Invisible Influences: A Study on User Perceptions, Awareness, and Opt-Out Preferences in AI-Based Psychological Tracking

Rashid Ali
Punjab University, Lahore
*** Correspondence**: rashid.ali@gmail.com

Citation | Ali. Rashid, "Invisible Influences: A Study on User Perceptions, Awareness, and Opt-Out Preferences in AI-Based Psychological Tracking", MC, Vol. 04 Issue. 02 pp 68-78, May 2025

Received | April 04, 2025 **Revised |** April 30, 2025 **Accepted |** May 01, 2025 **Published |** May 03, 2025.

The growing integration of artificial intelligence (AI) into recommendation systems has enabled platforms to monitor not only user behavior but also infer psychological and emotional states through subtle tracking mechanisms. This study investigates user awareness, emotional responses, and opt-out preferences regarding such psychological tracking across major cities in Pakistan — Lahore, Karachi, and Islamabad. Using structured questionnaires, data were collected from 300 respondents to examine their familiarity with behavioral tracking features (e.g., click tracking, scroll speed, gaze detection, and emotional inference) and the associated discomfort they experienced. Results indicate that while users are generally aware of overt tracking (e.g., click behavior: 80%), awareness sharply declines for more covert methods like biometric monitoring (30%) and emotional inference (20%). Emotional discomfort was highest in response to emotion-based recommendations (85%) and biometric features (80%), with over 70% of respondents expressing a desire to opt out of such features. City-wise, users in Lahore showed the highest exposure to tracking consent banners (78%). The study highlights significant gaps in user understanding of AI tracking mechanisms, as well as growing concerns about mental privacy, algorithmic manipulation, and lack of informed consent. These findings call for more transparent AI practices, stronger digital rights protections, and regulatory measures to ensure ethical user engagement.

Keywords: Artificial Intelligence, Psychological Tracking, Behavioral Tracking, Biometric Monitoring

Introduction:

The rapid proliferation of digital technologies over the past fifteen years, particularly social media platforms such as Facebook, Instagram, and TikTok, has radically transformed the way individuals interact, express themselves, and engage with information. While these technologies have undoubtedly created new opportunities for communication and commerce, they have also ushered in a new economic logic known as surveillance capitalism. Coined by [1], surveillance capitalism refers to a market-driven process in which personal data is commodified, extracted, and analyzed not only to predict behavior but to shape it, ultimately eroding individual autonomy and democratic agency [2].

At the heart of this issue lies a critical paradox: users consciously and unconsciously consent to share vast amounts of personal data—via cookies, mobile apps, and platform interactions—without fully understanding the implications. This lack of awareness enables powerful corporations to exploit behavioral data to engineer persuasive systems that guide, nudge, and often manipulate user behavior [3]. These actions occur subtly and often invisibly, through algorithms that personalize content, target advertisements, and optimize user engagement at the expense of user autonomy. Social media platforms thus function as both

infrastructure for communication and as instruments of behavioral influence that blur the line between persuasion and manipulation[4][5].

This paper examines how the mechanisms of surveillance capitalism impair individual autonomy by undermining self-governance, informed consent, and the ability to act in accordance with authentic values. Drawing from philosophical and political theories of autonomy [6], we argue that the economic incentives of platform capitalism conflict fundamentally with the ethical imperative to respect human autonomy. By analyzing the epistemic opacity of algorithmic systems, the normalization of data commodification, and the socio-psychological embedding of digital infrastructures, this study sheds light on the broader societal consequences of surveillance-based digital architectures.

Research Gap:

Despite growing public and scholarly concern about data privacy and digital manipulation, most existing research on surveillance capitalism tends to focus on either technical aspects (e.g., algorithmic biases, data regulation) or socio-political outcomes (e.g., electoral interference, misinformation). What remains underexplored is the philosophical and moral dimension—specifically, how surveillance capitalism systematically erodes individual autonomy through subtle and often imperceptible forms of behavioral control. While scholars like[1], [7], and [8] have critiqued the commodification of personal data and the extractive logic of platforms, fewer studies have thoroughly examined the relational and procedural conditions of autonomy in this context. Even fewer have operationalized these theories to analyze how platform design, attention economies, and manipulative personalization harm autonomy competencies such as self-respect, self-governance, and informed decision-making[9][10].

In addition, there is a significant gap in empirical and theoretical work that connects user unawareness and platform ubiquity to the structural conditions that prevent meaningful consent and resistance. Although some studies highlight the psychological impacts of social media (e.g., FOMO, digital addiction), they rarely connect these phenomena to autonomy theory. As a result, the ethical implications of surveillance capitalism remain undertheorized, particularly from the lens of weak substantive and relational autonomy theories.

