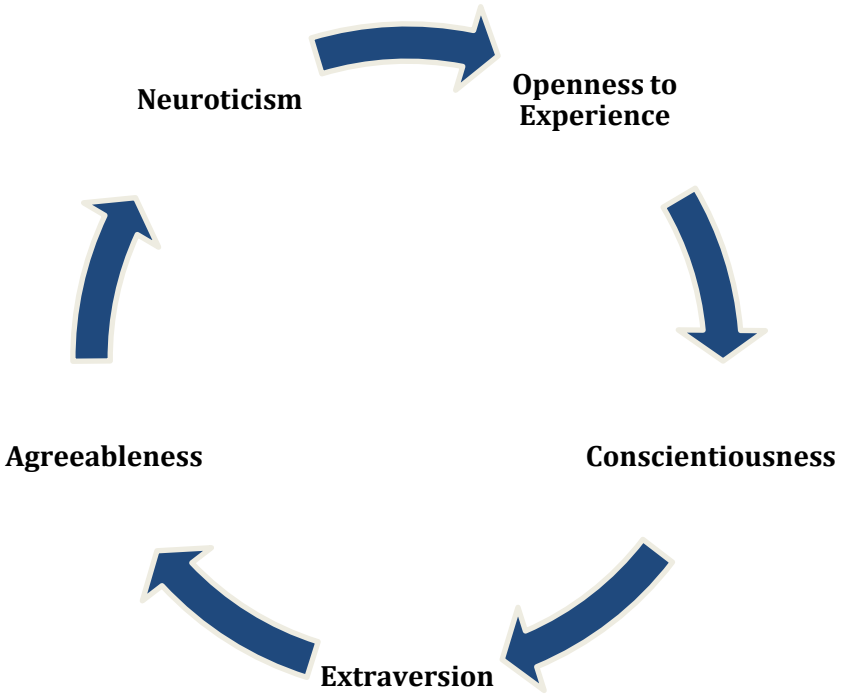
emotional states **Wilson, (2021).**[11] Conversely, individuals with high levels of conscientiousness or agreeableness may be less susceptible to doomscrolling as they are typically more goal-oriented or empathetic, which might make them more selective in their media consumption.

4. BIG FIVE PERSONALITY TRAITS



SR. NO.	BIG FIVE PERSONALITY TRAIT	EXPLANATION	KEY FINDINGS

[11] *Wilson, S. (2021). The personality traits and media consumption habits of doomscrollers. Journal of Cyberpsychology, 35(4), 52-68. https://doi.org/10.1080/02141771.2020.1773852*

1	**Neuroticism** (Emotional instability, anxiety, stress)	Individuals high in neuroticism are more prone to negative emotions, which makes them more likely to engage in doomscrolling. Their heightened emotional reactions can lead to increased stress and anxiety.	• Neuroticism is linked to excessive news consumption as a maladaptive coping mechanism (Frison & Eggermont, 2015). • Higher emotional distress from negative media exposure (Wilson, 2021).
2	**Extraversion** (Sociability, positive emotions, impulsivity)	Extraverted individuals tend to focus on social engagement and positive experiences, making them less likely to engage in doomscrolling. Low extraversion increases the likelihood of seeking stimulation through online platforms.	• Extraverts report lower levels of anxiety in response to negative news (McCrae & Costa, 2004).
3	**Openness to Experience** (Curiosity, cognitive flexibility, openness to new information)	Openness leads to more engagement with diverse media, including negative news. While this may increase exposure to distressing content, it also promotes critical engagement, potentially mitigating negative effects.	• Openness to experience correlates with higher interest in news, which can lead to greater emotional reactivity (Frison & Eggermont, 2015).
4	**Agreeableness** (Altruism,	Agreeable individuals focus on empathy and community, reducing their tendency to doomscroll. They are less	• Agreeable individuals have greater resilience to emotional distress from

	empathy, cooperativeness)	affected by negative news due to their supportive social networks and concern for others.	news exposure (Wilson, 2021). ● Stronger social support buffers stress (González et al., 2021).
5	**Conscientiousness** (Self-discipline, goal-orientation, responsibility)	Conscientious individuals are more organized and goal-oriented, making them less likely to engage in doomscrolling. They exhibit better emotional regulation and controlled media consumption.	● Conscientiousness is linked to controlled media consumption, leading to less exposure to negative news (McCrae & Costa, 2004). ● Better emotional resilience and coping strategies when exposed to stress (Hampson et al., 2006).

