

Assessing the Impact of Generative Pre-Trained Transformers on AI Literacy and Public Awareness in India

Subhodeep Mukhopadhyay

Manipal GlobalNxt University, Kuala Lumpur, Malaysia

E-mail: subhodeepm.infinity@gmail.com

(Received 30 September 2024; Revised 11 October 2024, Accepted 28 October 2024; Available online 4 November 2024)

Abstract - Generative Pre-Trained Transformers (GPTs), a class of Artificial Intelligence (AI) models capable of producing human-like responses, have become widely adopted since their release. In India, this development raises questions about whether GPTs have influenced public awareness and interest in AI. Understanding this influence is crucial, particularly in the context of AI literacy. This study examines the impact of GPT adoption on creating increased awareness and public interest in AI in India. AI literacy is assessed using the four-factor framework proposed by Ng *et al.*, (2021): knowledge and understanding of AI, uses and applications, evaluation and creation of new solutions, and ethical considerations. Information-seeking behavior serves as the theoretical foundation for examining changes in public interest across these dimensions. Google search volumes from 2020 to 2024 are analyzed to measure public engagement, with data divided into two periods: 2.5 years prior to and 1.5 years following the initial public release of ChatGPT in November 2022. Welch's t-test is applied to assess changes in search volumes across these time periods. The results indicate a statistically significant increase in interest across all four aspects of AI literacy. The adoption of GPTs has significantly boosted public engagement with AI literacy in India, enhancing awareness and interest across all facets of AI knowledge and application.

Keywords: GPT Adoption, AI Literacy, Public Interest, Generative Pre-Trained Transformer (GPT), Information-Seeking Behavior

I. INTRODUCTION

The rapid advancement of artificial intelligence (AI) technologies is transforming societies worldwide in significant ways. AI has become omnipresent, with applications in diverse areas such as medical diagnostics, automated content creation, weather forecasting, e-commerce, education, and robotics. With the advent of generative pre-trained transformers (GPTs) - a specialized type of AI model capable of understanding and mimicking human language - AI is also making inroads into creative sectors like the arts, music, and entertainment, reshaping how individuals engage with culture and creativity.

GPTs, with their advanced natural language processing capabilities, have democratized access to AI, making sophisticated tools available for general use. The launch of ChatGPT in November 2022 is described as having "triggered an exponential surge" in the widespread popularity and adoption of generative AI (GAI) among the general public (Bengesi *et al.*, 2024).

There is a heightened public interest in AI concepts, tools, and policies as individuals engage more deeply with these technologies. AI tools and applications are no longer restricted to data scientists, domain specialists, and computer engineers; they are now deployed across industries, workplaces, academia, and governments. In industrial applications, GAIs offer "greater engagement, cooperation, and accessibility," as well as the ability to understand unstructured queries from non-specialist users and provide solutions, alternatives, and actionable advice (Baldassarre *et al.*, 2023).

In education and academia, generative AI (GAI) is being extensively used across fields such as computer science, communication studies, engineering, medical and nursing studies, and higher education. Its applications span a wide range of use cases, including classroom design and learning environments, assessment practices, personalized learning support, and intelligent tutoring (Bahroun *et al.*, 2023). GAI is also being employed by governments to further sociopolitical goals and national ambitions, and "it has become necessary for governments to develop national strategies for directing the ethical use of artificial intelligence to respect fundamental human values" (Alnahhas & Yousef, 2024, p. 618).

Consequently, there is a sustained surge of interest among the wider public - including students, office workers, government employees, and ordinary citizens - regarding AI technologies and their applications across various contexts and use cases. Given the increasing ubiquity of AI in diverse domains of human endeavor, AI literacy is emerging as an essential competency in contemporary society.

As a multidimensional construct, AI literacy encompasses technological, cognitive, ethical, and practical dimensions that empower individuals to navigate the complexities of AI-driven environments. It involves equipping individuals with the skills and knowledge to understand AI principles and capabilities, interact effectively with AI systems, and critically evaluate AI applications in a range of settings. This paper assesses AI proficiency using the four-aspect AI literacy framework proposed by Ng *et al.*, (2021): (1) knowledge and understanding, (2) use and application, (3) evaluation and creation, and (4) ethical issues.