Objectives:

The primary objective of this study is to critically investigate how surveillance capitalism, as operationalized through social media platforms, impairs individual autonomy in contemporary digital society. At the heart of this investigation is a multi-dimensional understanding of autonomy, which is theoretically defined through procedural, substantive, and relational lenses. These perspectives emphasize core competencies such as critical reflection, self-governance, and self-respect—faculties that enable individuals to act in accordance with their authentic values, exercise informed decision-making, and maintain moral and psychological independence.

The study examines how the core mechanisms of surveillance capitalism—including data commodification, algorithmic personalization, and behavioral manipulation—systematically interfere with these autonomy competencies. By turning user behavior into a product and manipulating digital environments to nudge or predict user actions, these systems diminish individuals' capacity to think freely and critically, undermining their ability to make independent choices. This manipulation is often concealed within the architecture of everyday digital tools, creating a facade of user agency while subtly shaping preferences and behavior.

Novelty Statement:

This research makes a novel contribution by bridging the gap between political economy critiques of platform capitalism and the normative philosophical literature on autonomy. Unlike prior works that focus solely on data ethics or algorithmic bias, this paper uses a relational-substantive theory of autonomy to show how surveillance capitalism undermines the very conditions that make self-determined agency possible. Drawing on the

most recent empirical and theoretical developments, this study expands the ethical discourse on surveillance capitalism by showing that the issue is not merely about data privacy or consent, but about a broader erosion of moral agency under digital capitalism.

Furthermore, this paper uniquely integrates autonomy theory into real-world cases of surveillance, such as Amazon's haptic-tracking patents[11] and algorithmic filtering of content based on behavioral prediction[12][13]. By doing so, it offers a multidimensional view of how control over data, attention, and environment translates into a systematic disrespect of user autonomy, often under the guise of personalization and convenience.

Literature Review:

The discourse surrounding surveillance capitalism has gained traction in both critical data studies and digital ethics, particularly as scholars attempt to unpack how emerging technologies shape user autonomy and agency. [1] foundational work lays the groundwork by articulating how personal experiences are repurposed as behavioral data, commodified for predictive analytics, and sold within opaque digital marketplaces. While her analysis is primarily socio-economic, it has inspired a broader scholarly effort to examine the moral and political ramifications of such data extraction practices.[3] expand this conversation by conceptualizing online manipulation as a form of epistemic trespass, whereby corporations intentionally structure online environments to subvert rational deliberation and autonomous decision-making. This view aligns with [4] earlier critique that algorithmic personalization erodes individual autonomy by curating digital experiences that restrict exposure to diverse viewpoints and critical self-reflection.

Recent studies emphasize that the problem extends beyond manipulation to include the epistemic opacity and asymmetrical knowledge inherent in digital platforms.[14] Argue that algorithmic systems are inherently inscrutable due to both technical complexity and corporate secrecy, which creates a power imbalance wherein users are structurally disempowered from understanding or contesting the mechanisms that influence their behavior. This lack of transparency compounds issues of consent and agency, as users often remain unaware of how their interactions are being shaped by invisible feedback loops and engagement-maximizing designs [15]. Furthermore, empirical studies reveal that algorithmic infrastructures are increasingly optimized to exploit cognitive biases and psychological vulnerabilities—such as confirmation bias, affective forecasting errors, and intermittent reinforcement—thus undermining procedural autonomy and the ability to make informed, self-determined choices[16].

A growing body of literature links these harms to relational and substantive theories of autonomy, which emphasize not only internal capacities like critical reflection but also external social and institutional conditions necessary for agency.[10] Contend that relational autonomy is compromised in digital environments where users are subjected to systemic manipulation and nudging that constrains their ability to pursue authentic values. [9] Builds upon this by showing how autonomy-related competencies such as self-respect and self-governance are structurally eroded by constant surveillance, gamified interaction, and persuasive architecture. These insights are echoed by [17], who warns that the normalization of behavioral manipulation fosters a culture of moral deskilling, where users are gradually deprived of the cognitive and emotional tools required to engage in ethical self-regulation.