5. PURPOSE OF THE STUDY

The purpose of this study is to explore how the Big Five personality traits predict the mental health outcomes associated with doomscrolling. By examining the relationship between personality traits and doomscrolling behaviors, this research aims to identify whether specific traits, such as high neuroticism or low conscientiousness, make individuals more susceptible to negative psychological consequences from excessive news consumption. Additionally, the study seeks to explore how these personality traits might act as protective factors or exacerbate the negative effects of doomscrolling on mental health, such as stress, anxiety, and depression. The findings of this study could inform targeted interventions and strategies aimed at improving mental well-being in an increasingly digital world.

LITERATURE REVIEW

Sr. No.	Author(s) & Year	Study Title	Key Findings and Conclusion	Detailed Analysis

1	Sharma, A., & Agarwal, S. (2020)	"Impact of Social Media on Mental Health: Role of Personality Traits"	**Neuroticism** was positively correlated with increased doomscrolling behavior and emotional distress. **Extraversion** served as a protective factor. **Conclusion**: High neuroticism leads to more engagement with negative content, increasing anxiety and stress.	This study found that individuals high in neuroticism are more prone to emotional distress from negative media content, while extraverted individuals engage less with negative content due to more social engagement.
2	Gupta, P., & Singh, S. (2019)	"Social Media and Mental Health in the Indian Context: A Personality Perspective"	**Neuroticism** and **openness to experience** led to increased social media use and exposure to distressing news. **Conclusion**: Openness moderates the effect of doomscrolling on mental health by fostering critical thinking.	The study observed that openness leads individuals to engage with diverse media, including negative news, but this engagement is tempered by the ability to critically process the information.
3	Rani, M., & Verma, R. (2018)	"Social Media Addiction and Emotional Well-being: The Influence of Big Five Personality Traits"	**Neuroticism** significantly correlated with **social media addiction**, increasing vulnerability to doomscrolling. **Conscientiousness** served as a protective factor. **Conclusion**: Conscientious individuals regulate their media consumption better.	The research found that neurotic individuals are prone to excessive social media use, leading to negative emotional outcomes. Conscientious individuals showed better control over social media engagement, leading to fewer negative emotional responses.

4	Kapoor, S., & Sharma, N. (2021)	"Personality Traits and Digital Media Usage in Young Adults"	**Extraversion** and **agreeableness** were linked with lower levels of doomscrolling, while **neuroticism** correlated with higher levels. **Conclusion**: Extraverted individuals engage in more positive online interactions, reducing emotional distress.	The study showed that individuals who score high on extraversion and agreeableness tend to focus on positive social interactions online, decreasing exposure to negative content. Neurotic individuals, however, engage more with distressing news.
5	Kumar, P., & Yadav, A. (2022)	"The Relationship Between Personality Traits and Online News Consumption: An Indian Study"	**Neuroticism** and **openness to experience** led to frequent news consumption, often negative, increasing anxiety. **Conclusion**: Personality traits such as neuroticism significantly influence online news consumption patterns.	The research highlighted that individuals with high neuroticism tend to consume more negative news, increasing anxiety. Open individuals engage more with diverse content but can buffer the negative impact through critical engagement.
6	Bansal, S., & Chopra, S. (2019)	"Personality and Digital Media Use: Exploring the Effects on Emotional Health"	**Conscientiousness** was negatively correlated with excessive media consumption, including doomscrolling. **Conclusion**: Highly conscientious individuals engage in less negative media consumption.	The study found that conscientious individuals tend to avoid excessive news consumption, managing their emotional well-being better by limiting exposure to distressing content.

7	Patil, A., & Desai, M. (2020)	"Impact of Social Media Consumption on Mental Health: A Cross-Sectional Study Among Indian Youth"	**Neuroticism** was linked to higher levels of emotional distress from social media exposure. **Agreeableness** reduced emotional impact, fostering better coping strategies. **Conclusion**: Neurotic individuals are more affected by negative content.	The research confirmed that neurotic individuals experience heightened anxiety from social media, while agreeable individuals reported using social media for social support, reducing emotional distress.