The main focus of this study is to investigate whether the introduction and widespread use of Generative Pre-trained Transformers (GPTs) since late 2022 has led to increased public interest in becoming more knowledgeable about AI tools, concepts, policies, and ethical concerns. The study employs the information-seeking behavior model as its theoretical foundation to address this question.

We hypothesize that the advent and widespread adoption of GPTs, such as ChatGPT, Gemini (formerly Bard), and custom GPTs like Consensus and Canva, among others, have prompted the general public to seek information about various AI tools and AI in general. This is supported by the fact that, within a short time of their release, GPTs were used across diverse fields, including psychiatry, radiology, web application security, and education (Cheng *et al.*, 2023; Lecler *et al.*, 2023; Szabó & Bilicki, 2023; Imran & Almusharraf, 2024).

Notably, within six months, ChatGPT was employed in the cultural sector for “text processing tasks like paraphrasing and summarization and for monetizing hobbies and creative output” (Mukhopadhyay, 2023, p. 112). GPTs have seen extensive usage by both the general public and the research community (Ahmadi, 2023).

Some authors have even cited ChatGPT as an author, although this practice remains controversial and is subject to ongoing debate. The need to seek information about AI and specific AI tools has arisen for a variety of purposes, including general interest, monetization, academic pursuits, and research.

In this context, Google Trends data is used as an empirical measure to capture the degree of public interest in AI literacy over time. By analyzing search volumes from 2020 to 2024, we aim to identify changes in public engagement with AI-related topics, focusing on the four dimensions of AI literacy: (1) understanding AI principles, (2) uses and applications, (3) evaluation and creation of novel solutions using AI, and (4) ethical considerations associated with AI technologies. The results demonstrate a significant increase in search volumes across all four aspects of AI literacy since the release of ChatGPT.

II. LITERATURE REVIEW

A. Artificial Intelligence (AI) Literacy

Artificial intelligence (AI) literacy can be conceptualized as an evolution and extension of digital literacy, adapting to the complexities and demands of an increasingly AI-driven world. Digital literacy equips individuals with the skills needed to effectively find and consume digital content, use digital tools for creative expression and the development of novel concepts, and communicate and share such content (Tinmaz *et al.*, 2022; Agina-Obu & Okwu, 2023). AI literacy extends these capabilities by integrating AI technologies into these processes.

AI literacy refers to the knowledge and skills necessary to understand, interact with, and critically evaluate artificial intelligence technologies in order to enhance productivity and innovation. AI literacy goes beyond technical knowledge to include an understanding of the ethical, social, and practical aspects of AI’s application in various sectors. Evaluating AI’s ethical and social consequences is essential for addressing concerns related to bias, fairness, and inclusivity (Su & Zhong, 2022). According to Ng *et al.*, (2021), the four fundamental factors for nurturing AI literacy are:

1. *Know and Understand AI*: Involves learning fundamental and foundational AI concepts and skills without requiring prior expertise.
2. *Use and Apply AI*: Entails learning how to apply AI concepts across various domains and settings.
3. *Evaluate and Create AI*: Focuses on learning how to critically evaluate AI technologies and collaborate to create new AI solutions.
4. *AI Ethics*: Encompasses factors such as fairness, accountability, transparency, ethics, safety, and other related concepts.

Another study by Kong *et al.*, (2023) evaluates AI literacy in terms of three dimensions: teaching essential AI concepts, empowering participants regarding AI usage, and understanding the ethical implications of AI. For the present study, the four-aspect literacy framework proposed by Ng *et al.*, (2021) is used, as it is well-suited to our research goals.

B. Google Trends

Google Trends (GT) is an online tool that provides insights into the frequency of searches for specific terms and concepts by offering a normalized representation of search volumes. Google does not provide absolute search volumes; instead, the publicly available data represents search volumes over a specific period, adjusted to a scale of 0 to 100. A GT score of 100 indicates the maximum level of popularity observed within the specified timeframe, while a score of 50 signifies that the term was searched half as frequently as at its peak. GT data have been shown to be a reliable measure of information-seeking behavior across various issues, including public health, economics, and media studies (Dancy & Fariss, 2024).

GT is increasingly used by social science researchers as “a real-time monitoring tool or leading indicator of public opinion” (Lorenz *et al.*, 2022, p. 203). It has been employed to explain patterns of information-seeking behavior across various fields, from women’s health to international financial reporting (Dehkordy *et al.*, 2014; Zhang, 2023).