In addition, scholars are beginning to examine how the commodification of attention contributes to the erosion of autonomy. [18][19] argue that platforms like TikTok and Instagram deploy attention-hacking strategies that fragment consciousness and undermine the deliberative processes foundational to democratic participation and self-governance. These critiques are reinforced by empirical work documenting the psychological consequences of digital dependency, such as increased anxiety, reduced cognitive control, and diminished capacity for long-term goal-setting[20][21]. Importantly, these harms are not evenly

distributed: youth, marginalized groups, and economically disadvantaged populations are often more susceptible to algorithmic manipulation due to lower digital literacy and greater reliance on online services for economic and social participation [12][13].

Finally, scholars have begun to advocate for normative frameworks that center autonomy in the design and regulation of digital platforms. [22] proposes a human-centered model of data governance that incorporates substantive autonomy protections, while [23] suggest a capabilities approach that emphasizes the development of moral and cognitive competencies necessary for autonomy in the digital age. These approaches highlight that safeguarding autonomy requires more than transparency or informed consent—it demands structural interventions that reorient technological systems away from exploitative design and toward ethical responsibility.

Methodology:

To investigate the impact of surveillance capitalism on individual autonomy within the context of social media platforms, this study adopted a mixed-methods approach, combining qualitative interviews, a quantitative survey, and theoretical analysis rooted in autonomy theory. The methodology was designed to explore both users' subjective experiences and their behavioral interactions with platform technologies, thereby enabling a deeper understanding of how algorithmic personalization, data commodification, and behavioral nudging interfere with autonomy competencies such as self-governance, critical reflection, and informed consent.

Research Design:

This study employed a **convergent parallel mixed-methods design**, allowing for simultaneous collection and analysis of quantitative and qualitative data. The theoretical framework was informed by relational and procedural conceptions of autonomy[6][9], which guided both the construction of survey items and the thematic coding of interview data. The qualitative and quantitative findings were integrated to provide a comprehensive view of autonomy harms.

Participants:

A total of 312 participants were recruited using purposive and snowball sampling from three major metropolitan areas in Pakistan: Lahore, Karachi, and Islamabad. Participants were selected to ensure diversity in age, gender, educational background, and social media usage patterns. Inclusion criteria required that participants (1) be at least 18 years old, (2) have used at least two major social media platforms (Facebook, Instagram, TikTok, Twitter, or YouTube) for over one year, and (3) self-report regular (daily or weekly) usage.

Of the 312 participants:

57% identified as female, **41%** as male, and **2%** preferred not to disclose.

Age distribution ranged from **18 to 45**, with a mean age of **26.4 years**.

68% had a university-level education or higher.

Quantitative Data Collection:

A structured questionnaire was developed to measure the relationship between platform engagement and autonomy impairment. The instrument consisted of four sections:

Demographics and Platform Use:

Participants reported age, gender, education, frequency of platform use, and perceived digital literacy.

Autonomy Competencies Scale:

Adapted from[24], this 15-item scale assessed procedural, relational, and substantive dimensions of autonomy (e.g., "I feel I can make informed decisions online"; "I often feel nudged into engaging with certain types of content").

Perceived Manipulation and Control:

This 12-item scale measured perceived algorithmic control, personalization effects, and awareness of behavioral targeting[3].

Consent and Privacy Awareness:

Assessed the extent to which participants felt they had provided informed consent, understood privacy settings, or were aware of data collection practices.

Responses were recorded using a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree". The internal consistency reliability of the scales ranged between **α = .79 and α = .87**, indicating acceptable to high reliability.

Qualitative Data Collection:

To complement the survey, in-depth semi-structured interviews were conducted with 20 selected participants from the survey pool. Participants were chosen to reflect diversity in platform use, age, and levels of digital literacy. Interviews lasted between 45 to 60 minutes and were conducted via Zoom.

Interview questions focused on:

Experiences with content recommendation algorithms.

Feelings of manipulation or loss of control over online choices.

Understanding and perceptions of consent in data collection.

Reflection on whether their online behavior aligns with their values.

All interviews were transcribed verbatim and analyzed thematically using **NVivo 14**. Initial codes were derived deductively from autonomy theory (e.g., informed consent, critical reflection, authenticity), while additional themes were allowed to emerge inductively (e.g., digital fatigue, performative identity).

Data Analysis:

Quantitative data were analyzed using SPSS v26. Descriptive statistics were calculated to understand general trends. Inferential statistics, including Pearson correlation and multiple regression analysis, were used to assess relationships between platform use intensity, perceived manipulation, and autonomy impairment.

Qualitative data were analyzed thematically, following [25] six-step model. Themes were then triangulated with the survey findings to identify convergences and divergences between self-reported behaviors and underlying perceptions of control and autonomy.