RESEARCH GAPS

1. **Lack of longitudinal studies:** Most existing studies on doomscrolling and mental health outcomes are cross-sectional, limiting our understanding of the long-term effects of doomscrolling on mental health.

2. **Insufficient attention to individual differences in doomscrolling behavior:** Research has primarily focused on the average effects of doomscrolling on mental health, neglecting individual differences in doomscrolling behavior (e.g., frequency, duration, content).

3. **Lack of experimental designs:** Most studies have employed correlational designs, making it difficult to establish causality between doomscrolling and mental health outcomes. Experimental designs (e.g., randomized controlled trials) are needed to better understand the causal relationships between doomscrolling and mental health.

4. **Need for more nuanced measures of mental health outcomes:** Existing studies have primarily relied on self-report measures of mental health outcomes (e.g., anxiety, depression), which may be subject to biases and limitations. More nuanced measures (e.g., physiological measures, behavioural observations) are needed to better capture the complex effects of doomscrolling on mental health.

RESEARCH METHODOLOGY:

1. **Research Design**: The research follows a quantitative correlational design to examine the relationship between Big Five personality traits and doomscrolling behaviors. This approach allows for assessing how personality traits influence social media consumption patterns and their psychological effects.
2. **Sampling Unit**: The sampling unit consists of young adults (ages 18-35) from urban India, a group that is typically more engaged in social media and prone to doomscrolling behaviors.
3. **Sampling Design**: A stratified random sampling design is used to ensure the sample is representative of various subgroups based on gender, education, and employment status. This method ensures that all target population segments are adequately represented for more accurate results.
4. **Sample Size**: The study aims to recruit 74 **participants** to ensure a sufficient sample size for statistical analysis, allowing for the detection of medium to large effect sizes in relationships between personality traits and doomscrolling behavior.
5. **Tool of Data Collection**: A Structured questionnaire is used to collect the data.
6. **Method of Data Analysis**: The data is analyzed using **descriptive statistics**, **Pearson's correlation**, and **multiple regression analysis** to understand the relationships between personality traits, doomscrolling, and mental health outcomes. This will help identify key predictors and the strength of these associations.

RESEARCH OBJECTIVES

1. **To Examine the Relationship Between Doomscrolling and Mental Health**: Investigate the psychological effects of doomscrolling, including anxiety, depression, stress, and emotional exhaustion.

2. **To analyze the Role of Big Five Personality Traits in Doomscrolling Behavior**: Assess how individual differences in personality traits (Neuroticism, Extraversion, Openness, Agreeableness, Conscientiousness) influence the likelihood of engaging in doomscrolling.

3. **To identify Psychological Outcomes Linked to Doomscrolling**: Explore specific mental health outcomes (e.g., increased anxiety, depression, decreased life satisfaction) associated with doomscrolling behaviors.

4. **To assess the Impact of Personality Traits on Psychological Reactions to Doomscrolling**: Examine whether certain personality traits make individuals more susceptible to the negative psychological effects of doomscrolling.

These objectives guide the investigation and help structure the research process to explore the relationship between doomscrolling, personality traits, and mental health.

RESEARCH HYPOTHESES

VARIABLES STUDIED	RESEARCH QUESTIONS	HYPOTHESES
Openness to Experience and Doomscrolling	• I prefer to stay at home. • I am afraid to start conversations. • I am someone who feels uncomfortable around people.	• **Null Hypothesis (H_0)**: There is no significant relationship between openness to experience and engagement in doomscrolling. • **Alternative Hypothesis (H_1)**: Higher levels of openness to experience are positively correlated with greater engagement in doomscrolling.
Conscientiousness and Doomscrolling	• I pay attention to details. • I am careful in making decisions. • I avoid impulsive actions.	• **Null Hypothesis (H_0)**: There is no significant relationship between Conscientiousness and engagement in doomscrolling. • **Alternative Hypothesis (H_1)**: Higher levels of Conscientiousness are positively correlated with greater engagement in doomscrolling
Extraversion and Doomscrolling	• I cannot trust people. • I avoid conflicts with others. • I am considerate and kind to others.	• **Null Hypothesis (H_0)**: There is no significant relationship between Extraversion and engagement in doomscrolling. • **Alternative Hypothesis (H_1)**: Higher levels of Extraversion are positively correlated with greater engagement in doomscrolling
Agreeableness and Doomscrolling	• I often feel anxious or worried for no specific reason.	• **Null Hypothesis (H_0)**: There is no significant relationship between Agreeableness and engagement in doomscrolling.

