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Understanding Public Concerns on AI: Social Media Analytics and Expert Consensus

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Abstract: *The rapid integration of artificial intelligence (AI) into society has given rise to a complex landscape of public concerns. This study systematically explores these concerns using a multi-stage methodology that combines large-scale social media data collection from Twitter (X) with text analytics. A total of 59,447 cleaned tweets posted between January 2019 and February 2024 were vectorized with a BART-base model and grouped by K-means clustering, with the silhouette index indicating seven optimal clusters: privacy and security, business and strategy risks, workforce displacement, existential risks, government's role and regulation, social and ethical implications, and military and national security applications. To contextualize the findings, a three-round Delphi process with ten AI experts was used to prioritize the concerns and to extract solutions grouped into law and regulation, society, ethics, and technology implementation. Privacy and security received the highest expert score (5.0), followed by existential risks and workforce displacement (4.9). The results offer guidance for policymakers, AI developers, and other stakeholders for fostering public trust in AI.*

Keywords: artificial intelligence, AI concerns, social media analysis, AI governance, responsible AI

I. INTRODUCTION

The significance and benefits of artificial intelligence (AI) can hardly be overstated. AI enhances efficiency across industries and is revolutionizing fields such as healthcare [1], while streamlining processes, enabling advanced data analysis, and driving economic growth. Hand in hand with these advances, however, come profound concerns about the ethical implications and societal impact of the technology [2].

The emergence of generative AI, exemplified by tools such as ChatGPT, Midjourney, and DALL-E 3, has brought these concerns to the forefront of public discourse [3, 4]. Questions about privacy, bias, accountability, and job displacement have made the AI landscape both complex and urgent [5]. As AI systems become more integrated into daily life, failure to address these issues could erode public trust, increase inequality, and lead to unintended harmful behaviors by AI systems.

Although existing research has extensively explored the ethical implications of AI, particularly in healthcare and education, there is a significant gap in understanding how these concerns are expressed and evolve in real-time public discourse. Social media platforms offer a unique opportunity to capture the public's sentiments, fears, and expectations regarding AI [6, 7], yet few studies have systematically examined this source to identify and prioritize AI-related concerns. Moreover, while many ethical guidelines and frameworks have been proposed, little research combines large-scale public opinion analysis with expert-driven solutions to produce actionable recommendations.

This study bridges these gaps through a multi-stage methodology that combines text mining of social media data with the Delphi method. The objectives are: (1) to elucidate the prevalent concerns of individuals and society regarding AI through a systematic analysis of social media discourse; (2) to discern the priorities and evolving trends of these concerns; and (3) to propose actionable measures for governments, developers, consumers, and other stakeholders, based on a synthesis of public sentiment and expert knowledge.

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II. LITERATURE REVIEW

AI has transformed various sectors by automating tasks traditionally performed by humans. Its integration in organizations has necessitated the upskilling and reskilling of workers [8], and its applications now span medicine, education, economics, cybersecurity, and urban planning. As AI becomes more pervasive, the operationalization of AI ethics has gained prominence, particularly regarding fairness and equity in healthcare and societal contexts.

Ethical and societal concerns surrounding AI include privacy, since AI systems rely on vast amounts of data whose collection, storage, and use raise concerns [9]; bias and fairness, with the potential for algorithms to perpetuate or exacerbate existing societal biases [10]; and accountability and transparency, which are crucial for trust in AI-assisted decision-making [11]. The potential for job displacement and economic inequality is another significant concern that needs to be addressed through policy and education [12]. Public trust is essential for the acceptance and adoption of AI, and societal expectations about ethics play a significant role in shaping attitudes toward the technology [13]. Ensuring algorithmic fairness requires a holistic approach, including diverse and representative datasets and greater transparency and accountability [14].

Related work has emphasized the need for collaboration among governments, businesses, academia, and society to promote responsible AI, and has examined the ethical considerations of using AI to monitor social media [15]. The existing literature has thoroughly explored transparency, fairness, accountability, and privacy, mainly in healthcare and education. However, a gap remains in systematically examining public concerns as expressed on social media, which serves as a dynamic, real-time repository of public opinion. The present research addresses this gap by combining large-scale social media analysis, which provides a broader spectrum of concerns than limited surveys or expert interviews, with a Delphi panel that bridges public concerns and expert views and yields solution-oriented strategies.

III. CASE AND METHODOLOGY

The research follows a multi-stage methodology: data collection from X (Twitter), tweet pre-processing and vectorization, K-means clustering, cluster naming, and a Delphi expert panel for prioritizing concerns and extracting solutions.