C. Information Seeking Behaviour

The field of information-seeking behavior has emerged as a multidisciplinary domain of inquiry, attracting sustained interest from a wide array of academic and professional

disciplines, including library science, information technology, communication, sociology, and psychology (Hussain & Ahmad, 2014). According to this model, individuals are driven to seek information when they perceive a significant gap in their existing knowledge base. By obtaining this knowledge, they move closer to achieving their desired objective (Case & Given, 2016). Increased public interest in a particular subject, especially novel AI tools like ChatGPT, is often reflected in heightened search activity on internet search engines. The topic becomes salient in an individual’s mind, making them aware of a gap between

what they know and what they need to know to make sense of new information (Timmins, 2006).

Individuals enter relevant keywords into search engines such as Google to fulfill this interest. Google has been the leading desktop search engine in terms of market share from 2015 to 2024, with approximately 81.95% of the global share (Bianchi, 2024). Thus, Google search data and corresponding data trends can be considered a representative proxy for internet searches over time. Figure 1 illustrates the proposed model for understanding public interest trends in AI literacy.

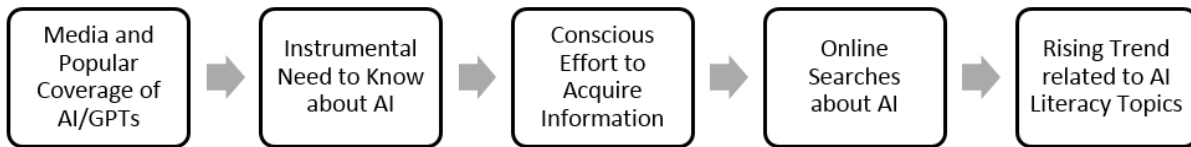


Fig. 1 Proposed Model of Public Interest Trend in AI Literacy

Using Google Trends (GT) data, we attempt to understand how the public’s interest in AI literacy-related topics has evolved during the period corresponding to the advent of GPT tools.

Research indicates that increased online searches on a particular topic signify its importance to the general public. However, since not all salient issues result in online searches, aggregate search data should be viewed as an indicator of information-seeking behavior (Housholder *et al.*, 2018).

Conversely, if a subject consistently fails to capture public attention, it suggests that the public does not consider it salient. Consequently, a rise in online search volumes at a national level for terms associated with AI literacy indicates that the topic is of increasing importance to citizens.

III. METHODOLOGY

Quantitative data analysis is used to investigate whether the introduction and widespread adoption of Generative Pre-trained Transformers (GPTs) since November 2022, when ChatGPT was launched, have increased public interest in AI, its applications, tools, and ethical issues. For each of the four aspects of AI literacy, Google Trends (GT) data corresponding to different search terms have been used:

1. Know and Understand AI – 2 terms
2. Use and Apply AI – 2 terms
3. Evaluate and Create AI – 5 terms
4. AI Ethics – 5 terms

GT data for four years for all 14 terms, as shown in Table I, were collected and aggregated to arrive at the four-aspect level trends.

Aggregation was done using a simple average of the search volumes of terms corresponding to each factor. For example, the dataset for F3: Evaluate and Create AI is the average of the search volumes of the five terms (ST05 through ST09).

TABLE I LITERACY FACTORS AND SEARCH TERMS

AI Literacy Factor	Search Terms
F1: Know and Understand AI	ST01: What is AI?
	ST02: Use of AI
F2: Use and Apply AI	ST03: How to use AI
	ST04: How to use AI tools
F3: Evaluate and Create AI	ST05: Free AI Tools
	ST06: Best AI Tools
	ST07: AI Tools
	ST08: AI App
	ST09: AI Software
F4: AI Ethics	ST10: AI ethics
	ST11: Ethical AI
	ST12: AI Privacy
	ST13: AI Bias
	ST14: AI Safety

For each of the 14 search terms (ST01 through ST14), weekly Google Trends (GT) data for web searches from June 2020 to May 2024 were collected, yielding four years of data. There are 209 data points per dataset, and each dataset is split into two groups, “before” and “after,” consisting of 131 and 78 data points, respectively.