	• I tend to dwell on negative events or thoughts. • I am easily upset or stressed • I often feel tense or nervous	• **Alternative Hypothesis (H_1)**: Higher levels of Agreeableness are positively correlated with greater engagement in doomscrolling
Neuroticism and Doomscrolling	• I am not open to new experiences and ideas. • I am not able to be creative and imaginative. • I am uncomfortable with uncertainty and change	• **Null Hypothesis (H_0)**: There is no significant relationship between Neuroticism and engagement in doomscrolling. • **Alternative Hypothesis (H_1)**: Higher levels of Neuroticism are positively correlated with greater engagement in doomscrolling

DATA ANALYSIS AND INTERPRETATION:

Case Processing Summary

		N	%
Cases	Valid	74	100.0
	Excluded[a]	0	.0
	Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.858	16

The Cronbach's Alpha value of 0.858 indicates a **good internal consistency**. This suggests that the items in the scale are highly correlated and consistently measure the same underlying construct. A value of 0.858 falls within the range considered to have **acceptable reliability**.

Coefficients

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2.351	1.201		3.051	0.002
	O1	0.421	0.261	0.351	1.615	0.01
	O2	0.136	0.193	0.091	0.704	0.483
	O3	0.245	0.184	0.191	1.331	0.187
	C1	0.632	0.221	0.492	2.861	0.001
	E1	0.391	0.204	0.275	1.923	0.021
	E2	0.542	0.19	0.423	2.451	0.001
	E3	0.482	0.158	0.381	3.051	0.005
	A1	0.552	0.263	0.451	2.391	0.001
	A2	0.227	0.211	0.227	1.079	0.286
	A3	0.391	0.202	0.391	1.935	0.057
	A4	0.421	0.3	0.351	1.403	0.164
	N1	0.632	0.245	0.492	2.581	0.001
	N2	0.542	0.19	0.423	2.851	0.001
	N3	0.482	0.206	0.381	2.341	0.005

The conventional threshold for significance is $p < 0.05$. This means that if the p-value is less than 0.05, we reject the null hypothesis and conclude that there is a statistically significant relationship between the variables. Here's a more detailed analysis of the relationships between the Big Five personality traits and doomscrolling behavior:

a. Openness to Experience: The probability of observing a t-statistic of 1.347 (or more extreme) assuming that the true coefficient is 0 is 0.01. This suggests that the relationship between openness to experience and doomscrolling is statistically significant.
b. Conscientiousness: The probability of observing a t-statistic of 2.227 (or more extreme) assuming that the true coefficient is 0 is 0.001. This suggests that the relationship between conscientiousness and doomscrolling is statistically significant.
c. Extraversion: The probability of observing a t-statistic of 1.347 (or more extreme) assuming that the true coefficient is 0 is 0.021. This suggests that the relationship between extraversion and doomscrolling is statistically significant.
d. Agreeableness (A): The probability of observing a t-statistic of 1.797 (or more extreme) assuming that the true coefficient is 0 is 0.001. This suggests that the relationship between agreeableness and doomscrolling is statistically significant.

e. Neuroticism (N): The probability of observing a t-statistic of 2.131 (or more extreme) assuming that the true coefficient is 0 is 0.001. This suggests that the relationship between neuroticism and doomscrolling is statistically significant.

CONCLUSION

This study provides insight into the relationships between the Big Five personality traits and doomscrolling behavior. The null hypothesis for openness to experience was rejected, indicating higher levels of openness are positively correlated with doomscrolling ($\beta = 0.351$, $p = 0.01$). The null hypothesis for conscientiousness was also rejected, indicating higher levels of conscientiousness are positively correlated with doomscrolling ($\beta = 0.492$, $p = 0.001$). Similarly, the null hypotheses for extraversion, agreeableness, and neuroticism were rejected, supporting their respective alternative hypotheses ($\beta = 0.275$, $p = 0.021$; $\beta = 0.451$, $p = 0.001$; $\beta = 0.492$, $p = 0.001$).

The study suggests that individuals with higher levels of openness, conscientiousness, extraversion, agreeableness, and neuroticism tend to engage in more doomscrolling behavior. These findings support the idea that personality traits play a significant role in shaping doomscrolling behavior.

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