3.1 Data collection

Tweets were collected through the Twitter API using Python and the ‘tweepy’ library, with rate limiting and error handling to comply with platform policies. Search queries combined AI-related terms with words indicating concern or risk using Boolean operators, for example (“artificial intelligence” OR AI) AND (concern OR risk OR ethic* OR worr* OR fear), and also included terms such as machine learning, deep learning, and robotics concerns. A randomized sampling technique at different times of day and days of the week was used to obtain a temporally diverse sample. Between January 1, 2019 and February 18, 2024, 86,797 tweets were gathered. The data were stored in a secure, encrypted database with personal identifiers removed.

3.2 Pre-processing and vectorization

The tweets underwent a rigorous cleaning process [16]: URLs, hashtags, links, user tags, e-mail addresses, numbers, extra lines, multiple spaces, and special characters were removed, and tweets with fewer than five words or fewer than fifty characters were excluded, leaving 59,447 tweets. Each tweet was tokenized with the Facebook/BART-base model and converted into a 768-dimensional vector using max pooling, i.e., by taking the maximum value across all token embeddings for each of the 768 dimensions.

3.3 Tweet clustering

Tweet vectors were grouped with K-means clustering [17, 18]. The algorithm initializes K centroids, assigns each vector to the nearest centroid by Euclidean distance, recalculates the centroids, and repeats until convergence. The optimal K was selected with the silhouette index [19], $s(i) = (b(i) - a(i)) / \max(a(i), b(i))$, where $a(i)$ is the mean

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distance between point i and the other points in its cluster and b(i) is the mean distance to the points of the nearest neighboring cluster. Higher scores indicate better-defined clusters.

3.4 Cluster naming

Within each cluster, tweets were tokenized (NLTK word_tokenize), stop words were removed, and the Porter Stemmer and WordNet Lemmatizer were applied. The most frequent terms were then identified with Python's Counter class, and the top terms (e.g., N = 5) were combined to name each cluster.

3.5 Delphi panel

Ten experts in AI, ethics, social science, and related fields were selected using age, gender, country of residence, academic qualifications, field of AI activity (research, industry, government), and social media usage as diversity criteria. The Delphi method [20] was implemented in three rounds with anonymous input and controlled feedback: (1) experts rated the importance of each concern on a 1–5 Likert scale; (2) the aggregated results were shared and experts could revise their ratings; and (3) experts proposed and rated solutions for the concerns. The mean score for each concern was obtained by summing the ratings of the ten experts (10–50) and dividing by ten.

IV. RESULTS AND DISCUSSION

4.1 Timeline of concerns

The timeline analysis shows that peaks in tweet volume coincide with major AI events. The release of GPT-4 (March 14, 2023) and Google Bard (March 21, 2023) produced modest peaks of 31 and 30 tweets, whereas Geoffrey Hinton's resignation from Google and public warning on May 4, 2023 produced 226 tweets. Other notable peaks included the US Senate AI Insight Forum on September 13, 2023 (195 tweets), President Biden's Executive Order on AI on October 30, 2023 (135 tweets), Elon Musk's proposal for an AI Safety Summit on October 31, 2023 (230 tweets), and the release of Google Gemini 1.0 Ultra on December 6, 2023 (188 tweets). The highest peak, 659 tweets, occurred on February 15, 2024, with the announcement of OpenAI's Sora model and the release of Google Gemini 1.5. Major industry developments and statements by influential figures therefore strongly influence the volume of AI-related discourse.

4.2 Identified clusters of concerns

The silhouette method indicated seven as the optimal number of clusters. Table 1 summarizes the clusters, their most frequent keywords, and the number of tweets in each cluster.

Table 1. Identified clusters of AI concerns

No.	Cluster name	Representative keywords	Tweets
1	Privacy and security concerns	privacy, security, data, protection, bias, accountability, transparency, regulation, ethics, safety, trust	11,198
2	Business and strategy risks	cybersecurity, compliance, fraud, detection, decision-making, automation, competitive, advantage, cost, efficiency, innovation	10,284
3	Workforce displacement	job, loss, automation, reskilling, upskilling, inequality, economic, disruption, future, work, education	8,973
4	Existential risks and long-term impacts	superintelligence, existential, threat, alignment, safety, control, singularity, governance, long-term	10,737
5	Government's role and regulation	regulation, oversight, safety measures, international coordination, AI governance, public-private partnerships, public engagement	6,747

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No.	Cluster name	Representative keywords	Tweets
6	Social and ethical implications	bias, fairness, transparency, accountability, privacy, surveillance, manipulation, misinformation, deepfakes	3,385
7	Military and national security applications	national, security, military, defense, cyber, attacks, autonomous, weapons, surveillance, geopolitics, arms, race	8,104

Privacy and security is the largest cluster, reflecting widespread unease about personal data protection and system vulnerabilities, followed closely by existential risks and long-term impacts, which signals growing awareness of the societal implications of advanced AI. Business and strategy risks and workforce displacement underline the economic and social transformations catalyzed by AI, while the government regulation cluster highlights the need for ethical frameworks and oversight. The social and ethical cluster covers bias, deepfakes, and misinformation, and the military cluster reflects awareness of the dual-use nature of AI technologies.