The first sample (“before”) of 2.5 years of data from June 2020 to November 2022 corresponds to the period prior to the launch of ChatGPT. The second sample (“after”) consists of 1.5 years of search volume data from December 2022 to May 2024, corresponding to the period after the launch of ChatGPT. The statistical test used in this study is the Welch Two-Sample t-test, which helps analyze whether there is a significant difference in the means of the two samples, which may have unequal variances. The null hypothesis tested for the three samples is that the mean of the search volumes on and after November 2022 (“after”) is equal to the mean of the search volumes prior to it (“before”).

If the results of the Welch t-test lead to the rejection of the null hypothesis, it would imply that the mean search volumes for AI literacy-related terms in the “after” period are significantly higher than in the “before” period. This increase is unlikely to be due to random variation and would indicate a genuine rise in public interest in AI literacy following the release and adoption of GPTs.

IV. RESULTS OF THE STUDY

The following section presents the findings of the visual analysis and descriptive statistics for the four aspects of AI literacy, along with the results of Welch’s t-test.

A. Know and Understand AI

The graph in Fig. 2 shows the Google search volumes related to the AI literacy factor of knowing and understanding AI. Average search volumes for two keywords were used: “What is AI?” and “Use of AI.”

Visual inspection reveals a steady upward trend starting from the end of 2022. While there is a general upward trend from May 2020 until the end of 2022, a noticeable increase is observed after that period.

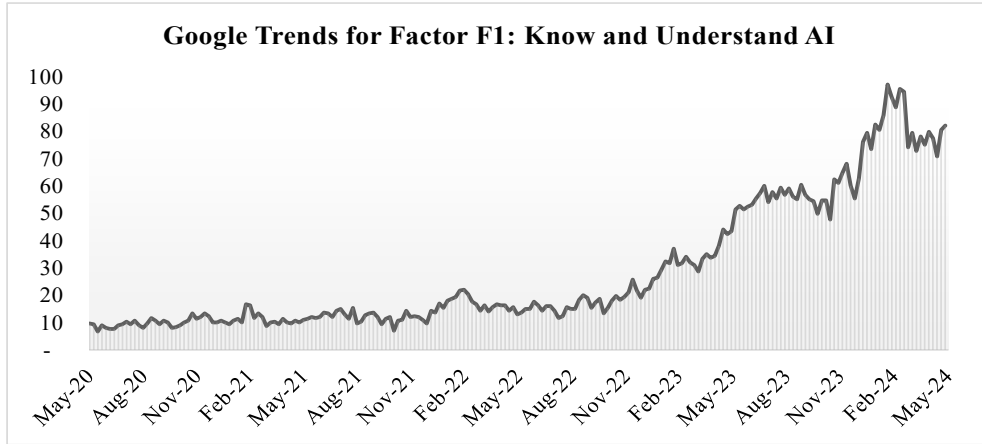


Fig. 2 Google search volumes related to knowing and understanding AI

TABLE II KNOW AND UNDERSTAND AI: WELCH’S T-TEST RESULT

Parameter	Value
Mean (“before”)	12.93
Mean (“after”)	54.79
Variance (“before”)	11.66
Variance (“after”)	426.63
p-value (two-tail)	0.00
Mean (“before”)	12.93

323.6%, from 12.93 to 54.79. The p-value is less than 0.05; therefore, we can reject the null hypothesis and conclude that the observed increase in public interest in knowing and understanding AI is statistically significant.

B. Use and Apply AI

The graph in Fig. 3 shows the Google search volumes related to the use and application of AI. Average search volumes for two keywords were used: “How to use AI” and “How to use AI tools.” Visual inspection reveals a noticeable and abrupt increase in search volumes from the end of 2022.

The results of Welch’s t-test in Table II indicate that the average search volumes after November 2022 increased by