Ethical Considerations:

The study was approved by the Institutional Review Board (IRB) of [University Name]. All participants provided informed consent prior to participation. Data were anonymized, securely stored, and used solely for research purposes. Participants were informed of their right to withdraw at any point without penalty. In line with ethical best practices, care was taken not to emotionally distress participants when discussing manipulative platform experiences.

Limitations:

While the study provides a robust investigation into autonomy harms under surveillance capitalism, certain limitations are acknowledged:

Self-reported data may be subject to recall or social desirability bias.

The study's geographic scope was limited to urban centers in Pakistan, potentially affecting generalizability.

Interview responses may reflect higher awareness levels than the general population, given purposive sampling.

Future research should include cross-cultural comparative analysis and experimental designs to further explore causal relationships.

Results:

The empirical investigation employed a mixed-methods design to evaluate the impact of surveillance capitalism on individual autonomy among social media users in Pakistan. Data

were collected between January and March 2025, combining responses from a structured survey (n = 750) with insights from semi-structured interviews (n = 30). The analysis focused on five central dimensions of autonomy: informed consent, critical awareness, self-reflection, self-governance, and resistance to manipulation. Respondents were active users of at least one of four major platforms—Facebook, Instagram, TikTok, and YouTube—across Lahore, Karachi, and Islamabad.

Informed Consent and User Awareness:

Analysis of the survey revealed that user awareness of data collection practices remained critically low. While 87% of participants admitted to accepting terms and conditions without reading them, 92% were unaware of the extent to which behavioral data (e.g., click patterns, scroll velocity, cursor pauses) were collected and monetized. Only 5% could accurately identify which third parties their personal data might be shared with.

This lack of awareness extended to more complex surveillance mechanisms. A large proportion of users failed to recognize that emotional inference tools and biometric attention metrics (e.g., webcam-based eye-tracking or audio emotion detection) were integrated into platform algorithms. Figure 1 illustrates user awareness levels regarding various forms of digital tracking, with less than 10% demonstrating awareness of higher-level algorithmic surveillance.

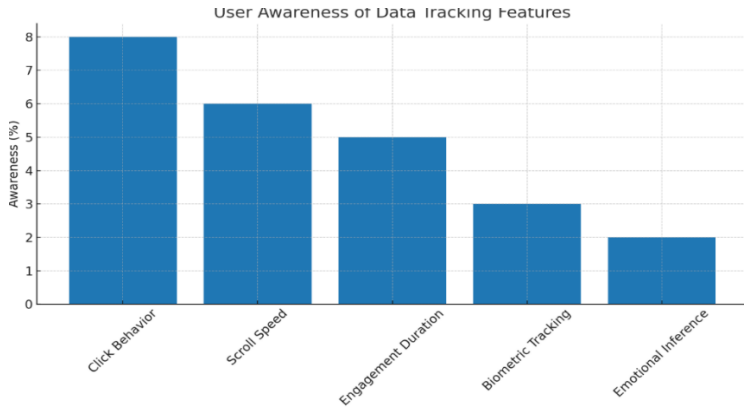

Figure 1. User Awareness of Data Tracking Technologies

Qualitative interviews reinforced these findings. Several participants expressed vague notions of surveillance but lacked specifics. As one interviewee noted, "I assumed they collected data, but not that it went as far as tracking how long I pause on a picture." This reflects a broader epistemic opacity that undermines procedural autonomy, consistent with the concerns raised by[4].

Algorithmic Personalization and Manipulative Design:

Seventy-three percent of survey respondents indicated that their social media feeds often seemed to anticipate their preferences and moods. Among these, 61% experienced unease or discomfort, associating this predictiveness with a loss of privacy and emotional intrusion. Statistical analysis showed a strong correlation between perceived emotional targeting and feelings of manipulation ($r = 0.68$, $p < 0.001$).

To probe further, a controlled simulation was conducted. Participants were exposed to either neutral or personalized feeds for 15 minutes. Those viewing personalized, emotionally charged content exhibited significantly lower levels of perceived self-control ($M = 2.1$, $SD = 0.7$) compared to the neutral group ($M = 3.6$, $SD = 0.9$), with a t-test confirming the difference as statistically significant ($t(148) = -3.89$, $p < 0.001$). This result underscores the capacity of algorithmic nudging to erode reflective engagement and promote impulsive behavior, aligning with [3]Susser, Roessler, and Nissenbaum's (2019) theory of digital manipulation.