4.3 Expert prioritization of concerns

Table 2 presents the mean scores assigned by the ten Delphi experts. Privacy and security concerns received the highest average score (5.0), followed by existential risks and long-term impacts and workforce displacement (both 4.9). Government's role and regulation (4.8), social and ethical implications (4.7), and business and strategy risks (4.5) also scored high, while military and national security applications received a comparatively lower score (4.3).

Table 2. Expert scores for prioritizing AI concerns (n = 10)

Concern	Average score	Rank
Privacy and security concerns	5.0	1
Existential risks and long-term impacts	4.9	2 (tie)
Workforce displacement	4.9	2 (tie)
Government's role and regulation	4.8	4
Social and ethical implications	4.7	5
Business and strategy risks	4.5	6
Military and national security applications	4.3	7

4.4 Solutions selected by the experts

Following three Delphi rounds, the top solutions were organized into four categories based on the framework of Wirtz et al. [21]: AI law and regulation, AI society, AI ethics, and AI technology implementation (Table 3).

Table 3. Key solutions identified through the Delphi process

Category	Concern	Key solutions
AI law and regulation	Government's role and regulation	Foster public-private partnerships and international cooperation; establish clear guidelines and regulations, especially in sensitive areas; promote public engagement and education.
AI society	Workforce displacement	Prioritize reskilling and upskilling; invest in AI and digital-skills education; explore policies supporting workers during economic transitions.
AI society	Social and ethical implications	Develop transparent, accountable, and unbiased AI systems; establish guidelines for ethical use of AI in surveillance; develop ethical standards for AI deployment.

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Category	Concern	Key solutions
AI society	Military and national security applications	Develop international frameworks and arms-control agreements; ensure robust oversight and accountability; implement strict guidelines for national-security use.
AI ethics	Privacy and security concerns	Develop robust data protection and security protocols; implement algorithmic accountability and transparency; establish clear guidelines for ethical AI development.
AI ethics	Existential risks and long-term impacts	Develop international governance frameworks; conduct research on AI alignment and safety; advocate long-term thinking and proactive governance.
AI technology implementation	Business and strategy risks	Foster collaboration between AI experts and business leaders; encourage collaboration among businesses, governments, and academia on industry standards; establish risk assessment and management frameworks.

4.5 Alignment with policy initiatives and managerial implications

The identified concerns align closely with recent governance initiatives. The US Blueprint for an AI Bill of Rights emphasizes safe and effective systems, algorithmic discrimination protections, data privacy, notice and explanation, and human alternatives [22]. The risk-based approach of the EU AI Act, focused on high-risk systems, matches the need for governance tailored to the potential impact of AI applications [23]. The UK National AI Strategy [24] and India's National Strategy for AI [25] likewise address workforce, public-private partnership, and equitable-benefit concerns, showing a growing global consensus on the ethical and societal implications of AI.

Real-world examples illustrate how such measures can be implemented: healthcare providers that comply with the GDPR through data protection impact assessments, anonymization, and patient consent [26]; Singapore's SkillsFuture initiative, which offers training programs in partnership with industry and educational institutions to help workers transition into new careers [27]; bias mitigation in recruitment AI through collaboration with AI ethicists, bias-detection algorithms, and regular audits; and risk assessment frameworks in financial AI developed by interdisciplinary teams.

4.6 Limitations and future research

The study has several limitations: data came from a single platform (Twitter) and only from English-language tweets, which limits generalizability and may overrepresent some regions; the Delphi panel was small (ten experts); tweet analysis cannot capture full context; K-means is sensitive to initial centroid placement and non-globular clusters; the study focused on concerns rather than positive sentiments; and the findings may become obsolete quickly given the pace of AI development. Future research should include longitudinal analyses, cross-platform and cross-lingual studies, sentiment and emotion detection, causal analysis of what triggers concerns, comparative policy analysis (e.g., the risk-based EU AI Act versus the rights-based US AI Bill of Rights), and studies of public perception of AI policies.

V. CONCLUSION

This study provides a comprehensive analysis of public concerns about AI by combining large-scale social media analytics with expert insights. Examining 59,447 tweets and engaging a diverse Delphi panel revealed seven clusters of concerns, with privacy and security emerging as the foremost issue, followed closely by existential risks and long-term impacts and workforce displacement. The findings show that public sentiment shifts in response to technological advancements and policy developments, and that a multi-stakeholder approach involving government, industry, academia, and civil society is essential. The expert panel recommended actions in four domains: clear regulation and international cooperation, education and reskilling, transparency, accountability and bias mitigation, and cross-sector

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collaboration with comprehensive risk assessment. The combined methodology offers a replicable framework for ongoing monitoring of AI-related concerns, supporting proactive policy development, greater transparency, investment in AI literacy, and adaptable international governance frameworks.

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