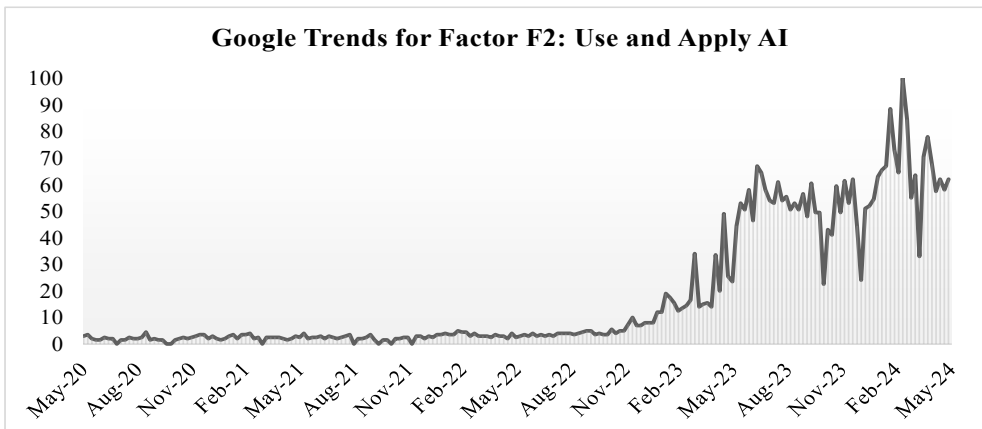


Fig. 3 Google search volumes related to using and applying AI

TABLE III USE AND APPLY AI: WELCH'S T-TEST RESULT

Parameter	Value
Mean ("before")	2.72
Mean ("after")	43.61
Variance ("before")	1.34
Variance ("after")	522.60
p-value (two-tail)	0.00

The results of Welch's t-test in Table III show that the average search volumes after November 2022 increased more than 16-fold, from 2.72 to 43.61. The p-value is less than 0.05;

therefore, we can reject the null hypothesis and conclude that the observed increase in public interest in using and applying AI is statistically significant.

C. Evaluate and Create AI

The graph in Fig. 4 shows the Google search volumes related to evaluating and creating novel AI solutions. Average search volumes for five representative keywords were used: "Free AI Tools," "Best AI Tools," "AI Tools," "AI App," and "AI Software." Visual inspection indicates a noticeable and steady upward trend in search volumes from the end of 2022.

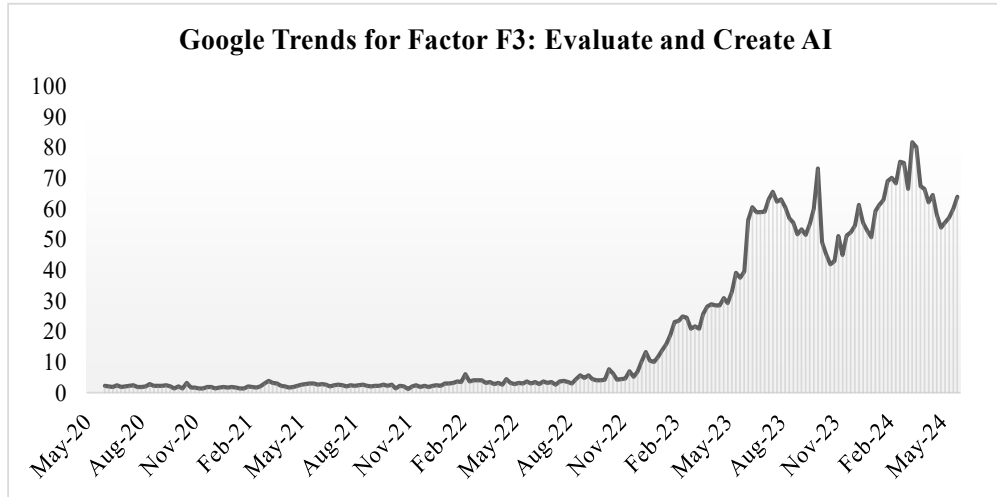


Fig. 4 Google search volumes related to evaluating and creating AI

TABLE IV EVALUATE AND CREATE AI: WELCH'S T-TEST RESULT

Parameter	Value
Mean ("before")	2.82
Mean ("after")	47.46
Variance ("before")	1.49
Variance ("after")	367.25
p-value (two-tail)	0.00

The results of Welch's t-test in Table IV show that the average search volumes after November 2022 increased by a massive 1,586%, from 2.82 to 47.46. The p-value, which is below the threshold of 0.05, allows us to reject the null hypothesis and assert that the observed increase in public interest in evaluating and creating novel AI solutions is statistically significant.