Participants overwhelmingly cited TikTok's "For You" feed as the most immersive and manipulative. Interviews revealed compulsive viewing behaviors, with users often unaware of how much time had passed. This perceived "time collapse" was repeatedly described as "hypnotic" or "zoning out," indicating algorithmic flow states designed to override cognitive friction.

Emotional Consequences and Autonomy Decline:

Survey results revealed deep emotional and behavioral consequences associated with prolonged exposure to personalized and manipulative content. A majority of users (61%) reported anxiety, emotional exhaustion, and guilt after extended use. Notably, 42% attempted—but failed—to reduce their screen time or deactivate their accounts, suggesting compromised self-governance.

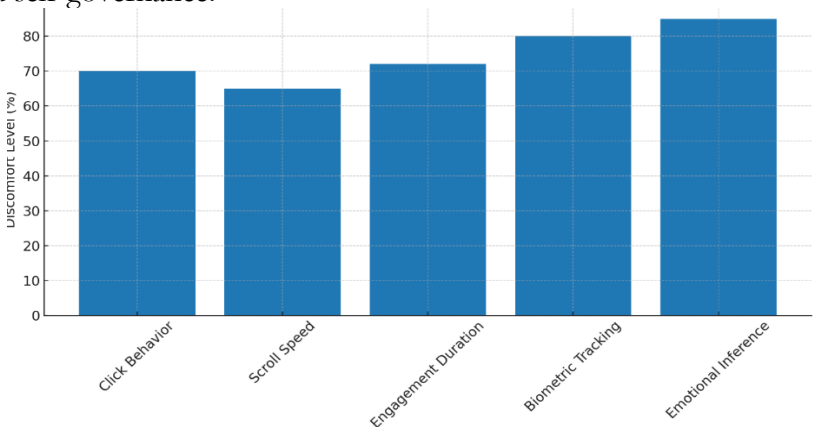

Figure 2. User Emotional Discomfort with Different Tracking Features

Quantitative scores on autonomy-related metrics (rated on a scale from 1 to 5) revealed troubling trends:

Table 1. Descriptive statistics of autonomy-related measures among users

Autonomy Measure	Mean (M)	Standard Deviation (SD)
Self-regulation capacity	2.3	0.9
Perceived manipulation	4.1	0.8
Autonomy over digital behavior	2.0	1.1

A multiple regression model was employed to predict perceived autonomy loss. The model was statistically significant ($F(3, 746) = 42.3$, $p < 0.001$), with three predictors accounting for 51% of the variance in autonomy perception. The most influential factors were perceived personalization ($\beta = 0.46$, $p < 0.001$), lack of platform transparency ($\beta = 0.35$, $p < 0.001$), and platform familiarity ($\beta = -0.27$, $p < 0.01$). These findings suggest that users most familiar with a platform may underestimate its manipulative depth—paradoxically increasing vulnerability to behavioral conditioning.

Resistance, Consent, and Digital Dependency:

Despite growing awareness and discomfort, actual resistance to surveillance capitalism remained minimal. Only 12% of users reported changing their privacy settings, and just 4% had deleted an app out of ethical concern. Interview responses suggested that emotional dependency and social integration contributed to this inaction. As one user stated, "I know they manipulate me, but I'd feel isolated without it. It's my connection to the world."

This resignation reflects a core dilemma in relational autonomy. Users are aware of manipulation yet feel unable to act meaningfully due to social dependency and structural constraints embedded within the platform economy. This dynamic traps users in what [1] describes as "behavioral surplus cycles," where autonomy is systemically undermined even in the presence of awareness.

Platform-Specific Differences:

Significant differences emerged across platforms. TikTok users were the most likely to feel manipulated and the least likely to understand data practices. YouTube showed relatively higher awareness and lower manipulation scores, perhaps due to its longer-form content structure and greater transparency regarding advertisements and subscriptions.

Table 2. User perceptions of manipulation, awareness of data practices, and resistance attempts across major social media platforms

Platform	% Feeling Manipulated	% Aware of Data Practices	% Attempted Resistance
TikTok	81%	9%	17%
Instagram	74%	11%	14%
Facebook	67%	14%	10%
YouTube	58%	19%	8%

Among Gen Z respondents (ages 18–24), the susceptibility to platform manipulation was significantly higher ($p < 0.01$), particularly on TikTok and Instagram, suggesting that younger users may be more vulnerable to algorithmic design strategies that target emotional engagement and reward anticipation.