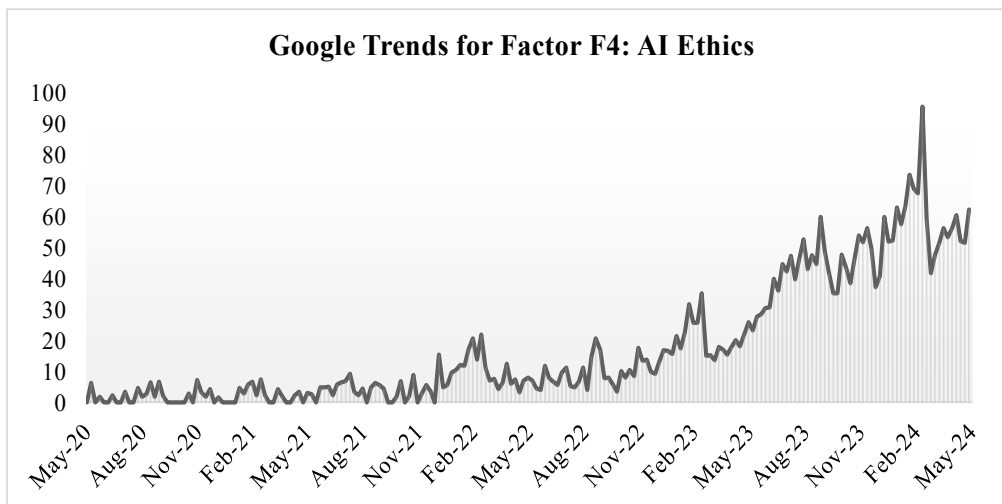


Fig. 5 Google search volumes related to AI ethics

D. AI Ethics

The graph in Fig. 5 shows the Google search volumes related to AI ethics. We use the average search volumes of five keywords related to the broader theme of ethics in AI: “AI ethics,” “Ethical AI,” “AI Privacy,” “AI Bias,” and “AI Safety.” Visual inspection indicates three major phases of public interest:

1. An early phase until November 2021, characterized by low, steady interest.
2. A middle phase from December 2021 to November 2022, marked by a slight increase in public interest.
3. A significant jump in public awareness and interest in AI ethics-related issues from December 2022 onward.

TABLE V AI ETHICS: WELCH’S T-TEST RESULT

Parameter	Value
Mean (“before”)	5.13
Mean (“after”)	38.94
Variance (“before”)	23.49
Variance (“after”)	329.51
p-value (two-tail)	0.00

The results of Welch’s t-test in Table V indicate that the average search volumes after November 2022 increased by a factor of 7.6, from 5.13 to 38.94. With a p-value less than 0.05, we can reject the null hypothesis and conclude that the observed surge in public interest in AI-related ethical issues is statistically significant.

V. ANALYSIS AND DISCUSSION

The analysis reveals a statistically significant increase in public awareness and interest across all four aspects of AI literacy following the launch of ChatGPT and subsequent GPTs starting in November 2022. Each aspect of AI literacy has shown a clear upward trend, indicating that the release of GPTs has catalyzed heightened public engagement with AI technologies. This phenomenon can be explored in detail across the four dimensions of AI literacy:

A. Know and Understand AI: This increase reflects a broader societal shift toward understanding fundamental AI concepts and skills, even among individuals without prior expertise. For many, ChatGPT provided an entry point to explore how AI operates, how it can be utilized, and the underlying mechanics of generative models, sparking curiosity and interest. The ease of interacting with GPTs allowed users to grasp foundational AI ideas through direct experience, enhancing their knowledge base in a practical and engaging manner.

B. Use and Apply AI: This increase reflects the versatility of GPT applications across domains, from content creation to customer service, education, and beyond. The ease of integrating GPTs into various workflows has encouraged individuals and organizations to explore the potential of AI

in different settings, further stimulating interest and experimentation.

C. Evaluate and Create AI: The release of GPTs has also spurred increased interest in the critical evaluation and creation of AI technologies. As more people engage with GPTs, there has been growing curiosity about how these tools function, their limitations, and potential biases. This shift reflects a broader cultural trend where users seek to collaborate in creating new solutions that leverage AI technologies.

D. AI Ethics: Notably, increasing interest in AI ethics began to be observed a year before the launch of ChatGPT. Media coverage and regulatory body reports during this period frequently highlighted AI-related controversies and how biases, safety concerns, and flawed AI implementations led to unintended consequences, including financial losses (DataRobot, 2022). However, the subsequent launch of GPTs and their sudden widespread visibility brought these issues to the forefront, prompting a broader public engagement with ethical considerations, including fairness, accountability, transparency, and the broader implications of AI in everyday life.