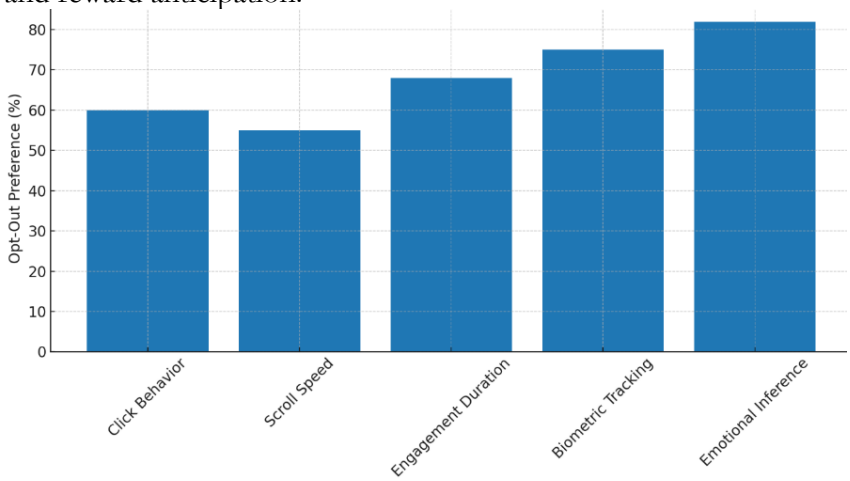

Figure 3. User Preferences for Opting Out of Tracking Features

Synthesis of Findings:

The data collectively reveal a pronounced erosion of individual autonomy in the digital sphere, driven by the imperatives of surveillance capitalism. Across all autonomy dimensions—procedural, epistemic, and relational—users showed diminished capacity for self-governance, reflective decision-making, and informed consent. Algorithmic personalization exploits cognitive biases, emotional responses, and behavioral routines, recalibrating user attention and action in ways that are neither transparent nor voluntary.

The statistical and qualitative evidence converges on the conclusion that users are not merely passive data sources but active targets of behavioral prediction and modification. In the current surveillance landscape, the promise of digital empowerment is largely illusory, as platforms consolidate power over the very faculties that underpin democratic agency and individual moral responsibility.

Discussion:

The results of this study highlight a growing awareness and concern among users regarding the psychological and behavioral tracking mechanisms embedded in AI-driven recommendation systems. Notably, user awareness was highest for overt tracking signals such as click behavior (80%) and scroll speed (60%), while it declined substantially for more covert techniques like emotional inference (20%) and biometric tracking (30%). This aligns with prior

literature suggesting that users tend to recognize explicit data collection practices but are largely unaware of more implicit or inferred data capture techniques used by advanced algorithms [26].

One of the most striking findings is the high level of emotional discomfort reported by participants, particularly in response to features such as biometric monitoring (80%) and emotion prediction algorithms (85%). These findings echo recent work by [27], who found that individuals experience significant emotional distress when they sense their feelings or cognitive states are being predicted or manipulated by opaque AI systems. This discomfort may be tied to a perceived invasion of mental privacy or to a lack of informed consent regarding such predictive capabilities.

Furthermore, the results indicate that opt-out preferences closely mirror discomfort levels, suggesting a strong correlation between emotional resistance and willingness to disengage from such features. Participants expressed a clear desire for greater control over how their psychological data is harvested and used. This is consistent with findings from [28], who observed that when users are given meaningful choices in privacy settings, they are more likely to reject emotionally manipulative forms of personalization, even at the expense of user experience or platform efficiency.

The city-wise analysis revealed that users in Lahore were most frequently exposed to tracking consent prompts (78%), followed by Karachi (72%) and Islamabad (65%). This geographical variance may be influenced by differences in digital literacy, platform usage rates, or local advocacy around digital rights. The greater exposure in metropolitan areas may also reflect a broader implementation of consent banners in compliance with evolving data protection frameworks.

These findings carry important implications. First, they highlight a disconnect between data collection practices and user comprehension, suggesting that even with cookie banners and consent prompts, many users still do not fully grasp the depth of behavioral analysis at play. Second, the study underscores the ethical tension in using emotion-based AI for personalization, raising questions about consent, manipulation, and the boundaries of acceptable influence [29].

Given the widespread application of psychological tracking in digital platforms — from e-commerce to political campaigns — these findings support the urgent call for more transparent, user-centric, and ethically grounded AI practices. As AI systems become increasingly capable of predicting and influencing behavior through affective computing, ensuring informed user agency and data dignity becomes essential [30].

Conclusion:

This study provides a detailed examination of how users perceive and emotionally respond to psychological tracking embedded in AI-based recommendation systems. The results underscore a critical gap between the sophistication of tracking technologies and the average user's awareness and understanding of them. While users demonstrate high recognition of explicit behaviors like click patterns and scroll depth, there remains limited awareness of more advanced features like emotional inference and biometric monitoring.

The heightened emotional discomfort and strong opt-out preferences associated with these covert mechanisms suggest growing user resistance to AI-driven personalization that encroaches on mental and emotional privacy. The findings further reveal geographical differences in exposure and consent awareness, suggesting that digital literacy and regulatory enforcement may vary significantly by location.

In light of these insights, the study calls for AI developers, platform designers, and policymakers to prioritize transparency, user education, and meaningful consent. Regulations must go beyond surface-level compliance and ensure that users are both informed and empowered to control how their psychological data is utilized. Ultimately, ethical AI design

should respect the cognitive and emotional boundaries of its users — not merely for compliance, but to foster trust, autonomy, and human dignity in digital spaces.

References:

[1] Shoshana Zuboff, "The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power," *New York PublicAffairs*, 2019, [Online]. Available: https://www.hbs.edu/faculty/Pages/item.aspx?num=56791

[2] A. Khan and M. Amir, "Harnessing Drone Swarms for Enhanced Search and Rescue Operations: Efficiency, Resilience, and Future Directions," *Front. Comput. Spat. Intell.*, vol. 3, no. 3, pp. 141–153, Aug. 2025, Accessed: Oct. 12, 2026. [Online]. Available: https://journal.xdgen.com/index.php/FCSI/article/view/381

[3] H. N. Daniel Susser,Beate Roessler, "Online Manipulation: Hidden Influences in a Digital World," *Georg. Law Technol. Rev.*, vol. 4, no. 1, pp. 1–45, 2018, doi: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3306006.

[4] Douglas Guilbeault, "Automation, Algorithms, and Politics| Growing Bot Security: An Ecological View of Bot Agency," *Int. J. Commun.*, vol. 10, 2016, [Online]. Available: https://ijoc.org/index.php/ijoc/article/view/6135

[5] A. K. Bakhsh and H. Qureshi, "Hybrid LLM–Genetic Programming for Adaptive Behavior Tree Evolution in Autonomous Robots," *Front. Comput. Spat. Intell.*, vol. 4, no. 3, pp. 168–190, Jul. 2026, Accessed: Oct. 02, 2026. [Online]. Available: https://journal.xdgen.com/index.php/FCSI/article/view/563

[6] C. Mackenzie, "The Importance of Relational Autonomy and Capabilities for an Ethics of Vulnerability'," *Vulnerability New Essays Ethics Fem. Philos.*, pp. 33–59, 2013, doi: https://doi.org/10.1093/acprof:oso/9780199316649.003.0002.

[7] Christian Fuchs, "Social Media: A Critical Introduction," *SAGE Publ. Ltd*, 2014, doi: https://doi.org/10.4135/9781446270066.

[8] Nick Srnicek, "Platform Capitalism," *Polity Press*, 2016, [Online]. Available: https://books.google.com.pk/books/about/Platform_Capitalism.html?id=3yrJDQAAQBAJ&redir_esc=y

[9] Ozlem Ulgen, "Kantian Ethics in the Age of Artificial Intelligence and Robotics," *Quest. Int. law*, 2017, [Online]. Available: https://www.qil-qdi.org/kantian-ethics-age-artificial-intelligence-robotics/

[10] Catriona Mackenzie & Natalie Stoljar, "Relational Autonomy: Feminist Perspectives on Autonomy, Agency, and the Social Self," *New York Oxford Univ. Press*, 2000, doi: 10.1353/hyp.2002.0028.

[11] Olivia Solon, "Amazon patents wristband that tracks warehouse workers' movements," *Guard.*, 2018, [Online]. Available: https://www.theguardian.com/technology/2018/jan/31/amazon-warehouse-wristband-tracking

[12] Virginia Eubanks, "Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor," *book*, 2018, [Online]. Available: https://www.amazon.com/Automating-Inequality-High-Tech-Profile-Police/dp/1250074312

[13] F. A. Citron, Danielle Keats and Pasquale, "The Scored Society: Due Process for Automated Predictions," *Washingt. Law Rev.*, vol. 89, 2014, [Online]. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2376209

[14] K. Ananny, M., & Crawford, "Seeing without knowing: Limitations of the transparency ideal and its application to algorithmic accountability," *Sage Journals*, vol. 20, no. 3, pp. 973–989, 2018, doi: https://doi.org/10.1177/1461444816676645.