The major increase in interest across all four aspects of AI literacy reflects the changing perception of AI from a niche technology to a mainstream tool. AI is no longer perceived as a distant concept associated only with science fiction, rocket scientists, or computer researchers. Instead, it has become part of everyday discourse, prompting even non-experts to explore, apply, and critically engage with AI technologies. The increase in public awareness, particularly in AI ethics, suggests that as AI tools become more integrated into daily life, ethical considerations are becoming increasingly central to public discourse. This trend is crucial for policymakers, educators, and industry leaders, as it highlights the need to prioritize AI education, including ethical discussions and technical training.

VI. LIMITATIONS AND FUTURE RESEARCH

A. Limitations

This study, while offering unique insights into public interest in AI literacy following the launch of GPTs, is subject to some limitations. First, it focuses on a single model of AI literacy; however, multiple other models of AI literacy emphasize different competencies and learning outcomes. Second, the selection of keywords for each of the four aspects was based on terms deemed representative of these dimensions. While efforts were made to ensure that these keywords accurately captured the essence of each aspect, they are not exhaustive. Third, this study primarily examines the impact of a single factor - the launch of GPTs - on public interest in AI literacy. While GPTs represent a significant development in AI technology, other factors could also affect public awareness.

B. Future Research Directions

Future studies could incorporate alternative models of AI literacy, each with its distinct set of competencies and domains. Research could benefit from a more diverse set of keywords to represent each aspect of AI literacy more comprehensively. To better understand the drivers of AI literacy, future studies should consider additional factors beyond the launch of GPTs. For example, the role of national AI policies, educational initiatives, or even global events related to AI (e.g., controversies, breakthroughs, or regulations) could provide a more comprehensive view of what shapes public interest.

While this study examines all four aspects of AI literacy, future research could delve deeper into each aspect individually. By studying how public interest in understanding AI, applying AI, evaluating AI, and engaging with AI ethics has evolved over time, researchers could identify specific trends, challenges, and opportunities related to each competency. This approach could yield more granular insights and inform targeted interventions to promote AI literacy.

VII. CONCLUSION

The release and subsequent widespread adoption of GPTs beginning in November 2022 have not only increased public interest in AI literacy in India but also democratized access to AI, enabling a more informed, critical, and participatory public discourse. This shift emphasizes the importance of ongoing education and policy efforts that promote AI literacy in all aspects. Such efforts will ensure that people are prepared to comprehend, utilize, assess, and ethically interact with AI in a world that is increasingly reliant on it.