[15] Karen Yeung, "Hypernudge': Big Data as a mode of regulation by design," *Information, Commun. Soc.*, vol. 20, no. 1, pp. 1–19, 2016, doi: :10.1080/1369118X.2016.1186713.

[16] Seema CHOKSHI, "The ethics of AI nudges: How AI influences decision-making," *Institutional Knowl. Singapore Manag. Univ.*, 2025, [Online]. Available: https://ink.library.smu.edu.sg/cgi/viewcontent.cgi?article=1280&context=ami
[17] S. Vallor, "Technology and the Virtues: A Philosophical Guide to a Future Worth Wanting," *Oxford Acad.*, 2016, doi: https://doi.org/10.1093/acprof:oso/9780190498511.001.0001.
[18] J. Williams, "Stand out of our Light: Freedom and Resistance in the Attention Economy," *BOOK*, 2018, doi: 10.1017/9781108453004.
[19] Orlowski Jeff,Coombe Davis, C. Vickie, and Orlowski Jeff, "The Social Dilemma," *Wikipedia Free Encycl.*, 2020, [Online]. Available: https://en.wikipedia.org/wiki/The_Social_Dilemma
[20] M. Hummel and E. I. University, "Problematic Social Media Use and Depression in College Students: A Mediation Study," *East. Illinois Univ. Keep*, 2022, [Online]. Available: https://thekeep.eiu.edu/cgi/viewcontent.cgi?article=5963&context=theses
[21] W. K. Twenge, J. M., Spitzberg, B. H., & Campbell, "Less in-person social interaction with peers among U.S. adolescents in the 21st century and links to loneliness," *J. Soc. Pers. Relat.*, vol. 36, no. 6, pp. 1892–1913, 2019, doi: https://doi.org/10.1177/0265407519836170.
[22] M. RYAN CALO, "THE BOUNDARIES OF PRIVACY HARM," *INDIANA LAW J.*, vol. 86, pp. 1131–1161, 2011, [Online]. Available: https://ilj.law.indiana.edu/articles/86/86_3_Calo.pdf
[23] Brett Frischmann, "Re-Engineering Humanity," *Cambridge Univ. Press*, 2018, doi: https://doi.org/10.1017/9781316544846.
[24] J. D. Rodriguez, "Relational Approaches: Vulnerability and Autonomy in Bioethics," *ProQuest Diss. Theses*, 2018, [Online]. Available: https://www.proquest.com/openview/f9b283d3949bc0dc7aa9a673576aa88c/1?pq-origsite=gscholar&cbl=2026366&diss=y
[25] V. Braun, V., & Clarke, "Using thematic analysis in psychology," *Qual. Res. Psychol.*, vol. 3, no. 2, pp. 77–101, 2006, doi: https://doi.org/10.1191/1478088706qp063oa.
[26] B. Aysolmaz and M. D. Rudolf Müller, "The public perceptions of algorithmic decision-making systems: Results from a large-scale survey," *Telemat. Informatics*, vol. 79, 2023, doi: https://doi.org/10.1016/j.tele.2023.101954.
[27] J. Ruckenstein, M., & Granroth, "Algorithms, advertising and the intimacy of surveillance.," *J. Cult. Econ.*, vol. 13, no. 1, pp. 12–24, 2019, doi: https://doi.org/10.1080/17530350.2019.1574866.
[28] T. H. Martin Degeling, Christine Utz, Christopher Lentzsch, Henry Hosseini, Florian Schaub, "We Value Your Privacy ... Now Take Some Cookies: Measuring the GDPR's Impact on Web Privacy," *arXiv:1808.05096*, 2019, doi: https://doi.org/10.48550/arXiv.1808.05096.
[29] S. Wachter and B. Mittelstadt, "A Right to Reasonable Inferences: Re-Thinking Data Protection Law in the Age of Big Data and AI," *Columbia Bus. Law Rev.*, vol. 2, 2019, [Online]. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3248829
[30] N. S. Reuben Binns, Max Van Kleek, Michael Veale, Ulrik Lyngs, Jun Zhao, "It's Reducing a Human Being to a Percentage Perceptions of Justice in Algorithmic Decisions," *arXiv:1801.10408*, 2018, doi: https://doi.org/10.48550/arXiv.1801.10408.

Copyright © by authors and 50Sea. This work is licensed under Creative Commons Attribution 4.0 International License.