REFERENCES

- [1] Agina-Obu, R., & Okwu, E. (2023). Impact of digital literacy on university students' use of digital resources in Nigeria. *Asian Journal of Information Science and Technology*, 13(2), 60-65.
- [2] Ahmadi, A. (2023). ChatGPT: Exploring the threats and opportunities of artificial intelligence in the age of chatbots. *Asian Journal of Computer Science and Technology*, 12(1), 25-30.
- [3] Alnahhas, N., & Yousef, D. (2024, June). GAI as a catalyst in national technology sovereignty: Evaluating the influence of GAI on government policy. In *Proceedings of the 25th Annual International Conference on Digital Government Research* (pp. 618-626).
- [4] Bahroun, Z., Anane, C., Ahmed, V., & Zacca, A. (2023). Transforming education: A comprehensive review of generative artificial intelligence in educational settings through bibliometric and content analysis. *Sustainability*, 15(17), 12983. <https://doi.org/10.3390/su151712983>
- [5] Baldassarre, M. T., Caivano, D., Fernandez Nieto, B., Gigante, D., & Ragone, A. (2023, September). The social impact of generative AI: An analysis of ChatGPT. In *Proceedings of the 2023 ACM Conference on Information Technology for Social Good* (pp. 363-373).
- [6] Bengesi, S., El-Sayed, H., Sarker, M. K., Houkpati, Y., Irungu, J., & Oladunni, T. (2024). Advancements in generative AI: A comprehensive review of GANs, GPT, autoencoders, diffusion models, and transformers. *IEEE Access*, 12, 69812-69837. <https://doi.org/10.1109/ACCESS.2024.3397775>
- [7] Bianchi, T. (2024, May 22). Market share of leading desktop search engines worldwide from January 2015 to January 2024. *Statista*. <https://www.statista.com/statistics/216573/worldwide-market-share-of-search-engines>
- [8] Case, D. O., & Given, L. M. (2016). *Looking for information: A survey of research on information seeking, needs, and behavior*. Emerald.
- [9] Cheng, S. W., Chang, C. W., Chang, W. J., Wang, H. W., Liang, C. S., Kishimoto, T., & Su, K. P. (2023). The now and future of ChatGPT and GPT in psychiatry. *Psychiatry and Clinical Neurosciences*, 77(11), 592-596. <https://doi.org/10.1111/pcn.13458>
- [10] Dancy, G., & Fariss, C. J. (2024). The global resonance of human rights: What Google Trends can tell us. *American Political Science Review*, 118(1), 252-273. <https://doi.org/10.1017/apsa.2024.17>
- [11] DataRobot. (2022, January 18). DataRobot's State of AI Bias report reveals 81% of technology leaders want government regulation of AI bias. *DataRobot*. <https://www.datarobot.com/newsroom/press/data-robots-state-of-ai-bias-report-reveals-81-of-technology-leaders-want-government-regulation-of-ai-bias>
- [12] Dehkordy, S. F., Carlos, R. C., Hall, K. S., & Dalton, V. K. (2014). Novel data sources for women's health research: Mapping breast screening online information seeking through Google Trends. *Academic Radiology*, 21(9), 1172-1176. <https://doi.org/10.1016/j.acra.2014.03.013>
- [13] Housholder, E., Watson, B. R., & LoRusso, S. (2018). Does political advertising lead to online information seeking? A real-world test using Google search data. *Journal of Broadcasting & Electronic Media*, 62(2), 337-353. <https://doi.org/10.1080/08838151.2018.1461041>
- [14] Hussain, G. A., & Ahmad, P. (2014). Information seeking behaviour of the teachers and students at the College of Engineering, King Saud University, Riyadh: A study. *Asian Review of Social Sciences*, 3(1), 45-54.
- [15] Imran, M., & Almusharraf, N. (2024). Google Gemini as a next-generation AI educational tool: A review of emerging educational technology. *Smart Learning Environments*, 11(1), 22. <https://doi.org/10.1186/s40561-023-00253-4>
- [16] Kong, S. C., Cheung, W. M. Y., & Zhang, G. (2023). Evaluating an artificial intelligence literacy program for developing university students' conceptual understanding, literacy, empowerment, and ethical awareness. *Educational Technology & Society*, 26(1), 16-30.
- [17] Lecler, A., Duron, L., & Soyer, P. (2023). Revolutionizing radiology with GPT-based models: Current applications, future possibilities, and limitations of ChatGPT. *Diagnostic and Interventional Imaging*, 104(6), 269-274. <https://doi.org/10.1016/j.diii.2023.04.002>
- [18] Lorenz, R., Beck, J., Horneber, S., Kusch, F., & Antoun, C. (2022). Google Trends as a tool for public opinion research: An illustration of the perceived threats of immigration. *Migration Research in a Digitized World*, 193. <https://doi.org/10.1007/s12134-022-00954-5>
- [19] Mukhopadhyay, S. (2023). ChatGPT adoption in cultural domains in India: A diffusion of innovation analysis. *Asian Journal of Management and Commerce*, 4(2), 112-117.
- [20] Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, 100041. <https://doi.org/10.1016/j.caeai.2021.100041>
- [21] Su, J., & Zhong, Y. (2022). Artificial intelligence (AI) in early childhood education: Curriculum design and future directions. *Computers and Education: Artificial Intelligence*, 3, 100072. <https://doi.org/10.1016/j.caeai.2022.100072>
- [22] Szabó, Z., & Bilicki, V. (2023). A new approach to web application security: Utilizing GPT language models for source code inspection. *Future Internet*, 15(10), 326. <https://doi.org/10.3390/fi15100326>
- [23] Timmins, F. (2006). Exploring the concept of 'information need.' *International Journal of Nursing Practice*, 12(6), 375-381. <https://doi.org/10.1111/j.1440-172X.2006.00568.x>
- [24] Tinmaz, H., Lee, Y. T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. *Smart Learning Environments*, 9(1), 21. <https://doi.org/10.1186/s40561-022-00210-2>
- [25] Zhang, Y. (2023). Using Google Trends to track the global interest in International Financial Reporting Standards: Evidence from big data. *Intelligent Systems in Accounting, Finance and Management*, 30(2), 87-100. <https://doi.org/10.1002/isaf.1754>